STATE OF CALIFORNIA
California Environmental Protection Agency
AIR RESOURCES BOARD
ASD/BCGB-337 (NEW 10/2017)

GRANT AGREEMENT COVER SHEET

APPROVED AS TO FORM AND LEGALITY
March 4 2019
MICHAEL N. FEUER, City Attorney
By Assistant City Attorney

GRANT NUMBER: G17-ZNZE-10

NAME OF GRANT PROGRAM: Zero- and Near Zero-Emission Freight Facilities Project	
GRANTEE NAME: City of Los Angeles Harbor Department (Port of Los Angeles)	
TAXPAYER'S FEDERAL EMPLOYER IDENTIFICATION NUMBER: 95-6000735	TOTAL GRANT AMOUNT NOT TO EXCEED: $41,122,260.00
FISCAL GRANT TERM: FROM: March 1, 2019	TO: March 31, 2021
PROJECT PERFORMANCE PERIOD OF GRANT AGREEMENT: FROM: March 1, 2019	TO: June 30, 2021

This legally binding Grant Agreement, including this cover sheet and Exhibits attached hereto and incorporated by reference herein, is made and executed between the State of California, California Air Resources Board (CARB) and City of Los Angeles Harbor Department (Port of Los Angeles or the "Grantee").

Harbor Department
Agreement 19-3639
City of Los Angeles

Exhibit A – Grant Provisions
Exhibit B – Work Statement:
- Attachment I – Budget Summary
- Attachment II – Project Milestones and Disbursement Schedule
- Attachment III – Key Project Personnel

Exhibit C – Fiscal Year 2017-2018 Grant Solicitation Zero- and Near Zero-Emission Freight Facilities Project
Exhibit D –Grantee Application Package

This Agreement is of no force or effect until signed by both parties. Grantee shall not commence performance until it receives written approval from CARB.

The undersigned certify under penalty of perjury that they are duly authorized to bind the parties to this Grant Agreement.

California Air Resources Board	GRANTEE'S NAME (PRINT OR TYPE): City of Los Angeles Harbor Department (Port of Los Angeles)
SIGNATURE OF CARB'S AUTHORIZED SIGNATORY: Brandy Hunt	SIGNATURE OF GRANTEE (AS AUTHORIZED IN RESOLUTION, LETTER OF COMMITMENT, OR LETTER OF DESIGNATION): Eugene S. Seroka Mark Blevins For
TITLE: Administrative Services Branch Chief, CARB — DATE: 4/9/19	TITLE: Executive Director — DATE: 3/27/19
	GRANTEE'S ADDRESS (INCLUDE STREET, CITY, STATE AND ZIP CODE): 425 South Palos Verdes Street, San Pedro ,California 90731

CERTIFICATION OF FUNDING

AMOUNT ENCUMBERED BY THIS AGREEMENT: $41,122,260.00	FISCAL YEAR/PROGRAM: 2017/18 / 3510 2018/19 / 3510			FUND TITLE: *Greenhouse Gas Reduction Fund*
PRIOR AMOUNT ENCUMBERED FOR THIS AGREEMENT: $0.00	(OPTIONAL USE)			
TOTAL AMOUNT ENCUMBERED TO DATE: $41,122,260.00	ITEM: 3900-101-3228 ($31,122,260.00) 3900-101-3228 ($10,000,000.00)	CHAPTER: 254 30	STATUTE: 2017 2018	FISCAL YEAR: 2017/18 2018/19
	OBJECT OF EXPENDITURE: 6100-702-57207			

I hereby certify that the California Air Resources Board Budget Office acknowledges that budgeted funds are available for the period and purpose of the expenditure stated above.

SIGNATURE OF CALIFORNIA AIR RESOURCES BOARD BUDGET OFFICE: — DATE: 2/20/19

I hereby certify that the California Air Resources Board Legal Office has reviewed this Grant Agreement.

SIGNATURE OF CALIFORNIA AIR RESOURCES BOARD LEGAL OFFICE: — DATE: 2/21/19

TRANSMITTAL 1

EXHIBIT A

GRANT PROVISIONS

I. The parties agree to comply with the requirements and conditions contained herein, as well as all commitments identified in the Grant Solicitation for Zero- and Near Zero-Emission Freight Facilities Project (Exhibit C) and Grantee Application Package (Exhibit D).

II. The California Climate Investments logo and name serves to bring under a single brand the many investments whose funding comes from the Greenhouse Gas Reduction Fund (GGRF). The logo represents a consolidated and coordinated initiative by the State to address climate change by reducing greenhouse gases, while also investing in disadvantaged communities and achieving many other co-benefits. The Grantee agrees to acknowledge the California Climate Investments program as a funding source from CARB's Low Carbon Transportation program whenever projects funded, in whole or in part by this Agreement, are publicized in any news media, websites, brochures, publications, audiovisuals, or other types of promotional material. The acknowledgement must read as follows: 'This publication (or project) was supported by the "California Climate Investments" (CCI) program. Guidelines for the usage of the CCI logo can be found at www.arb.ca.gov/ccifundingguidelines

III. GRANT SUMMARY AND AMENDMENTS (IF APPLICABLE)

Project Title: Zero-Emission Freight "Shore to Store" Project

Funding Amount:[1] $ 41,122,260
Match Amount: $ 41,426,612

IV. GRANT PARTIES AND CONTACT INFORMATION

A. This grant is from the California Air Resources Board (hereinafter referred to as (CARB) to the City of Los Angeles Harbor Department (Port of Los Angeles) (hereinafter referred to as Grantee).

B. The CARB Project Liaison is Ryan Murano. Correspondence regarding this project must be directed to:

Ryan Murano
California Air Resources Board
Mobile Source Control Division
1001 I Street
Sacramento, California 95814
Phone: (916) 322-2383
E-mail: Ryan.Murano@arb.ca.gov

C. The Grantee Liaison is Jacob Goldberg. Correspondence regarding this project must be directed to:

Grantee Liaison: Jacob Goldberg
Title: Project Manager/Grant Administrator
Address: 425 South Palos Verdes Street
San Pedro, California 90731
Phone: 310-732-2675
Email: jgoldberg@portla.org

V. TIME PERIOD

A. CARB retains full discretion to consider all available information relating to California Environmental Quality Act (CEQA) compliance before determining whether to proceed forward with this grant agreement. **No work may be done by the grantee, nor will any funding be disbursed by CARB until CARB has affirmatively notified the grantee in writing that this provision has been satisfied.** If CARB decides not to proceed forward with this grant

[1] Budget Act of 2017, as amended by Assembly Bill 134 (for projects using FY17/18 LCT) OR Budget Act of 2017, as amended by Senate Bill 132 (for projects using Warehouse funds); and Budget Act of 2018, as amended by Senate Bill 856.

agreement under this provision, the agreement will be terminated immediately by CARB upon written notice to the grantee.

B. Performance of work or other expenses billable to CARB under this grant may commence after meeting conditions specified in Section V.A., signing and awarding of this grant. Performance on this grant ends once the Grantee has submitted the CARB approved final report or if the grant is terminated, whichever is earlier.

C. Upon completion of the project, the Grantee must submit a draft final report to the Project Liaison no later than **February 14, 2021** (see Section IX.D).

D. Final report and final request for payment must be received by CARB no later than **April 1, 2021** (see Section IX).

VI. SCOPE OF WORK

Description

A. This project will demonstrate ten Kenworth zero-emission Class 8 hydrogen fuel cell electric trucks, integrated with Toyota's fuel cell drive technology, along with the two hydrogen fueling stations that will be built by Equilon Enterprises LLC (d/b/a Shell Oil Products USA) (Shell) in Ontario and Wilmington. The hydrogen fuel cell electric trucks will be operated by the United Parcel Services, Total Transportation Services Inc., Southern Counties Express, and Toyota Logistics Services (TLS) throughout the Los Angeles basin ports, inland locations such as Riverside County, and the Port of Hueneme (POH). Additionally, POH will demonstrate two electric yard tractors, and TLS will demonstrate two zero-emission forklifts at their facility.

B. Additional Scope of Work detail is in Exhibit B Work Statement and Exhibit D Grantee Application Package Attachment B.

General Responsibilities

C. CARB is responsible for the following:

1. Participation in regular meetings with Grantee to discuss project refinements and guide the administration of the project.

2. Reviewing and approving project elements provided by Grantee, such as general vehicle and equipment design criteria, data collection and analysis.

3. Review and approve all grant disbursement requests (Form MSCD/ISB-90).

4. Provide project oversight in conjunction with Grantee.

5. Ensure compliance with applicable requirements of:

   a. Fiscal Year 2017-2018 Funding Plan for Clean Transportation Incentives (FY 2017-18 Funding Plan)

   b. Fiscal Year 2017-18 Clean Transportation Incentives Zero- and Near Zero-Emission Freight Facilities Project (Solicitation).

   c. Fiscal Year 2018-2019 Funding Plan for Clean Transportation Incentives (FY 2018-19 Funding Plan)

   d. Air Quality Improvement Program Guidelines

6. Maintaining adherence to the project timeline.

D. Grantee's responsibilities include all project development, press events, project administration, and project reporting, including the following tasks:

1. Grantee's key project personnel will participate in an initial Project Kick-Off meeting with CARB staff before work on the project begins. The purpose of the initial meeting will be to discuss the overall plan, details for performing the tasks, the project schedule, and any issues that may need to be addressed. Grantee's key personnel and data collector will also participate in review meetings to discuss progress to be held at least quarterly beginning three months after the initial Project Kick-Off meeting. Grantee may be asked to schedule additional meetings at the sole discretion of the CARB Project Liaison.

2. Regular project update meetings, to be held at least quarterly, more frequent meetings may be scheduled at the sole discretion of the CARB Project Liaison.

   a. Regular Project Meetings will have an Agenda with call-in information for all participants.

   b. Agenda will detail all the issues to be discussed during the Regular Project Update Meeting.

   c. Agenda will detail items that may cause the project to slip on the time schedule.

   d. The Regular Project Update Meetings will cover the project timeline and steps needed to maintain the project timeline.

e. The Regular Project Update Meetings will have discussion on what milestones and work plan tasks are expected to be completed before the next Regular Project Update Meeting.

f. Regular Project Update Meetings must include at a minimum the Grantee Liaison, representative from the data collection team and key project partners for any milestone that is behind schedule.

3. The Grantee must submit numbered status reports accompanying grant disbursement requests to CARB at least quarterly, but may submit on a monthly basis if necessary for more frequent disbursements with prior approval from CARB. These reports must be approved by CARB and must contain the following information, at a minimum, in either Microsoft Word or PDF, as a single electronic file:

   a. Project Status Report number, title of project, name of Grantee, date of submission, and project grant number.

   b. Summary of work completed since the last progress report, noting progress toward completion of tasks and milestones identified in the work plan.

   c. Statement of work expected to be completed by the next progress report.

   d. Notification of problems encountered and an assessment of their effects on the project's outcome.

   e. Data collected from vehicles, equipment and facilities since the last data reporting.

   f. Grantee must ensure that trucking fleets, equipment operators, freight facilities and technology manufacturers are flexible for the scheduling of the data logging installation, and data retrieval as needed.

   g. Itemized invoice showing all costs for which reimbursement is being requested.

   h. Discussion of the project's adherence to the project timeline.

4. A draft final report shall be provided to CARB for comments at least one month before the due date of the final report.

5. Ensure that project end-users are working with data collection provider.

VII. FISCAL ADMINISTRATION

Budget

A. The maximum amount of this grant is $41,122,260. Under no circumstance will CARB reimburse the Grantee for more than this amount. The budget for the project is shown in Exhibit B, Attachment I.

B. The project will include a cash-match and an in-kind match from private, eligible state, and local funding to leverage this grant, for a total project budget of $82,548,872.

C. Project implementation funding may be reallocated to project funds with prior written approval by CARB.

D. The Grantee Application package is incorporated by reference as part of the Grant Agreement. The Grantee application submitted will be the actual costs for the project and will not be amended due to faulty estimations, increases in costs due to inflation or other reasons that have not been covered in the budget.

E. Subject to prior written approval from CARB, line item shifts of up to ten percent of each milestone may be made over the life of the grant. Grantee can continue to work upon approval of line item shifts by CARB, and CARB will follow up with a formal amendment to the grant. Line item shifts may be proposed by either the State or the Grantee and must not increase the total grant amount.

Earned Interest

F. Earned interest means any interest earnings generated from grant funds held by Grantee in interest-bearing accounts.

1. Project funds are not required to be held in an interest bearing account. However, if interest is earned by Grantee on the project the earnings must be reported to CARB. All interest income on the Project funds must be reinvested in and used by the Project or returned to CARB. Grantee is responsible for reporting to CARB all project expenditures funded with interest earned on the Project funds.

2. Grantee must maintain accounting records (e.g., general ledger) that track interest earned, expended, or returned on the Project funds, as follows:

a. The calculation of interest must be based on an average daily balance or some other reasonable and demonstrable method.

b. Interest earned must ensure that it is separately identifiable from interest earned on non-Project funds.

c. The methodology for calculating earned interest must be consistent with how it is calculated for Grantee's other fiscal programs.

d. Earned interest must be fully expended or returned to CARB by completion of the project, submittal of the Final Report, or by **January 31, 2021**, whichever comes first.

e. Documentation of interest earned on the Project funds and expenditures made on those funds or returned to CARB must be:

   i. Retained for a minimum of three years after it is generated.

   ii. Provided to CARB in Status Reports and a Final Report.

Grant Disbursements

G. Requests for payment shall be made with the Grant Disbursement Request Form (Form MSCD/ISB-90) and conform to the instructions identified in the Fiscal Year 2017-18 Clean Transportation Incentives Zero- and Near Zero-Emission Freight Facilities Project Solicitation (Solicitation). Grant payments shall be made on a reimbursement basis and only for actual costs incurred by the Grantee for recurring milestones. Grant Payments shall be made upon achievement of discrete payable milestone as defined in Project Milestones and Disbursement Schedule (EXHIBIT B, Attachment II) and only when the Grantee has submitted a Grant Disbursement Request Form, milestones stipulated in Exhibit B, Attachment II and the instructions found in the Solicitation have been accomplished, documentation of accomplishment has been provided to CARB in the form of the Status Report, and any associated deliverables (if applicable) have been provided to CARB. CARB will have sole discretion to accelerate the timeline for allowable disbursements of administration and project funds identified in Exhibit B, Attachment II (with the exception of the final project administration disbursement), necessary to assure the goals of the project are met.

H. Grant payments are subject to CARB's approval of Status Reports and any accompanying deliverables (see Section IX Reporting). A payment will not be made if the CARB Project Liaison deems that a milestone has not been accomplished or documented, a deliverable meeting specifications has not been provided, claimed expenses are not documented, not valid per the

budget, or not reasonable, or the Grantee has not met other terms of the grant.

The Chief of the Mobile Source Control Division or designee of CARB may review the Project Liaison's approval or disapproval of a Grant Disbursement Request. No reimbursement will be made for expenses that, in the judgment of the Division Chief of the Mobile Source Control Division, are not reasonable or do not comply with the Grant Agreement.

I. The Grantee shall mail completed and signed Grant Disbursement Requests to the Project Liaison.

J. CARB retains the right to withhold payment of ten percent of administrative funds until completion of all work and submission of a Final Report to CARB. It is the Grantee's responsibility to submit a Grant Disbursement Request for this final disbursement of funds.

K. CARB shall disburse funds in accordance with the California Prompt Payment Act, Government Code, Section 927, et seq.

Oversight and Accountability

L. The Grantee shall comply with all oversight responsibilities identified in the Solicitation, Grantee Application Package, and this Grant Agreement.

M. CARB, or its designee, reserves the right to audit at any time during the duration of this grant the Grantee's costs of performing the grant and to refuse payment of any reimbursable costs or expenses that in the opinion of CARB or its designee are unsubstantiated or unverified. The Grantee shall cooperate with CARB or its designee including, but not limited to, promptly providing all information and documents requested, such as all financial records, documents, and other information pertaining to reimbursable costs, and any matching costs and expenses.

N. CARB or its designee may recoup funds which were received based upon misinformation or fraud, or for which a Grantee, manufacturer (including vehicle and equipment manufacturers), technology provider, or vehicle/equipment purchaser is in significant or continual non-compliance with the terms of this grant or State law. CARB also reserves the right to prohibit any entity from participating in the Zero- and Near Zero-Emission Freight Facilities Project due to non-compliance with project requirements or other CARB regulations.

VIII. PROJECT MONITORING

Meetings

A. Kick-Off meeting: A meeting will be held between key project personnel as defined in Exhibit B Attachment III Key Project Personnel and CARB staff before work on the project begins. The purpose of the first meeting will be to discuss the overall plan, details of performing the tasks, the project schedule, and any issues that may need to be resolved.

B. Review meetings: Meetings to discuss progress must be held at least quarterly beginning three months after the initial Project Kickoff Meeting. Additional meetings may be scheduled at the sole discretion of the CARB Project Liaison. Such meetings may be conducted by phone, if deemed appropriate by the CARB Project Liaison.

Technical Monitoring

C. Any changes in the scope or schedule for the project shall require the prior written approval of the CARB Project Liaison and may require an amendment to the Grant.

D. The Grantee shall notify the CARB Project Liaison in writing, immediately if any circumstances arise (technical, economic, or otherwise), which might place completion of the project in jeopardy. In addition, the Grantee shall also make such notification if there is a change in key project personnel (see Exhibit B, Attachment III).

E. The Grantee shall notify the CARB Project Liaison if the project technology will pursue official verification/certification during the term of this agreement and all documentation in support of the verification/certification must be submitted to CARB Project Liaison concurrently with the verification/certification submittal.

F. In addition to Status Reports (discussed in Section IX Reporting), the Grantee shall provide information requested by the Project Liaison that is needed to assess progress in completing tasks and meeting the objectives of the project.

G. Any change in budget allocations, re-definition of deliverables, or extension of the project schedule must be requested in writing to the CARB Project Liaison and approved by CARB, in its sole discretion, and may require a grant amendment.

IX. REPORTING

Status Reports

A. The Grantee will submit Status Reports at monthly intervals. The Status Reports shall be provided in a format agreed upon between the CARB Project Liaison and the Grantee and meet the requirements of the Solicitation.

B. Every Grant Disbursement Request Form (Form Number MSCD/ISB-90) shall be accompanied by a Status Report that documents the completion of a milestone(s) specified in Exhibit B, Attachment II.

C. If the project is behind schedule, the Status Reports must contain an explanation of reasons and a detailed explanation of how the Grantee plans to resume the schedule.

Final Report

D. When the project is complete, the Grantee shall submit a draft Final Report. The draft Final Report must be submitted to CARB in an appropriate format agreed upon between the CARB Project Liaison and the Grantee. Upon approval of the draft Final Report by the Project Liaison, the Grantee shall provide a written copy of the final version, plus an electronic file.

E. The Grantee must present, at CARB's sole discretion, the results of the project at a minimum two forums, symposiums, or other event to describe the project and the results. CARB will notify the Grantee at least 10 business days prior to event date.

X. TERMINATION AND SUSPENSION OF PAYMENTS

A. CARB reserves the right to terminate this grant upon thirty days' written notice to the Grantee, if CARB determines that the project has not progressed satisfactorily during the previous three months and the Grantee and CARB have been unable to agree on modifications. In case of early termination, the Grantee will submit a Grant Disbursement Request Form, a Status Report covering activities up to, and including, the termination date and following the requirements in Section IX of these provisions. Upon receipt of the Grant Disbursement Request Form and all Status Reports, a final payment will be made to the Grantee. This payment shall be for all CARB-approved, actual incurred costs that in the opinion of CARB are justified. The total amount paid shall not exceed the total grant amount.

B. CARB reserves the right to issue a grant suspension order in the event that a dispute should arise. The grant suspension order will be in effect until the dispute has been resolved or the grant has been terminated. If the Grantee

chooses to continue work on the project after receiving a grant suspension order, the Grantee will not be reimbursed for any expenditure incurred during the suspension in the event CARB terminates the grant. If CARB rescinds the suspension order and does not terminate the grant, CARB will reimburse the Grantee for any expenses incurred during the suspension that are reimbursable in accordance with the terms of the grant.

XI. CONTINGENCY PROVISION

In the event this grant is terminated for whatever reason, the CARB Executive Officer or designee reserves the right in his or her sole discretion to award a grant to the next highest scored applicant and if an agreement cannot be reached, to the next applicant(s) until an agreement is reached. If CARB is unable to award a grant under these circumstances, CARB may award a grant to other projects.

XII. PROJECT RECORDS

Grantee Record

A. As further described below, project records include but are not limited to Grantee, financial, and other records. All project records must be retained for a period of three (3) years after final payment under this Grant. All project records are subject to audit pursuant to the General Provisions Section (Section XIII) of this Grant Agreement. Upon completion of the third year of record retention, the Grantee shall submit all project records to CARB. Hardcopy of electronic records are suitable. Acceptable forms of electronic media include hard drives, compact discs, digital video discs and flash drives. Other forms of electronic media may be allowed based on prior written concurrence from CARB.

B. The Grantee shall retain a file for the Shore to Store Project containing, but not limited to:

1. Original executed copy of the Grant Agreement and Grant Agreement Amendments (if applicable);

2. Copies of Grant Disbursement Request Forms;

3. Documentation of earned interest generation and expenditure;

4. All Project Status Reports;

5. Invoices from project participants for reimbursable items; and

6. All other information that documents all aspects of the project.

C. Without limitation of the requirement to maintain project accounts in accordance with generally accepted accounting principles, the Grantee must:

1. Establish an official file for the Shore to Store Project, which shall adequately document all significant actions relative to the project.

2. Establish separate accounts, which will adequately and accurately depict all amounts received and expended on the Shore to Store Project.

3. Establish separate accounts, which will adequately and accurately depict all income received which is attributable to the Shore to Store Project, including cash and in-kind match.

4. Establish an accounting system, which will adequately depict final total costs of the Shore to Store Project, including both direct and indirect costs.

D. Other Records include all deliverables required in Exhibit B, Attachment II, of this Grant Agreement.

XIII. GENERAL PROVISIONS

A. **Amendment:** No amendment or variation of the terms of this Grant Agreement shall be valid unless made in writing, signed by the parties and approved as required. No oral understanding or agreement not incorporated in the Grant Agreement is binding on any of the parties.

B. **Assignment:** This grant is not assignable by the Grantee, either in whole or in part, without the consent of CARB in the form of a formal written amendment.

C. **Compliance with law, regulations, etc.:** The Grantee agrees that it will, at all times, comply with and require its contractors and subcontractors to comply with all applicable federal and State laws, rules, guidelines, regulations, and requirements.

D. **Conflict of interest:** The Grantee certifies that it is in compliance with applicable State and/or federal conflict of interest laws.

E. **Disputes:** The Grantee shall continue with the responsibilities under this Grant Agreement during any dispute. Grantee staff or management may work in good faith with CARB staff or management to resolve any disagreements or conflicts arising from implementation of this Grant Agreement. However, any disagreements that cannot be resolved at the

management level within 30 days of when the issue is first raised with CARB staff shall be subject to resolution by the CARB Executive Officer, or his designated representative. Nothing contained in this paragraph is intended to limit any rights or remedies that the parties may have under law.

F. **Environmental justice:** In the performance of this Grant Agreement, the Grantee shall conduct its programs, policies, and activities that substantially affect human health or the environment in a manner that ensures the fair treatment of people of all races, cultures, and income levels, including minority populations and low-income population of the State.

G. **Fiscal management systems and accounting standards:** The Grantee agrees that, at a minimum, its fiscal control and accounting procedures will be sufficient to permit tracing of grant funds to a level of expenditure adequate to establish that such funds have not been used in violation of State law or this Grant Agreement. Unless otherwise prohibited by State or local law, the Grantee further agrees that it will maintain separate Project accounts in accordance with generally accepted accounting principles.

H. **Force majeure:** Neither CARB nor the Grantee shall be liable for or deemed to be in default for any delay or failure in performance under this Grant Agreement or interruption of services resulting, directly or indirectly, from acts of God, enemy or hostile governmental action, civil commotion, strikes, lockouts, labor disputes, fire or other casualty, etc.

I. **Governing law and venue:** This grant is governed by and shall be interpreted in accordance with the laws of the State of California, CARB and the Grantee hereby agree that any action arising out of this Grant Agreement shall be filed and maintained in the Superior Court in and for the County of Sacramento, California, or in the United States District Court in and for the Eastern District of California. The Grantee hereby waives any existing sovereign immunity for the purposes of this Grant Agreement.

J. **Indemnification:** The Grantee agrees to indemnify, defend, and hold harmless the State and the Board and its officers, employees, agents, representatives, and successors-in-interest against any and all liability, loss, and expense, including reasonable attorneys' fees, from any and all claims for injury or damages arising out of the performance by the Grantee, and out of the operation of equipment that is purchased with funds from this Grant Award.

K. **Grantee's responsibility for work:** The Grantee shall be responsible for work and for persons or entities engaged in work, including, but not limited to, contractors, subcontractors, suppliers, and providers of services. The Grantee shall be responsible for any and all disputes arising out of its contract for work on the Project, including but not limited to payment disputes with

contractors, subcontractors, and providers of services. The State will not mediate disputes between the Grantee and any other entity concerning responsibility for performance of work.

L. **Independent Contractor:** The Grantee, and its agents and employees, if any, in their performance of this Grant Agreement, shall act in an independent capacity and not as officers, employees, or agents of CARB.

M. **Nondiscrimination:** During the performance of this Grant Agreement, the Grantee and its third party entities shall not unlawfully discriminate, harass, or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, physical disability (including HIV and AIDS), mental disability, medical condition (e.g., cancer), age (over 40), marital status, and denial of family care leave. The Grantee and its third party entities shall insure that the evaluation and treatment of their employees and applicants for employment are free from such discrimination and harassment. The Grantee and its third party entities shall comply with the provisions of the Fair Employment and Housing Act (Gov. Code §12990 (a-f) et seq.) and the applicable regulations promulgated thereunder (California Code of Regulations, Title 2, Section 7285 et seq.). The applicable regulations of the Fair Employment and Housing Commission implementing Government Code Section 12990 (a-f), set forth in Chapter 5 of Division 4 of Title 2 of the California Code of Regulations, are incorporated into this Agreement by reference and made a part hereof as if set forth in full. The Grantee and its third party entities shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement.

The Grantee shall include the nondiscrimination and compliance provisions of this clause in all subcontracts to perform work under this Grant Agreement

N. **No third party rights:** The parties to this Grant Agreement do not create rights in, or grant remedies to, any third party as a beneficiary of this Grant Agreement, or of any duty, covenant, obligation or undertaking establish herein.

O. **Prevailing wages and labor compliance:** If applicable, the Grantee agrees to be bound by all the provisions of State Labor Code Section 1771 regarding prevailing wages. If applicable, the Grantee shall monitor all agreements subject to reimbursement from this Grant Agreement to ensure that the prevailing wage provisions of State Labor Code Section 1771 are being met.

P. **Professionals:** For projects involving installation or construction services, the Grantee agrees that only licensed professionals will be used to perform services under this Grant Agreement where such services are called for and licensed professionals are required for those services under State law.

Q. **Severability:** If a court of competent jurisdiction holds any provision of this Grant Agreement to be illegal, unenforceable or invalid in whole or in part for any reason, the validity and enforceability of the remaining provisions, or portions of those provisions, will not be affected.

R. **Termination:** CARB may terminate this Grant Agreement by written notice at any time prior to completion of projects funded by this Grant Agreement, upon violation by the Grantee of any material provision after such violation has been called to the attention of the Grantee and after failure of the Grantee to bring itself into compliance with the provisions of this Grant Agreement.

S. **Timeliness:** Time is of the essence in this Grant Agreement. Grantee shall proceed with and complete the Project in an expeditious manner.

T. **Waiver of Rights:** Any waiver of rights with respect to a default or other matter arising under the Grant Agreement at any time by either party shall not be considered a waiver of rights with respect to any other default or matter. Any rights and remedies of the State provided for in this Grant Agreement are in addition to any other rights and remedies provided by law.

U. **Availability of funds:** CARB's obligations under this Grant Agreement are contingent upon the availability of funds. In the event funds are not available, the State shall have no liability to pay any funds whatsoever to the Grantee or to furnish any other considerations under this Grant Agreement.

V. **Ownership:** All information or data received or generated by the Grantee under this agreement shall become the property of CARB. No information or data received or generated under this agreement shall be released without CARB's approval. Notwithstanding the above, in the event Grantee is required by deposition, interrogatory, subpoena, or request for documents under the Public Records Act to disclose information or data received or generated under this agreement, Grantee shall provide CARB a prompt written notice prior to disclosure.

W. **Audit:** Grantee agrees that CARB, the Department of General Services, Department of Finance, the Bureau of State Audits, or their designated representative shall have the right to review and to copy any records and supporting documentation pertaining to the performance of this Grant and all State funds received. Grantee agrees to maintain such records for possible audit for a minimum of three (3) years after the term of this Grant is completed, unless a longer period of records retention is stipulated. Grantee agrees to allow the auditor(s) access to such records during normal business hours and to allow interviews of any employees who might reasonably have information related to such records.

Further, Grantee agrees to include similar right of the State to audit records and interview staff in any subgrant or subcontract related to performance of this Agreement.

This page left intentionally blank

EXHIBIT B

Work Statement

Budget Summary (Attachment I)
Project Milestones and Disbursement Schedule (Attachment II)
Key Project Personnel (Attachment III)

This page intentionally left blank.

EXHIBIT B, Attachment I

Budget Summary

Grantee: City of Los Angeles Harbor Department (Port of Los Angeles)
Grant No.: G17-ZNZE-10

Project: Zero-Emission Freight "Shore to Store" Project

Total Costs & Funding

Costs	Grant	Applicant Match Funding		Total
	Cash	Cash	In-Kind	
1. Demonstration Technology Funds	$41,122,260	$14,297,281	$27,129,331	$82,548,872
2. Administrative Funds	$0.00	$0.00	$0.00	$0.00
Total	$41,122,260	$14,297,281	$27,129,331	$82,548,872

This page intentionally left blank.

EXHIBIT B, Attachment II

Project Milestones and Disbursement Schedule

Grantee: City of Los Angeles Harbor Department (Port of Los Angeles) Grant No.: G17-ZNZE-10

Project: Zero-Emission Freight "Shore to Store" Project

Task	Task Description	Task Deliverables	Project Funding		Match Funding		Total	DUE DATE
			Project	Admin	Cash	In-Kind		
Task 1.0 Administrative and Project Management								
Task 1.1 - Execute Grant Agreement								
1.1.1	Execute Subcontracts – provide copies of subcontracts to CARB	N/A	$0	$0	$0	$0	$0	Jun-19
1.1.2	Verified Completed CEQA		$0	$0	$0	$0	$0	Feb-19
1.1.3	Signed Grant Agreement		$0	$0	$0	$0	$0	Feb-19
Task 1.2 - CEC Funded Projects	**Provide copies of executed Agreements to CARB**	Executed Agreements	**$0**	**$0**	**$0**	**$25,999,331**	**$25,999,331**	**Feb-19**
Task 1.3 - Quarterly Reports	**Quarterly Reports**	Quarterly reports	**$0**	**$0**	**$0**	**$0**	**$0**	**Ongoing**
Task 1.4 - Final Report	**Final Report**	Final Report	**$100,000**	**$0**	**$0**	**$0**	**$100,000**	**Mar-21**
Task 2.0 Design, Construction, and Commissioning of Hydrogen Infrastructure								
2.1	Hydrogen Refueling Station in Ontario	Final photos, commissioning	$9,250,000	$0	$0	$0	$9,250,000	May-20

Task	Task Description	Task Deliverables	Project Funding		Match Funding		Total	DUE DATE
			Project	Admin	Cash	In-Kind		
		report including proof of operation						
2.2	Hydrogen Refueling Station in Wilmington	Final photos, commissioning report including proof of operation	$7,850,000	$0	$1,400,000	$0	$9,250,000	Jun-20
Task 3.0 Truck Fleet Design, Build, and Support								
3.1	Vehicle Design / Build / Validation Units #1 - #5	Internal tests report, proof of delivery and operation	$9,500,000	$0	$5,810,000	$0	$15,310,000	Jul-19
3.2	Design Updates / Build / Validation Units #6 - #10	Internal tests report, proof of delivery and operation	$8,830,000	$0	$4,810,000	$0	$13,640,000	Jun-20
3.3	Demonstration Readiness / Vehicle Operation & Support	Final Engineering Documentation, Ongoing Manufacturer Support report	$2,100,000	$0	$200,000	$0	$2,300,000	Jan-21
Task 4.0 Yard Tractors and Charging Infrastructure								
4.1	Engineering and Design - Infrastructure	Final design report	$100,000	$0	$0	$100,000	$200,000	Jun-19
4.2	Infrastructure Bid Process	Issued RFP, final scores and selection summary	$0	$0	$0	$0	$0	Aug-19
4.3	Utility Permitting and Construction	Final Permits, Overall Construction plan	$250,000	$0	$0	$0	$250,000	Jun-20

Task	Task Description	Task Deliverables	Project Funding		Match Funding		Total	DUE DATE
			Project	Admin	Cash	In-Kind		
4.4	Site Construction and Commissioning	Final photos, commissioning report	$2,050,000	$0	$0	$100,000	$2,150,000	Aug-20
4.5	Yard Truck Delivery	Photos of delivered tractors, written notice of first operation	$600,000	$0	$0	$0	$600,000	Aug-20
Task 5.0 Technology Demonstrations								
Task 5.1 - Truck Demonstration								
5.1.1	Operation of Phase 1 Trucks	Test plan prior to beginning of each demonstration, Collected data provided in Status Reports.	$0	$0	$1,531,848	$0	$1,531,848	**Jan-21**
5.1.2	Operation of Phase 2 Trucks		$0	$0	$545,433	$930,000	$1,475,433	**Jan-21**
Task 5.2 - Yard Tractor Demonstrations	**Demonstration of 2 Yard Tractors at POH**		**$0**	**$0**	**$0**	**$0**	**$0**	**Jan-21**
Task 5.3 - Forklift Demonstration	**Forklift Demonstration at Toyota Warehouse**		**$0**	**$0**	**$0**	**$0**	**$0**	**Jan-21**
Task 6.0 Data Collection and Analysis								
6.1	Data Collection	Data collection plan	$193,794	$0	$0	$0	$193,794	Jun-19
6.2	Data Analysis, Ongoing	Data included in Quarterly Reports (Task 1.3)	$131,630	$0	$0	$0	$131,630	Mar-21
6.3	Advanced Data Analytics	Analytics included in Final Report (Task 1.4)	$166,836	$0	$0	$0	$166,836	Mar-21
	TOTAL		$41,122,260	$0	$14,297,281	$27,129,331	$82,548,872	

*CARB will not reimburse for Final Report until approval of Final Report

This page intentionally left blank.

EXHIBIT B, Attachment III

Key Project Personnel

Grantee: City of Los Angeles Harbor Department (Port of Los Angeles) Grant No.: G17-ZNZE-10

Project: Zero-Emission Freight "Shore to Store" Project

Name	Organization	Position	Duties
Christopher Cannon	Port of Los Angeles	Chief Sustainability Officer	Project Director – Provides overall leadership and executive oversight for the project.
Jacob Goldberg	Port of Los Angeles	Environmental Specialist	Project Manager/Grant Administrator– Manages the project and oversees grant administrative duties and coordination with ARB throughout the project.
Tim DeMoss	Port of Los Angeles	Marine Environmental Supervisor	Technology Demonstration Lead – Oversees and coordinates technology demonstration partners' participation in the project.
Oliver Bishop	Shell	General Manager Hydrogen	Overall responsibility for the success of the hydrogen infrastructure deployment.
Wayne Leighty, MBA, PhD	Shell	Hydrogen Business Development Manager, North America	Accountable for hydrogen business development in North America.

Name	Organization	Position	Duties
Mark Brown	Kenworth Truck Company	Executive Program Manager – Advanced Technologies	Program Management, Budget, Schedule and Reporting Responsibility.
John Luoma	Kenworth Truck Company	Assistant Chief Engineer	Technical Responsibility and Resource Management.
Andrew Lund	Toyota Motor North America	Chief Engineer	Oversee the research and development activities of the fuel cell electric truck project.
Tak Yokoo	Toyota Motor North America	Senior Executive Engineer	Responsible for product development and execution for fuel cell powertrain system development.
Aaron Harris	Air Liquid	Technical Director, Hydrogen Energy	Will serve as the lead technical contact for the Air Liquide stations.
Christina Birdsey	Port of Hueneme	Chief Operations Officer	Oversee the Port's overall project status and implementation.
Giles Pettifor	Port of Hueneme	Environmental Manager	Coordinate with CARB and Port of LA on overall project status and management. He will work with the EV yard tractor vendor on coordinating delivery and timing.
Kenneth Kelly	National Renewable Energy Laboratory	Team Leader, Commercial Vehicle Technologies	Data analysis program management and technical oversight.

Name	Organization	Position	Duties
Jason Lustbader	National Renewable Energy Laboratory	Senior Research Engineer	Project management, technical leadership, and planning.
Matt Miyasato, PhD	South Coast Air Quality Management District	Deputy Executive Officer for Science & Technology Advancement	Technical Advisor – Development and commercialization of clean air technologies. SCAQMD is also providing co-funding in the form of cash match.
Jesse Marquez	Community for a Safe Environment	Executive Director	Community Advisor

EXHIBIT C

2017-2018 GRANT SOLICITATION

Zero- and Near Zero-Emission Freight Facilities Project

Mobile Source Control Division
California Air Resources Board
March 21, 2018

CALIFORNIA CLIMATE INVESTMENTS
Cap and Trade Dollars at Work

CALIFORNIA AIR RESOURCES BOARD

This page left intentionally blank.

2017-2018 GRANT SOLICITATION

Zero- and Near Zero-Emission Freight Facilities Project

Mobile Source Control Division
California Air Resources Board
March 21, 2018

CALIFORNIA CLIMATE INVESTMENTS
Cap and Trade Dollars at Work

CALIFORNIA AIR RESOURCES BOARD

This page intentionally left blank.

California Air Resources Board

Zero- and Near Zero-Emission Freight Facilities Project

March 21, 2018

Table of Contents

I. SUMMARY 1
II. BACKGROUND 2
III. NEED FOR EMISSION REDUCTIONS FROM ON FREIGHT ACTIVITIES 4
IV. OVERVIEW OF CURRENT VEHICLE AND EQUIPMENT TECHNOLOGIES 5
V. AVAILABLE FUNDING 7
VI. REQUIRED MATCHING FUNDS 8
VII. ELIGIBLE GRANTEES 10
VIII. RESPONSIBILITIES OF GRANTEE, TECHNOLOGY MANUFACTURER AND DATA COLLECTOR 11
IX. ELIGIBLE PROJECTS 13
X. SCOPE OF WORK 17
XI. PROPRIETARY INFORMATION AND INTELLECTUAL PROPERTY 21
XII. APPLICATION REQUIREMENTS 22
XIII. APPLICATION INSTRUCTIONS 23
XIV. APPLICANT TELECONFERENCE 25
XV. EVALUATION, SCORING, AND PRELIMINARY SELECTION 25
XVI. GRANTEE SELECTION 36
XVII. IMPLEMENTATION PROCESS 37
XVIII. ADMINISTRATION 39

APPLICATION Appendix A

ZERO- AND NEAR-ZERO EMISSION FREIGHT FACILITIES PROJECT SAMPLE GRANT AGREEMENT Appendix B

HYDROGEN REFUELING STATION REQUIREMENTS Appendix C

METHODOLOGY FOR DETERMINING EMISSION REDUCTIONS AND COST-EFFECTIVENESS Appendix D

CALIFORNIA ENVIRONMENTAL QUALITY ACT COMPLIANCE AND PERMITTING REQUIREMENTS Appendix E

DATA COLLECTION REQUIREMENTS Appendix F

This page intentionally left blank.

I. SUMMARY

The California Air Resources Board (CARB or Board) is soliciting for several Grantees to implement and administer projects eligible for the Zero- and Near Zero-Emission Freight Facilities Project (Freight Facilities Project) under the Fiscal Year 2017-18 Funding Plan for Clean Transportation Incentives (FY 2017-18 Funding Plan).[1] Total funding for this project includes up to $100 million from the FY 2017-18 Low Carbon Transportation Allocation[2] and $50 million from the Trade Corridor Enhancement Account (TCEA).[3] It is anticipated that up to $150 million will be available under this Solicitation for the Freight Facilities Project and at least $50 million of the total funding will be spent directly on zero- and near zero-emission warehouses, as required under Senate Bill (SB) 132.[4]

CARB's goal under the Zero-and Near-Zero Emission Freight Facility Project solicitation is to support bold, transformative emission reduction strategies that can be emulated throughout freight facilities statewide. These projects will holistically reduce greenhouse gas (GHG)[5], criteria pollutant[6], and toxic air contaminant[7] emissions in and around freight facilities and to provide economic, environmental, and public health benefits to disadvantaged and low-income communities.[8] As such, a wide variety of zero- and near zero-emission heavy-duty vehicles and off-road equipment, supporting fueling infrastructure, as well as other facility and efficiency improvements that reduce these emissions facility-wide are eligible for funding. Freight facilities, for the purpose of this Solicitation, include warehouses, distribution centers, seaports, freight airports, intermodal rail yards, cold storage warehouses, rail yard, ports of entry, and other freight facilities. Projects funded under this solicitation can support both pre-commercial technologies that are not offered for sale into the market place as well those commercial technologies that have already been deployed into the marketplace. More details on eligible components can be found in Section IX Eligible Projects. All work shall be completed by April 15, 2021. Specific tasks are outlined within this Solicitation. Applications are due to CARB no later than **5:00 p.m., July 19, 2018**.

---

[1] The FY 2017-18 Funding Plan is available at https://www.arb.ca.gov/msprog/aqip/fundplan/1718_draft_funding_plan_workshop_100417.pdf

[2] Of the $540 million appropriated for Low Carbon Transportation Projects in Assembly Bill (AB) 134 (Committee on Budget, Chapter 254, Statutes of 2017), $140 million was allocated for Freight Equipment Advanced Demonstration and Pilot Commercial Deployment Projects. The FY 2017-18 Funding Plan allocated $100 million of this amount to this freight facilities project and $40 million to the Zero-Emission Off-Road Freight Voucher Incentive Project, which will be solicited at a later date.

[3] CARB was appropriated $50 million for a new Zero- and Near Zero-Emission Warehouse Program in SB 132 (Committee on Budget and Fiscal Review, Chapter 7, Statutes of 2017) and was included as part of the FY 2017-18 Funding Plan, per SB 108.

[4] Ibid.

[5] For purposes of this solicitation, please refer the definition of greenhouse gases found at the CARB website: https://www.arb.ca.gov/cc/inventory/background/ghg.htm

[6] For purposes of this solicitation, please refer the definition of criteria pollutants found at the CARB website: https://ww2.arb.ca.gov/resources/california-ambient-air-quality-standards

[7] For purposes of this solicitation, please refer the definition of toxic air contaminants found at the CARB website: https://www.arb.ca.gov/toxics/id/taclist.htm

[8] Disadvantaged communities, as identified by the California Environmental Protection Agency, are available at http://www.calepa.ca.gov/EnvJustice/GHGInvest/.

This Solicitation utilizes the process established under the Assembly Bill 118 (AB 118) Air Quality Improvement Program (AQIP), with project funds coming from two sources: the Cap-and-Trade auction proceeds deposited into the Greenhouse Gas Reduction Fund (GGRF) as part of the California Climate Investments (CCI) and funds deposited into the TCEA. The project is intended to fund a wide array of technologies that further the purposes of AB 32 (Nunez, Chapter 488, Statues of 2006) and the more recent SB 32, which codified a 2030 GHG emissions reduction target of 40 percent below 1990 levels[9], and SB 1 (Beall, Chapter 5, Statutes of 2017). This competitive Solicitation is open to local air districts or other California-based public agencies and California-based non-profit organizations that demonstrate the requisite administrative and technical expertise in overseeing large scale advanced technology deployments.

II. BACKGROUND

In 2007, the *California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007* (AB 118, Statutes of 2007, Chapter 750) was signed into law. AB 118 created AQIP, a voluntary incentive program administered by CARB, to fund clean vehicle and equipment projects, air quality research, and workforce training.

As required in Health and Safety Code (HSC) Section 44274(a), the Board adopted regulatory guidelines in 2009 for AQIP. The AQIP Guidelines (Guidelines)[10] define the overall administrative requirements, policies, and procedures for program implementation based on the framework established in statute. Central to the Guidelines is the requirement for a Board-approved annual funding plan developed with public input. The funding plan is each year's blueprint for expending Clean Transportation Incentive funds appropriated to CARB in the annual State Budget. The funding plan focuses funds on supporting development and deployment of the advanced technologies needed to meet California's longer-term, post 2020 air quality goals.

In 2012, the Legislature passed, and Governor Brown signed into law, three bills – AB 1532 (Pérez, Chapter 807), SB 535 (De León, Chapter 830), and SB 1018 (Budget and Fiscal Review Committee, Chapter 39) that established GGRF to receive Cap-and-Trade auction proceeds and to provide the framework for how the auction proceeds will be administered in furtherance of the purposes of AB 32 including supporting long-term, transformative efforts to improve public health and develop a clean energy economy. The suite of implementing legislation offers strong direction for investing a portion of the auction proceeds to benefit disadvantaged communities, including specific allocation requirements in SB 535 and bolstered by AB 1550 (Gomez, Chapter 369, Statutes of 2016).

---

[9] SB 32 can be found at https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB32

[10] The Guidelines for the AB 118 Air Quality Improvement Program are available at www.arb.ca.gov/msprog/aqip/aqip.htm.

In 2014, the Legislature appropriated nearly $200 million dollars in GGRF monies to establish a Low Carbon Transportation GGRF program that CARB is implementing in coordination with the AQIP AB 118 programs. Projects funded by the Low Carbon Transportation GGRF program must reduce GHG emissions and further the purposes of AB 32, with a strong emphasis on benefiting disadvantaged communities.

In order to identify the priority investments that facilitate GHG emission reductions, the legislature directed the development of the Cap-and-Trade Auction Proceeds Investment Plan (Investment Plan).[11] The second 3-year Investment Plan, which was released in January 2016, calls for projects that support the large-scale deployment of alternative technologies, such as zero- and near zero-emission vehicles, to help achieve the State's near-term and longer-term GHG emission reduction goals. In 2016, AB 1550 revised SB 535 requirements, increasing the percent of the State's auction proceeds that must be invested within disadvantaged communities and adding new requirements to direct additional investments to low-income communities and low-income households. AB 1550 requires at least 25 percent of auction proceeds be invested for projects within and benefiting disadvantaged communities; 5 percent for projects within and benefiting low-income communities or benefiting low-income households statewide; and 5 percent for projects within and benefiting low-income communities, or low-income households, that are within ½ mile of a disadvantaged community. These communities are identified by the California Environmental Protection Agency (CalEPA).[12]

In 2017, SB 1 established the TCEA, which will provide approximately $300 million per year in state funding for projects that more efficiently enhance the movement of goods along corridors that have a high freight volume. Additionally in 2017, SB 132 directed a one-time appropriation of $50 million dollars to CARB to advance implementation of zero- and near zero-emission warehouses and technology., Further, SB 108 the directed those dollars to be spent through the established AQIP funding process.

Because California's goals for the investment of GGRF monies are consistent with the established objectives of AQIP, and because of the past success of AQIP structure, staff combined the two funding sources (AQIP and Low Carbon Transportation GGRF Investments) into one FY 2017-18 Funding Plan. Staff also included the allocation from the TCEA, per the direction of AB 108.

---

[11] The Cap-and-Trade Auction Proceeds Investment Plan is available at http://www.arb.ca.gov/cc/capandtrade/auctionproceeds/auctionproceeds.htm.

[12] The identified Disadvantaged Communities census tracts are available at http://www.calepa.ca.gov/EnvJustice/GHGInvest/.

This Solicitation is also supportive of Executive Order B-32-15, which directed the development of the California Sustainable Freight Action Plan.[13] This action plan was released July 29, 2016, and includes three main targets:

- Zero-Emission Technology Target – Deploy over 100,000 freight vehicles and equipment capable of zero-emission operation and maximize near zero-emission freight vehicles and equipment powered by renewable energy by 2030.

- System Efficiency Target – Improve freight system efficiency 25 percent by increasing the value of goods and services produced from the freight sector, relative to the amount of carbon that it produces by 2030.

- Competitiveness and Economic Target – Establish a target(s) for increased State competitiveness and future economic growth within the freight and goods movement industry.

In December 2017, the Board approved the Fiscal Year 2017-18 Funding Plan, which identified projects that both provide immediate emission reductions from the vehicles and/or equipment directly funded and, more importantly, set the stage for greater, indirect reductions in the future by accelerating large-scale market penetration and technology transfer to other sectors. The foundation for the Freight Facilities Project solicitation was established with this plan and will support technology evolution through three phases of technology advancement: demonstration, commercialization, and transition to widespread deployment.

III. NEED FOR EMISSION REDUCTIONS FROM ON FREIGHT ACTIVITIES

The movement of freight within, and through California's regional centers relies predominately on the use of diesel-fueled heavy-duty vehicles and a multitude of equipment types. Freight activity is a large source of GHG, criteria pollutant, and toxic air contaminant emissions. Since these vehicles and equipment types operate at ports, railyards and warehouse districts as part of their normal activities, large amounts of oxides of nitrogen (NOx) and diesel particulate matter (PM) emissions significantly impact nearby communities. Reducing emissions from these activities is not only necessary to meet federally imposed clean air standards but also to reduce adverse health effects from their emissions– especially in disadvantaged communities.

The continued development and demonstration of advanced technologies (zero-emission and near zero-emission) is necessary in order to meet California's long-term GHG emission reduction goals, protect public health, and reach attainment with increasingly more stringent federal air quality standards. Projects selected under this Solicitation to demonstrate advanced technologies should be able to provide a significant reduction in GHG emissions and improve air quality for many affected areas within the State when the technology is fully integrated into the marketplace. Selected

[13] CARB et al. California Sustainable Freight Action Plan; July 2016; http://www.casustainablefreight.org/theplan.html

projects should be a model to other such freight facilities to adopt demonstrated strategies and technologies magnifying the future emission reduction potential of wide scale adoption.

IV. OVERVIEW OF CURRENT VEHICLE AND EQUIPMENT TECHNOLOGIES

There are a variety of advanced, emission-reducing technologies applicable to heavy-duty on-road trucks and off-road equipment that meet the objectives of this Solicitation, ranging from those currently commercially available, to those that have the potential to be expanded into new applications, to those that have surpassed the research and development phase, but have not yet been introduced into the marketplace. Understanding the current status of technologies for this solicitation is important because a technology hierarchy will be used to determine if the vehicle or piece of equipment is eligible for funding. This technology hierarchy is described in more detail in Section IX, Eligible Projects.

In Part II of the FY 17-18 Funding Plan, staff provided updated technology snapshots for a variety of on-road vehicles and off-road equipment.[14] These snapshots were meant as a high level update to the work that was conducted previously for the Technology and Fuels Assessments, which are posted in draft form on the CARB website: https://www.arb.ca.gov/msprog/tech/report.htm

These technology assessments included evaluations of the following segments:

- Trucks,
- Transport Refrigeration Units,
- Locomotives,
- Fuels,
- Ocean Going Vessels,
- Commercial Harbor Craft,
- Cargo Handling Equipment, and
- Aviation which includes aircraft and ground support equipment

The technologies highlighted below are also reflective of the eligible project components. Additional eligible project components, such as infrastructure, renewable power generation, and technologies that support emission reductions from ships at berth are covered in Section IX.

A. On-Road Vehicles

1. Trucks

Current on-road heavy-duty diesel emission standards have been in place since 2010 with phased implementation of federal greenhouse gas standards continuing until 2024.

[14] The FY 2017-18 Funding Plan is available at https://www.arb.ca.gov/msprog/aqip/fundplan/1718_draft_funding_plan_workshop_100417.pdf

Battery electric technologies are beginning to be introduced into medium and heavy duty on-road trucks with hybrids and full battery electric offering available. Several models of battery electric trucks are available commercially between 8,001 to 26,000 gross vehicle weight rating (GVWR). Fuel cell powered trucks are not yet commercially available. Several large demonstrations are underway of zero-emission heavy duty trucks involving major truck manufacturers.

2. Transport Refrigeration Units

Cryogenic transport refrigerators, which use liquid nitrogen or liquid carbon dioxide, have been commercially available in Europe for over 18 years; however, they have not caught-on here in the U.S. due to high infrastructure costs. All-electric lithium-ion battery-powered TRUs with solar panel range extender strategies are now in use in small numbers; but incentive funding could accelerate commercialization and help gain acceptance by refrigerated carriers. Electric power plug infrastructure costs are also significant for battery-electric-solar TRUs. All-electric battery-powered TRUs with hydrogen fuel cell range extender are also in the demonstration phase; but again, infrastructure costs are a significant barrier.

B. Off-Road Equipment

1. Cargo Handling Equipment

Cargo handling equipment has already seen a strong push toward zero-emission technology driven both by economic and regulatory goals. [15] For example, there has been appreciable interest in electric yard trucks in freight operations, and commercially available electric yard trucks are funded through programs implemented by CARB and/or other agencies. Technology has not advanced as rapidly in higher tonnage equipment operating at ports and intermodal rail yards, such as reach stackers, top handlers, and high lift-capacity forklifts powered by diesel, for which there is immense potential to significantly reduce GHG and criteria pollutant emissions with zero-emission technologies. CARB, as well as other public entities have been making investments in demonstrations for these types of equipment.

2. Advanced Port Equipment

Cargo handling equipment is an important category to transition to zero-emission, but another technology category that has great potential to reduce GHG emissions and criteria pollutants is equipment that can increase operational efficiencies. This could include zero-emission vessel automated container movement technologies, advanced logistic strategies, and other equipment or strategies that enable more efficient operations. Improving the efficiency and logistics of ports could help reduce GHGs by reducing idling time, right sizing the amount of effort required to perform a specific task, and improving accuracy and scheduling in order to improve the movement of goods through the ports. It should be noted that AB 134 has restrictions for funding fully automated cargo handling equipment, and more details on its impacts on eligibility are described in Section IX.

---

[15] For more information regarding CARB's regulatory activities for cargo handling equipment, visit https://www.arb.ca.gov/ports/cargo/cargo.htm

3. *Ground Support Equipment*

Similar to cargo handling equipment, airport ground support equipment (GSE) will play a role in future deployment of zero-emission off-road equipment. Zero-emission GSE is readily available and in widespread use in a number of applications, such as belt loaders, baggage tugs, and cargo tractors.

4. *Locomotive Technologies and Operations*

The baseline for locomotives is the current Tier 4 national emissions standards[16], and they conventionally meet these requirements through the use of diesel-electric configurations. The goal of this funding category is to demonstrate on-board energy systems in order to provide supplemental motive power and reduce fuel consumption and GHG emissions in a locomotive application. Some potential technologies this could include are energy storage solutions, such as batteries, and zero-emission energy generation systems, such as fuel cells, utilizing on-board storage or locomotive tenders.

5. *Marine Vessels*

The baseline technological level for marine vessels is the current tier-4 national emission standard. Diesel to diesel hybrid technologies are making their way into the marine vessel segment utilizing advanced technologies to use auxiliary engines for vessel propulsion, reducing main engine usage when demand for high horsepower is not needed such as pulling away from dockside, staying on station or other low horsepower operations.

V. AVAILABLE FUNDING

The anticipated total funding available for projects through this Solicitation is up to $150 million, with up to $100 million being available from AB 134 and $50 million from SB 132. If additional funds become available, and valid applications remain unfunded, those projects may be funded without reissuing a solicitation. If additional funding becomes available, the expenditure timeline of those new funds may extend the project end date beyond those listed in this solicitation.

A minimum of $50 million will be available for projects located at warehouses either as part of a larger application for funding or as a standalone application for funding that is directed solely at warehouse projects. Up to an additional $100 million in funding that is available under this solicitation and can be directed at warehouses, distribution centers, seaports, freight airports, intermodal rail yards, cold storage warehouses, rail yard, ports of entry, and other freight facilities.

This Solicitation may fund such activities as:

- Construction and deployment of pre-commercial vehicles and equipment with a high potential to be commercialized;

[16] For more information regarding the U.S. EPA's current locomotive standards, visit https://www.epa.gov/regulations-emissions-vehicles-and-engines/regulations-emissions-locomotives

- Deployment of eligible commercially available vehicles and equipment;
- Production, installation, and supporting infrastructure operations and maintenance;
- Technologies that support ships at berth, including shore power and bonnet systems;
- Demonstration of the deployed vehicle technology and infrastructure;
- Renewable power generation and energy storage that support vehicle, equipment, facility operations and assist in managing energy demand;
- System efficiency upgrades including process improvements such as preferential queuing and operational strategies;
- Data collection and emission testing on vehicles, equipment, infrastructure and facility improvements deployed as part of a proposed project;
- Education and outreach components that highlight the economic benefits of a zero-emission freight facility transformation; and
- Project implementation costs (project implementation costs shall not exceed 5 percent of the project amount funded by CARB).

These activities are further described in Section IX of this solicitation. This solicitation may not fund research or design-only projects. Fully automated cargo handling equipment is not eligible for funding, more information on the automation restriction can be found in section IX. Practical field demonstrations are required for vehicles funded under this Solicitation.

A grantee cap will be applied to the funds available under this solicitation as follows: no single Grantee may be awarded more than $50 million of the funding for projects under this solicitation. A minimum of $50 million of available funds will be directed at projects located at warehouses.

VI. REQUIRED MATCHING FUNDS

The Grantee is required to match a minimum of 50 percent of the Total Project Cost. Total Project Cost is equal to the sum of requested grant funding amount and the applicant's proposed match amount. Only applications that meet the minimum match amount will be scored.

Match funding must be provided in the following manner:

- A minimum of 10 percent of the Total Project Cost must be in the form of cash committed by the Grantee, federal and local public agencies, project partners, and/or technology manufacturer (exclusive of providing in-kind contributions). Cash includes labor and capital outlays that occur during the term of the Grant Agreement. Currently budgeted and programmed Federal funds may be considered as cash.

- The remaining portion of the match may be through some combination of in-kind contributions committed by the Grantee, federal and local public agencies,

project partners, and/or technology manufacturer such as equipment, materials, consumables, equipment transportation, private financing, labor and federal or state funds. Public funds committed as part of an in-kind match cannot be sourced from GGRF. If an application proposes to use an award of funding from another state agency as a portion of their in-kind match, the award letter for those funds must be included as part of the application (see Appendix A, Section X).

Project facilities, laboratories, or property will not be considered as part of a proposed in-kind match whether owned or leased by the Grantee or technology manufacturer.

If the project uses assets that have or will be funded in whole or part by other public incentive programs and is still under contractual obligations, its incentive program status must be clearly identified in the project's narrative. Additionally, the project narrative must include a plan to ensure that emission reductions required by any incentive program's contract or grant are considered and accounted for (see Appendix A, Attachment 2).

The applicant may propose to use in-kind matching funds for administrative activities, if selected for funding, to be performed after the issuance of a preliminary award of funding and before the execution of the project's grant agreement. Such activities may include completing California Environmental Quality Act (CEQA) requirements, entering into sub-agreements with technology manufactures and end-users, and performing other administrative activities required by the prospective grantee, to enter into the grant agreement. However, an applicant does this at its own risk and with no guarantee that a grant agreement will be executed. CARB will not reimburse the prospective grantee for any costs incurred before the grant agreement is executed.

If a third-party, (i.e., a party other than the Grantee or technology manufacturer) proposes to provide any part of the required match, the Grantee must include a letter from each third-party stating that it is committed to providing a specific dollar value and the source of those funds. Match letters from third-party participants must be signed by someone who has the authority to commit those funds and will be considered binding on the applicant. Letters that do not have specific dollar amounts may not be considered.

Match contributions letters from public agencies that require approval from their governing board but do not have such approval at the time of application is submitted must be clearly documented in the match letter. CARB will consider such contributions as pending in the application review and, for applications selected for a preliminarily award, Grantees will be required to show governing board approval of all proposed match funding before grant execution. Match letters that do not meet these Match Letter Requirements may not be considered.

A Grantee and its partners must demonstrate technical and fiscal resources sufficient to meet their cost share commitment and complete the proposed project.

VII. ELIGIBLE GRANTEES

This competitive Solicitation is open to local air districts, other California-based public entities, or California-based non-profit organizations as the Grantee (applicant). The Grantee must demonstrate its expertise at implementing large scale advanced technology deployment projects and providing sufficient administration and oversight. Private sector parties (i.e., technology manufacturers and end-users) interested in securing funding for a technology or strategy, must partner with an eligible Grantee submitting a project proposal. Only projects from eligible Grantees will be scored.

Eligible applicants must meet all applicable requirements of State law and regulations, AQIP Guidelines, FY 2017-18 Funding Plan, and this Solicitation. Specific requirements for the Grantee are further described in this Solicitation. To be considered for the grant award, applicants must fully complete the Application (Appendix A) and demonstrate that they meet the application requirements (see Section XII of this Solicitation). CARB may request clarification regarding application responses during the application review process. Responses to clarifying questions will not be considered for scoring, but will become part of the application and therefore the grant agreement if a proposal is selected for funding.

An eligible Grantee can request Zero- and Near-Zero Emission Freight Facility project funds without an identified technology manufacturer(s), provided they commit in the application to solicit for the project partners once funds are secured from CARB via this competitive Solicitation process. However, projects that already have all the needed participants, such as the identified end users of the proposed vehicles or equipment, technology manufacturer(s), data collection and analysis provider, eligible Community Based Organizations (CBOs), and eligible Grantee, will score higher than those that do not have team members identified in advance (see Criteria 2 in Section XV, Evaluation, Scoring, and Preliminary Selection).

The Grantee will be required to submit a resolution of its governing board prior to execution of the Grant Agreement that commits the agency/organization to:

- Comply with the requirements of this solicitation;
- Accept the Grant funds from CARB; and
- Allocate any funding that the Grantee has committed to be part of a project application.

It is recommended that the resolution allow for grant amendments without governing board approval, if possible. If the public agency or non-profit organization does not have a governing board, then a binding written commitment from an official of the agency that has authority to enter into contractual obligations will be required to fulfill the above commitments.

If the public agency or non-profit organization that is submitting the application contributes a match to the project, the governing board resolution shall authorize the agency's or organization's legally authorized official to supply sufficient funding to meet the stated match commitment. Signed Grant Agreements and approved governing board resolutions need to be in place on or before the deadline listed in the Solicitation Timeline in Section XIII. Sub-agreements between the technology manufacturer(s) and the Grantee need to be in place before non-administrative work can begin.

VIII. RESPONSIBILITIES OF GRANTEE, TECHNOLOGY MANUFACTURER AND DATA COLLECTOR

The Grantee will be responsible for administration of the demonstration project, and major responsibilities will include:

- Develop project team including, technology manufacturer, end-users and data collection and analysis provider;
- Submit of demonstration project proposal (application) to CARB;
- Administer the project;
- Coordination of press releases and press events;
- Ensure completion of required CEQA documents;
- Oversee technology manufacturer(s) if applicable;
- Oversee project budget, completion of milestones, and verify receipt of deliverables and the amount of funds being used for the project's match requirement;
- Report to CARB on project status, Grant performance, and match expenditure;
- Submit periodic reports and Grant disbursement requests to CARB;
- Ensure purchase, installation, and maintenance of data logging or other data collection equipment as required;
- Submit data, as requested by CARB; and
- Coordinate periodic project status update meetings.

The technology manufacturer's major responsibilities in (if applicable) the project will include:

- Teaming with an air district, other public agency, or non-profit organization to develop the demonstration project application;
- Providing the technical expertise in performance of the demonstration;
- Timely achievement of stated project goals; and
- On-time reporting to the Grantee on project status and Grant performance.

The data collection and analysis provider's major responsibilities in a proposed project will include:

- Installation and maintenance of data collection equipment on advanced technology and baseline vehicles, equipment and facilities;

- Coordination with CARB, Grantee, and other project partners on data to be collected; and
- Collection, analysis and reporting of collected data.

Progress reports will be submitted from all project partners to the Grantee at a minimum of three-month intervals. The Grantee is responsible for forwarding all progress reports, unaltered, to CARB within seven business days of receipt (see Reporting and Monitoring Requirements in Section XVII, Implementation Process). Additionally, every Grant disbursement request shall be accompanied by a progress report, in addition to any other required reports, that documents the time interval, expenditure of match funds and the completion of specific project milestones, including any specific deliverables as defined for that milestone (see Project Funding Procedure in Section XVII, Implementation Process).

In order to ensure consistent data analysis across all CARB funded projects, specific data elements will be required to be collected and required formats are listed in Appendix F, Data Collection Requirements.

Data collection will be required throughout the project, and the data gathered will be required to be submitted to CARB periodically and as part of project milestones and periodic project update reports. The Grantee must coordinate installation of data logging or other equipment to facilitate data collection. The type of data to be collected includes, but is not limited to, fuel/electricity consumption and cost, fueling/charging times, state of charge information for battery and fuel cell electric vehicles and equipment, odometer readings, scheduled and unscheduled maintenance information, relevant telematics and GPS data, operating costs, hours of operation, vehicle and equipment idle times, temperatures, facility efficiency improvement metrics, and end user experience. Data collection and emission testing will also be required for baseline vehicles and equipment where non-zero-emission vehicles and equipment is being deployed as part of the project. The applicant should suggest a minimum number of baseline vehicles and equipment that will be outfitted with data collection equipment in their submittal. The Grantee will ensure that the data collection and analysis provider will have access to representative baseline vehicles and equipment with comparable duty-cycles. Emission testing protocols will be approved by CARB, at its sole discretion. For more details, please see Appendix F, Data Collection Requirements.

A final report must be submitted to CARB by the Grantee at the conclusion of the project. The project will not be complete until the final report has been accepted by CARB. The final report will include, but will not be limited to: a summary of the progress reports, any deliverables that were committed to in the project, the results from any emission testing performed, and any other information required by CARB. The Draft final report is due to CARB no later than March 15, 2021 and the final report to CARB no later than April 15, 2021 (see Sample Grant Agreement, Appendix B). CARB retains the right to withhold up to 10 percent of the total award amount until delivery of the final report.

Additional reporting requirements are detailed in the Reporting and Monitoring Requirements section of this Solicitation.

IX. ELIGIBLE PROJECTS

A. Overview

CARB's goal under the Zero-and Near-Zero Emission Freight Facility Project solicitation is to support bold, transformative emission reduction strategies that can be emulated throughout freight facilities statewide. Elements of an eligible project can include but is not limited to on-road vehicles, equipment, supporting infrastructure, energy generation and storage, facilities improvements, system efficiency upgrades and strategies and education and outreach.

The project will fund a variety of technologies and strategies designed to:

- Provide direct GHG, criteria, and toxic pollutant emission reductions from freight facilities.
- Synergistically demonstrate the practicality and economic viability of deploying system and energy efficiencies alongside multiple zero- and near zero-emission vehicles and equipment along with necessary infrastructure.
- Demonstrate the potential for widespread commercial acceptance of the various types of zero- and near zero-emission vehicles and equipment used in freight facilities and associated on-road freight applications.
- Accelerate commercialization of zero- and near zero-emission goods movement technologies.

B. Eligible Facilities

Eligible project locations are freight facilities located in California such as warehouses, distribution centers, seaports, freight airports, intermodal rail yards, cold storage warehouses, rail yard, ports of entry, and other freight facilities.

C. Eligible Technologies

Eligible projects can include all of the vehicle and equipment technologies that were discussed in Section IV. This includes technologies that are not commercially available and still in the development phase but will be commercially available at least three years after the end of the project and technologies that are currently commercially available. A technological hierarchy will be applied as follows:

- Zero-emission technologies are eligible for funding in all vehicle and/or equipment types.
- Zero-emission enabling technologies are eligible for funding where full zero-emission vehicles and equipment are not commercially available by major manufacturers.

- Use of Low NOx engines will be eligible for funding where fully zero-emission or zero-emission enabling technologies are not commercially available.

The current state of advanced technology in any one vocation or duty cycle will be considered the baseline for funding eligibility. If a technology is proposed that does not fit into this technological hierarchy, staff retains the discretion to not include it as part of the project.

Below are some practical examples of this technological hierarchy:

- Yard Trucks - Zero-emission battery-electric yard trucks are offered for sale by major manufacturers. Therefore, the only eligible technology for use in yard trucks is zero-emission. If a proposed project elects to include in their application a proposal for yard trucks using internal combustion engine technology a compelling case must be made in the Project Narrative why zero-emission technologies are not feasible in the intended application.
- Locomotives - The current state of locomotive technology is US EPA tier-4 emission levels. Engines that meet that tier and also reduce GHGs would be eligible for funding.

Regardless of the technological hierarchy, any proposed technology for use in vehicles or pieces of equipment must get GHG emission reductions. GHG emission reductions cannot come solely from the use of low carbon fuels.

Elements of an eligible project application could include, but are not limited to:

On-road vehicles and off-road equipment that enter and exit the facility, including, but not limited to: Zero-emission or zero-emission capable yard trucks, on-road delivery trucks, transport refrigeration units, drayage trucks, and locomotives. Technology options include battery electric, fuel cell electric, and hybrid technologies used in trucks that operate as zero-emission at all times, or are able to operate in zero-emission only mode. In areas where zero-emission or zero-emission capable technology is not available, hybrid systems and low NOx engines may be included.

Off-road equipment that works on-site, including, but not limited to: zero-emission or zero-emission capable switch locomotives and full size locomotives, zero-emission cargo handling equipment, rubber tired gantry cranes, yard trucks, ground support equipment, forklifts, tugboats, etc. Technology options include battery electric, fuel cell electric, and hybrid technologies that operate as zero-emission at all times or are able to operate in zero-emission only mode. In areas where zero-emission or zero-emission capable technology is not available, hybrid systems and low NOx engines may be included.

It should be noted that fully automated cargo handling equipment is not eligible for funding or for use as a match, per AB 134. This legislation defines fully automated as 'equipment that is remotely operated or remotely monitored with or without the exercise of human intervention or control'. For the purpose of this solicitation "cargo handling

equipment" means any off-road, self-propelled vehicle or equipment used at a port or intermodal rail yard to lift or move container, bulk, or liquid cargo carried by ship, train, or another vehicle, or used to perform maintenance and repair activities that are routinely scheduled or that are due to predictable process upsets. Equipment includes, but is not limited to, rubber-tired gantry cranes, yard trucks, top handlers, side handlers, reach stackers, forklifts, loaders, aerial lifts, excavators, and dozers.[17]

For the purpose of this solicitation, fully automated equipment means that the equipment is not directly human operated, and this includes off-site human control. Human operators must either be on the piece of equipment or tethered to the piece of equipment, and must control the equipment's function within approximately 100 feet of the piece of equipment that is being operated. Tethering can be wired or wireless. The vehicle or equipment operator must be within approximately 100 feet of the piece of equipment, with clear line of sight that is the primary means of equipment control and operation. Remote control locomotives (RCLs) are an example of tethering, and commonly used with switch locomotives in some railyards, where the operator walks alongside the locomotive controlling it through a tethered control. Equipment that has automated activities, such as predictive cruise control or crane positioning, are not considered fully automated. However, the automation restriction does not apply to recharging or refueling protocols or data collection efforts. Fully automated equipment will not be able to be counted as eligible match funding as described in Section IV, Required Match Funds.

D. Other Eligible Project Components

In order to facilitate bold transformations to zero- and near zero-emission freight facilities, other technologies and strategies are included in this solicitation. For example, infrastructure to support advanced technology vehicles and equipment is an important component. Charging infrastructure for many vehicles and equipment applications is not yet standardized, making interoperability between different manufactures challenging. Charging and refueling infrastructure (e.g. hydrogen refueling station) is an eligible expense for projects funded under this Solicitation, and their use with advanced technology vehicles and equipment should help further the infrastructure standardization efforts to facilitate ubiquitous heavy-duty vehicle and equipment charging.

Another important component could include renewable power generation and energy storage, which is also an eligible funding category under this solicitation. Conventional freight facilities are just now beginning to incorporate such systems in their facilities to reduce electrical consumption, help to balance electrical loads and to mitigate demand charges from utilities.

---

[17] Cargo Handling Equipment is defined per the Cargo Handling regulation, which can be found on the following webpage:
https://www.arb.ca.gov/ports/cargo/cargo.htm

Other project components can include:

- Technologies that support ships at berth, including shore power and bonnet systems;
- Fueling infrastructure to support project vehicles and equipment, including, but not limited to, hydrogen fueling infrastructure and charging infrastructure;
- Renewable power generation and energy storage systems to support vehicle and equipment fuel generation and freight facility operations, and manage energy demand;
- System efficiency upgrades, including process improvements such as preferential queuing and operational strategies; and
- Education and outreach components that highlight measureable environmental and economic benefits of a zero-emission freight facility transformation.

In addition, the Zero-and Near Zero-Emission Facilities Project would allow as match, other project elements that are compatible with the intent of this project. These include, but are not limited to:

- Energy efficiency upgrades to heating, cooling and ventilation systems, lighting, cold storage facilities, etc.;
- Grid improvements necessary to support the increased use of electricity.
- Facility improvements to support infrastructure, system efficiency, and energy efficiency upgrades;
- Workforce training and development; and
- Employee mobility enhancements that reduce GHG and criteria pollutant emissions through ride sharing, bike sharing, vanpools or shuttle services, and charging stations for electric vehicles.

E. Disadvantaged Community Component

The eligible projects that can be funded by this Solicitation are required to achieve significant reductions in GHG, criteria pollutant, and toxic air contaminant emissions compared to conventional technologies and provide benefits to disadvantaged communities. Projects will not be required to be located in disadvantaged communities to be eligible for funding but is highly encouraged. Benefits to disadvantaged communities will be considered during the scoring process and those applications that show a benefit to a disadvantaged community will score better than those applications that do not.

To determine whether a project qualifies as being located in a disadvantaged community, applicants must use the criteria in CARB's SB 1550 Guidance.[18] To determine whether a project qualifies as benefiting disadvantage communities,

[18] The latest guidance on AB 1550 requirements can be found here: https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/fundingguidelines.htm

applicants must use SB 535 Guidance.[19] Specifically, how the different facets of the proposed project will be located in a disadvantaged community or vehicles and equipment funded will be domiciled, registered or used a majority of the time in a disadvantaged community. Applicants are required to make an affirmation in their application Project Narrative (Appendix A, Attachment 3) as to how the proposed project meets the criteria for being located in a disadvantaged community and the reason that criteria has been satisfied, including any site- or route-specific information used to make that determination.

Fueling and charging infrastructure to facilitate the successful demonstration of vehicle and equipment technologies and logistics/operations efficiency improvements may also be included as an eligible expense.

Technologies that by themselves do not provide a GHG benefit, but solely rely on the use of renewable fuel for their GHG emission reductions will not be considered an eligible project under this solicitation.

X. SCOPE OF WORK

This section provides information on required elements for the project's scope of work. The requirements identified below are minimum requirements and are not comprehensive. In addition to the information below, the scope of work must include reporting and monitoring requirements as detailed in the Reporting and Monitoring Requirements section of this Solicitation.

Applications for funding can combine multiple vehicle and equipment types as well as facility improvements and ship-at-berth emission reducing technologies. There is no limit to the number of technologies or strategies that can be funded under this solicitation, as long as the requests for funds does not exceed the $50 million cap, as described in section V. Practical field demonstrations are required for any pre-commercial technologies funded under this Solicitation. Field demonstrations must be done while the vehicle or piece of equipment is in revenue service in its intended vocation by the end-user partner included in the project application. Field demonstrations of pre-commercial technologies should provide enough data to determine the economic viability for the continued use of the advanced technologies and must collect the relevant data items that are identified in Appendix F. Projects with longer field demonstration will score higher than those that only meet the minimum deployment timeline. Field demonstrations of proposed technologies must be at least one year in aggregate for the project with any one vehicle, piece of equipment, or facility improvement having at least three months of data collection while in operation in their intended service. The application should discuss the disposition of all funded vehicles and equipment at the end of the proposed project. Projects that indicate they will continue the use of funded assets in their normal business practices after the term of

[19] The original guidance on SB 535 requirements can be found here: https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/arb-funding-guidelines-for-ca-climate-investments.pdf

the project could score higher than those that do not indicate the disposition of funded assets. All on-road trucks funded under this solicitation will be required to install data collection equipment that can track the truck in real time and provide data on the position of the truck, including when it is in operation in a disadvantaged community, as well as collect data on vehicle operation.

Applications that have elements of their proposals for pre-commercial demonstrations must show a strong ability to be deployed widely into the marketplace within 3 years of the conclusion of the project, therefore 2024.

Projects that contain zero-emission trucks must meet the minimum range requirement of at least 150 miles per day. Charging and fueling infrastructure can be an eligible component of an application for this category and needs to meet the infrastructure CEQA requirements as described in Appendix E. No emission reductions associated with infrastructure can be claimed.

Funded projects will be expected to be made available for tours by government officials, competing freight facility operators, members of the public and other interested stakeholders to highlight firsthand the benefits of any funded project and the anticipated cost savings from employing such technologies and strategies.

A. Data Collection and Analysis and Emissions Testing

Data collection and analysis will be a required element of all funded projects and will be accomplished by an identified member of the proposed project team with experience in collecting and analyzing data from large and complex projects. All types of data to be collected will be determined at CARB's sole discretion, as outlined in Appendix F or as modified by CARB at its sole discretion, in consultation with the project's technology manufacturer(s), end-users, data collection and analysis provider and Grantee. All project team participants must work cooperatively with the data analysis provider and supply data as requested in a timely manner. The sharing of data collected from vehicles and equipment, funded infrastructure and facility improvements, and other relevant equipment with the project team and CARB is required.

Reproducible emission testing for internal combustion engines to verify the emission benefits from the demonstration of technologies funded under this Solicitation is required. NOx emissions will be shown as NOx and nitric oxide (NO) plus nitrogen dioxide (NO_2). The emission testing procedure must be cited in the project's narrative (see Appendix A, Attachment 2). The final emission testing procedure will be subject to CARB approval.

Data collected from emission or durability testing as part of a selected project and included in the project's submitted work plan and scope of work can be applied toward CARB or United States Environmental Protection Agency (U.S. EPA) certification or verification. However, funding cannot be used directly to fund formal CARB or U.S. EPA verification or certification processes.

B. Vehicle Certification, Verification, and Permitting

All vehicles in the proposed project that will be operated on California roadways must be compliant with all State requirements, such as, but not limited to, CARB Experimental Vehicle Permitting, Department of Motor Vehicles licensing, California Highway Patrol requirements, and others. Further, the proposed on-road vehicles must be approved for use by truck operators that will be using them in the demonstration, and confirmation must be indicated in their letter of support for the project. A clear explanation of what steps are required in the process for legal operations on California roadways, usage on port properties, rail yards, and other sites where the on-road vehicle will be operated, should be indicated.

As part of a viable commercialization plan, CARB verification or certification must be a goal for all pre-commercial vehicles, pieces of equipment or engines funded under this Solicitation. For any technology that will require CARB verification or certification or U.S. EPA certification or consideration, the applicant must explain in the project narrative the steps that will be followed to accomplish required certification and verification protocols. All submittals of certification documents to U.S. EPA must concurrently be submitted to CARB.

C. Vehicle Conversions

Projects containing a vehicle conversion component will be required to meet certain criteria. A conversion means removing the existing internal combustion engine and replacing it with a zero-emission drive system, or a near zero-emission system utilizing an electric drive system with an internal combustion engine as a range extender, or removing the existing internal combustion engine and replacing it with an advanced low NOx engine. The following criteria apply to conversions:

- A vehicle converted to a partial zero-emission system must achieve zero-emission miles while at a port, rail yard, intermodal facility, distribution center, or warehouse, or while transiting disadvantaged communities. A piece of equipment converted to a partial zero-emission system must reduce GHG emissions when compared to conventional diesel fueled counterparts. The determination when a vehicle or piece of equipment is operated in zero-emission mode must be made automatically without input from the vehicle operator.
- Conversions of existing vehicles are limited to vehicles that the applicant can demonstrate will have a remaining useful life of at least 10 years. Conversions of pieces of equipment must be demonstrated to have sufficient useful life remaining to complete the term of the proposed project.

D. Infrastructure

Infrastructure necessary for operating vehicles that are the subject of this Solicitation is an eligible cost. Proposed infrastructure should be capable of allowing a robust and significant field demonstration of the proposed technology. In-route charging, yard charging, and refueling infrastructure may be part of an eligible application; however, the infrastructure must be coupled with the demonstrated vehicles and be sized appropriately. Projects that propose only infrastructure without accompanying vehicles will not be scored.

Emission reductions resulting from vehicle or equipment recharging or refueling infrastructure funded by this Solicitation are not allowed to be included as part of the emission reduction benefits of the project.

Proposed infrastructure costs must be substantiated by qualified entities with experience in the installation, permitting, and commission of the proposed infrastructure type. Any infrastructure proposal should indicate all the required steps, including, but not limited to, siting, permitting, safety certifications, and other necessary certifications. Operation and maintenance of any proposed infrastructure must be addressed in the project application budget. The amount of funds proposed in the application for infrastructure that will be funded by the grant will be the total amount of funds that CARB will devote to infrastructure funding. **NOTE: If the actual infrastructure costs exceed the proposed amount of funds allocated in the application, the difference must be covered by the applicant or another party.**

Projects that propose a dual use (public and private) charging/refueling station are encouraged and may be scored higher.

a. Hydrogen Refueling Stations

Proposals containing a hydrogen refueling station installation must adhere to the minimum technical requirements and renewable hydrogen requirements specified in Appendix C and the CEQA and permitting requirements described in Appendix E. Additionally, the project must comply with all applicable federal, state, and local laws and requirements for acceptable installation and usage of hydrogen refueling stations. Each hydrogen refueling station must be designed to allow the station to accept delivery of hydrogen fuel from a mobile refueler or hydrogen tube trailer if on-site hydrogen production goes off-line or if hydrogen delivered via a pipeline is disrupted. Public or private access to refueling from proposed refueling stations is not required. However, infrastructure proposals that allow refueling to non-project entities during or following the completion of the demonstration project may score higher than those that do not allow refueling to non-project entities.

b. Electric Vehicle Supply Equipment

Proposals containing electric vehicle or equipment charging infrastructure installation must adhere to the CEQA and permitting requirements described in Appendix E, and the project must comply with all applicable federal, state, and local laws and requirements for acceptable installation and usage of electrical vehicle supply equipment (EVSE). The proposal must include a maintenance plan for continued reliable operation and unforeseen breakdowns of the EVSE. Public access to charging from proposed EVSE is not required. However, projects that allow public charging to non-project entities during or following the completion of the demonstration project may score higher than those that do not allow charging to non-project entities.

XI. PROPRIETARY INFORMATION AND INTELLECTUAL PROPERTY

CARB will not make any claims as to ownership of any vehicles or equipment funded by this grant. However, all information and data generated under the Grant Agreement is the property of CARB. Additionally, the technology manufacturer(s), end-users, data collection and analysis provider and Grantee will make available any information and data needed to satisfy the requirements discussed in the Reporting and Monitoring Requirements section of this Solicitation.

Data gathered on actual emissions to the air as part of this demonstration project cannot be protected from disclosure. Any information determined to be a trade secret or otherwise exempt from disclosure under the California's Public Records Act or other provisions of law must be labeled "confidential." Review Appendix A, Attachment 6 for Procedures for Handling Confidential Information. If you wish to include confidential information, you must:

- Complete the Confidentiality Provision (Appendix A, Attachment 6) and attach it to your project proposal;
- Separate confidential pages from the other elements of the project proposal (do not include any confidential information in the main project proposal); and
- Clearly label every confidential page as "CONFIDENTIAL".

Project proposals will be reviewed by CARB staff and may include reviewers outside of CARB associated with public universities in California and other State government agencies as needed. In the project proposal, at the point where the information would appear if it were not confidential, please indicate its existence under the separate cover. Please provide the name, address, and telephone number of the individual to be contacted if CARB receives a request for disclosure of the information claimed as confidential. CARB may share confidential information related to a project (such as certification/verification data) with multiple units and sections within CARB or other relevant State agencies.

XII. APPLICATION REQUIREMENTS

Eligible Grantees must meet all applicable requirements of State law and regulations, AQIP Guidelines, Funding Plan, and this Solicitation. To be considered for the grant award, Grantees must complete the application and demonstrate that they meet the required Solicitation elements. CARB may request clarification regarding application responses during the application review process. Clarifying questions will not be considered changes to the application for the purpose of scoring, but will be considered part of the project application and will be included in the grant agreement if the project is selected for funding. Only applications that contain all of the required elements as described in the Required Application Elements section and Appendix A of this Solicitation will be scored.

Please enclose with your project proposal any documents (or pertinent excerpts) that you cite in support of performance claims in your project. However, do not include materials that are not needed to supply the information requested in these instructions. CARB will not review patent documents, engineering drawings and specifications, or promotional materials. Include in your application package letters of commitment from project partners that describe the nature of their contribution to the project.

The submitted application package must include four (4) copies in addition to the signed original and one (1) compact disc (CD). The CD must contain the application package, including all required documents, as a single electronic file in either Microsoft Word or Portable Document Format (PDF). Applications that do not meet the above requirements may not be scored and may be disqualified.

Letters of support from non-project partners are discouraged and are not part of the scoring criteria. However, letters of commitment from local Community Based Organizations (CBOs) that are part of the project team are required. Local CBOs that are part of the project team should detail their support for the project and what role the community group will play in the project. Further, letters should indicate the level of support the project has in the disadvantaged community(ies) where the project is located and indicate the group's role in the community. Strong support from eligible community groups may be eligible for extra points under the Optional Extra Credit Scoring Criteria 12, described in Section XV Evaluation, Scoring and Preliminary Selection section.

CARB requires applications to be accurate, and applicants are strongly encouraged to ensure their applications are brief and clear. If a project is selected for funding, the application will be the basis for the development of the grant agreement and will be incorporated as part of the grant agreement. Applications will be considered a promise to perform actions in a specific project and are not considered a starting place to begin negotiations on the project's final scope of work. Applications will be initially screened for completeness; incomplete applications will not be scored. The application is included as Appendix A of this Solicitation and includes the following required elements:

Appendix A: AQIP Application (Application must be signed and dated)

- Attachment 1: Project Executive Summary and Project Summary for Public Posting
- Attachment 2: Project Narrative and Work Plan
- Attachment 3: Emission Reduction and Cost-Effectiveness Calculations
- Attachment 4: Proposed Budget and Project Milestone and Disbursement Schedule
- Attachment 5: Disadvantaged Communities Eligibility Determination
- Attachment 6: Procedures for Handling Confidential Information
- Attachment 7: Letters of Commitment
- Attachment 8: California Environmental Quality Act Worksheet (if applicable)
- Attachment 9: Conflict of Interest Declaration
- Attachment 10: STD. 204 Payee Data Record (**required even if applicant is a public entity**)
- Attachment 11: Applicant Qualifications

XIII. APPLICATION INSTRUCTIONS

Appendix A contains the forms and information necessary for submittal of a complete application. CARB will select a Grantee based upon the scoring criteria identified in this Solicitation. All information and data submitted as a response to this Solicitation are the property of CARB and will become a public record. If no qualified proposal is submitted, CARB will not award a grant and will re-evaluate this Solicitation to re-solicit for project proposals or other options at CARB's sole discretion.

If you need this document in an alternate format or language, please contact Earl Landberg at (916) 323-1384 or earl.landberg@arb.ca.gov. TTY/TDD/Speech to Speech users may dial 711 for the California Relay Service.

One (1) signed original, four (4) copies, and one (1) CD of the application, including all of the required documents, must be received at the Air Resources Board headquarters at 1001 I Street, Sacramento, California 95814. The CD must contain the application and other required documents, all in a single Word or PDF file.

Applications submitted via U.S. Postal Service, United Parcel Service (UPS), Express Mail, Federal Express, or another delivery service provider must be dispatched with enough time so that they are received by CARB no later than **5:00 p.m. (Pacific Time)**

on July 19, 2018 (delivery service provider tracking number may be used to verify date of receipt). Applications received after July 19, 2018 may be rejected and not scored.

Applications submitted via the United States Postal Service must be mailed to the following address:

Earl Landberg
California Air Resources Board
Mobile Source Control Division – Mailstop 5B
P.O. Box 2815
Sacramento, California 95812-2815

Applications submitted via another delivery service or in person may be delivered to the following address:

Earl Landberg
California Air Resources Board
Mobile Source Control Division – Mailstop 5B
1001 I Street
Sacramento, California 95814

Once the application has been mailed or delivered in person, please send an email to Earl Landberg at earl.landberg@arb.ca.gov indicating that you have submitted an application. Sending this email secures one of the five points provided for the Application Completeness scoring criteria and lets CARB staff know that your formal application is on the way. CARB will send a confirmation email within 24 hours to the applicant once the hard-copy of the application has been received. **No applications may be submitted by fax or email.**

Solicitation Timeline*

Key Actions	Dates	Time (Pacific)
Public Release of Solicitation	March 21, 2018	--
Applicant Question Deadline	April 20, 2018	5:00 pm
Applicant Teleconference	April 24, 2018	10:00 am
Application Submittal Deadline	**July 19, 2018**	**5:00 pm**
Preliminary Grantee Selection	September 6, 2018	5:00 pm
Final CEQA Documentation Submittal Deadline**	November 1, 2018	5:00 pm
Execute Grant Agreement and Return to CARB***	November 16, 2018	5:00 pm
Sub-Agreement Process Complete	December 31, 2018	5:00 pm

* Timelines are subject to change at CARB's sole discretion.
**This step only applies for projects containing infrastructure proposals where an agency other than CARB is the lead CEQA agency for the project.
***Includes governing board resolution.

XIV. APPLICANT TELECONFERENCE

CARB will hold an Applicant Teleconference at which time staff will be available to answer questions potential applicants may have regarding eligibility, application completion, and other requirements. The Applicant Teleconference will take place on the following date and time:

Date: April 24, 2018
Time: 10:00 a.m. – 12:00 p.m. (Pacific Time)
Place: Cal/EPA Headquarters, Conference Room 2410
1001 I Street, Sacramento, California 95814

Teleconference Information:

Domestic Call-in Phone Number: 800-593-9924
International Call-in Number: 1-312-470-0065
Passcode: 8206640

The Applicant Teleconference will be open to all interested entities. The intent of the Applicant Teleconference is to provide potential project applicants with an opportunity to ask clarifying questions regarding the Solicitation package and project requirements. Written questions submitted before the Applicant Teleconference will be given priority. Questions may be emailed to Earl Landberg at earl.landberg@arb.ca.gov. Questions may be submitted up to 5:00 p.m. (Pacific Time) two business days prior to the Applicant Teleconference. The questions and answers from the Applicant Teleconference and any questions received via email will be posted on the CARB website no later than **5:00 p.m. (Pacific Time) on May 22, 2018**; this date may be extended at CARB's sole discretion. CARB will not answer questions regarding this Solicitation after the Applicant Teleconference. Any verbal communication with a CARB employee concerning this Solicitation is not binding on the State and shall in no way alter a specification, term, or condition of the Solicitation.

XV. EVALUATION, SCORING, AND PRELIMINARY SELECTION

CARB will evaluate all eligible project applications based on the same scoring criteria described below. The maximum score is 120 points. The qualified applicant(s) with the highest overall score(s) will be preliminarily selected as Grantee(s).

The preliminary selection of a project does not in any way commit CARB to approving the grant. The selected applicant will be required to sign a Grant Agreement with CARB to fulfill the duties of Grantee (see Appendix B). The Grant Agreement may not be executed unless and until any required CEQA review has been completed. For a project where an agency other than CARB is serving as lead CEQA agency, the applicant must submit any required final CEQA documents by November 17, 2018 (prior to execution of the Grant Agreement). If an applicant fails to meet this requirement, CARB may deny the grant application. CARB will independently review any CEQA documentation provided by the applicant. CARB may modify any Grant Agreement based upon information produced from the CEQA environmental review process. If

CARB in its sole discretion finds a project's CEQA documentation inadequate, CARB retains absolute sole discretion to either (1) modify the grant agreement as necessary to comply with CEQA, (2) select other feasible alternatives to avoid significant environmental impacts, or (3) deny the grant application. No legal obligations will exist unless and until the parties have executed and delivered a Grant Agreement, as informed by information produced from the CEQA environmental review process (to the extent applicable).

CARB, in its sole discretion, may cancel the proposed grant and make a selection to the next highest scoring project, and so on, until an agreement is reached, or exercise its right, in its sole discretion, throughout this process to not award a grant. CARB reserves the right, in its sole discretion, to cancel this Solicitation, re-solicit for a Grantee, or direct funding to another project in the Funding Plan. In the event funding has been awarded to the highest scoring project(s), and the remaining available funds are less than the amount requested in the next highest scoring application, ARB, in its sole discretion, may offer funding to the next highest scoring project(s), may fund a portion of the next highest scoring project(s), or carry the remaining funds forward to the next fiscal year, shift the funds to another project category, or not award a grant.

CARB retains the right to remove discrete elements of projects selected for funding that CARB determines to be ineligible or to reduce the scope of a proposed project to use any remaining funds. In the event that one or more projects cannot be fully funded because the requested amount exceeds the available remaining funds, CARB in its sole discretion may offer to fund those projects at a lesser amount at a scaled down scope. If the project applicant declined funding at the reduced project scope, CARB may offer funding to the next highest scoring eligible application, either fully or at a scaled down scope, carry the remaining funds forward to the next fiscal year, shift funds to another project category, or not award a grant(s). As such, applicants are encouraged to include language in their Project Narrative that allows for scaling of the project both larger and smaller than initially proposed to facilitate negations with CARB if there are remaining funds or if additional funds become available.

It is anticipated that up to $150 million for all selected projects will be available under this Solicitation. If additional funds become available, and valid applications remain unfunded or if a funded application can be expanded beyond the original scope outlined in their application, those projects may be funded without reissuing a Solicitation at CARB's sole discretion. If additional funds are made available for remaining applications the expenditure timeline of those funds may be used to extend a project beyond the project end date described in this solicitation.

If two or more applications are submitted for the same project by different applicants, those applications will be scored separately, and the highest scoring project will then compete against applications submitted for different projects.

Proposed projects can contain both warehouse and other freight facilities as part of a single application and the total sum of dollars spent on the warehouse components of

projects must be $50 million. Higher scoring freight facility projects without a warehouse component may not be awarded funds if the minimum allocation for warehouse projects is not fulfilled by awarding funds to projects that contain a warehouse element even if they have not scored as high as other non-warehouse containing applications.

Other elements are also required to be included in each application as indicated in this Solicitation (see the Required Application Elements area of this section). Location of projects in disadvantaged communities will be part of the allocation scoring process and is not a requirement to be eligible for funding. Information on determining if a proposed project is located within a disadvantaged communities can be found in Appendix A, Attachment 5.

Applications that already have sub-agreements in place with all the proposed project partners will be eligible for extra credit points, see scoring criteria 12 in this section.

A. Summary of Scoring Criteria for Demonstration Projects

	Scoring Criteria	Points
1	Applicant Qualifications	5
2	Project Team Capabilities and Degree of Industry Collaboration	10
3	Project Objectives and Work Plan	15
4	Budget, Match Funding, and Financial Capabilities	10
5	Potential Emission Reduction Benefits	5
6	Cost-Effectiveness	5
7	Disadvantage Community Benefit	15
8	Technology and Innovation	10
9	Potential for Market Penetration and Commercialization of the Technology	15
10	Potential of Project to Act as a Showcase of Technology	15
10	Application Completeness	5
11	Timeline for Project Completion	5
12	Optional Extra Credit Scoring Criteria	5
	TOTAL	120

Applicants will be evaluated based on the Scoring Criteria. The Project Narrative and Work Plan must address how the applicant will implement all of the tasks in the proposed scope of work.

B. Scoring Scale

Using the scoring scale below, the evaluation team will score each eligible application for each scoring criteria described within this Solicitation.

Possible Points	Interpretation	Explanation for Percentage Points
0%	Not Responsive	Response does not include or fails to address the requirements being scored. The omission(s), flaw(s), or defect(s) are significant and unacceptable.
10-30%	Minimally Responsive	Response minimally addresses the requirements being scored. The omission(s), flaw(s), or defect(s) are significant and unacceptable.
40-60%	Inadequate	Response addresses the requirements being scored, but there are one or more omissions, flaws, or defects or the requirements are addressed in such a limited way that it results in a low degree of confidence in the proposed solution.
70%	Adequate	Response adequately addresses the requirements being scored. Any omission(s), flaw(s), or defect(s) are inconsequential and acceptable.
80%	Good	Response fully addresses the requirements being scored with a good degree of confidence in the Applicant's response or proposed solution. No identified omission(s), flaw(s), or defect(s). Any identified weaknesses are minimal, inconsequential, and acceptable.
90%	Excellent	Response fully addresses the requirements being scored with a high degree of confidence in the Applicant's response or proposed solution. Applicant offers one or more enhancing features, methods or approaches exceeding basic expectations.
100%	Exceptional	All requirements are addressed with the highest degree of confidence in the Applicant's response or proposed solution. The response exceeds the requirements in providing multiple enhancing features, a creative approach, or an exceptional solution.

The **PROJECT NARRATIVE** must separately address each of the scoring criteria listed below; see instructions for the Project Narrative in Appendix A, Attachment 2.

1. Applicant Qualifications (Appendix A, Attachment 11) – Maximum 5 points

- Describe the experience and expertise the proposed Grantee has in implementing large-scale air quality incentive projects or programs and working with vehicle and equipment manufacturers, technology providers, and other key

project stakeholders. Scoring will be based upon the applicant's ability to successfully act as Grantee according to their demonstrable staffing, infrastructure, funding, and other available resources.

2. **Project Team Capabilities and Degree of Industry Collaboration – Maximum 10 points**

- Proposals that identify the end user of the proposed technologies or strategies to be used during the project. Applications that have all the project participants in place at time of application submittal will score higher than those that do not have all the needed participants identified in advance.

- Describe the roles and the work to be performed by each of the project's key participants, including project administration, end users, data collection and reporting, and community groups.

- Describe the administrative and technical qualifications and capabilities of key personnel, such as education and training, research and professional experience, publications (patents, copyrights, and software systems may be provided in addition to or substituted for publications), and the ability of the applicant to administer similar air quality programs.

- Describe the project team's relationship and degree of collaboration with among the project partners including vehicle and equipment manufacturers, charging/refueling infrastructure builders, end users, and data collection and analysis partners. Describe what business alliances and partnerships will be involved in commercialization of any pre-commercial technology proposed to be part of the project.

- Performance of the Grantee, technology manufacturer(s), end-users, and other project participants with previous CARB funded projects will also be considered.

- Describe any community based organizations that are in support of the proposed project, and any plans for ongoing engagement with those organizations.

3. **Project Objectives and Work Plan (for Work Plan, see Appendix A, Attachment 2) – Maximum 15 points**

- Provide a concise statement of how the project meets CARB's goal under the Zero- and Near-Zero Emission Freight Facilities Project solicitation and the FY 2017/18 Funding Plan.

- In a logical sequence, describe the tasks necessary to prepare for and conduct the proposed project. Tasks should be divided into the phases of the project,

as appropriate, and described in enough detail for reviewers to understand the scope of the work. Identify what entity (Grantee, industry partner, or data collection and analysis provider) will perform each task.

- Identify the extent to which renewable sources of energy will be used to support the zero- or near zero-emission technologies to be demonstrated. Projects employing a higher percentage of renewable energy will score higher than those employing a lower percentage or no renewable energy. Please note that the sole source of GHG reductions for the project cannot come from renewable energy use.

- Provide quantitative milestones for each budget period of the project, and identify them with a number, title, and planned completion date. The general duration for each task must be specified. Identify at which milestones disbursement requests will be made, at what amounts, and the deliverables associated with each milestone.

- Identify the entities that will be using the vehicles, equipment, strategies, and facility improvements included in the project and how the Grantee will ensure data will be reported as required to CARB.

- Describe the disposition of funded vehicles and equipment after the end of the proposed project.

- Identify the resources (e.g., equipment, machine and electronic shops, field and laboratory facilities, materials, etc.) to be used at each of the freight facilities that are part of the proposed project. Describe only those resources that are directly applicable to the proposed work. List important items of equipment already available for this project. If proposing an equipment acquisition, describe comparable equipment, if any, already at the freight facility and explain how they will work in concert during the project.

- Identify any fueling, charging, or other related infrastructure already in place that will be utilized by the proposed vehicles and equipment during the proposed demonstration project and the agreements that are planned or already in place to utilize the existing infrastructure.

- Specify if any mobile refueling will be included in the project and agreements that are planned or already in place to provide mobile refueling to funded vehicles and equipment.

- Identify any infrastructure, including charging and refueling infrastructure that will need to be installed to allow proper use of the vehicles and equipment identified in the project and a brief description of the process for planning and installation. Identify the entities that will be doing the infrastructure installation

and at what cost. Describe plans, if any, for future use of charging and refueling stations following the demonstration project.

- For proposals that include installation of a hydrogen refueling station to be funded as part of the project, provide a description of how all of the components of the Hydrogen Refueling Station Requirements (Appendix C) will be met. The proposal must include overall station performance parameters including, but not limited to, fuel quality, metering accuracy, fueling protocol, pressures, storage, compression, daily throughput, hourly peak throughput, and a plan to maintain and verify the same.

- For projects that include electric vehicle supply equipment (e.g., charging stations), identify the analysis that has been accomplished, if any, to identify and/or address grid impacts during peak electricity demand hours.

- For proposals that include fueling or charging infrastructure installation to be funded as part of the project, include information showing the infrastructure is designed and engineered to match the specific minimum fueling/charging needs of the proposed vehicles and equipment. The proposal must include a template illustrating station parameters that must be met, in addition to a "space or area" where parameters that must be supplied or provided by the applicant will be placed appropriate to the vehicles and equipment being served. Details must be provided explaining the existing similar infrastructure where the funded infrastructure is proposed to be sited (e.g., existing electrical infrastructure where proposed EVSE is to be sited, or existing fueling station or industrial facility where a proposed hydrogen refueling station is to be sited). In cases where the applicant would make the funded infrastructure available to non-project fleets, the proposal must include information showing how the applicant will plan for capacity adjustments to handle the additional demand.

4. Budget, Match Funding, and Financial Capabilities – Maximum 10 points

- Provide a clear and concise project budget that lists all expenditures and source of those funds in a logical sequence that leads to on-time completion of the project (see sample budget in Appendix A, Attachment 4). Administrative fees may not exceed 5 percent of the total amount awarded by CARB.

- Indicate the source of funding, CARB funds, cash match, and in-kind match, for each task, the amount of the funds for each task, and the amount of funds that are being used as match for the project. Funds that are identified as match must also indicate what entity is providing the match and if the match is part of the cash match or in-kind match.

- Demonstrate that the Grantee and/or technology manufacturer(s) will be financially capable of providing the minimum 50 percent match requirement of the total project budget (including the 10 percent cash requirement exclusive of

in-kind contributions). Higher match pledges will be scored higher. See section VI Required Match Funds for more information.

- Describe each financial contribution to the project (match funding or other leveraged funding) in addition to describing other current and pending funding sources for the required cost share match. Identify if all or a portion of the match funding is dependent upon successful grant award under any other solicitation.

- Attach Letter(s) of Commitment from each project partner stating that it is committed to providing a specific minimum dollar amount of cost sharing as part of the match funding requirement or as other leveraged funding. Letters must be signed by the person authorized by the entity to commit the expenditure of funds.

5. Potential Emission Reduction Benefits – Maximum 5 Points

- Describe in Appendix A, Attachment 3 the estimated emission reductions of GHG, criteria pollutant, and toxic air contaminant emissions (PM) as determined by using the methodology in Appendix D. Combined weighted criteria pollutant and PM emission reductions are to be based on exhaust emissions (tank to wheel) and calculated in tons reduced per year. The GHG emission reductions are to be based on life cycle analysis (well to wheel) and calculated in metric tons of CO_2 equivalent[20] reduced per year. Emission reduction calculations are required for two scenarios:

  - During the actual proposed project over a 2-year time frame; and
  - Two year post after the end of the proposed project with a useful life of ten years.

- **Show all math used in calculations.** Cite all sources and explain all variables used in the calculations that are not included in Appendix D.

- Describe the utility of the innovative technology to help California achieve its climate change and air quality goals by reducing GHG, criteria pollutant, and toxic air contaminant emissions, particularly in disadvantaged communities.

- If an alternative methodology is used to calculate the emission reductions for this project, all math should be shown and all values should be cited. Alternative methodologies will not be used to score the project but may provide insight to the scoring team on the potential emission reductions of the project.

[20] "CO_2 equivalent" means the number of metric tons of CO_2 emissions with the same global warming potential as one metric ton of another greenhouse gas.

- Summarized the expected emission reductions for the entire project as described in Appendix D.

6. Cost-Effectiveness – Maximum 5 Points

- Describe in Appendix A, Attachment 3 the estimated cost-effectiveness of the project in dollars per ton of combined criteria pollutant and weighted PM emissions reduced, and per metric ton of GHG emissions (in CO_2 equivalent) reduced for the two scenarios below, using the methodology in Appendix D:
  - During the actual proposed project; and
  - Two year after the end of the proposed project with a useful life of ten years for all on-road trucks, 5 years for pieces of equipment and the proposed useful life for any facility improvements and technologies that support ships at berth.

- If an alternative methodology is used to calculate the project's cost effectiveness for this project, all math must be shown and all values must be cited. Alternative methodologies will not be used to score the project but may provide insight to the scoring team on the potential emission reductions of the project and are not a replacement for the required methodology as described in Appendix D.

7. Disadvantage Community Benefit – Maximum 15 Points

- Projects that are located within a disadvantaged community(ies) will score better than those that provide benefits to a disadvantaged community(ies). Projects benefiting disadvantaged communities will score better than those projects that do not demonstrate benefits to disadvantaged communities.

- Describe how the project is located in or how it benefits disadvantaged communities. Being located in a disadvantage community is determined by the location of the freight facilities that are part of the proposed project and the vehicles or pieces of equipment that will be domiciled, registered or operated a majority of the time.

8. Technology and Innovation – Maximum 15 points

- Identify and describe all the technological innovations that are included in the proposed project. If a proposed technology is a component of a device, process or strategy, also describe the device, process or strategy. Descriptions should be understandable to reviewers who are not expert in the field. Cite (but do not include) patents if needed. Describe exactly what part of the technology is innovative, how it is innovative, and how it works.

- Describe what safety measures are in place to ensure safe operation and maintenance of the vehicle, equipment or facility improvements during operations, battery charging, refueling, maintenance, and other operational parameters. Identify any specific issues that first responders, such as firefighters, police, etc., should be aware of if an emergency is encountered, either due to internal or external forces, with vehicles, equipment, facility improvements and EVSE/refueling equipment funded under this demonstration.

- Explain the technical advantages of the innovations proposed as part of the project, and document performance claims.

- Describe what type of emission testing has already been done on the proposed technology(ies), if applicable.

9. Potential for Market Penetration and Commercialization of the Technology – Maximum 10 points

- For projects that contain pre-commercial technologies, define target markets and explain why the targeted industries would buy the innovation after a successful demonstration of the technology. Both markets within and outside of California should be considered.

- Describe the recent and expected growth or decline of the each of the targeted end-users, including vehicles, equipment and facilities.

- Identify the specific market for the proposed technology and describe its size and potential for growth.

- Describe any specific barriers to entry or expansion.

- Describe the commercialization plan for the proposed pre-commercial technology(ies).

- Describe what steps will be followed to gain CARB certification or verification of the proposed pre-commercial technology(ies) if needed.

- Describe the economic benefits or costs that a California business could expect if they operated advanced technology vehicles, equipment and facility improvements that are part of the proposed project.

- Describe any special training that will be required for installation and maintenance personnel.

10. Potential of Project to Act as a Showcase of Technology – Maximum 15 Points

- The goal of this solicitation is to fund bold transformative projects that have the capability to significantly demonstrate the cost effectiveness and environmental benefit of deploying such technologies at freight facilities and the movement of freight. The project application should describe how the proposed project will be transformative to freight facilities in California, nationally and internationally.

- Describe in the application the plans to share results and lessons learned from the project to other freight facility owners and operators, end-user fleets and freight equipment operators.

- Applications that contain multiple facilities, end-users, vehicle, and equipment types operating in concert will be scored higher than projects that have a limited number of facility, vehicle or equipment types included in the application.

11. Application Completeness – Maximum 5 points

- Applications that are clear, concise, and include all of the requested information will be scored higher than those that are unclear or missing information. Do not make a declaration as to application completeness in your submittal.

- Provide a written affirmation in the Project Narrative that all parties participating in the proposed project have read and agree to abide by the Sample Grant Agreement that is included in this Solicitation packet as Appendix B, and confirm that they are committing to fulfill obligations detailed in the application package.

12. Timeline for Project Completion – Maximum 5 points

- Provide a project schedule including the milestones as described in the Project Narrative and Work Plan section of Appendix A (Attachment 2). Both a tabular and graphic display (such as a Gantt chart) of the project schedule is preferred, but at a minimum, a tabular display is required. Information must include task duration, start and completion dates, and expected time to secure materials and construction services, in addition to the milestones being clearly identified.

- Demonstrate that all work will be accomplished by April 15, 2021.

13. Optional Extra Credit Scoring Criteria – Maximum 5 points

- Include in the project application all completed CEQA documents.

- Provide evidence of sub-agreements being in place, or Describe how the sub-agreements with all project partners are already in place at the time of application submittal.

- For commitments from local Community Base Organizations that are part of the proposed project team, indicate the level of support and what role the local community group will play in the proposed project.

XVI. GRANTEE SELECTION

The successful Grantee will be required to sign a Grant Agreement with CARB to fulfill the administrative duties and technical duties associated with the project (see Appendix B, Sample Grant Agreement).[21] Signed grant agreements and approved governing board resolutions must be returned to CARB no later than the deadline described in the Solicitation Timeline in Section XIII of this Solicitation. If project Grant Agreements and approved governing board resolutions are not returned by the deadline, CARB , in its sole discretion, may deny the grant application and can redirect funds to another submitted application to this Solicitation or to another project in the Funding Plan as needed. If, in CARB 's sole discretion, no submitted project proposal meets the goals of this Solicitation, Funding Plan, or AQIP Guidelines, no selection of a Grantee or technology manufacturer will be required to be made, and funding can be directed to another project identified in the Funding Plan as needed.

CARB, in its sole discretion, may make minor changes to proposed project milestones, work plan, or disbursement schedules in consultation with the applicant, for inclusion in the Grant Agreement.

NOTE: All CEQA requirements must be completed by November 1, 2018 and sub-agreements with all project partners must be executed by February 1, 2019.

[21] As noted above, the Grant Agreement may not be executed unless and until any required CEQA review has been completed. For a project where an agency other than CARB is serving as lead CEQA agency, the applicant must submit any required final CEQA documents by November 30, 2018 (prior to execution of the Grant Agreement). If an applicant fails to meet this requirement, CARB may deny the grant application. CARB will independently review any CEQA documentation provided by the applicant. CARB may modify any Grant Agreement based upon information produced from the CEQA environmental review process. If CARB in its sole discretion finds a project's CEQA documentation inadequate, CARB retains absolute sole discretion to either (1) modify the grant agreement as necessary to comply with CEQA, (2) select other feasible alternatives to avoid significant environmental impacts, or (3) deny the grant application. No legal obligations will exist unless and until the parties have executed and delivered a mutually acceptable Grant Agreement, as informed by information produced from the CEQA environmental review process (to the extent applicable). See Appendix E for additional information.

XVII. IMPLEMENTATION PROCESS

A. Meetings

Before work begins, a kick-off meeting will be held in Sacramento between the Grantee, the technology manufacturer(s), end-users, data collection and analysis provider and CARB project management staff. The purpose of this meeting will be to discuss the work plan, details of task performance, the project schedule, any changes to the project team, and any issues that may need resolution before CARB -funded work begins. Project update meetings to discuss the project's progress will be held as often as needed, but typically monthly. These meetings can occur via telephone conference calls upon approval of the CARB Project Liaison. Project update meetings are the responsibility of the Grantee to schedule and prepare a meeting agenda. Project update meetings need to contain, but are not limited to:

- Agenda for the meeting with conference call information;
- Update of the status of the project;
- Discussion of any difficulties encountered since the last project update meeting;
- Discussion on any deliverables that are nearing a due date;
- Notification of any pending disbursement requests; and
- Schedule of the next project update meeting.

Site visits by CARB staff may be required at CARB's sole discretion. A final meeting, or conference call pending CARB Project Liaison approval, will be held at the conclusion of the project to review the results and discuss the status of commercialization plans.

B. Project Funding Procedure

In order to receive a disbursement, the Grantee must submit a grant disbursement request to CARB. The Grant Disbursement Request Form (Appendix B, Exhibit C) must be signed by the party authorized and designated in the Grant Agreement, mailed to CARB and must include all information to substantiate the eligibility of costs to be reimbursed. GGRF grant funds will only be issued for vehicles, equipment, facility improvements and other eligible components that are identified in the Project Narrative and Work Plan included in the application package, memorialized in the signed Grant Agreement, and that have already been rendered. A detailed invoice will be required. A Progress Report on the status of the project to date, including the milestones and associated deliverables for which the disbursement request is requesting reimbursement, is required for all disbursement requests. The advance of grant funds will not be allowed in any cases. All disbursements, including administration and project funding are made on a reimbursement basis after expenses are incurred by the grantee or other project partners.

Disbursements will be made following the procedure described in the Reporting and Monitoring Requirements section of this Solicitation and the signed Grant Agreement.

NOTE: The Application package including the Budget submitted by an Applicant, if selected for funding, will be incorporated by reference as part of the Grant Agreement. Costs associated with project implementation detailed in the Application must consider the time frame of the proposed project and may cover an increase in costs that take into account inflation or planned cost of living increases. The application submitted will be the actual costs for the project and will not be amended due to faulty estimations by the applicant, increases in costs due to inflation or other reasons that have not been covered in the proposed budget.

C. Reporting and Monitoring Requirements

The Grantee must submit numbered status reports accompanying grant disbursement requests to CARB at least every three months, but may submit on a monthly basis if necessary for more frequent invoicing with prior approval from CARB. These reports must be approved by CARB and must contain the following information, at a minimum, in either Microsoft Word or PDF, as a single electronic file:

- Project Status Report number, title of project, name of Grantee, date of submission, and project grant number;
- Summary of work completed since the last progress report, noting progress toward completion of tasks and milestones identified in the work plan;
- Statement of work expected to be completed by the next progress report;
- Notification of problems encountered and an assessment of their effects on the project's outcome;
- Data collected from vehicles and equipment since the last data reporting,
- Itemized invoice showing all costs for which reimbursement is being requested; and
- Discussion of the project's adherence to the project timeline.

A final report is required at the end of the project and must include:

- A description of the project's goals and objectives, methods, results of the demonstration, and future application of the technology;
- An update on the commercialization prospects of any funded pre-commercial technologies;
- An update on broader acceptance of any technologies that are the part of the project;
- Efforts by the project team to use the proposed project as a showcase of the funded technologies and strategies; and

- How disadvantaged communities benefited by having a proposed project or part of a proposed project in their community.

Final reports will be made public and posted on CARB's website. Requests for additional information may be required by CARB, at its sole discretion, to evaluate reports and to determine if a monthly, quarterly, or final report is complete.

If the Grantee plans on pursuing official verification or certification of the emission reducing potential for its proposed technology, the Grantee must submit documentation in support of that verification or certification to CARB's Project Liaison. Any supporting documentation sent to CARB, U.S. EPA, or any other government agency granting certification or verification, must be concurrently submitted to the Project Liaison assigned to the project, as identified in the Grant Agreement (see Appendix B).

Changes in the project budget, re-definition of deliverables, or extension of the project schedule may not be possible and should be avoided. In cases where minor changes are allowed, they must be approved in advance and in writing by CARB and may require a grant amendment. Once a grant is in place, minor changes to the work to be done or other project scope changes may be considered by CARB, in consultation with the Grantee or technology manufacturer(s). CARB reserves the right to terminate a grant if CARB determines, in its sole discretion, that the objectives cannot be reached or that the Grantee, technology manufacturer(s), or their subcontractors cannot or will not perform the required work in a timely manner, as specified in Section 6 of the Grant Agreement.

The Grantee and technology manufacturer(s) must allow CARB, the California Department of Finance, the California Bureau of State Audits, or any authorized designee access, during normal business hours, to conduct reviews and fiscal audits or other evaluations. Access includes, but is not limited to, reviewing project records, site visits, interviews, and other evaluations as needed. Project evaluations or site visits may occur unannounced as CARB staff or its designee deem necessary.

XVIII. ADMINISTRATION

A. Cost of Developing Application

The Applicant is responsible for the cost of developing an Application, and this cost cannot be charged to the State. In addition, CARB is not liable for any costs incurred during environmental review or as a result of withdrawing a proposed award or canceling the solicitation.

B. Errors

If an Applicant discovers any ambiguity, conflict, discrepancy, omission, or other error in the solicitation, the Applicant shall immediately notify the CARB of such error in writing

and request modification or clarification of the document. The CARB shall not be responsible for failure to correct errors.

C. Immaterial Defect

The CARB may waive any immaterial defect or deviation contained in an Applicant's application. CARB's waiver shall in no way modify the Application or excuse the successful Applicant from full compliance.

D. Disposition of Applicant's Documents

All applications and related material submitted in response to this solicitation become a part of the property of the State and public record.

E. Applicant's Admonishment

This solicitation contains the instructions governing the requirements for funding Applications to be submitted by interested Applicants, including the format in which the information is to be submitted, the material to be included, the requirements which must be met to be eligible for consideration, and Applicant responsibilities. Applicants must take the responsibility to carefully read the entire solicitation, ask appropriate questions in a timely manner, submit all required responses in a complete manner by the required date and time, and make sure that all procedures and requirements of the solicitation are followed and appropriately addressed.

F. Agreement Requirements

The content of this solicitation and each grant Recipient's application shall be incorporated by reference into the final agreement. See the sample Agreement terms and conditions included in this solicitation.

G. CARB Reserves the Right to Negotiate with Applicant

CARB reserves the right to negotiate with Applicants to modify the project scope, the level of funding, or both. If the CARB is unable to successfully negotiate and execute a funding agreement with an Applicant, the CARB, at its sole discretion, reserves the right to withdraw the pending award and fund the next highest ranked eligible project. This does not limit CARB's ability to withdraw a proposed award for other reasons, including for no cause.

H. No Agreement Until Signed

No agreement between CARB and the successful Applicant is in effect until the agreement is signed by the Recipient and signed by the authorized ARB representative. Costs are only subject to reimbursement by the CARB after execution; no costs incurred

prior to execution of the agreement are reimbursable using CARB funds. No Modifications to the General Provisions

I. No Modifications to the General Provisions

Because time is of the essence, if an Applicant at any time, including after Preliminary Grantee Selection, attempts to negotiate, or otherwise seeks modification of, the General Conditions (attached as Appendix B, Sample Grant Agreement, section 10), the CARB may reject an application or withdraw a proposed award. This does not alter or limit CARB's ability to withdraw a proposed award for other reasons, including failure of a third party agency to complete CEQA review, or for no cause.

J. Payment of Prevailing Wages

All applicants must read and pay particular attention to Appendix B, Sample Grant Agreement Section 10.17 entitled "Prevailing wages and labor compliance". Prevailing wage rates can be significantly higher than non-prevailing wage rates. Failure to pay legally-required prevailing wage rates can result in substantial damages and financial penalties, termination of the grant agreement, disruption of projects, and other complications.

APPENDIX A

APPLICATION

Zero- and Near-Zero Emission Freight Facilities Project

Mobile Source Control Division
California Air Resources Board
March 21, 2018

CALIFORNIA
AIR RESOURCES BOARD

This page intentionally left blank.

STATE OF CALIFORNIA
California Environmental Protection Agency
AIR RESOURCES BOARD
MSCD/ISB/AQIP_97 (Rev. 08/13)

ZERO- AND NEAR-ZERO EMISSION FREIGHT FACILITIES PROJECT APPLICATION

Please print clearly or type all information on this application.

1. AQIP Project: Click here to enter text.		
2. Company Name/Air District/Organization Name/Individual Name: Click here to enter text.		
3. Business Type: Click here to enter text.		
4. Contact Name and Title: Click here to enter text.		
5. Person with Contract Signing Authority (if different from above)/Air Pollution Control Officer (APCO): Click here to enter text.		
6. Mailing Address and Contact Information: Street: Click here to enter text.		
City: Click here to enter text.	State: Click here to enter text.	Zip Code: Click here to enter text.
Phone: (XXX) XXX-XXX	Fax: (XXX) XXX-XXX	
Email: Click here to enter text.		
☐ I have read and understood the terms and conditions of the Sample Grant Agreement.		

I hereby certify under penalty of perjury that all information provided in this application and any attachments are true and correct.

Printed Name of Responsible Party or APCO: Click here to enter text.	Title: Click here to enter text.
Signature of Responsible Party or APCO:	Date:

Third Party Certification (if applicable)
I have completed the application, in whole or in part, on behalf of the applicant.

Printed Name of Third Party: Click here to enter text.	Title: Click here to enter text.
Signature of Third Party:	Date:
Amount Being Paid for Application Completion in Whole or Part: Click here to enter text.	Source of Funding to Third Party: Click here to enter text.

Attachment 1: PROJECT EXECUTIVE SUMMARY

The Project Executive Summary must contain a summary of the proposed project. It is a self-contained document that identifies:

- The name of the applicant,
- The project technology demonstrator(s),
- The project title,
- The objectives of the project,
- A description of the project,
- Methods to be employed,
- Technologies to be utilized and supporting infrastructure,
- Potential benefits and outcomes,
- Major participants,
- Total project cost,
- Requested funding amount,
- Match amounts proposed,
- Expected emission reductions from the entire project in criteria, toxic and GHG and
- Requested funding amount.

The Project Executive Summary should not include information that is not in the rest of the proposal. This document must not include any proprietary or sensitive business information as it may be made available to the public. The project summary must not exceed 1 page when printed using standard 8.5" by 11" paper with a minimum of 1" margins (top, bottom, left, and right) with font not smaller than 11 point.

The *Project Summary for Public Posting* is required for all competitive applications for Low Carbon Transportation GGRF funds and will be publically posted on CARB's website at least ten days before CARB preliminarily selects applications as Grantees. The Brief Project Summary for Public Posting must be no more than 500 words and must include:

- Project Name
- Name of applicant and project partners.
- Brief description of proposed project including location (excluding personally identifiable information for any private individuals).
- Amount of funding requested.
- Total cost of project including requested funding amount and match amounts that are proposed
- Expected emission reductions in criteria, toxic and GHG
- Whether the project is to be located within or provide benefits to a disadvantaged community.

Please note that CARB may, at its sole discretion, modify the Project Summary for Public Posting to more accurately present the required project information as it is presented in the actual project application.

Attachment 2: PROJECT NARRATIVE AND WORK PLAN

THE PROJECT NARRATIVE MUST SEPARATELY ADDRESS EACH OF THE SCORING CRITERIA REQUIRING A RESPONSE LISTED IN THE EVALUATION AND SCORING SECTION OF THE SOLICITATION. The first page of the project narrative must include the project's title, funding amount requested, applicant (public entity or non-profit organization), industry partner(s) that will act as the technology demonstrator(s) (if applicable), and data collection and analysis partner and end user(s). Partners are persons or organizations that will contribute resources to the project via cash, equipment/materials, facilities, or in-kind services. The project narrative must not exceed 25 pages when printed using standard 8.5" by 11" paper with a minimum of 1" margins (top, bottom, left and right) with font no smaller than 11 point. Additional information can be provided in an appendix to support the discussion in the Project Narrative, if necessary. Do not include internet addresses (URLs) as a substitute to providing information necessary to review the application. Provide sufficient information so that reviewers will be able to evaluate the application in accordance with these scoring criteria. The project narrative must contain affirmation that all parties participating in the demonstration have read the Sample Grant Agreement (Appendix B). Include the project's estimated reductions of GHG, criteria pollutant, and toxic air contaminant emissions for each vehicle, piece of equipment, system efficiency or facility improvement and in total (with supportive calculations included in Attachment 3). Describe any proposed use of existing infrastructure (e.g., electric vehicle supply equipment, hydrogen refueling stations, etc.) to support advanced technology project vehicles. Declare if the proposed project uses any equipment that has been funded with a public incentive program and state its incentive program status, as described in the Scope of Work section of the Solicitation. The project narrative must include a plan to ensure that emission reductions required by any incentive program's contract or grant are considered for the piece of equipment that is proposed to be used for the technology demonstration. Include a clear explanation of the steps required in the process for legal operations on California roadways, usage on port properties, rail yards, and other sites where funded vehicles or equipment will be operated. Explain the steps that will be followed to accomplish required government certification and verification protocols where applicable. Both the project narrative and work plan must address how the applicant will implement all of the tasks in the proposed scope of work. Provide bibliographic citations for any references cited, including names of all authors, the article and journal title, book title, volume number, page numbers, and year of publication. Enclose with your application any documents (or pertinent excerpts) that you cite in support of performance claims in your project.

Work Plan

A detailed work plan needs to be included in the application package. The work plan should detail each specific task that is required to complete the demonstration project, as milestones, and the timing of each task that lead to the on-time completion of the demonstration project. Emission testing is a required element and must be included in the work plan where non-zero-emission technologies are part of the proposed project.

The work plan should be in a format that shows a logical sequence of tasks with project deliverables easily identifiable. The Grantee and technology demonstrator will make available, at CARB's request, all information and data generated as part of the project that is described in the work plan and scope of work.

Sample Work Plan Format

Task 9. Hybrid School Bus Emission Testing
The purpose of this task is to perform preliminary on-road emission testing on a demonstration hybrid school bus and collect fuel usage data.

Task 9.1 *Hybrid School Bus Company* will install PEMs unit on school bus and verify that the PEMS is operating normally.

Task 9.2 *Hybrid School Bus Company* will calibrate PEMS unit for on-road testing and perform on-road testing and evaluate results.

Task 9.3 *Hybrid School Bus Company* will begin sampling of exhaust emissions and fuel usage using PEMS and on-board ECM.

Task 9.4 *Hybrid School Bus Company* will collect emissions data from PEMS and fuel usage data from engines ECM.

Task 9.5 *Hybrid School Bus Company* will evaluate emissions and fuel usage data and prepare report on emissions and fuel usage to Grantee

Deliverable Description: Emission and Fuel Usage Report
Deliverable Due Date: June 30, 2019

Attachment 3: EMISSION REDUCTIONS AND COST-EFFECTIVENESS CALCULATIONS

The applicant must use the methodology in Appendix D to determine emission reductions and cost-effectiveness of proposed projects and include the calculations and results here. All references and variables used that are not included in Appendix D must be cited and explained. All calculations and assumptions made must be shown clearly and in their entirety. SHOW ALL MATH used in calculations. Inaccurate calculations could result in disqualification.

The GHG emission reductions are to be based on life cycle analysis (well to wheel) and calculated in tons of CO_2 equivalent[1] reduced per year. Combined weighted criteria pollutant and PM emission reductions are to be based on exhaust emissions (tank to wheel) and calculated in tons reduced per year.

Eight cost-effectiveness calculations are required as follows:

1. Dollars per ton of GHG emissions (in CO_2 equivalent) reduced during the actual proposed project over a 2-year operational timeline for each vehicle and piece of equipment;
2. Dollars per ton of GHG emissions (in CO_2 equivalent) reduced, two year after the conclusion of the proposed project and based on a 10-year useful life for each vehicle and piece of equipment;
3. Dollars per ton of combined criteria pollutant and weighted PM emissions reduced during the actual proposed project over a 2-year operational timeline for each vehicle and piece of equipment;
4. Dollars per ton of combined criteria pollutant and weighted PM emissions reduced two year after the conclusion of the proposed project and based on a 10-year useful life for each vehicle and piece of equipment;
5. Dollars per ton of GHG emissions (in CO2 equivalent) reduced during the actual proposed project over a 2-year operational timeline for all facility improvements;
6. Dollars per ton of combined criteria pollutant and weighted PM emissions reduced two year after the conclusion of the proposed project and based on a 10-year useful life for all the facility improvements that are part of the proposed project; and
7. Dollars per ton of GHG emissions (in CO_2 equivalent) reduced during the actual proposed project over a 2-year operational timeline that include the project in its entirety;
8. Dollars per ton of GHG emissions (in CO_2 equivalent) reduced, two year after the conclusion of the proposed project and based on a 10-year useful life that include the project in its entirety;

[1] "CO_2 equivalent" means the number of metric tons of CO_2 emissions with the same global warming potential as one metric ton of another greenhouse gas.

Attachment 4: PROPOSED BUDGET, PROJECT MILESTONES AND DISBURSEMENT SCHEDULE

The Proposed Budget must include all estimated labor, material, equipment, construction and installation costs associated with the project, including but not limited to:

1. requested administrative funds and description of any applicable commitments of cash or match funding for administrative expenses; and
2. requested project-related funds for:
   a) production and/or deployment of project vehicles and equipment; and
   b) site preparation, construction and installation of associated infrastructure needed to support project vehicles and equipment.
   c) construction of funded renewable power generation and storage systems
   d) education and outreach
   e) other funded actives that are part of the proposed project
3. committed cash and in-kind match for:
   a) production and/or deployment of project vehicles and equipment; and
   b) site preparation, construction and installation of associated infrastructure needed to support project vehicles and equipment.
   c) construction of funded renewable power generation and storage systems
   d) education and outreach
   e) other funded actives that are part of the proposed project

The Solicitation has a cost share requirement of at least 50 percent of the total project cost of which 10 percent must be cash committed by the project team. Please be as specific as possible when describing cash or in-kind match services (i.e., itemize staff time, equipment, consumables, or other costs that are being committed).

Cash match can include cash contributions to the project by the applicant or project partner, cash contributions from Federal, State, Local, and private sources, and administrative and project-related labor expenses, and equipment, materials and fuel purchased specifically for the project.

In-kind match refers to materials, equipment and services provided by project partners and made available to the project (i.e., access to existing hydrogen fueling station, equipment transportation). In-kind match can also include funding that is awarded to a member of the project team and will be used as part of the proposed project. Funds from GGRF are not allowed to be used as match.

The Project Milestones and Disbursement Schedule must follow the format described in Exhibit B Attachment II in the sample Grant Agreement (see Appendix B) and illustrated in the Sample Budget and Sample Project Milestones and Disbursement schedule later in this appendix. Milestones must be linked to specific tasks and deliverables detailed in the Project Scope of Work and Schedule and illustrated in the Sample Budget and Sample Project Milestones and Disbursement Schedule later in this appendix. All

disbursement amounts must be tied to a milestone; however, it is not necessary for every milestone to be paired with a disbursement request.

The following conditions apply to the proposed budget, and the Project Milestones and Disbursement Schedule:

1. Administrative expenses, both match and grant funded, must be described as either time-and-materials with detailed labor rates, or described as a work product deliverable (i.e., quarterly report, project management plan, etc.).
2. Any labor rate adjustments must be included in the application budget detail for the entire project term. Labor rates may not be increased at any time from those identified in the application.
3. All project partners must participate in the development of the project budget and the Project Milestones and Disbursement Schedule, and agree to be bound by it for the duration of the project. Any expectation of cost of living increases or increases in costs for project administration due to inflation or other reasons need to be included in the proposed project budget along with rationalization for any increases in administrative costs. Regardless of any proposed increases in costs due to cost of living, inflation or other reasons the total amount of funding for a proposed project will not be changed once the grant agreement is executed.
4. **All milestones are expense reimbursements. Expenses must be incurred before payment of grant funding. Purchase orders are not sufficient for reimbursement.**
5. Reimbursement for the final report must be at least 10 percent of the requested administrative budget or $10,000, which ever amount is greater.

Sample Proposed Budget

The Sample Proposed Budget may be copied or recreated as needed.[2,3]

(Numbers are provided for illustrative purposes only. Applicant may modify this sample budget to meet their specific needs. This page may also be edited, or deleted if not used)

TASK 1 – PROJECT ADMINISTRATION					
Direct Labor plus Expenses		Grant	Match Funding		
Position/Classification	Hourly rate	CARB	Cash	In-Kind	Total
Program Manager	$200	$10,000	$2,000		$12,000
Project Manager	$150	$45,000	$15,000		$60,000
Technician	$80	$40,000	$8,000		$48,000
Accountant	$80	$16,000	$3,200		$19,200
Clerical	$60	$24,000	$3,000		$27,000
Labor Subtotal		*$135,000*	*$31,200*		*$166,200*
Direct Costs (non-labor)					
Travel Costs	N/A	$20,000		$20,000	$40,000
Equipment and Supplies	N/A			$5,000	$5,000
Other Direct Costs	N/A	$5,000	$5,000	$5,000	$15,000
Task 1 subtotal		***$160,000***	***$36,200***	***$30,000***	***$226,200***
TASK 2 – TECHNOLOGY DESIGN AND BUILD					
Project Costs[4]	N/A				
Task 2.1-Purchase orders	N/A		$80,000	$20,000	$100,000
Task 2.2-Parts delivered	N/A	$2,000,000			$2,000,000
Task 2.3-Assembly	N/A	$1,500,000	$500,000		$2,000,000
Task 2.4-Test and certify	N/A	$1,000,000		$500,000	$1,500,000
Task 2 subtotal		***$4,500,000***	***$580,000***	***$520,000***	***$5,600,000***
TASK 3 – TECHNOLOGY DEMONSTRATION					
Direct Labor					
Project Manager	$150	$30,000			$30,000
Technician	$80	$40,000			$40,000
Labor subtotal		*$70,000*			*$70,000*
Direct costs-Travel/Supplies		$50,000			$50,000
Project Costs					
Task 3.1-Vehicle operation	$80		$500,000		$500,000
Task 3.2-Data collection	N/A	$200,000	$100,000		$300,000
Task 3 subtotal		***$320,000***	***$600,000***		***$920,000***
Total All Tasks		***$4,980,000***	***$1,216,200***	***$550,000***	***$6,746,200***
			% of total		
Total Grant Request to CARB		$4,980,000	74%		
Administration Portion of Request		$226,200	4.5%		
Cash Match		$1,216,200	18%		
In-Kind Match		$550,000	8%		

[2] Hourly rates must include direct labor plus overhead and fringe benefits. Any adjustments to hourly rates that may occur over the term of the project must be detailed in the project budget and explained in the application.

[3] Provide additional detail, as necessary, to show cost break down by task, subtask, and project partner.

[4] Example assumes that Task 2 will be invoiced based on completion of work product deliverables.

Sample Project Milestone and Disbursement Schedule

Milestone	Task Description	Project Funding		Match Funds	
		Project Funds	Administrative Funds	Cash	In-Kind
1	Conduct Kick-Off Meeting. Task 1.1[a]	$0	$20,000	$0	$0
2	Status updates and quarterly progress reports. Task 1.2[a]	$0	$150,000	$0	$0
...	...	...	...	...	...
7	Execute purchase orders. Completion of Task 2.1[b]	$0	$0	$0	$0
8.1	Part #1 delivered. Completion of Task 2.2.1[b]	$500,000	$0	$75,000	$0
8.2	Part #2 delivered. Completion of Task 2.2.2[b]	$700,000	$0	$0	$0
...	...	...	...	...	...
9.1	A, B & C assembled. completion of Task 2.3.1[b]	$0	$0	$15,000	$20,000
9.2	D, E &F assembled. Completion of Task 2.3.2[b]	$0	$0	$0	$0
...	...	...	...	...	...
10	Vehicle deployment. Task 3.1	$0	$0	$10,000	$0
11	Data collection. Task 3.2[b]	$200,000	$0	$0	$5,000
12	Oversight of Tasks 3.1 and 3.2[a]	$120,000	$0	$0	$0
13	Draft Final Project Report: Completion of Task 1.4	$0	$0	$0	$0
14	Final Project Report. Completion of Task 1.5[b]	$0	$22,620	$0	$0
Subtotal of Project Funds and Administrative Funds		**$**	**$**	**$**	**$**
Grant Total Funding Amount		**$**			

a) Indicates that work to be invoiced on a time-and-materials basis but not to exceed the total amount for the specific Milestone.
b) Indicates that disbursement will include the total dollar mount for that Milestone contingent upon completion of a specific task supported with a deliverable (as detailed in the Project Schedule.

Attachment 5: DISADVANTAGED COMMUNITIES ELIGIBILITY DETERMINATION

Project location is an important consideration in scoring an application for funding. Location in a disadvantaged community is not required to be eligible for funding. However, projects that are located in a disadvantaged community can be eligible for additional points during the scoring process and at least 90% of these funds must be located in or benefit disadvantaged communities.

Disadvantaged community status is determine using CalEnviroScreen 3.0. CalEnviroScreen is a screening methodology that is used to help identify California communities that are disproportionately burdened by multiple sources of pollution. CalEnviroScreren 3.0 gives scores to every census track in the state. Those census tracks in the 75th percentile or higher are considered disadvantaged communities. CalEniroScreen 3.0 mapping tool can be found at:
https://calepa.ca.gov/EnvJustice/GHGInvest/

Being located in a disadvantage community is determined by the location of the freight facilities that are part of the proposed project and the vehicles or pieces of equipment that will be domiciled, registered or operated a majority of the time. If a facility is partially located in a disadvantaged community, then the project located at that facility is, regardless of the exact site location is considered located in a disadvantaged community.

Determining if a project is providing benefits to a disadvantaged community will use the following process

If the project does not meet the above criteria for "located in," evaluate the project to see if it meets at least one of the following criteria for providing direct, meaningful, and assured benefits to a disadvantaged community; and meaningfully addresses an important community need*.
Project must meet at least one of the following criteria focused on reducing air pollution for disadvantaged community residents:

A. Project provides incentives for vehicles or equipment to those with a physical address in a ZIP code that contains a disadvantaged community census tract**; or
B. Project provides incentives for freight vehicles or equipment that primarily serve freight hubs located in a ZIP code that contains a disadvantaged community census tract.

Attachment 6: PROCEDURES FOR HANDLING CONFIDENTIAL INFORMATION

How CARB Handles Confidential Information

The CARB prefers that you do not include confidential information (e.g., trade secrets) in your proposal. However, if you find it necessary to include such information, **clearly label it "Confidential"**, and submit under a separate cover. CARB will protect it as confidential information to the degree allowed by CARB regulations on information disclosure in conformance with State law (see Title 17, California Code of Regulations, section 91000, et seq.). The CARB will not disclose data identified by an applicant as confidential, except as required by law. However, because of the legal requirements for disclosure of some kinds of information, applicants are advised that the CARB cannot provide an absolute guarantee that all material designated as confidential will not be disclosed to the public. Also, the State cannot accept legal liability for such disclosure. If such restrictions are not acceptable to you, **DO NOT INCLUDE CONFIDENTIAL MATERIAL IN YOUR PROPOSAL**.

Confidentiality Provision

The following statement must be signed and returned to CARB with your application if the application includes confidential information that you want to be protected as trade secrets.

* * * ** * * *

The restriction on disclosing this information shall not apply to any information identified by the applicant as confidential that (a) is already known to the public or the CARB at the time of disclosure, or (b) is or becomes publicly known through no wrongful or negligent act on the part of the review panel members or the CARB.

The applicant further agrees that s/he has read the following confidentiality provision and agrees to its terms and conditions.

It is understood that in the course of carrying out this agreement, the CARB may provide Confidential Information to non-CARB reviewers. Each review panel member agrees to use his/her best effort to hold Confidential Information in confidence and shall return it to the ARB upon the completion of the agreement.

This obligation shall apply only to Confidential Information that is designated or identified as such in writing by the CARB prior to the disclosure thereof. All Confidential Information shall be sent only to the review panel members. Moreover, this obligation shall not apply to any Confidential Information which: (a) is or becomes publicly known through no wrongful or negligent act on the part of the review panel; (b) is already known to the review panel member at the time of disclosure; (c) is independently developed by the review panel member without breach of this agreement; or (d) is generally disclosed to third parties by the CARB without similar restrictions on such third parties."

X _____ _____

Applicant's signature Date

Attachment 7: LETTERS OF COMMITMENT

Include letters of commitment from partners, subcontractors, community groups that are part of the project team etc., as appropriate to complete the application.

Attachment 8: CALIFORNIA ENVIRONMENTAL QUALITY ACT WORKSHEET

This attachment must be submitted as part of the application if the project proposal includes proposed infrastructure installation (e.g., electric vehicle supply equipment or hydrogen refueling station). Additional information regarding this requirement is available in Appendix .E

The California Environmental Quality Act (CEQA) (Public Resources Code §§ 21000 et seq.) requires public agencies to identify the significant environmental impacts of their actions and to avoid or mitigate them, if feasible.[5] Under CEQA, an activity that may cause either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment is called a "project" (Public Resources Code § 21065). Agency compliance with CEQA may include preparing a Notice of Exemption or conducting an Initial Study and preparing a Negative Declaration, a Mitigated Negative Declaration, or, if there are significant impacts, an Environmental Impact Report.

The Lead Agency is the public agency that has the greatest responsibility for preparing environmental documents under CEQA, and for carrying out, supervising, or approving a project. Where the grant recipient is a public agency, the Lead Agency is typically the recipient. Where the grant recipient is a private entity, the Lead Agency is the public agency that has greatest responsibility for supervising or approving the project as a whole.[6] When issuing contracts, grants, or loans, the California Air Resources Board (CARB or Board) is typically a "Responsible Agency" under CEQA, which means that it may make its own CEQA findings based on review of the Lead Agency's environmental documents. If CARB is the only public agency with responsibility for approving the project, then CARB may act as the Lead Agency and prepare its own environmental documents (based on analysis provided by the applicant).

This worksheet will help CARB determine what kind of CEQA review, if any, is necessary, and which agency will be performing that review as a Lead Agency. No project can be selected, nor can any grant be executed, until the CEQA requirements have been satisfied.

Please answer all questions in the worksheet below as completely as possible. It may also help you to think through the CEQA process necessary for your proposed project. The CARB may request additional information in order to clarify responses provided on this worksheet.

---

[5] To view frequently asked questions and answers about CEQA, please visit http://resources.ca.gov/ceqa/more/faq.html.

[6] 14 CCR §§ 15050, 15051. The Lead Agency typically has general governmental powers (such as a city or county), rather than a single or limited purpose (such as an air pollution control district).

1. **What are the physical aspects of the project? (Check all that apply and provide brief description of work, including any size or dimensions of the project).**

Project Aspect	Yes	No	Description of Project Aspect
Construction (including grading, paving, etc.)	☐	☐	
Trenching	☐	☐	
New or replaced pipelines	☐	☐	
Construction of underground facilities (including tanks)	☐	☐	
Modification or conversion of a facility	☐	☐	
New or modified operation of a facility or equipment	☐	☐	
On-road demonstration	☐	☐	
Paper study (including analyses on economics, feedstock availability, workforce availability, etc.)	☐	☐	
Laboratory research	☐	☐	
Temporary or mobile structures (skid-mounted)	☐	☐	
Design/Planning	☐	☐	
Other (describe and add pages as necessary)	☐	☐	

2. **Where is the project located or where will it be located? (Attach additional sheets as necessary.)**

Address	County	Type of Work to Be Completed at Site

3. **Will the project potentially have environmental impacts that trigger CEQA review? (Check a box and explain the answer for each question. Additionally, please provide a complete description of any direct physical changes and reasonably foreseeable indirect changes to the environment that may result from the project. Please provide as much detail as possible. You may provide additional information on supplemental pages as necessary.)**

Question	Yes	No	Don't Know	Explanation
Is the project site environmentally sensitive?	☐	☐	☐	
Is the project site on agricultural land?	☐	☐	☐	
Is the land on which the project would be built previously disturbed?	☐	☐	☐	
Is this project part of a larger project?	☐	☐	☐	
Is there public controversy about the proposed project or larger project?	☐	☐	☐	
Will historic resources or historic buildings be impacted by the project?	☐	☐	☐	

Question	Yes	No	Don't Know	Explanation
Is the project located on a site the Department of Toxic Substances Control and the Secretary of the Environmental Protection have identified as being affected by hazardous wastes or cleanup problems?	☐	☐	☐	
Will the project generate noise or odors in excess of permitted levels?	☐	☐	☐	
Will the project increase traffic at the site and by what amount?	☐	☐	☐	
Is the project expected to result in environmental impacts to any other resource area (e.g., air quality, aesthetics, water quality)? (Add pages as necessary.)	☐	☐	☐	

4. Will the project require discretionary permits or determinations, as listed below?

Type of Permit	No	Modified	New	Approving Agency	Reason for Permit, Summary of Process, and Anticipated Date of Issuance
Air Quality Permit	☐	☐	☐		
Water Quality Permit	☐	☐	☐		
Conditional Use Permit or Variance	☐	☐	☐		
Building Expansion Permit	☐	☐	☐		
Hazardous Waste Permit	☐	☐	☐		

Type of Permit	No	Modified	New	Approving Agency	Reason for Permit, Summary of Process, and Anticipated Date of Issuance
Rezoning	☐	☐	☐		
Authority to Construct	☐	☐	☐		
Other Permits (List types)	☐	☐	☐		

5. **Of the agencies listed in #4, have you identified and contacted the public agency who will be the lead CEQA agency on the project?**

   ☐ **Yes**. Provide the name and contact information for the lead agency.

   _____
   _____
   _____
   _____

   ☐ **No.** Explain why no contact has been made and/or a proposed process for making contact with the lead agency.

   _____
   _____
   _____
   _____
   _____

6. **If you identified an agency with discretionary approval authority over the project (see Item 4 above), has as the public agency prepared environmental documents (e.g., Notice of Exemption, Initial Study/Negative Declaration/Mitigated Negative Declaration, Environmental Impact Report, Notice of Determination) under CEQA for the proposed project?**

   ☐ **Yes**. Please complete the following and attach the CEQA document to this worksheet. (For "Not a project," the title of the document may be an e-mail, resolution, or letter.)

Type of Environmental Review	Title of Environmental Document (Attach the document to this form)	State Clearinghouse Number	Completion Date	Planned Completion Date (must be before approval of grant)
"Not a project" ☐ Email ☐ Letter ☐ Resolution ☐ Other:		N/A		N/A
Exempt (Resolution of public agency or Agenda Item approving Exemption)		N/A		N/A
Exempt (Notice of Exemption)		N/A		
Initial Study				
Negative Declaration				
Mitigated Negative Declaration				
Notice of Preparation				
Environmental Impact Report				
Master Environmental Impact Report				
Notice of Determination				

Type of Environmental Review	Title of Environmental Document (Attach the document to this form)	State Clearinghouse Number	Completion Date	Planned Completion Date (must be before approval of grant)
NEPA Document (Environmental Assessment, Finding of No Significant Impact, and/or Environmental Impact Statement)				

☐ **No**. Explain why no document has been prepared. Propose a process for obtaining lead agency approval and estimated date for that approval (must occur before CARB will approve the grant).

_____

_____

_____

_____

_____

_____

Certification: I certify to the best of my knowledge that the information contained in this worksheet is true and complete. I further certify that I am authorized to complete and sign this form on behalf of the proposing organization.

Name: _____

Title: _____

Signature: _____

Phone Number: _____

Email: _____

Date: _____

Attachment 9: CONFLICT OF INTEREST DECLARATION

All applicants must disclose any Conflict of Interest with their ability to fulfill the duties of the Zero- and Near Zero-Emission Freight Facilities Project Grantee. Summarize your organization's or any subcontractor's (as identified in Attachment 1 of this application) current, ongoing, or pending direct or indirect interest, which poses an actual, apparent, or potential conflict of interest with your ability to fulfill the duties of the Grantee. These may include but are not limited to financial arrangements with or interest in zero- or near zero-emission technology providers, vehicle manufacturers, or related organizations. ARB may consider the nature and extent of any potential or apparent conflict of interest in evaluating, considering, or scoring the application and may disqualify the applicant at ARB's sole discretion.

Attachment 10: STD. 204 PAYEE DATA RECORD

Please fill out and submit as a part of this application the STD. 204 Payee Data Record:

http://www.dhcs.ca.gov/services/Documents/DHCS_STD.204.pdf

This form is required, even if the applicant is a governmental entity. Applications that do not include this completed form will not be scored.

Attachment 11: APPLICANT QUALIFICATIONS

1. Qualifications Narrative: Please provide an attachment describing your experience/expertise developing, implementing, or administering similar demonstration projects and working with vehicle and equipment manufacturers, technology providers, and other stakeholders; identify how this background will enable you to efficiently and effectively implement the Zero- and Near Zero Emission Freight Facilities Project. This narrative should not exceed two pages.

2. Staff Information: Include information for each staff member to be involved in developing, implementing, or administering the On-Road Advanced Technology Demonstration Project. Clearly identify staff proposed for day-to-day project implementation. Attach résumés.

Name:	Hourly rate:
Phone:	Email:
Title:	
Expected duties:	
Name:	Hourly rate:
Phone:	Email:
Title:	
Expected duties:	
Name:	Hourly rate:
Phone:	Email:
Title:	
Expected duties:	

If more room is needed, this page may be copied or recreated.

3. Subcontractor Information: Applicants may partner with other entities. Responsibility for deliverables lies with the primary applicant, and the grant will be awarded only to the primary applicant. Provide the names and information for any and all subcontractors and partners. Attach qualification narratives, résumés, and letters of commitment for individuals listed below. Each letter of commitment must describe the nature of the partner's contribution to the project.

Name:	Hourly rate:
Phone:	Email:
Title:	
Expected duties:	
Name:	Hourly rate:
Phone:	Email:
Title:	
Expected duties:	
Name:	Hourly rate:
Phone:	Email:
Title:	
Expected duties:	

If more room is needed, this page may be copied or recreated.

APPENDIX B

SAMPLE GRANT AGREEMENT

Zero- and Near Zero-Emission Freight Facilities Project

Mobile Source Control Division
California Air Resources Board
March 21, 2018

CALIFORNIA
AIR RESOURCES BOARD

This page left intentionally blank.

EXHIBIT A

GRANT PROVISIONS

1. The parties agree to comply with the requirements and conditions contained herein, as well as all commitments identified in the Grant Solicitation for Clean Transportation Incentives, Zero- and Near Zero-Emission Freight Facilities Project (Exhibit C) and Grantee Application Package (Exhibit D).

2. The California Climate Investments logo and name serves to bring under a single brand the many investments whose funding comes from the Greenhouse Gas Reduction Fund (GGRF). The logo represents a consolidated and coordinated initiative by the State to address climate change by reducing greenhouse gases, while also investing in disadvantaged communities and achieving many other co-benefits. The Grantee agrees to acknowledge the California Climate Investments program as a funding source from CARB's Low Carbon Transportation program whenever projects funded, in whole or in part by this Agreement, are publicized in any news media, websites, brochures, publications, audiovisuals, or other types of promotional material. The acknowledgement must read as follows: 'This publication (or project) was supported by the "California Climate Investments" (CCI) program. Guidelines for the usage of the CCI logo can be found at www.arb.ca.gov/ccifundingguidelines

3. GRANT SUMMARY AND AMENDMENTS (IF APPLICABLE)

Project Title: Zero- and Near Zero-Emission Freight Facilities Project

Funding Amount: $_____

Match Amount: $_____

4. GRANT PARTIES AND CONTACT INFORMATION

4.1 This grant is from the California Air Resources Board (hereinafter referred to as (CARB) to Eligible Applicant (hereinafter referred to as Grantee).

4.2 The CARB Project Liaison is Earl Landberg. Correspondence regarding this project must be directed to:

Earl Landberg
California Air Resources Board
Mobile Source Control Division
Post Office Box 2815
Sacramento, California 95812
Phone: (916) 323-1384
E-mail: earl.landberg@arb.ca.gov

4.3 The Grantee Liaison is _____. Correspondence regarding this project must be directed to:

Grantee Liaison: Eligible Applicant Staff Member
Title: Project Manager
Address: 1001 Main Street
Phone: 805-915-9889
Email: staff.member@eligableapplicant.org

5. TIME PERIOD

5.1 Performance of work or other expenses billable to CARB under this grant may commence after signing and awarding of this grant. Performance on this grant ends once the Grantee has submitted the CARB approved final report or if the grant is terminated, whichever is earlier.

5.2 Upon completion of the project, the Grantee must submit a draft final report to the Project Liaison no later than **February 14, 2021** (see Section 9.4).

5.3 Final report and final request for payment must be received by CARB no later than **April 1, 2021** (see Section 9).

6. SCOPE OF WORK

6.1 Description

6.1.1 The Zero- and Near Zero-Emission Freight Facilities Project is a new, multi-faceted project that is designed to holistically reduce GHG and criteria pollutant emissions in freight facilities and to help achieve additional benefits, such as providing economic, environmental, and public health benefits to disadvantaged communities and/or low-income communities.

6.1.2 Additional Scope of Work detail is in Exhibit B Work Statement and Exhibit D Grantee Application Package Attachment B.

6.2 General responsibilities.

6.2.1 CARB is responsible for the following:

a. Participation in regular meetings with Grantee to discuss project refinements and guide the administration of the project.
b. Reviewing and approving project elements provided by Grantee, such as general vehicle and equipment design criteria, data collection and analysis.
c. Review and approve all grant disbursement requests (Form MSCD/ISB-90).
d. Provide project oversight in conjunction with Grantee.
e. Ensure compliance with applicable requirements of:
    i. Fiscal Year 201-2018 Funding Plan for Clean Transportation Incentives (FY 2017-18 Funding Plan)
    ii. Fiscal Year 2017-18 Clean Transportation Incentives Zero- and Near Zero-Emission Freight Facilities Project (Solicitation).
    iii. Air Quality Improvement Program Guidelines
f. Maintaining adherence to the project timeline.

6.2.2 Grantee's responsibilities include all project development, press events, project administration, and project reporting, including the following tasks:

a. Grantee's key project personnel will participate in an initial Project Kick-Off meeting with CARB staff before work on the project begins. The purpose of the initial meeting will be to discuss the overall plan, details for performing the tasks, the project schedule, and any issues that may need to be addressed. Grantee's key personnel and data collector will also participate in review meetings to discuss progress to be held at least quarterly beginning three months after the initial Project Kick-Off meeting. Grantee may be

asked to schedule additional meetings at the sole discretion of the CARB Project Liaison.

b. Regular project update meetings, to be held at least quarterly, more frequent meetings may be scheduled at the sole discretion of the CARB Project Liaison.
   i. Regular Project Meetings will have an Agenda with call-in information for all participants.
   ii. Agenda will detail all the issues to be discussed during the Regular Project Update Meeting
   iii. Agenda will detail items that may cause the project to slip on the time schedule
   iv. The Regular Project Update Meetings will cover the project timeline and steps needed to maintain the project timeline.
   v. The Regular Project Update Meetings will have discussion on what milestones and workplan tasks are expected to be completed before the next Regular Project Update Meeting
   vi. Regular Project Update Meetings must include at a minimum the Grantee Liaison, representative from the data collection team and key project partners for any milestone that is behind schedule.

c. The Grantee must submit numbered status reports accompanying grant disbursement requests to CARB at least quarterly, but may submit on a monthly basis if necessary for more frequent disbursements with prior approval from CARB. These reports must be approved by CARB and must contain the following information, at a minimum, in either Microsoft Word or PDF, as a single electronic file:
   i. Project Status Report number, title of project, name of Grantee, date of submission, and project grant number.
   ii. Summary of work completed since the last progress report, noting progress toward completion of tasks and milestones identified in the work plan.
   iii. Statement of work expected to be completed by the next progress report.
   iv. Notification of problems encountered and an assessment of their effects on the project's outcome.
   v. Data collected from vehicles, equipment and facilities since the last data reporting.
   vi. Grantee must ensure that trucking fleets, equipment operators, freight facilities and technology manufacturers are flexible for the scheduling of the data logging installation, data retrieval and PEMS testing as needed.
   vii. Itemized invoice showing all costs for which reimbursement is being requested.
   viii. Discussion of the project's adherence to the project timeline.

d. A draft final report shall be provided to CARB for comments at least one month before the due date of the final report.

e. Ensure that project end-users are working with data collection provider.

7. FISCAL ADMINISTRATION

Budget

7.1 The maximum amount of this grant is $_____. Under no circumstance will CARB reimburse the Grantee for more than this amount. The budget for the project is shown in Exhibit B, Attachment I.

7.2 The project will include a cash-match and an in-kind match from private, eligible state, and local funding to leverage this grant, for a total project budget of $_____.

7.3 Project implemntation funding may be reallocated to project funds with prior written approval by CARB.

7.4 The Application package is incorporated by reference as part of the Grant Agreement. Costs associated with project implementatin, detailed in the Application must consider the time frame of the project and may cover an increase in costs that take into account inflation or planned cost of living increases. The application submitted will be the actual costs for the project and will not be amended due to faulty estimations, increases in costs due to inflation or other reasons that have not been covered in the budget.

7.5 Subject to prior written approval from CARB, line item shifts of up to ten percent of the grant total may be made over the life of the grant. Line item shifts greater than ten percent require a formal amendment to the grant. Line item shifts may be proposed by either the State or the Grantee and must not increase the total grant amount. All line item shifts must be approved in writing by CARB. If the grant is formally amended, all line item shifts must be included in the amendment.

7.6 Earned Interest

7.6.1 Earned interest means any interest earnings generated from grant funds held by Grantee in interest-bearing accounts.

a. Project funds are not required to be held in an interest bearing account. However, if interest is earned by Grantee on the project the earnings must be reported to CARB. All interest income on the Project funds must be reinvested in and used by the Project or returned to CARB. Grantee is responsible for reporting to CARB all project expenditures funded with interest earned on the Project

funds.

b. Grantee must maintain accounting records (e.g., general ledger) that tracks interest earned, expended, or returned on the Project funds, as follows:
   i. The calculation of interest must be based on an average daily balance or some other reasonable and demonstrable method.
   ii. Interest earned must ensure that it is separately identifiable from interest earned on non-Project funds.
   iii. The methodology for calculating earned interest must be consistent with how it is calculated for Grantee's other fiscal programs.
   iv. Earned interest must be fully expended or returned to CARB by completion of the project, submittal of the Final Report, or by **January 31, 2021,** whichever comes first.
   v. Documentation of interest earned on the Project funds and expenditures made on those funds or returned to CARB must be:
      1. Retained for a minimum of three years after it is generated.
      2. Provided to CARB in Status Reports and a Final Report.

Grant Disbursements

7.7 Requests for payment shall be made with the Grant Disbursement Request Form (Form MSCD/ISB-90) and conform to the instructions identified in the Fiscal Year 2017-18 Clean Transportation Incentives Zero- and Near Zero-Emission Freight Facilities Project Solicitation (Solicitation). Grant payments shall be made on a reimbursement basis and only for actual costs incurred by the Grantee for recurring milestones. Grant Payments shall be made upon achievement of discrete payable milestone as defined in Project Milestones and Disbursement Schedule (EXHIBIT B, Attachment II) and only when the Grantee has submitted a Grant Disbursement Request Form, milestones stipulated in Exhibit B, Attachment II and the instructions found in the Solicitation have been accomplished, documentation of accomplishment has been provided to CARB in the form of the Status Report, and any associated deliverables (if applicable) have been provided to CARB. CARB will have sole discretion to accelerate the timeline for allowable disbursements of administration and project funds identified in Exhibit B, Attachment II (with the exception of the final project administration disbursement), necessary to assure the goals of the project are met.

7.8 Grant payments are subject to CARB's approval of Status Reports and any accompanying deliverables (see Section 9 Reporting). A payment will not be made if the CARB Project Liaison deems that a milestone has not been accomplished or documented, a deliverable meeting specifications has not

been provided, claimed expenses are not documented, not valid per the budget, or not reasonable, or the Grantee has not met other terms of the grant.

The Chief of the Mobile Source Control Division or designee of CARB may review the Project Liaison's approval or disapproval of a Grant Disbursement Request. No reimbursement will be made for expenses that, in the judgment of the Division Chief of the Mobile Source Control Division, are not reasonable or do not comply with the Grant Agreement.

7.9 The Grantee shall mail completed and signed Grant Disbursement Requests to the Project Liaison.

7.10 CARB retains the right to withhold payment of ten percent of administrative funds until completion of all work and submission of a Final Report to CARB, It is the Grantee's responsibility to submit a Grant Disbursement Request for this final disbursement of funds.

7.11 CARB shall disburse funds in accordance with the California Prompt Payment Act, Government Code, Section 927, et seq.

Oversight and Accountability

7.12 The Grantee shall comply with all oversight responsibilities identified in the Solicitation, Grantee Application Package, and this Grant Agreement.

7.13 CARB, or its designee, reserves the right to audit at any time during the duration of this grant the Grantee's costs of performing the grant and to refuse payment of any reimbursable costs or expenses that in the opinion of CARB or its designee are unsubstantiated or unverified. The Grantee shall cooperate with CARB or its designee including, but not limited to, promptly providing all information and documents requested, such as all financial records, documents, and other information pertaining to reimbursable costs, and any matching costs and expenses.

7.14 CARB or its designee may recoup funds which were received based upon misinformation or fraud, or for which a Grantee, manufacturer (including vehicle and equipment manufacturers), technology provider, or vehicle/equipment purchaser is in significant or continual non-compliance with the terms of this grant or State law. CARB also reserves the right to prohibit any entity from participating in the Zero- and Near Zero-Emission Freight Facilities Project due to non-compliance with project requirements or other CARB regulations.

8 PROJECT MONITORING

Meetings

8.1 Kick-Off meeting: A meeting will be held between key project personnel as defined in Exhibt B Attachment IV Key Project Personnel and CARB staff before work on the project begins. The purpose of the first meeting will be to discuss the overall plan, details of performing the tasks, the project schedule, and any issues that may need to be resolved.

Review meetings: Meetings to discuss progress must be held at least quarterly beginning three months after the initial Project Kickoff Meeting. Additional meetings may be scheduled at the sole discretion of the CARB Project Liaison. Such meetings may be conducted by phone, if deemed appropriate by the CARB Project Liaison.

Technical Monitoring

8.2 Any changes in the scope or schedule for the project shall require the prior written approval of the CARB Project Liaison and may require an amendment to the Grant.

8.3 The Grantee shall notify the CARB Project Liaison in writing, immediately if any circumstances arise (technical, economic, or otherwise), which might place completion of the project in jeopardy. In addition, the Grantee shall also make such notification if there is a change in key project personnel (see Exhibit B, Attachment IV).

8.4 The Grantee shall notify the CARB Project Liaison if the project technology will pursue official verification/certification during the term of this agreement and all documentation in support of the verification/certification must be submitted to the Project Liaison concurrently with the verification/certification submittal.

8.5 In addition to Status Reports (discussed in Section 9 Reporting), the Grantee shall provide information requested by the Project Liaison that is needed to assess progress in completing tasks and meeting the objectives of the project.

8.6 Any change in budget allocations, re-definition of deliverables, or extension of the project schedule must be requested in writing to the CARB Project Liaison and approved by CARB, in its sole discretion, and may require a grant amendment.

9 REPORTING

Status Reports

9.1 The Grantee will submit Status Reports at monthly intervals. The Status Reports shall be provided in a format agreed upon between the CARB Project Liaison and the Grantee and meet the requirements of the Solicitation.

9.2 Every Grant Disbursement Request Form (Form Number MSCD/ISB-90) shall be accompanied by a Status Report that documents the completion of a milestone(s) specified in Exhibit B, Attachment II.

9.3 If the project is behind schedule, the Status Reports must contain an explanation of reasons and a detailed explanation of how the Grantee plans to resume the schedule.

Final Report

9.4 When the project is complete, the Grantee shall submit a draft Final Report. The draft Final Report must be submitted to CARB in an appropriate format agreed upon between the CARB Project Liaison and the Grantee. Upon approval of the draft Final Report by the Project Liaison, the Grantee shall provide a written copy of the final version, plus an electronic file.

9.5 The Grantee must present, at CARBs sole discression, the results of the project at up to two forums, symposiums, or other event to discribke the project and the results.

10 TERMINATION AND SUSPENSION OF PAYMENTS

10.1 CARB reserves the right to terminate this grant upon thirty days' written notice to the Grantee, if CARB determines that the project has not progressed satisfactorily during the previous three months and the Grantee and CARB have been unable to agree on modifications. In case of early termination, the Grantee will submit a Grant Disbursement Request Form, a Status Report covering activities up to, and including, the termination date and following the requirements in Section 9 of these provisions. Upon receipt of the Grant Disbursement Request Form and all Status Reports, a final payment will be made to the Grantee. This payment shall be for all CARB-approved, actually incurred costs that in the opinion of CARB are justified. However, the total amount paid shall not exceed the total grant amount.

10.2 CARB reserves the right to issue a grant suspension order in the event that a dispute should arise. The grant suspension order will be in effect until the dispute has been resolved or the grant has been terminated. If the Grantee chooses to continue work on the project after receiving a grant suspension

order, the Grantee will not be reimbursed for any expenditure incurred during the suspension in the event CARB terminates the grant. If CARB rescinds the suspension order and does not terminate the grant, CARB will reimburse the Grantee for any expenses incurred during the suspension that are reimbursable in accordance with the terms of the grant.

11 CONTINGENCY PROVISION

11.1 In the event this grant is terminated for whatever reason, the CARB Executive Officer or designee reserves the right in his or her sole discretion to award a grant to the next highest scored applicant and if an agreement cannot be reached, to the next applicant(s) until an agreement is reached. If CARB is unable to award a grant under these circumstances, CARB may award a grant to other projects.

12 PROJECT RECORDS

Grantee Record

12.1 As further described below, project records include but are not limited to Grantee, financial, and other records. All project records must be retained for a period of three (3) years after final payment under this Grant. All project records are subject to audit pursuant to the General Provisions Section (Section 13) of this Grant Agreement. Upon completion of the third year of record retention, the Grantee shall submit all project records to CARB. Hardcopy of electronic records are suitable. Acceptable forms of electric media include hard drives, compact discs, digital video discs and flash drives. Other forms of electronic media may be allowed based on prior written concurrence from CARB.

12.2 The Grantee shall retain a file for the Freight Facilities Project containing, but not limited to:

a. Original executed copy of the Grant Agreement and Grant Agreement Amendments (if applicable);
b. Copies of Grant Disbursement Request Forms;
c. Documentation of earned interest generation and expenditure;
d. All Project Status Reports;
e. Invoices from project participants for reimbursable items; and
f. All other information that documents all aspects of the project

Financial Record

12.3 Without limitation of the requirement to maintain project accounts in accordance with generally accepted accounting principles, the Grantee must:

a. Establish an official file for the Freight Facilities Project, which shall adequately document all significant actions relative to the project.

b. Establish separate accounts, which will adequately and accurately depict all amounts received and expended on the Freight Facilities Project.
c. Establish separate accounts, which will adequately and accurately depict all income received which is attributable to the Freight Facilities Project, including cash and in-kind match.
d. Establish an accounting system, which will adequately depict final total costs of the Freight Facilities Project, including both direct and indirect costs.

12.4 Other Records include all deliverables required in Exhibit B, Attachment III, of this Grant Agreement.

13 GENERAL PROVISIONS

13.1 **Amendment:** No amendment or variation of the terms of this Grant Agreement shall be valid unless made in writing, signed by the parties and approved as required. No oral understanding or agreement not incorporated in the Grant Agreement is binding on any of the parties.

13.2 **Assignment:** This grant is not assignable by the Grantee, either in whole or in part, without the consent of CARB in the form of a formal written amendment.

13.3 **Compliance with law, regulations, etc.:** The Grantee agrees that it will, at all times, comply with and require its contractors and subcontractors to comply with all applicable federal and State laws, rules, guidelines, regulations, and requirements.

13.4 **Conflict of interest:** The Grantee certifies that it is in compliance with applicable State and/or federal conflict of interest laws.

13.5 **Disputes:** The Grantee shall continue with the responsibilities under this Grant Agreement during any dispute. Grantee staff or management may work in good faith with CARB staff or management to resolve any disagreements or conflicts arising from implementation of this Grant Agreement. However, any disagreements that cannot be resolved at the management level within 30 days of when the issue is first raised with CARB staff shall be subject to resolution by the CARB Executive Officer, or his designated representative. Nothing contained in this paragraph is intended to limit any rights or remedies that the parties may have under law.

13.6 **Environmental justice:** In the performance of this Grant Agreement, the Grantee shall conduct its programs, policies, and activities that substantially affect human health or the environment in a manner that ensures the fair treatment of people of all races, cultures, and income levels, including minority populations and low-income population of the State.

13.7 **Fiscal management systems and accounting standards:** The Grantee agrees that, at a minimum, its fiscal control and accounting procedures will be sufficient to permit tracing of grant funds to a level of expenditure adequate to establish that such funds have not been used in violation of State law or this Grant Agreement. Unless otherwise prohibited by State or local law, the Grantee further agrees that it will maintain separate Project accounts in accordance with generally accepted accounting principles.

13.8 **Force majeure:** Neither CARB nor the Grantee shall be liable for or deemed to be in default for any delay or failure in performance under this Grant Agreement or interruption of services resulting, directly or indirectly, from acts of God, enemy or hostile governmental action, civil commotion, strikes, lockouts, labor disputes, fire or other casualty, etc.

13.9 **Governing law and venue:** This grant is governed by and shall be interpreted in accordance with the laws of the State of California, CARB and the Grantee hereby agree that any action arising out of this Grant Agreement shall be filed and maintained in the Superior Court in and for the County of Sacramento, California, or in the United States District Court in and for the Eastern District of California. The Grantee hereby waives any existing sovereign immunity for the purposes of this Grant Agreement.

13.10 **Indemnification:** The Grantee agrees to indemnify, defend and hold harmless the State and the Board and its officers, employees, agents, representatives, and successors-in-interest against any and all liability, loss, and expense, including reasonable attorneys' fees, from any and all claims for injury or damages arising out of the performance by the Grantee, and out of the operation of equipment that is purchased with funds from this Grant Award.

13.11 **Grantee's responsibility for work:** The Grantee shall be responsible for work and for persons or entities engaged in work, including, but not limited to, contractors, subcontractors, suppliers, and providers of services. The Grantee shall be responsible for any and all disputes arising out of its contract for work on the Project, including but not limited to payment disputes with contractors, subcontractors, and providers of services. The State will not mediate disputes between the Grantee and any other entity concerning responsibility for performance of work.

13.12 **Independent actor:** The Grantee, and its agents and employees, if any, in their performance of this Grant Agreement, shall act in an independent capacity and not as officers, employees or agents of CARB.

13.13 **Nondiscrimination**: During the performance of this Grant Agreement, the Grantee and its third party entities shall not unlawfully discriminate, harass, or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, physical disability

(including HIV and AIDS), mental disability, medical condition (e.g., cancer), age (over 40), marital status, and denial of family care leave. The Grantee and its third party entities shall insure that the evaluation and treatment of their employees and applicants for employment are free from such discrimination and harassment. The Grantee and its third party entities shall comply with the provisions of the Fair Employment and Housing Act (Gov. Code §12990 (a-f) et seq.) and the applicable regulations promulgated thereunder (California Code of Regulations, Title 2, Section 7285 et seq.). The applicable regulations of the Fair Employment and Housing Commission implementing Government Code Section 12990 (a-f), set forth in Chapter 5 of Division 4 of Title 2 of the California Code of Regulations, are incorporated into this Agreement by reference and made a part hereof as if set forth in full. The Grantee and its third party entities shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement.

The Grantee shall include the nondiscrimination and compliance provisions of this clause in all subcontracts to perform work under this Grant Agreement

13.14 **No third party rights:** The parties to this Grant Agreement do not create rights in, or grant remedies to, any third party as a beneficiary of this Grant Agreement, or of any duty, covenant, obligation or undertaking establish herein.

13.15 **Prevailing wages and labor compliance:** If applicable, the Grantee agrees to be bound by all the provisions of State Labor Code Section 1771 regarding prevailing wages. If applicable, the Grantee shall monitor all agreements subject to reimbursement from this Grant Agreement to ensure that the prevailing wage provisions of State Labor Code Section 1771 are being met.

13.16 **Professionals:** For projects involving installation or construction services, the Grantee agrees that only licensed professionals will be used to perform services under this Grant Agreement where such services are called for and licensed professionals are required for those services under State law.

13.17 **Severability:** If a court of competent jurisdiction holds any provision of this Grant Agreement to be illegal, unenforceable or invalid in whole or in part for any reason, the validity and enforceability of the remaining provisions, or portions of those provisions, will not be affected.

13.18 **Termination:** CARB may terminate this Grant Agreement by written notice at any time prior to completion of projects funded by this Grant Agreement, upon violation by the Grantee of any material provision after such violation has been called to the attention of the Grantee and after failure of the Grantee to bring itself into compliance with the provisions of this Grant Agreement.

13.19 **Timeliness:** Time is of the essence in this Grant Agreement. Grantee shall proceed with and complete the Project in an expeditious manner.

13.20 **Waiver of Rights:** Any waiver of rights with respect to a default or other matter arising under the Grant Agreement at any time by either party shall not be considered a waiver of rights with respect to any other default or matter. Any rights and remedies of the State provided for in this Grant Agreement are in addition to any other rights and remedies provided by law.

13.21 **Availability of funds:** CARB's obligations under this Grant Agreement are contingent upon the availability of funds. In the event funds are not available, the State shall have no liability to pay any funds whatsoever to the Grantee or to furnish any other considerations under this Grant Agreement.

13.22 **Ownership:** All information or data received or generated by the Grantee under this agreement shall become the property of CARB. No information or data received or generated under this agreement shall be released without CARB's approval. Notwithstanding the above, in the event Grantee is required by deposition, interrogatory, subpoena, or request for documents under the Public Records Act to disclose information or data received or generated under this agreement, Grantee shall provide CARB a prompt written notice prior to disclosure.

13.23 **Audit:** Grantee agrees that CARB, the Department of General Services, Department of Finance, the Bureau of State Audits, or their designated representative shall have the right to review and to copy any records and supporting documentation pertaining to the performance of this Grant and all State funds received. Grantee agrees to maintain such records for possible audit for a minimum of three (3) years after the term of this Grant is completed, unless a longer period of records retention is stipulated. Grantee agrees to allow the auditor(s) access to such records during normal business hours and to allow interviews of any employees who might reasonably have information related to such records. Further, Grantee agrees to include similar right of the State to audit records and interview staff in any subgrant or subcontract related to performance of this Agreement.

This page intentionally left blank.

EXHIBIT B

Work Statement

Budget Summary (Attachment I)
Project Milestones and Disbursement Schedule (Attachment II)
Project Schedule (Attachment III)
Key Project Personnel (Attachment IV)

EXHIBIT B, Attachment I

Budget Summary

Grantee: Eligible Applicant **Grant No.: X##-XXXX-##**

Project: Freight Facilities Project

Total Costs & Funding

Costs	Grant	Applicant Match Funding		Total
	Cash	Cash	In-Kind	
1. Demonstration Technology Funds				
2. Administrative Funds				
Total				

EXHIBIT B, Attachment II

Project Milestones and Disbursement Schedule

Grantee: Eligible Applicant **Grant No.: X##-XXXX-##**

Project: Freight Facilities Project

Milestone	Task Description	Project Funding		Match Funds	
		Project Funds	Administrative Funds	Cash	In-Kind
1	Conduct Kick-Off Meeting. Task 1.1[a]	$0	$20,000	$0	$0
2	Recurring Milestone: Project Administration	$0	$150,000	$0	$0
...	...	...	...	...	...
7	Execute purchase orders. Completion of Task 2.1[b]	$0	$0	$0	$0
8.1	Part #1 delivered. Completion of Task 2.2.1[b]	$500,000	$0	$75,000	$0
8.2	Part #2 delivered. Completion of Task 2.2.2[b]	$700,000	$0	$0	$0
...	...	...	...	...	...
...	...	...	...	...	...
10	Vehicle deployment. Task 3.1	$0	$0	$10,000	$0
11	Data collection. Task 3.2[b]	$200,000	$0	$0	$5,000
12	Oversight of Tasks 3.1 and 3.2[a]	$120,000	$0	$0	$0
13	Draft Final Project Report: Completion of Task 1.4	$0	$0	$0	$0
14	Final Project Report. Completion of Task 1.5[b]	$0	$22,620	$0	$0
Subtotal of Project Funds and Administrative Funds		**$**	**$**	**$**	**$**
Grant Total Funding Amount		**$**			

*CARB will not reimburse for the Final Report until approval of the Final Report.

EXHIBIT B, Attachment III

Project Schedule

Grantee: Eligible Applicant **Grant No.: X##-XXXX-##**

Project: Freight Facilities Project

Detailed Scope of Work and Schedule

Work Task	**Start Date**	**Completion Date**
Task 1 – Description		
Task 2 –		
Task 3 –		
Task 4 –		
Task 5 –		

EXHIBIT B, Attachment IV

Key Project Personnel

Grantee: Eligible Applicant **Grant No.: X##-XXXX-##**

Project: Freight Facilities Project

Name	Position	Duties
	Project Manager	Oversees day to day management of the project, overseeing all tasks and coordinating activities of all partners. Oversee grant management and accounting and ensure that all project timelines and milestones are achieved.
	Chief Technical Officer	Ensures the technical requirements, quality, and timing are met. Ensure engineering rigor is applied to the project.
	VP, Technology Development	Oversees overall directions of the engine refinement program.
	Chief Engineer and Program Manager	Line manager with day to day responsibility of technology refinement and development.

EXHIBIT C

2017-2018 GRANT SOLICITATION

Zero- and Near Zero-Emission Freight Facilities Project

Mobile Source Control Division
California Air Resources Board
March 21, 2018

CALIFORNIA CLIMATE INVESTMENTS
Cap and Trade Dollars at Work

CALIFORNIA AIR RESOURCES BOARD

This page left intentionally blank.

EXHIBIT D

GRANTEE APPLICATION PACKAGE

APPENDIX C

HYDROGEN REFUELING STATION REQUIREMENTS

Zero- and Near Zero-Emission Freight Facilities Project

Mobile Source Control Division
California Air Resources Board
March 21, 2018

CALIFORNIA
AIR RESOURCES BOARD

This page intentionally left blank.

I. MINIMUM TECHNICAL REQUIREMENTS

To be eligible under this Solicitation, applications that include a hydrogen refueling station to be funded as part of the project must, at a minimum, meet each of the following minimum technical requirements. CARB will only process applications that include hydrogen refueling infrastructure projects where the project is proposed to be sited where similar infrastructure already exists (e.g., installing a hydrogen refueling station at an existing fueling station or a commercial or industrial facility). Applications including the use of an existing hydrogen station for refueling project vehicles must provide assurances that the station can meet all refueling needs of the project vehicles in terms of refueling pressure, vehicle storage vessel capacities, hydrogen quality, safe refueling, and other requirements described herein.

A. Station Access

Access to hydrogen refueling stations funded as part of the project must be limited to vehicles and devices approved by the station owner/operator for use. Applications must describe how station access will be controlled and, if non-project vehicles are granted access for refueling, what steps will be taken to ensure safe refueling.

B. Hydrogen Quality

Hydrogen dispensed at the station shall meet the requirements adopted by the Department of Food and Agriculture Division of Measurement Standards, and found in Title 4, Division 9, Chapter 6, Article 8 of the California Code of Regulations, Automotive Products Specifications. The regulation adopts by reference the Society of Automotive Engineers (SAE) International J2719: "Hydrogen Fuel Quality for Fuel Cell Vehicles," most recent version (www.sae.org). A hydrogen refueling station must undergo and pass the hydrogen purity test under all of the following circumstances: before being considered operational; every 6 months thereafter; and when the hydrogen lines are potentially exposed to contamination due to maintenance or other activity. The applicant must employ and provide a narrative of the best practices that ensure continued adherence to hydrogen purity standards.

C. Fueling Protocols

The station/dispenser(s) shall meet the appropriate SAE International standards for the vehicles or equipment being fueled, including SAE J2601/2, "Fueling Protocol for Gaseous Hydrogen Powered Heavy Duty Vehicles," most recent version. The applicant must describe how the fueling protocol and equipment at the station match project vehicle requirements and equipment. Applications that include hydrogen station access by non-project light duty vehicles and refueling of light-duty passenger vehicles, shall meet SAE Standard J2601, "Fueling Protocols for Light Duty Gaseous Hydrogen Surface Vehicles" (www.sae.org).

D. Fire and Safety Awareness, Prioritization, and Adherence

To the extent practicable and with consideration of local ordinances, applicants should meet the requirements of the following California Fire Code sections: Chapter 23 – Hydrogen Motor Fuel Dispensing and Generation Facilities; Chapter 53, Section 5301.1 – Compressed Gasses; and Chapter 58, Section 5801.1 – Flammable Gasses and Flammable Cryogenic Fluids, all of which incorporate by reference National Fire Protection Association (NFPA) 2: Hydrogen Technologies Code: most recent edition, http://www.nfpa.org, as a guideline for hydrogen refueling station design.

E. Dispenser Pressure

Each hydrogen refueling station identified for the project that dispenses gaseous hydrogen into onboard storage tanks of medium and heavy duty vehicles and equipment shall dispense fuel at 350 bar and follow the appropriate SAE International fueling protocol (e.g., SAE J2601/2 for medium and heavy duty vehicles and equipment, and SAE J2601/3 for hydrogen powered industrial trucks).

F. Hydrogen Dispensing

For applications including a hydrogen station that intends to sell gaseous hydrogen by the kilogram, the applicant must demonstrate that the hydrogen dispensers conform to the specifications and tolerances specified in California Code of Regulations (CCR), Title 4, Division 9, Chapter 1, Article 1, Section 4002.9 Hydrogen Gas Measuring Devices (3.39).

Applications with hydrogen stations that do not intend to sell gaseous or liquid hydrogen by the kilogram must explain how they will quantify hydrogen fuel dispensed and the estimated degree of accuracy. Hydrogen stations funded through this solicitation will be required to quantify hydrogen dispensed on a quarterly basis.

G. Hydrogen Technologies Code

The station/dispenser(s) shall be capable of meeting or exceeding the National Fire Protection Association (NFPA) 2: Hydrogen Technologies Code, most recent edition, www.nfpa.org.

H. Station Design Requirements

Hydrogen refueling stations must have a plan in place for continued refueling of project vehicles in the event that the existing station goes off-line. The applicant must provide a detailed plan, equipment list, and performance specifications to show they are able to obtain and contract for temporary fueling from an experienced supplier.

I. Renewable Hydrogen

Applications must demonstrate compliance with the minimum Renewable Hydrogen Requirements and the data collection requirements detailed in Section II of this Appendix. This compliance may be met considering all stations and fuel dispensed included in the application for which the applicant is applying for funding under this Solicitation.

II. RENEWABLE HYDROGEN REQUIREMENTS

Applications that request funding for proposed hydrogen refueling station(s) must provide a plan for ensuring that dispensed hydrogen is generated using at least 33 percent eligible renewable resources (i.e., feedstocks or electricity) as detailed below. This plan must detail the process used to generate the hydrogen, the location where the hydrogen will be generated (i.e., at the proposed hydrogen station site or at an off-site production facility), the eligible renewable resources used to generate the hydrogen, and how the applicant will track and provide verifiable evidence that the dispensed hydrogen is generated from at least 33 percent eligible renewable resources.

A. Eligible Renewable Feedstocks

Eligible renewable feedstocks include:

- Biomethane or biogas such as: biomass, digester gas, landfill gas, sewer gas, or municipal solid waste gas.

- Other feedstocks may be eligible if the Application demonstrates that the proposed feedstock is sustainably produced, reduces greenhouse gas emissions compared to the petroleum baseline, and achieves the Sustainability Goals of the Alternative and Renewable Fuel and Vehicle Technology Program Regulations (20 CCR 3101.5).

B. Eligible Renewable Electricity Sources

Eligible renewable electricity sources include facilities that use the following:

- Fuel cells using renewable fuels
- Geothermal
- Small hydroelectric (30 megawatts or less)
- Ocean wave
- Ocean thermal
- Tidal current
- Photovoltaic (PV)
- Solar Thermal
- Wind
- Biomass digester gas

- Municipal solid waste conversion (non-combustion thermal process)
- Landfill gas

C. Required Information

For hydrogen produced directly from eligible renewable feedstocks, applications must include information about the source of the feedstock(s); how the feedstocks will be processed into fuel; and how the fuel will be transported, stored, and ultimately dispensed at the proposed station(s). For hydrogen generated from electricity (e.g., electrolysis), applicants must describe source(s) of eligible renewable electricity that satisfy the conditions outlined below in Appendix C, II, D.

Once a project hydrogen station is operational, the Grantee will be responsible for ensuring that data is provided to CARB on a quarterly basis regarding hydrogen production, delivery, and dispensing for the purposes of carrying out the demonstration. Data collection will include but not be limited to:

- For all stations – performance data including quantity of fuel produced and dispensed, energy used for hydrogen production, storage, cooling, compression, and dispensing, estimated cost to produce fuel, fueling times, station down time, servicing and maintenance information, and driver/operator feedback on refueling.
- For a station generating hydrogen from electrolysis – documentation of electricity and water used for hydrogen generation, power generated from on-site sources and attributed to onsite hydrogen production, and if applicable, power obtained through other eligible sources.
- For a station producing hydrogen from eligible renewable feedstocks – amount of biogas or other renewable feedstock (in mega joules), total amount of fossil natural gas from the pipeline (in mega joules) or other fuel used for hydrogen generation and steam production, and total electricity and water usage for hydrogen generation, storage, compression and dispensing.

All data will be recorded on the NREL Data Collection Tool,[1] or another format as specified by CARB.

D. Renewable Electricity Requirements

Renewable electricity used for hydrogen generation may be:

(1) generated from one or more eligible electricity sources (listed above-Appendix C. II. B) that meet the requirements under California Public Utilities Code section 399.12, and are co-located with the refueling station site or located on property owned by the hydrogen producer, and produce no additional renewable attributes such as renewable energy certificates; or

[1] The NREL Data Collection Tool is Attachment 11 of GFO-15-605 – Light Duty Vehicle Hydrogen Refueling Infrastructure located on the California Energy Commissions Contracts webpage. http://www.energy.ca.gov/contracts/GFO-15-605/.

(2) obtained through a program with eligibility requirements that match or are more stringent than the Green Tariff Shared Renewables program under the California Public Utilities Code sections 2831-2833.

E. Biogas Requirements

Biogas or biomethane used for hydrogen generation may be:

(1) Physically supplied directly to the hydrogen production facility; or

(2) Injected as certified Renewable Natural Gas (RNG) into a common carrier pipeline in North America (and thus comingled with fossil natural gas) and reported as an input to hydrogen production, provided the following conditions are met:

a. The quantity of RNG (and all associated environmental attributes) injected into the pipeline must be accompanied by documents linking the environmental attributes of the injected RNG to the corresponding quantities of natural gas withdrawn for hydrogen production. Documents include monthly invoices showing quantities of RNG sourced and the contracted price per unit, and the contract by which the hydrogen producer obtained the environmental attributes.

b. The quantity of RNG (and all associated environmental attributes) injected into pipeline in one calendar quarter must match the quantity of pipeline natural gas sold as RNG for hydrogen production no later than the following calendar quarter.

F. Verification

CARB will verify, based on the information provided in the application, whether the renewable hydrogen requirement is met.

G. SB 1505 Disclaimer

The 33 percent Renewable Hydrogen Content requirement is a condition to participate in this Solicitation. This is separate and distinct from CARB's sole authority to regulate the renewable hydrogen content requirements for hydrogen refueling stations under Health and Safety Code, Section 43869 (commonly referred to as Senate Bill 1505 or SB 1505). Fulfilling the 33 percent Renewable Hydrogen Content requirement in this Solicitation does not guaranty or warranty in any way that hydrogen refueling stations funded under this Solicitation will meet any standards or regulations that CARB may adopt in the future for hydrogen refueling stations pursuant to the authority in SB 1505. The applicant will be solely responsible for complying with such standards and regulations as applicable, including funding its compliance with them.

H. Greenhouse Gas Requirements

Applicants must use the "well-to-wheel" calculation methodology for the greenhouse gas emission calculations that includes the feedstock(s) and energy used to produce

hydrogen, the process, combustion and fugitive emissions that occur during production of the hydrogen, and the fuel transport and final use of the hydrogen. See Appendix D for the emission reduction and cost-effectiveness methodology.

APPENDIX D

METHODOLOGY FOR DETERMINING EMISSION REDUCTIONS AND COST-EFFECTIVENESS

Zero- and Near Zero-Emission Freight Facilities Project

Mobile Source Control Division
California Air Resources Board
March 21, 2018

This page intentionally left blank.

Table of Contents

I. OVERVIEW 1

II. GHG EMISSIONS CALCULATIONS: COST-EFFECTIVENESS AND EMISSION REDUCTION FORMULAS 3

A. Well-to-Wheel GHG Emission Calculations 3

B. Conversion from Diesel Fuel Usage to Electricity / Hydrogen / CNG Usage.. 3

C. GHG Emission Reduction Calculation 4

D. Cost-Effectiveness Calculations for GHG 4

E. Composite Carbon Intensity Calculations 5

F. Advanced Technology Efficiency Calculation 5

III. CRITERIA POLLUTANT AND PARTICULATE MATTER EMISSIONS CALCULATIONS: COST-EFFECTIVENESS AND EMISSION REDUCTION 6

A. Calculating Cost-Effectiveness 6

B. Determining the Annualized Cost 6

C. Calculating the Annual Weighted Surplus Emission Reductions 7

D. Calculating Annual Emission Reductions based on Usage 8

E. List of Criteria Pollutant Cost-Effectiveness Formulas 9

IV. EXAMPLE CALCULATIONS 11

A. Example A: Battery-Electric Heavy-Lift Forklift 14

B. Example B: Fuel Cell Top Handler 20

C. Example C: Battery-Electric Switch Locomotive with Fuel Cell Range Extender 26

D. Example D: Logistic Strategy for Container Movement Technology 33

E. Example E: Fuel Cell Regional Haul Truck 39

F. Example F: Fuel Cell Transportation Refrigeration Unit (TRU) 45

G. Example G: Facility Efficiency Improvement 51

H. Example H: Project Wide Summation of Emission Reductions and Cost Effectiveness Determination: 53

V. EMISSION FACTORS FOR GHG REDUCTIONS 56

VI. Tables for Calculating Criteria and Toxic Pollutant Emission Reductions 59

ABBREVIATIONS

The following abbreviations are used in this appendix:

"AQIP" means the Air Quality Improvement Program.
"ATV" means advanced technology vehicle.
"bhp-hr" means brake-horsepower-hour.
"CARB" means the California Air Resources Board.
"CARBOB" means California Reformulated Gasoline Blendstock for Oxygenate Blending.
"CaRFG" means California reformulated gasoline.
"CI" means carbon intensity.
"CO2e" means carbon dioxide equivalent.
"CNG" means compressed natural gas.
"CRF" means capital recovery factor.
"ED" means fuel energy density.
"EER" means energy economy ratio.
"EF" means emission factor.
"ER" means emission reduction.
"g/bhp-hr" means grams per brake-horsepower-hour.
"gal" means gallon.
"GHG" means greenhouse gas.
"GVWR" means gross vehicle weight rating.
"HC" means hydrocarbon.
"hp" means horsepower.
"kWh" means kilowatt-hour.
"LNG" means liquefied natural gas.
"LSI" means large spark-ignition.
"MJ" means megajoule.
"NMHC" means non-methane hydrocarbon.
"NOx" means oxides of nitrogen.
"PM" means particulate matter.
"PM10" means particulate matter less than 10 microns in diameter.
"ROG" means reactive organic gases.
"scf" means standard cubic foot.
"ULSD" means ultra-low sulfur diesel.
"WER" means weighted surplus emission reduction.
"yr" means year.

EXHIBIT D

GRANTEE APPLICATION PACKAGE

I. OVERVIEW

The methodology described within this appendix must be used to calculate the emission reductions and cost-effectiveness of projects proposed under this Solicitation. All calculations and assumptions made must be shown clearly and in their entirety in the application (Appendix A, Attachment 3).

All calculations will use the cleanest commercially available diesel-fueled engine installed in a vehicle or piece of equipment, which in many cases will employ a 2017 model year or Tier 4 Final engine, for baseline greenhouse gas (GHG) and criteria pollutant emission calculations. This technique may not adequately capture the emission profiles of all the vehicles or equipment included in an applications; however to ensure all applications are scored on an objective basis, this technique will be used for scoring all submitted applications. Alternate calculation methodologies, in addition to that required above, may be submitted to illustrate the potential emission reductions from the proposed projects.

A "well-to–wheel" analysis to quantify GHG emission reductions is required for all vehicles funded under this Solicitation. The applicant is required to determine the resulting emission reductions associated with their project (see Appendix D for the methodology). All calculations must be shown in their entirety and included in the application (see Appendix A, Attachment 3). Incomplete illustration of the mathematical processes used will result in no points being allocated for scoring criteria 5 and reduced points allocated under scoring criteria 10 in Section IV, Evaluation, Scoring, and Preliminary Selection of the solicitation, as well as possible disqualification.

If the applicant believes that the methodology for determining emission reductions and cost effectiveness does not accurately represent the emission potential of the proposed project, the applicant may submit, in addition to using the required methodology as outlined above, an alternative methodology for determining emission benefits and cost effectiveness to illustrate the potential emission reductions of the proposed technology or strategy that the applicant is proposing. Regardless of inclusion of an alternate methodology the applicant must still must utilize the required methodology as outlined in Appendix D and required under Appendix A, Attachment 3). Projects will only be scored based on the required methodology for determining emission reduction and cost effectiveness.

The GHG emission factors in Section II, below, are excerpted from the 2018 CCI Quantification Methodology Emission Factor Database. Low Carbon Fuel Standard (LCFS) regulation.[1] Please note that while the LCFS fuel carbon intensity values may change during the Solicitation period, project applicants must use the values listed in this appendix. The remaining emission factors and methodology below are from Appendices C, D, and G of the California Air Resources Board (CARB or Board)

[1] CARB, 2018; 2018 CCI Quantification Methodology Emission Factor Database https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/cci_emissionfactordatabase.xlsx accessed [March 20, 2018

approved 2017 Carl Moyer Program Guidelines (Moyer Guidelines), as updated in 2017.[2] Language has been modified where necessary for the purposes of this Solicitation. The complete Moyer Guidelines, including all of its appendices, can be found at http://www.arb.ca.gov/msprog/moyer/guidelines/current.htm.

Emission factors for engines that meet an optional low oxides-of-nitrogen (NOx) standard are given for the purpose of this Solicitation only and are based on emission factors developed for the FY 2017-18 Clean Transportation Incentives Funding Plan (Funding Plan).

If a proposed project is for an application that uses a baseline diesel engine of 24 horsepower (hp) or lower, for the purpose of this solicitation and to calculate the needed emission reductions and cost-effectiveness, use the relevant tables for a 25 hp baseline diesel engine in the Moyer Guidelines.

Please see the example calculations provided in Section V of this Appendix to better understand how the following formulas and figures used to calculate emission reduction and cost-effectiveness values. Any examples provided herein are for reference only and do not imply additional project types or categories, nor do Carl Moyer Program funding amounts limit the amount of funding that may be available for project projects. Criteria pollutant and particulate matter (PM) table numbers are the same as those in the 2017 Moyer Guidelines. While Carl Moyer Program guidelines may change during the Solicitation period, project applicants must use the values listed in this appendix.

[2] CARB, 2017; The 2017 Carl Moyer Program Guidelines, https://www.arb.ca.gov/msprog/moyer/guidelines/current.htm

II. GHG EMISSIONS CALCULATIONS[3]: COST-EFFECTIVENESS AND EMISSION REDUCTION FORMULAS

A. Well-to-Wheel GHG Emission Calculations

Formula 1 and Formula 2 are used to calculate the GHG emission factor in grams of carbon dioxide equivalent (CO2e) per year of use. Formula 2 is used to determine the fuel usage of the baseline vehicle or equipment.

Formula 1 calculates the greenhouse gas emission factor (GHG EF) using the carbon intensity (CI) of the fuel, the fuel's energy density, and the annual fuel usage for the technology employed in the vehicle/equipment.

Formula 1: Greenhouse Gas Emission Factor Based on Fuel Usage

$$GHG\ EF\left(\frac{metric\ tons\ CO2e}{year}\right) = CI * fuel\ energy\ density * fuel\ usage * \frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}$$

$$= \left(\frac{gram\ CO2e}{MJ}\right) * \left(\frac{MJ}{gal}\ or\ \frac{MJ}{kg}\ or\ \frac{MJ}{scf}\ or \frac{MJ}{kWh}\right) * \left(\frac{gal}{year}\ or\ \frac{kg}{year}\ or\ \frac{scf}{year}\ or \frac{kWh}{year}\right) * \left(\frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}\right)$$

Where CI is provided in Table II-2 and fuel energy density is provided in Table II-1.

Formula 2: Annual Fuel Usage

Formula 2 should be used to determine the fuel usage for the baseline vehicle or equipment based on hours of operations and/or miles driven and the fuel economy of the baseline vehicle or equipment.

$$Fuel\ Usage\ \left(\frac{gal}{year}\right) = \left(\frac{gal}{mile} or \frac{gal}{hour}\right) * \left(\frac{miles}{day} or \frac{hours}{day}\right) * \left(\frac{days}{year}\right)$$

B. Conversion from Diesel Fuel Usage to Electricity / Hydrogen / CNG Usage

Formula 3 is used to calculate the advanced technology vehicle (ATV) fuel usage based on the diesel usage of the baseline vehicle/equipment calculated from Formula 2.

---

[3] GHG emissions are measured in "CO_2 equivalent", which means the number of metric tons of CO_2 emissions with the same global warming potential as one metric ton of another greenhouse gas.

Formula 3:

$$ATV\ Fuel\ Usage\left(\frac{unit}{year}\right) = Baseline\ fuel\ usage * ED_{diesel} * \left(\frac{1}{ED_{replacement\ fuel}}\right) * \left(\frac{1}{EER}\right)$$

Where:

- **ED** is the fuel energy density (see Table II-1: Fuel Energy Density);
- **EER** is the Energy Economy Ratio value for fuels relative to diesel (see Table D-3: EER Values for Fuels Used in Light-, Medium-, and Heavy-Duty Applications); and
- **Unit** is the units associated with the replacement fuel. Electricity usage is in units of kWh, hydrogen is in kg, and CNG is in standard cubic feet (scf).

C. GHG Emission Reduction Calculation

The project's GHG emission reduction value is determined by taking the difference between the GHG emissions of the baseline vehicle or equipment and the advanced technology vehicle or equipment.

Baseline vehicles or equipment are those using the cleanest engines commercially available at the time the application for funding is submitted, which for the purposes of this solicitation is a Tier 4 Final engine, or the cleanest 2017 model year engine if a Tier 4 Final engine is not commercially available.

Formula 4 is used to determine the annual GHG emission reductions (GHG ER_{annual}) associated with the ATV.

Formula 4:

$$Project\ GHG\ ER_{annual}\left(\frac{metric\ tons\ CO2e}{year}\right) = GHG\ EF_{base} - GHG\ EF_{ATV}$$

Where:

- **Project GHG ER_{annual}** is the annual GHG emission reductions that are associated with the proposed project;
- **GHG EF_{base}** is the GHG emission factor associated with the baseline vehicle or equipment that the advanced technology vehicle or equipment is compared against; and
- **GHG ER_{ATV}** is the GHG emission factor that is associated with the proposed advanced technology vehicle.

D. Cost-Effectiveness Calculations for GHG

The cost-effectiveness of a project is determined by dividing the annualized cost of the potential project by the annual emission reductions that will be achieved by the project as shown in Formula 5 below.

Formula 5 is used to determine the cost-effectiveness of the project in dollars per ton of emissions reduced.

Formula 5:

$$Cost\ Effectiveness\ \left(\frac{\$}{metric\ ton\ CO2e}\right) = \frac{CRF * incremental\ cost}{Project\ GHG\ ER_{annual}}$$

Where, for the purposes of this Solicitation:

- **CRF** is the Capital Recovery Factor;
- **CRF_2 = 0.508** (2-year life) [4];
- **CRF_{10} = 0.106** (10-year life)[10]; and
- **Incremental cost** is the difference between the cost of the baseline vehicle or equipment and the advanced technology vehicle or equipment.

E. Composite Carbon Intensity Calculations

Formula 6 below is used to determine a composite carbon intensity value in the calculations if two of the same fuel types are to be blended for use in the proposed vehicle or equipment. Use values from Table II-2: Fuel Carbon Intensity Values above as inputs into Formula 6.

Formula 6:

$$CI_{composite} = (fraction\ of\ total\ fuel * CI_{fuel\ 1}) + (fraction\ of\ total\ fuel * CI_{fuel\ 2})$$

F. Advanced Technology Efficiency Calculation

Formula 7 should be used to determine the amount of fuel per year necessary to operate an advanced technology vehicle or equipment that provides a percent efficiency improvement. Use results from Formula 2 to determine the annual fuel usage for the baseline vehicle or equipment.

Formula 7:

$$Fuel\ Usage_{ATV}\left(\frac{gal}{year}\right) = fuel\ usage * \left(1 - \frac{(X * Y\%\ improvement)}{100\%}\right)$$

Where:

- **X** is the fraction of the time the advanced operational efficiency technology or logistic strategy is enabled and providing emission reductions. If the advanced operational efficiency technology or logistic strategy is always engaged and providing emission reductions assume that X is equal to 1; and

[4] CARB, 2017; The 2017 Carl Moyer Program Guidelines Appendix D: Table D-24. https://www.arb.ca.gov/msprog/moyer/guidelines/2017gl/2017_gl_appendix_d.pdf

- **Y** is the percentage fuel economy improvement that is gained by having the advanced operational efficiency technology or logistic strategy efficiency improvement over the baseline engine.

III. CRITERIA POLLUTANT AND PARTICULATE MATTER EMISSIONS CALCULATIONS: COST-EFFECTIVENESS AND EMISSION REDUCTION

Formulas are taken from Appendix C of the 2017 Moyer Guidelines. Other sections of the Moyer Guidelines are referenced as well. Language has been modified where necessary for the purposes of this Solicitation. Tables that contain emission factors and necessary inputs follow at the end of this section. Updates to these tables in the Moyer Guidelines may have been made since the release of this Solicitation. Only use the information included in the tables in this Solicitation for criteria pollutant reduction and cost-effectiveness calculations.

Baseline vehicles or equipment for the purpose of this Solicitation are the cleanest vehicle or equipment commercially available at the time the application for funding is submitted.

A. Calculating Cost-Effectiveness

The cost-effectiveness of a potential project is determined by dividing the annualized cost of the project by the annual weighted surplus emission reductions that will be achieved by the project as shown in Formula 8 below.

Formula 8: Cost-Effectiveness of Weighted Surplus Emission Reductions ($/ton)

$$\textit{Cost-Effectiveness (\$/ton)} = \frac{\textit{Annualized Cost (\$/year)}}{\textit{Annual Weighted Surplus Emission Reductions (tons/year)}}$$

Where Annualized Cost is calculated using Formula 9 and Annual Weighted Surplus Emission Reductions is calculated using Formula 11.

Descriptions on how to calculate annual emission reductions and annualized cost are provided in the following sections.

B. Determining the Annualized Cost

Annualized cost is the amortization of the one-time incentive grant amount for the life of the project to yield an estimated annual cost. The annualized cost is calculated by multiplying the incremental cost by the capital recovery factor (CRF). [NOTE: For the purposes of this calculation, the CRF is 0.111, which assumes a 10-year life.] The resulting annualized cost is used to complete Formula 8 above to determine the cost-effectiveness of surplus emission reductions.

Formula 9: Annualized Cost ($)

*Annualized Cost = CRF * incremental cost ($)*

Where: **CRF_2 = 0.508**, (2 year life)[5];
CRF_{10} = 0.106, (10-year life)[11]; and
Incremental cost is calculated using Formula 10.

Calculating the Incremental Cost

Formula 10: Incremental Cost ($)

Incremental Cost = Cost of New Technology ($) – Cost of Baseline Technology ($)

C. Calculating the Annual Weighted Surplus Emission Reductions

Annual weighted surplus emission reductions (WER) are estimated by taking the sum of the project's annual surplus pollutant reductions following Formula 11 below. This will allow projects that reduce one, two, or all three of the covered pollutants to be evaluated. While NOx and ROG emissions are given equal weight, emissions of PM carry a greater weight in the calculation.

Formula 11: Annual Weighted Surplus Emission Reductions (tons/yr)

Annual Weighted Surplus Emission Reductions =

*NOx reductions (tons/yr) + ROG reductions (tons/yr) + [20 * (PM reductions (tons/yr)]*

The result of Formula 11 is used to complete Formula 8 to determine the cost-effectiveness of surplus emission reductions.

In order to determine the annual surplus emission reductions by pollutant, emission reduction calculations need to be completed for each pollutant (NOx, ROG, and PM), for the baseline technology and the advanced technology, totaling up to six calculations:

Baseline Technology	Advanced Technology
1. Annual emissions of NOx	4. Annual emissions of NOx
2. Annual emissions of ROG	5. Annual emissions of ROG
3. Annual emissions of PM	6. Annual emissions of PM

These calculations are completed for each pollutant by multiplying the engine emission factor or converted emission standard by the annual activity level of the technology and by other adjustment factors as specified for the calculation methodologies presented.

[5] CARB, 2017; The 2017 Carl Moyer Program Guidelines Appendix D: Table d-25. https://www.arb.ca.gov/msprog/moyer/guidelines/2017gl/2017_gl_appendix_d.pdf

D. Calculating Annual Emission Reductions based on Usage

1. Calculating Annual Emission Reductions Based on Hours of Operation

When actual annual hours of equipment operation are the basis for determining emission reductions, use Formula 12 below.

Formula 12: Estimated Annual Emission Reductions Based on Hours of Operation (tons/year)

Annual Emission Reductions =

*Emission Factor or Converted Emission Standard (g/bhp-hr) * Horsepower * Load Factor * Activity (hrs/yr) * Percent Operation in California * ton/907,200g*

Where the Emission Factor is provided in Table IV-3, IV-4, IV-6, IV-7, IV-9, IV-10, IV-11, IV-12a, IV-12b, IV-14a, IV-14b, IV-15a, or IV-15b; the Converted Emission Standard is provided in Table IV-1 or IV-2; and the Load Factor is provided in Table IV-5, IV-8, or IV-16.

2. Calculating Annual Emissions Based on Fuel Consumption

When annual fuel consumption is used for determining emission reductions, the equipment activity level must be based on annual fuel usage within California provided by the applicant.

A fuel consumption rate factor must be used to convert emissions given in g/bhp-hr to units of grams of emissions per gallon of fuel used (g/gal). The fuel consumption rate factor is a number that combines the effects of engine efficiency and the energy content of the fuel used in that engine into an approximation of the amount of work output by an engine for each unit of fuel consumed. Formulas 13 and 14 below are the formulas for calculating annual emissions based on annual fuel consumed.

Formula 13: Estimated Annual Emissions based on Fuel Consumed using Emission Factors or Converted Emission Standard (tons/yr)

Annual Emission Reductions =

*Emission Factor or Converted Emission Standard (g/bhp-hr) * fuel consumption rate factor (bhp-hr/gallon (gal)) * Activity (gal/yr) * Percent Operation in CA * ton/907,200g*

Where the fuel consumption rate factor is provided in Table IV-19.

Formula 14: Estimated Annual Emissions based on Fuel using Emission Factors (tons/yr)

Annual Emission Reductions =

*Emission Factor (g/gal) * Activity (gal/yr) * Percent Operation in CA * ton/907,200g*

E. List of Criteria Pollutant Cost-Effectiveness Formulas

For an easy reference, the necessary formulas to calculate the cost-effectiveness of surplus emission reductions for a project funded through the Carl Moyer Program are provided below.

Formula 8: Cost-Effectiveness of Weighted Surplus Emission Reductions ($/ton):

$$\textit{Cost-Effectiveness (\$/ton)} = \frac{\textit{Annualized Cost (\$/year)}}{\textit{Annual Weighted Surplus Emission Reductions (tons/yr)}}$$

Formula 9: Annualized Cost ($)

*Annualized Cost = CRF * incremental cost ($)*

Formula 10: Incremental Cost ($)

Incremental Cost = Cost of New Technology ($) – Cost of Baseline Technology ($)

Formula 11: Annual Weighted Surplus Emission Reductions

Annual Weighted Surplus Emission Reductions =

*NOx reductions (tons/yr) + ROG reductions (tons/yr) + [20 * (PM reductions (tons/yr)]*

Formula 12: Estimated Annual Emission Reductions Based on Hours of Operation (tons/year)

Annual Emission Reductions =

*Emission Factor or Converted Emission Standard (g/bhp-hr) * Horsepower * Load Factor * Activity (hrs/yr) * Percent Operation in California * ton/907,200g*

Formula 13: Estimated Annual Emissions based on Fuel Consumed using Emission Factors or Converted Emission Standard (tons/yr)

Annual Emission Reductions =

*Emission Factor or Converted Emission Standard (g/bhp-hr) * fuel consumption rate factor (bhp-hr/gallon (gal)) * Activity (gal/yr) * Percent Operation in CA * ton/907,200g*

Formula 14: Estimated Annual Emissions based on Fuel using Emission Factors (tons/yr)

Annual Emission Reductions =

*Emission Factor (g/gal) * Activity (gal/yr) * Percent Operation in CA * ton/907,200g*

IV. EXAMPLE CALCULATIONS

Example calculations are provided to illustrate many of the permutations that staff expects may be included in an application for funding. Example calculations are included for eight scenarios providing the values that are needed for a complete application. Those required values are:

- GHG annual emission reductions from each proposed vehicle or piece of equipment;
- Criteria pollutant and toxic air contaminant annual pollutant emission reductions for each proposed vehicle or piece of equipment;
- GHG reduction cost-effectiveness for a two-year life during the time of the proposed project;
- GHG reduction cost-effectiveness for a 10-year life, two years after the end of the proposed project , assuming the technology is fully commercialized and integrated into the marketplace at numbers described in the application;
- Criteria pollutant and toxic air contaminant reduction cost-effectiveness for a two-year life during the time of the proposed project;
- Criteria pollutant and toxic air contaminant reduction cost-effectiveness for a 10-year life, two years after the end of the proposed project, assuming the technology is fully commercialized and integrated into the marketplace at numbers described in the application;
- GHG reduction cost effectiveness for an entire proposed project, during the time of the proposed project; and
- Criteria pollutant and toxic air contaminant reduction cost effectiveness for an entire proposed project, during the time of the proposed project

GHG emission reductions are calculated on a well-to-wheel basis and the criteria pollutant emission reductions are determined under a tank-to-wheel scenario. The example calculations contained in this appendix are illustrations of:

Example A: Battery-Electric Heavy-Lift Forklift:

- This example assumes that a heavy-lift forklift will have the same energy requirements as a diesel counterpart and will be used the same number of hours. Electricity to charge the proposed forklift will come from the electrical grid.

Example B: Fuel Cell Top Handler:

- This example assumes that a fuel cell top handler will have the same energy requirements as a diesel counterpart and will be used the same number of hours. It is assumed that this project will use hydrogen that is SB 1505 compliant and therefore, has a 1/3 renewable component.

Example C: Battery-Electric Switch Locomotive with Fuel Cell Range Extender:

- This example assumes that a fuel cell switcher locomotive with battery storage will have the same energy requirements as a diesel-electric counterpart and will be used the same number of hours. Further, it is assumed that in this project, continuous power is provided by the fuel cell and peak power requirements are provided by the on-board traction battery. It is assumed that half of the advanced technology vehicle's energy needs will come from the on-board battery pack and that half of the vehicle's energy needs will come from the on-board range extending engine.

Example D: Logistic Strategy for Container Movement Technology:

- This example assumes that a piece of cargo handling equipment utilizing advanced logistic technology will have the same energy requirements as a diesel counterpart without the logistic technology and will be used the same number of hours. The logistic strategy is only functional while loading and unloading ocean going vessels and therefore, will only be engaged half of the time during the cargo handling equipment's operation.

Example E: Fuel Cell Regional Haul Truck"

- This example assumes that a fuel cell on-road regional haul truck will have the same energy requirements as a diesel counterpart and will be used the same number of miles. The proposed truck in this example will not be plugged in to the electrical grid to charge on-board battery packs, but will use the on-board fuel cell. Further, it is assumed that this project will use hydrogen that is produced from natural gas and compressed for use in the project.

Example F: Fuel Cell Transportation Refrigeration Unit:

- This example shows a project that proposes to utilize a hydrogen fuel cell as the power source for a transportation refrigeration unit. The hydrogen refueling station is proposed to be funded by the AQIP/GGRF grant and therefore must utilize renewable hydrogen as required by SB 1505.

Example G: Facility Efficiency Improvement:

- This example shows the emission reductions by increasing the efficiency at a freight facility by installing advanced technologies that reduce the electrical needs of a freight facility by 10%.

Example H: Project Wide Summation of Emission Reductions and Cost Effectiveness Determination:

- This example shows the summation of the emission reductions and cost effectiveness from an entire project utilizing the example calculations for specific vehicle and equipment types and including reductions from the freight facility efficiency improvement project. This calculation is to illustrate the emission reductions for the entire project and the determination of cost effectives for the entire project using the summation of emission reductions from each aspect of the project and using the total project cost as a basis for that determination.

All of the following examples assume diesel fuel usage by the baseline vehicle or equipment as a basis for the GHG and criteria pollutant emission calculations and grid electricity as the basis of determining GHG emission reductions from freight facility improvements. This technique may not adequately capture the emission profiles of all proposed applications; however; this technique is used to allow all submitted applications to be scored objectively. If an applicant feels that this methodology does not capture the emission reductions from their proposed project, the applicant can submit an alternative methodology, in addition to the required methodology, to illustrate the potential emission reductions

If a proposed project is for an application that uses a baseline diesel engine of 24 hp or lower, for the purpose of this solicitation and to calculate the needed emission reductions and cost-effectiveness, use the relevant tables for a 25 hp baseline diesel engine in the Moyer Guidelines.

A. Example A: Battery-Electric Heavy-Lift Forklift

Potential GHG emission reductions are determined on a well-to-wheel basis, while criteria pollutant emission reductions are determined using a tank-to-wheel analysis. This example assumes that a heavy-lift forklift will have the same energy requirements as a diesel counterpart and will be used the same number of hours. Electricity to charge the proposed forklift will come from the electrical grid.

Baseline Diesel Forklift:

- Off-Road diesel engine: Tier 4 Final certification, 110 hp
- 19,000 lbs. lift capacity
- Diesel usage: 2 gallons per hour, 3,000 gallons per year
- Operation: 1,500 hours per year
- Forklift cost at project : $40,000
- Forklift cost two years after project : $40,000

Advanced Technology:

- Battery-electric forklift
- Forklift cost at project : $75,000
- Forklift cost two years after project : $65,000

Variables Used in Calculation:

Carbon Intensity

From Table II-2: Fuel Carbon Intensity Values

CI = Carbon Intensity

$CI_{diesel} = \frac{102.01\ g\ CO2e}{MJ}$ Table Pathway Identifier ULSD001

$CI_{electricity} = \frac{105.15\ g\ CO2e}{MJ}$ Table Pathway Identifier ELC001

Energy Density

From Table II-1: Fuel Energy Density

ED = Energy Density

$ED_{diesel} = \frac{134.47\ MJ}{gal\ diesel}$ $ED_{electricity} = \frac{3.60\ MJ}{kWh}$

Energy Efficiency Ratio

From Table II-3: EER Values for Fuels Used in Light- Medium- and Heavy-Duty Applications

EER = Energy Efficiency Ratio (unit less)

$EER_{electricity} = 5.5$

Step 1: Convert the diesel used per year to the amount of electricity needed to do the same work using Formula 3 and the variables identified above.

Formula 3:

$$Replacement\ Fuel\ Usage\left(\frac{unit}{year}\right) = fuel\ usage * ED_{diesel} * \left(\frac{1}{ED_{replacement\ fuel}}\right) * \left(\frac{1}{EER}\right)$$

Where:

- **ED** is the fuel energy density (see Table II-1: Fuel Energy Density);
- **EER** is the Energy Economy Ratio value for fuels relative to diesel (see Table II-3: EER Values for Fuels Used in Light- Medium- and Heavy-Duty Applications);
- **Unit** is the units associated with the replacement fuel. Electricity is in terms of kWh, hydrogen is in kg, and CNG is in scf.

$$Replacement\ Fuel\ Usage\left(\frac{unit}{year}\right) = \left(3{,}000\frac{gal\ diesel}{year}\right) * \left(\frac{134.47\ MJ}{1\ gal\ diesel}\right) * \left(\frac{1\ kWh}{3.60\ MJ}\right) * \left(\frac{1}{5.5}\right)$$

$$= 20{,}374\frac{kWh}{year}$$

Step 2: Determine the GHG emissions that are attributed to the baseline diesel-fueled heavy-lift forklift using Formula 1 and the variables identified above.

Formula 1:

$$GHG\ EF\left(\frac{metric\ tons\ CO2e}{year}\right) = CI * fuel\ energy\ density * fuel\ usage * \frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}$$

$$= \left(\frac{gram\ CO2e}{MJ}\right) * \left(\frac{MJ}{gal}\ or\ \frac{MJ}{kg}\ or\ \frac{MJ}{scf}\ or \frac{MJ}{kWh}\right)$$

$$* \left(\frac{gal}{year}\ or\ \frac{kg}{year}\ or\ \frac{scf}{year}\ or \frac{kWh}{year}\right) * \left(\frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}\right)$$

$$GHG\ EF_{base} = \left(\frac{102.01\ gram\ CO2e}{MJ}\right) * \left(\frac{134.47\ MJ}{gal\ diesel}\right) * \left(\frac{3{,}000\ gal\ diesel}{year}\right) * \left(\frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}\right)$$

$$= 41 \frac{metric\ tons\ CO2e}{year}$$

Step 3: Determine the GHG emissions that are attributed to the advanced technology forklift using Formula 1, the result from Step 1 and the variables identified above.

Formula 1:

$$GHG\ EF\left(\frac{metric\ tons\ CO2e}{year}\right) = CI * fuel\ energy\ density * fuel\ usage * \frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}$$

$$= \left(\frac{gram\ CO2e}{MJ}\right) * \left(\frac{MJ}{gal}\ or\ \frac{MJ}{kg}\ or\ \frac{MJ}{scf}\ or \frac{MJ}{kWh}\right)$$

$$* \left(\frac{gal}{year}\ or\ \frac{kg}{year}\ or\ \frac{scf}{year}\ or \frac{kWh}{year}\right) * \left(\frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}\right)$$

$$GHG\ EF_{ATV} = \left(\frac{105.16\ gram\ CO2e}{MJ}\right) * \left(\frac{3.60\ MJ}{kWh}\right) * \left(\frac{20{,}374\ kWh}{year}\right) * \left(\frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}\right)$$

$$= 7.7 \frac{metric\ tons\ CO2e}{year}$$

Step 4: Determine the GHG emission reductions that are associated with the proposed project using Formula 4, populated by results from Step 2 and Step 3 above to give the GHG emission benefit from the proposed project.

Formula 4:

$$Project\ GHG\ ER_{annual}\left(\frac{metric\ tons\ CO2e}{year}\right) = GHG\ EF_{base} - GHG\ EF_{ATV}$$

Where:

- **GHG ER$_{annual}$** is the annual GHG emission reductions that are associated with the proposed project;
- **GHG EF$_{base}$** is the GHG emission factor associated with the base case vehicle or equipment that the advanced technology vehicle or equipment is compared against; and
- **GHG ER$_{ATV}$** is the GHG emission factor that is associated with the proposed advanced technology vehicle.

$$Project\ GHG\ ER_{annual} = \left(41\frac{metric\ tons\ CO2e}{year}\right) - \left(7.7\frac{metric\ tons\ CO2e}{year}\right)$$

$$= 33\frac{metric\ tons\ CO2e}{year}$$

Step 5: Determine the annual criteria pollutant emission reductions that are associated with the proposed project. The baseline diesel-fueled forklift is using a 110 hp diesel engine that is certified to the Tier 4 Final emissions standard, therefore, using emission values from Table IV-7 and fuel consumption rate factors from Table IV-19, the result of Step 1 above to populate Formula 13. The forklift will be used 100% of the time in California. There are no criteria pollutant emissions associated with the use of the battery-electric forklift in a tank-to-wheel analysis.

For a Tier 4 Final off-road engine at 110 hp, Table IV-7 gives criteria pollutant emissions per bhp-hr and Table IV-5 gives the load factor. Therefore:

NOx = 0.26 $\frac{g\ NOx}{bhp-hr}$; ROG = 0.05 $\frac{g\ ROG}{bhp-hr}$; PM10 = 0.009 $\frac{g\ PM10}{bhp-hr}$

Load Factor $_{\text{industrial forklift}}$ = 0.20

Formula 12:

Annual Emission Reductions =

*Emission Factor or Converted Emission Standard (g/bhp-hr) * Horsepower * Load Factor * Activity (hrs/yr) * Percent Operation in California * ton/907,200g*

$$Annual\ ER_{NOx} = \left(0.26\frac{g\ NOx}{bhp-hr}\right) * (110\ hp) * (0.20) * \left(1{,}500\frac{hours}{year}\right) * (1) * \left(\frac{1\ ton}{907{,}200\ grams}\right)$$

$$= 0.009\frac{tons\ NOx}{year}$$

$$Annual\ ER_{ROG} = \left(0.05\frac{g\ NOx}{bhp-hr}\right) * (110\ hp) * (0.20) * \left(1{,}500\frac{hours}{year}\right) * (1) * \left(\frac{1\ ton}{907{,}200\ grams}\right)$$

$$= 0.002\frac{tons\ ROG}{year}$$

$$Annual\ ER_{PM10} = \left(0.009\frac{g\ PM10}{bhp-hr}\right) * (110\ hp) * (0.20) * \left(1{,}500\frac{hours}{year}\right) * (1) * \left(\frac{1\ ton}{907{,}200\ grams}\right)$$

$$= 0.0003\frac{tons\ PM10}{year}$$

Step 6: Determine the weighted annual surplus emission reductions that are associated with the proposed project. Use the results from Step 5 above along with the realization that the proposed battery-electric forklift will not produce any criteria pollutant emissions in a tank-to-wheel scenario to populate Formula 11.

Formula 11:

Annual Weighted Surplus Emission Reductions =

*NOx reductions (tons/yr) + ROG reductions (tons/yr) + [20 * (PM reductions (tons/yr)]*

$$WER = \left(0.009\ \frac{tons\ NOx}{year}\right) + \left(0.002 \frac{tons\ ROG}{year}\right) + \left(20 * 0.0003 \frac{tons\ PM}{year}\right)$$

$$= 0.017\ \frac{tons}{year}$$

Step 7: Determine the incremental cost of the proposed technology using Formula 10 and the equipment costs for the baseline diesel-fueled forklift and the battery-electric heavy lift forklift given at the start of this example. Cost-effectiveness is to be calculated for two scenarios; for two years during the project and for 10 years, two years after the completion of the project.

Baseline Equipment:

- Forklift cost at project : $40,000
- Forklift cost two years after project : $40,000

Advanced Technology:

- Forklift cost at project : $75,000
- Forklift cost two years after project : $65,000

Formula 10:

Incremental Cost = Cost of New Technology ($) – Cost of Baseline Technology ($)

Incremental $Cost_{2\ years}$ = $75,000 – $40,000 = $35,000

Incremental $Cost_{10\ years}$ = $65,000 – $40,000 = $25,000

Step 8: Determine the GHG emission reduction cost-effectiveness for the proposed project using Formula 5 and the results from Step 4 and Step 7.

Formula 5:

$$GHG\ Cost\ Effectiveness\ \left(\frac{\$}{metric\ ton\ CO2e}\right) = \frac{CRF * incremental\ cost}{Project\ GHG\ ER_{annual}}$$

Where, for the purposes of this Solicitation:

- **CRF** is the Capital Recovery Factor;
- **CRF_2 = 0.508**, per Moyer Table D-25 (2-year life);
- **CRF_{10} = 0.106**, per Moyer Table D-25 (10-year life); and
- **Incremental cost** is the difference between the cost of the baseline vehicle or equipment and the advanced technology vehicle or equipment.

$$GHG\ Cost\ Effectiveness_{2\ years} = \frac{(0.508 * \$35{,}000)}{\left(33\ \frac{metric\ tons\ CO2e}{year}\right)}$$

$$= \$539\ per\ metric\ ton\ CO2e\ reduced$$

$$GHG\ Cost\ Effectiveness_{10\ years} = \frac{(0.106 * \$25{,}000)}{\left(33\ \frac{metric\ tons\ CO2e}{year}\right)}$$

$$= \$80\ per\ metric\ ton\ CO2e\ reduced$$

Step 9: Determine the criteria pollutant cost-effectiveness for the proposed technology. Use the results from Step 6 and Step 7 to populate Formula 8.

Formula 8:

$$Cost\text{-}Effectiveness\ (\$/ton) = \frac{Annualized\ Cost\ (\$/year)}{Annual\ Weighted\ Surplus\ Emission\ Reductions\ (tons/year)}$$

$$WER\ Cost\ Effectiveness_{2\ years} = \frac{(0.508 * \$35{,}000)}{\left(0.017\ \frac{tons\ WER}{year}\right)}$$

$$= \$1{,}050.000\ per\ ton\ weighted\ criteria\ pollutants\ reduced$$

$$WER\ Cost\ Effectiveness_{10\ years} = \frac{(0.106 * \$25{,}000)}{\left(0.017\ \frac{tons\ WER}{year}\right)}$$

$$= \$156{,}000\ per\ ton\ weighted\ criteria\ pollutants\ reduced$$

B. Example B: Fuel Cell Top Handler

Potential GHG emission reductions are determined on a well-to-wheel basis, while criteria pollutant emission reductions are determined using a tank-to-wheel analysis. This example assumes that a fuel cell top handler will have the same energy requirements as a diesel counterpart and will be used the same number of hours. It is assumed that this project will use hydrogen that is SB 1505 compliant and therefore, has 1/3 renewable component.

Baseline Diesel Top Handler:

- Off-road diesel engine: Tier 4 final certification, 300 hp
- Diesel usage: 7.5 gallons per hour
- Operation: 2,500 hours per year, 18,750 gallons of diesel consumed per year
- Top handler cost at project : $550,000
- Top handler cost two years after project : $550,000

Advanced Technology:

- Hydrogen fuel cell top handler
- Top Handler cost at project : $1,000,000
- Top Handler cost two years after project : $750,000

Variables Used in Calculation:

Carbon Intensity

From Table II-2: Fuel Carbon Intensity Values

CI = Carbon Intensity

$CI_{diesel} = \frac{102.01\ g\ CO2e}{MJ}$ Table Pathway Identifier ULSD001

$CI_{hydrogen} = \frac{88.33\ g\ CO2e}{MJ}$ Table Pathway Identifier HYGN005

Energy Density

From Table II-1: Fuel Energy Density

ED = Energy Density

$ED_{diesel} = \frac{134.47\ MJ}{gal\ diesel}$ $ED_{hydrogen} = \frac{119.99\ MJ}{kg}$

Energy Efficiency Ratio

From Table II-3: EER Values for Fuels Used in Light- Medium- and Heavy-Duty Applications

EER = Energy Efficiency Ratio (unit less)

$EER_{fuel\ cell\ vehicle} = 1.9$

Step 1: Convert the diesel used per year to the amount of hydrogen needed to do the same work using Formula 3 and the variables identified above.

Formula 3:

$$Replacement\ Fuel\ Usage\left(\frac{unit}{year}\right) = fuel\ usage * ED_{diesel} * \left(\frac{1}{ED_{replacement\ fuel}}\right) * \left(\frac{1}{EER}\right)$$

Where:

- **ED** is the fuel energy density (see Table II-1: Fuel Energy Density);
- **EER** is the Energy Economy Ratio value for fuels relative to diesel (see Table II-3: EER Values for Fuels Used in Light- Medium- and Heavy-Duty Applications);
- **Unit** is the units associated with the replacement fuel. Electricity is in terms of kWh, hydrogen is in kg, and CNG is in scf.

$$Replacement\ Fuel\ Usage\left(\frac{unit}{year}\right) = \left(\frac{18{,}750\ gal\ diesel}{year}\right) * \left(\frac{134.47\ MJ}{1\ gal\ diesel}\right) * \left(\frac{1\ kg}{119.99\ MJ}\right) * \left(\frac{1}{1.9}\right)$$

$$= 11{,}059\ \frac{kg\ hydrogen}{year}$$

Step 2: Determine the GHG emissions that are attributed to the baseline diesel-fueled top handler. Using Formula 1 and the variables identified above.

Formula 1:

$$GHG\ EF\left(\frac{metric\ tons\ CO2e}{year}\right) = CI * fuel\ energy\ density * fuel\ usage * \frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}$$

$$= \left(\frac{gram\ CO2e}{MJ}\right) * \left(\frac{MJ}{gal}\ or\ \frac{MJ}{kg}\ or\ \frac{MJ}{scf}\ or \frac{MJ}{kWh}\right)$$

$$* \left(\frac{gal}{year}\ or\ \frac{kg}{year}\ or\ \frac{scf}{year}\ or \frac{kWh}{year}\right) * \left(\frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}\right)$$

$$GHG\ EF_{base} = \left(\frac{102.01\ g\ CO2e}{MJ}\right) * \left(\frac{134.47\ MJ}{gal\ diesel}\right) * \left(\frac{18{,}750\ gal\ diesel}{year}\right) * \left(\frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}\right)$$

$$= 257 \frac{metric\ tons\ CO2e}{year}$$

Step 3: Determine the GHG emissions that are attributed to the advanced technology top handler. Using Formula 1, the result from Step 1 and the variables identified above.

Formula 1:

$$GHG\ EF\left(\frac{metric\ tons\ CO2e}{year}\right) = CI * fuel\ energy\ density * fuel\ usage * \frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}$$

$$= \left(\frac{gram\ CO2e}{MJ}\right) * \left(\frac{MJ}{gal}\ or\ \frac{MJ}{kg}\ or\ \frac{MJ}{scf}\ or \frac{MJ}{kWh}\right)$$

$$* \left(\frac{gal}{year}\ or\ \frac{kg}{year}\ or\ \frac{scf}{year}\ or \frac{kWh}{year}\right) * \left(\frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}\right)$$

$$GHG\ EF_{ATV} = \left(\frac{88.33\ gram\ CO2e}{MJ}\right) * \left(\frac{119.99\ MJ}{kg}\right) * \left(\frac{11{,}059\ kg}{year}\right) * \left(\frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}\right)$$

$$= 117 \frac{metric\ tons\ CO2e}{year}$$

Step 4: Determine the GHG emission reductions that are associated with the proposed project. Using Formula 4, populated by results from Step 2 and Step 3 above to give the GHG emission benefit from the proposed project.

Formula 4:

$$Project\ GHG\ ER_{annual}\left(\frac{metric\ tons\ CO2e}{year}\right) = GHG\ EF_{base} - GHG\ EF_{ATV}$$

Where:

- **GHG ER$_{annual}$** is the annual GHG emission reductions that are associated with the proposed project;
- **GHG EF$_{base}$** is the GHG emission factor associated with the base case vehicle or equipment that the advanced technology vehicle or equipment is compared against; and
- **GHG ER$_{ATV}$** is the GHG emission factor that is associated with the proposed advanced technology vehicle.

$$Project\ GHG\ ER_{annual} = \left(257 \frac{metric\ tons\ CO2e}{year}\right) - \left(117 \frac{metric\ tons\ CO2e}{year}\right)$$

$$= 140 \frac{metric\ tons\ CO2e}{year}$$

Step 5: Determine the annual criteria pollutant emission reductions that are associated with the proposed project. The baseline diesel-fueled top handler is using a 300 hp diesel engine that is certified to the Tier 4 Final emissions standard, therefore, using emission values from Table IV-7 and off-road load factors from Table IV-5, the result of Step 1 above to populate Formula 12. The top handler will be used 100% of the time in California. There are no criteria pollutant emissions associated with the use of the hydrogen fuel cell top handler in a tank-to-wheel analysis.

For a Tier 4 Final off-road engine at 300 hp, Table IV-7 gives criteria pollutant emissions per bhp-hr and Table IV-5 gives the load factor. Therefore:

NOx = 0.26 $\frac{g\ NOx}{bhp-hr}$; ROG = 0.05 $\frac{g\ ROG}{bhp-hr}$; PM10 = 0.009 $\frac{g\ PM10}{bhp-hr}$

Load Factor$_{\text{container handling equipment}}$ = 0.59

Formula 12:

Annual Emission Reductions =

*Emission Factor or Converted Emission Standard (g/bhp-hr) * Horsepower * Load Factor * Activity (hrs/yr) * Percent Operation in California * ton/907,200g*

$$Annual\ ER_{NOx} = \left(0.26 \frac{g\ NOx}{bhp-hr}\right) * (300\ hp) * (0.59) * \left(2{,}500 \frac{hours}{year}\right) * (1) * \left(\frac{1\ ton}{907{,}200\ grams}\right)$$

$$= 0.127 \frac{tons\ NOx}{year}$$

$$Annual\ ER_{ROG} = \left(0.05 \frac{g\ NOx}{bhp-hr}\right) * (300\ hp) * (0.59) * \left(2{,}500 \frac{hours}{year}\right) * (1) * \left(\frac{1\ ton}{907{,}200\ grams}\right)$$

$$= 0.024 \frac{tons\ ROG}{year}$$

$$Annual\ ER_{PM10} = \left(\frac{0.009\ g\ PM10}{bhp-hr}\right) * (300\ hp) * (0.59) * \left(2{,}500 \frac{hours}{year}\right) * (1) * \left(\frac{1\ ton}{907{,}200\ grams}\right)$$

$$= 0.004 \frac{tons\ PM10}{year}$$

Step 6: Determine the weighted annual surplus emission reductions that are associated with the proposed project. Using the results from Step 5 above along with the realization that the proposed battery-electric forklift will not produce any criteria pollutant emissions in a tank-to-wheel scenario, populate Formula 11.

Formula 11:

Annual Weighted Surplus Emission Reductions =

*NOx reductions (tons/yr) + ROG reductions (tons/yr) + [20 * (PM reductions (tons/yr)]*

$$WER = \left(0.127\ \frac{tons\ NOx}{year}\right) + \left(0.024 \frac{tons\ ROG}{year}\right) + \left(20 * 0.004 \frac{tons\ PM}{year}\right)$$

$$= 0.231\ \frac{tons}{year}$$

Step 7: Determine the incremental cost of the proposed technology using Formula 10 and the equipment costs for the baseline diesel-fueled top handler and the fuel cell top handler given at the start of this example. Cost-effectiveness is to be calculated for two scenarios; for two years during the project and for 10 years, two years after the completion of the project.

Baseline Equipment:

- Top handler cost at Project : $550,000
- Top handler cost two years after project : $550,000

Advanced Technology:

- Top handler cost at project : $1,000,000
- Top handler cost two years after project : $750,000

Formula 10:

Incremental Cost = Cost of New Technology ($) – Cost of Baseline Technology ($)

Incremental $Cost_{2\ years}$ = $1,000,000 – $550,000 = $450,000

Incremental $Cost_{10\ years}$ = $750,000 – $550,000 = $200,000

Step 8: Determine the GHG emission reduction cost-effectiveness for the proposed project using Formula 5 and the results from Step 4 and Step 7.

Formula 5:

$$Cost\ Effectiveness\left(\frac{\$}{metric\ ton\ CO2e}\right) = \frac{CRF * incremental\ cost}{Project\ GHG\ ER_{annual}}$$

Where, for the purposes of this Solicitation:

- **CRF** is the Capital Recovery Factor;
- **CRF_2 = 0.515**, per Moyer Table G-3a (2-year life);
- **CRF_{10} = 0.111**, per Moyer Table G-3a (10-year life); and
- **Incremental cost** is the difference between the cost of the baseline vehicle or equipment and the advanced technology vehicle or equipment.

$$GHG\ Cost\ Effectiveness_{2\ years} = \frac{(0.508 * \$450{,}000)}{\left(140\ \frac{metric\ tons\ CO2e}{year}\right)}$$

$$= \$1{,}630\ per\ metric\ ton\ CO2e\ reduced$$

$$GHG\ Cost\ Effectiveness_{10\ years} = \frac{(0.106 * \$200{,}000)}{\left(140\ \frac{metric\ tons\ CO2e}{year}\right)}$$

$$= \$151\ per\ metric\ ton\ CO2e\ reduced$$

Step 9: Determine the criteria pollutant cost-effectiveness for the proposed technology. Use the results from Step 6 and Step 7 to populate Formula 8.

Formula 8:

$$Cost\text{-}Effectiveness\ (\$/ton) = \frac{Annualized\ Cost\ (\$/year)}{Annual\ Weighted\ Surplus\ Emission\ Reductions\ (tons/year)}$$

$$WER\ Cost\ Effectiveness_{2\ years} = \frac{(0.508 * \$450{,}000)}{\left(0.231\ \frac{tons\ WER}{year}\right)}$$

$$= \$990{,}000\ per\ ton\ weighted\ criteria\ pollutants\ reduced$$

$$WER\ Cost\ Effectiveness_{10\ years} = \frac{(0.106 * \$200{,}000)}{\left(0.231\ \frac{tons\ WER}{year}\right)}$$

$$= \$91{,}800\ per\ ton\ weighted\ criteria\ pollutants\ reduced$$

C. Example C: Battery-Electric Switch Locomotive with Fuel Cell Range Extender

Potential GHG emission reductions are determined on a well-to-wheel basis, while criteria pollutant emission reductions are determined using a tank-to-wheel analysis. This example assumes that a fuel cell locomotive with battery storage will have the same energy requirements as a diesel-electric counterpart and will be used the same number of hours. Further, it is assumed that in this project, continuous power is provided by the fuel cell and peak power requirements are provided by the on-board traction battery. It is assumed that half of the advanced technology vehicle's energy needs will come from the on-board battery pack and that half of the vehicle's energy needs will come from the on-board range extending engine. It is assumed that this project will use hydrogen that is SB 1505 compliant and therefore, has 1/3 renewable component.

Baseline Locomotive:

- Off-road diesel engine with electric drivetrain: Tier 4 certification, 1,500 hp
- Diesel usage: 23 gallons per hour
- Operation: 6,000 hours per year, 138,000 gallons per year
- Locomotive cost at project : $1,500,000
- Locomotive cost two years after project : $1,500,000

Advanced Technology:

- Battery-electric locomotive with fuel cell range extender
- Energy requirements during operation: 50% on electricity, 50% on hydrogen
- Locomotive cost at project : $3,500,000
- Locomotive cost two years after project : $2,500,000

Variables Used in Calculation:

Carbon Intensity

From Table II-2: Fuel Carbon Intensity Values

CI = Carbon Intensity

$CI_{diesel} = \frac{102.01\ g\ CO2e}{MJ}$ Table Pathway Identifier ULSD001

$CI_{electricity} = \frac{105.15\ g\ CO2e}{MJ}$ Table Pathway Identifier ELC001

$CI_{hydrogen} = \frac{88.33\ g\ CO2e}{MJ}$ Table Pathway Identifier HYGN005

Energy Density

From Table II-1: Fuel Energy Density

ED = Energy Density

$ED_{diesel} = \frac{134.47\ MJ}{gal\ diesel}$ $ED_{hydrogen} = \frac{119.99\ MJ}{kg}$

$ED_{electricity} = \frac{3.60\ MJ}{kWh}$

Energy Efficiency Ratio

From Table II-3: EER Values for Fuels Used in Light- Medium- and Heavy-Duty Applications

EER = Energy Efficiency Ratio (unit less)

$EER_{electric\ heavy\ rail} = 4.6$ $EER_{fuel\ cell\ vehicle} = 1.9$

Step 1: Convert the diesel used per year to the amount of electricity and hydrogen needed to do the same work using Formula 3 and the variables identified above.

Formula 3:

$$Replacement\ Fuel\ Usage\left(\frac{unit}{year}\right) = fuel\ usage * ED_{diesel} * \left(\frac{1}{ED_{replacement\ fuel}}\right) * \left(\frac{1}{EER}\right)$$

Where:

- **ED** is the fuel energy density (see Table II-1: Fuel Energy Density);
- **EER** is the Energy Economy Ratio value for fuels relative to diesel (see Table II-3: EER Values for Fuels Used in Light- Medium- and Heavy-Duty Applications);
- **Unit** is the units associated with the replacement fuel. Electricity is in terms of kWh, hydrogen is in kg, and CNG is in scf.

$$Replacement\ Fuel\ Usage_{electricity} = \left(\frac{69{,}000\ gal\ diesel}{year}\right) * \left(\frac{134.47\ MJ}{1\ gal\ diesel}\right) * \left(\frac{1\ kWh}{3.60\ MJ}\right) * \left(\frac{1}{4.6}\right)$$

$$= 560{,}000\ \frac{kWh}{year}$$

$$Replacement\ Fuel\ Usage_{hydrogen} = \left(\frac{69{,}000\ gal\ diesel}{year}\right) * \left(\frac{134.47\ MJ}{1\ gal\ diesel}\right) * \left(\frac{1\ kg}{119.99\ MJ}\right) * \left(\frac{1}{1.9}\right)$$

$$= 40{,}700\ \frac{kg\ hydrogen}{year}$$

Step 2: Determine the GHG emissions that are attributed to the baseline diesel-fueled locomotive using Formula 1 and the variables identified above.

Formula 1:

$$GHG\ EF\left(\frac{metric\ tons\ CO2e}{year}\right) = CI * fuel\ energy\ density * fuel\ usage * \frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}$$

$$= \left(\frac{gram\ CO2e}{MJ}\right) * \left(\frac{MJ}{gal}\ or\ \frac{MJ}{kg}\ or\ \frac{MJ}{scf}\ or \frac{MJ}{kWh}\right) * \left(\frac{gal}{year}\ or\ \frac{kg}{year}\ or\ \frac{scf}{year}\ or \frac{kWh}{year}\right) * \left(\frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}\right)$$

$$GHG\ EF_{base} = \left(\frac{102.01\ g\ CO2e}{MJ}\right) * \left(\frac{134.47\ MJ}{gal\ diesel}\right) * \left(\frac{138{,}000\ gal\ diesel}{year}\right) * \left(\frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}\right)$$

$$= 1{,}893\ \frac{metric\ tons\ CO2e}{year}$$

Step 3: Determine the GHG emissions that are attributed to the advanced technology locomotive. Use Formula 1, the result from Step 1, and the variables identified above to calculate the GHG emissions for electricity and hydrogen separately, then add together.

Formula 1:

$$GHG\ EF\left(\frac{metric\ tons\ CO2e}{year}\right) = CI * fuel\ energy\ density * fuel\ usage * \frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}$$

$$= \left(\frac{gram\ CO2e}{MJ}\right) * \left(\frac{MJ}{gal}\ or\ \frac{MJ}{kg}\ or\ \frac{MJ}{scf}\ or \frac{MJ}{kWh}\right) * \left(\frac{gal}{year}\ or\ \frac{kg}{year}\ or\ \frac{scf}{year}\ or \frac{kWh}{year}\right) * \left(\frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}\right)$$

$$GHG\ EF_{electricity} = \left(\frac{105.16\ g\ CO2e}{MJ}\right) * \left(\frac{3.60\ MJ}{kWh}\right) * \left(\frac{560{,}000\ kWh}{year}\right) * \left(\frac{metric\ ton\ CO2e}{1{,}000{,}000\ grams}\right)$$

$$= 212\ \frac{metric\ tons\ CO2e}{year}$$

$$GHG\ EF_{hydrogen} = \left(\frac{88.33\ g\ CO2e}{MJ}\right) * \left(\frac{119.99\ MJ}{kg}\right) * \left(\frac{40{,}700\ kg}{year}\right) * \left(\frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}\right)$$

$$= 431 \frac{metric\ tons\ CO2e}{year}$$

$$GHG\ EF_{ATV} = \left(212 \frac{metric\ tons\ CO2e}{year}\right) + \left(431 \frac{metric\ tons\ CO2e}{year}\right)$$

$$= 643 \frac{metric\ tons\ CO2e}{year}$$

Step 4: Determine the GHG emission reductions that are associated with the proposed project. Use Formula 4, populated by results from Step 2 and Step 3 above, to give the GHG emission benefit from the proposed project.

Formula 4:

$$Project\ GHG\ ER_{annual} \left(\frac{metric\ tons\ CO2e}{year}\right) = GHG\ EF_{base} - GHG\ EF_{ATV}$$

Where:

- **GHG ER$_{annual}$** is the annual GHG emission reductions that are associated with the proposed project;
- **GHG EF$_{base}$** is the GHG emission factor associated with the base case vehicle or equipment that the advanced technology vehicle or equipment is compared against; and
- **GHG ER$_{ATV}$** is the GHG emission factor that is associated with the proposed advanced technology vehicle.

$$Project\ GHG\ ER_{annual} = \left(1{,}893 \frac{metric\ tons\ CO2e}{year}\right) - \left(643 \frac{metric\ tons\ CO2e}{year}\right)$$

$$= 1{,}250 \frac{metric\ tons\ CO2e}{year}$$

Step 5: Determine the annual criteria pollutant emission reductions that are associated with the proposed project. The baseline locomotive is using a 1,500 hp diesel engine that is certified to the Tier 4 emissions standard, therefore, using emission values from Table IV-12b and fuel consumption rate factors from Table IV-19, the result of Step 1 above to populate Formula 13. The locomotive will be used 100% of the time in California. There are no criteria pollutant emissions associated with the use of the battery-electric locomotive with the fuel cell range extender in a tank-to-wheel analysis.

For a Tier 4 locomotive engine at 1,500 hp, Table IV-12b gives criteria pollutant emissions per bhp-hr and Table IV-19 gives the fuel consumption rate factor. Therefore:

NOx = 1.22 $\frac{g\ NOx}{bhp-hr}$; ROG = 0.15 $\frac{g\ ROG}{bhp-hr}$; PM10 = 0.026 $\frac{g\ PM10}{bhp-hr}$

Formula 13:

Annual Emission Reductions =

*Emission Factor or Converted Emission Standard (g/bhp-hr) * fuel consumption rate factor (bhp-hr/gallon (gal)) * Activity (gal/yr) * Percent Operation in CA * ton/907,200g*

$$Annual\ ER_{NOx} = \left(1.22\frac{g\ NOx}{bhp-hr}\right) * \left(15.2\frac{bhp-hr}{gal\ diesel}\right) * \left(138{,}000\frac{gal\ diesel}{year}\right) * (1) * \left(\frac{1\ ton}{907{,}200\ grams}\right)$$

$$= 2.821\frac{tons\ NOx}{year}$$

$$Annual\ ER_{ROG} = \left(0.15\frac{g\ ROG}{bhp-hr}\right) * \left(15.2\frac{bhp-hr}{gal\ diesel}\right) * \left(138{,}000\frac{gal\ diesel}{year}\right) * (1) * \left(\frac{1\ ton}{907{,}200\ grams}\right)$$

$$= 0.347\frac{tons\ ROG}{year}$$

$$Annual\ ER_{PM10} = \left(0.026\frac{g\ PM10}{bhp-hr}\right) * \left(15.2\frac{bhp-hr}{gal\ diesel}\right) * \left(138{,}000\frac{gal\ diesel}{year}\right) * (1) * \left(\frac{1\ ton}{907{,}200\ grams}\right)$$

$$= 0.060\frac{tons\ PM10}{year}$$

Step 6: Determine the weighted annual surplus emission reductions that are associated with the proposed project. Use the results from Step 5 above, along with the realization that the proposed battery-electric locomotive with a fuel cell range extender will not produce any criteria pollutant emissions in a tank-to-wheel scenario, to populate Formula 11.

Formula 11:

Annual Weighted Surplus Emission Reductions =

*NOx reductions (tons/yr) + ROG reductions (tons/yr) + [20 * (PM reductions (tons/yr)]*

$$WER = \left(2.821\ \frac{tons\ NOx}{year}\right) + \left(0.347 \frac{tons\ ROG}{year}\right) + \left(20 * 0.060 \frac{tons\ PM}{year}\right)$$

$$= 4.368\ \frac{tons}{year}$$

Step 7: Determine the incremental cost of the proposed technology using Formula 10 and the equipment costs for the baseline locomotive and the battery-electric locomotive with a fuel cell range extender given at the start of this example. Cost-effectiveness is to be calculated for two scenarios; for two years during the project and for 10 years, two years after the completion of the project.

Baseline Equipment:

- Locomotive cost at Project : $1,500,000
- Locomotive cost two years after project : $1,500,000

Advanced Technology:

- Locomotive cost at project : $3,500,000
- Locomotive cost two years after project : $2,500,000

Formula 10:

Incremental Cost = Cost of New Technology ($) – Cost of Baseline Technology ($)

Incremental $Cost_{2\ years}$ = $3,500,000 – $1,500,000 = $2,000,000

Incremental $Cost_{10\ years}$ = $2,500,000 – $1,500,000 = $1,000,000

Step 8: Determine the GHG emission reduction cost-effectiveness for the proposed project using Formula 5 and the results from Step 4 and Step 7.

Formula 5:

$$Cost\ Effectiveness\ \left(\frac{\$}{metric\ ton\ CO2e}\right) = \frac{CRF * incremental\ cost}{Project\ GHG\ ER_{annual}}$$

Where, for the purposes of this Solicitation:

- **CRF** is the Capital Recovery Factor;
- **CRF_2 = 0.508**, per Moyer Table D-25 (2-year life);
- **CRF_{10} = 0.106**, per Moyer Table D-25 (10-year life); and
- **Incremental cost** is the difference between the cost of the baseline vehicle or equipment and the advanced technology vehicle or equipment.

$$GHG\ Cost\ Effectiveness_{2\ years} = \frac{(0.508 * \$2{,}000{,}000)}{\left(1{,}250 \frac{metric\ tons\ CO2e}{year}\right)}$$

$$= \$813\ per\ metric\ ton\ CO2e\ reduced$$

$$GHG\ Cost\ Effectiveness_{10\ years} = \frac{(0.106 * \$1{,}000{,}000)}{\left(1{,}250\ \frac{metric\ tons\ CO2e}{year}\right)}$$

$$= \$85\ per\ metric\ ton\ CO2e\ reduced$$

Step 9: Determine the criteria pollutant cost-effectiveness for the proposed technology. Use the results from Step 6 and Step 7 to populate Formula 8.

Formula 8:

$$Cost\text{-}Effectiveness\ (\$/ton) = \frac{Annualized\ Cost\ (\$/year)}{Annual\ Weighted\ Surplus\ Emission\ Reductions\ (tons/year)}$$

$$WER\ Cost\ Effectiveness_{2\ years} = \frac{(0.508 * \$2{,}000{,}000)}{\left(4.368\ \frac{tons\ WER}{year}\right)}$$

$$= \$233{,}000\ per\ ton\ weighted\ criteria\ pollutants\ reduced$$

$$WER\ Cost\ Effectiveness_{10\ years} = \frac{(0.106 * \$1{,}000{,}000)}{\left(4.368\ \frac{tons\ WER}{year}\right)}$$

$$= \$24{,}300\ per\ ton\ weighted\ criteria\ pollutants\ reduced$$

D. Example D: Logistic Strategy for Container Movement Technology

Potential GHG emission reductions are determined on a well-to-wheel basis, while criteria pollutant emission reductions are determined using a tank-to-wheel analysis. This example assumes that a piece of cargo handling equipment utilizing advanced logistic technology will have the same energy requirements as a diesel counterpart without the logistic technology and will be used the same number of hours. The logistic strategy is only functional while loading and unloading ocean going vessels and, therefore, will only be engaged half of the time during the cargo handling equipment's operation.

Baseline Vehicle:

- Top handler with off-road diesel engine: Tier 4 final certification, 300 hp
- Diesel usage: 7.5 gallons per hour
- Operation: 2,500 hours per year, 18,750 gallons of diesel consumed per year
- Top handler cost at project : $550,000
- Top handler cost two years after project : $550,000

Advanced Technology:

- Top handler with off-road diesel engine: Tier 4 final certification, 300 hp
- Operation: 2,500 hours per year
    - 50% of operation is loading and unloading ocean going vessels
- Logistic system provides a 5% increase in fuel economy while loading and unloading ocean going vessels
- Top handler with logistic technology cost at project : $590,000
- Top handler with logistic technology two years after project : $575,000

Variables Used in Calculation:

Carbon Intensity

From Table II-2: Fuel Carbon Intensity Values

CI = Carbon Intensity

$CI_{diesel} = \frac{102.01\ g\ CO2e}{MJ}$ Table Pathway Identifier ULSD001

Energy Density

From Table II-1: Fuel Energy Density

ED = Energy Density

$ED_{diesel} = \frac{134.47\ MJ}{gal\ diesel}$

Energy Efficiency Ratio

From Table II-3: EER Values for Fuels Used in Light- Medium- and Heavy-Duty Applications

EER = Energy Efficiency Ratio (unit less)

$EER_{diesel} = 1.0$

Step 1: Calculate the amount of diesel needed to operate the advanced technology vehicle. Use Formula 7 and the baseline information above.

Formula 7:

$$Fuel\ Usage_{ATV}\left(\frac{gal}{year}\right) = fuel\ usage * \left(1 - \frac{(X * Y\%\ improvement)}{100\%}\right)$$

Where:

- **X** is the fraction of the time the advanced operational efficiency technology or logistic strategy is enabled and providing emission reductions. If the advanced operational efficiency technology or logistic strategy is always engaged and providing emission reductions assume that X is equal to 1; and
- **Y** is the percentage fuel economy improvement that is gained by having the advanced operational efficiency technology or logistic strategy efficiency improvement over the baseline engine.

$$Fuel\ Usage_{ATV}\left(\frac{gal}{year}\right) = \left(\frac{18{,}750\ gal\ diesel}{year}\right) * \left(1 - \frac{(0.5 * 5\%\ improvement)}{100\%}\right)$$

$$= 18{,}280\frac{gal\ diesel}{year}$$

Step 2: Determine the GHG emissions that are attributed to the baseline vehicle using Formula 1 and the variables identified above.

Formula 1:

$$GHG\ EF\left(\frac{metric\ tons\ CO2e}{year}\right) = CI * fuel\ energy\ density * fuel\ usage * \frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}$$

$$= \left(\frac{gram\ CO2e}{MJ}\right) * \left(\frac{MJ}{gal}\ or\ \frac{MJ}{kg}\ or\ \frac{MJ}{scf}\ or \frac{MJ}{kWh}\right)$$

$$* \left(\frac{gal}{year}\ or\ \frac{kg}{year}\ or\ \frac{scf}{year}\ or \frac{kWh}{year}\right) * \left(\frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}\right)$$

$$GHG\ EF_{base} = \left(\frac{102.01\ g\ CO2e}{MJ}\right) * \left(\frac{134.47\ MJ}{gal\ diesel}\right) * \left(\frac{18{,}750\ gal\ diesel}{year}\right) * \left(\frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}\right)$$

$$= 257 \frac{metric\ tons\ CO2e}{year}$$

Step 3: Determine the GHG emissions that are attributed to the advanced technology vehicle using Formula 1, the result from Step 1 and the variables identified above.

Formula 1:

$$GHG\ EF\left(\frac{metric\ tons\ CO2e}{year}\right) = CI * fuel\ energy\ density * fuel\ usage * \frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}$$

$$= \left(\frac{gram\ CO2e}{MJ}\right) * \left(\frac{MJ}{gal}\ or\ \frac{MJ}{kg}\ or\ \frac{MJ}{scf}\ or \frac{MJ}{kWh}\right)$$

$$* \left(\frac{gal}{year}\ or\ \frac{kg}{year}\ or\ \frac{scf}{year}\ or \frac{kWh}{year}\right) * \left(\frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}\right)$$

$$GHG\ EF_{ATV} = \left(\frac{102.01\ g\ CO2e}{MJ}\right) * \left(\frac{134.47\ MJ}{gal\ diesel}\right) * \left(\frac{18{,}280\ gal\ diesel}{year}\right) * \left(\frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}\right)$$

$$= 251 \frac{metric\ tons\ CO2e}{year}$$

Step 4: Determine the GHG emission reductions that are associated with the proposed project. Use Formula 4, populated by results from Step 3 and Step 4 above, to give the GHG emission benefit from the proposed project.

Formula 4:

$$Project\ GHG\ ER_{annual}\left(\frac{metric\ tons\ CO2e}{year}\right) = GHG\ EF_{base} - GHG\ EF_{ATV}$$

Where:

- **GHG ER_{annual}** is the annual GHG emission reductions that are associated with the proposed project;
- **GHG EF_{base}** is the GHG emission factor associated with the base case vehicle or equipment that the advanced technology vehicle or equipment is compared against; and
- **GHG ER_{ATV}** is the GHG emission factor that is associated with the proposed advanced technology vehicle.

$$Project\ GHG\ ER_{annual} = \left(257 \frac{metric\ tons\ CO2e}{year}\right) - \left(251 \frac{metric\ tons\ CO2e}{year}\right)$$

$$= 6 \frac{metric\ tons\ CO2e}{year}$$

Step 5: Determine the annual criteria pollutant emissions that are associated with the baseline vehicle. The baseline vehicle is using a 300 hp diesel engine that is certified to the Tier 4 Final emissions standard, therefore, using emission values from Table IV-7 and fuel consumption rate factors from Table IV-19, populate Formula 13. The vehicle will be used 100% of the time in California.

For a Tier 4 Final off-road engine at 300 hp, Table IV-7 gives criteria pollutant emissions per bhp-hr and Table-24 gives the fuel consumption rate factors. Therefore:

NOx = 0.26 $\frac{g\ NOx}{bhp-hr}$; ROG = 0.05 $\frac{g\ ROG}{bhp-hr}$; PM10 = 0.009 $\frac{g\ PM10}{bhp-hr}$

Formula 13:

Annual Emission Reductions =

*Emission Factor or Converted Emission Standard (g/bhp-hr) * fuel consumption rate factor (bhp-hr/gallon (gal)) * Activity (gal/yr) * Percent Operation in CA * ton/907,200g*

$$Annual\ ER_{NOx} = \left(0.26 \frac{g\ NOx}{bhp-hr}\right) * \left(18.5 \frac{bhp-hr}{gal\ diesel}\right) * \left(18{,}750 \frac{gal\ diesel}{year}\right) * (1) * \left(\frac{1\ ton}{907{,}200\ grams}\right)$$

$$= 0.099 \frac{tons\ NOx}{year}$$

$$Annual\ ER_{ROG} = \left(0.05 \frac{g\ ROG}{bhp-hr}\right) * \left(18.5 \frac{bhp-hr}{gal\ diesel}\right) * \left(18{,}750 \frac{gal\ diesel}{year}\right) * (1) * \left(\frac{1\ ton}{907{,}200\ grams}\right)$$

$$= 0.019 \frac{tons\ ROG}{year}$$

$$Annual\ ER_{PM10} = \left(0.009\frac{g\ PM10}{bhp-hr}\right) * \left(18.5\frac{bhp-hr}{gal\ diesel}\right) * \left(18{,}750\frac{gal\ diesel}{year}\right) * (1) * \left(\frac{1\ ton}{907{,}200\ grams}\right)$$

$$= 0.003\frac{tons\ PM10}{year}$$

Step 6: Determine the annual criteria pollutant emissions that are associated with the advanced technology vehicle. The vehicle is using a 300 hp diesel engine that is certified to the Tier 4 Final emissions standard, therefore, using emission values from Table IV-7, fuel consumption rate factors from Table IV-19, and the result of Step 2 above to populate Formula 13. The vehicle will be used 100% of the time in California.

Formula 13:

Annual Emission Reductions =

*Emission Factor or Converted Emission Standard (g/bhp-hr) * fuel consumption rate factor (bhp-hr/gallon (gal)) * Activity (gal/yr) * Percent Operation in CA * ton/907,200g*

$$Annual\ ER_{NOx} = \left(0.26\frac{g\ NOx}{bhp-hr}\right) * \left(18.5\frac{bhp-hr}{gal}\right) * \left(18{,}280\frac{gal}{year}\right) * (1) * \left(\frac{1\ ton}{907{,}200\ grams}\right)$$

$$= 0.097\frac{tons\ NOx}{year}$$

$$Annual\ ER_{ROG} = \left(0.05\frac{g\ ROG}{bhp-hr}\right) * \left(18.5\frac{bhp-hr}{gal}\right) * \left(18{,}280\frac{gal}{year}\right) * (1) * \left(\frac{1\ ton}{907{,}200\ grams}\right)$$

$$= 0.019\frac{tons\ ROG}{year}$$

$$Annual\ ER_{PM10} = \left(0.009\frac{g\ PM10}{bhp-hr}\right) * \left(18.5\frac{bhp-hr}{gal}\right) * \left(18{,}280\frac{gal}{year}\right) * (1) * \left(\frac{1\ ton}{907{,}200\ grams}\right)$$

$$= 0.003\frac{tons\ PM10}{year}$$

Step 7: Determine the weighted annual emissions reductions that are associated with the proposed project. Using the results from Step 5 and Step 6 above, populate Formula 11.

Formula 11:

Annual Weighted Surplus Emission Reductions =

*NOx reductions (tons/yr) + ROG reductions (tons/yr) + [20 * (PM reductions (tons/yr)]*

$$WER = \left(0.099 - 0.097\frac{tons\ NOx}{year}\right) + \left(0.019 - 0.019\frac{tons\ ROG}{year}\right) + \left(20 * (0.003 - 0.003)\frac{tons\ PM}{year}\right)$$

$$= 0.002\ \frac{tons}{year}$$

Step 8: Determine the incremental cost of the proposed technology using Formula 10 and the equipment costs for the baseline and advanced technology vehicle given at the start of this example. Cost-effectiveness is to be calculated for two scenarios; for two years during the project and for 10 years, two years after the completion of the project.

Baseline Equipment:

- Top handler cost at project : $550,000
- Top handler cost two years after project : $550,000

Advanced Technology:

- Top handler with logistic technology cost at project : $590,000
- Top handler with logistic technology two years after project : $575,000

Formula 10:

Incremental Cost = Cost of New Technology ($) – Cost of Baseline Technology ($)

Incremental $Cost_{2\ years}$ = $590,000 – $550,000 = $40,000

Incremental $Cost_{10\ years}$ = $575,000 – $550,000 = $25,000

Step 9: Determine the GHG emission reduction cost-effectiveness for the proposed project using Formula 5 and the results from Step 4 and Step 8.

Formula 5:

$$Cost\ Effectiveness\ \left(\frac{\$}{metric\ ton\ CO2e}\right) = \frac{CRF * incremental\ cost}{Project\ GHG\ ER_{annual}}$$

Where, for the purposes of this Solicitation:

- **CRF** is the Capital Recovery Factor;
- **CRF_2 = 0.508**, per Moyer Table D-25 (2-year life);
- **CRF_{10} = 0.106**, per Moyer Table D-25 (10-year life); and
- **Incremental cost** is the difference between the cost of the baseline vehicle or equipment and the advanced technology vehicle or equipment.

$$GHG\ Cost\ Effectiveness_{2\ years} = \frac{(0.508 * \$40{,}000)}{\left(6 \frac{metric\ tons\ CO2e}{year}\right)}$$

$$= \$3{,}390\ per\ metric\ ton\ CO2e\ reduced$$

$$GHG\ Cost\ Effectiveness_{10\ years} = \frac{(0.106 * \$25{,}000)}{\left(6 \frac{metric\ tons\ CO2e}{year}\right)}$$

$$= \$442\ per\ metric\ ton\ CO2e\ reduced$$

Step 10: Determine the criteria pollutant cost-effectiveness for the proposed technology. Use the results from Step 7 and Step 8 to populate Formula 8.

Formula 8:

$$\textit{Cost-Effectiveness (\$/ton)} = \frac{\textit{Annualized Cost (\$/year)}}{\textit{Annual Weighted Surplus Emission Reductions (tons/year)}}$$

$$WER\ Cost\ Effectiveness_{2\ years} = \frac{(0.508 * \$40{,}000)}{\left(0.002 \frac{tons\ WER}{year}\right)}$$

$$= \$10{,}200{,}000\ per\ ton\ weighted\ criteria\ pollutants\ reduced$$

$$WER\ Cost\ Effectiveness_{10\ years} = \frac{(0.106 * \$25{,}000)}{\left(0.002 \frac{tons\ WER}{year}\right)}$$

E. Example E: Fuel Cell Regional Haul Truck

Potential GHG emission reductions are determined on a well-to-wheel basis, while criteria pollutant emission reductions are determined using a tank-to-wheel analysis. This example assumes that a fuel cell on-road regional haul truck will have the same energy requirements as a diesel counterpart and will be used the same number of miles. The proposed truck in this example will not be plugged in to the electrical grid to charge on-board battery packs, but will use the on-board fuel cell. Further, it is assumed that this project will use hydrogen that is produced from natural gas and compressed for use in the project.

Baseline vehicle:

- 2017 diesel fueled regional haul truck with a heavy duty 2017 on-road diesel engine

- Usage 5 miles per gallon, 175 miles per day, 210 days per year
- On-road truck cost at project : $100,000
- On-road truck cost two years after project : $100,000

Advanced Technology:

- Hydrogen fuel cell on-road truck
- Hydrogen fuel cell on-road truck cost at project : $750,000
- Hydrogen fuel cell on-road truck cost two years after project : $500,000

Variables Used in Calculation:

Carbon Intensity

From Table ORATD App D2: Fuel Carbon Intensity Values

CI = Carbon Intensity

$CI_{diesel} = \frac{102.01\ g\ CO2e}{MJ}$ Table Pathway Identifier ULSD001

$CI_{hydrogen} = \frac{88.33\ g\ CO2e}{MJ}$ Pathway Identifier HYGN005

Energy Density

From Table ORATD App D1: Fuel Energy Density

ED = Energy Density

$ED_{diesel} = \frac{134.47\ MJ}{gal\ diesel}$ $ED_{hydrogen} = \frac{119.99\ MJ}{kg\ H2}$

Energy Efficiency Ratio

From Table ORATD App D3: EER Values for Fuels Used in Light- Medium- and Heavy-Duty Applications

EER = Energy Efficiency Ratio (unit less)

$EER_{hydrogen} = 1.9$

Step 1: Calculate the baseline vehicle's annual fuel usage using Formula 1a:

Formula 1a:

$$Fuel\ Usage_{baseline} = \left(\frac{gallon}{mile}\right) * \left(\frac{miles}{day}\right) * \left(\frac{days}{year}\right)$$

$$Fuel\ Usage_{baseline} = \left(\frac{1\ gallon}{5\ miles}\right) * \left(\frac{175\ miles}{day}\right) * \left(\frac{210\ days}{year}\right) = \frac{7{,}350\ gallons\ diesel}{year}$$

Step 2: Convert the diesel used per year from the baseline vehicle to the amount of hydrogen needed to do the same work. Using Formula 3 and the variable identified above.

Formula 3:

$$Fuel\ Usage_{ATV} = \left(\frac{X\ gal\ Diesel}{yr}\right) * \left(ED\ \frac{MJ}{1\ gal\ diesel}\right) * \left(ED\ \frac{NF\ unit}{MJ}\right) * \left(\frac{1}{EER}\right)$$

Where:

- **X** is the number of gallons diesel fuel used as a basis for the conversion;
- **ED** is the Energy Density of the replacement fuel (see Table ORATD App D1: Fuel Energy Density);
- **EER** is the Energy Economy Ratio value for fuels relative to diesel fuel (see Table ORATD App D3: EER Values for Fuels Used in Light- Medium- and Heavy-Duty Applications);
- **NF** is the new fuel that is proposed to be used as a diesel replacement; and
- **Unit** is the units associated with the replacement fuel:
    - Electricity: kWh
    - Hydrogen: kg
    - CNG: scf

$$Fuel\ Usage_{ATV} = \left(\frac{7{,}350\ gal\ Diesel}{yr}\right) * \left(\frac{134.47\ MJ}{gal\ diesel}\right) * \left(\frac{1\ kg\ H2}{119.99\ MJ}\right) * \left(\frac{1}{1.9}\right) = 4{,}335\frac{kg\ H2}{year}$$

Step 3: Determine the GHG emissions that are attributed to the baseline on-road truck. Using Formula 1 and the variables identified above.

Formula 1:

$$GHG\ EF = CI * fuel\ energy\ density * \ fuel\ usage * \frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}$$

$$= \left(\frac{gram\ CO2e}{MJ}\right) * \left(\frac{MJ}{gal}\ or\ \frac{MJ}{kg}\ or\ \frac{MJ}{scf}\right) * \left(\frac{gal}{year}\ or\ \frac{kg}{year}\ or\ \frac{scf}{year}\right) * \left(\frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}\right)$$

$$GHG\ EF_{baseline} = \left(\frac{102.01\ g\ CO2e}{MJ}\right) * \left(\frac{134.47\ MJ}{gal\ diesel}\right) * \left(\frac{7{,}350\ gallons\ diesel}{year}\right) * \left(\frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}\right)$$

$$= 101 \frac{metric\ tons\ CO2e}{year}$$

Step 4: Determine the GHG emissions (GHG EF_{ATV})that are attributed to the advanced technology fuel cell on-road truck. Using the result from Step 2, the variables identified above as inputs into Formula 1.

Formula 1:

$$GHG\ EF = CI * fuel\ energy\ density * \ fuel\ usage * \frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}$$

$$= \left(\frac{gram\ CO2e}{MJ}\right) * \left(\frac{MJ}{gal}\ or\ \frac{MJ}{kg}\ or\ \frac{MJ}{scf}\right) * \left(\frac{gal}{year}\ or\ \frac{kg}{year}\ or\ \frac{scf}{year}\right) * \left(\frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}\right)$$

$$GHG\ EF_{ATV} = \left(\frac{88.33\ g\ CO2e}{MJ}\right) * \left(\frac{120.00\ MJ}{kg\ H2}\right) * \left(\frac{4{,}335\ kg\ H2}{year}\right) * \left(\frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}\right)$$

$$= 46 \frac{metric\ tons\ CO2e}{year}$$

Step 5: Determine the annual GHG emission reductions that are associated with the proposed project. Using Formula 4 above populated by results from Step 3 and Step 4 from the above example to give the annual GHG emission benefit from the proposed project.

Formula 4:

$$Project\ GHG\ ER_{annual} = GHG\ EF_{baseline} - GHG\ EF_{ATV}$$

$$Project\ GHG\ ER_{annual} = \left(101 \frac{metric\ tons\ CO2e}{year}\right) - \left(46 \frac{metric\ tons\ CO2e}{year}\right)$$

$$= 55 \frac{metric\ tons\ CO2e}{year}$$

Step 6: Determine the annual criteria and toxic pollutant emission reductions that are associated with the proposed project. Since the baseline vehicle is using an on-road engine certified to the 2010 standard, inputs from Table D-1 and the result of Step1 above will be used to populate Formula C-9. Since there are not any criteria or toxic air contaminant pollutant emissions associated with the use of the advanced technology on-road truck, all the emissions associated with the baseline vehicle are considered to be the criteria and toxic air contaminant emission reductions for the proposed project.

For a 2010 on-road engine with EO Certification Standard of 0.20 g NOx/bhp-hr, Table D-1 gives emissions per gallon of diesel consumed. Therefore:

NOx = 3.44 $\frac{g\ NOx}{gal\ diesel}$; ROG =0.18 $\frac{g\ ROG}{gal\ diesel}$; PM10 = 0.148 $\frac{g\ PM\ 10}{gal}$

Using Formula C-9:

Formula C-9: Estimated Annual Emissions based on Fuel using Emission Factors (tons/yr). All the emission reductions are taking place in CA.

Annual Emission Reductions =

*Emission Factor (g/gal) * Activity (gal/yr) * ton/907,200g*

Annual ER is the calculated annual emission reductions

$$\text{Annual ER}_{NOx} = \left(\frac{3.44\ g\ NOx}{gal\ diesel}\right) * \left(\frac{7350 gal\ diesel}{year}\right) * \left(\frac{1\ ton}{907{,}200\ g}\right) = 0.0279 \frac{tons\ NOx}{year}$$

$$\text{Annual ER}_{ROG} = \left(\frac{0.18\ g\ ROG}{gal\ diesel}\right) * \left(\frac{7350\ gal\ diesel}{year}\right) * \left(\frac{1\ ton}{907{,}200\ g}\right) = 0.00146\ \frac{tons\ ROG}{year}$$

$$\text{Annual ER}_{PM10} = \left(\frac{0.148\ g\ NOx}{gal\ diesel}\right) * \left(\frac{7350 gal\ diesel}{year}\right) * \left(\frac{1\ ton}{907{,}200\ g}\right) = 0.00120 \frac{tons\ PM}{year}$$

Step 7: Determine the weighted annual surplus emission reductions that are associated with the proposed project. Using the results from Step 6 above along with the realization that the proposed fuel cell on-road truck will not produce any criteria pollutant emissions in a tank-to-wheel scenario populate Formula C-5.

Formula C-5: Annual Weighted Surplus Emission Reductions (tons/yr)

Weighted Emission Reductions =

*NOx reductions (tons/yr) + ROG reductions (tons/yr) + [20 * (PM reductions (tons/yr)]*

Therefore using the results from Step 6 above and Formula C-5:

WER is the Weighted Emission Reductions

$$\text{WER} = \left(0.0279 \frac{tons\ NOx}{year}\right) + \left(0.00146\ \frac{tons\ ROG}{year}\right) * 20 \left(0.00120 \frac{tons\ NOx}{year}\right) = 0.0534\ tons$$

Therefore, WER = $0.053\ \frac{tons\ criteria\ pollutants\ reduced}{year}$

Step 8: Determine the Incremental cost of the proposed technology using Formula C-3 and the vehicle costs for the baseline vehicle and the fuel cell on-road truck given at the start of this example. Cost effectiveness is to be calculated for two scenarios; for two years during the project and for 10 years, two years after the completion of the project.

Baseline vehicle:

- On-Road truck cost at Project : $100,000
- On-Road truck cost two years after project : $100,000

Advanced Technology:

- Fuel cell on-road truck cost at project : $750,000
- Fuel cell on-road truck cost two years after project : $500,000

Formula C-3: Incremental Cost ($)

Incremental Cost = Cost of New Technology ($) – Cost of Baseline Diesel Technology ($)

Incremental $Cost_{2\ years}$ = $750,000 - $100,000 = $650,000
Incremental $Cost_{10\ years}$ = $500,000 - $100,000 = $400,000

Step 9: Determine the GHG emission reduction cost effectiveness for the proposed project using the results from Step 5, Step 8 and Formula 5

Formula 5:

$$Cost\ Effectiveness\ \left(\frac{\$}{metric\ ton}\right) = \left(\frac{\frac{CRF*(\$Advanced\ Technology\ Vehicle - \$Baseline\ Diesel\ Vehicle)}{year}}{\frac{metric\ ton\ emissions\ reduced}{year}}\right)$$

Where, for the purposes of this solicitation:

- **CRF** is the Capital Recovery Factor:
  - CRF_2 = 0.515 per Moyer Table G-3a (2-year life); and
  - CRF_{10} = 0.111 per Moyer Table G-3a (10-year life).

Therefore:

GHG C/E is the GHG Cost Effectiveness

$$GHG\ C/E_{\ 2\ years} = \left(\frac{\frac{(0.508*\$650{,}000)}{year}}{\frac{55\ metric\ tons\ CO2e}{year}}\right) = \frac{\$6004}{metric\ tons\ CO2e\ reduced}$$

$$GHG\ C/E_{\ 10\ years} = \left(\frac{\left(\frac{(0.106*\$400{,}000)}{year}\right)}{\frac{55\ metric\ tons\ CO2e}{year}}\right) = \frac{\$771}{metric\ tons\ CO2e\ reduced}$$

Step 10: Determine the criteria pollutant cost effectiveness for the proposed technology. Use the results from Step 7 and Step 8 to populate Formula C-1.

Formula C-1: Cost-Effectiveness of Weighted Surplus Emission Reductions ($/ton)

$$Cost\text{-}Effectiveness\ (\$/ton) = \frac{Annualized\ Cost\ (\$/year(yr))}{Annual\ Weighted\ Surplus\ Emission\ Reductions\ (tons/yr)}$$

Criteria Pollutant $C/E_{2\ years} = \left(\frac{\frac{(0.508*\$650{,}000)}{year}}{\frac{0.053\ tons\ WER}{year}}\right) = \frac{\$6.2\ million}{tons\ criteria\ pollutants\ reduced}$

Criteria Pollutant $C/E_{10\ years} = \left(\frac{\frac{(0.106*\$400{,}000)}{year}}{\frac{0.053\ tons\ WER}{year}}\right) = \frac{\$800{,}000}{tons\ criteria\ pollutants\ reduced}$

F. Example F: Fuel Cell Transportation Refrigeration Unit (TRU)

Potential GHG emission reductions are determined on a well-to-wheel basis, while criteria pollutant emission reductions are determined using a tank-to-wheel analysis. This example assumes that a TRU will have the same energy requirements as a diesel counterpart and will be used the same number of hours. The initial chill down of the trailer, TRU operations and any needed standby power are provided by the fuel cell. Further, it is assumed that this project will use hydrogen that is SB 1505 compliant and therefore has a 1/3 renewable component.

Baseline TRU:

- Off-Road diesel engine: Tier-4 final certification, 24 hp
- Diesel usage: 0.8 gal per hour, 40 hours per week, 1664 gal per year
- TRU cost at project : $26,000
- TRU cost two years after project : $26,000

Advanced Technology:

- Hydrogen fuel cell TRU
- TRU cost during project: $45,000
- TRU cost two years after project: $40,000

Variables Used in Calculation:

Carbon Intensity

From Table MSF App D2: Fuel Carbon Intensity Values

CI = Carbon Intensity

$CI_{diesel} = \frac{102.01\ g\ CO2e}{MJ}$ Table Pathway Identifier ULSD001

From Table II-2: Fuel Carbon Intensity Values

$CI_{hydrogen} = \frac{88.33\ g\ CO2e}{MJ}$ Pathway Identifier HYGN005

Energy Density

From Table II-1: Fuel Energy Density

ED = Energy Density

$ED_{diesel} = \frac{134.47\ MJ}{gal\ diesel}$ $ED_{hydrogen} = \frac{119.99\ MJ}{kg\ H2}$

Energy Efficiency Ratio

From Table II-3: EER Values for Fuels Used in Light- Medium- and Heavy-Duty Applications

EER = Energy Efficiency Ratio (unit less)

$EER_{hydrogen} = 1.9$

Step 1: Convert the diesel used per year to the amount of hydrogen needed to do the same work. Using Formula 3 and the variable identified above.

Formula 3:

$$= \left(\frac{X\ gal\ Diesel}{yr}\right)\left(ED\ \frac{MJ}{1\ gal\ diesel}\right) * \left(ED\frac{NF\ unit}{MJ}\right) * \left(\frac{1}{EER}\right)$$

Where:
X is the number of gallons diesel fuel used as a basis for the conversion;
NF is the new fuel that is proposed to be used as a diesel replacement;
ED is the Energy Density of the replacement fuel see Table MSF App D1: Fuel Energy Density; and
Unit is the units associated with the replacement fuel:

Electricity: kWh
Hydrogen: kg
CNG: scf

$$\frac{kg\ H2}{year} = \left(\frac{1664\ gal\ diesel}{year}\right) * \left(\frac{134.47\ MJ}{gal\ diesel}\right) * \left(\frac{1\ kg\ H2}{119.99\ MJ}\right) * \left(\frac{1}{1.9}\right) = 981\ \frac{kg\ H2}{year}$$

Step 2: Determine the GHG emissions that are attributed to the base case diesel fueled TRU. Using Formula 1 and the variables identified above.

Formula 1:

$$GHG\ EF = carbon\ intensity * \frac{fuel\ energy\ density}{efficiency} * \frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}$$

$$= \left(\frac{gram\ CO2e}{MJ}\right) * \left(\frac{MJ}{gal}\ or\ \frac{MJ}{kg}\ or\ \frac{MJ}{scf}\right) * \left(\frac{gal}{day}\ or\ \frac{kg}{day}\ or\ \frac{scf}{day}\right) * \left(\frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}\right)$$

$$\text{GHG EF}_{base} = \left(\frac{102.01\ g\ CO2e}{MJ}\right) * \left(\frac{134.47\ MJ}{gal\ diesel}\right) * \left(\frac{1664\ gal}{year}\right) * \left(\frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}\right) = 23\ \frac{metric\ tonc\ CO2e}{year}$$

Step 3: Determine the GHG emissions that are attributed to the advanced technology TRU. Using Formula 1, the result from Step 1 and the variables identified above.

$$\text{GHG EF}_{adv\ tech} = \left(\frac{88.33\ g\ CO2e}{MJ}\right) * \left(\frac{119.99\ MJ}{kg\ H2}\right) * \left(\frac{981\ kg\ H2}{year}\right) * \left(\frac{1\ metric\ ton}{1{,}000{,}000\ grams}\right) = 10\ \frac{metric\ tons\ CO2e}{year}$$

Step 4: Determine the GHG emission reductions that are associated with the proposed project. Using Formula 4, populated by results from Step 2 and Step 3 to give the GHG emission benefit from the proposed project.

Formula 4:

$$\text{Project GHG ER}_{annual} = \text{GHG EF}_{base} - \text{GHG EF}_{adv\ tech}$$

$$\text{Project GHG ER}_{annual} = \left(\frac{23\ metric\ tons\ CO2e}{year}\right) - \left(\frac{10\ metric\ tons\ CO2e}{year}\right) = 13\ \frac{metric\ tons\ CO2e}{year}$$

Step 5: Determine the annual criteria pollutant emission reductions that are associated with the proposed project. The base case TRU is using a 24 hp, diesel engine that is certified to the Tier-4 final emissions standard, therefore, using emission values from Table D-12 and fuel consumption rate factors from Table D-24, the result of Step1 above to populate Formula C-8. The fuel cell TRU will be used 100% of the time in California. There are no criteria pollutant emissions associated with the use of the fuel cell TRU in a tank to wheel analysis.

For a Tier-4 final off-road engine at 24 hp, Table D-12 gives criteria pollutant emissions per bhp-hr, but only for diesel engines above 25 hp, for this calculation use the emission factor for a 25 hp diesel engine. The conversion factor from Table D-24, for the relevant engine power rating, allows for the conversion from gram per bhp-hr to gram per gallon of fuel consumed. Therefore:

$$\text{NOx} = 2.75\ \frac{g\ NOx}{bhp-hr}\ ;\ \text{ROG} = 0.09\ \frac{g\ ROG}{bhp-hr}\ ;\ \text{PM10} = 0.009\ \frac{g\ PM\ 10}{bhp-hr}$$

Formula C-8: Estimated Annual Emissions based on Fuel Consumed using Emission Factors or Converted Emission Standard (tons/yr)

Annual Emission Reductions =

*Emission Factor or Converted Emission Standard (g/bhp-hr) * fuel consumption rate factor (bhp-hr/gallon (gal)) * Activity (gal/yr) * Percent Operation in CA * ton/907,200g*

Annual ER is the annual emission reductions for a particular pollutant.

Annual $ER_{NOx} = \left(\frac{2.75g\ NOx}{b/hp-/hr}\right) * \left(\frac{18.5\ b/hp-/hr)}{gal\ diesel}\right) * \left(\frac{1664\ gal\ diesel}{year}\right) * (1) * \left(\frac{1\ ton}{907{,}200\ g}\right) =$

Annual $ER_{NOx} = 0.093\ \frac{tons\ NOx}{year}$

Annual $ER_{ROG} = \left(\frac{0.09\ g\ ROG}{b/hp-/hr}\right) * \left(\frac{18.5\ b/hp-/hr)}{gal\ diesel}\right) * \left(\frac{1664\ gal\ diesel}{year}\right) * (1) * \left(\frac{1\ ton}{907{,}200\ g}\right) =$

Annual $ER_{ROG} = 0.0031\ \frac{tons\ ROG}{year}$

Annual $ER_{PM} = \left(\frac{0.009\ g\ PM}{b/hp-/hr}\right) * \left(\frac{18.5\ b/hp-/hr)}{gal\ diesel}\right) * \left(\frac{1664 gal\ diesel}{year}\right) * (1) * \left(\frac{1\ ton}{907{,}200\ g}\right) =$

Annual $ER_{PM} = 0.00031\ \frac{tons\ PM}{year}$

Step 6: Determine the weighted annual surplus emission reductions that are associated with the proposed project. Using the results from Step 5 above along with the realization that the proposed fuel cell TRU will not produce any criteria pollutant emissions in a tank-to-wheel scenario populate Formula C-5.

Formula C-5: Annual Weighted Surplus Emission Reductions (tons/yr)

WER is the Weighted Emission Reductions

Weighted Emission Reductions =

*NOx reductions (tons/yr) + ROG reductions (tons/yr) + [20 * (PM reductions (tons/yr)]*

Therefore, using the results from Step 6 above and Formula C-5:

$WER = (0.093\ \frac{tons\ NOx}{year}) + \left(0.0031\ \frac{tons\ ROG}{year}\right) * 20\left(0.00031\ \frac{tons\ PM}{year}\right) = 0.10\ \frac{tons}{year}$

Therefore, $WER = 0.10\ \frac{tons\ criteria\ pollutants\ reduced}{year}$

Step 7: Determine the incremental cost of the proposed technology using Formula C-3, the equipment costs for the base case TRU and the fuel cell TRU given at the start of this example. Cost effectiveness is to be calculated for two scenarios; for two years during the project and for 10 years, two years after the completion of the project.

Step 8: Determine the GHG emission reduction cost effectiveness for the proposed project using the results from Step 4, Step 7 and Formula 5

Formula 5:

$$Cost\ Effectiveness\ \left(\frac{\$}{metric\ ton}\right) = \left(\frac{\left(\frac{CRF*(\$Advanced\ Technology\ Vehicle - \$Baseline\ Diesel\ Vehicle)}{year}\right)}{\left(\frac{metric\ ton\ emissions\ reduced}{year}\right)}\right)$$

For the purposes of this Solicitation:

CRF is the Capital Recover Factor for a specific useful life.

CRF_2 = 0.508 per Moyer Table IV-24 (2-year life)

CRF_{10} = 0.106 per Moyer Table IV-24 (10-year life)

Therefore:

GHG C/E is the GHG Cost Effectiveness

$$\text{GHG C/E}_{\text{2 years}} = \left(\frac{\frac{(0.508*\$19{,}000)}{year}}{\frac{13\ metric\ tons\ CO2e}{year}}\right) = \frac{\$742}{metric\ tons\ CO2e\ reduced}$$

$$\text{GHG C/E}_{\text{10 years}} = \left(\frac{\left(\frac{(0.106*\$14{,}000)}{year}\right)}{\frac{13\ metric\ tons\ CO2e}{year}}\right) = \frac{\$114}{metric\ tons\ CO2e\ reduced}$$

Step 9: Determine the criteria pollutant cost effectiveness for the proposed technology. Use the results from Step 6 and Step 7 to populate Formula C-1.

Formula C-1: Cost-Effectiveness of Weighted Surplus Emission Reductions ($/ton):

$$\textit{Cost-Effectiveness (\$/ton)} = \frac{\textit{Annualized Cost (\$/year(yr))}}{\textit{Annual Weighted Surplus Emission Reductions (tons/yr)}}$$

$$\text{Criteria Pollutant C/E}_{2\text{ years}} = \left(\frac{\frac{(0.508*\$19{,}000)}{year}}{\frac{0.10\ tons\ WER}{year}}\right) = \frac{\$96{,}500}{tons\ criteria\ pollutants\ reduced}$$

$$\text{Criteria Pollutant C/E}_{10\text{ years}} = \left(\frac{\frac{(0.106*\$14{,}000)}{year}}{\frac{0.10\ tons\ WER}{year}}\right) = \frac{\$14{,}800}{tons\ criteria\ pollutants\ reduced}$$

G. Example G: Facility Efficiency Improvement

Potential GHG emission reductions are determined on a well-to-wheel basis. This example shows the emission reductions by increasing the efficiency at a freight facility by installing advanced technologies that reduce the electrical needs of a freight facility by 10%. Criteria pollutant emission reductions are determined on tank-to-wheel basis. Since this project is using electrically from the electrical grid there are no criteria pollution emission reductions.

Baseline technology:

- Business as Usual
- Facility uses 190.8 Kw/hr

Advanced Technology:

- 10% efficiency improvement thru the use of advanced strategies
- Advanced strategy cost during the project: $175,000
- Advanced strategy cost two years after the project: $150,000

Variables used in Calculation:

Energy Density

From Table II-1 Fuel Energy Density

$ED_{electricity} = \frac{3.60\ MJ}{KWh}$

Carbon Intensity

$CI_{electricy} = \frac{105.15\ g\ CO2e}{MJ}$

Step 1: Determine the amount of electric used at the freight facility during one year without the use of advanced technologies reducing electrical load for the facility.

$$Annual\ Electrical\ usage = \frac{190.8\ Kw}{hr} * \frac{8760\ hrs}{year} = \frac{1{,}671{,}408\ Kw}{yr}$$

Step 2: Calculate the baseline emissions from the freight facility.

Formula 1:

$$GHG\ EF\left(\frac{metric\ tons\ CO2e}{year}\right) = CI * fuel\ energy\ density * fuel\ usage * \frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}$$

$$GHG\ EF = \frac{105.15\ g\ CO2e}{MJ} * \frac{3.60\ MJ}{KWh} * \frac{1{,}671{,}408\ Kw}{yr} * \frac{1\ metric\ ton\ CO2e}{1{,}000{,}000\ grams}$$

$$GHG\ EF = \frac{633\ metric\ tons\ CO2e}{Year}$$

Since the advanced technology, being deployed at the freight facility will reduce electrical load by 10% that gives a GHG emission reduction of:

Project GHG ER $_{annual}$ = $\left(\frac{633\ metric\ tons\ CO2e}{year}\right) * 10\% = 63\ \frac{metric\ tons\ CO2e}{year}$

For the purposes of this Solicitation:

CRF is the Capital Recover Factor for a specific useful life.

CRF_2 = 0.508 per Moyer Table IV-24 (2-year life)

CRF_{10} = 0.106 per Moyer Table IV-24 (10-year life)

Therefore:

GHG C/E is the GHG Cost Effectiveness

GHG C/E $_{2\ years}$ = $\left(\frac{\frac{(0.508*\$175{,}000)}{year}}{\frac{633\ metric\ tons\ CO2e}{year}}\right) = \frac{\$140}{metric\ tons\ CO2e\ reduced}$

GHG C/E $_{10\ years}$ = $\left(\frac{\left(\frac{(0.106*\$150{,}000)}{year}\right)}{\frac{633\ metric\ tons\ CO2e}{year}}\right) = \frac{\$25}{metric\ tons\ CO2e\ reduced}$

H. Example H: Project Wide Summation of Emission Reductions and Cost Effectiveness Determination:

This example shows the summation of the emission reductions and cost effectiveness from an entire project utilizing the example calculations for specific vehicle and equipment types and including reductions from the freight facility efficiency improvement project. The total project will have a one-to-one match and the total project cost is $18,500,000 with a request for funding of $9,000,000. The summation calculation will only be required for the time frame of the proposed project and not require a calculation for a period after the end of the project.

A proposed project wants to deploy:

- **10 Fuel Cell Regional Haul Trucks**

  Advanced Technology Trucks:

  - Hydrogen fuel cell on-road truck cost at project : $750,000

  Emission Reductions:

  - 55 metric tons CO2e per truck
  - 0.053 tons WER per truck

- **75 Fuel Cell TRUs**

  Advanced Technology TRUs :
  - Hydrogen fuel cell TRU cost at project : $45,000

  Emission Reductions:

  - 13 metric tons CO2e per TRU
  - 0.10 tons WER per TRU

- **Facility Efficiency Improvement**

  Advanced Technology Strategy:

  - 10% efficiency improvement thru the use of advanced strategies
  - Advanced strategy cost during the project: $175,000

Emission Reductions:

- 633 metric tons CO2e
- 0.0 tons WER

Determination of the Total Cost of the Project:

Total Cost for Fuel Cell Trucks = 10 trucks * $\frac{\$750,000}{truck} = \$7,500,000$

Total Cost for TRUs = 75 TRUs * $\frac{\$45,000}{TRU} = \$3,375,000$

Total Cost for Freight Facility Improvement = $\$175,000$

Fueling Infrastructure = $7,000,000

Project Administration = $450,000

Therefore the total project cost is = $18,500,000

Determination of the total emission reductions from the project:

GHG Emission reduction from trucks =

10 trucks * $\frac{55\ metric\ tons\ CO2e}{truck} = 550$ metric tons CO2e

WER from Trucks =

10 trucks * $\frac{0.053\ tons\ WER}{truck} = 0.53$ tons WER

Emission reductions from TRUs =

75 TRUs * $\frac{13\ metric\ tons\ CO2e}{truck} = 975$ metric tons CO2e

WER from Trucks =

10 trucks * $\frac{0.10\ tons\ WER}{truck} = 1.0$ tons WER

Emission reductions from Facility Efficiency Improvement =

633 metric tons CO2e for Facility Improvement

Therefore, the total emission reductions for the project can be determined:

550 metric tons CO2e from trucks +875 metric tons CO2e from TRUs +

633 metric tons CO2e from facility improvement =

= 2,058 metric tons CO2e for project

0.53 tons WER from trucks + 1.0 tons WER from TRU + 0 tons WER from facility improvement = 1.53 tons WER

:

CRF is the Capital Recover Factor for a specific useful life.

CRF_2 = 0.508 per Moyer Table IV-24 (2-year life)

Therefore:

GHG C/E is the GHG Cost Effectiveness

$$\text{GHG C/E}_{\text{2 years}} = \left(\frac{\frac{(0.508*\$18{,}500{,}000)}{year}}{\frac{2058\ metric\ tons\ CO2e}{year}}\right) = \frac{\$4570}{metric\ tons\ CO2e\ reduced}$$

Determine the criteria pollutant cost effectiveness for the proposed technology. Use the results from Step 6 and Step 7 to populate Formula C-1.

Formula C-1: Cost-Effectiveness of Weighted Surplus Emission Reductions ($/ton):

$$\textit{Cost-Effectiveness (\$/ton)} = \frac{\textit{Annualized Cost (\$/year(yr))}}{\textit{Annual Weighted Surplus Emission Reductions (tons/yr)}}$$

$$\text{Criteria Pollutant C/E}_{\text{2 years}} = \left(\left(\frac{\frac{(0.508*\$118{,}500{,}000)}{year}}{\frac{1.53\ tons\ WER}{year}}\right) = \frac{\$6{,}140{,}000}{tons\ criteria\ pollutants\ reduced}\right.$$

V. EMISSION FACTORS FOR GHG REDUCTIONS

The following emission factors apply when calculating emission reductions and cost-effectiveness for Zero- and Near Zero-Emission Freight Facility Project applications:

Table II-1: Fuel Energy Density[6]

Fuel (units)	*Energy Density*
CARBOB (gal)	119.53 (MJ/gal)
CaRFG (gal)	115.83 (MJ/gal)
Diesel fuel (gal)	134.47 (MJ/gal)
CNG (scf)	1.04 (MJ/scf)
LNG (gal)	78.83 (MJ/gal)
Electricity (KWh)	3.60 (MJ/KWh)
Hydrogen (kg)	119.99 (MJ/kg)
Denatured Ethanol (gal)	81.51 (MJ/gal)
Biodiesel (gal)	126.13 (MJ/gal)
Renewable Diesel (gal)	129.65 (MJ/gal)

[6] CARB, 2015; LCFS Regulation, Table 3: Energy Densities of LCFS Fuels and Blendstocks. https://www.arb.ca.gov/regact/2015/lcfs2015/lcfsfinalregorder.pdf

Table II-2: Fuel Carbon Intensity Values[7,8]

Fuel	Pathway Identifier	Carbon Intensity Values (gCO_2e/MJ)
ULSD – based on the average crude oil supplied to California refineries and average California refinery efficiencies	ULSD001	102.01
CaRFG (calculated)	--	98.47
Fossil CNG	CNG400T	78.37
Fossil LNG	LNG401T	94.42
Biomethane CNG	CNG500T	46.42
Biomethane LNG	LNG501T	64.63
Biodiesel – any feedstock	BIOD202T	102.01
Renewable Diesel – any feedstock	RNWD302T	102.01
Ethanol – corn	ETH100T	75.97
Ethanol – any starch or sugar feedstock	ETH103T	98.47
Hydrogen – all sources	HYGN005	88.33
Electricity – California average	ELC001	105.16
Electricity – Solar based	--	0

[7] CARB, 2018; CCI Quantification Methodology Emission Factor Database https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/cci_emissionfactordatabase.xlsx accessed [March 20, 2018].
[8] CARB, 2015; LCFS Regulation. https://www.arb.ca.gov/regact/2015/lcfs2015/lcfsfinalregorder.pdf

Table II-3: EER Values for Fuels Used in Light-, Medium-, and Heavy-Duty Applications[9]

Fuels Used as a Diesel Replacement for Heavy-Duty and Off-Road Applications	
Fuel/Vehicle Combinations	**EER Value Relative to Diesel**
Diesel Fuel or Biomass Based Diesel Blends	1.0
CNG	0.9
LNG	0.9
Electricity / Battery Electric or Plug-in Hybrid Electric Vehicle or Equipment	5.5
Electricity / Fixed Guideway, Heavy Rail	4.6
H_2 / Fuel Cell Vehicle or Equipment	1.9

Table II-4: Low NOx Engine Emission Values[9]

Low-NOx Engine Incentives Emission Factors				
Vehicle Class	**(g/mi)**	**2017 Diesel**	**2017 CNG**	**2017 Low NO_x RNG**
MHD	GHG (CO_2e)		1,261	557
	ROG		0.0371	0.0371
	NO_x		0.8579	0.0858
	$PM_{2.5}$		0.0616	0.0616
	Diesel PM		0	0
HHD	GHG (CO_2e)	2,223	1,821	804
	ROG	0.0789	0.0789	0.0789
	NO_x	1.4310	1.4310	0.1431
	$PM_{2.5}$	0.0408	0.0408	0.0408
	Diesel PM	0.0055	0	0

[9] CARB, 2018; CCI Quantification Methodology Emission Factor Database https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/cci_emissionfactordatabase.xlsx accessed [March 20, 2018].https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/quantification.htm

VI. Tables for Calculating Criteria and Toxic Pollutant Emission Reductions

ON-ROAD TRUCK TABLES

Table IV-1
Diesel Heavy-Duty Engines
Converted Emission Standards for Fuel Based Usage Calculations

EO Certification Standards g/bhp-hr		NOx	ROG[a]	PM10
		g/gal[b][c][d]		
6.0 NOx	0.60 PM10	103.23	5.33	7.992
5.0 NOx	0.25 PM10	86.03	4.44	3.330
5.0 NOx	0.10 PM10	86.03	4.44	1.332
4.0 NOx	0.10 PM10	68.82	3.55	1.332
2.5 NOx + NMHC	0.10 PM10	40.86	2.11	1.332
1.8 NOx + NMHC	0.01 PM10	29.42	1.52	0.148
1.5 NOx + NMHC	0.01 PM10	24.52	1.27	0.148
1.2 NOx + NMHC	0.01 PM10	19.61	1.01	0.148
0.84 NOx + NMHC	0.01 PM10	13.73	0.71	0.148
0.50 NOx	0.01 PM10	8.60	0.44	0.148
0.20 NOX	0.01 PM10	3.44	0.18	0.148

Table IV-2
Alternative Fuel Heavy-Duty Engines
Converted Emission Standards for Fuel Based Usage Calculations

EO Certification Standards g/bhp-hr		NOx	ROG[a]	PM10
		g/gal[b][c][d]		
6.0 NOx	0.60 PM10	111.00	35.14	11.100
5.0 NOx	0.25 PM10	92.50	29.29	4.625
5.0 NOx	0.10 PM10	92.50	29.29	1.850
4.0 NOx	0.10 PM10	74.00	23.43	1.850
2.5 NOx + NMHC	0.10 PM10	37.00	11.71	1.850
1.8 NOx + NMHC	0.01 PM10	26.64	8.43	0.185
1.5 NOx + NMHC	0.01 PM10	22.20	7.03	0.185
1.2 NOx + NMHC	0.01 PM10	17.76	5.62	0.185
0.84 NOx + NMHC	0.01 PM10	12.43	3.94	0.185
0.50 NOx	0.01 PM10	9.25	2.93	0.185
0.20 NOX	0.01 PM10	3.70	1.17	0.185

a - ROG = HC * 1.26639.
b - Fuel based emissions factors were calculated using fuel consumption rate factors from Table IV-19.
c - Fuel based factors are for engines less than 750 horsepower only.

d - Emission standards were converted where appropriate, using the NMHC and NOx fraction default values and the ultra low sulfur diesel fuel correction factors listed in Table D-25 and D-26 of the Moyer Guidelines, respectively.

Table IV-3
Heavy-Duty Vehicles
14,001-33,000 pounds (lbs) Gross Vehicle Weight Rating (GVWR)
Emission Factors for Mileage Based Calculations (g/mile)

Model Year	Diesel[b]		
	NOx	ROG[c]	PM10
Pre-1987	14.52	0.75	0.695
1987-1990	14.31	0.59	0.755
1991-1993	10.70	0.26	0.409
1994-1997	10.51	0.20	0.226
1998-2002	10.33	0.20	0.249
2003-2006	6.84	0.13	0.157
2007-2009	4.01	0.11	0.017
2007+ (0.21-0.50 g/bhp-hr NOx)[d]	1.73	0.10	0.017
2010+ (0.20 g/bhp-hr NOx or cleaner)	0.74	0.09	0.017

Table IV-4
Heavy-Duty Vehicles
Over 33,000 lbs GVWR
Emission Factors for Mileage Based Calculations (g/mile)[a]

Model Year	Diesel[b]		
	NOx	ROG[c]	PM10
Pre-1987	21.37	1.09	1.247
1987-1990	21.07	0.86	1.355
1991-1993	18.24	0.56	0.562
1994-1997	17.92	0.42	0.365
1998-2002	17.61	0.43	0.403
2003-2006	11.64	0.27	0.254
2007-2009	6.62	0.23	0.028
2007+ (0.21-0.50 g/bhp-hr NOx)[d]	2.88	0.20	0.028
2010+ (0.20 g/bhp-hr NOx or cleaner)	1.27	0.19	0.028

a - EMFAC 2011 Zero-Mile Based Emission Factors.
b - Emission factors reflect the ultra low sulfur diesel fuel correction factors listed in Table D-26 of the Moyer Guidelines.

c - ROG = HC * 1.26639.
d - Use interpolated values assuming 1.2 g/bhp-hr NOx Standards for 2007-2009 Model Year Grouping and 0.2 g/bhp-hr NOx Standards for 2010+ Model Years.

OFF-ROAD PROJECTS AND NON-MOBILE AGRICULTURAL PROJECTS

Table IV-5
Off-Road Diesel Engines Default Load Factors

Category	Equipment Type	Load Factor
Airport Ground Support	Aircraft Tug	0.54
	Air Conditioner	0.75
	Air Start Unit	0.90
	Baggage Tug	0.37
	Belt Loader	0.34
	Bobtail	0.37
	Cargo Loader	0.34
	Cargo Tractor	0.36
	Forklift	0.20
	Ground Power Unit	0.75
	Lift	0.34
	Passenger Stand	0.40
	Service Truck	0.20
	Other GSE	0.34
Construction	Air Compressors	0.48
	Bore/Drill Rigs	0.50
	Cement & Mortar Mixers	0.56
	Concrete/Industrial Saws	0.73
	Concrete/Trash Pump	0.74
	Cranes	0.29
	Crawler Tractors	0.43
	Crushing/Process Equipment	0.78
	Excavators	0.38
	Graders	0.41

Table IV-5 (Continued)

Off-Road Diesel Engines Default Load Factors Category	Equipment Type	Load Factor
Construction	Off-Highway Tractors	0.44
	Off-Highway Trucks	0.38
	Pavers	0.42
	Other Paving	0.36
	Pressure Washer	0.30
	Rollers	0.38
	Rough Terrain Forklifts	0.40
	Rubber Tired Dozers	0.40
	Rubber Tired Loaders	0.36
	Scrapers	0.48
	Signal Boards	0.78
	Skid Steer Loaders	0.37
	Surfacing Equipment	0.30
	Tractors/Loaders/Backhoes	0.37
	Trenchers	0.50
	Welders	0.45
	Other Construction Equipment	0.42
Industrial	Aerial Lifts	0.31
	Forklifts	0.20
	Sweepers/Scrubbers	0.46
	Other General Industrial	0.34
	Other Material Handling	0.40
Cargo Handling	Container Handling Equipment	0.59
	Cranes	0.43
	Excavators	0.57
	Forklifts	0.30
	Other Cargo Handling Equipment	0.51
	Sweeper/Scrubber	0.68
	Tractors/Loaders/Backhoes	0.55
	Yard Trucks	0.65
Other	All	0.43

Table IV-6
Uncontrolled Off-Road Diesel Engines
Emission Factors (g/bhp-hr)

Horsepower	Model Year	NOx	ROG	PM10
25 – 49	pre-1988	6.51	2.21	0.547
	1988 +	6.42	2.17	0.547
50 – 119	pre-1988	12.09	1.73	0.605
	1988 +	8.14	1.19	0.497
120+	pre-1970	13.02	1.59	0.554
	1970 – 1979	11.16	1.20	0.396
	1980 – 1987	10.23	1.06	0.396
	1988 +	7.60	0.82	0.274

Table IV-7
Controlled Off-Road Diesel Engines
Emission Factors (g/bhp-hr)[a]

Horsepower	Tier	NOx	ROG	PM10
25-49	1	5.26	1.32	0.480
	2	4.63	0.22	0.280
	4 Interim	4.55	0.09	0.128
	4 Final	2.75	0.09	0.009
50-74	1	6.54	0.90	0.552
	2	4.75	0.17	0.192
	3[(b)]	2.74	0.09	0.192
	4 Interim	2.74	0.09	0.112
	4 Final	2.74	0.09	0.009
75-99	1	6.54	0.90	0.552
	2	4.75	0.17	0.192
	3	2.74	0.09	0.112
	4 Phase-Out	2.74	0.09	0.009
	4 Phase-In/ Alternate NOx	2.14	0.08	0.009
	4 Final	0.26	0.05	0.009
100-174	1	6.54	0.62	0.304
	2	4.17	0.15	0.128
	3	2.32	0.09	0.112
	4 Phase-Out	2.32	0.09	0.009
	4 Phase-In/ Alternate NOx	2.15	0.08	0.009
	4 Final	0.26	0.05	0.009
175-299	1	5.93	0.38	0.120
	2	4.15	0.12	0.088
	3	2.32	0.12	0.088
	4 Phase-Out	2.32	0.12	0.009
	4 Phase-In/ Alternate NOx	1.29	0.08	0.009
	4 Final	0.26	0.06	0.009

Table IV-7 (Continued)
Controlled Off-Road Diesel Engines
Emission Factors (g/bhp-hr)a

Horsepower	Tier	NOx	ROG	PM10
300-750	1	5.93	0.29	0.120
	2	3.79	0.11	0.088
	3	2.32	0.09	0.088
	4 Phase-Out	2.32	0.09	0.009
	4 Phase-In/ Alternate NOx	1.29	0.06	0.009
	4 Final	0.26	0.05	0.009
751+	1	5.93	0.29	0.120
	2	3.79	0.09	0.088
	4 Interim	2.24	0.06	0.051
	4 Final	2.24	0.05	0.017

Note: Engines that are participating in the "Tier 4 Early Introduction Incentive for Engine Manufacturers" program per California Code of Regulations, Title 13, section 2423(b)(6) are eligible for funding provided the engines are certified to the final Tier 4 emission standards. The CARB Executive Order indicates engines certified under this provision. The emission rates for these engines used to determine cost-effectiveness shall be equivalent to the emission factors associated with Tier 3 engines.

For equipment with baseline engines certified under the flexibility provisions per California Code of Regulations, Title 13, section 2423(d), baseline emission rates shall be determined by using the previous applicable emission standard or Tier for that engine model year and horsepower rating. The CARB Executive Order indicates engines certified under this provision.

a - Emission factors were converted using the ultra low sulfur diesel fuel correction factors listed in Table D-27 of the Moyer Guidelines.
b - Alternate compliance option.

LARGE SPARK IGNITION ENGINES (LSI)

Table IV-8
Off-Road LSI Equipment Default Load Factors

Category	Equipment Type	Load Factor
Airport Ground Support	A/C Tug	0.80
	Baggage Tug	0.55
	Belt Loader	0.50
	Bobtail	0.55
	Cargo Loader	0.50
	Forklift	0.30
	Ground Power Unit	0.75
	Lift	0.50
	Passenger Stand	0.59
	Other GSE	0.50
Construction	Air Compressors	0.56
	Asphalt Pavers	0.66
	Bore/Drill Rigs	0.79
	Concrete/Industrial Saws	0.78
	Concrete/Trash Pump	0.69
	Cranes	0.47
	Gas Compressor	0.85
	Paving Equipment	0.59
	Pressure Washer	0.85
	Rollers	0.62
	Rough Terrain Forklifts	0.63
	Rubber Tired Loaders	0.54
	Skid Steer Loaders	0.58
	Tractors/Loaders/Backhoes	0.48

Table IV-8 (Continued)
Off-Road LSI Equipment Default Load Factors

Category	Equipment Type	Load Factor
Construction	Trenchers	0.66
	Welders	0.51
	Other Construction	0.48
Industrial	Aerial Lifts	0.46
	Forklifts	0.30
	Sweepers/Scrubbers	0.71
	Other Industrial	0.54

Table IV-9
Off-Road LSI Engines
Emission Factors (g/bhp-hr)

Horsepower	Fuel	Model Year	NOx	ROG	PM10
25 – 49	Gasoline	Uncontrolled – pre-2004	8.01	3.81	0.060
		Controlled 2001-2006	1.33	0.72	0.060
		Controlled 2007-2009[a]	0.89	0.48	0.060
		Controlled 2010+	0.27	0.14	0.060
	Alt Fuel	Uncontrolled – pre-2004	13.00	0.90	0.060
		Controlled 2001-2006	1.95	0.09	0.060
		Controlled 2007-2009[a]	1.30	0.06	0.060
		Controlled 2010+	0.39	0.02	0.060
50 – 120	Gasoline	Uncontrolled – pre-2004	11.84	2.66	0.060
		Controlled 2001-2006	1.78	0.26	0.060
		Controlled 2007-2009[a]	1.19	0.18	0.060
		Controlled 2010+	0.36	0.05	0.060
	Alt Fuel	Uncontrolled – pre-2004	10.51	1.02	0.060
		Controlled 2001-2006	1.58	0.11	0.060
		Controlled 2007-2009[a]	1.05	0.07	0.060
		Controlled 2010+	0.32	0.02	0.060
>120	Gasoline	Uncontrolled – pre-2004	12.94	1.63	0.060
		Controlled 2001-2006	1.94	0.16	0.060
		Controlled 2007-2009[a]	1.29	0.11	0.060
		Controlled 2010+	0.39	0.03	0.060
	Alt Fuel	Uncontrolled – pre-2004	10.51	0.90	0.060
		Controlled 2001-2006	1.58	0.09	0.060
		Controlled 2007-2009[a]	1.05	0.06	0.060
		Controlled 2010+	0.32	0.02	0.060

a - Emission factors for federally certified engines used in preempt equipment.

Table IV-10
Emission Factors for Off-Road LSI Engine Retrofits
Verified to Absolute Emission Number (g/bhp-hr)

Manufacturers of LSI retrofit systems may verify to a percent emission reduction or absolute emissions. If a retrofit system is verified to a percent reduction, the emission factors will be that verified percent of the appropriate emissions factors in Table IV-9. If a retrofit system is verified to an absolute emission number, use the following table for the emission factors.

Fuel	Verified Value	NOx	ROG	PM10
Gasoline	3.0 g/bhp-hr	1.78	0.26	0.060
	2.5 g/bhp-hr	1.48	0.22	0.060
	2.0 g/bhp-hr	1.19	0.18	0.060
	1.5 g/bhp-hr	0.89	0.13	0.060
	1.0 g/bhp-hr	0.59	0.09	0.060
	0.6 g/bhp-hr	0.36	0.05	0.060
	0.5 g/bhp-hr	0.30	0.04	0.060
Alt Fuel	3.0 g/bhp-hr	1.58	0.10	0.060
	2.5 g/bhp-hr	1.32	0.09	0.060
	2.0 g/bhp-hr	1.05	0.07	0.060
	1.5 g/bhp-hr	0.79	0.05	0.060
	1.0 g/bhp-hr	0.53	0.03	0.060
	0.6 g/bhp-hr	0.32	0.02	0.060
	0.5 g/bhp-hr	0.26	0.02	0.060

Table IV-11
Off-Road LSI Engines Certified to Optional Standards
Emission Factors (g/bhp-hr)

Horsepower	Fuel	Optional Standard	NOx	ROG	PM10
25-50	Gasoline	1.50	0.67	0.36	0.060
		1.00	0.44	0.24	0.060
		0.60	0.27	0.14	0.060
		0.40	0.18	0.10	0.060
		0.20	0.09	0.05	0.060
		0.10	0.04	0.02	0.060
	Alt Fuel	1.50	0.98	0.05	0.060
		1.00	0.65	0.03	0.060
		0.60	0.39	0.02	0.060
		0.40	0.26	0.01	0.060
		0.20	0.13	0.01	0.060
		0.10	0.07	0.00	0.060
50-120	Gasoline	1.50	0.89	0.13	0.060
		1.00	0.59	0.09	0.060
		0.60	0.36	0.05	0.060
		0.40	0.24	0.04	0.060
		0.20	0.12	0.02	0.060
		0.10	0.06	0.01	0.060
	Alt Fuel	1.50	0.79	0.05	0.060
		1.00	0.53	0.03	0.060
		0.60	0.32	0.02	0.060
		0.40	0.21	0.01	0.060
		0.20	0.11	0.01	0.060
		0.10	0.05	0.00	0.060
>120	Gasoline	1.50	0.97	0.08	0.060
		1.00	0.65	0.05	0.060
		0.60	0.39	0.03	0.060
		0.40	0.26	0.02	0.060
		0.20	0.13	0.01	0.060
		0.10	0.06	0.01	0.060
	Alt Fuel	1.50	0.79	0.05	0.060
		1.00	0.53	0.03	0.060
		0.60	0.32	0.02	0.060
		0.40	0.21	0.01	0.060
		0.20	0.11	0.01	0.060
		0.10	0.05	0.00	0.060

LOCOMOTIVES

Table IV-12a
Locomotive Emission Factors (g/bhp-hr)
Based on 1998 Federal Standards

Engine Model Year	Type	NOx[a]	ROG[b]	PM10[a]
Pre-1973	Line-haul and Passenger	12.22	0.51	0.275
	Switcher	16.36	1.06	0.378
1973-2001 Tier 0	Line-haul and Passenger	8.93	1.05	0.516
	Switcher	13.16	2.21	0.619
2002-2004 Tier 1	Line-haul and Passenger	6.96	0.58	0.387
	Switcher	10.34	1.26	0.464
2005-2011 Tier 2	Line-haul and Passenger	5.17	0.32	0.172
	Switcher	7.61	0.63	0.206

These factors are to be used for the project baseline emissions if the baseline locomotive is certified or required to be certified to the 1998 federal locomotive remanufacture standards and for the reduced emission locomotive if the project locomotive is remanufactured to these 1998 standards. Factors are based upon Regulatory Impact Analysis: Final United States Environmental Protection Agency (U.S. EPA) Locomotive Regulation (2008).
a - NOx and PM10 emission factors have been adjusted by a factor of 0.94 and 0.86, respectively, to account for use of California ultra-low sulfur diesel fuel.
b - ROG = HC * 1.053

Table IV-12b
Locomotive Emission Factors (g/bhp-hr)
Based on 2008 Federal Standards

Engine Model Year	Type	NOx[(a)]	ROG[(b)]	PM10[(a)]
1973-2001 Tier 0+	Line-haul and Passenger	6.96	0.58	0.189
	Switcher	11.09	2.21	0.224
2002-2004 Tier 1+	Line-haul and Passenger	6.96	0.58	0.189
	Switcher	10.34	1.26	0.224
2005-2011 Tier 2+	Line-haul and Passenger	5.17	0.32	0.086
	Switcher	7.61	0.63	0.112
2011-2014 Tier 3	Line-haul and Passenger	5.17	0.32	0.086
	Switcher	4.70	0.63	0.086
2015 Tier 4	Line-haul and Passenger	1.22	0.15	0.026
	Switcher	1.22	0.15	0.026

These factors are to be used for the project baseline emissions if the baseline locomotive is certified or required to be certified to the new (2008) federal locomotive remanufacture standards, and for the reduced emission locomotive if the project locomotive is remanufactured to the new standards or meets Tier 3 standards. Factors are based upon Regulatory Impact Analysis: Final U.S. EPA Locomotive Regulation (2008).
a - NOx and PM10 emission factors have been adjusted by a factor of 0.94 and 0.86, respectively, to account for use of California ultra-low sulfur diesel fuel.
b - ROG = HC * 1.053

Table IV-13
Locomotive Idle-Limiting Device Emission Reduction Factors

Type	Factor
Switchers	0.90
Line-Haul	0.97
Passenger	0.97

Note: Factors based on assumption Idle Limiting Device (ILD) reduces locomotive engine idling by 50 percent. Multiply total baseline emissions by this factor to determine reduced emissions with ILD.

MARINE VESSELS

Table IV-14a
Uncontrolled Harbor Craft Propulsion Engine
Emission Factors (g/bhp-hr)

Horsepower	Model Year	NOx	ROG	PM10
25-50	All	7.57	1.32	0.520
51-120	pre-1997	14.27	1.04	0.575
	1997+	9.70	0.71	0.524
121-250	pre-1971	15.36	0.95	0.527
	1971-1978	14.27	0.79	0.451
	1979-1983	13.17	0.72	0.376
	1984+	12.07	0.68	0.376
251+	pre-1971	15.36	0.91	0.506
	1971-1978	14.27	0.76	0.431
	1979-1983	13.17	0.68	0.363
	1984-1994	12.07	0.65	0.363
251-750	1995+	8.97	0.49	0.260
751+	1995+	12.07	0.60	0.363

Table IV-14b
Controlled Harbor Craft Propulsion Engine
Emission Factors (g/bhp-hr)

Horsepower	Tier	NOx	ROG	PM10
25-50	1	6.93	1.30	0.580
	2	5.04	1.30	0.240
	3	5.04	1.30	0.176
51-120	1	6.93	0.71	0.524
	2	5.04	0.71	0.240
	3	5.04	0.71	0.176
121-175	1	8.97	0.49	0.290
	2	4.84	0.49	0.176
	3	3.60	0.49	0.077
176-750	1	8.97	0.49	0.290
	2	4.84	0.49	0.120
	3	3.87	0.49	0.068
751-1900	1	8.97	0.49	0.290
	2	5.24	0.49	0.160
	3	3.87	0.49	0.068
1901 +	1	8.97	0.49	0.290
	2	5.24	0.49	0.160
	3	4.14	0.49	0.085

Table IV-15a
Uncontrolled Harbor Craft Auxiliary Engine
Emission Factors (g/bhp-hr)

Horsepower	Model Year	NOx	ROG	PM10
25-50	all	6.42	1.58	0.460
51-120	pre-1997	12.09	1.23	0.508
	1997+	8.14	0.85	0.417
121-250	pre-1971	13.02	1.13	0.466
	1971-1978	12.09	0.94	0.399
	1979-1983	11.16	0.86	0.333
	1984-1995	10.23	0.82	0.333
	1996+	7.75	0.59	0.255
251-750	pre-1971	13.02	1.08	0.448
	1971-1978	12.09	0.90	0.381
	1979-1983	11.16	0.81	0.321
	1984-1994	10.23	0.77	0.321
	1995+	7.60	0.58	0.230
751 +	pre-1971	13.02	1.08	0.448
	1971-1978	12.09	0.90	0.381
	1979-1986	11.16	0.81	0.321
	1987-1998	10.23	0.72	0.321
	1999+	7.75	0.58	0.255

Table IV-15b
Controlled Harbor Craft Auxiliary Engine
Emission Factors (g/bhp-hr)

Horsepower	Tier	NOx	ROG	PM10
25-50	1	6.54	1.54	0.511
	2	5.04	1.54	0.240
	3	5.04	1.54	0.176
51-120	1	6.93	0.85	0.464
	2	5.04	0.85	0.240
	3	5.04	0.85	0.176
121-175	1	6.93	0.58	0.255
	2	4.84	0.58	0.176
	3	3.60	0.58	0.077
176-750	1	6.93	0.58	0.255
	2	4.84	0.58	0.120
	3	3.78	0.58	0.068
751-1900	1	6.93	0.58	0.255
	2	5.24	0.58	0.160
	3	3.87	0.58	0.068
1901 +	1	6.93	0.58	0.255
	2	5.24	0.58	0.160
	3	4.14	0.58	0.085

Table IV-16
Harbor Craft Load Factors

Vessel Type	Propulsion Engine	Auxiliary Engine
Charter Fishing	0.52	0.43
Commercial Fishing	0.27	
Ferry/Excursion	0.42	
Pilot	0.51	
Tow	0.68	
Work	0.45	
Other	0.52	
Barge/Dredge	0.45	0.65
Crew & Supply	0.38	0.32
Tug	0.50	0.31

Table IV-17
Shore Power
Default Emission Rates Grams per kilowatt-hour (g/kWh)

Pollutant	Emission Rate
NOx	13.9
ROG	0.49
PM10 (marine gas oil fuel with 0.11- 0.5 % sulfur content)	0.38
PM10 (marine gas oil fuel with <= 0.10 % sulfur content)	0.25

Table IV-18
Shore Power
Default Power Requirements

Ship Category	Ship Size / Type Default Twenty-foot Equivalent Unit (TEU)	Power Requirement (kW)
Container Vessel	<1,000	1,000
	1,000 – 1,999	1,300
	2,000 – 2,999	1,600
	3,000 – 3,999	1,900
	4,000 – 4,999	2,200
	5,000 – 5,999	2,300
	6,000 – 6,999	2,500
	7,000 – 7,999	2,900
	8,000 – 9,999	3,300
	10,000 – 12,000	3,700
Passenger Vessel	No Default Value – Use Actual Power Requirement[a]	
Reefer	Break Bulk	1,300
	Fully containerized	3,300

a - The average power requirement for passenger vessels is 7,400 kW (ARB Oceangoing Vessel Survey, 2005).

ALL ENGINES

Table IV-19
Fuel Consumption Rate Factors (bhp-hr/gal)

Category	Horsepower/Application	Fuel Consumption Rate
Non-Mobile Agricultural Engines	ALL	17.5
Locomotive	Line Haul and Passenger (Class I/II)	20.8
	Line Haul and Passenger (Class III)	18.2
	Switcher	15.2
Other	< 750 hp	18.5
	≥ 750 hp	20.8

Table IV-20
Shore Power
Default Emission Rates (Grams per kilowatt-hour (g/kW-hr))

Pollutant	Emission Rate
NOx	13.09
ROG	0.49
PM10 (marine gas oil fuel with 0.11- 0.5 % sulfur content)	0.38
PM10 (marine gas oil fuel with <= 0.10 % sulfur content)	0.25

Table IV-21
Shore Power
Default Power Requirements

Ship Category	Ship Size / Type Default (Twenty-foot Equivalent Unit (TEU))	Power Requirement (kW)
Container Vessel	<1,000	1,000
	1,000 – 1,999	1,300
	2,000 – 2,999	1,600
	3,000 – 3,999	1,900
	4,000 – 4,999	2,200
	5,000 – 5,999	2,300
	6,000 – 6,999	2,500
	7,000 – 7,999	2,900
	8,000 – 9,999	3,300
	10,000 – 12,000	3,700
Passenger Vessel	No Default Value – Use Actual Power Requirement[(a)]	
Reefer	Break Bulk	1,300
	Fully containerized	3,300

[(a)] The average power requirement for passenger vessels is 7,400 kW (ARB Oceangoing Vessel Survey, 2005).

Table IV-24
Capital Recovery Factor (CRF) for Various Project Lives
At a 1% Discount Rate

Project Life	CRF
1	1.010
2	0.508
3	0.340
4	0.256
5	0.206
6	0.173
7	0.149
8	0.131
9	0.117
10	0.106
11	0.096
12	0.089
13	0.082
14	0.077
15	0.072
16	0.068
17	0.064
18	0.061
19	0.058
20	0.055

APPENDIX E

CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA) COMPLIANCE AND PERMITTING REQUIREMENTS

Zero- and Near Zero-Emission Freight Facilities Project

Mobile Source Control Division
California Air Resources Board
March 21, 2018

This page intentionally left blank.

Each proposed infrastructure installation (e.g., electric vehicle supply equipment or hydrogen refueling station) may be subject to California Environmental Quality Act (CEQA) compliance, as well as permitting and other requirements. Such proposals must adhere to the requirements specified in this Appendix.

I. CEQA COMPLIANCE INFORMATION

The California Environmental Quality Act (CEQA) requires public agencies to identify the significant environmental impacts of their actions and to avoid or mitigate them, if feasible. Under CEQA, an activity that may cause either a direct or reasonably foreseeable indirect physical change in the environment is generally considered a project. An activity funded by a grant may be considered a project under CEQA if it will cause a direct or reasonably foreseeable indirect physical change in the environment. Agencies must comply with CEQA before they approve a project. For projects which are exempt from CEQA, agencies may prepare a Notice of Exemption (an example is provided for reference).

Before applicants submit an application, applicants must be certain that the project will be able to satisfy any and all CEQA requirements before grant execution can take place. Grant execution is required to take place on or before December 31, 2018. Applicants must complete a CEQA Worksheet (Appendix A, Attachment 9) for each proposed infrastructure installation. The California Air Resources Board (CARB or Board) must ensure that the appropriate level of environmental review under CEQA has been completed prior to grant approval/execution. Thus, no grant can be approved/executed until the lead agency has determined that the project is exempt from CEQA requirements, or the lead agency has satisfied all CEQA requirements.

As part of its application, the Applicant shall provide a detailed description of the project and all of its components, as well as any direct physical changes and reasonably foreseeable indirect changes to the surrounding environment. Because of CARB's role as a CEQA responsible agency (see section D below), CARB needs detailed information from project applicants about the project's components in order to properly evaluate each grant application under CEQA. In order to minimize or avoid adverse environmental impacts, CARB will only accept applications for proposed projects to be sited where similar infrastructure already exists (e.g., installing electric vehicle supply equipment where electrical infrastructure already exists, or installing a hydrogen refueling station at an existing fueling station or industrial facility).

Applicants must provide documentation from the lead agency showing the CEQA process has been completed. If no CEQA review is required by a local lead agency, provide documentation from the local lead agency explaining why not.

The Applicant must provide the following information as it pertains to the proposed project:

A. **Proposed Station Location:** The Applicant must provide the specific address or equivalent location information for the proposed station, equipment, fill system(s), and/or dispensing unit(s).

B. Permits: The Applicant must identify the permits necessary for the project with the proposal narrative.

C. Project Impacts: The Applicant must describe the direct physical changes and reasonably foreseeable indirect changes to the surrounding environment that may result from the project. Please see Section 3 of Attachment 9 to Appendix A.

D. CEQA Lead Agency: The lead agency is the public agency that has the greatest responsibility for carrying out or approving a project and for preparing environmental review documents under CEQA. Where the award recipient is a public agency, the lead agency is typically the grantee. Where the award recipient is a private entity, the lead agency is the public agency that has the greatest responsibility for approving the project as a whole. When awarding grants, CARB is typically a Responsible Agency under CEQA, which means that it must make a CEQA finding based on review of the funded activities and any environmental documents created by the lead agency. The lead agency will be identified using the following process.

1. Where the proposed project would require a discretionary approval from another permitting agency, the Applicant must identify the CEQA lead agency in the application and include documentation demonstrating that contact has been made with the lead agency with jurisdiction over the project for purposes of complying with CEQA. The documentation may be in the form of a letter from the lead agency that is stamped as received by the local agency.

2. If CARB is the only agency with discretionary approval over the proposed project, then CARB will act as the lead agency and will work with the Applicant to satisfy CEQA requirements.

3. Regardless of which agency is the lead agency for a proposed project, the Applicant shall be responsible for all costs associated with preparation of environmental review documents. The Applicant may also be required to retain a consultant to perform environmental studies as appropriate. CARB ***WILL NOT*** reimburse any Applicant for these costs. The Applicant shall also be responsible for all costs associated with defending any legal challenge against the grant agreement or the environmental review documents prepared in support of entering into the grant agreement.

E. **CEQA Compliance Where the Proposed Project Would require a Discretionary Approval From Another Permitting Agency (i.e., another permitting agency serves as the Lead Agency):**

1. **Exempt Projects:** If the lead agency determines that the proposed project is exempt from CEQA or not a "project" for purposes of CEQA, the Applicant must submit proof of such a determination as well as a legally adequate, properly filed Notice of Exemption or proof that more than 180 days have elapsed since the agency's decision to carry out or approve the project to CARB prior to grant execution. Additionally, the Applicant must provide detailed information on why the project meets the applicable statutory or categorical exemption and why no exceptions to the categorical exemptions apply (see CEQA guidelines section 15300.2). The Applicant shall provide facts that support the lead agency's conclusion. For example, for a Class One Categorical Exemption (California Code of Regulations (CCR), Title 14 § 15301), the Applicant should provide documentation showing that the project is located at an existing facility that involves negligible or no expansion of an existing use.
    i. Ministerial or "Common Sense" Exemptions: If the lead agency exempts a proposed project under the "ministerial" or "common sense" exemptions (CCR, Title 14, § 15268 and § 15061, subd. (b)(3), respectively), the Applicant shall provide details on whether the project meets some other statutory or categorical exemption. For example, the Applicant should not simply state that a 100% renewable hydrogen project is exempt under the common sense exemption.

2. **Non-Exempt Projects**: For non-CEQA exempt projects, the Applicant must submit proof that all CEQA requirements have been satisfied, along with the appropriate CEQA documentation and lead agency approval documentation. The Applicant must provide CARB with a copy of the appropriate CEQA approval notice(s) to demonstrate that the project was properly approved under CEQA and that any statute of limitations for challenging the project approval and CEQA determination has run. If CARB would serve as the lead agency, the Applicant must satisfy the requirements in section (F) below.

3. If an Applicant fails to timely submit the required CEQA documentation as described above, CARB in its sole discretion may cancel the proposed grant and make a selection to the next-highest scoring project, and so on, until an agreement is reached, or exercise its right, in its sole discretion, throughout this process, not award a grant. CARB reserves the right, in its sole discretion, to cancel this solicitation, re-solicit for a Grantee, or to direct funding to another project in the Funding Plan.

4. In accordance with CEQA requirements, CARB will review each project application and consider the facts and circumstances of each project application (including the project's reasonably foreseeable direct and indirect impacts) before determining whether the lead agency's CEQA review findings and documentation are adequate.

F. **CEQA Compliance Where the Proposed Project Would Not Require a Discretionary Approval From Another Permitting Agency:** If CARB is the only agency with discretionary approval over the proposed project, then CARB will act as the lead agency

and will work with the Applicant to satisfy CEQA requirements. The applicant must provide CARB with detailed information regarding the project description why the project would qualify for any CEQA exemptions, and why no exceptions would apply pursuant to CEQA Guidelines section 15300.2. In accordance with CEQA requirements, CARB will review each project application, and consider the facts and circumstances of each project application (including the project's reasonably foreseeable direct and indirect impacts) before determining the level of required environmental review. As noted above, the Applicant shall be responsible for all costs associated with preparation of environmental review documents. The Applicant may also be required to retain a consultant to perform environmental studies as appropriate. CARB will not reimburse any Applicant for these costs.

G. **Other Relevant CEQA Information:** The Applicant shall submit any other relevant CEQA documentation or information that will assist CARB in confirming CEQA compliance.

Within a proposal, the applicant is encouraged to fully document efforts completed or underway to achieve CEQA compliance. This includes, but is not limited to, CEQA compliance documentation, completed or schedule pre-application meetings with the local CEQA lead agency, or documentation of contact with CEQA lead agency.

NOTE REGARDING ENCUMBRANCE DEADLINES AND DISCLAIMER: The funds under this solicitation have strict encumbrance deadlines. The lead agency (which may be CARB if no other local discretionary approval is required) must complete environmental review under CEQA and approve each grant prior to the applicable encumbrance deadline. Thus, if a project cannot complete CEQA review in time to meet the applicable encumbrance deadline, **CARB reserves the right to cancel the proposed grant and recommend funding the next highest scoring project that can meet the encumbrance deadline,** regardless of the Applicant's diligence in submitting CEQA information and materials. Further, CARB is not liable for any costs incurred during environmental review or as a result of cancelling the proposed grant.

II. PERMITTING

The Applicant must include information in their narrative that describes their plans to obtain permits for each proposed infrastructure installation. The Governor's Office of Business and Economic Development is available to provide permitting assistance. Contact information is available below:

Mr. Tyson Eckerle
Zero-Emission Vehicle Infrastructure Project Manager
Office of Business and Economic Development
1400 Tenth Street, 2nd Floor
Sacramento, CA 95814
Phone: 916-322-0563
Fax: 916-322-0693
Email: tyson.eckerle@gov.ca.gov

III. PHOTOGRAPHIC EVIDENCE OF THE STATION LAYOUT

The Application must provide photographic images with both date and time stamps of all intended locations. The images must show the station ingress and egress.

IV EXAMPLE NOTICE OF EXEMPTION

Notice of Exemption

To: Office of Planning and Research
P.O. Box 3044, Room 113
Sacramento, CA 95812-3044

From: Grantee
101 Main Street
Ventura, CA 93003

Project Title: Zero Emission Transit Project

Project Applicant: Company Zero

Project Location - Specific:
742 Evergreen Terrace, Ventura, CA 93003

Project Location - City: Ventura Project Location - County: Ventura

Description of Nature, Purpose and Beneficiaries of Project:
Company Zero will design, develop, and operate an all-electric, zero-emission, public transit buses in the city of Ventura. Project will install ten Level II EVSE in the adjacent parking lot of the existing site to support charging of the buses. The project will reduce production costs and accelerate the deployment of zero-emission, public transit buses throughout the State. The project will also leverage public funds with private capital to provide high paying jobs that will contribute to the local economy.

Name of Public Agency Approving Project: City/County/Air Districts, etc.

Name of Person or Agency Carrying Out Project: City and County of Sacramento

Exempt Status: **(check one):**

☐ Ministerial (Sec. 21080(b)(1); 15268);
☐ Declared Emergency (Sec. 21080(b)(3); 15269(a));
☐ Emergency Project (Sec. 21080(b)(4); 15269(b)(c));
☐ Categorical Exemption. State type and section number: 14 C.C.R. sects. 15301, 15303, 15304
☐ Statutory Exemptions. State code number: ___

Reasons why project is exempt:

The project consists of minor alteration of existing facilities and mechanical equipment involving negligible or no expansion of the facility beyond that existing. Interior modification work includes installation of

manufacturing equipment inside the existing building. Work on the fast charging system includes installation of conduit, wiring, electrical connections and mounting equipment. Minor trenching is required to bring power to the charging system. The project will not impact surrounding residential areas, traffic or right of way, or noise impacts because the project is located in an industrial area zoned for industrial use. The reconstruction and conversion of small structures for this project will not impact the scenic resources because the project is industrially zoned.

Lead or Responsible Agency

Contact Person: _____ Area Code/Telephone/Extension:

_____

If filed by applicant:

1. Attach certified document of exemption finding.
2. Has a Notice of Exemption been filed by the public agency approving the project? ☐ Yes ☐ No

Signature: _____ Date: _____ Title:

_____

☒ Signed by Responsible Agency

☐ Signed by Lead Agency Date received for filing at OPR:

_____

☐ Signed by Applicant

APPENDIX F

DATA COLLECTION REQUIREMENTS

Zero- and Near-Zero Emission Freight Facilities Project

Mobile Source Control Division
California Air Resources Board
March 21, 2018

CALIFORNIA
AIR RESOURCES BOARD

DATA COLLECTION REQUIREMENTS

Table F-1 and F-2 below list the minimum requirements for data collection elements to be collected as part of a project requesting funding under this solicitation. Additional data collection elements may be collected beyond what is presented below.

Table F-1. Minimum Data Items

Vehicles and Equipment
Vehicle Specification
Vehicle specification (e.g., manufacturer, model, model year, gross vehicle weight, fuel capacity etc.) Full propulsion system specification, including legible engine label photos
Vehicle Operation
Description of daily use of vehicles; duty cycle Vehicle usage, e.g., hours of operation per day, days of operation per year, odometer reading, GPS data (must be able to distinguish between key off and key on but not moving) Origin and destination Miles traveled per trip Average speed Number of stops per mile (applicable to buses) Duration per trip (applicable to buses) Idling/queuing time (helpful in determining efficiency of use) (applicable to trucks) Weight of load Battery degradation (battery charge capacity/power output over the length of the project), if applicable
Vehicle / Equipment Performance
Miles between roadcalls, if applicable Number of road calls (including propulsion-related, energy storage system-related) Battery degradation (battery charge capacity/power output over the length of the project) Vehicle availability Vehicle zero emission range
Fuel / Energy Consumption
Amount of fuel/electricity; odometer reading; date; fuel price per unit when a vehicle is fueled (include electricity rates as applicable) State of charge (SOC), if applicable Refueling time/charging time Distance traveled to refuel/charge if fueled off−site Refueling/charging source (e.g., on-site energy storage, grid, delivery, etc.) Off-peak and/or renewable energy load shifting potential (e.g., battery recharging optimization with smart meter) Refueling/charge frequency Fuel efficiency, energy consumption rate per distance driven Fuel/energy consumption while idling (if applicable)

All-electric range and average electric usage in hybrids as a function of trip duration and work output, if applicable
Maintenance
Type of maintenance: scheduled, unscheduled, configuration change Repairs: date, description of problem, description of repair performed, parts replaced, costs of parts replaced, costs of labor, odometer reading Time out of service with an explanation of reason for any extended delay
Service Calls
Date of service call, length of repair, description of problem, description of repair performed, parts replaced, odometer reading Time out of service Service response time to new trouble call
Safety
Description of any accidents or incidents, including collisions, maintenance and fueling incidents
Emissions Testing
Tailpipe emissions test for vehicles/equipment that are not 100% zero emission, and their respective baseline vehicles/equipment using PEMS technology.
Fueling / Charging Infrastructure and Maintenance Infrastructure
Infrastructure facility description, including station throughput/capacity, for both fueling/charging station and maintenance bay Infrastructure reliability
Capital Costs
Capital costs for advanced technology vehicles and baseline vehicles, or cost of vehicle upgrade Infrastructure/facility capital costs, or cost of facility modification/upgrade, for both fueling/charging station and maintenance bay
Operating and Maintenance Costs
Detailed operating costs for both baseline and advanced technology vehicles Detailed maintenance costs for both baseline and advanced technology vehicles, including parts and labor (total labor cost and mechanic labor cost in $/hour) Fueling/charging infrastructure and maintenance bay O&M costs (e.g., type of maintenance, costs for parts and labors, problems) O&M costs for facility safety systems related to hydrogen and fuel cells (e.g., type of maintenance, costs for parts and labors, problems), if applicable
Cooperative Intelligent Transportation Systems (C-ITS)
Describe any applications of C-ITS. Identify the vehicles that make up the network, including their drive cycles and the resulting benefits (e.g., work cycle efficiency productivity optimization, safety (collision/accident avoidance), cost reductions, emission reductions, etc.). Log the opportunities encountered to use the C-ITS technology.
User / Fleet Experience Survey
User/fleet experience of the advanced technology vehicles/equipment, e.g., vehicle availability, power, capacity to meet fleet operation demand, O&M challenges, service parts availability, perceived safety, refueling experience and any barriers

Describe the workforce training programs, if any, related to the use and maintenance of the advanced technology vehicles. Evaluate the effectiveness of such programs and the costs associated with them. Describe warranty claims and insurance policies, as well as the experience of working with vehicle/equipment manufacturers in the instance of an accident or a major period of unexpected down time (as applicable). The vehicle or equipment manufacturer response/service for warranty claims and/or trouble shooting

Table F-2 Minimum Data Items of Facility Improvements

Facility Improvements
Data collection elements for freight facility improvements should focus on either reduced electrical demand due to the use of more efficient technologies or shifts in processes or strategies toward zero-emission.

APPLICATION
for the

Zero-Emission Freight "Shore-to-Store" Project

to the
LOW CARBON TRANSPORTATION AND FUELS INVESTMENTS
AND
TRADE CORRIDOR ENHANCEMENT ACCOUNT

Fiscal Year 2017-2018
Zero- and Near Zero-Emission Freight Facilities Project

CALIFORNIA CLIMATE INVESTMENTS
Cap and Trade Dollars at Work

CALIFORNIA AIR RESOURCES BOARD

July 2018

Presented by

THE PORT OF LOS ANGELES

Partnered with

KENWORTH
A PACCAR COMPANY

TOYOTA

The Port OF Hueneme
Oxnard Harbor District

TABLE OF CONTENTS

APPLICATION I

ATTACHMENT 1: PROJECT EXECUTIVE SUMMARY & PROJECT SUMMARY FOR PUBLIC POSTING II

Project Objectives ..... *ii*
Project Benefits, Outcomes and Cost Effectiveness ..... *ii*
Project Summary for Public Posting ..... *iii*

ATTACHMENT 2: PROJECT NARRATIVE AND WORK PLAN 1

PROJECT NARRATIVE 1

1. *Applicant Qualifications* *2*
2. *Project Team Capabilities and Degree of Industry Collaboration* *2*
   Technical Qualifications, Capabilities and Industry Collaboration 3
   Applicant/Grantee, Grant Management and Administration Qualifications 4
   Technology Manufacturer Qualifications 4
   Data Collection and Analysis Qualifications 7
   Coalition For A Safe Environment 8
3. *Project Objectives and Work Plan* *9*
   Project Objectives 9
   A Note about the Work Plan 14
4. *Budget, Match Funding, and Financial Capabilities* *14*
5. *Potential Emission Reduction Benefits* *15*
6. *Cost-Effectiveness* *16*
7. *Benefits to Disadvantaged Communities* *16*
8. *Technology and Innovation* *17*
   a) Commercially available subsystems 18
   b) Fueling profile 18
   c) Station Availability and Reliability 19
   Emissions Testing 19
9. *Potential for Market Penetration and Commercialization of the Technology* *19*
   Target Markets for Zero-Emission Class 8 Trucks and Freight Facility Equipment 19
   Vehicle, Equipment and Facility Growth Projections 19
   Barriers to Entry for Zero-Emission Hydrogen Fuel Cell Vehicles and Equipment 19
   Commercialization Plans 20
   CARB Certification Plan 22
   Economic Impacts for Operators of Advanced Technologies from this Project 22
   Safety Measures 23
   Training Requirements 23
10. *Potential of Project to Act as a Showcase of Technology* *23*
11. *Application Completeness* *25*
12. *Timeline for Project Completion (Project Schedule)* *25*

WORK PLAN 26

ATTACHMENT 3: EMISSION REDUCTION AND COST-EFFECTIVENESS CALCULATIONS 34

Description of Baseline Class 8 Truck: 35
Description of Zero-Emission HFCT: 35
Calculations for the HFCT: 35
Description of Baseline Diesel Yard Tractor: 37
Description of Zero-Emission Yard Tractor: 38

Calculations for the ZE Yard Tractor: 38
Description of Baseline Forklift: 41
Description of Zero-Emission Forklift: 41
Calculations for the Forklift: 41

ATTACHMENT 4: PROPOSED BUDGET, PROJECT MILESTONE, AND DISBURSEMENT SCHEDULE 45

Proposed Budget 45
Project Milestone and Disbursement Schedule 48

ATTACHMENT 5: DISADVANTAGED COMMUNITIES ELIGIBILITY DETERMINATION 51

Project Locations within Disadvantaged Communities 51
Project Benefits to Disadvantaged Communities 58

ATTACHMENT 6: PROCEDURES FOR HANDLING CONFIDENTIAL INFORMATION 60

ATTACHMENT 7: LETTERS OF COMMITMENT 61

ATTACHMENT 8: CALIFORNIA ENVIRONMENTAL QUALITY ACT WORKSHEET 62

ATTACHMENT 9: CONFLICT OF INTEREST DECLARATION 85

ATTACHMENT 10: STD. 204 PAYEE DATA RECORD 86

ATTACHMENT 11: APPLICANT QUALIFICATIONS 88

1. *Harbor Department Qualifications Narrative:* 88
2. *Data Collection and Analysis Qualifications Narrative (NREL):* 90
3. *Staff Contact Information* 92
4. *Subcontractor and Partner Contact Information* 93

Resumes for the key team members included above can be found in Appendix A. 97

APPENDIX A - RESUMES 98

APPENDIX B: POLA BOARD REPORT AND EVIDENCE OF APPROVED GRANT MATCH SUPPORT 99

APPENDIX C – HYDROGEN STATION REQUIREMENTS AND SPECIFICATIONS 105

APPENDIX D – PORT OF HUENEME BACKGROUND SUPPLEMENT 114

APPENDIX E – ADDITIONAL BACKGROUND ON SAFETY MEASURES 120

APPENDIX F – GRAPHICS SUPPLEMENT 123

APPLICATION

STATE OF CALIFORNIA
California Environmental Protection
Agency AIR RESOURCES BOARD
MSCD/ISB/AQIP_97 (Rev. 08/13)

ZERO AND NEAR ZERO EMISSION FREIGHT FACILITIES PROJECT APPLICATION

Please print clearly or type all information on this application

1. AQIP Project: **Zero-Emission Freight "Shore-to-Store" Project**		
2. Company Name/Air District/Organization Name/Individual Name: **Los Angeles Harbor Department**		
3. Business Type: **Government Agency**		
4. Contact Name and Title: **Christopher Cannon, Chief Sustainability Officer**		
5. Person with Contract Signing Authority (if different from above)/Air Pollution Control Officer (APCO): **Eugene S. Seroka**		
6. Mailing Address and Contact Information: Street: **425 S. Palos Verdes St.**		
City: **San Pedro**	State: **CA**	Zip Code: **90731**
Phone: **(310) 732-3763**	Fax: **(310) 547-4643**	
Email: **CCannon@portla.org**		
√ **I have read and understood the terms and conditions of the Sample Grant Agreement.**		

I hereby certify under penalty of perjury that all information provided in this application and any attachments are true and correct.

Printed Name of Responsible Party or APCO: **Eugene S. Seroka**	Title: **Executive Director**
Signature of Responsible Party or APCO: Michael DeBaca	Date: July 18, 2018

Third Party Certification (if applicable)
I have completed the application, in whole or in part, on behalf of the applicant.

Printed Name of Third Party: NA	Title: NA
Signature of Third Party:	Date:
Amount Being Paid for Application Completion in Whole or Part:	Source of Funding to Third Party:

ATTACHMENT 1: PROJECT EXECUTIVE SUMMARY & PROJECT SUMMARY FOR PUBLIC POSTING

In support of the California Air Resources Board's vision of transformative emissions reduction, the City of Los Angeles Harbor Department (Harbor Department, Port) proposes to establish a new forward-looking zero-emissions (ZE) framework for future goods movement throughout Southern California and beyond. The team is committed to developing this "Shore to Store" (S2S) concept in several phases, and it would ultimately encompass initiatives in Southern California, the Central Coast Area, and Merced County. The initial phase of this proposed project contains three key elements. First, ten hydrogen (H2) fuel cell electric powered ZE Class 8 on-road trucks would be developed through a collaboration between Kenworth Truck Company and Toyota Motor North America to move cargo from the L.A. basin ports and on to inland locations such as Riverside County, the Port of Hueneme, and eventually Merced in subsequent phases. Kenworth and Toyota will employ a proven tollgate product development methodology to complete this project, meet team and company goals, and comply with federal and state regulations. The second key element of this proposed project is foundational infrastructure that would be developed by Equilon Enterprises LLC (d/b/a Shell Oil Products US) (Shell) to support the operation of the fuel cell electric trucks (FCET). Shell proposes to establish two new large capacity hydrogen fueling stations in Wilmington and Ontario, California as part of this project. These two stations, in conjunction with three additional heavy-duty stations at area Toyota facilities will establish a 5-station strategically-developed, -situated, and -integrated hydrogen fueling network, that will enable zero-emission freight transport to flow through the ports and across the greater Los Angeles basin. The on-road trucks would be operated by United Parcel Services, Toyota Logistic Services Total Transportation Services Inc., and Southern Counties Express. The third key element of this proposed project involves expansion and development of ZE off-road equipment, including the first two electric yard tractors to be operated at the Port of Hueneme, and the expanded use of ZE forklifts at Toyota's Port warehouse.

These proposed project elements complement the extensive ZE and near zero-emission (NZE) equipment that is already under development for testing at Los Angeles terminals through partnership with the California Energy Commission. These investments, viewed together, showcase a clear and concise at-scale snapshot of the ZE supply chain of the future, and will provide a model by which freight facilities can structure their operations to support ZE/NZE emissions operations. Review and input on project implementation will be provided by the National Renewable Energy Laboratory and the South Coast Air Quality Management District. The Coalition for A Safe Environment, an important community activist group in the Port area, will attend project meetings to monitor potential community benefits, and overall provide input on strategy and project management. The total project cost for this initial phase is $82,568,872, with project partners providing 50.2%, or $41,446,612 in match funding ($14,317,281 cash and $27,129,331 in-kind).

Project Objectives

- Realize a bold and transformative ship/shore-to-store ZE transport vision to serve as a future template;
- Design, develop, build, operate and support FCETs for demonstration at port facilities and warehouses;
- Design, develop, build, operate and support a heavy-duty hydrogen station network and associated market-enabling fueling protocols and standards demonstration;
- Purchase and demonstrate the first ZE battery-electric yard tractors at Port of Hueneme (POH);
- Collect and evaluate demonstration data, including performance metrics and costs.

Project Benefits, Outcomes and Cost Effectiveness

Successful implementation of this project will demonstrate the technical feasibility of Class 8 FCETs in rigorous goods movement operation and expand the usage of ZE equipment at warehouse facilities. The initial phase of this project will result in direct localized emission reductions in designated disadvantaged communities, initiate a leap to ZE technology for a new class of on-road goods movement vehicles, expand the use of ZE technology in off-road warehouse equipment, and provide multiple sources of hydrogen throughout the region. Estimated emission reductions include 465 metric tonnes of CO2e and 0.72 weighted tons of NOx, ROG and PM10.

Project Summary for Public Posting

The City of Los Angeles Harbor Department (Harbor Department, POLA), Equilon Enterprises LLC (d/b/a Shell Oil Products US) (Shell), Toyota Motor North America (Toyota) and Kenworth Truck Company (Kenworth) are partnering with the Port of Hueneme (POH), United Parcel Services (UPS), Total Transportation Services Inc. (TTSI), Southern Counties Express (SCE), Toyota Logistics Services (TLS), Air Liquide, National Renewable Energy Laboratory, Coalition For A Safe Environment, and the South Coast Air Quality Management District (SCAQMD) to implement the first phase of a long-term industry collaboration to scale a zero emission (ZE) freight market in southern California. This initial phase focuses on the introduction of hydrogen fuel into the southern California market by demonstrating near-commercial heavy-duty H2 fuel cell electric trucks (FCETs) at and between freight facilities throughout the region, while continuing to lay the groundwork for battery electric operations. The proposed "Shore-to-Store Project" (S2S) builds on project team experience to help realize our vision of ZE freight operations in the future. In support of this visionary project, the Harbor Department and its team are requesting $41,122,260 in grant funding. The total project cost for this initial phase is $82,568,872, with partners providing 50.2%, or $41,446,612 in match funding.

Ten Kenworth ZE Class 8 FCETs, integrated with Toyota's fuel cell drive technology, will be operated by UPS, TTSI, SCE, and TLS in revenue service. The demonstration fleet will be fueled at the proposed hydrogen fueling stations that will be built in Ontario, CA and Wilmington, CA, as well as at a station at the Port of Long Beach that is supported by the California Energy Commission (CEC) and SCAQMD. This fleet will transport cargo between POLA terminals, the Inland Empire warehouses, and POH. Also, POH will demonstrate two electric yard tractors, and TLS will demonstrate two zero-emission forklifts at their facility showcasing elements of the entire supply chain operating on ZE. These TLS and POH projects complement the extensive ZE and near zero-emission (NZE) equipment that will be operated by Everport Terminal Services under two recent CEC grants. When taken together as the first phase of an ongoing collaborative project, this project will showcase a clear snapshot of the zero-emissions supply chain of the future, and will provide a model by which freight facilities can support ZE and NZE operations.
The S2S project will:

- Demonstrate the technical feasibility of zero-emission hydrogen fueled Class 8 heavy-duty trucks and electric cargo handling equipment in rigorous goods movement operation throughout the southern California region.
- Create direct localized emission reductions in designated disadvantaged communities, including those in zip codes 90220, 90247, 90248, 90731, 90744, 90802, 91761.
- Achieve actual[1] emission reductions (tons) for the proposed project are estimated to be: 0.39 NOx, 0.04 ROG, 0.015 PM10 and 465 metric tonnes per year of CO2e (between 50% and 81% GHG reduction, depending on type).

[1] This estimate follows ARB guidance but only includes operation during the proposed demonstration (i.e., does not extrapolate beyond the project term, which is 6 months per on-road truck and 12-months per off-road equipment.

ATTACHMENT 2: PROJECT NARRATIVE AND WORK PLAN

PROJECT NARRATIVE

In support of the California Air Resources Board's (CARB's) vision of transformative emissions reduction, the City of Los Angeles Harbor Department (Harbor Department) proposes to partner with a team of very important industry leaders to establish a new forward-looking framework for future movement of goods throughout Southern California and other parts of the State. The team is dedicated to developing this concept in several phases, and to ultimately encompass activity in Southern California, the California Central Coast Area, and Merced County in the California Central Valley.

The City of Los Angeles Harbor Department (Port, Harbor Department, POLA) requests $41,122,260 from the CARB's Zero- and Near-Zero Emission Freight Facilities (ZANZEFF) Project funding, to conduct the **Zero Emission Freight "Shore-to-Store" Project** (S2S), which is summarized in the table and graphic below. Industry and End User partners are all contributing to the success of this project either financially or by providing in-kind assistance.

Project Title:	Zero-Emission Freight "Shore-to-Store" Project
Total Project Budget:	$82,568,872
Funding Amount Requested:	$ 41,122,260
Match Funding Total:	$ 41,446,612 (50.2 %)
Match Funding Breakout:	Cash: $ 14,317,281 In-Kind: $27,129,331
Applicant:	Port of Los Angeles, Public Entity
OEM and Infrastructure Industry Partners (Technology Development Team):	Equilon Enterprises LLC (d/b/a Shell Oil Products US) (Shell) Toyota Motor North America (Toyota) Kenworth Truck Company (Kenworth)
End Users (Demonstration Partners):	Toyota Logistics Services, United Parcel Service, Total Transportation Services, Inc., Southern Counties Express, Port of Hueneme, Air Liquide
Independent Third-Party Data Collection and Analysis Provider	National Renewable Energy Laboratory
Technical Advisor and Agency Funding Partner	South Coast Air Quality Management District (SCAQMD)
Community Advisor	Coalition For A Safe Environment
Disadvantaged Community Zip Codes	90220, 90247, 90248, 90731, 90744, 90802, 91761
Equipment funded with a public incentive program and state its incentive program status (Shell/POLB H2 Station)	The hydrogen refueling station at the Port of Long beach has been awarded $8 million from CEC's Alternative and Renewable Fuel and Vehicle Technology Program (ARFVTP) and $1.2 million from SCAQMD's Clean Fuels Program.[2]
Equipment funded with a public incentive program and state its incentive program status (POLA/Everport ZE and NZE demonstrations)	CEC Agreement ARV- 15-069 for 25 ZE and NZE yard tractors, and CEC Agreement ARV-16-025 for ZE yard tractors and top handlers and advanced smart charging, in the amount of $7,237,000 and $6,762,331, respectively.

[2] Appendix B provides evidence of funding approval for these projects.

1. Applicant Qualifications

The Port of Los Angeles is the nation's number one container port and a global model for sustainability and social responsibility. The Port brings extensive experience developing, implementing, and administering both large-scale air quality incentive projects and programs and technology demonstrations through its landmark Clean Air Action Plan (CAAP) and through other initiatives that support CAAP objectives. The CAAP, a joint effort with the Port of Long Beach, is a comprehensive program to reduce port-related emissions to make the region a cleaner, healthier place to live and work. In 2016, the California Air Resources Board (CARB) awarded the Port $15 million from its Air Quality Improvement Program (AQIP) for the Port's Green Omni Terminal Demonstration project. This AQIP experience ensures that the Port is fully aware of the detailed and active project management that is required for successful implementation of large demonstration projects and already has the tools in place to implement the proposed S2S Project, if grant funding is awarded. The proposed project has the full commitment of the Port's Executive Director and the Director of Environmental Management, ensuring that resources will be available throughout implementation of the project at the levels necessary for success. Through the project team's existing relationships and extensive coordination with OEM technology providers and vehicle/equipment manufacturers, freight fleet operators, as well as other project stakeholders, the project team has met the match funding requirements for this project. In addition, a number of projects are summarized below that further support the Port's robust grant implementation experience.

Experience with Large-Scale Air Quality Incentive/Technology Demonstration Projects

Green OMNI Terminal Demonstration Project – In 2016, Pasha and the Port of Los Angeles began the Green Omni Terminal Demonstration Project. The project involves testing clean cargo handling equipment and infrastructure at the Pasha terminal to create a working laboratory for advancing zero and near-zero emission technologies at the Port. Additionally, Pasha is working to install a solar-powered microgrid with a 1.03 megawatt photovoltaic rooftop array, a 2.6 megawatt-hour battery storage system, charging equipment that can both receive and supply power and an energy management control system. This project received a $14,510,400 grant from the California Air Resources Board. To date, 66% of the funds have been received.

Advanced Yard Tractor Deployment/Eco-FRATIS Drayage Project – This project includes testing of a new fleet of 25 zero and near-zero emission yard tractors at the Everport marine container terminal in the Port of Los Angeles. Additionally, a companion project will equip 100 more drayage trucks with smart technology aimed at reducing emissions by streamlining their time on the road and improving the flow of containers to and from the port complex. This project received a $5,833,000 grant from the California Energy Commission's (CEC) Alternative and Renewable Fuel and Vehicle Technology Program (ARFVTP). Subrecipient agreements are fully executed and the electric and renewable LNG yard tractors are under development. This project initiated POLA's zero-emission pathway vision.

Advanced Cargo Handling Demonstration Project, Everport – This project expands on existing demonstrations of zero-emission goods movement technologies by taking another step toward implementation of a zero emissions pathway for loading and unloading cargo throughout an entire marine container terminal with the demonstration of two zero-emission top handlers and three next generation yard tractors. The top handlers will be charged with standard infrastructure and the yard tractors will be "fueled" by a state of the art Automated SmartCharger System (ASCS), the first of its kind at the Port of Los Angeles. This project was awarded a $4,600,000 grant from the California Energy Commission's ARFVTP, and all subagreements are fully executed. This project is underway, and POLA is close to issuing bids for the infrastructure construction.

2. Project Team Capabilities and Degree of Industry Collaboration

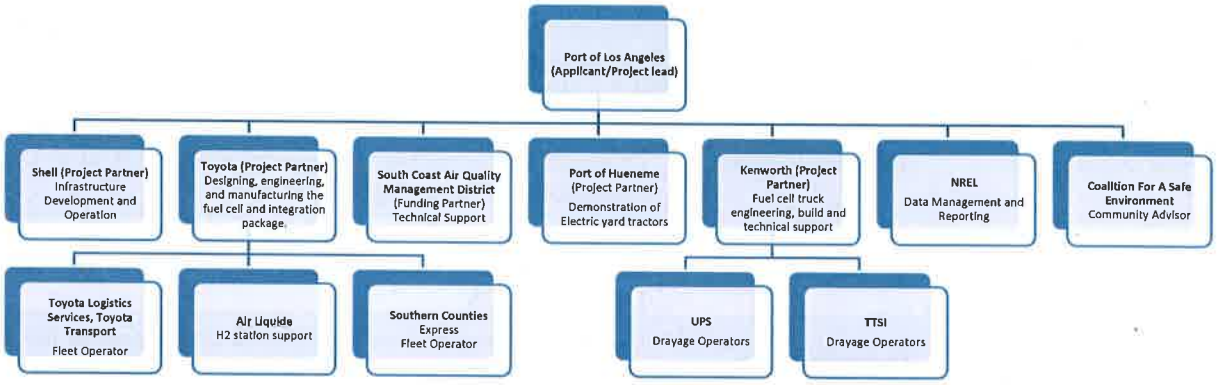
The Harbor Department has carefully assembled an industry-leading team of technology manufacturers (OEMs) and industry partners/end users to provide scalable zero-emission hydrogen fuel cell trucking solutions and enhanced market acceptance for heavy-duty hydrogen fuel cell technology. The Harbor Department's project partners and subcontractors include:

Key Participant	Role	Responsibilities and *Relationship to Harbor Department
Harbor Department	Applicant/Grantee	Grant Administration and Reporting, Project Leadership, Oversight of Technology Demonstration, Oversight of Data Collection and Reporting Subcontractor
Shell	H_2 Station Lead	Design, Build and Operate the high-capacity H_2 station for freight in Ontario, CA, in Wilmington, CA and in the Port of Long Beach, CA
Toyota Motor North America	Technology Manufacturer	Design and integrate Fuel Cell Electric Drive systems for Class 8 trucks, site location for hydrogen stations in POLB and Gardena, and warehouse location of ZE forklifts.
Kenworth Truck Company	Technology Manufacturer	Design and build ten Class 8 FCEV trucks, integration of the Toyota drive system, support interface with Data Collection Team
Port of Hueneme	Demonstration Partners	Electric Yard Tractors for POH
TTSI, SCE, UPS, Toyota Logistics Services, Port of Hueneme	End Users Demonstration Partners[3]	Equipment Operations for Demonstration (14 zero-emission units total, including both fuel cell and battery electric)
Air Liquide	H_2 Station Support	Operations and maintenance support for medium-capacity stations at Toyota Logistics Services in POLB and Toyota Technical Center in Gardena
National Renewable Energy Laboratory	Data Collection and Analysis Provider	Data Collection, Analysis and Reporting – Lead, proposed scope will be covered under direct contract with POLA
South Coast Air Quality Management District	Technical Advisor	Zero-Emission Technology Demonstration and Commercialization Advisor, direct co-funding support
Coalition For A Safe Environment	Community Advisor	Community Advisor– Provide comments and advice from community perspective and assist w/ outreach

Technical Qualifications, Capabilities and Industry Collaboration

Below is a summary of the technical qualifications and capabilities of the project partners as well as the key personnel serving as project leads. Key personnel were selected for this team based on their ability to successfully carry out the project tasks in their areas of expertise. The OEM partner technology manufacturers are critical members of the team, without which the Harbor Department would not be able to conduct the proposed demonstration. The technology manufacturers are established and well-respected manufacturing companies, with incredibly experienced engineering and product development professionals well-matched to this project and the proposed technical approach. The depth of this industry collaboration provides an excellent opportunity to accelerate zero-emission freight technology to widespread commercial use. A project organization chart is provided below:

[3] In support of this project, POLA is working with Everport to demonstrate 30 ZE and NZE cargo handling equipment and advanced smart charging technology; these projects have benefits that are accounted for in other grant allocations (See Appendix B) and are therefore not detailed as part of the scope of this proposed project.



Please refer to Attachment 11, Applicant Qualifications, for additional information regarding projects that demonstrate the Harbor Department's experience is well-matched to implement this proposed project. Resumes for the below individuals have been included with our Application in Appendix A to document our team's depth of experience. Below is a summary of each partner's role in the project and key personnel.

Applicant/Grantee, Grant Management and Administration Qualifications

The **Port of Los Angeles Harbor Department** is the Applicant for the Zero-Emissions Shore-to-Store Project. As discussed above in subsection 1, as well as Attachment 11, Applicant Qualifications, the Port brings extensive experience developing, implementing, and administering both large-scale air quality incentive projects and programs and technology demonstration projects. The Port's extensive technology development and demonstration project experience illustrates that the collaborative efforts between the Harbor Department and equipment owners and technology providers span decades. In addition, these projects demonstrate the Harbor Department's ability to successfully implement cooperative agreements, manage resources, meet reporting requirements, evaluate projects/initiatives, and document progress. The Port's extensive history implementing grant projects from both sides (grantor and grantee) uniquely positions the Harbor Department for this proposed project in that it has both managed and implemented technology development and demonstration programs for zero-emission vehicles and equipment. Consistent with its CAAP strategies, the Port will work with its industry business partners to see these technologies through commercialization and beyond to widespread implementation, as it will benefit all stakeholders and help the Port reach its environmental goals. Resumes are provided in Attachment 11 for the following key personnel, including:

- Christopher Cannon, Director, Environmental Management Division and Chief Sustainability Officer, will have overall responsibility for the success of the demonstration project, and will be supported by the Harbor Department's Environmental Management Division's Grantee Liaison/Technical Project Manager.
- Jacob Goldberg, Environmental Specialist, will serve as Grantee Liaison/Technical Project Manager for this project.
- Tim DeMoss, Marine Environmental Supervisor, will serve as a general advisor to the project, having significant prior experience with grant funded projects.

Technology Manufacturer Qualifications

Through the S2S Project, **Equilon Enterprises LLC (d/b/a Shell Oil Products US) (Shell)** is building on an established collaboration with Toyota Motor North America (Toyota) in which the two industry leaders joined forces in California to increase the number of light-duty hydrogen refueling stations, and heavy-duty hydrogen refueling stations as part of the ongoing H2Freight project. This follow-on project will move the industry forward with two additional high capacity heavy-duty hydrogen-fueling stations and regional zero-emission trucking for the Port of Los Angeles and its project partners. For this project, Shell has already started designing, evaluating and selecting the equipment for installation. Shell has also engaged with the local authorities, leveraging years of experience in building

hydrogen stations. Shell has previous experience in managing a grant from CARB (Grant Hydrogen Highway Station GHHS 006). This grant was successfully implemented on time and within budget. Shell's organization has been involved in the development of hydrogen as a viable fuel for the transportation sector for more than 20 years. In the last decade, Shell has participated in hydrogen fueling station operations, industry and R&D steering committees, infrastructure demonstration projects, technology development, and commercial planning in the United States, Europe, and Asia. Shell personnel have meticulously developed and recorded lessons learned over two decades to preserve institutional knowledge in a handbook and other internal resources. This information has been used to help Shell formulate step-by-step plans for a hydrogen fuel mass market, design hydrogen infrastructure networks, and streamline the build-out of hydrogen fueling stations. Shell is dedicating the requisite personnel to ensure the long-term viability and reliability of public hydrogen stations. Resumes are provided in Attachment 11 for the following key personnel:

- Oliver Bishop, General Manager, Hydrogen, will have overall responsibility for the success of the hydrogen infrastructure deployment.
- Hechem Nadjar, Hydrogen Business Development Manager, will serve as project leader.
- Dr Wayne Leighty, Business Development Manager, is accountable for hydrogen business development in North America, reporting to Oliver Bishop.
- James Martin, Hydrogen Retail Projects Manager, will perform project engineering for development of the Hydrogen Refueling facilities. And develop scope of work, engineering standards, permitting, construction and operation of retail facilities.

Toyota Motor North America (Toyota)

Toyota is one of the world's largest manufacturers of vehicles, including advanced vehicles using hybrid electric and fuel cell electric technology. For the past 16 years in North America, Toyota has worked closely with hydrogen refueling providers both large and small. Its groundbreaking alliances have catalyzed the market for FCEVs in California and the Northeast. In April 2017, Toyota unveiled its plans to develop a heavy-duty prototype built on an existing Class 8 vehicle body. Toyota will be responsible for ensuring the availability of prototype trucks for operation during the project timeframe. S2S is yet another demonstration of Toyota's commitment as a trailblazer for hydrogen and fuel cell technology. The Toyota project team brings strong experience and expertise with hydrogen and fuel cell technology. Their broad experience with business development, engineering, project management, and environmental policy demonstrates industry leadership with fuel cell electric vehicles and the supporting hydrogen infrastructure. This includes direct involvement with both the light-duty Toyota Mirai, and the newly developed heavy-duty Class 8 fuel cell truck application deemed 'Project Portal'. As a strong supporter of hydrogen infrastructure build-out, the core team will bring their knowledge and experience to the project where they look forward to providing a zero-emission solution for freight movement at the ports. The demonstration piece of Toyota's commitment involves Toyota Logistic Services (TLS) who will operate the ZE forklifts. TLS also oversees Toyota Transport, which will operate the fuel cell electric trucks. Key personnel for the S2S project include the following key individuals.

- Andy Lund, Chief Engineer, will oversee the research and development activities of the fuel cell electric truck project.
- Tak Yokoo, Senior Executive Engineer, will be responsible for product development and execution for fuel cell powertrain system development.
- Craig Scott, Senior Manager, is the project lead for business and strategy development with responsibility for successful project execution.
- Ash Corson, Alternative Fuels Vehicle Manager, will support business development through active coordination of project stakeholders.
- James Kast, Fuel Cell Business Analyst, will support the business and strategy group with project development.

Kenworth Truck Company (Kenworth)

Kenworth Truck Company is the manufacturer of The World's Best® heavy and medium duty trucks. With an excellent heritage of quality, innovation and technology, Kenworth has produced over 1.1 million trucks for thousands of customers since the company began in 1923. Over the past 95 years, Kenworth has played an essential role in the development of trucks that are more fuel efficient, productive and economical to operate. Today, Kenworth is developing important advancements in Class 8 truck aerodynamics, engine and powertrain efficiencies under the $8 million SuperTruck II program funded by the Vehicle Technologies Office of the U.S. Department of Energy (DOE). Goals for the program include the demonstration of greater than 100 percent improvement in freight efficiency* over 2009 equivalent product, and a 55 percent engine increase in brake thermal efficiency performance. Kenworth is collaborating with UPS on this major program. The Kenworth T680 HECT (Hybrid Electric Cargo Transport), and T680 is ZECT (Zero Emission Cargo Transport) Class 8 truck projects are funded in part by the Office of Energy Efficiency and Renewable Energy (EERE), the U.S. Department of Energy and the South Coast Air Quality Management District. The T680 HECT tractor incorporates a parallel hybrid electric propulsion system and Cummins Westport ISL G Near Zero emission engine fueled by compressed natural gas, in combination with a generator to extend the truck's battery range. The T680 ZECT tractor uses a hydrogen fuel cell that combines compressed hydrogen gas and air to produce electricity, with only water vapor emitted at the exhaust pipe. This spring, Kenworth announced delivery of the first near-zero emission 12-liter natural gas truck – a Kenworth T680 – to AJR Trucking, a port drayage and mail delivery fleet, in Southern California. The Cummins Westport 12-liter ISX12N engine is the only engine to be certified by the California Air Resources Board as meeting the California Air Resources Board's toughest optional Low NOx standard, which is 90% cleaner than current federal EPA emission standards. The truck was purchased with funds from the Proposition 1B (Prop 1B) incentive pool managed by the South Coast Air Quality Management District (SCAQMD). A total of 20 T680s with this engine are entering the AJR Trucking fleet. Resumes are provided in Attachment 11 for the following key personnel, including:

- Mark Brown, Executive Program Manager - Advanced Technologies, is responsible for the advanced technology programs including the current SuperTruck program with the U.S. Department of Energy.
- John Luoma, Assistant Chief Engineer, is responsible for Kenworth's product development. He is responsible for managing engineering teams that design major product development programs, Electrical/Electronics systems, Chassis systems, and Cab structure.
- Brian Lindgren, Director - Research and Development, is responsible for the R&D team and Kenworth's two R&D facilities.
- Stan Delizo, Research Engineering Manager, is responsible for Anti Idling Systems and Hybrid Vehicles for Kenworth Truck Company.

Port of Hueneme (POH)

The Port of Hueneme is the only deep water port between Los Angeles and the San Francisco Bay. It services many of the cargo needs of the Central Coast and Valley of California and the Southern California markets. Specializing in the fresh produce and automobile niche markets, the Port of Hueneme is integral to the supply chain of exports and imports throughout California. In fiscal year 2017, about 1.49 million tons of cargo moved via these terminals and were produced and consumed by exporters and importers located within the metropolitan region, the State of California, as well as throughout the Southwest and the Western States. This Shore-to-Store Project (S2S) project will fund two significant innovations at the Port of Hueneme: (1) Installation of electrical infrastructure to power a new generation of zero-emission cargo handling equipment, and (2) Acquisition of the Port's first all-electric, zero-emission cargo handling equipment. The electrical infrastructure and zero-emission (ZE) cargo handling equipment will make possible the starting of a new era of zero and near-zero emission cargo movement at the Port. Once installed, this infrastructure will immediately power the Port's first electric, zero-emission yard tractors. In addition to the infrastructure and ZE yard tractors at the Port of Hueneme, one of the new hydrogen fuel-cell, zero-emission trucks included in the S2S Project will be dedicated to bringing the world's first zero-emission avocados to and from the Port of Hueneme and the packing facility in Oxnard. This truck will also carry shipments of avocados grown in the Port of Hueneme region to the Port of Los Angeles for export. These elements combine to support a

groundbreaking pilot program spanning multiple counties, two commercial seaports, two air quality control districts. The S2S Project will demonstrate how new technology can reduce the carbon emissions from cargo movement while improving air quality throughout disadvantage communities, all while leading the way for the future of zero-emission cargo logistics from ship to the consumer's store. Appendix D provides additional background for the Port of Hueneme.

Data Collection and Analysis Qualifications

National Renewable Energy Laboratory (NREL) NREL conducts research and development in all aspects of advanced vehicle technologies for the USDOE and other clients. We have active research in the areas of battery technology, electric motors, power electronics, efficient mobility systems, electric vehicle charging systems, grid integration, fuel cells, hydrogen, hydrogen infrastructure, advanced fuels and combustion research. Our Renewable Fuels and Lubricants Laboratory (ReFUEL) has heavy-duty chassis dynamometer with full emissions characterization that can test up to class 8 vehicles. NREL has successfully worked with project team members on performance evaluations of zero emission yard tractors and drayage trucks using both field evaluation and their heavy-duty truck dynamometer. NREL is currently working with Kenworth on ZECT II project, DOE's Super Truck II, and DOE-funded project to develop a range extended EV medium-duty delivery vehicle. NREL has worked successfully collecting data and evaluating vehicle technologies with the Ports of Long Beach and Los Angeles, and several fleets (TTSI, Cal Cartage, Dependable Highway Express) ZECT I & II. NREL has successfully executed a number of collaborative research project with Toyota North America. NREL has also worked extensively with California State agencies including Californian Air Resources Board, California Energy Commission, SCAQMD, and others. Expanded qualifications are provided in Attachment 11 and resumes are provided in Appendix A for the following key personnel:

- Ken Kelly has over 25 years of experience working on clean transportation research and integrated deployment and currently leads the Commercial Vehicle Technologies team at NREL. Ken will lead the program management and provide technical oversight for the project.
- Jason Lustbader has over 15 years of experience in efficient transportation energy research and development. He has successfully led multiple DOE and industry funded projects. He will provide project management and technical leadership to the data analysis team.
- Andrew Kotz is an expert in data collection, analysis, and analytics. He focuses on analysis of large, real-world vehicle operational datasets using spatial computing and big data techniques. Andrew will support data management, processing, and analysis.
- Leonard Strnad is a data scientist with expertise in mathematics and statistics. Leonard will provide advanced analytical and statistical method expertise which could include advanced clustering methods, deep learning, and geospatial analysis methods.
- Eric Miller has expertise in fleet data analysis and will support the data analysis and analytics tasks.
- Leslie Eudy manages transit bus evaluations and will provide expertise on maintenance data processing and analysis methods. Additional qualifications and resumes are provided in Attachment 11.

Shore-to-Store Operator Fleet Partners (UPS, TTSI, SCE, Toyota Logistics and Port of Hueneme)

The project team has assembled an impressive group of four influential and progressive fleet operators to be a part of the S2S project. United Parcel Services (UPS), Total Transportation Services Inc. (TTSI), Southern Counties Express (SCE), and Toyota Logistics Services (TLS) all bring a wealth of experience and expertise from the freight movement industry and have a strong local presence in the Southern California region. The strong interest from these successful freight movement companies demonstrates that there is not only a market push of ZEV technology from OEM's, but there is also a strong market pull and demand for ZEV solutions in the freight movement industry. Key individuals from each operator are listed below, with the key points of contact identified, should you have any questions:

- UPS – Scott Phillippi and Michael McDonald will oversee UPS's involvement as a featured fleet operator
- TTSI – Vic La Rosa. Phone: (310) 816-0260, email: vicla@tts-i.com

- SCE – Sherry Hertel and Gordon Reimer will oversee SCE's involvement as a featured fleet operator
- Toyota Logistics Services – Lee Hobgood: Lee.Hobgood@toyota.com , (469) 292-1160, and Kirk Welch: Kirk.Welch@toyota.com , (469) 292-1335

Air Liquide

In the US, Air Liquide is embarking on an ambitious plan to construct and operate a large network of public hydrogen fueling stations for light-duty Fuel Cell Electric Vehicles in California and in the Northeast United States. As the U.S. auto market continues to shift to more efficient vehicles and fuels, we believe *(along with most of the major automakers)* that hydrogen offers the best solution for reducing transportation-related emissions while still providing a user-experience the typical American driver expects. As we have entered the hydrogen mobility market in California, Air Liquide has partnered with the state to own and operate five public refueling stations, with open stations in Anaheim, LAX, and Long Beach and new stations under development in Palo Alto and Santa Nella. We have opened new industrial gas manufacturing facilities and distribution fleets in Etiwanda, CA, and in Sacramento, CA to provide dedicated supply of hydrogen to our growing network of mobility customers across the state. Altogether, we have committed more than $50M in investments into the state to date as we anticipate significant new investments in production, distribution, and dispensing in the future. Our objective is to bring cost competitive hydrogen to the market with a low carbon intensity at a scale that supports the ambitious state targets for vehicle introductions. Aaron Harris and David Fernandes will oversee Air Liquide's involvement in this project.

- David Fernandes: davida.fernandes@airliquide.com, (281) 804-8118: Business Development Manager, Hydrogen Energy: Will serve as the prime business contact for the Air Liquide stations.
- Aaron Harris: aaron.harris@airliquide.com , (713) 624-8359: Technical Director, Hydrogen Energy: Will serve as the lead technical contact for the Air Liquide stations.

South Coast Air Quality Management District (SCAQMD)

Matt Miyasato, PhD, Deputy Executive Officer Science and Technology Advancement Office

SCAQMD will be a technical advisor to the project team on development and commercialization of the zero-emission technology. SCAQMD is committed to undertaking all necessary steps to protect public health from air pollution, with sensitivity to the impacts of its actions on the community and businesses. SCAQMD's Science and Technology Advancement Office is supporting this project with a direct cost-share contribution[4] of $1,000,000, without which this project application would not have been possible. Dr. Matt Miyasato will serve as a technical advisor to the project. He has an undergraduate degree in Mechanical Engineering, and a masters and Ph.D. in Engineering, specializing in combustion technologies and air pollution control.

Coalition For A Safe Environment

Jesse Marquez, Founder and Executive Director, Coalition for a Safe Environment (CFASE)

The Coalition For A Safe Environment (CFASE) is a community based non-profit environmental justice, public health and public safety advocacy organization. CFASE is primarily a Latino EJ Organization founded in 2001 by Wilmington resident Jesse N. Marquez. CFASE has been a member of numerous state, regional and local governmental agency committees on ports, freight transportation, goods movement transportation corridors, air quality plans, air pollution monitoring, ship electric shorepower, emissions capture and treatment technologies. CFASE has additionally conducted its own community based scientific research on zero emission and near zero emission technologies status. Jesse will serve on the project team as the community outreach advisor. He has been Executive Director of the CFASE for sixteen years. Please refer to CFASE's Letter of Commitment in Attachment 7.

[4] Subject to final SCAQMD Board approval.

3. Project Objectives and Work Plan

Project Objectives

The Zero-Emission Shore-to-Store Project meets ARB's goals under the ZANZEFF Project Solicitation and the FY 2017-18 funding plan by:

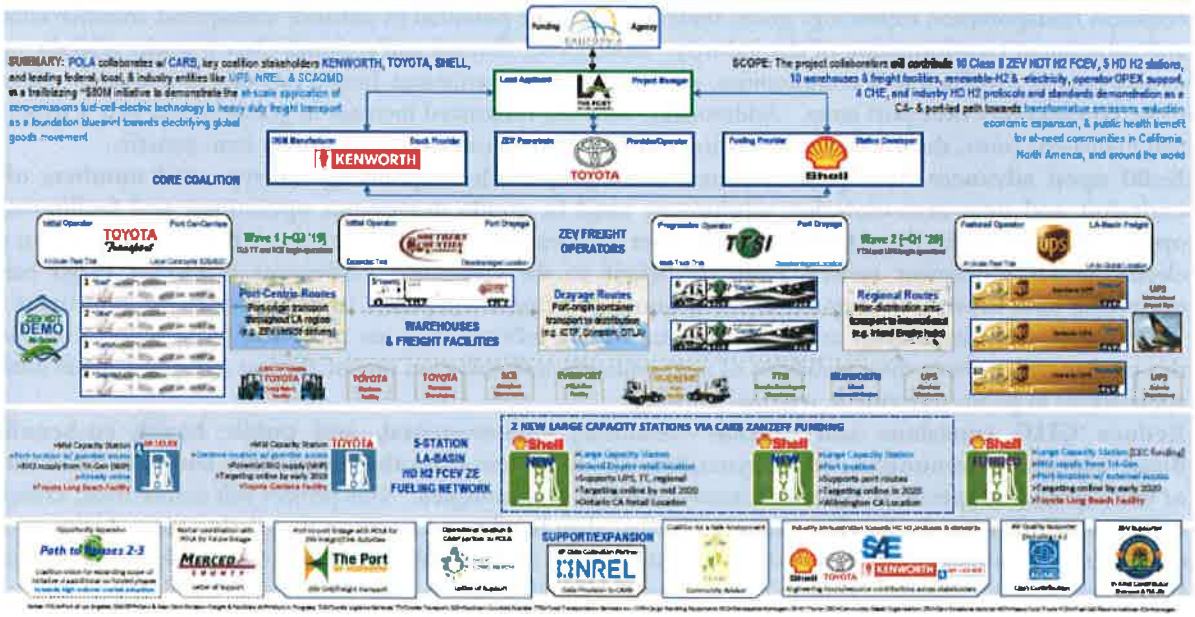
- **Support bold, transformative emission reduction strategies that can be emulated throughout freight facilities statewide.** Through robust testing and careful data logging, this project will demonstrate that zero-emission battery and fuel cell powered CHE and Class 8 trucks, with their increased range and reliability, can be a cost effective and efficient solution for the goods movement industry, thus fast-tracking advanced emissions reduction technologies into the market place. Without this demonstration and testing platform, the industry would not be able to view the potential of battery and fuel cell power in heavy-duty freight operations. This project provides a snapshot of a ZE supply chain in operation, providing a model that can be emulated in operations throughout the state.
- **Potential for widespread commercialization and significant transformation of the industry while holistically achieving greenhouse gas, criteria pollutant, and toxic emission reductions benefitting disadvantaged communities.** This project has the potential to be a cost-effective alternative to meet zero-emission transportation technology goals, thereby having the potential to enhance widespread commercialization, and subsequent transformation of the industry. Since CHE, drayage and regional Class 8 trucks typically operate in and around disadvantaged communities, the benefit of zero-emission freight movement is directly relevant to those communities near port areas. Additionally, with the forecasted increase in goods movement activity in the San Pedro Bay ports, the use of zero-emission CHE and trucks can have even longer term benefits.
- **Build upon advances from prior demonstration projects by expanding the type and numbers of zero emission and near-zero-emission equipment used in goods movement operations and facilitating the opportunity for technology transfer from other applications.** This project closes the remaining gap in an all-electric goods movement system, from the wharf to the consumer. Advances in electric cargo handling equipment have expanded the potential for all goods movement equipment to move toward zero-emissions as the vehicle/equipment technology and zero emission fueling infrastructure are more and more supported. Further, this project will evaluate the capabilities of zero-emission technology in one of the last remaining diesel dominant applications in goods movement: regional trucking.
- **Reduce GHG emissions and provide economic, environmental, and public health co-benefits to disadvantaged communities, while synergistically demonstrating the practicality and economic viability of widespread adoption of advanced zero-emission technologies.** This project will reduce toxic, criteria and GHG emissions from the baseline, and even further than baseline comparison if replacing older, higher polluting equipment. This technology can provide a cost-effective and scalable model for sustainable and zero-emission freight operations at marine terminals and warehouses throughout the state, nation, and world.
- **This project can be implemented, demonstrated and tested by April 15, 2021.** The maturity of this project's technology combined with the proposed work plan and pre-existing relationships of the project team, ensures that the project can be completed by April 15, 2021.

As the largest container port in the western hemisphere, the Port of Los Angeles has established itself as a leader in the goods movement industry. However, facilitating global trade while protecting the environment is a delicate balance at the nation's largest trade gateway. To strike that balance, the Port is leading the way internationally when it comes to reducing air emissions and cultivating the development of new technologies that will help ensure good jobs and a brighter future for millions of people. Achieving this balance requires a far-reaching vision that must include all aspects of the supply chain. To achieve this end, the Port envisions a future wherein large goods movement centers work closely together to ensure that freight transport occurs with minimal impact to the environment. While this certainly includes the equipment used at a given facility, each such center, be they marine or inland ports, warehouses, or distribution centers, has a responsibility to look beyond their direct control to the mechanisms by which freight moves between them.

With the goal of realizing this vision in mind, the Port has joined together with myriad partners, such as other agencies, private industry, and our local communities to construct a multi-phase sequence of projects and investments needed to achieve efficient and clean goods movement throughout the state. Specifically on this phase, the Port, Equilon Enterprises LLC (d/b/a Shell Oil Products US) (Shell), Toyota Motor North America (Toyota) and Kenworth Truck Company (Kenworth) are partnering with, the Port of Hueneme (POH), United Parcel Services (UPS), Total Transportation Services Inc. (TTSI), Southern Counties Express (SCE), Toyota Logistics Services (TLS), Air Liquide, National Renewable Energy Laboratory (NREL), Coalition For A Safe Environment (CFASE), and the South Coast Air Quality Management District (SCAQMD) to implement the first phase of a long-term industry collaboration to transform the freight market in southern California to zero emissions.

This proposal is the first step of a much larger vision that the Port, alongside its project partners, believes is vital to ensuring the transition of the freight industry towards clean technologies and improving the overall efficiency of goods movement to handle the rising demands of the future. The image below details the specifics of the currently proposed project[5]:

Transformational "Shore-to-Store" Zero Emissions CARB ZANZEFF Project Image



The initial phase described in this application focuses on the introduction, demonstration, and support of the at-scale zero emission on-road and off-road equipment together with supporting infrastructure in inland areas near the Port of Los Angeles to and from Southern California's Inland Empire and the Port of Hueneme. Once this foundation is developed, subsequent phases will increase the amount of zero emissions equipment operating in warehouses and between the Port of Los Angeles and Southern California inland areas, as well as expand the zero emissions pathway between the Port of Los Angeles and the Inland Empire, the Port of Hueneme and the California central coast. An especially exciting part of the next phases of this project will be their contribution to an already planned development at the Mid-California International Trade District in Merced County that will include processing activities to help facilitate the movement of cargo to and from the central valley of California by truck and rail. A Memorandum Of Understanding with a facility in Merced has already been signed by the Port of Los Angeles[6]. Merced County, a

[5] Please refer to Appendix F for a larger version of this graphic.
[6] Link to press release documenting MOU approval:
https://www.portoflosangeles.org/newsroom/2017_releases/news_102417_MercedCountyPortOfLaAgreement.pdf

supporter of this S2S project, is particularly interested in seeing expanded efficiencies for movement of cargo in and out of the California Central Valley, which would support development of the Mid-California International Trade District.

The initial phase of this proposed project described in this application contains three key elements.

- First, ten hydrogen fuel cell zero emission Class 8 on-road trucks would be developed through a partnership between Toyota Motor North America (Toyota) and Kenworth Truck Company (Kenworth) to move cargo from the Port of Los Angeles to inland locations such as Riverside County, the Port of Hueneme, and eventually Merced, California. This fleet will transport commercial cargo – such as international drayage loads, regional delivery parcels, and zero-emissions passenger vehicles – in revenue service between POLA terminals, Los Angeles and Inland Empire warehouses, facilities and businesses, and Port of Hueneme. The hydrogen fuel cell design for these trucks offers the advantage of increased range, which is expected to help reduce near-term concerns about range limitations for longer trips between the Port of Los Angeles and Southern California inland areas, and especially to the Port of Hueneme and eventually Merced County. The hydrogen fuel cell trucks can also be refueled in about the same amount of time as a standard diesel truck, thereby limiting recharging down time for operation of these trucks.
- The second key element of this proposed project is foundational infrastructure that would be developed by Equilon Enterprises LLC (d/b/a Shell Oil Products US) (Shell) to support the operation of the zero emission on-road trucks. Shell initially proposes in S2S to establish a strategically-developed, -situated, and -integrated hydrogen fueling network, in key locations in order to enable zero-emissions freight transport flowing through the ports and across the greater Los Angeles basin. Two large Shell stations will be funded in S2S at the retail station of Travel Center of America, in Ontario CA and at the Shell Lubricant Blending Plant, in Wilmington CA. They will be complemented by the future Shell station at the Port of Long Beach that will come as a match share in S2S, and two smaller stations that will not be financed through this solicitation, including one existing Air Liquide station at Toyota Logistics Services in Port of Long Beach and one planned at the Toyota Technical Center in Gardena. In summary, the S2S project proposes the design and construction of two new, high capacity hydrogen stations by Shell at:

  ✓ Travel Center of America retail station of, 4325 E. Guasti Road., Ontario, CA 91761
  ✓ Shell Lubricant Blending Plant, 1926 East Pacific Coast Hwy., Wilmington, CA 90744
  ✓ Shell's future hydrogen refueling station at 785 Edison Ave., Long Beach, CA 90813 (as an in-kind match share)

  And S2S will leverage three medium- and high-capacity stations currently under development by Air Liquide at:

  ✓ Toyota Logistic Services, in Port of Long Beach, CA
  ✓ Toyota Technical Center, in Gardena, CA

  More fueling centers would be established in later phases of this project along the California central coast near Port of Hueneme and in the Merced area. A key feature is that, in addition to hydrogen fueling infrastructure, the centers could be designed to offer natural gas to support operation of near-zero on-road trucks in the next few years, as well as eventually plug-in capability for battery operated trucks operating in the area. ARB's ZANZEFF Solicitation, Appendix C, H2 station requirements are met and addressed in Appendix C.

- The third key element of this proposed project involves development of zero-emission off-road equipment to be operated at inland port warehouses operated by Toyota, and at cargo handling terminals in the Port of Hueneme. It is this team's vision, that warehouses can quickly move to operate with substantially reduced use of the electrical grid, through the installation of solar panels on warehouse roofs, and the use of battery electric or hydrogen fuel cell electric (depending upon the duty cycle) zero emission equipment inside the

facilities themselves. This set-up would also help to support charging and infrastructure for on-road trucks that could operate moving goods to and from the warehouses. The model for this vision is under development at the Port of Los Angeles' Pasha terminal, where zero emission equipment will eventually allow that terminal to operate fully off the grid. That project does include the testing of an on-road zero emission truck as well.

Solar power is not proposed for this initial phase of this S2S project, but as the project expands, it is the hope of the project partners that each of their warehouses will substantially be able to reduce their dependence on the electric grid, if not become capable of achieving full grid independence in emergencies. Since the duty cycle of off-road cargo handling equipment is different than for on-road drayage trucks, two types of off-road equipment could provide a viable ZE solution. At the Toyota warehouse at TLS in the POLB, the current ZE forklifts within the fleet will be expanded by replacing two conventional propane[7] forklifts with two battery electric forklifts. The entire warehouse operation will be powered by 100% renewable electricity provided by the fuel cell Tri-Generation facility onsite. TLS has a goal to convert the entire forklift fleet to ZE technology, and have interest in demonstrating fuel cell forklifts in the future, as it would integrate well with the Toyota on-road FCETs that would move to and from these locations. UPS has a large warehouse operation located at the Ontario airport, and has also expressed interest in demonstrating fuel cell material handling equipment to help achieve their environmental goals. At the Port of Hueneme, battery-electric yard tractors would be owned and operated by POH, with the plan to lease them to Port terminals. The S2S project will provide POH its first opportunity to evaluate ZE technology in cargo operations.

These proposed project elements complement the extensive ZE and NZE equipment that are already under development for testing at Los Angeles terminals through partnership with the California Energy Commission (i.e., Everport). These investments, viewed together as a single project, showcase a clear and concise snapshot of the ZE supply chain of the future, and will provide a model by which freight facilities can structure their operations to support ZE/NZE emissions operations.

Review and input on project development and implementation will be provided by the National Renewable Energy Laboratory (NREL) and the South Coast Air Quality Management District (SCAQMD). The San Joaquin Valley Air Pollution Control District will also be consulted for overall conceptual direction, especially as this project expands to include movement to and from central valley locations such as Merced County. The Coalition for A Safe Environment (CFASE), an important community activist group in the Port of Los Angeles area, will attend project meetings to monitor potential community benefits, and overall provide input on strategy and project management.

The proposed team of industry leaders believes this project will provide a model for the development and implementation of zero emission technology and supporting infrastructure in California by world-wide industry leaders, and a meaningful pathway towards emissions reduction, economic expansion, and public health benefit for communities in California, North America, and around the world. This trailblazing effort features a deeply qualified coalition and a complete value chain implementation—including a multi-operator ZE hydrogen fuel-cell-electric-vehicle (FCEV) truck fleet, dedicated heavy-duty hydrogen fueling network, renewable hydrogen and electricity generation, ZE cargo handling equipment, and local freight operator support—to help initiate port- and southern California-based ZE freight movement. This proposed S2S Project will build upon the project team's experience in impactful ongoing projects already undertaken at or near the Port of Los Angeles, through funding from CARB and other sources towards the realization of the Port's vision of ZE freight operations and will serve as a foundational ZE blueprint for the sustainable electrification of port, regional, national, and global goods movement. .

Benefits to California

SCAQMD, CARB and CEC support hydrogen and fuel cell technologies and recognize that light-, medium- and heavy-duty vehicles must achieve zero or near-zero emissions for the region to meet state and federal air quality

[7] Note that since ARB Appendix D guidance did not provide factors for propane, the emissions calculations for this equipment are based on a CI engine baseline.

attainment standards. This project will help ensure that sufficient hydrogen infrastructure is available to support the demonstration and early-market introduction of zero emission fuel cell vehicles, including drayage and regional Class 8 trucks for goods movement. Use of zero emission heavy-duty trucks further supports the state's goals in reducing emissions from goods movement programs, including the Sustainable Freight Action Plan. Successful demonstration and greater deployment of fuel cell vehicles are expected to provide reduction of criteria pollutants from heavy-duty trucking activities, especially in disadvantaged communities that are disproportionately exposed to harmful diesel emissions, such as the San Pedro Bay Ports and Inland Empire area.

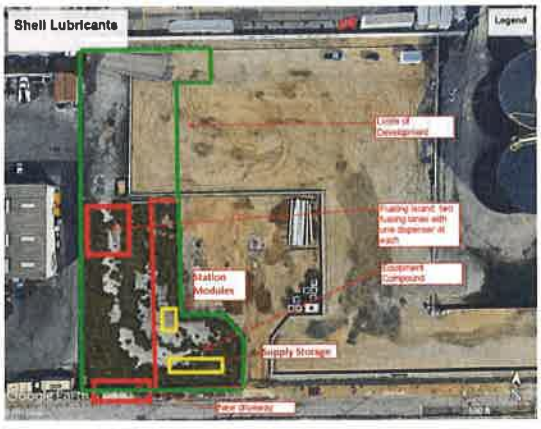
The Ports of Los Angeles and Long Beach have emissions reduction goals laid out in the San Pedro Bay Ports Clean Air Action Plan. One of the goals included in the plan is to phase out non-zero emission drayage trucks by 2035. Using only POLA and POLB as an example, a total of ~17,000 drayage trucks operate in and out of these two ports. The transition plan alone at POLA and POLB represents a significant fleet of trucks targeted for replacement with zero emission technologies such as hydrogen fuel cells. While the ability to expand the volume of freight handled is always a consideration for the ports, they are constrained by stringent emissions regulations. Expanded operations means the addition of more trucks servicing the ports, however, additional vehicles would have to utilize zero emission technologies to meet emissions regulations. If the ports aim to double freight capacity, there is a potential need for 30,000+ zero emission trucks in the San Pedro ports alone.

This proposal is the culmination of a long series of investments and demonstrations made at and by POLA over the last decade. As several successful and ongoing demonstrations of ZE and NZE technologies in a wide variety of applications have begun to show the ability to perform the tasks needed, the focus must now shift to the future, and focus on widespread deployment and infrastructure support to allow for ZE and NZE freight movement across the region, state, and beyond. Together with our industry, agency, and community partners, POLA believes that the scope of this specific proposal, and the pathway laid out herein for future projects, demonstrates the clearest and quickest path towards clean and efficient freight transport in California.

It is noteworthy that this project is scheduled as an informational item for the upcoming Board of Harbor Commissioners meeting on August 2, 2018. This educational effort will streamline the final approval process, should the Harbor Department ultimately be selected for an award under this program. A copy of this Board Report is included in Appendix B.

Station Parameters for Wilmington CA Site (Shell Lubricants Facility)

To meet the daily fueling capacity of 12 trucks per day with a peak capacity of four trucks per hour, the station will have two fueling positions (dispensers). Each fueling position will have its own station module, such that should one station module experience a failure the other would be able to continue fueling to fully meet the daily fueling needs. The hydrogen supply will be stored on site in pressure vessels at a nominal charge pressure of 45 MPa. An on-site storage capacity of 1,500 kg of hydrogen will be sufficient to meet the daily required fueling needs. Hydrogen will be supplied to site by compressed gas tube trailer.



Electrical Power: Power to run station compressors and chillers as well as ancillary equipment will be delivered from the local utility at 480 VAC 3-phase. The estimated electrical maximum power need will be approximately 290 kW, with an average power draw during fueling estimated at 220 kW. At the Shell Lubricants site, the existing utility will have spare capacity to provide the needed additional power for the station.

Site Layout: The fueling station storage vessels and station modules will be sited on a concrete slab construction and occupy a total of approximately 750 square feet. This comprises a supply storage skid occupying 12 ft by 40 ft and 2

station modules occupying a total of 18 ft by 28 ft. In addition, an area will be added for roadside access and for two fueling positions for two trucks. For the proposed site at Wilmington, the aerial view layout indicates there is ample room for the proposed equipment on site and easy access for truck fueling and for refueling of the station.

Station Parameters for Ontario CA Site (Travel Center of America)
To meet the daily fueling capacity of 12 trucks per day with a peak capacity of four truck per hour, the station will have two fueling positions (dispensers). Each fueling position will have its own station module, such that should one station module experience a failure the other would be able to continue fueling to fully meet the daily fueling needs. The hydrogen supply will be stored on site in pressure vessels at a nominal charge pressure of 45 MPa. An on-site storage capacity of 1,500 kg of hydrogen will be sufficient to meet the daily required fueling needs. Hydrogen will be supplied to site by compressed gas tube trailer.

Electrical Power: Power to run station compressors and chillers as well as ancillary equipment will be delivered from the local utility at 480 VAC 3-phase. The estimated electrical maximum power need will be approximately 290 kW, with an average power draw during fueling estimated at 220 kW. At the Ontario travel center, the existing utility will have spare capacity to provide the needed additional power for the station.

Site Layout: The fueling station storage vessels and station modules will be sited on a concrete slab construction and occupy a total of approximately 750 square feet. This comprises a supply storage skid occupying 12 ft by 40 ft and 2 station modules occupying a total of 18 ft by 28 ft. The modules will be behind barriers to not interfere with normal travel center truck operations. Room for the dispensers will be accommodated at the current truck fueling island.

For the proposed travel center site, the layout is shown in this aerial view. As shown, there is ample room for the proposed equipment on site and easy access for truck fueling and for refueling of the station using the existing road access.

A Note about the Work Plan
The Zero-Emission Shore-to-Store Project Work Plan, which provides a task-by-task breakdown of the important steps and milestones necessary to successfully implement this project, is provided at the end of the Narrative, since the Work Plan discussion does not count toward the 25-page limit. Please refer to it after Section 13.

4. Budget, Match Funding, and Financial Capabilities

The table below lists the tasks required to successfully complete the S2S Project, the associated budget and the source of funding associated with each task (i.e., grant vs. match type). No administrative fees are requested from CARB for this project.

The total project cost is $82,568,872, with project partners providing 50.2%, or $41,446,612 in match funding ($14,317,281 cash and $27,129,331 in-kind). Each funding partner's cost share commitment is documented by a Letter of Commitment signed by an authorized representative provided in Attachment 7. Further, no match funding is dependent on a future award under any other solicitation. The project team consists of major OEM companies that are technology innovators who have already demonstrated a strong commitment to the long-term success of the proposed zero-emission goods movement strategies proposed under the S2S project. The table below documents the source and type of match funding for each project task. Attachment 4 provides additional budget information, including the project milestone and disbursement schedule.

Description	Match Funding Source	Cash	In-kind	ARB Grant Request	Total
Task 1.0 Administration & Project Management	POLA/ SCAQMD	$1,000,000	$13,999,331	$0	$14,999,331
Task 2.0 Design and Construction of Hydrogen Infrastructure	Shell	$1,400,000	$12,000,000	$17,100,000	$30,500,000
Task 3.0 Truck Fleet Design and Build	Kenworth/ Toyota	$9,820,000	$0	$20,430,000	$30,250,000
Task 4.0 Yard Tractors and Charging Infrastructure	POH	$0	$200,000	$3,000,000	$3,200,000
Task 5.0 Technology Demonstrations	Toyota/UPS/ TTSI/SCE	$2,097,281	$930,000	$0	$3,027,281
Task 6.0 Data Collection and Analysis	N/A	$0	$0	$592,260	$592,260
Totals		**$14,317,281**	**$27,129,331**	**$41,122,260**	**$82,568,872**

The cash and in-kind match funding commitments include the following:

- **Harbor Department** is providing a total in-kind match contribution of $13,999,331 from the concurrent CEC projects at its Everport Terminal.
- **Shell is providing $1,400,000 of cash match dedicated to the infrastructure in Wilmington and Ontario and an in-kind match contribution of $12,000,000 from the concurrent CEC project at Port of Long Beach (H2Freight)**
- **Toyota** is providing a total cash match contribution of $9,41,848 which includes the design, engineering, integration, and support of 10 fuel cell electric powertrain systems for Class 8 trucks; operational, requisite fuel, maintenance, and administrative expenses to operate 4 FCETs during the demonstration period.
- **Kenworth** is providing a cash match of $1.32M in the form of ten (10) class 8 day cab gliders that will be the basis upon which the fuel cell electric vehicles will be built.
- **UPS** is providing an in-kind match contribution of $930,000 for operational, requisite fuel, maintenance, and administrative expenses to operate three FCETs during the demonstration period.
- **TTSI** is providing a cash match contribution of $545,433 for operational, requisite fuel, maintenance, and administrative expenses to operate two FCETs during the demonstration period.
- **SCE** is providing a cash match contribution of $310,000 for operational, requisite fuel, maintenance, and administrative expenses to operate one FCET during the demonstration period.
- **Port of Hueneme** is providing a cash match contribution of $200,000 for the engineering and construction of electric charging infrastructure to support two battery electric yard trucks at POH.
- **SCAQMD**: will contribute a cash match contribution of $1,000,000 to support the overall success of this project which will provide significant emissions reductions in the South Coast Air Quality Basin.

5. Potential Emission Reduction Benefits

The innovative technology proposed in the Zero-Emission Shore-to-Store Project will directly help California achieve its climate change and air quality goals by reducing GHG, criteria pollutant, and toxic air contaminant emissions from the project vehicles and equipment as they operate throughout several disadvantaged communities (DAC). The Harbor Department itself is located in a designated DAC and there are several other DACs directly adjacent to the Port of Los Angeles. In addition, there are nine additional sites for this project that are directly located in a designated DAC, with the on-road trucks traversing many more DAC. Our partner fleets have indicated a strong interest in

expanding the zero-emission freight transport capability throughout their fleets, and if successful, this project could lead to implementation at other ports throughout California and the United States. The emission reductions presented below reflect an estimate (using ARB's Appendix D methodology) of the project equipment relative to the ARB-prescribed Tier 4 baseline (for off-road equipment) and 2017 engine standards for on-road Class 8 trucks. The below tables summarize the project benefits expected from the demonstration vehicles and equipment on an annual basis as well as a two-year and ten-year project life, as required by page 32 of the CARB Solicitation.

	Reductions in Tons/Year per unit type				
Equipment Type	**NOx**	**ROG**	**PM10**	**WER**	**GHG (MT)**
Fuel Cell Electric Class 8 Truck	0.038	0.002	0.002	0.08	74.66
ZE Yard Tractor	0.0629	0.0145	0.0022	0.1214	23.41
ZE Industrial Forklift	0.0364	0.0012	0.0001	0.0396	22.29

	Total Fleet Emission Reductions			
	Total Fleet Emissions over 2 years		Total Fleet Emissions over 10 years	
Equipment Type	**WER (tons)**	**GHG (MT)**	**WER (tons)**	**GHG (MT)**
Ten (10) Fuel Cell Electric Class 8 Trucks	1.6	1,493	8.0	7,466
ZE Yard Tractors	0.4856	94	2.428	468
ZE Industrial Forklift	0.1584	89	0.792	446

The emissions reduction benefits quantified for the S2S project do not double count the emissions reductions for the CEC funded project H2Freight, which is being provided by Shell as in-kind match share. The H2Freight project is supporting the development of a heavy duty hydrogen fueling station at the Toyota facility in the Port of Long Beach. The emissions reductions claimed within H2Freight only claimed the potential emissions benefits for a total of 100,000 kg of hydrogen by the end of the project demonstration period in April 2022. This amount of hydrogen only assumes 250 total days of fueling at an average of 400 kg/day demand to fuel FCETs. After the conclusion of the proposed S2S project in April 2021, the H2Freight fueling station is projected to exceed 400 kg/day of demand for the next year of project life to achieve the quantified emissions reductions outside the scope of the S2S project.

6. Cost-Effectiveness

Please refer to Attachment 3 for a detailed, step-by-step evaluation of the cost effectiveness of the proposed project, as defined by ARB's Methodology for Determining Emission Reductions and Cost-Effectiveness (Appendix D) of the ARB Solicitation:

1. The project equipment's incremental cost at time of the demonstration, based on a 2-year project life;
2. The project equipment's incremental cost two years after completion of the demonstration, based on a 10-year project life; and
3. To comply with the Solicitation (p. 33), the project equipment's incremental cost two years after completion of the demonstration, based on a 5-year project life is provided for off-road equipment.

7. Benefits to Disadvantaged Communities

The POLA Shore-to-Store Project includes several project sites, as detailed below, all located within designated disadvantaged communities. Note that while POH is not located in an identified DAC, it is situation directly adjacent

to DACs. Overall, the proposed project will provide environmental, social, and economic benefits to the surrounding disadvantaged communities, as detailed in Attachment 5.

Census Tracts	Population	CalEnviroScreen3.0 Score
1. Toyota Hydrogen Refueling Station, 1630 186th Street, Gardena, CA 90248 (Census Tract 6037291300)	2,601	90-95%
2. 785 Edison Ave, Long Beach, CA 90802 (Census Tract 6037980033), includes three project elements: -Shell Hydrogen Refueling Station -Air Liquide Hydrogen Station -Toyota Logistics Services (battery-forklift demo)	61	NA (Pollution >95)*
3. Shell Hydrogen Refueling Station, 4325 E Guasti Road, Ontario, CA 91761 (Census Tract 6071012700)	4,052	75-80%
4. Shell Wilmington Sales Terminal, 1926 E. Pacific Coast Highway, Wilmington, CA 90744 (Census Tract 6037980014)	239	99%
5. Southern Counties Express, 18020 Santa Fe Ave, Rancho Dominguez, CA 90220 (Census Tract 6037543305)	2,666	95-100%
6. TTSI, 18735 S Ferris Pl, Rancho Dominguez, CA 90220 (Census Tract 6037543305)	2,666	95-100%
7. UPS Freight Facility, 3140 Jurupa St., Ontario, CA 91761 (Census Tract 6071012700)	4,052	75-80%
8. UPS Gardena Facility, 17115 S Western Ave, Gardena, CA 90247 (Census Tract 6037603302)	3,804	90-95%
9. Everport Terminal Services, 389 Terminal Island Way, TI, CA 90731 (Census Tract 6037980033)	61	NA (Pollution >95)*

8. Technology and Innovation

The first area of innovation is the sheer scale of the shore-to-store project. A daily fueling capacity of 1,000 kg for Fuel Cell Electric Trucks (FCET) at three sites demonstrates the scalability that will be needed for future station infrastructure supporting widespread deployment of FCEVs, both in the light-duty and heavy-duty sectors. Deploying larger stations with higher throughputs will continue to attract large station developers and gas suppliers because of the cost reduction which is realized by selling high volumes of hydrogen fuel. Simply scaling up is one method needed in order to reach dispensed fuel cost targets. The scale of the station also provides insight into the demand of heavy-duty vehicles. A station of this size may only be able to provide fuel for tens of trucks as opposed to hundreds of cars. This level of understanding is valuable to the heavy-duty industry and an entity such as a port specifically which is currently planning for the transition to zero-emission trucks by 2035.

FCETs for Class 8 applications are still early in their product development, with only a few prototypes on the road today including Toyota's Project Portal truck. The team has already obtained many valuable lessons learned from actual on-road demonstration data, but much further development with more prototype trucks is needed. The entire electrified powertrain system consisting of major components such as the fuel cell, battery, electric motor, transmission, and power control units requires significant engineering and optimization to meet the performance needs of fleet operators without affecting their operations. Total cost of ownership, durability, and payload are also key factors that must be considered. Simultaneously meeting all of these needs of the freight movement industry requires significant innovation in powertrain optimization, effective packaging of components, performance improvements, and cost reduction of components. The S2S project provides a great opportunity for the industry to

learn from real world operations at-scale, which will provide valuable feedback to the necessary research and development efforts throughout the industry.

The prototype trucks are a developing product which will require greater innovation and cost reduction to become a viable alternative for heavy-duty fleets. These stations, specifically designed to fuel heavy-duty vehicles, allow for real world demonstrations of the prototype trucks in daily fleet operations. The project team will collect valuable data from the trucks' operation to identify system components that need improvement. The durability of the powertrain is an important factor which can be tracked throughout the life of the project as the trucks accrue much higher annual mileage than their light-duty FCEV counterparts. These data for heavy-duty truck operation are invaluable for developing a powertrain system that can meet the demanding needs of heavy-duty fleet customers.

It is apparent that this project will require innovation to be successful, while also enabling numerous areas of further improvements to the heavy-duty fuel cell market throughout project life. The large scale of the system also shows the greatest promise for cost reduction, while providing a blueprint for further cost reduction in future stations.

a) Commercially available subsystems

Overall station design is a major factor that can help identify areas for cost reduction. With high station capacity and throughput, there are more options to consider how to best optimize the station to achieve the desired reliability and performance. This engineering design exercise will enable cost reduction due to the modularity and redundancy of station components. By following a modular approach to design, component suppliers will begin to produce more units and thus make faster improvements to their product, all while continuing to reduce cost. As more large stations like this one are developed, the supply chain will continue to grow as standardized parts are required in greater numbers. The project intends to build the station from commercially available subsystems procured from suppliers that all have a proven record of accomplishment and fully approved by Shell in terms of technical performance, safety, regulations and standards. The use of standard equipment will ultimately reduce their unit price and maintenance costs at scale.

b) Fueling profile

Another area of innovation is realized from the process of fueling the trucks. Fueling protocols, dispenser design, station throughput, and station reliability are just some examples that can be evaluated through this project. Light-duty fueling protocols have taken years to develop, and heavy-duty truck fueling will require similar parallel development. This station will provide lessons learned for fueling requirements of heavy-duty trucks, which will help inform and develop the appropriate protocols for safe and fast fueling for the heavy-duty market as a whole. Considering the longer refueling times and the need for higher flow nozzles, dispenser design can also be integrated and tested as innovative technologies are developed. The project intends to build two stations capable of fueling up to four trucks every hour at peak capacity from two fueling positions working simultaneous and 10 - 15 trucks in a 12-hour shift per weekday. Each fill is expected to be 30+ kg initially, with the potential for 50+ kg fills that should take between 20 to 30 minutes. This corresponds to an initial average daily demand of ~400 kg/day and will increase as the project matures.

The station will employ a fueling profile that will be designed to spread compression work in time, thereby reducing peak compressor power demand in exchange for longer compressor run time. This allows smaller compressor sizing and lower electricity demand charges and is expected to significantly improve the operating costs.

To achieve the targeted fueling capability, two compressor skids should be used to compress gas to 90 MPa, reliably and with a maximum redundancy.

c) Station Availability and Reliability

Optimization of station design will play a major role in the reliability of the station. Compared to early adopters of light-duty FCEVs, commercial users of the technology for hauling freight demand the highest reliability and station uptime. Even short periods of unexpected downtime could result in significant losses to freight businesses. Because of this strong need for station reliability, innovation in station design, component design, and redundancy will all be necessary to meet the needs of heavy-duty fleet customers. Therefore a complete fault model of the station design has been prepared to ensure better than 96% full fueling availability and better than 99% reduced throughput availability. At reduced throughput, the station will be capable of meeting daily fueling needs, albeit without simultaneous fueling of two trucks. For instance, if one compressor, one chiller or one dispenser fails, the system will not be able to supply peak flow rate, and therefore not be able to maintain simultaneous fueling capability. It will however be able to fuel one truck at a time and meet daily fueling requirements. The site will also allow another four trucks to line up safely on the station forecourt away from the main road.

Emissions Testing

Fuel cell and battery-electric zero-emission equipment and vehicles have no tailpipe emissions; therefore emission testing is not necessary to prove zero-emission capability.

9. Potential for Market Penetration and Commercialization of the Technology

Target Markets for Zero-Emission Class 8 Trucks and Freight Facility Equipment

Technological innovations being demonstrated through the Zero-Emission Shore-to-Store Project have broad commercialization potential. About 17,000 Class 8 trucks are registered to operate in the Port of Los Angeles, with anywhere from 8,000 to 12,000 making at least one move on a given day. Additionally, almost 2,000 yard tractors and hundreds of other pieces of heavy-duty cargo handling equipment operate on a daily basis at the Port of Los Angeles' various marine container terminals. The San Pedro Ports Clean Air Action plan sets ambitious goals to transition all terminal equipment to zero-emissions by 2030, and all heavy-duty trucks to zero-emissions by 2035. This is just one California specific example that demonstrates the need for viable zero-emission technology solutions that this project scope aims to develop and demonstrate. The San Pedro ports can serve as a proving ground for ZEV freight movement which could then be applied to ports throughout the U.S. and across the globe. But freight movement doesn't end near the ports. Regional and long haul distribution are also potential markets for ZEV freight movement. This project scope will focus on the port drayage and regional haul duty cycles associated with freight movement.

Battery electric and fuel cell electric technologies are ZE solutions that are available today to meet the needs of freight movement. Depending on the specific operation needs and duty cycle, certain technology solutions may be better suited for certain applications. This project will demonstrate fuel cell electric technology for class 8 on road applications and potentially forklifts, and battery technology for terminal equipment. In general, applications that require long range, heavy cargo, and fast fueling are best suited for fuel cell electric propulsion. Applications that have shorter range, lighter cargo, and longer downtime are well suited with batteries.

Vehicle, Equipment and Facility Growth Projections

The need for freight movement continues to grow as a result of global trends. Globalization of industries, increasing population, rapid growth of developing countries, and the increasing percentage of online shopping are just a few examples that demonstrate the consistent growth in freight movement that is likely to continue for some time. All of these macro trends require more goods movement, which translates to more trucks, ships, planes, and material handling equipment to move those goods. All of this growth comes at time when there is also a strong push to reduce emissions. In order to achieve increased growth while simultaneous decreasing emissions, ZE solutions are needed in all aspects of freight movement. To use the San Pedro ports as an example, the goal is to achieve 100% ZE trucks and terminal equipment while simultaneously continuing to increase the container throughput of the port.

Barriers to Entry for Zero-Emission Hydrogen Fuel Cell Vehicles and Equipment

There are a number of potential barriers to consider when bringing a new technology to the market.

- Some of the key factors to consider for freight movement are total cost of ownership, reliability, fueling infrastructure, and driver acceptance. Moving freight is a business that requires cost competitiveness and high uptime to deliver a service. Operators are unable to absorb the higher initial costs of zero-emission technology, especially if new infrastructure investments are needed to support the equipment. Maintaining an operational schedule is an integral part of effective freight movement. This requires reliable equipment with well understood maintenance practices to keep vehicles on the road in revenue service. Logistics of refueling the vehicles also plays a major role in daily operations.
- At this early stage of Fuel Cell Electric Truck (FCET) development, all of these factors present a challenge to the operators because costs are higher, infrastructure is limited, and they must learn about the operational nuances of a new technology. The industry team assembled for this project combines the perspectives of OEMs, infrastructure providers, and freight operators to better understand and address the requirements of new ZE technology. The technology development within the project scope is an important step towards overcoming these barriers and enabling widespread adoption of ZE equipment for freight movement.
- Hydrogen refueling stations designed for heavy-duty trucks are needed in California, and more importantly, in ports, to make FCETs a viable zero-emission transportation option for freight transport. This project will help address scientific and technical barriers, including the unproven design and fueling protocols for freight applications, and also limited availability of hydrogen refueling infrastructure performance data. The project will provide evidence of scalability by delivering station performance data for very large capacity stations (800 kg of hydrogen in 12 hours), which will augment current data collection efforts managed by the National Renewable Energy Laboratory (NREL). The industry also lacks the demonstration and standardization of stations utilizing on-site renewable hydrogen production and critically important protocols to develop standards for safely and quickly refueling trucks at 700 bar pressure. The delivery method proposed in this project will provide valuable experience that can inform efforts to develop industry-wide standards.
- Market barriers that need to be overcome include the ability to predict future behavior related to FCET deployments and the availability of hydrogen refueling infrastructure. The deployment and operation of a large-capacity station servicing a fleet of 10 or more FCETs will provide real world data on market drivers, fuel supply logistics, and station demand — all key variables to feed the analysis necessary to understand future market scenarios. Finally, cost and financial barriers may be the most significant hurdles to overcome. Early station deployments will be significantly underutilized, and a limited number of companies with the technical expertise and financial resources are able to bear this level of financial burden and risk, especially during early stage deployment. Another key barrier is the high cost of station equipment, in particular, the costs associated with pre-cooling systems and redundancy systems to ensure uptime and availability.

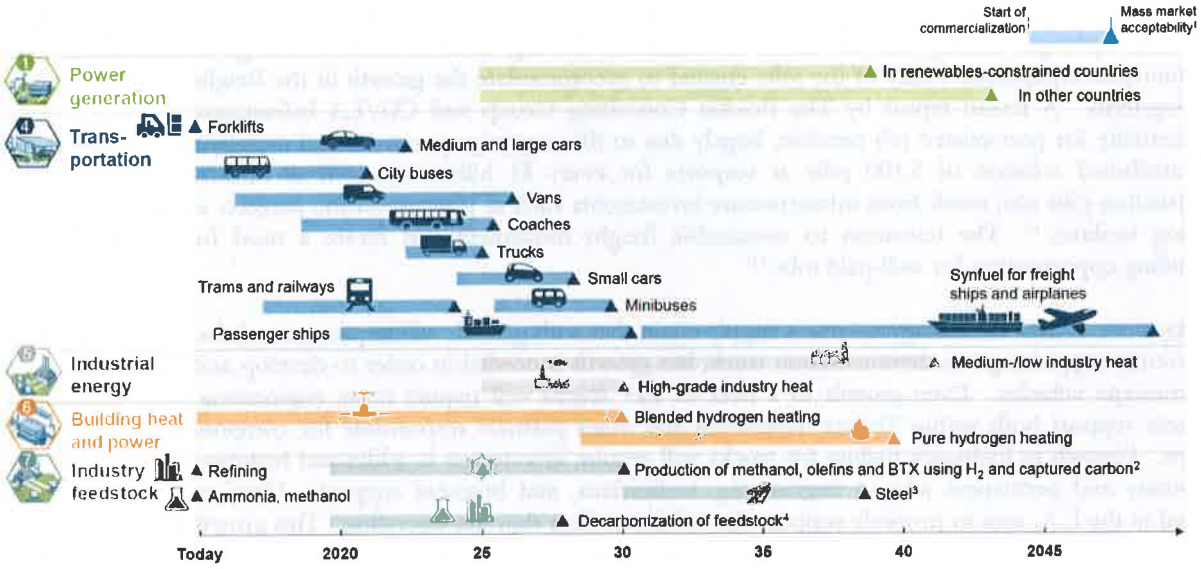
Commercialization Plans

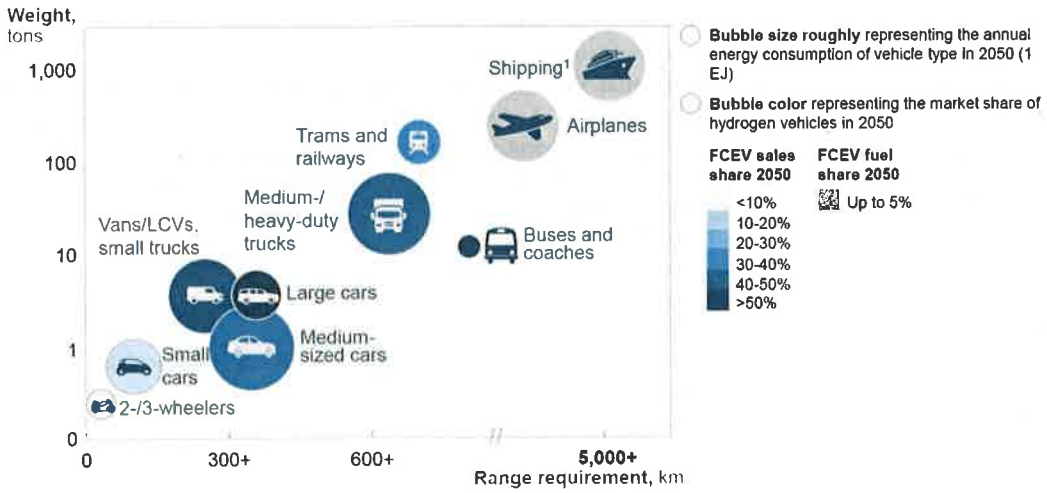
Heavy duty FCETs are a pre-commercial technology today, but the need for commercial heavy duty ZEV solutions is clear. Both Toyota and Kenworth have already begun demonstration of their first FCET prototypes and are excited by this transformative CARB opportunity that is key to enabling the next stage of expanded vehicle development. New technology development requires considerable financial, engineering, and facilities resources over multiple development cycles, and Class 8 FCETs are no exception. Successful implementation of S2S will push the development ahead from a single prototype, to the next generation of prototypes, but several more development cycles are still needed to assess the potential commercial viability of the product. All potential OEMs in the FCET space will benefit greatly from the learnings of this project to further the development of FCETs. As large scale vehicle OEMs, Toyota and Kenworth treat new product development very seriously to ensure that any new product performs well and is safe, reliable, and cost effective for customers. The learnings from this project will be no different, and will provide invaluable experience to CARB and all interested industry stakeholders.

The Hydrogen Council[8] has created a detailed global roadmap for hydrogen and fuel cell technology development for a variety of transportation applications. The first figure below outlines the estimated commercialization timelines for

[8] *http://hydrogencouncil.com/*

each application with input from the world's industry leaders from their respective industries. The timeline shows a rapid development of FCET's from early commercialization beginning in the early 2020's, to mass market acceptability by 2025. The second figure further demonstrates the potential future market for fuel cell technology in key transportation sectors, and medium and heavy duty trucks represent a significant future market. A project team consisting of Toyota, Kenworth, Shell, UPS, and Air Liquide represent key global industry leaders in the hydrogen mobility, freight movement, and hydrogen infrastructure sectors that require further growth, development, and scale to realize a viable market for zero-emissions freight. Successful demonstration of the S2S project is another critical step towards the path of commercialization for heavy duty FCETs, and the project team looks forward to playing an integral role in future project phases. The strong focus on hydrogen infrastructure buildout for S2S displays the future vision of the project team. The construction of two new high capacity heavy-duty stations coupled with three additional heavy-duty stations within the scope of S2S represents a total local network that could supply up to ~4,000 kg/day of hydrogen for freight movement, with the ability to serve ~50+ trucks upon project completion. Further investment and public funding support will be needed to build upon the success of S2S to continue development, demonstration, and scale up of the FCET's, hydrogen supply, and supporting fueling infrastructure.





CARB Certification Plan

OEM's are directed by the California Air Resources Board to follow a set product development plan. As these vehicles are demonstration, as opposed to production units, they will follow the standard production certification process but meet less stringent or less parameters that will be negotiated with US EPA, ARB and Kenworth representatives. All aspects of the agreed upon certification process will be tested for adherence to federal and state emissions certifications as they pertain to respective power train vehicles contained within this proposal. Vehicles will be made available for Kenworth agreed to limited testing once they meet minimum Kenworth reliability and performance standards.

Economic Impacts for Operators of Advanced Technologies from this Project

The significant role freight-movement plays in California's economy is undeniable. In 2014, more than five million jobs were attributed to freight-dependent industries, which translate to 33% of jobs in the state[9]. Projected growth of transported freight tons between 2015 and 2045 in the U.S. as a whole translates to 59% growth in California[10]. To attract the growth anticipated in the freight-movement sector—and the associated jobs—facilities such as ports must remain competitive. S2S contributes to the competitiveness of the Port of Los Angeles, Port of Long Beach and Inland Empire by supporting strategies to achieve zero-emissions goods movement. Building and operating successful large-scale hydrogen fueling stations will be essential in furthering the commercialization goals and rollout of FCETs and transport equipment. Many of the jobs created to accommodate the growth in the freight-movement sector will be long-term. A recent report by The Boston Consulting Group and CG/LA Infrastructure found "very high" sustainability for port-related job creation, largely due to the ongoing operations and maintenance positions required and attributed creation of 5,100 jobs at seaports for every $1 billion invested in infrastructure[11]. Short-term construction jobs also result from infrastructure investments such as port expansion projects and projects to enhance existing facilities.[12] The transition to sustainable freight movement will create a need for a skilled workforce, expanding opportunities for well-paid jobs.[13]

Deployment of new technology creates a supply chain that with growth will require more jobs. For example, Toyota is currently supporting one demonstration truck, but growth is needed in order to develop and support an expansion of prototype vehicles. Even growth to a fleet of 10+ trucks will require more engineering jobs, technicians, and business support both within Toyota, Kenworth and other partners responsible for component supply and vehicle service. Growth in hydrogen fueling for trucks will require investment in additional hydrogen production and both temporary and permanent jobs in engineering, technicians, and business support. Many of these jobs would be located in the L.A. area to properly support the vehicles where they are operating. This growth is also for permanent positions as the fuel cell business continues to grow, and not just temporary support for S2S. Job growth is not the only economic metric associated with the ports. According to the California Transportation Plan 2040, more than $40 billion in annual economic activity is attributed to the state's ports.[14] Overall, more than $740 billion of the state's gross domestic product is associated with freight-dependent industries.[15] While key to the state's economy, the impacts of freight-movement can be detrimental to communities and the environment. The development and implementation of the California Sustainable Freight Action Plan with a focus on deployment of zero-emission technologies is key to maintaining and growing the economic activity associated with freight movement. When discussing the Economic Context of Freight, the California Freight Mobility Plan notes trade does not have to pass through California and if the state fails to remain competitive, the shipments (along with jobs) could go elsewhere. [16]

---

[9] Brown, Jr, Governor Edmund G. "California Sustainable Freight Action Plan." 2016, p-G-1.
[10] Ibid. pp. G-2- G-3
[11] Freedman, Mark, Norman Anderson, Jeff Hill, Daniel Acosta, Santiago Ferrer, Tina Zuzek, and Karan Mistry. "A Jobs-Centric Approach to Infrastructure Investment." 2017, pp. 6-7.
[12] Ibid. pp. 8-9.
[13] Brown. p. 7.
[14] Caltrans. "California Transportation Plan 2040." 2016, p. 43.
[15] Brown. p. 1.
[16] CalSTA and Caltrans. "California Freight Mobility Plan." 2014, p. 175.

Projects such as S2S provide support and encourage the use of zero-emission trucks at the ports and freight facilities. Perhaps the largest effect to the local region is the increased activity of fleet operators at the port which is enabled through the deployment of zero-emission trucks. This expansion may be small with respect to the overall operation of the ports, but the site will provide a successful blueprint that the ports can learn from and deploy as part of their portfolio of zero-emission solutions. Currently, fuel cell-electric and battery-electric vehicles are the only zero-emissions technologies at the tailpipe, and they enable full well to wheel zero emissions by sourcing hydrogen and electrons from renewable sources. Demonstrating the fuel cell and hydrogen pathway at the port brings the industry one step closer to realizing a zero-emission solution that enables future economic growth. By directly enabling the use of zero-emission technology, ports reduce emissions and operate in a sustainable, competitive manner. This allows ports to continue to be a major contributor to the state's overall economy.

Safety Measures

As an operator and a demonstrator of the equipment, safe working conditions and careful cargo handling are paramount to the demonstration partner fleets. The project partner fleets maintain strong safety standards and safe working conditions at all times. They provide on-going safety training for management, staff, and union labor to ensure federal and state OSHA requirements are not just met, but are surpassed. Safety training on the project vehicles and equipment will be provided by the OEM manufacturers to all operations and maintenance personnel. Operations and Maintenance Manuals will contain written safety instructions. Shell will prepare safety manuals and training classes for Shell operations staff and First Responders. Shell will work with Shell's equipment provider and maintenance contractor, the California Fuel Cell Partnership's Safety Officer, and other state and local fire officials familiar with hydrogen fueling, to conduct training sessions prior to full commissioning of each station. In order to ensure the maximum number of trained first responders, classes will be held at nearby fire stations, and an effort will be made to schedule site visits of each fueling station with as many first responders as possible, depending on their availability. Taking the appropriate safety measures to ensure safe project implementation is a high priority for the entire project team. Please see Appendix E for a detailed description of the safety measures to be followed.

Training Requirements

During the project demonstration, any powertrain installation and maintenance will be handled by Toyota and Kenworth personnel. The truck operators will receive initial training from the project team so they understand how to operate and fuel the vehicles. Routine maintenance of standard truck components can be handled by the end users, but any maintenance to the fuel cell electric powertrain is the responsibility of Toyota and Kenworth.

10. Potential of Project to Act as a Showcase of Technology

The simple name of the project 'Shore to Store' is meant to capture the broad transformative nature of the project which touches the full ecosystem of regional freight movement:

It is transformative: Envision cargo arriving at the ports being carried by ZE cargo handling equipment at the Ports of Los Angeles, Long Beach, and Hueneme. Four unique operators then take this cargo to warehouses, distribution centers, railheads, airports, and businesses throughout the Southern California region using 10 prototype Class 8 ZE FCETs emitting nothing but water. Existing and future ZE cargo handling equipment continues the ZE journey of the cargo at several warehouse hubs. 33% minimum renewable hydrogen (100% in POLB) and electricity generated directly from CA feedstock will even be produced to support a portion of the project scope. All of this ZE freight movement is enabled by significant hydrogen infrastructure buildout specifically designed to support heavy duty vehicles. In total, 5 hydrogen refueling stations located in the San Pedro Ports, Gardena, and the Inland Empire, will be leveraged and expanded to support this project, with freight movement between 10+ key freight facilities in the region. Attachment 5 provides detailed maps and addresses for these locations. This exceptional showcase of regional freight movement requires an impressive consortium of project contributors, and POLA has successfully assembled that coalition of forward thinking industry influencers. POLA has teamed with Toyota, Shell, Kenworth, UPS, TTSI, SCE, Air Liquide, SCAQMD, Port of Long Beach, Port of Hueneme, NREL, Merced County, and others to deliver a government, community, and industry stakeholder collaboration initiative to demonstrate the at-scale

application of zero-emissions to heavy duty transport via H2-fuel-cell-electric technology as a port-led path towards transformative emissions reduction, economic expansion, & public health benefit for CA's at-need communities and a foundational zero-emissions blueprint for the sustainable electrification of port, regional, national, and global goods movement.

It is cost effective: POLA, Shell, Toyota and Kenworth will need to contribute significant financial and professional resources to ensure reliable operation and to encourage increased consumer demand for hydrogen fuel-cell electric freight vehicles. The total contribution from Toyota and Shell is expected to be higher than the investment made by the CARB over the lifetime of the trucks and the stations. Shell, Toyota and Kenworth are committing to the long-term development of the market, the project partners understand that CARB funding for this proposal is crucial to develop FCET and its infrastructure of this size and scale to jumpstart the promotion and adoption of FCEV for freight. In reality; the total contribution required by the partners combined for the HRS and the prototype trucks is estimated to be more than that provided by CARB. Shell, Toyota and Kenworth are able to provide the public a high level of assurance in their ability to be successful. They bring considerable knowledge, experience, skills, and practical know-how to fulfill its commitments and meet its goals and objective. They have extensive experience effectively managing large-scale projects for over decades. The partners will apply their Governance and Control standards to the project to ensure adequately accounting for and controlling cost.

Environmental benefits: Enabling deployment of zero emission vehicles will eliminate the emissions associated with the operation of these vehicles not only on ports property, but as they travel along the I-710 corridor. Of further significance, this sizeable first-stage deployment of Class 8 zero-emission prototypes, developed by two of the largest automotive and truck OEMs in the world, will open the door to a complete transformation of the fleet of thousands of diesel trucks now serving the ports and freight facilities. This has the potential and promise of nearly eliminating all of the harmful criteria emissions impacting nearby southern California neighborhood communities. Additionally, while the project will not reduce traffic, zero emission vehicles offer quiet operation, eliminating the noise pollution typically associated with heavy-duty vehicles. The use of fuel cell technology proposed in **S2S** allows for a greater range of operation of the prototype trucks and the ability to utilize zero emission technology on drayage trucks. The I-710 corridor is a key thoroughfare for container traffic to and from POLB and the Port of Los Angeles. The route allows for not only near-dock transportation, but also transport to intermodal facilities, warehouses, and distribution centers in the region.

Plans to share results and lessons learned: The positive impacts of this project cannot be overstated. The successful implementation of this initial phase 1 scope will already result in significant infrastructure buildout, immediate emissions reductions, and industry stakeholder investment. The S2S project will provide a blueprint for what is possible with ZE freight movement, and all of the learnings will be publicly available for other regions in California, the U.S., and internationally to benefit from and consider their own demonstration. By its nature and the number notorious partners involved, the results and lessons will be shared broadly and naturally at the Ports but also in the private sector. Press releases, media interviews, opening ceremonies will have a local and global reach.

Multiple facilities, end-users, vehicle, and equipment types operating in concert: S2S tries to reflect what the future may look like – a comprehensive mix of technologies operating in concert depending on the end use, which is made possible by this unique consortium of major private and public entities. The below table illustrates the variety of usages.

End use	End users	Vehicles	Equipment types
Freight facility	TLS	ZE Forklift	BEV
Port centric routes	POLA, POH	Clean cargo handling equipment Zero-emission top handlers 25 zero and near-zero emission yard tractors	BEV, LNG 1.03MW photovoltaic 2.6MWh battery storage
Drayage routes	TLS, TTSI, SCE	10 Class 8 FCETs	Hydrogen fuel cell electric 5 HRS (3 large, 2 medium size)
Regional routes	UPS		

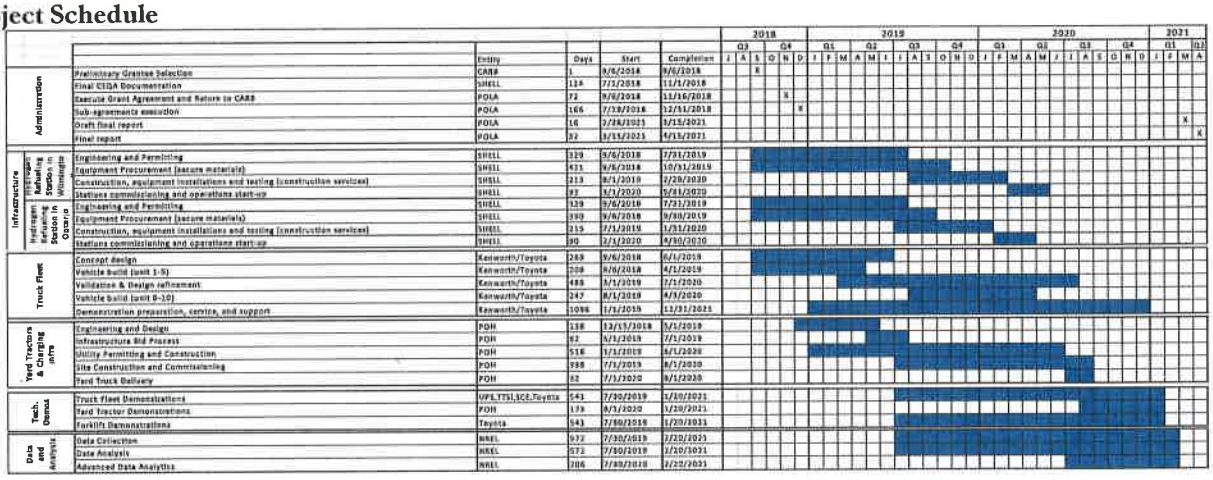
11. Application Completeness

All parties participating in the demonstration have read and agree to abide by the Sample Grant Agreement (Appendix B) and are committing to fulfill the obligations detailed in the application package.

12. Timeline for Project Completion (Project Schedule)

The project is anticipated to begin following the kick off meeting with ARB. All project components will be accomplished by April 15, 2021 as detailed in the project schedule summarized below. Please review Attachment 4 for a detailed Milestone and Disbursement Schedule and Project Schedule. A larger size is available in Appendix F.

Project Schedule



WORK PLAN

The proposed Work Plan was developed in collaboration with our project team and is based on the Harbor Department's extensive experience designing and implementing a number of similar technology development and demonstration programs. The Work Plan is designed to ensure timely completion of all required project elements, including the technology demonstration's comprehensive data collection and emissions testing, which is based on ARB's Appendix F: Data Collection Requirements. For a detailed breakdown structure of the Work Plan, please refer to the fully developed Work Plan at the end of the Project Narrative. Quantitative milestones are included in Attachment 4.

The work plan will be executed in six (6) major tasks:

- Task 1.0 Administration and Project Management
- Task 2.0 Design, Construction, and Commissioning of Hydrogen Infrastructure
- Task 3.0 Truck Fleet Design, Build, and Support
- Task 4.0 Yard Tractors and Charging Infrastructure
- Task 5.0 Technology Demonstrations
- Task 6.0 Data Collection and Analysis

Task 1.0 Administration and Project Management will be carried out by the Harbor Department including all grantee administration duties. If awarded, a Kick-off meeting will be held as soon as possible to discuss the work plan, task performance details, schedule, and the approach for issue/problem resolution.

Task 2.0 Two new high capacity hydrogen refueling stations will be designed, constructed, and commissioned to serve FCET's in the region. One station will be located in Ontario at the Shell Travel Center of America, with a second station located in Wilmington at a Shell industrial site.

Task 3.0 Kenworth and Toyota will be responsible for the design, build, and performance evaluation of 10 Class 8 fuel cell electric trucks to be demonstrated by 4 separate fleet end users within the scope of this project. The vehicles will complete functional, track and local service tests to meet minimum reliability and performance standards prior to field deployment. Service and support will be provided during the demonstration period.

Task 4.0 The Port of Hueneme will manage the engineering, permitting, and construction of electric charging infrastructure to support the demonstration of 2 electric yard tractors operating at the port.

Task 5.0 A total of 14 zero-emissions vehicles will be demonstrated within the project scope and timeline. The truck fleets and equipment operators will demonstrate these vehicles with the support of the core project team.

Task 6.0 NREL will be responsible for all data collection and analysis for the equipment and supporting infrastructure during the life of the project. The project team will coordinate closely with NREL to ensure that high quality insightful data is produced and shared with CARB.

A detailed breakdown of tasks, showing responsible parties for each task and subtasks, is provided below. A project schedule, which shows the timing of tasks that lead to the on-time completion of the demonstration project, is presented in the table following the work plan details.

Task 1.0 Administration and Project Management –Harbor Department
(1Q 2019-March 30, 2021)

Task 1.1 Kick-off Meeting – Zero-Emission Shore-to-Store Project Team
The project team will meet with CARB and third-party data analysis team (NREL) to discuss the work plan, task performance details, schedule, and the approach for issue/problem resolution.

Task 1.2 Monthly Project Update Meetings and Reports – Harbor Department
The Harbor Department will coordinate monthly project update meetings that will be held via WebEx or teleconference to discuss progress. The meetings will follow a defined agenda that will cover project status update, difficulties encountered, upcoming deliverables, pending disbursement requests, and schedule of the next update meeting.

Task 1.3 Final Report – Harbor Department
At the completion of the project, the Harbor Department will submit a final report to CARB that describes the project goals and objectives, methods, results of the demonstration, future application of the technologies, and commercialization prospects.

Task 1.0 Deliverables: Monthly Agenda, Monthly Project Status Reports, Disbursement Requests, and draft Final Report on March 15, 2021.

Task 2.0 Design, Construction, and Commissioning of Hydrogen Infrastructure

The goal of this task is to finalize the engineering design, procure equipment, submit permits, complete installation, test and commission the hydrogen refueling station located at:

1926 E. Pacific coast highway, Wilmington
4325 E. Guasti Rd. Ontario, CA 9176
785 Edison Ave, Long Beach, CA 90802 (CEC project H2Freight)

Task 2.1 Hydrogen Refueling Station in Wilmington (Sept 2018-May 2020)

Task 2.1.1 – Engineering and permitting
Task 2.1.2 – Equipment procurement
Task 2.1.3 – Construction, equipment installation, and testing
Task 2.1.4 – Station commission and operations start-up

Task 2.2 Hydrogen Refueling Station in Ontario (Sept 2018-April 2020)

Task 2.2.1 – Engineering and permitting
Task 2.2.2 – Equipment procurement
Task 2.2.3 – Construction, equipment installation, and testing
Task 2.2.4 – Station commission and operations start-up

Task 2.3 Hydrogen Refueling Station in Port of Long Beach (Sept 2018-April 2020) – H2Freight project

Task 2.3.1 – Engineering and permitting
Task 2.3.2 – Equipment procurement
Task 2.3.3 – Construction, equipment installation, and testing
Task 2.3.4 – Station commission and operations start-up

Task 2.0 Deliverables:

- Tasks 2.1.1, 2.2.1 and 2.3.1: Permit and CEQA extracts
- Tasks 2.1.2, 2.2.2 and 2.3.2: Suppliers invoices
- Tasks 2.1.3, 2.2.3 and 2.3.3: Written notification of safety training plan
- Tasks 2.1.3, 2.2.3 and 2.3.3: Written notification regarding station installation
- Tasks 2.1.3, 2.2.3 and 2.3.3: Photographs of installed equipment
- Tasks 2.1.4, 2.2.4 and 2.3.4: Written notification of preventative maintenance plan
- Tasks 2.1.4, 2.2.4 and 2.3.4: Station acceptance testing report
- Tasks 2.1.4, 2.2.4 and 2.3.4: Written notification of when the station becomes operational

Task 3.0 Truck Fleet Design, Build and Support
(3Q 2018 – 4Q 2020)

Task 3.1 Vehicle Concept Design, (September 2018 – June 2019)

A team of engineers at Kenworth and Toyota will develop the initial vehicle design that will integrate a Toyota fuel cell stack into a Kenworth T680 day cab platform configured and optimized for port drayage operations. Advanced vehicle simulation methods will be used to accelerate design progress and validate vehicle performance and durability in advance of the first truck build

Task 3.1.1 – Vehicle layout/system architecture design/simulation models
Task 3.1.2 – Design analysis and optimization
Task 3.1.3 – Final engineering documentation

Task 3.2 Vehicle Builds (Units 1 – 5), (September 2018 – April 2019)

Fully assembled chassis gliders and truck cabs will be built on the Kenworth assembly line to production quality standards. These components will be delivered to a dedicated assembly location for installation of the advanced Toyota fuel cell powertrain and hydrogen fuel system. These initial vehicles will be used for internal validation activities and design optimization before being released into commercial service

Task 3.2.1 – Long lead component procurement – Unit #1
Task 3.2.2 – Standard component procurement – Unit #1
Task 3.2.3 – Vehicle assembly – Unit #1
Task 3.2.4 – Long lead component procurement – Units #2,3
Task 3.2.5 – Standard component procurement – Units #2,3
Task 3.2.6 – Vehicle assembly – Units #2,3
Task 3.2.7 – Long lead component procurement – Units #4,5
Task 3.2.8 – Standard component procurement – Units #4,5
Task 3.2.9 – Vehicle assembly – Units #4,5

Task 3.3 Validation and Design Refinement, (March 2019– July 2020)

Validation facilities from both Kenworth and Toyota will utilized to test components and full vehicle assemblies in simulated commercial applications with full instrumentation to monitor and analyze performance. The results of these early validation activities will be fed back into the design process to improve designs in advance of the second wave of vehicle assemblies.

Functional Testing – each vehicle will undergo basic functional and safety checks on site at the manufacturing facility to ensure all components are installed and operating properly

Track Testing – each vehicle will be run on various tracks at Kenworth and Toyota testing facilities. At these facilities the vehicles will be put into simulated operating conditions and instrumented to track performance and identify performance and durability enhancement opportunities.

Field Test – in this phase vehicles will be into service on public roads and may run the final demonstration routes to validate performance targets will be met.

Task 3.3.1 – Functional test – Unit #1
Task 3.3.2 – Track test – Unit #1
Task 3.3.3 – Field test – Unit #1
Task 3.3.4 – Functional test – Units #2,3
Task 3.3.5 – Track test – Units #2,3
Task 3.3.6 – Field test – Units #2,3
Task 3.3.7 – Functional test – Units #4,5
Task 3.3.8 – Track test – Units #4,5
Task 3.3.9 – Field test – Units #4,5
Task 3.3.10 – Functional test – Units #6,7
Task 3.3.11 – Field test – Units #6,7
Task 3.3.12 – Functional test – Units #8,9,10
Task 3.3.13 – Field test – Units #8,9,10

Task 3.4 Vehicle Builds (Units 6 - 10), (August 2019 – April 2020)

These vehicles will be assemble in a similar manner as the first wave of trucks and will leverage knowledge gained in the validation and design refinement phase (3.3) to implement improved designs.

Task 3.4.1 – Long lead component procurement – Unit #6
Task 3.4.2 – Standard component procurement – Unit #6
Task 3.4.3 – Vehicle assembly – Unit #6
Task 3.4.4 – Long lead component procurement – Unit #7
Task 3.4.5 – Standard component procurement – Unit #7
Task 3.4.6 – Vehicle assembly – Unit #7
Task 3.4.7 – Long lead component procurement – Unit #8
Task 3.4.8 – Standard component procurement – Unit #8
Task 3.4.9 – Vehicle assembly – Unit #8
Task 3.4.10 – Long lead component procurement – Unit #9
Task 3.4.11 – Standard component procurement – Unit #9
Task 3.4.12 – Vehicle assembly – Unit #9
Task 3.4.13 – Long lead component procurement – Unit #10
Task 3.4.14 – Standard component procurement – Unit #10
Task 3.4.15 – Vehicle assembly – Unit #10

Task 3.5 Demonstration Preparation, Service, and Support, (January 2019 – December 2020)

Key emergency, operations, and maintenance personnel will be given training prior to the demonstration period to ensure safe operation and emergency response. Telemetry data from the vehicles will be monitored along with regular follow up with the operators to assure proper vehicle operation. Throughout the demonstration period, the operating fleet size will be changing as new vehicles are brought into service and others are taken out of service for checkups and enhancements. During this period each vehicle will operate for a minimum of 3 months with a targeted average operating term of 6 months.

Task 3.5.1 – Emergency services training
Task 3.5.2 – Operator and support training

Task 3.5.3 – Truck operation/support – 3Q 2019
Task 3.5.4 – Truck operation/support – 4Q 2019
Task 3.5.5 – Truck operation/support – 1Q 2020
Task 3.5.6 – Truck operation/support – 2Q 2020
Task 3.5.7 – Truck operation/support – 3Q 2020
Task 3.5.8 – Truck operation/support – 4Q 2020

Task 3.0 Deliverables:

Task 3.1 deliverables – PDF copies of the vehicle layout, powertrain architecture, and simulation model (3.1.1), vehicle performance forecast report (3.1.2), design review summary (3.1.2), chassis build paper (3.1.3).

Task 3.2 deliverables – invoices for long lead components (3.2.1, 3.2.4, 3.2.7), invoices for standard lead components (3.2.2, 3.2.5, 3.2.8), pictures of completed vehicles (3.2.3, 3.2.6, 3.2.9).

Task 3.3 deliverables – vehicle transport to track test facility (3.3.1, 3.3.4, 3.3.7), vehicle transport to field test location (3.3.2, 3.3.5, 3.3.8, 3.3.10, 3.3.12), vehicle transport to in service holding location (3.3.3, 3.3.6, 3.3.9, 3.3.11, 3.3.13).

Task 3.4 deliverables – invoices for long lead components (3.4.1, 3.4.4, 3.4.7. 3.4.10, 3.4.13), invoices for standard lead components (3.4.2, 3.4.5, 3.4.8, 3.4.11, 3.4.14), pictures of completed vehicles (3.4.3, 3.4.6, 3.4.9, 3.4.12, 3.4.15).

Task 3.5 deliverables – training rosters (3.5.1, 3.5.2), vehicle operation report (3.5.3, 3.5.4, 3.5.5, 3.5.6, 3.5.7, 3.5.8).

Task 4.0 Yard Tractors and Charging Infrastructure
(Q4 2018 – Q4 2020)

Task 4.1 Engineering and Design (Dec 2018 – May 2019)
The charging infrastructure to support two battery electric zero-emissions yard tractors will be designed and engineering to meet the operational needs at the Port of Hueneme.

Task 4.2 Infrastructure Bid Process (May 2019 – July 2019)
The infrastructure installation contractor will be selected to execute the construction and installation of the electric charging equipment.

Task 4.3 Utility Permitting and Construction (Jan 2019 – June 2020)
The Port of Hueneme will work with Southern California Edison to permit and construct the required electric infrastructure to support the charging equipment.

Task 4.4 Site Construction and Commissioning (July 2019 – Aug 2020)
All electric charging parts and equipment will be procured, installed, and commissioned.

Task 4.5 Yard Truck Delivery (July 2020 – Aug 2020)
Two battery electric yard tractors will be delivered to the Port of Hueneme to begin demonstration.

Task 4.0 Deliverables:
4.2 Bid awarded to contractor
4.4. Electric charging equipment received

4.5 Two battery electric yard trucks are received

Task 5.0 Technology Demonstration – All End Users
(Q3 2019 – Q1 2021)

Task 5.1 Truck Fleet Demonstrations (Q3 2019 – Q4 2020)
10 prototype Class 8 FCETs will be operated in revenue service by 4 fleet operators (UPS, TTSI, Toyota Transport, and SCE) over a variety of drayage and regional routes across Southern California. Kenworth and Toyota will support the vehicles over the demonstration period with training, operational, and maintenance support(Task 3.5). During this period, each vehicle will operate for a minimum of 3 months with a targeted average operating term of 6 months.

Task 5.1.1 – Phase 1 demonstration of the first 5 trucks will feature 4 trucks operated by TLS and 1 truck with SCE. The focus will be on drayage and local routes.

Task 5.1.2 – Phase 2 demonstration of the second 5 trucks will feature 3 trucks operated by UPS and 2 trucks operated by TTSI. Routes will include both drayage and regional routes supported by station network expansion to the Inland Empire.

Task 5.2 Yard Tractors Demonstration (Q3 2020 – Q1 2021)
Two battery electric yard tractors will be demonstrated in revenue service at the Port of Hueneme.

Task 5.3 Forklifts Demonstration (Q3 2019 – Q4 2020)
Two battery electric forklifts will operate in revenue service at the Toyota Logistics Services warehouse in the Port of Long Beach.

Task 5.0 Deliverables:
NREL has confirmed receipt for at least 3 months of collected data per piece of equipment, but the target is for an average of 6 months per equipment (5.1.1, 5.1.2, 5.2, 5.3)

Task 6.0 Data Collection and Analysis –Third Party Data Contractor NREL
(3Q 2019 – 1Q 2021)

Task 6.1 Data Collection
On-board data collection devices will be installed on the demonstration and baseline vehicles to capture appropriate and necessary data from the vehicles for the length of the test. Kenworth will provide loggers for their demonstration vehicles, while NREL will provide loggers for the other demonstration and baseline vehicles. Electrical and hydrogen infrastructure hardware associated with the ZANZEFF vehicles will also be instrumented by vehicle manufactures, fleet or infrastructure service provider (if not available on vehicle datalogger) as needed with appropriate data loggers to provide electrical and hydrogen energy use data. Data to be captured by vehicle original equipment manufacturers (OEMs) and/or infrastructure operators will meet the parameters defined in Appendix F. Frequency of data transmission from vehicles and infrastructure to data servers will depend on file size. NREL's existing electronic data collection and analysis system will be used to automate uploads and filter and convert files into NREL's Fleet Analysis Toolkit, which will be used to process the data and provide summary reports described in later tasks. NREL's in-house data processing capabilities include:

- Automated, secure data transfer from Vector loggers to NREL's secure commercial fleet data center
- 25 TB of data storage arrays and tape backup
- NREL's Fleet Analysis Toolkit (described earlier in this section)

Trucks will be equipped with a data logger which records GPS and CAN data. The data collection will include GPS, fuel efficiency (miles/kWh), battery state-of-charge (SOC), mileage/odometer readings, runtime, idle time, battery temperature, speed, charging current/voltage, and ambient conditions.

Monthly maintenance, safety, and operation cost data/records will be supplied by fleet operations or manufactures on all test vehicles and associated infrastructure.

Field data collection will be sufficient to meet the requirements from Appendix F as described below.

- **Vehicle Specification:** These will be recorded for each test vehicle including manufacturer, model, model year, gross vehicle weight, fuel capacity, and fuel proposal system.
- **Vehicle / Equipment Performance:** A combination of on-board and off-board vehicle data will be collected to characterize miles between road calls, number of road calls, battery degradation, vehicle availability, and zero emissions range.
- **Fuel / Energy Consumption:** Using a combination of vehicle data, refueling logs, and infrastructure information, summary statistics will be calculated including fuel/electricity use, fuel price, refueling SOC, refueling/charging time, distance to refueling/charging, refueling/charging source, load shifting potential, fueling/charging frequency, fuel efficiency, idle fuel energy use, and all-electric range/average electric range for HEVs.
- **Maintenance (Vehicle and Infrastructure):** Monthly logs of maintenance, which NREL will consolidate with the data set. These will include the type of maintenance (schedule, unscheduled, configuration change) and the repairs done. Data will include date, description of problem, repair performance, parts replaces, cost of parts, costs of labor, and odometer reading. Repair records will also be kept for any fueling/charging infrastructure maintenance required.
- **Service calls:** Detailed logs will be kept for all required service calls including date, length of repair, description of problem, repair performed, pars replaced, odometer reading, time out of service, response time.
- **Emission testing:** Only zero emission vehicles will be tested during this project. Therefore, emissions tests will not be necessary. Standard emission certification and analysis will be used to determine emissions over cycles.
- **Costs**
  - Capital costs for advanced technology vehicles and vehicle upgrades will be reported. Infrastructure/facility costs for fueling/charging and maintenance bay will be reported.
  - Operating costs will be tracked for both baseline and advanced technology vehicles. This will include maintenance costs for both vehicles and infrastructure.
- **User and fleet experience:** User/fleet experience will be quantified through a user survey. This will include questions related to vehicle availability, performance (power and energy) to meet operation demands, operation and maintenance challenges, part availability, perceived safety, refueling experience, and other barriers.
- **Facilities performance:** This will be quantified through data collection on facility electrical demand and/or emissions.

Task 6.2 Data Analysis

NREL will apply its set of data and analysis tools to both consolidate the data and provide analysis reports.

6.2.1 On-road data: Analysis of on-road data collected from loggers will be provided on a quarterly basis and will include, but not limited to:

- Vehicle efficiency by trip
- Cargo ton-mile/energy unit

- Fuel consumption
- Charging and refueling profiles (including times, durations, and amounts)
- Vehicle usage, route profiles & drive characteristics
- Miles driven (total and per trip)
- Time spent charging (per vehicle)
- Start and End SOC
- Charge efficiency / electrical energy efficiency through drivetrain
- Fuel cell & battery durability
- Hydrogen refueling efficiency and usage information
- Fuel efficiency
- Drive cycle cycle-versus-range calculations
- Idle time statistics
- Driveline temperatures
- Air conditioning/auxiliary load impacts
- Effective vehicle range calculations (efficiency and SOC observations)
- Voltage transients in battery pack
- Estimated cost savings versus baseline

Example reports from similar projects can be found on NREL's Fleet DNA website: *https://www.nrel.gov/transportation/fleettest-fleet-dna.html*

6.2.2 Operations and maintenance data collected from fleets will be processed using NREL's data analysis protocols. The analysis will be performance and reported on a quarterly basis and will include, but not limited to:

- Mileage accumulation
- Fuel and energy usage as reported by fleet
- Maintenance cost per mile (part costs and labor hours)
- Maintenance cost per day
- Maintenance cost details by vehicle system (propulsion and energy storage)
- Scheduled vs unscheduled maintenance costs
- Total vehicle operating costs (maintenance and fuel)
- Reliability/uptime analysis
- Infrastructure operating and capital costs.

Task 6.3 Advanced Data Analytics

Going beyond standard data analysis and reports in Task 5.2, advanced data analytic methods will be applied to provide insight and learning from the data collected. Methods such as advanced clustering, non-linear classification or regression, operational feature construction, geospatial analysis, and Lagrangian hotspot analysis will be explored to expand understanding of vehicle operation and performance and further inform vehicle design as well as identify opportunities for infrastructure improvements. The data analysis task above will help inform selection of the most appropriate advanced analytics methods to apply. As one example, Lagrangian hotspot analysis could be used to evaluate spatiotemporal energy consumption allowing us to identify geospatial influences and variations in vehicle energy use. Such analysis could help identify performance impacts and environmental variables that produce anomalous operation.

Task 6.0 Deliverables: Electronic data in the format required by ARB, quarterly data reports, final data analysis report.

ATTACHMENT 3: EMISSION REDUCTION AND COST-EFFECTIVENESS CALCULATIONS

Below is a detailed GHG and criteria pollutant emission reduction and cost-effectiveness evaluation for the Zero-Emission Shore-to-Store Project, based on ARB's Appendix D Guidance document entitled: "Methodology for Determining Emission Reductions and Cost-Effectiveness." Baseline equipment specifications are based on real-world operation of the partner fleet vehicles and equipment, layered with ARB's required use of current technology to establish the baseline engine certification (i.e., Tier 4 off-road or 2017 MY on-road engines). Since the primary objective of this project is to demonstrate zero-emission operation over the entirety of our partners' operational shifts, the project team projects 100% of the baseline emissions will be offset by the proposed advanced zero-emission technologies.

For this project benefits evaluation, there are 14 units consisting of three ZE equipment types, as follows:

I. Ten (10) Class 8 heavy-duty trucks that will be operated across the air basin by our fleet partners.
II. Two (2) on-terminal yard trucks/tractors at the Port of Hueneme; and
III. Two (2) Industrial Forklifts at Toyota Logistics Services.

Detailed calculations following ARB's step-by-step methodology[17] for each of the three project elements are summarized in Table 3-1 and provided below. NOTE: There are 25 zero-and near-zero emission yard tractors that will operate at POLA's Everport terminal as part of this demonstration. Since this equipment is financially supported by CEC grant funding, *no* emission reductions are being attributed for the S2S project from the Everport equipment, and therefore these units are not included in the below analysis.

Term Over Which Reductions are Estimated	Emission Type	Ten (10) Fuel Cell Electric Class 8 Trucks	Two (2) ZE Yard Tractors	Two (2) ZE Industrial Forklift	Total Reductions
Annual Reductions Per Unit	GHG (metric tonnes CO2e)	74.66	23.41	22.29	120.36
	NOx (tons)	0.038	0.0629	0.0364	0.1373
	ROG (tons)	0.002	0.0145	0.0012	0.0177
	PM10 (tons)	0.002	0.0022	0.0001	0.0043
	WER (tons)	0.08	0.1214	0.04	0.241
Annual Reductions for Total Fleet (by Type)	GHG (metric tonnes CO2e)	746.6	46.82	44.58	838.0
	NOx (tons)	0.380	0.1258	0.0728	0.5786
	ROG (tons)	0.02	0.029	0.0024	0.0514
	PM10 (tons)	0.02	0.0044	0.0002	0.0246
	WER (tons)	0.80	0.2428	0.0792	1.122
ACTUAL Reductions for Total Fleet (by Type) for the Demonstration Period**	**GHG (metric tonnes CO2e)**	**373.3**	**46.82**	**44.58**	**465**
	NOx (tons)	**0.19**	**0.1258**	**0.0728**	**0.39**
	ROG (tons)	**0.01**	**0.029**	**0.0024**	**0.04**
	PM10 (tons)	**0.01**	**0.0044**	**0.0002**	**0.015**
	WER (tons)	**0.4**	**0.2428**	**0.0792**	**0.72**

[17] Note that ARB's Solicitation document (page 33) provides guidance to use a 5-year life for equipment cost-effectiveness, but that both the Appendix A guidance and Appendix D methodology require a 10-year life analysis for equipment. POLA provides both 5- and 10-year terms (as well as the 2-year) for this analysis, in order to strictly adhere to ARB Solicitation requirements.

I. Kenworth Fuel Cell Electric Class 8 Heavy-Duty Trucks

Description of Baseline Class 8 Truck:

- Off-Road diesel on-road Class 8 Truck, equipped with 2017 MY engine
- Operation: 200 mi/day; 280 day/year; 10,000 diesel gallons per year
- Equipment cost at demonstration: $175,000
- Equipment cost two years after demonstration: $256,000

Description of Zero-Emission HFCT:

- Hydrogen Fuel Cell Electric Class 8 Truck
- Energy requirements during demonstration operation: 100% H2
- Equipment cost at demonstration: $1,300,000
- Equipment cost two years after demonstration: $1,000,000

Carbon Intensity (CI)

From Appendix D - Table II-2: Fuel Carbon Intensity Values

$CI_{diesel} = \frac{102.01\ gCO2e}{MJ}$ for table pathway identifier ULSD001

$CI_{hydrogen} = \frac{88.33\ gCO2e}{MJ}$ for table pathway identifier HYGN005

Energy Density (ED)

From Appendix D - Table II-1: Fuel Energy Density

$ED_{diesel} = \frac{134.47 MJ}{gal\ diesel}$

$ED_{hydrogen} = \frac{119.99\ MJ}{kg\ H2}$

Energy Efficiency Ratio (EER)

Appendix D - Table II-3: EER Values for Fuels Used in LD, MD and HD Applications

$ERR_{hydrogen} = 1.9$

Calculations for the HFCT:

STEP 1: Convert diesel used per year to the amount of electricity to do the same work using Formula 3 and the above variables:

$$Replacement\ Fuel\ Usage\ \left(\frac{kg\ H2}{yr}\right) = \left(\frac{10{,}000\ gal\ diesel}{year}\right) * \left(\frac{134.47\ MJ}{1\ gal\ diesel}\right) * \left(\frac{1\ kg\ H2}{119.99\ MJ}\right) * \left(\frac{1}{1.9}\right)$$

$$= \mathbf{5{,}898.3}\ \left(\frac{\mathbf{kg\ H2}}{\mathbf{yr}}\right)$$

STEP 2: Determine the GHG emissions that are attributed to the baseline diesel-fueled Equipment, using Formula 1 and the above variables:

$$GHG\ EF_{base} = \frac{102.01\ g\ CO_2e}{MJ} * \frac{134.47\ MJ}{gal\ diesel} * \frac{10{,}000\ gal}{year} * \frac{1\ metric\ ton\ CO_2e}{1{,}000{,}000\ grams}$$

$$= \mathbf{137.17}\ \frac{\mathbf{metric\ tons\ CO_2e}}{\mathbf{year}}$$

STEP 3: Similarly, determine the GHG emissions that are attributed to the Advanced Technology Equipment (ATE):

$$GHG\ EF_{adv\ tech} = \frac{88.33\ g\ CO_2e}{MJ} * \frac{119.99\ MJ}{kg\ H2} * \frac{5{,}898.3\ kWh}{year} * \frac{1\ metric\ ton\ CO_2e}{1{,}000{,}000\ grams}$$

$$= \mathbf{62.51\ \frac{metric\ tons\ CO_2e}{year}}$$

STEP 4: Determine the GHG emissions reductions that are associated with the proposed project using Formula 4, populated by results from Step 2 and Step 3 above:

$$Project\ GHG\ ER_{annual} = GHG\ EF_{base} - GHG\ EF_{adv\ tech}$$

$$= \frac{137.17\ metric\ tons\ CO_2e}{year} - \frac{62.51\ metric\ tons\ CO_2e}{year} = \mathbf{\frac{74.66\ metric\ tons\ CO_2e}{year}}$$

STEP 5: Determine the annual criteria and toxic air pollutant emission reductions (ER) for this equipment. The Equipment will be used 100% of the time in California. There are no criteria pollutant emissions associated with the use of the battery-electric Equipment. Baseline emission factors based on Tier 4 Final criteria pollutant emission standards (Table IV-7), Load Factor of 0.65 (Table IV-5) and operational data provided above, then apply to Formula 13:

$$NO_x = 3.44\ \frac{g\ NO_x}{gallon};\ ROG = 0.18\ \frac{g\ ROG}{gallon};\ PM_{10} = 0.148\ \frac{g\ PM_{10}}{gallon}$$

$$\mathbf{Annual\ ER_{NO_x}}$$
$$= \frac{3.44\ g\ NO_x}{gallon} * \frac{10{,}000\ gallon}{year} * 100\% * \frac{1\ ton}{907{,}200\ g} = \mathbf{\frac{0.038\ ton\ NO_x}{year}}$$

$$\mathbf{Annual\ ER_{ROG}}$$
$$= \frac{0.18\ g\ ROG}{gallon} * \frac{10{,}000\ gallon}{year} * 100\% * \frac{1\ ton}{907{,}200\ g} = \mathbf{\frac{0.002\ ton\ ROG}{year}}$$

$$\mathbf{Annual\ ER_{PM_{10}}}$$
$$= \frac{0.148\ g\ PM_{10}}{gallon} * \frac{10{,}000\ hour}{year} * 100\% * \frac{1\ ton}{907{,}200\ g} = \mathbf{\frac{0.002\ ton\ PM_{10}}{year}}$$

STEP 6: Determine the weighted annual surplus emission reductions (WER) that are associated with the proposed project using the results from Step 5 above and Formula 11:

$$Equipment\ WER = Annual\ ER_{NO_x} + Annual\ ER_{ROG} + 20 * (Annual\ ER_{PM_{10}})$$

$$= \frac{0.038\ ton\ NO_x}{year} + \frac{0.002\ ton\ ROG}{year} + (20 * \frac{0.002\ ton\ PM_{10}}{year}) = \mathbf{\frac{0.08\ ton}{year}}$$

STEP 7: Determine the incremental cost of the proposed technology using Formula 10 and the baseline and advanced technology equipment costs. Cost effectiveness is calculated for *two* scenarios: (1) two-year project term based on costs at the time of demonstration, and (2) ten-year project term, with costs projected two years after the completion of the demonstration project.

$$Incremental\ Cost = Cost\ of\ New\ Tech - Cost\ of\ Baseline\ Tech$$
$$Incremental\ Cost_{2\ years} = \$1{,}300{,}000 - \$175{,}000 = \$1{,}125{,}000$$
$$Incremental\ Cost_{10\ years} = \$1{,}000{,}000 - \$256{,}000 = \$744{,}000$$

STEP 8: Determine the GHG emission reduction cost effectiveness (CE) for the proposed project using Formula 5 and results from Step 4 and Step 7, where CRF = Capitol Recovery Factor:

$$GHG\ CE = \frac{CRF * Incremental\ Cost}{GHG\ ER_{annual}}$$

$CRF_2 = 0.508$ and $CRF_{10} = 0.106$ per Table IV-24 (2 and 10-year lives, respectively)

$$GHG\ CE_2 = \frac{\frac{0.508 * \$1{,}125{,}000}{year}}{\frac{74.66\ metric\ tons\ CO_2e}{year}} = \frac{\$7{,}655}{\boldsymbol{metric\ ton\ CO_2e}}$$

$$GHG\ CE_{10} = \frac{\frac{0.106 * \$744{,}000}{year}}{\frac{74.66\ metric\ tons\ CO_2e}{year}} = \frac{\$1{,}056}{\boldsymbol{metric\ ton\ CO_2e}}$$

STEP 9: Determine the criteria pollutant cost effectiveness for the proposed technology using Formula 8 and the results from Steps 6 and 7:

$$Cost - effectiveness\ (\frac{\$}{ton}) = \frac{CRF * Incremental\ Cost}{WER}$$

$$WER\ Cost - effectiveness\ (@\ 2\ year\ term) = \frac{\frac{0.508 * \$1{,}125{,}000}{year}}{\frac{0.08\ ton}{year}} = \frac{\$7{,}143{,}750}{\boldsymbol{weighted\ tons}}$$

$$WER\ Cost - effectiveness\ (@\ 10\ year\ term) = \frac{\frac{0.106 * \$744{,}000}{year}}{\frac{0.08\ ton}{year}} = \frac{\$985{,}800}{\boldsymbol{weighted\ tons}}$$

II. Port of Hueneme Battery-Electric Yard Tractors

Description of Baseline Diesel Yard Tractor:

- Off-Road diesel on-terminal Yard Truck/Tractor: Tier-4 certification
- Engine rating: 241 horsepower (hp)

- Operation: 1,400 hours per year; 2,100 diesel gallons per year
- Load Factor for Cargo Handling Yard Truck/Tractor: 0.65 (Table IV-5)
- Equipment cost at demonstration: $115,000
- Equipment cost two years after demonstration: $128,800

Description of Zero-Emission Yard Tractor:

- Battery-electric Yard Tractor charged via grid power
- Energy requirements during demonstration operation: 100% on electricity
- Equipment cost at demonstration: $300,000
- Equipment cost two years after demonstration: $250,000

Carbon Intensity (CI)

From Appendix D - Table II-2: Fuel Carbon Intensity Values

$CI_{diesel} = \frac{102.01\ gCO2e}{MJ}$ for table pathway identifier ULSD001

$CI_{electricity} = \frac{105.16\ gCO2e}{MJ}$ for table pathway identifier ELC001

Energy Density (ED)

From Appendix D - Table II-1: Fuel Energy Density

$ED_{diesel} = \frac{134.47 MJ}{gal\ diesel}$

$ED_{electricity} = \frac{3.60\ MJ}{kWh}$

Energy Efficiency Ratio (EER)

Appendix D - Table II-3: EER Values for Fuels Used in LD, MD and HD Applications

$EER_{electric\ vehicle\ or\ equipment} = 5.5$

Calculations for the ZE Yard Tractor:

STEP 1: Convert diesel used per year to the amount of electricity to do the same work using Formula 3 and the above variables:

$$Replacement\ Fuel\ Usage\ \left(\frac{kWh}{yr}\right) = \left(\frac{2{,}100\ gal\ diesel}{year}\right) * \left(\frac{134.47\ MJ}{1\ gal\ diesel}\right) * \left(\frac{1\ kWh}{3.6\ MJ}\right) * \left(\frac{1}{5.5}\right)$$

$$= \mathbf{14{,}262}\ \left(\frac{\mathbf{kWh}}{\mathbf{yr}}\right)$$

STEP 2: Determine the GHG emissions that are attributed to the baseline diesel-fueled Equipment, using Formula 1 and the above variables:

$$GHG\ EF_{base} = \frac{102.01\ g\ CO_2e}{MJ} * \frac{134.47\ MJ}{gal\ diesel} * \frac{2{,}100\ gal}{year} * \frac{1\ metric\ ton\ CO_2e}{1{,}000{,}000\ grams}$$

$$= \mathbf{28.81}\ \frac{\mathbf{metric\ tons\ CO_2e}}{\mathbf{year}}$$

STEP 3: Similarly, determine the GHG emissions that are attributed to the Advanced Technology Equipment (ATE):

$$GHG\ EF_{adv\ tech} = \frac{105.16\ g\ CO_2e}{MJ} * \frac{3.60\ MJ}{kWh} * \frac{14{,}262\ kWh}{year} * \frac{1\ metric\ ton\ CO_2e}{1{,}000{,}000\ grams}$$

$$= 5.40 \frac{\textbf{metric tons } CO_2e}{\textbf{year}}$$

STEP 4: Determine the GHG emissions reductions that are associated with the proposed project using Formula 4, populated by results from Step 2 and Step 3 above:

$$Project\ GHG\ ER_{annual} = GHG\ EF_{base} - GHG\ EF_{adv\ tech}$$

$$= \frac{28.81\ metric\ tons\ CO_2e}{year} - \frac{5.40\ metric\ tons\ CO_2e}{year} = \frac{\textbf{23.41 metric tons } CO_2e}{\textbf{year}}$$

STEP 5: Determine the annual criteria and toxic air pollutant emission reductions (ER) for this equipment. The Equipment will be used 100% of the time in California. There are no criteria pollutant emissions associated with the use of the battery-electric Equipment. Baseline emission factors based on Tier 4 Final criteria pollutant emission standards (Table IV-7), Load Factor of 0.65 (Table IV-5) and operational data provided above, then apply to Formula 13:

$$NO_x = 0.26 \frac{g\ NO_x}{bhp-hr};\ ROG = 0.06 \frac{g\ ROG}{bhp-hr};\ PM_{10} = 0.009 \frac{g\ PM_{10}}{bhp-hr}$$

$$\textbf{Annual } ER_{NO_x}$$
$$= \frac{0.26\ g\ NO_x}{bhp-hr} * \frac{1{,}400\ hour}{year} * 241\ hp * 0.65 * 100\% * \frac{1\ ton}{907{,}200\ g} = \frac{\textbf{0.0629 ton } NO_x}{\textbf{year}}$$

$$\textbf{Annual } ER_{ROG}$$
$$= \frac{0.06\ g\ ROG}{bhp-hr} * \frac{1{,}400\ hour}{year} * 241\ hp * 0.65 * 100\% * \frac{1\ ton}{907{,}200\ g} = \frac{\textbf{0.0145 ton ROG}}{\textbf{year}}$$

$$\textbf{Annual } ER_{PM_{10}}$$
$$= \frac{0.009\ g\ PM_{10}}{bhp-hr} * \frac{1{,}400\ hour}{year} * 241\ hp * 0.65 * 100\% * \frac{1\ ton}{907{,}200\ g} = \frac{\textbf{0.0022 ton } PM_{10}}{\textbf{year}}$$

STEP 6: Determine the weighted annual surplus emission reductions (WER) that are associated with the proposed project using the results from Step 5 above and Formula 11:

$$Equipment\ WER = Annual\ ER_{NO_x} + Annual\ ER_{ROG} + 20 * (Annual\ ER_{PM_{10}})$$

$$= \frac{0.0629\ ton\ NO_x}{year} + \frac{0.0145\ ton\ ROG}{year} + (20 * \frac{0.0022\ ton\ PM_{10}}{year}) = \frac{\textbf{0.1214 ton}}{\textbf{year}}$$

STEP 7: Determine the incremental cost of the proposed technology using Formula 10 and the baseline and advanced technology equipment costs. Cost effectiveness is calculated for *three* scenarios: (1) two-year project term based on costs at the time of demonstration, (2) ten-year project term, with costs projected two years after the completion of the demonstration project, and (3) five-year project team, at the same costs of ten-year term, as required by the ARB Solicitation, Page 43 (see details for Evaluation Criterion #6).

$$Incremental\ Cost\ = Cost\ of\ New\ Tech - Cost\ of\ Baseline\ Tech$$

$$Incremental\ Cost_{2\ years} = \$300{,}000 - \$115{,}000 = \textbf{\$185,000}$$
$$Incremental\ Cost_{5\ years} = \$250{,}000 - \$128{,}800 = \textbf{\$121,200}$$
$$Incremental\ Cost_{10\ years} = \$250{,}000 - \$128{,}800 = \textbf{\$121,200}$$

STEP 8: Determine the GHG emission reduction cost effectiveness (CE) for the proposed project using Formula 5 and results from Step 4 and Step 7, where CRF = Capitol Recovery Factor:

$$GHG\ CE = \frac{CRF * Incremental\ Cost}{GHG\ ER_{annual}}$$

$CRF_2 = 0.508$, $CRF_5 = 0.206$, and $CRF_{10} = 0.106$ per Table IV-24 (2, 5 and 10-year lives, respectively)

$$GHG\ CE_2 = \frac{\frac{0.508 * \$185{,}000}{year}}{\frac{23.41\ metric\ tons\ CO_2e}{year}} = \frac{\mathbf{\$4{,}015}}{\mathbf{metric\ ton\ CO_2e}}$$

$$GHG\ CE_5 = \frac{\frac{0.206 * \$121{,}200}{year}}{\frac{23.41\ metric\ tons\ CO_2e}{year}} = \frac{\mathbf{\$1{,}067}}{\mathbf{metric\ ton\ CO_2e}}$$

$$GHG\ CE_{10} = \frac{\frac{0.106 * \$121{,}200}{year}}{\frac{23.41\ metric\ tons\ CO_2e}{year}} = \frac{\mathbf{\$549}}{\mathbf{metric\ ton\ CO_2e}}$$

STEP 9: Determine the criteria pollutant cost effectiveness for the proposed technology using Formula 8 and the results from Steps 6 and 7:

$$Cost - effectiveness\ (\frac{\$}{ton}) = \frac{CRF * Incremental\ Cost}{WER}$$

$$WER\ Cost - effectiveness\ (@\ 2\ year\ term) = \frac{\frac{0.508 * \$185{,}000}{year}}{\frac{0.1214\ ton}{year}} = \frac{\mathbf{\$774{,}135}}{\mathbf{weighted\ tons}}$$

$$WER\ Cost - effectiveness\ (@\ 5\ year\ term) = \frac{\frac{0.206 * \$121{,}200}{year}}{\frac{0.1214\ ton}{year}} = \frac{\mathbf{\$205{,}661}}{\mathbf{weighted\ tons}}$$

$$WER\ Cost - effectiveness\ (@\ 10\ year\ term) = \frac{\frac{0.106 * \$121{,}200}{year}}{\frac{0.1214\ ton}{year}} = \frac{\mathbf{\$105{,}825}}{\mathbf{weighted\ tons}}$$

III. Toyota Logistics Services Battery-Electric Industrial Forklift

Description of Baseline Forklift:

- Off-Road diesel Industrial Forklift: Tier-4 certification
- Engine rating: 30 horsepower (hp)
- Operation: 2,000 hours per year; 2000 diesel gallons per year
- Load Factor for Industrial Forklift: 0.2 (Table IV-5)
- Equipment cost at demonstration: $20,000
- Equipment cost two years after demonstration: $22,500

Description of Zero-Emission Forklift:

- Battery-electric Industrial Forklift charged via grid power
- Energy requirements during demonstration operation: 100% on electricity
- Equipment cost at demonstration: $25,000
- Equipment cost two years after demonstration: $23,000

Carbon Intensity (CI)

From Appendix D - Table II-2: Fuel Carbon Intensity Values

$CI_{diesel} = \frac{102.01\ gCO2e}{MJ}$ for table pathway identifier ULSD001

$CI_{electricity} = \frac{105.16\ gCO2e}{MJ}$ for table pathway identifier ELC001

Energy Density (ED)

From Appendix D - Table II-1: Fuel Energy Density

$ED_{diesel} = \frac{134.47 MJ}{gal\ diesel}$

$ED_{electricity} = \frac{3.60\ MJ}{kWh}$

Energy Efficiency Ratio (EER)

Appendix D - Table II-3: EER Values for Fuels Used in LD, MD and HD Applications

$EER_{electric\ vehicle\ or\ equipment} = 5.5$

Calculations for the Forklift:

STEP 1: Convert diesel used per year to the amount of electricity to do the same work using Formula 3 and the above variables:

$$Replacement\ Fuel\ Usage\ \left(\frac{kWh}{yr}\right) = \left(\frac{2{,}000\ gal\ diesel}{year}\right) * \left(\frac{134.47\ MJ}{1\ gal\ diesel}\right) * \left(\frac{1\ kWh}{3.6\ MJ}\right) * \left(\frac{1}{5.5}\right)$$

$$= 13{,}583\ \left(\frac{kWh}{yr}\right)$$

STEP 2: Determine the GHG emissions that are attributed to the baseline diesel-fueled Equipment, using Formula 1 and the above variables:

$$GHG\ EF_{base} = \frac{102.01\ g\ CO_2e}{MJ} * \frac{134.47\ MJ}{gal\ diesel} * \frac{2{,}000\ gal}{year} * \frac{1\ metric\ ton\ CO_2e}{1{,}000{,}000\ grams}$$
$$= \mathbf{27.43}\ \frac{\mathbf{metric\ tons\ CO_2e}}{\mathbf{year}}$$

STEP 3: Similarly, determine the GHG emissions that are attributed to the Advanced Technology Equipment (ATE):

$$GHG\ EF_{adv\ tech} = \frac{105.16\ g\ CO_2e}{MJ} * \frac{3.60\ MJ}{kWh} * \frac{13{,}583\ kWh}{year} * \frac{1\ metric\ ton\ CO_2e}{1{,}000{,}000\ grams}$$
$$= \mathbf{5.14}\ \frac{\mathbf{metric\ tons\ CO_2e}}{\mathbf{year}}$$

STEP 4: Determine the GHG emissions reductions that are associated with the proposed project using Formula 4, populated by results from Step 2 and Step 3 above:

$$Project\ GHG\ ER_{annual} = GHG\ EF_{base} - GHG\ EF_{adv\ tech}$$
$$= \frac{27.43\ metric\ tons\ CO_2e}{year} - \frac{5.14\ metric\ tons\ CO_2e}{year} = \frac{\mathbf{22.29\ metric\ tons\ CO_2e}}{\mathbf{year}}$$

STEP 5: Determine the annual criteria and toxic air pollutant emission reductions (ER) for this equipment. The Equipment will be used 100% of the time in California. There are no criteria pollutant emissions associated with the use of the battery-electric Equipment. Baseline emission factors based on Tier 4 Final criteria pollutant emission standards (Table IV-7), Load Factor of 0.2 (Table IV-5) and operational data provided above, then apply to Formula 13:

$$NO_x = 2.75\ \frac{g\ NO_x}{bhp-hr};\ ROG = 0.09\ \frac{g\ ROG}{bhp-hr};\ PM_{10} = 0.009\ \frac{g\ PM_{10}}{bhp-hr}$$

$$\mathbf{Annual\ ER_{NO_x}}$$
$$= \frac{2.75\ g\ NO_x}{bhp-hr} * \frac{2{,}000\ hour}{year} * 30\ hp * 0.2 * 100\% * \frac{1\ ton}{907{,}200\ g} = \frac{\mathbf{0.0364\ ton\ NO_x}}{\mathbf{year}}$$

$$\mathbf{Annual\ ER_{ROG}}$$
$$= \frac{0.09\ g\ ROG}{bhp-hr} * \frac{2{,}000\ hour}{year} * 30\ hp * 0.2 * 100\% * \frac{1\ ton}{907{,}200\ g} = \frac{\mathbf{0.0012\ ton\ ROG}}{\mathbf{year}}$$

$$\mathbf{Annual\ ER_{PM_{10}}}$$
$$= \frac{0.009\ g\ PM_{10}}{bhp-hr} * \frac{2{,}000\ hour}{year} * 30\ hp * 0.2 * 100\% * \frac{1\ ton}{907{,}200\ g} = \frac{\mathbf{0.0001\ ton\ PM_{10}}}{\mathbf{year}}$$

STEP 6: Determine the weighted annual surplus emission reductions (WER) that are associated with the proposed project using the results from Step 5 above and Formula 11:

$$Equipment\ WER = Annual\ ER_{NO_x} + Annual\ ER_{ROG} + 20 * (Annual\ ER_{PM_{10}})$$

$$= \frac{0.0364\ ton\ NO_x}{year} + \frac{0.0012\ ton\ ROG}{year} + (20 * \frac{0.0001\ ton\ PM_{10}}{year}) = \mathbf{\frac{0.0396\ ton}{year}}$$

STEP 7: Determine the incremental cost of the proposed technology using Formula 10 and the baseline and advanced technology equipment costs. Cost effectiveness is calculated for *three* scenarios: (1) two-year project term based on costs at the time of demonstration, (2) ten-year project term, with costs projected two years after the completion of the demonstration project, and (3) five-year project team, at the same costs of ten-year term, as required by the ARB Solicitation, Page 43 (see details for Evaluation Criterion #6).

$$Incremental\ Cost\ = Cost\ of\ New\ Tech - Cost\ of\ Baseline\ Tech$$
$$Incremental\ Cost_{2\ years} = \$25{,}000 - \$20{,}000 = \mathbf{\$5{,}000}$$
$$Incremental\ Cost_{5\ years} = \$23{,}000 - \$22{,}500 = \mathbf{\$500}$$
$$Incremental\ Cost_{10\ years} = \$23{,}000 - \$22{,}500 = \mathbf{\$500}$$

STEP 8: Determine the GHG emission reduction cost effectiveness (CE) for the proposed project using Formula 5 and results from Step 4 and Step 7, where CRF = Capitol Recovery Factor:

$$GHG\ CE = \frac{CRF * Incremental\ Cost}{GHG\ ER_{annual}}$$

$CRF_2 = 0.508$, $CRF_5 = 0.206$, and $CRF_{10} = 0.106$ per Table IV-24 (2, 5 and 10-year lives, respectively)

$$GHG\ CE_2 = \frac{\frac{0.508 * \$5{,}000}{year}}{\frac{22.29\ metric\ tons\ CO_2e}{year}} = \mathbf{\frac{\$114}{metric\ ton\ CO_2e}}$$

$$GHG\ CE_5 = \frac{\frac{0.206 * \$500}{year}}{\frac{22.29\ metric\ tons\ CO_2e}{year}} = \mathbf{\frac{\$5}{metric\ ton\ CO_2e}}$$

$$GHG\ CE_{10} = \frac{\frac{0.106 * \$500}{year}}{\frac{22.29\ metric\ tons\ CO_2e}{year}} = \mathbf{\frac{\$2}{metric\ ton\ CO_2e}}$$

STEP 9: Determine the criteria pollutant cost effectiveness for the proposed technology using Formula 8 and the results from Steps 6 and 7:

$$Cost - effectiveness\ (\frac{\$}{ton}) = \frac{CRF * Incremental\ Cost}{WER}$$

$$WER\ Cost - effectiveness\ (@\ 2\ year\ term) = \frac{\frac{0.508 * \$5{,}000}{year}}{\frac{0.0396\ ton}{year}} = \frac{\$64,141}{weighted\ tons}$$

$$WER\ Cost - effectiveness\ (@\ 5\ year\ term) = \frac{\frac{0.206 * \$500}{year}}{\frac{0.0396\ ton}{year}} = \frac{\$2,601}{weighted\ tons}$$

$$WER\ Cost - effectiveness\ (@\ 10\ year\ term) = \frac{\frac{0.106 * \$500}{year}}{\frac{0.0396\ ton}{year}} = \frac{\$1,338}{weighted\ tons}$$

ATTACHMENT 4: PROPOSED BUDGET, PROJECT MILESTONE, AND DISBURSEMENT SCHEDULE

Proposed Budget

The proposed budget includes all estimated labor and equipment/material costs associated with the POLA Zero-Emission Shore-to-Store Project. The proposed project budget is $82,568,872 consisting of $41,122,260 in proposed ARB grant funds from this solicitation, and $41,446,612 in matching funds, both cash and in-kind from the proposed project team. The table below presents details on the project funding sources, including cash, in-kind services, and grant funds. The project partners will contribute 50.2% of the total project cost in matching funds, of which 17.3% is cash match. A draft disbursement schedule is presented the table directly following.

TASK 1.0 – Project Administration					
Direct Labor plus Expenses		**Grant**	**Match Funding**		
Position/Classification	Hourly Rate	CARB	Cash	In-Kind	**Total**
CEC funded projects		$0	$0	$13,999,331	$13,999,331
SCAQMD contribution		$0	$1,000,000	$0	$1,000,000
NOTE: POLA staff time is being contributed as needed to successfully implement this project, but not as an official match.		$0	$0	$0	$0
Labor Subtotal		***$0***	***$0***	***$0***	$0
Direct Costs (non-labor)					$0
Travel Costs	N/A	$0	$0	$0	$0
Equipment and Supplies	N/A	$0	$0	$0	$0
Other Direct Costs	N/A	$0	$0	$0	$0
Task 1.0 subtotal		***$0***	***$1,000,000***	***$13,999,331***	***$14,999,331***
TASK 2.0 – Design, Construction, and Commissioning of Hydrogen Infrastructure					
Project Costs	**N/A**				
Task 2.1: Hydrogen Refueling Station in Ontario		$9,250,000	$0	$0	$9,250,000
Task 2.2: Hydrogen Refueling Station in Wilmington		$7,850,000	$1,400,000	$0	$9,250,000
Task 2.3: Hydrogen Refueling Station in POLB		$0	$0	$12,000,000	$12,000,000
Task 2.0 subtotal		***$17,100,000***	***$1,400,000***	***$12,000,000***	***$30,500,000***
TASK 3.0 –Truck Fleet Design, Build, and Support					
Project Costs	**N/A**				
Vehicle Concept Design		$0	$0	$0	$0
Task: 3.1.1 Vehicle layout/system architecture/simulation models		$1,584,426	$0	$0	$1,584,426
Task: 3.1.2 Design analysis and optimization		$1,183,925	$0	$0	$1,183,925
Task: 3.1.3 Final engineering documentation		$647,789	$0	$0	$647,789
Task: 3.2 Vehicle build (units 1-5)		$0	$4,150,000	$0	$4,150,000
Task: 3.2.1 Long lead component procurement – unit #1		$926,441	$132,000	$0	$1,058,441
Task: 3.2.2 Standard component procurement – unit #1		$87,500	$0	$0	$87,500

Task: 3.2.3 Vehicle assembly – unit #1		$362,728	$0	$0	$362,728
Task: 3.2.4 Long lead component procurement – units #2,3		$1,772,541	$264,000	$0	$2,036,541
Task: 3.2.5 Standard component procurement – units #2,3		$175,000	$0	$0	$175,000
Task: 3.2.6 Vehicle assembly – unit #2,3		$386,276	$0	$0	$386,276
Task: 3.2.7 Long lead component procurement – units #4,5		$1,772,541	$264,000	$0	$2,036,541
Task: 3.2.8 Standard component procurement – units #4,5		$175,000	$0	$0	$175,000
Task: 3.2.9 Vehicle assembly – unit #4,5		$386,276	$0	$0	$386,276
Task: 3.3. Validation and Design Refinement		$0	$0	$0	$0
Task: 3.3.1 Functional Test - Unit #1		$293,569	$0	$0	$293,569
Task: 3.3.2 Track Test - Unit #1		$315,277	$0	$0	$315,277
Task: 3.3.3 Field Test - Unit #1		$341,844	$0	$0	$341,844
Task: 3.3.4 Functional Test - Units #2 - #3		$303,595	$0	$0	$303,595
Task: 3.3.5 Track Test - Units #2 - #3		$346,011	$0	$0	$346,011
Task: 3.3.6 Field Test - Units #2 - #3		$351,245	$0	$0	$351,245
Task: 3.3.7 Functional Test - Units #4 - #5		$320,272	$0	$0	$320,272
Task: 3.3.8 Track Test - Units #4 - #5		$339,689	$0	$0	$339,689
Task: 3.3.9 Field Test - Units #4 - #5		$365,922	$0	$0	$365,922
Task: 3.3.10 Functional Test - Units #6 - #7		$184,708	$0	$0	$184,708
Task: 3.3.11 Field Test - Units #6 - #7		$181,608	$0	$0	$181,608
Task: 3.3.12 Functional Test - Units #8- #10		$171,375	$0	$0	$171,375
Task: 3.3.13 Field Test - Units #8 - #10		$168,276	$0	$0	$168,276
Task: 3.4 Vehicle Builds (units 6-10)		$0	$4,150,000	$0	$4,150,000
Task: 3.4.1 Long Lead Component Procurement - Unit #6		$873,834	$132,000	$0	$1,005,834
Task: 3.4.2 Standard Component Procurement - Unit #6		$87,500	$0	$0	$87,500
Task: 3.4.3 Vehicle Assembly - Unit #6		$158,000	$0	$0	$158,000
Task: 3.4.4 Long Lead Component Procurement - Unit #7		$873,834	$132,000	$0	$1,005,834
Task: 3.4.5 Standard Component Procurement - Unit #7		$87,500	$0	$0	$87,500
Task: 3.4.6 Vehicle Assembly - Unit #7		$94,800	$0	$0	$94,800
Task: 3.4.7 Long Lead Component Procurement - Unit #8		$873,834	$132,000	$0	$1,005,834
Task: 3.4.8 Standard Component Procurement - Unit #8		$87,500	$0	$0	$87,500
Task: 3.4.9 Vehicle Assembly - Unit #8		$94,800	$0	$0	$94,800
Task: 3.4.10 Long Lead Component Procurement - Unit #9		$873,834	$132,000	$0	$1,005,834
Task: 3.4.11 Standard Component Procurement - Unit #9		$87,500	$0	$0	$87,500
Task: 3.4.12 Vehicle Assembly - Unit #9		$94,800	$0	$0	$94,800
Task: 3.4.13 Long Lead Component Procurement - Unit #10		$873,834	$132,000	$0	$1,005,834
Task: 3.4.14 Standard Component Procurement - Unit #10		$87,500	$0	$0	$87,500
Task: 3.4.15 Vehicle Assembly - Unit #10		$94,800	$0	$0	$94,800
Task: 3.5 Demonstration preparation, service, and support		$0	$200,000	$0	$200,000
Task: 3.5.1 Emergency Services Training		$30,000	$0	$0	$30,000

Task: 3.5.2 Operator and Support Training		$70,000	$0	$0	$70,000
Task: 3.5.3 Truck Operation / Support - 3Q 2019		$153,526	$0	$0	$153,526
Task: 3.5.4 Truck Operation / Support - 4Q 2019		$187,979	$0	$0	$187,979
Task: 3.5.5 Truck Operation / Support - 1Q 2020		$212,242	$0	$0	$212,242
Task: 3.5.6 Truck Operation / Support - 2Q 2020		$419,832	$0	$0	$419,832
Task: 3.5.7 Truck Operation / Support - 3Q 2020		$477,739	$0	$0	$477,739
Task: 3.5.8 Truck Operation / Support - 4Q 2020		$390,978	$0	$0	$390,978
Task 3.0 Subtotal		***$20,430,000***	***$9,820,000***	***$0***	***$30,250,000***
Task 4.0: Yard Tractors and Charging Infrastructure					
Project Costs	**N/A**				
Task 4.1: Engineering and design		$100,000	$0	$100,000	$200,000
Task 4.2: Infrastructure bid process		$0	$0	$0	$0
Task 4.3: Utility permitting and construction		$250,000	$0	$0	$250,000
Task 4.4: Site construction and commissioning		$2,050,000	$0	$100,000	$2,150,000
Task 4.5: Yard Truck delivery		$600,000	$0	$0	$600,000
Task 4.0 Subtotal		**$3,000,000**	**$0**	**$200,000**	**$3,200,000**
Task 5.0: Technology Demonstrations					
Task 5.1.1: Phase 1		$0	$1,551,848	$0	$1,551,848
Task 5.1.2: Phase 2		$0	$545,433	$930,000	$1,475,433
Task 5.2: Yard Tractors demonstration		$0	$0	$0	$0
Task 5.3: Forklifts demonstration		$0	$0	$0	$0
Task 5.0 Subtotal		**$0**	**$2,097,281**	**$930,000**	**$3,027,281**
Task 6.0: Data Collection and Analysis					
Task 6.1: Data Collection		$193,794			$193,794
Task 6.2: Data Analysis		$231,630			$231,630
Task 6.3: Advanced Data Analytics		$166,836			$166,836
Task 6.0 Subtotal		**$592,260**	**$0**	**$0**	**$592,260**
Total All		***$41,122,260***	***$14,317,281***	***$27,129,331***	***$82,568,872***

		Total	% of total
Total Grant Request to		**$41,122,263**	**49.80%**
Administration Portion		**$ -**	**0.00%**
Cash Match		**$14,317,281**	**17.34%**
In-Kind Match		**$27,129,331**	**32.86%**

Project Milestone and Disbursement Schedule

Task # for Milestone	Task Description	ARB Grant Request Project Funding		Project Team Match Funding	
		Project Funds	Admin. Funds	Project Funds	Admin. Funds
1	Task: 1.1 Kick-Off Meeting.	$0	$0	$0	$0
2	Task: 1.2 Status updates, quarterly progress reports.	$0	$0	$0	$0
3	Task: 1.3 Final Report	$0	$0	$0	$0
4	Task: 2.1 HRS in Wilmington	$9,250,000	$0	$0	$0
5	Task: 2.2 HRS in Ontario	$7,850,000	$0	$1,400,000	$0
5	Task: 2.3 HRS in POLB	$0	$0	$12,000,000	$0
6	Task: 3.1.1 Vehicle layout/system architecture/simulation models	$1,584,426	$0	$0	$0
7	Task: 3.1.2 Design analysis and optimization	$1,183,925	$0	$0	$0
8	Task: 3.1.3 Final engineering documentation	$647,789	$0	$0	$0
9	Task: 3.2 Vehicle build (units 1-5)	$0	$0	$4,150,000	$0
10	Task: 3.2.1 Long lead component procurement – unit #1	$926,441	$0	$132,000	$0
11	Task: 3.2.2 Standard component procurement – unit #1	$87,500	$0	$0	$0
12	Task: 3.2.3 Vehicle assembly – unit #1	$362,728	$0	$0	$0
13	Task: 3.2.4 Long lead component procurement – units #2,3	$1,772,541	$0	$264,000	$0
14	Task: 3.2.5 Standard component procurement – units #2,3	$175,000	$0	$0	$0
15	Task: 3.2.6 Vehicle assembly – unit #2,3	$386,276	$0	$0	$0
16	Task: 3.2.7 Long lead component procurement – units #4,5	$1,772,541	$0	$264,000	$0
17	Task: 3.2.8 Standard component procurement – units #4,5	$175,000	$0	$0	$0
18	Task: 3.2.9 Vehicle assembly – unit #4,5	$386,276	$0	$0	$0
19	Task: 3.3.1 Functional Test - Unit #1	$293,569	$0	$0	$0
20	Task: 3.3.2 Track Test - Unit #1	$315,277	$0	$0	$0
21	Task: 3.3.3 Field Test - Unit #1	$341,844	$0	$0	$0
22	Task: 3.3.4 Functional Test - Units #2 - #3	$303,595	$0	$0	$0
23	Task: 3.3.5 Track Test - Units #2 - #3	$346,011	$0	$0	$0
24	Task: 3.3.6 Field Test - Units #2 - #3	$351,245	$0	$0	$0
25	Task: 3.3.7 Functional Test - Units #4 - #5	$320,272	$0	$0	$0
26	Task: 3.3.8 Track Test - Units #4 - #5	$339,689	$0	$0	$0
27	Task: 3.3.9 Field Test - Units #4 - #5	$365,922	$0	$0	$0
28	Task: 3.3.10 Functional Test - Units #6 - #7	$184,708	$0	$0	$0
29	Task: 3.3.11 Field Test - Units #6 - #7	$181,608	$0	$0	$0

30	Task: 3.3.12 Functional Test - Units #8- #10	$171,375	$0	$0	$0
31	Task: 3.3.13 Field Test - Units #8 - #10	$168,276	$0	$0	$0
32	Task: 3.4 Vehicle Builds (units 6-10)	$0	$0	$4,150,000	$0
33	Task: 3.4.1 Long Lead Component Procurement - Unit #6	$873,834	$0	$132,000	$0
34	Task: 3.4.2 Standard Component Procurement - Unit #6	$87,500	$0	$0	$0
35	Task: 3.4.3 Vehicle Assembly - Unit #6	$158,000	$0	$0	$0
36	Task: 3.4.4 Long Lead Component Procurement - Unit #7	$873,834	$0	$132,000	$0
37	Task: 3.4.5 Standard Component Procurement - Unit #7	$87,500	$0	$0	$0
38	Task: 3.4.6 Vehicle Assembly - Unit #7	$94,800	$0	$0	$0
39	Task: 3.4.7 Long Lead Component Procurement - Unit #8	$873,834	$0	$132,000	$0
40	Task: 3.4.8 Standard Component Procurement - Unit #8	$87,500	$0	$0	$0
41	Task: 3.4.9 Vehicle Assembly - Unit #8	$94,800	$0	$0	$0
42	Task: 3.4.10 Long Lead Component Procurement - Unit #9	$873,834	$0	$132,000	$0
43	Task: 3.4.11 Standard Component Procurement - Unit #9	$87,500	$0	$0	$0
44	Task: 3.4.12 Vehicle Assembly - Unit #9	$94,800	$0	$0	$0
45	Task: 3.4.13 Long Lead Component Procurement - Unit #10	$873,834	$0	$132,000	$0
46	Task: 3.4.14 Standard Component Procurement - Unit #10	$87,500	$0	$0	$0
47	Task: 3.4.15 Vehicle Assembly - Unit #10	$94,800	$0	$0	$0
48	Task: 3.5 Demonstration preparation, service, and support	$0	$0	$200,000	$0
49	Task: 3.5.1 Emergency Services Training	$30,000	$0	$0	$0
50	Task: 3.5.2 Operator and Support Training	$70,000	$0	$0	$0
51	Task: 3.5.3 Truck Operation / Support - 3Q 2019	$153,526	$0	$0	$0
52	Task: 3.5.4 Truck Operation / Support - 4Q 2019	$187,979	$0	$0	$0
53	Task: 3.5.5 Truck Operation / Support - 1Q 2020	$212,242	$0	$0	$0
54	Task: 3.5.6 Truck Operation / Support - 2Q 2020	$419,832	$0	$0	$0
55	Task: 3.5.7 Truck Operation / Support - 3Q 2020	$477,739	$0	$0	$0
56	Task: 3.5.8 Truck Operation / Support - 4Q 2020	$390,978	$0	$0	$0
57	Task: 4.1 Engineering and design	$100,000	$0	$100,000	$0
58	Task: 4.2 Infrastructure bid process	$0	$0	$0	$0
59	Task: 4.3 Utility permitting and construction	$250,000	$0	$0	$0
60	Task: 4.4 Site construction and commissioning	$2,050,000	$0	$100,000	$0
61	Task: 4.5 Yard truck delivery	$600,000	$0	$0	$0
62	Task 5.0 Technology Demonstrations	$0	$0	**$18,026,612**	$0
63	Task: 6.0 Data collection and analysis	$592,260	$0	$0	$0
64	Task 6.1: Data Collection	$193,794	$0	$0	$0
65	Task 6.2: Data Analysis	$231,630	$0	$0	$0
66	Task 6.3: Advanced Data Analytics	$166,837	$0	$0	$0

67	Draft Final Project Report. Completion of Task 1.4	$0	$0	$0	$0
68	Final Project Report. Completion of Task 1.5	$0	$0	$0	$0
Subtotal of Project Funds and Administrative Funds		*$41,122,260*	*$0*	*$41,446,612*	*$0*
Grant Total Funding Amount		**$41,122,260**		**$41,446,612**	

ATTACHMENT 5: DISADVANTAGED COMMUNITIES ELIGIBILITY DETERMINATION

Project Locations within Disadvantaged Communities

This project has nine locations identified as CalEPA SB 535 Disadvantaged Communities (DACs) with CalEnvroScreen3.0 scores above 75%. Four of the locations are home to hydrogen refueling stations, four house warehouse freight facilities where the ten zero-emission H_2FC powered Class 8 Kenworth trucks will be domiciled, and one is a marine terminal at the Port of Los Angeles. Also, two zero-emission forklifts will be domiciled in a disadvantaged community at the Shell Long Beach location, 785 Edison Ave. Table 5.1 details the CalEnviroScreen3.0 census tract information for each DAC location.

SB535 legislation gives CalEPA the responsibility for identifying DACs, and AB 1550 increased the funding minimums that must go to DACs identified under SB535. These communities are impacted by the adverse effects of freight transportation through their communities. This proposed project reduces air pollution and facilitates GHG emission reductions within the nine project locations and along the freight corridor between the Port of Los Angeles, Port of Hueneme and the Inland Empire. In addition to this project having locations within designated DACs, the project also meets the additional two criteria outlined in the application of providing incentives for vehicles with a physical address inside a DAC and providing incentives for freight vehicles that primarily serve freight hubs that contain DAC census tracts.

Table 5.1

Census Tracts	Population	CalEnviroScreen3.0 Score
1. Toyota Hydrogen Refueling Station, 1630 186th Street, Gardena, CA 90248 (Census Tract 6037291300)	2,601	90-95%
2. 785 Edison Ave, Long Beach, CA 90802 (Census Tract 6037980033), includes three project elements: -Shell Hydrogen Refueling Station -Air Liquide Hydrogen Station -Toyota Logistics Services (battery-forklift demo)	61	NA (Pollution >95)*
3. Shell Hydrogen Refueling Station, 4325 E Guasti Road, Ontario, CA 91761 (Census Tract 6071012700)	4,052	75-80%
4. Shell Wilmington Sales Terminal, 1926 E. Pacific Coast Highway, Wilmington, CA 90744 (Census Tract 6037980014)	239	99%
5. Southern Counties Express, 18020 Santa Fe Ave, Rancho Dominguez, CA 90220 (Census Tract 6037543305)	2,666	95-100%
6. TTSI, 18735 S Ferris Pl, Rancho Dominguez, CA 90220 (Census Tract 6037543305)	2,666	95-100%
7. UPS Freight Facility, 3140 Jurupa St., Ontario, CA 91761 (Census Tract 6071012700)	4,052	75-80%
8. UPS Gardena Facility, 17115 S Western Ave, Gardena, CA 90247 (Census Tract 6037603302)	3,804	90-95%
9. Everport Terminal Services, 389 Terminal Island Way, TI, CA 90731 (Census Tract 6037980033)	61	NA (Pollution >95)*

Source: SB 535 Interactive Maps (CalEnvroScreen3.0) *https://calepa.ca.gov/EnvJustice/GHGInvest*

*This area is a designated CalEnviroScreen3.0 Disadvantaged Community, but due to the low population, has no percentile score.

An overview of the site locations is shown in Figure 5.1, with an overlay from the CalEnviroScreen3.0. Additionally, the fuel cell truck fleet will transport cargo in revenue service between the major freight hubs of the Port of Los Angeles, the Inland Empire warehouses identified for this project, and the Port of Hueneme. Figure 5.2 shows this road network with an overlay from the CalEnviroScreen3.0. All ten project locations are within CalEPA SB 535 Disadvantaged Communities (DACs) and the road network connecting the freight facilities transits through multiple DACs.

Figure 5.1 Overview of the Project Infrastructure Locations

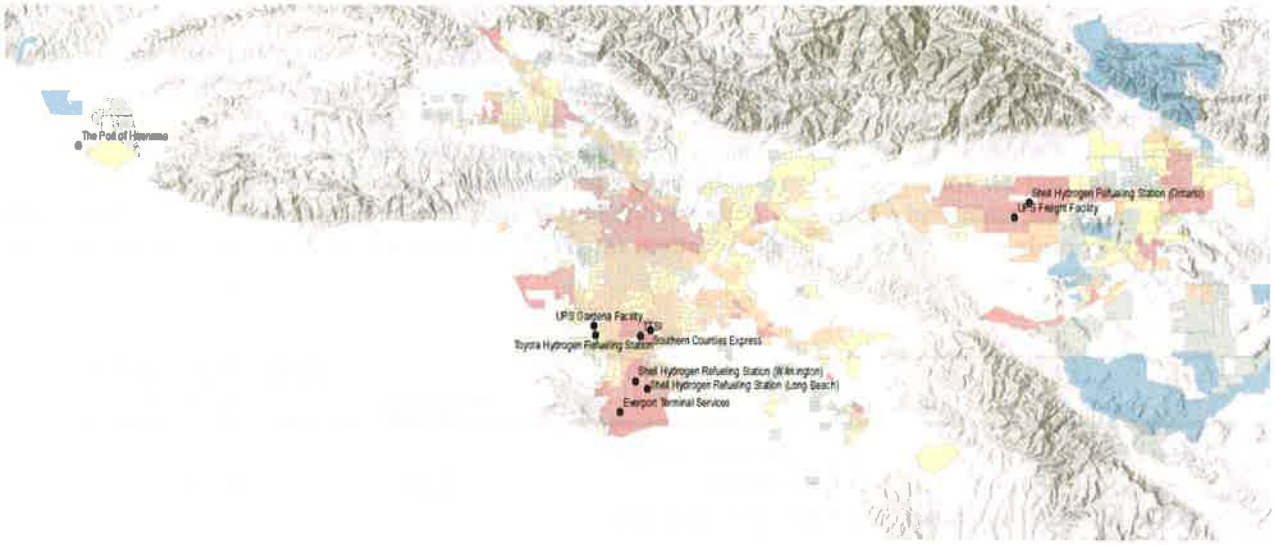
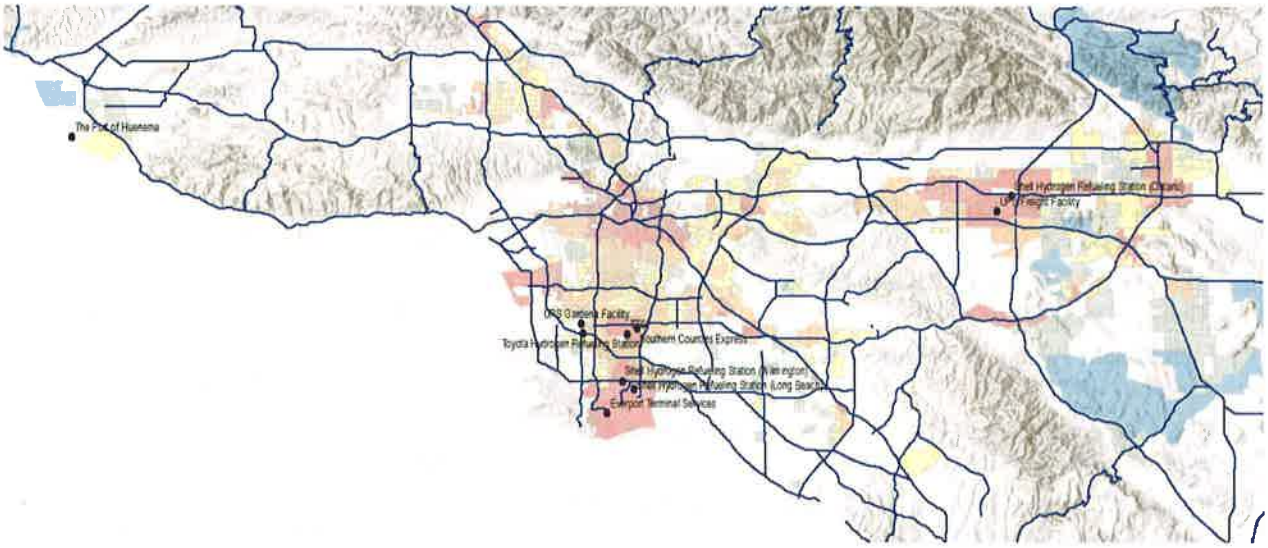


Figure 5.2 Overview of the Roadway Connections between Infrastructure Locations



Figures 5.3 – 5.11 are taken directly from CalEnviroScreen3.0 and they show the SB535 Disadvantaged Communities designated by CalEPA for each of the nine individual project areas. Additionally, as major freight hubs, the Port of Los Angeles is located within several DAC census tracks and the Port of Hueneme is located adjacent to DACs. Figures 5.12 and 5.13 show the CalEnviroScreen3.0 for those areas.

Figure 5.3 Toyota Hydrogen Refueling Station

1. Toyota Hydrogen Refueling Station, 1630 186th Street, Gardena, CA 90248

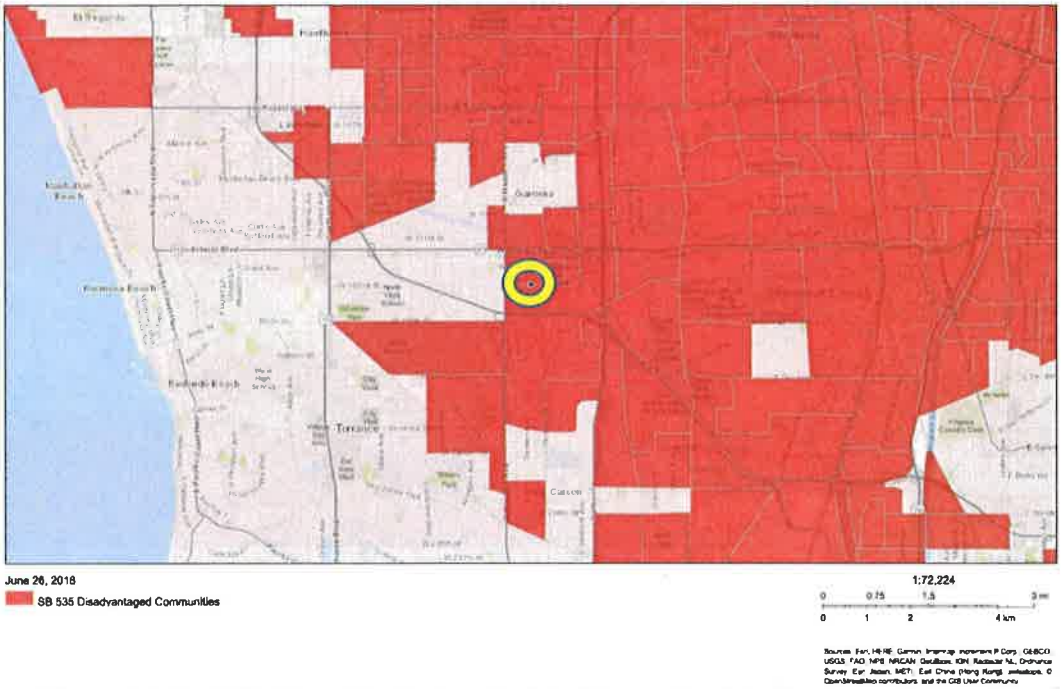


Figure 5.4 Shell Hydrogen Refueling Station, Toyota Logistic Services, Air Liquide

2. Shell Hydrogen Refueling Station, Toyota Logistic Services, 785 Edison Ave, Long Beach, CA 90813

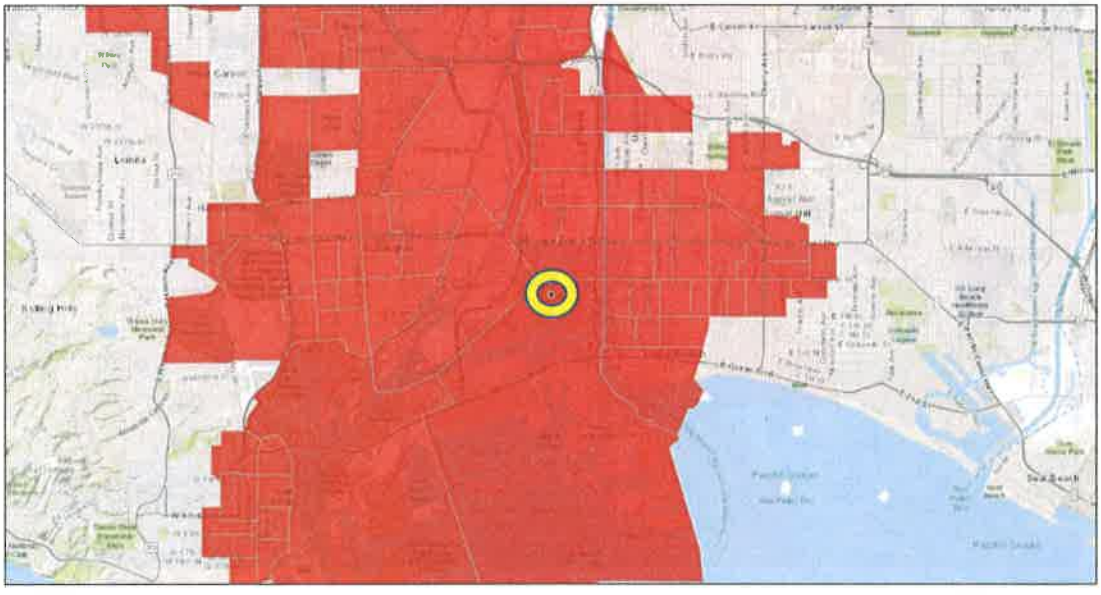


Figure 5.5 Shell Hydrogen Refueling Station, Ontario, CA

3. Shell Hydrogen Refueling Station, 4325 E Guasti Road, Ontario, CA 91761

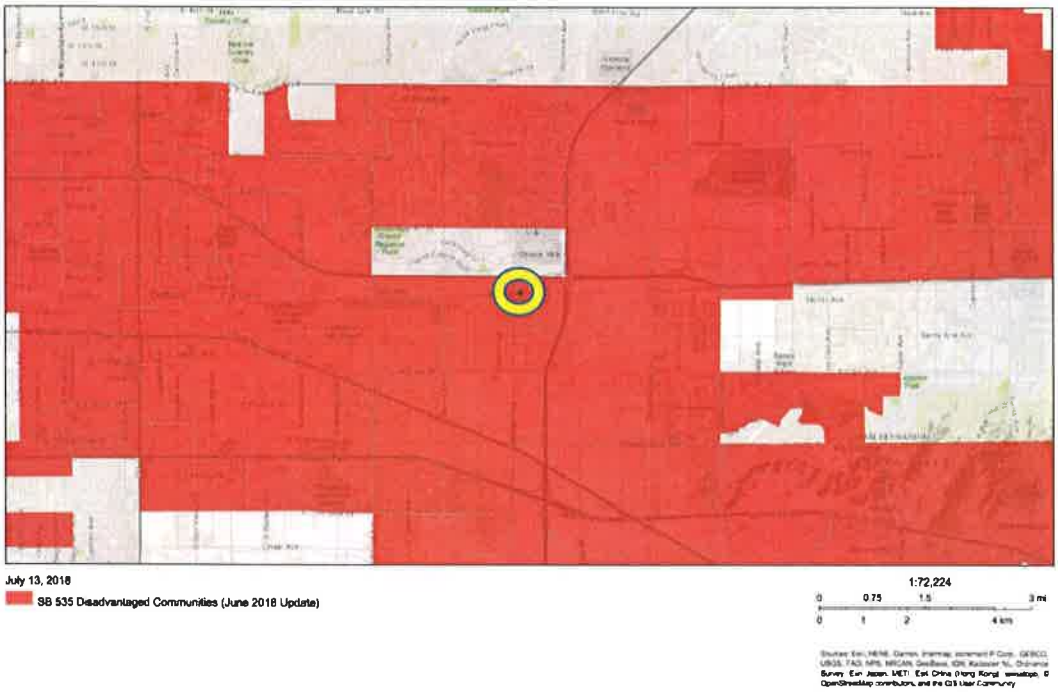


Figure 5.6 Shell Wilmington Sales Terminal

4. Shell Wilmington Sales Terminal, 1926 E. Pacific Coast Hwy., Wilmington, CA 90744

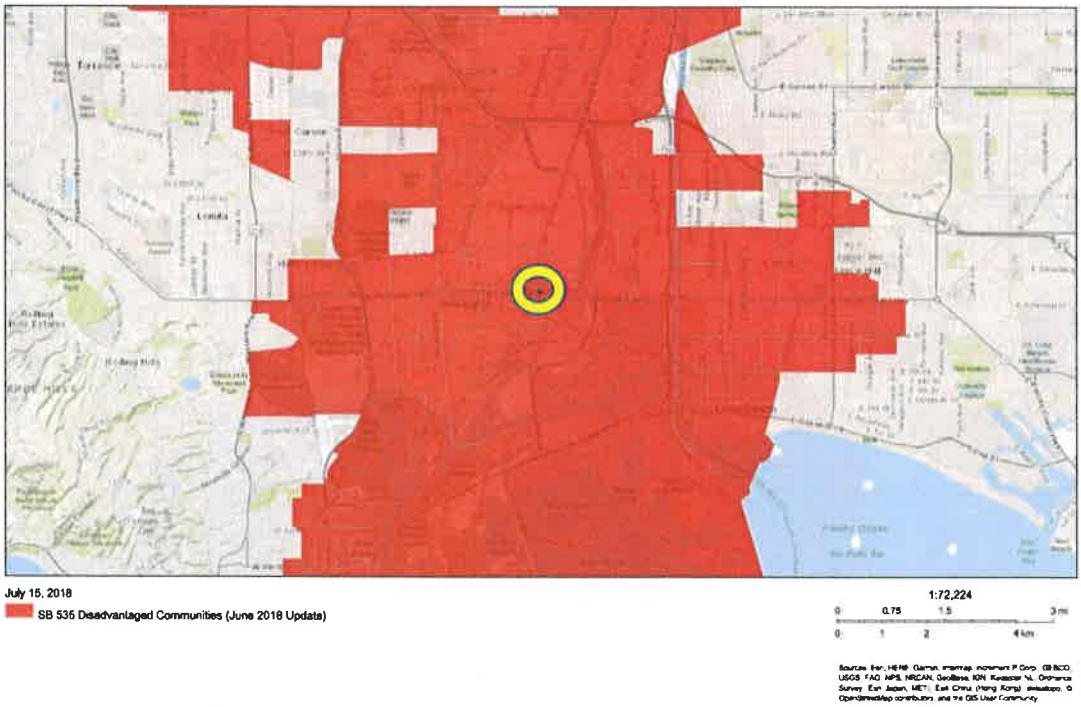


Figure 5.7 Southern Counties Express

5. Southern Counties Express, 18020 Santa Fe Ave, Rancho Dominguez, CA 90220

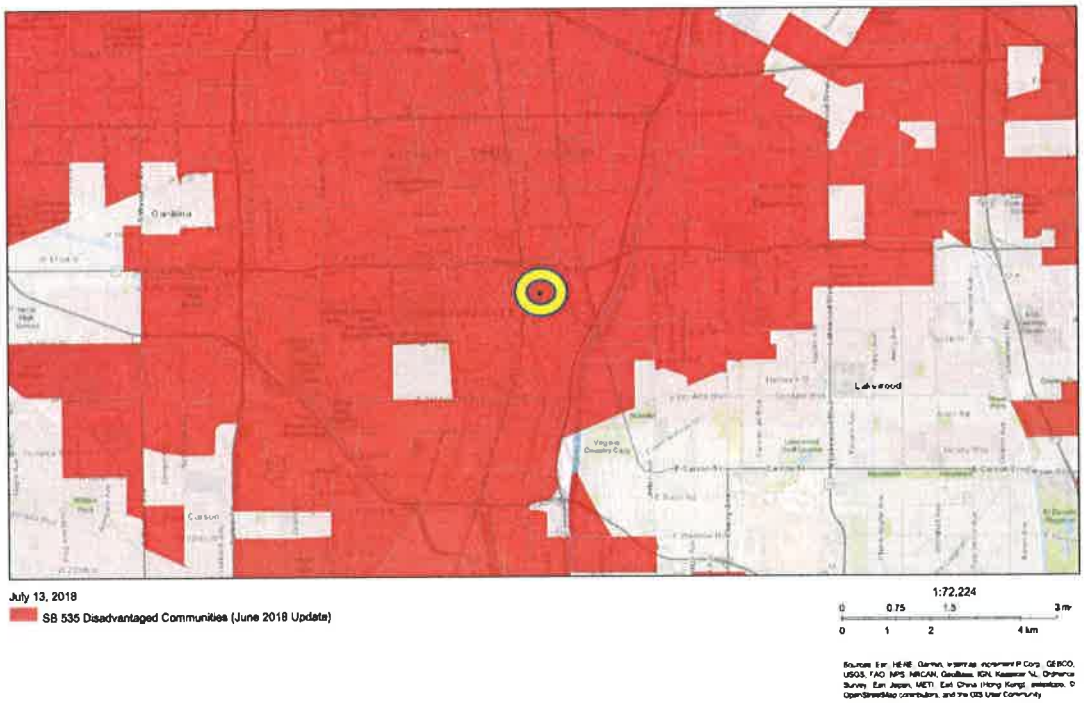


Figure 5.8 TTSI Freight Facility

6. TTSI, 18735 S Ferris Pl, Rancho Dominguez, CA 90220

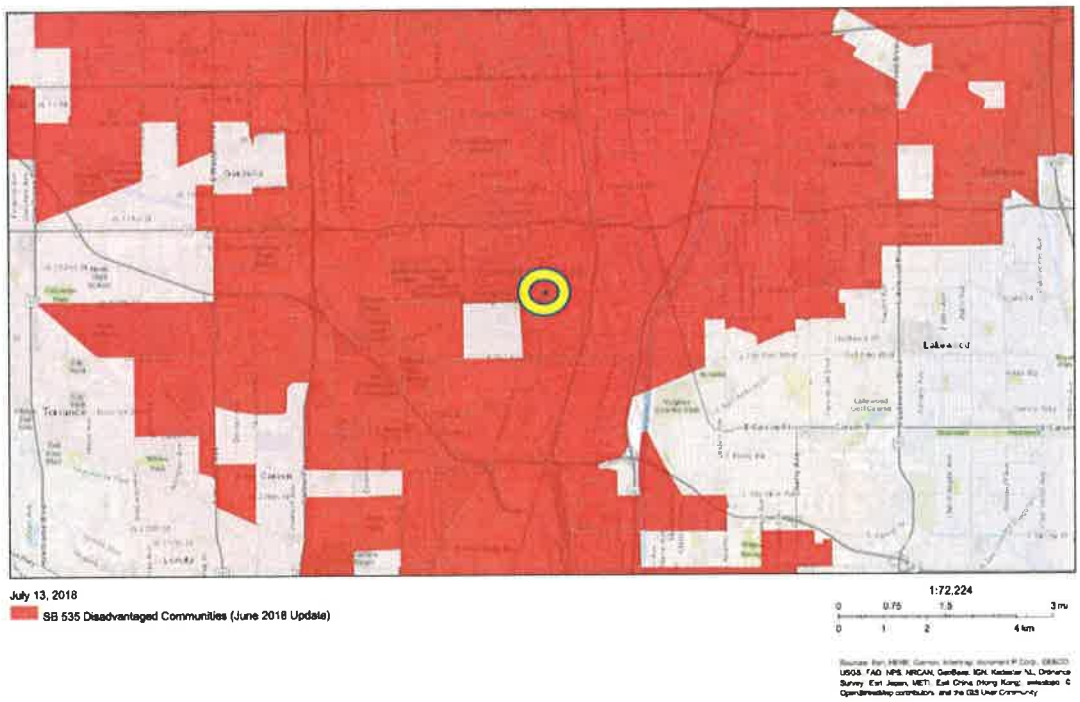


Figure 5.9 UPS Freight Facility, Ontario, CA

7. UPS Freight Facility, 3140 Jurupa St., Ontario, CA 91761

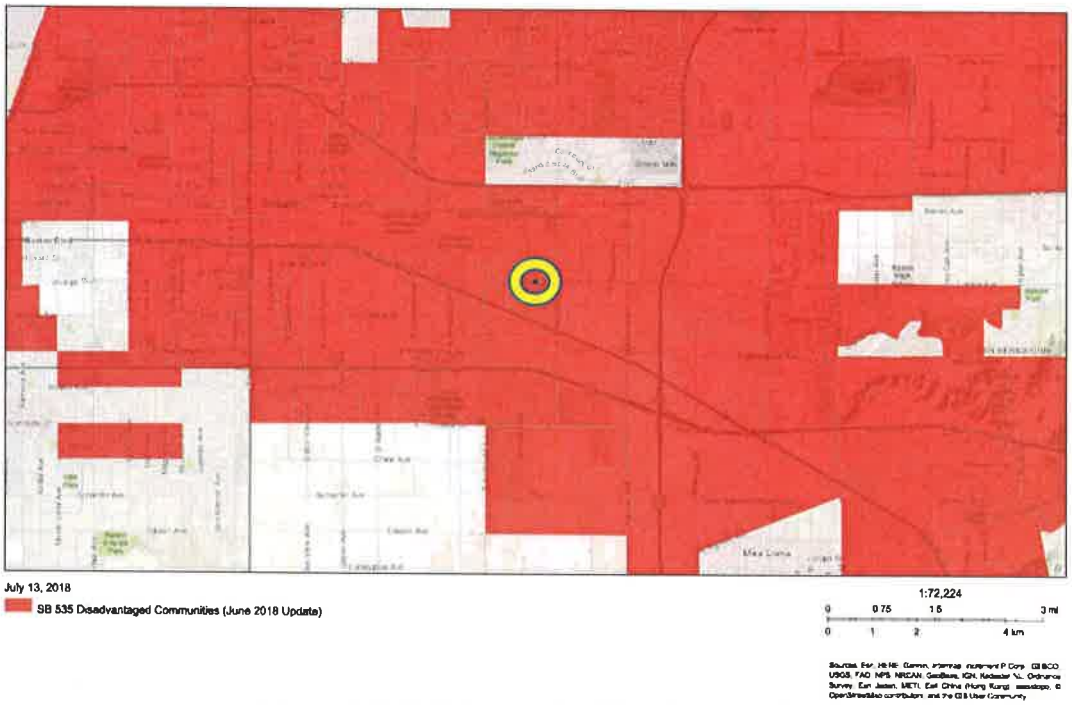


Figure 5.10 UPS Freight Facility, Gardena, CA

8. UPS Gardena Facility, 17115 S Western Ave, Gardena, CA 90247

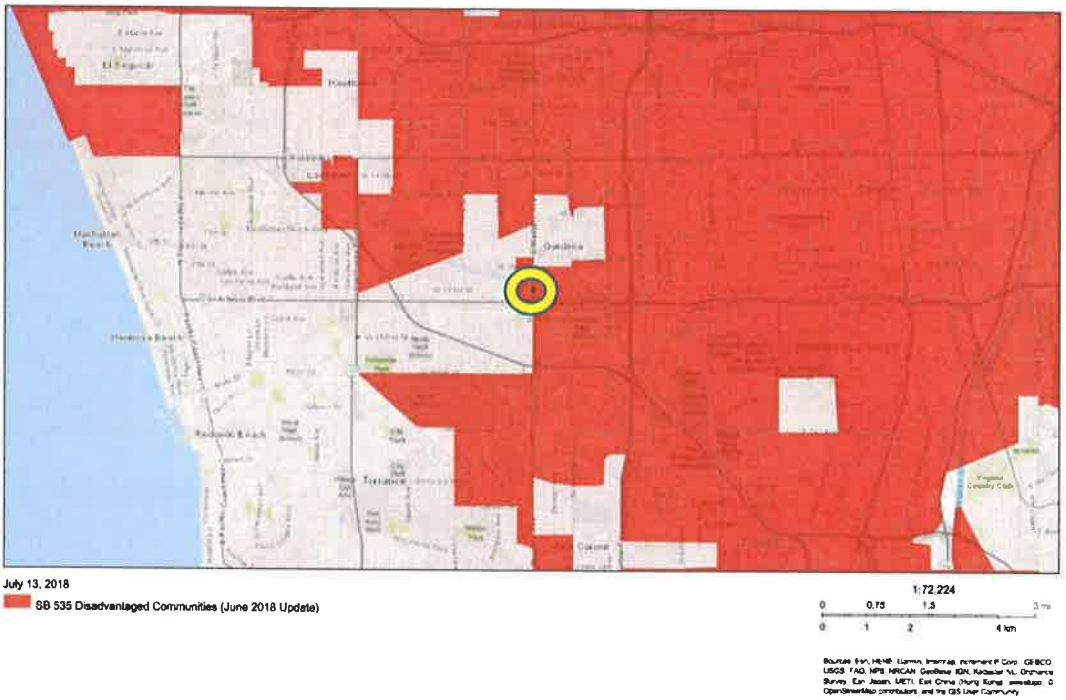


Figure 5.11 Everport Terminal Services, Port of Los Angeles

9. Everport Terminal Services, 389 Terminal Island Way, TI, CA 90731

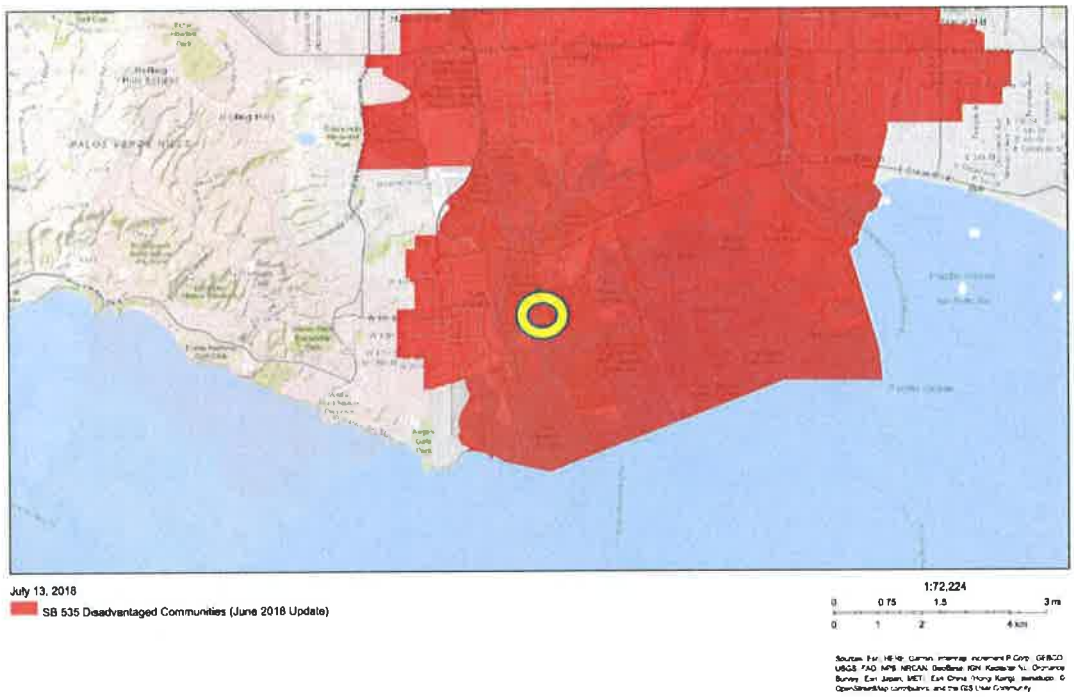


Figure 5.12 Port of Los Angeles CalEnviroScreen3.0

Port of Los Angeles

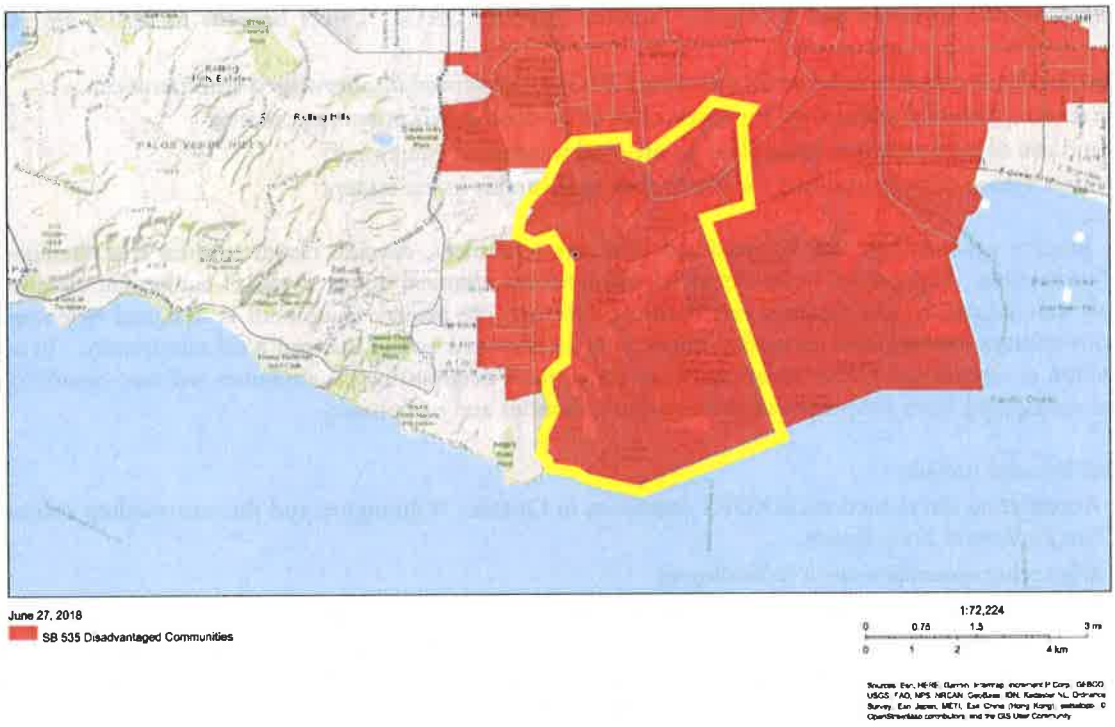
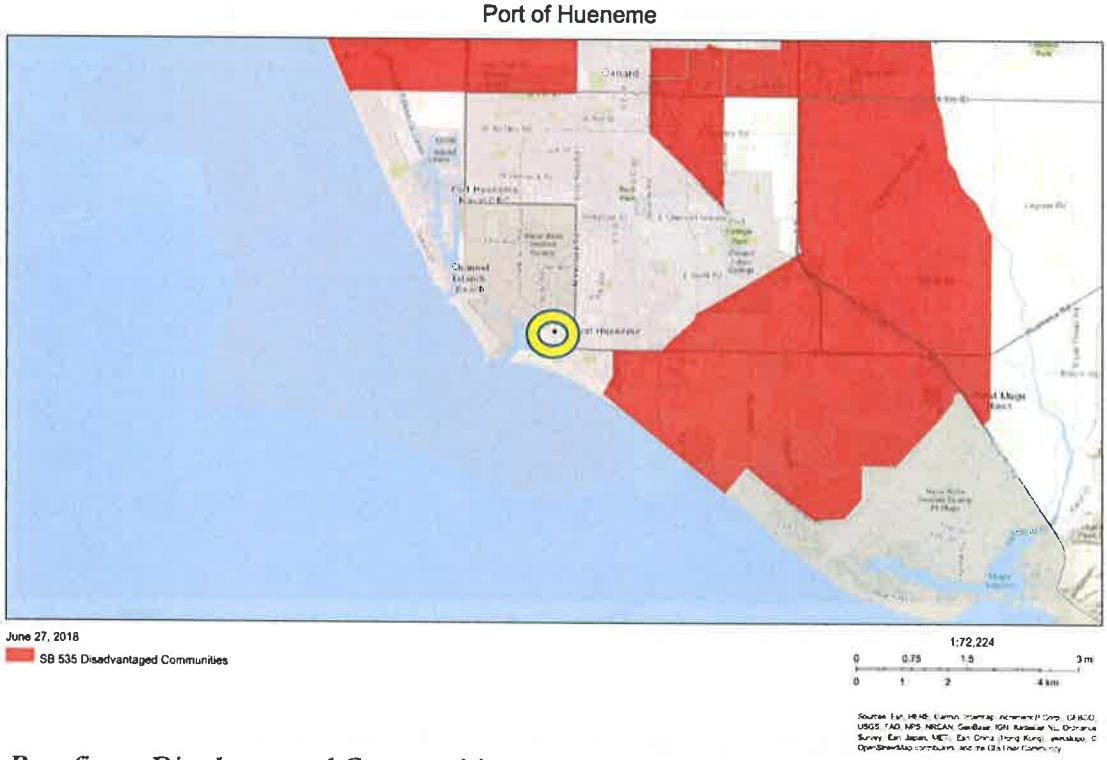


Figure 5.13 Port of Hueneme CalEnviroScreen3.0



Project Benefits to Disadvantaged Communities

Successful implementation of this project will expand the usage of zero emission cargo handling equipment at freight hubs, transportation corridors and warehouse facilities in many DACs. Direct benefits to DACs are expected to include:

- Direct localized emission reductions, including GHG, in designated disadvantaged communities;
- Leap to zero-emission technology for a new class of on-road goods movement trucks;
- Expand use of zero-emission technology in off-road warehouse equipment;
- Provide a source of hydrogen fuel for heavy-duty applications in the region;

For this project, no buildings will be modified near any residences, daycare facilities, elder care facilities, medical facilities or schools. Equipment to be deployed will perform identical duties to diesel equipment already routinely utilized at warehouses, freight facilities and roadways, though the project equipment is designed to complete these duties with without any negative air quality impacts to the terminal employees and local community. In addition to the reduction in criteria and GHG emissions from the project, neighboring communities will also benefit from noise reduction anticipated from the proposed zero-emission vehicles and equipment.

Additional benefits include:

- Accelerating the reductions in GHG emissions in Ontario, Wilmington and the surrounding communities of San Pedro and Long Beach
- Advancing innovative clean technologies
- Maximizing public and private resources to expedite clean energy solutions and meet air quality goals
- An economic benefit will be realized during construction of hydrogen and electric charging infrastructure and during demonstration and testing through an increased use of local business due to increased labor for installation, technical advisory services and data collection.

Coalition For A Safe Environment is POLA's Community Partner. CFASE will support the project team in a community advisor role, providing insights on how the project can provide economic, environmental, and community benefits to the surrounding disadvantaged communities. In addition to the Community Advisor, the Harbor Department has a dedicated community outreach program and holds a monthly meeting with the Neighborhood Council Presidents, which have representatives from the disadvantaged communities in the Port operating area. This forum will serve as another platform to introduce the project to the surrounding community. An initial presentation about the project will be provided at the first opportunity, and updates will be provided over the course of the project, with a presentation on the project accomplishments at the end of the demonstration.

In addition to meetings with the Neighborhood Council Presidents, the Port of Los Angeles project team will also share results with the local community and other stakeholders by engaging in outreach activities that rely on press releases and social media. The Port's mailing list for its press releases includes 300 media outlets around the world. The Port uses Facebook, Twitter and YouTube to share information and these portals currently have more than 75,000 followers. Port staff has led and supported extensive stakeholder outreach and communication during similar prior and current projects. The Port will also share progress and results of the project with the community and has staff with communications expertise to ensure the project results are well-understood. Outreach via the aforementioned communication methods will be conducted at the following key milestones, at a minimum:

- Notice of Proposed Award
- Project Equipment Commissioning
- Demonstration completion, with summary of results

Project updates will also be provided to various national and international maritime association meetings as part of periodic technology briefings.

ATTACHMENT 6: PROCEDURES FOR HANDLING CONFIDENTIAL INFORMATION

The Port of Los Angeles Zero-Emission Shore-to-Store Project application does not include any confidential information, and as such, the Confidentiality Provision is not included in this application.

ATTACHMENT 7: LETTERS OF COMMITMENT

The Harbor Department has included letters of commitment from our partners, subcontractors and technology demonstrators, as listed below to complete the application.

City of Los Angeles Harbor Department
Equilon Enterprises LLC (d/b/a Shell Oil Products US)
Toyota Motor North America
Kenworth Truck Company
Port of Hueneme
National Renewable Energy Laboratory
United Parcel Service
Total Transportation Services Inc.
Southern Counties Express
Air Liquide
Toyota Logistics Services
South Coast Air Quality Management District
Community for a Safe Environment (CSAFE) – Community Partner
Port of Long Beach
Merced County

THE PORT
OF LOS ANGELES

425 S. Palos Verdes Street Post Office Box 151 San Pedro, CA 90733-0151 TEL/TDD 310 SEA-PORT www.portoflosangeles.org

Eric Garcetti | *Mayor, City of Los Angeles*

Board of Harbor Commissioners | Jaime L. Lee, *President*; David Arian, *Vice President*; Lucia Moreno-Linares, *Commissioner*; Anthony Pirozzi, Jr., *Commissioner*; Edward R. Renwick, *Commissioner*

Eugene D. Seroka | *Executive Director*

July 18, 2018

Earl Landberg
California Air Resources Board
Mobile Source Control Division
1001 I Street
Sacramento, CA 95814

Dear Mr. Landberg:

SUBJECT: CITY OF LOS ANGELES HARBOR DEPARTMENT APPLICATION FOR CALIFORNIA AIR RESOURCES BOARD GRANT – ZERO EMISSION "SHORE TO STORE" PROJECT

The City of Los Angeles Harbor Department (Harbor Department) is pleased to submit this application to the California Air Resources Board's (CARB) Zero and Near Zero Emission Freight Facilities Project for the first phase of a long-term industry collaboration to transform the freight market in Southern California to zero emissions (ZE). In support of CARB's vision of transformative emissions reduction, the Harbor Department proposes to establish a new forward-looking framework for future goods movement throughout Southern California and beyond. Our team is committed to developing this Zero Emission Freight "Shore to Store" (S2S) Project in several phases that would ultimately encompass ZE freight movement activity in Southern California, the Central Coast Area, and Merced County.

The initial phase of this proposed Project described contains three key elements. First, ten hydrogen fuel cell-powered ZE on-road trucks would be developed through a partnership between Kenworth Truck Company and Toyota Motor North America to move cargo from the Port of Los Angeles (Port) to inland locations such as Riverside County, the Port of Hueneme, and eventually Merced. The second key element of this proposed Project is foundational infrastructure that would be developed by Equilon Enterprise LLC (d/b/a Shell Oil Products US (Shell)) to support the operation of the fuel cell electric trucks (FCET) throughout the region. Shell proposes to establish two new large capacity hydrogen fueling stations in Wilmington and Ontario, California as part of this Project. These two stations are in addition to three separately funded stations at Long Beach and Gardena. The establishment of this five station strategically developed, situated, and integrated hydrogen fueling network will enable ZE freight transport to flow through the Ports of Los Angeles and Long Beach and across the greater Los Angeles basin. The on-road trucks would be operated by United Parcel Services, Toyota Transport, Total Transportation Services Inc., and Southern Counties Express. The third key element of this proposed Project involves development of ZE off-road equipment to be operated at inland warehouses by Toyota Logistics Service, and the first ZE cargo handling equipment at the Port of Hueneme.

These proposed Project elements complement the extensive ZE and near zero emission (NZE) equipment that is already under development for testing at Los Angeles terminals through partnership with the California Energy Commission and CARB. These investments, viewed together, showcase a clear and concise snapshot of the ZE supply chain of the future, and will provide a model by which freight facilities can structure their operations to support ZE/NZE emissions operations. Review and input on Project development and implementation will be provided by the National Renewable Energy Laboratory and the South Coast Air Quality Management District. The Coalition for A Safe Environment, an important community activist group in the Port area, will attend Project meetings to monitor potential community benefits and provide input on strategy and project management. The total Project cost for this initial phase is $82,568,872 with project partners providing 50.2%, or $41,446,612 in match funding ($14,317,281 cash and $27,129,331 in-kind).

Once the foundational initial phase of the Project is completed, subsequent phases will increase the amount of ZE equipment operating in warehouses and between the Port and Southern California inland areas, as well as expand the ZE pathway between the Port and the Inland Empire, the Port of Hueneme and the California central coast. An especially exciting part of the second and third phases of this project will be their contribution to an already planned development at the Mid-California International Trade District in Merced County that will include processing activities to help facilitate the movement of cargo to and from the central valley of California by truck and rail. A Memorandum of Understanding with Merced County has already been signed by the Port. Merced County, a supporter of this S2S Project, is particularly interested in seeing expanded efficiencies for movement of cargo in and out of the California Central Valley, which would support development of the Mid-California International Trade District.

The Harbor Department is strongly committed to encouraging the use of ZE goods movement technology. This Project directly aligns with the Harbor Departments' Zero Emission Roadmap, Zero Emission Whitepaper, and the 2017 Clean Air Action Plan Update, and would help forge a path towards commercialization of ZE drayage trucks and cargo handling equipment.

We are excited to partner with industry leaders such as Shell, Toyota, and Kenworth as they demonstrate their continued commitment and collaboration with the Harbor Department, and we are proud to lead this team of industry experts and innovators for the S2S Project, as it will provide vital support to ZE initiatives in the heavy-duty transportation sector. Please feel free to contact me with any questions at (310) 732-3763 or via email at ccannon@portla.org.

Sincerely,

CHRISTOPHER CANNON
Director of Environmental Management

CC:LW:TD:JG:yo

Shell Oil Company
910 Louisiana Street
Houston, TX 77002

July 16, 2018

Mr. Earl Landberg
California Air Resources Board
Mobile Source Control Division
1001 I Street
Sacramento, California 95814

Dear Mr. Landberg,

This letter confirms that Equilon Enterprises LLC (dba Shell Oil Products US, hereinafter, "Shell"), contingent on the Port of Los Angeles obtaining a grant award under the California Air Resources Board's Zero- and Near-Zero Emission Freight Facilities Project, is able and duly authorized to provide all required match share funds (as detailed in the Application budget) from the Company's own resources, subject to the standard limits, approvals and internal controls of the Company.

Shell is committed to providing a total of $13.4mln of cash and in-kind match contribution to the project, as detailed in the Application budget and decomposed as follows:

- $12mln of in-kind match from the H2Freight project, which includes $8mln grant from the California Energy Commission, $1.2mln grant from the SCAQMD, and $2.8mln from Shell and Toyota;
- $1.4mln of cash match dedicated to the infrastructure of this new project.

The use of the match share funds is limited to the Company building, owning, and operating the hydrogen stations at:

- the Toyota Logistics Services distribution center at the Port of Long Beach ("POLB");
- the Travel Center of America truck refueling station in Ontario (Inland Empire);
- the Shell lubricants facilities in Wilmington near the Port of Los Angeles ("POLA").

The stations will directly support POLA, Toyota and Kenworth's hydrogen fuel cell trucks and also other hydrogen fleets. These three stations will form the minimum comprehensive network on the route from the Ports to the distribution centers and warehouses of the Inland Empire. They should provide the performance, redundancy and experience required by fleet operators to scale.

This project advances the overall goals of the California Air Resources Board's Zero- and Near-Zero Emission Freight Facilities Project by demonstrating the commercial viability of these technologies and their tremendous potential to reduce emissions and improve air quality. We strongly believe that, when adopted on a larger scale, this technology will

decrease California's dependence on petroleum fuels and help California achieve its aggressive emission reduction targets.

Shell's combined knowledge and experience as the largest fuels distributor in the world, together with that of the other project partners and their commitments to a fleet of fuel cell trucks, will allow for successful project completion. We believe this project will contribute significantly to the commercialization of hydrogen fueling stations, facilitating the transformation of the freight industry to a zero-emission future. We look forward to sharing the results of our project with the California Air Resources Board, in confirmation of our anticipated success.

We thank you for the opportunity to apply for this grant and appreciate your consideration. Should you have any questions about our role in this project, please do not hesitate to contact Shell's Hydrogen Business Development Manager – North America, Mr. Wayne Leighty, at (907) 223-1684, or via e-mail at W.Leighty@shell.com.

Sincerely,

Wayne Leighty
Attorney-in-Fact
Equilon Enterprises LLC

TOYOTA

Toyota Motor North America, Inc.
1630 West 186th Street
Gardena, CA 90248

July 16, 2018

Mr. Earl Landberg
California Air Resources Board
Mobile Source Control Division
1001 I Street
Sacramento, California 95814

Dear Mr. Landberg,

On behalf of Toyota Motor North America (TMNA), I am providing this letter of commitment and support to confirm our participation and significant contributions as a key collaborator in the Port of Los Angeles' Zero-Emission Shore-to-Store Project.

TMNA, the U.S. subsidiary of Toyota Motor Corporation, has extensive operations, facilities, and personnel throughout the State of California, our largest market. Our Toyota Logistics Services (TLS) location at the Port of Long Beach (POLB) is responsible for the distribution of imported vehicles, and freight movement of service parts and accessories. TMNA is committed to supporting this transformational project by providing total cash match funding of $9,741,848 million, including the following contributions:

- Design, integrate, and support zero-emissions fuel cell electric powertrain technology for 10 Class 8 trucks
- Utilize 3 heavy-duty hydrogen fueling stations at Toyota sites, including 1 Shell-operated station, 2 Air Liquide-operated stations, and renewable-hydrogen and -electricity generation
- Demonstrate 4 of the Class 8 fuel cell electric trucks within the Toyota Transport car carrier fleet
- Operate two additional zero-emission forklifts as part of the TLS warehouse operations in the POLB

TMNA will also dedicate substantial internal management, employee resources, and expertise as we work in prime collaboration with the Port of Los Angeles, Kenworth, and Shell to ensure successful vehicle, fueling, and equipment deployment.

This project advances the overall goals of the California Air Resources Board by demonstrating at-scale the commercial viability of this state of the art zero emissions electric technology and its tremendous potential to reduce emissions and improve society. Our team's combined significant expertise, together with that of the other project partners will allow for successful project completion, and we look forward to sharing the results of our joint efforts with the California Air Resources Board. We thank you for the opportunity to apply for this grant and appreciate your consideration. Should you have any questions about our involvement, please do not hesitate to contact Craig Scott at (310) 787-5646 or at craig.scott@toyota.com.

Sincerely,

Doug Murtha
Group Vice President
Corporate Strategy and Planning
Toyota Motor North America

TOYOTA

Lee Hobgood
General Manager

Toyota Logistic Services
6565 Headquarters Drive
Plano, TX 75024
469 292-1160

July 16, 2018

Mr. Earl Landberg
California Air Resources Board
Mobile Source Control Division
1001 I Street
Sacramento, California 95814

Dear Mr. Landberg,

Toyota Logistics Services (TLS) is pleased to provide this letter of commitment to confirm our support, participation, and significant contributions as a featured fleet operator to the Port of Los Angeles' Zero-Emission Shore-to-Store Project. We have reviewed the operational specifications of the equipment and are excited to integrate it into our vehicle dealer delivery operations as part of a robust demonstration project.

Our TLS "Toyota Transport" division provides 23% of all finished vehicle dealer deliveries in the United States for Toyota and Lexus. Our highest volume distribution terminal is located in Long Beach California

TLS is excited to participate in this project by operating 4 zero-emission H_2FC powered Class 8 Kenworth trucks in full revenue service for So Cal. regional vehicle distribution. The trucks will primarily utilize hydrogen fueling stations located at the TLS facility in the Port of Long Beach.

TLS's vehicle processing facility in the port is located in a disadvantaged community (DAC), and during daily freight operations, TLS's fleet traverses through many additional DACs. These communities will benefit from our participation in this important project by directly experiencing reduced emissions from freight activities and laying the groundwork for a growing fleet of zero emission Class 8 trucks.

TLS will provide match contribution to the project for operational, requisite fuel, maintenance, and administrative expenses to operate 4 trucks during the demonstration period. As part of Toyota Motor North American (TMNA), the level of TLS's support will be outlined in the TMNA commitment letter.

This project advances the overall goals of the California Air Resources Board by demonstrating the commercial viability of this state of the art zero emission technology and its tremendous potential to reduce emissions. Our significant transportation expertise in the rigorous goods movement industry, together with that of the other project partners, will allow for successful project completion. We look forward to participating in this demonstration project and appreciate your consideration of our team's application. Should you have any questions about our involvement, please do not hesitate to contact me directly at 469-292-1160 or via email at Lee.Hobgood@toyota.com

Sincerely,

Lee Hobgood
General Manager – Transportation Operations
Toyota Logistics Services

KENWORTH
A PACCAR COMPANY

KENWORTH Truck Company
P. O. Box 1000
Kirkland, WA 98083-1000

July 16, 2018

Mr. Earl Landberg
California Air Resources Board
Mobile Source Control Division
1001 I Street
Sacramento, California 95814

Dear Mr. Landberg,

On behalf of Kenworth Truck Company (Kenworth), I am providing this letter of commitment and support to confirm our participation and significant contributions as a project partner to the Port of Los Angeles' Zero-Emission Shore-to-Store Project.

Kenworth is a leading manufacturer of medium- and heavy-duty trucks, with a reputation for building high quality trucks tailored for their specific task. Kenworth commits its expertise accrued over its 95-year history toward this program. For this project, Kenworth in collaboration with the project partners, will design and develop ten hydrogen fuel cell heavy-duty Class 8 trucks for use in local and regional goods movement in and around the port and inland empire regions.

This project advances the overall goals of the California Air Resources Board's Zero- and Near-Zero Emission Freight Facilities Project by demonstrating the commercial viability of these technologies and their potential to reduce emissions and improve society. We strongly believe that, when adopted on a larger scale, this technology will decrease California's dependence on petroleum fuels and help California achieve its aggressive emission reduction targets.

We are committed to supporting this project by providing match funding of $1.3 million, as well as the support of our service network across the region. Kenworth will also dedicate employee resources and expertise as we work in collaboration with Toyota to ensure successful hydrogen fuel cell drive integration for our project trucks.

The Kenworth team's combined expertise, together with that of the other project partners will allow for successful project completion, and we look forward to sharing the results of our joint efforts with the California Air Resources Board. We thank you for the opportunity to apply for this grant and appreciate your consideration. Should you have any questions about our involvement, please do not hesitate to contact Mark Brown, Kenworth Executive Program Manager, at (425) 828-5591 or at mark.brown@paccar.com, or Brian Lindgren, Kenworth Director of Research & Development, at (425) 254-6046 or at brian.lindgren@paccar.com.

Sincerely,

Mike Dozier
PACCAR Vice President / Kenworth General Manager
Kenworth Truck Company

The Port OF Hueneme
Oxnard Harbor District

BOARD OF HARBOR COMMISSIONERS
Jason T. Hodge President
Mary Anne Rooney Vice President
Jess Herrera Secretary
Dr. Manuel M. Lopez Commissioner
Jess Ramirez Commissioner
PORT MANAGEMENT
Kristin Decas CEO & Port Director
Foreign Trade Zone #205
WORLD TRADE CENTER OXNARD

July 16, 2018

Mr. Earl Landberg
California Air Resources Board
Mobile Source Control Division
1001 I Street
Sacramento, California 95814

Dear Mr. Landberg,

The Port of Hueneme is pleased to provide this letter of commitment to confirm our participation and significant contributions as a project partner to the Port of Los Angeles' Zero-Emission Shore-to-Store Project. As the only commercial deep-water port between Los Angeles and San Francisco, the Port of Hueneme is a critical part of the regions goods movement network. Our partnership in this project demonstrates our appreciation for the valuable role we play in the California freight transportation network and aligns with our commitment to protecting the environment.

The Port of Hueneme is excited to be a vital link in this project to demonstrate hydrogen fuel cell heavy-duty Class 8 trucks in revenue service between the Port of Hueneme and its many nearby world class distribution centers, the Port of Los Angeles and Inland Empire warehouses. We will also be testing two zero emission battery operated yard tractors as part of this project.

This project advances the overall goals of the California Air Resources Board's Zero- and Near-Zero Emission Freight Facilities Project by demonstrating the commercial viability of these technologies and their tremendous potential to reduce emissions and improve society. We strongly believe that, when adopted on a larger scale, this technology will decrease California's dependence on petroleum fuels and help California achieve its aggressive emission reduction targets.

We are committed to supporting this project by providing in-kind match funding of $200,000. The Port of Hueneme will also dedicate substantial employee resources and expertise as we work in collaboration with the other project partners to ensure successful hydrogen fuel cell drive integration for the project trucks.

Our important role in California's goods movement network, together with that of the other project partners will allow for successful project completion, and we look forward to sharing the results of our joint efforts with the California Air Resources Board. We thank you for the opportunity to apply for this grant and appreciate your consideration. Should you have any

The Port
OF HUENEME
Oxnard Harbor District

questions about our involvement, please do not hesitate to contact Christina Birdsey, Chief Operations Officer at (805) 388-4677 or at cbirdsey@portofh.org.

Sincerely,

Giles Pettifor
Environmental Manager
The Port of Hueneme

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

June 20th, 2018

Jacob Goldberg
Port of Los Angeles, Environmental Management Division
425 S Palos Verdes St.
San Pedro, CA 90731

SUBJECT: Letter of Support
ZERO- AND NEAR ZERO-EMISSIONS FREIGHT FACILITIES PROJECT (ZANZEFF), CALIFORNIA AIR RESOURCES BOARD

Dear Mr. Goldberg:

The National Renewable Energy Laboratory (NREL) is pleased to support the Port of Los Angeles' ZANZEFF project at the request of Kenworth Truck Company, Toyota Motors North America, and Shell Oil Company as a sub-tier partner in response to the Subject opportunity. NREL is prepared to contribute to this project by conducting data collection, analysis, and evaluation of vehicle performance in a field demonstration to provide, at a minimum, the data analysis required by the ZANZEFF grant solicitation. NREL will leverage its data analysis tools including FleetDNA, DRIVE, and other internal analytics methods as appropriate. NREL will support the project timeline through December 2020 or as needed by the project.

Upon award, NREL is prepared to enter into the necessary agreements with the Prime awardee and to provide all resources as defined in our scope of work, budget, and proposal documents for the project's duration. If funded, NREL's participation in this project will be provided through an agreement with the Alliance for Sustainable Energy, LLC, managing and operating contractor for the National Renewable Energy Laboratory under U.S. Department of Energy M&O Contract No., DE-AC36-08GO28308; with a principal place of business at 15013 Denver West Parkway, Golden, Colorado 80401. Under the terms of the M&O contract, the Department of Energy permits access to NREL's unique capabilities and services to support industry, state or local governments, or universities in response to federal agency announcements or nonfederal solicitations. NREL's unique capabilities and services are provided subject to DOE review and approval, in accordance with DOE policies and regulations.

NREL's mission is to advance scientific knowledge and technologies in the areas of energy efficiency and renewable energy. The lead technical contacts are Jason.Lustbader@nrel.gov and Kenneth.Kelly@nrel.gov. We look forward to this collaboration.

Sincerely,

Chris Gearhart Ph.D.
Transportation and Hydrogen Systems Center Director

15013 Denver West Parkway
Golden, CO 80401
Phone 303-275-3000

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC

55 Glenlake Parkway NE
Atlanta, GA 30328
404.828.6000 Tel

July 16, 2018

Mr. Earl Landberg
California Air Resources Board
Mobile Source Control Division
1001 I Street
Sacramento, California 95814

Dear Mr. Landberg,

UPS is pleased to provide this letter of commitment to confirm our support, participation, and significant contributions as a featured fleet operator to the Port of Los Angeles' Zero-Emission Shore-to-Store Project. We are excited to integrate this technology into our goods movement freight operations as part of a robust demonstration project.

UPS has a history of exploring and advancing clean technology solutions. The UPS global fleet of more than 115,000 power vehicles includes over 9,100 alternative fuel and advanced technology vehicles. This project would add significant value by demonstrating potential ZEV solutions in the future.

UPS is excited to participate in this project by operating 3 zero-emission H_2FC powered Class 8 Kenworth trucks in full revenue service freight transportation operating out of UPS hubs in Ontario and Gardena. These trucks will primarily utilize hydrogen fueling stations located at the Toyota facility in Gardena, and the Shell station in Ontario.

UPS's fleet primarily operates in and around the Ontario and Gardena freight facilities which are designated as disadvantaged communities (DACs). Additionally, in daily freight operations, UPS's fleet traverses through many additional DACs. These communities will benefit from our participation in this important project by directly experiencing reduced emissions from freight activities and laying the groundwork for a growing fleet of zero emission Class 8 trucks.

We are committed to supporting this project by providing in-kind contributions of $930,000 for operational, requisite fuel, maintenance, and administrative expenses to operate 3 trucks during the demonstration period.

This project advances the overall goals of the California Air Resources Board by demonstrating the commercial viability of this state of the art zero emission technology and its tremendous potential to reduce emissions. Our significant transportation expertise in the rigorous goods movement industry, together with that of the other project partners, will allow for successful project completion.

We look forward to participating in this demonstration project and appreciate your consideration of our team's application. Should you have any questions about our involvement, please do not hesitate to contact Scott Phillippi at (404) 828-6852 or at sphillippi@ups.com.

Sincerely,

Scott Phillippi
Senior Director Fleet Maintenance and Engineering
UPS

STAYING A STEP AHEAD
& Leaving Small Footprints

July 16, 2018

Mr. Earl Landberg
California Air Resources Board
Mobile Source Control Division
1001 I Street
Sacramento, California 95814

Dear Mr. Landberg,

Premium Transportation Services, Inc. dba Total Transportation Services (TTSI) is pleased to provide this letter of commitment to confirm our support, participation, and significant contributions as a project partner to the Port of Los Angeles' Zero-Emission Shore-to-Store Project. We have reviewed the operational specifications of the equipment and are excited to integrate it into our goods movement freight operations as part of a robust demonstration project.

TTSI will participate in the project as follows:

- Operate two (2) Zero-Emission H_2FC powered Class 8 Kenworth trucks in full revenue service freight transportation between the major freight hubs of San Pedro Area and several warehouses located at in the LA Basin and Inland Empire
- Utilize hydrogen fueling stations located at 300 Ferry Street, San Pedro, CA.

TTSI's fleet primarily operates in and around San Pedro Basin Area and inland Empire freight facilities which are located in zip codes (See Attached) and designated as disadvantaged communities (DACs). Additionally, in daily freight operations, **TTSI's** fleet traverses through many additional DACs. These communities will benefit from our participation in this important project by directly experiencing reduced emissions from freight activities and laying the groundwork for a growing fleet of zero emission Class 8 trucks.

This project advances the overall goals of the **California Air Resources Board** by demonstrating the commercial viability of this state of the art zero emission technology and its tremendous potential to reduce emissions and improve California's freight "footprint". We strongly believe that, when adopted on a larger scale, this technology will decrease California's dependence on petroleum fuels and help California achieve its aggressive GHG and pollutant emission reduction targets.

We are committed to supporting this project by providing match funding of $545,433.00, consisting of $545,433.00 in cash to operate the trucks, to pay for driver(s) and to purchase the requisite fuel for operation.

STAYING A STEP AHEAD
& Leaving Small Footprints

Our significant transportation expertise in the rigorous goods movement industry, together with that of the other project partners, will allow for successful project completion. We look forward to participating in this demonstration project and appreciate your consideration of our team's application. Should you have any questions about our involvement, please do not hesitate to contact Victor N. La Rosa at (310) 816-0260 or at vicla@tts-i.com.

Sincerely,

Victor N. La Rosa
CEO/President
Premium Transportation Services, Inc. dba Total Transportation Services

July 16, 2018

Mr. Earl Landberg
California Air Resources Board
Mobile Source Control Division
1001 I Street
Sacramento, California 95814

Dear Mr. Landberg,

Southern Counties Express (SCE) is pleased to provide this letter of commitment to confirm our support, participation, and significant contributions as a featured fleet operator to the Port of Los Angeles' Zero-Emission Shore-to-Store Project. We have reviewed the operational specifications of the equipment and are excited to integrate it into our goods movement freight operations as part of a robust demonstration project.

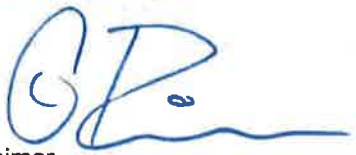
Southern Counties Express, Inc. is a local, family owned, trucking company that has been servicing the Ports of Los Angeles and Long Beach since 1992. As the family lives, works, and worships here in Southern California, we are aware of air quality and clean air initiatives. Southern Counties was an early adapter to 1st Generation Natural Gas semi-trucks during the initial Clean Air Action Plan, and is eager to participate in this new "zero emissions" technology. We currently collaborate with Toyota in their pilot program, testing, and daily use of their Hydrogen Electric Fuel Cell semi-truck for use in and around Southern California.

SCE is excited to build upon this existing collaboration with Toyota by operating a zero-emission H_2FC powered Class 8 Kenworth truck in full revenue service port drayage operation. The truck will primarily utilize hydrogen fueling stations located near the San Pedro Ports. During daily freight operations, SCE's fleet traverses through many disadvantaged communities (DACs). These communities will benefit from our participation in this important project by directly experiencing reduced emissions from freight activities and laying the groundwork for a growing fleet of zero emission Class 8 trucks.

We are committed to supporting this project by providing a match cash contribution of $310,000 for operational, requisite fuel, maintenance, and administrative expenses to operate one truck during the demonstration period.

This project advances the overall goals of the California Air Resources Board by demonstrating the commercial viability of this state of the art zero emission technology and its tremendous potential to reduce emissions. Our significant transportation expertise in the rigorous goods movement industry, together with that of the other project partners, will allow for successful project completion. We look forward to participating in this demonstration project and appreciate your consideration of our team's application. Should you have any questions about our involvement, please do not hesitate to contact Gordon Reimer at 310-900-2160 or GReimer@SCExpress.com.

Sincerely,



Gordon Reimer
President,
Southern Counties Express, Inc.

18020 South Santa Fe Avenue, Rancho Dominguez, CA 90220

Phone (310) 900 - 2160 Fax (310) 816 - 0130

TOYOTA

Lee Hobgood
General Manager

Toyota Logistic Services
6565 Headquarters Drive
Plano, TX 75024
469 292-1160

July 16, 2018

Mr. Earl Landberg
California Air Resources Board
Mobile Source Control Division
1001 I Street
Sacramento, California 95814

Dear Mr. Landberg,

Toyota Logistics Services (TLS) is pleased to provide this letter of commitment to confirm our support, participation, and significant contributions as a featured fleet operator to the Port of Los Angeles' Zero-Emission Shore-to-Store Project. We have reviewed the operational specifications of the equipment and are excited to integrate it into our vehicle dealer delivery operations as part of a robust demonstration project.

Our TLS "Toyota Transport" division provides 23% of all finished vehicle dealer deliveries in the United States for Toyota and Lexus. Our highest volume distribution terminal is located in Long Beach California

TLS is excited to participate in this project by operating 4 zero-emission H_2FC powered Class 8 Kenworth trucks in full revenue service for So Cal. regional vehicle distribution. The trucks will primarily utilize hydrogen fueling stations located at the TLS facility in the Port of Long Beach.

TLS's vehicle processing facility in the port is located in a disadvantaged community (DAC), and during daily freight operations, TLS's fleet traverses through many additional DACs. These communities will benefit from our participation in this important project by directly experiencing reduced emissions from freight activities and laying the groundwork for a growing fleet of zero emission Class 8 trucks.

TLS will provide match contribution to the project for operational, requisite fuel, maintenance, and administrative expenses to operate 4 trucks during the demonstration period. As part of Toyota Motor North American (TMNA), the level of TLS's support will be outlined in the TMNA commitment letter.

This project advances the overall goals of the California Air Resources Board by demonstrating the commercial viability of this state of the art zero emission technology and its tremendous potential to reduce emissions. Our significant transportation expertise in the rigorous goods movement industry, together with that of the other project partners, will allow for successful project completion. We look forward to participating in this demonstration project and appreciate your consideration of our team's application. Should you have any questions about our involvement, please do not hesitate to contact me directly at 469-292-1160 or via email at Lee.Hobgood@toyota.com

Sincerely,

Lee Hobgood
General Manager – Transportation Operations
Toyota Logistics Services

July 16, 2018

Mr. Earl Landberg
California Air Resources Board
Mobile Source Control Division
1001 I Street
Sacramento, California 95814

Dear Mr. Landberg,

On behalf of Air Liquide, I am providing this letter of commitment and support to confirm our participation and significant contributions to the Port of Los Angeles' Zero-Emission Shore-to-Store Project.

Air Liquide operates (1) retail hydrogen station in Anaheim and has (3) retail stations (LAX, Palo Alto, Santa Nella) under development. These projects have been developed utilizing California state grants from the light-duty vehicle hydrogen refueling infrastructure grant funding program. Additionally, Air Liquide operates a refueling station which is located at the Port of Long Beach for heavy-duty truck and light-duty vehicle refueling purposes. In addition to hydrogen refueling, Air Liquide owns and operates a liquid hydrogen to gas trans-fill distribution center in Etiwanda (Southern California.)

Air Liquide's participation in the project is twofold. To enable the initial rollout of trucks, we will provide two heavy duty private access hydrogen refueling stations located at Toyota sites in the Port of Long Beach and Gardena. One station is currently in operation to support Toyota's Class 8 fuel cell truck, and the other will be available by 2019. Air Liquide will operate and maintain the stations to allow for truck demonstrations starting next year. Air Liquide is also excited to bring our expertise with fueling protocol development to the project team as part of a collaborative effort to develop heavy duty fueling protocols for heavy duty trucks.

This project advances the overall goals of the California Air Resources Board by demonstrating the commercial viability of this state of the art zero emission technology and its tremendous potential to reduce emissions and improve society. We strongly believe that, when adopted on a larger scale, this technology will decrease California's dependence on petroleum fuels and help California achieve its aggressive emission reduction targets.

We are committed to supporting this project by providing operational and maintenance support for the two Air Liquide stations throughout the project life.

Our team's combined significant expertise, together with that of the other project partners will allow for successful project completion, and we look forward to sharing the results of our joint efforts with the California Air Resources Board. We thank you for the opportunity to apply for this grant and appreciate your consideration. Should you have any questions about our involvement, please do not hesitate to contact David Fernandes (Hydrogen Energy Business Developer) at 713-499-6847 or DavidA.Fernandes@airliquide.com

Sincerely,

Robert Fourie
Vice President, Business Development and Strategic Partnerships
Air Liquide Advanced Technologies, LLC

South Coast
Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178
(909) 396-2000 • www.aqmd.gov

Matt Miyasato, Ph.D.
Science and Technology Advancement
☎ *909.396.3249* 🖳 *mmiyasato@aqmd.gov*

July 13, 2018

Mr. Richard Corey
Executive Officer
California Air Resources Board
1001 I Street
Sacramento, CA 95814

RE: Letter of Commitment for Port of Los Angeles (POLA) application for CARB Zero and Near-Zero Emission Freight Facilities (ZANZEFF) Project

Dear Mr. Corey, RICHARD

South Coast Air Quality Management District (SCAQMD) staff is pleased to support the proposal by POLA for the ZANZEFF Project that includes development and deployment of zero emission vehicles, and design and installation of hydrogen infrastructure for heavy-duty trucks, including the Inland Empire area of the South Coast Air Basin (Basin). The proposal, a collaboration with other local ports, industry leading Original Equipment Manufacturers – Kenworth Truck Company & Toyota Motor North America, and national fleets, as well Shell International Petroleum Company, will greatly assist the ports and the Basin in transitioning to zero emission drayage trucks by 2035, especially duty cycles that need longer range capabilities.

The Basin is classified as an "extreme" nonattainment area for ozone under the federal Clean Air Act. A wide-scale deployment of zero emission technologies, including heavy-duty trucks and infrastructure, will be a critical step toward achieving air quality standards with considerable public health benefits for our region. Greater deployment of zero emission technologies is expected to provide criteria pollutant, greenhouse gas, and petroleum reduction benefits, especially in disadvantaged communities that are disproportionately exposed to toxic diesel emissions, and will assist the local ports in implementing the Clean Air Action Plan and further support the state's Sustainable Freight Action Plan.

SCAQMD staff urges CARB to fund the proposed project, and should it be awarded, commits to providing $1,000,000 in match funding pending approval by our Board, and promoting the technology and supporting infrastructure proposed. If you have any questions about our support, please do not hesitate to contact me.

Sincerely,

Matt Miyasato, Ph.D.
Deputy Executive Officer

MMM:NB

Coalition For A Safe Environment

1601 N. Wilmington Blvd., Ste. B, Wilmington, CA 90744
www.cfasecares.org jesse@cfasecares.org jnm4ej@yahoo.com
424-264-5959 310-590-0177

July 16, 2018

Mr. Earl Landberg
California Air Resources Board
Mobile Source Control Division
1001 I Street
Sacramento, California 95814

Dear Mr. Landberg,

The Coalition For A Safe Environment (CFASE) is pleased to submit a Letter of Commitment to participate in the Port of Los Angeles' Zero-Emission Shore-to-Store Project. CFASE is a nonprofit community-based organization based in Wilmington, CA, a disadvantaged community, that seeks to improve environmental health and justice in the Harbor communities near the Ports of Los Angeles and Long Beach. CFASE is involved in policy issues at all levels of government.

As one of the leading California Environmental Justice Organizations in the goods movement industry, CFASE supports zero emission, emissions capture and treatment technologies for trucks, trains, cargo handling equipment and ships as well as other efforts to improve air quality in the international trade and freight transportation industries. The Environmental Justice (EJ) Communities of Wilmington and San Pedro which border the Port of Los Angeles and are designated Disadvantaged Communities (DACs) recognize the need to invest in new emerging technologies and to think out-of-the-box for creative ideas to solve our state's ambitious goals to significantly reduce air pollution and greenhouse gas emissions. We support the Governors executive order for California to transition to zero emissions freight technologies and see this project as a major step in that direction.

The benefits to our Environmental Justice Communities are many and include:

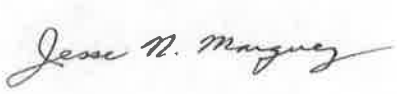
- Support for wise investment of public funds for emerging technologies
- Evidence that community-based EJ Organizations are capable of partnering with ports
- Significant reduction of all categories of criteria pollutants & toxic pollutants
- Significant reduction of greenhouse gases
- New technology job creation in Los Angeles and Harbor EJ Communities
- Reduction in diesel fuel transport and storage safety risk in our community
- Less petroleum exploration, drilling and refining in Harbor EJ Communities
- Less import of crude oil and refined fuels, storage and transport in our Harbor EJ Communities
- Prevention of micro-climatic impacts in Harbor EJ Communities
- Reduction of short and long-term public health impacts

CFASE is available to participate in the project with community outreach including presentations, event coordination and participation, press events, and ensuring the project details are reaching the community. CFASE has the necessary experience with emissions testing, field demonstrations and project management to effectively communicate the technical details and project progress to the impacted communities. This

commitment includes substantial internal management, employee resources, and expertise as we work in collaboration with the Port of Los Angeles and Kenworth to ensure successful vehicle and equipment deployment. We estimate that our in-kind contribution to the project will be approximately $ 5,000 based on 50 hrs. of participation.

Our significant expertise in environmental justice, port demonstration projects and the goods movement industry, together with that of the other project partners, will greatly aid the successful completion of this project. We look forward to sharing the results of our joint efforts with the surrounding communities. We thank you for the opportunity to apply for this grant and appreciate your consideration. Should you have any questions about our involvement, please do not hesitate to contact the Coalition For A Safe Environment (CFASE) at 424- 264-5959 office or 310-590-0177 direct line or Jesse N. Marquez at jesse@cfasecares.org or jnm4ej@yahoo.com.

Sincerely,



Jesse N. Marquez
Executive Director
Coalition For A Safe Environment

4801 Airport Plaza Drive, Long Beach, CA 90815 Tel 562.283.7000 www.polb.com

Port of
LONG BEACH
The Green Port

July 12, 2018

Mr. Earl Landberg
California Air Resources Board
Mobile Source Control Division
1001 I Street
Sacramento, California 95814

Dear Mr. Landberg:

On behalf of the Port of Long Beach, I am pleased to submit this letter of commitment for the Port of Los Angeles' Zero-Emission Shore-to-Store Project. This project is consistent with the goals of the two ports' Clean Air Action Plan and is an exciting step in a long-term industry collaboration to transform the freight market in southern California to zero emissions. We fully support the development of a zero-emission hydrogen refueling station at 785 Edison Avenue in the Port of Long Beach and see it as a key building block of a clean goods movement network. Successful implementation and operations of projects such as this will demonstrate the viability of full hydrogen adoption in the heavy-duty freight sector and serve as a critical pathway towards decarbonizing transportation not only for port-related operations, but for the entire state as well.

As the site owner for the proposed location of the station, the Port of Long Beach can commit that the lease agreement between POLB and Toyota Motor North America will not expire prior to the project end date of March 31, 2022; the term of the current lease is through December 31, 2028. The lease agreement allows for installation of the hydrogen infrastructure to refuel fuel cell vehicles, and POLB staff will work with Toyota to obtain a sub-lease of the land, subject to our Board of Harbor Commissioner's approval, to Shell which will own and operate the station.

Port of Long Beach will also dedicate the necessary personnel resources and expertise as we work in collaboration with Toyota, Shell, and the Port of Los Angeles to ensure successful vehicle and equipment deployment.

Port of Long Beach strives to be a leader in clean, efficient goods movement and be an exemplary Green Port for others to follow. We are excited by the prospects of this project and the fact that Toyota has chosen to work with us on our property at the Port of Long Beach for deployment.

Sincerely,

Heather A. Tomley
Director of Environmental Planning
Port of Long Beach

MERCED COUNTY

COUNTY EXECUTIVE OFFICE

James L. Brown
County Executive Officer

2222 "M" Street
Merced, CA 95340
(209) 385-7636
(209) 385-7673 Fax
www.countyofmerced.com

Equal Opportunity Employer

July 16, 2018

Mr. Earl Landberg
California Air Resources Board
Mobile Source Control Division
1001 I Street
Sacramento, California 95814

Dear Mr. Landberg:

Merced County is pleased to provide this letter of commitment and support for the Port of Los Angeles' Zero-Emission "Shore-to-Store" Project. We believe this project is a significant step in changing how goods move through California, including the Central Valley. Accelerating low-emissions freight movement from concept to market aligns with our existing agreement with the Port of Los Angeles to develop the Mid-California International Trade District, a growing logistics and manufacturing hub in Merced County. We see this project as a Central California focal point for goods movement and seamless connectivity to and from ocean transport and to key foreign markets is vital. The knowledge that is gained from the Shore-to-Store project will allow us to collectively incorporate additional infrastructure supporting zero emissions equipment and be a large-scale model for low emission freight handling facilities in future phases of the project.

As the "Shore to Store" project is focused on the connection between facilities, and the infrastructure required to support zero-emission transport from one terminal to the next, centers like the Mid-California International Trade District become key partners in the efficient movement of goods in the future, with manufacturing and distribution centers connected to Ports and other sources of freight. We believe this project advances the overall goals of the California Air Resources Board's Zero- and Near-Zero Emission Freight Facilities Project by demonstrating the commercial viability of these technologies and their tremendous potential to reduce emissions and improve the quality of life in California, and importantly to include the Central Valley. We believe wholeheartedly that, when adopted on a larger scale, this technology will decrease California's dependence on petroleum fuels, help California achieve its aggressive emission reduction targets and provide important competitive advantages in investment attraction and job creation.

Looking forward, we believe that the MCITD project can become a joint implementing partner with the Port of Los Angeles in supporting alternative fuel solutions for onsite cargo movement, cargo movement within a cargo shed, and critically for transport options to and from the Port.

We will be following the progress of this phase closely, and look forward to collaborating on future projects and phases with the Port of Los Angeles and the California Air Resources Board. We thank you for the opportunity to provide support for this project and appreciate your consideration. Should you have any questions about our involvement, please do not hesitate to contact Mark Hendrickson (209) 628-6147 or at mhendrickson@co.merced.ca.us.

Sincerely,

James L. Brown
County Executive Officer

ATTACHMENT 8: CALIFORNIA ENVIRONMENTAL QUALITY ACT WORKSHEET

Below is a summary of CEQA status of the three project hydrogen station sites. Please refer to the CEQA Worksheets for each site and additional documentation related to CEQA status for this project.

- HRS at 785 Edison Avenue, Long Beach, California 90813: The notice of availability and notice of intent to adopt an initial study/mitigated negative declaration (MND) was submitted on June 7, 2018 to the lead agency City of Long Beach Harbor Department Port of Long Beach. The public review period ended on July 10, 2018. It is anticipated that the final determination should be received in the August/September 2018 timeframe.
- HRS at 1926 E. Pacific Coast Highway, Wilmington: A presentation of the project was made to the City of Los Angeles on July 16, 2018. As the site is at an existing facility, the HRS will generate a minor addition to the existing facility (less than 10,000 SF), it qualifies for a Categorical Exemption. It is anticipated that the environmental review process will take a few weeks for completion and adoption of the MND with final determination before November 1st, 2018.
- HRS at 4325 E. Guasti Rd. Ontario, CA 91761: A presentation of the project was made to the City of Ontario on June 27, 2018. As the site is at an existing facility, the HRS will generate a minor addition to the existing facility (less than 10,000 SF), it qualifies for a Categorical Exemption. It is anticipated that the environmental review process will take a few weeks for completion and adoption of the MND with final determination before November 1st, 2018.

ATTACHMENT 08-1

CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA) WORKSHEET

Site Location: 4325 E. Guasti Road., Ontario, CA 91761

1. What are the physical aspects of the project? (Check all that apply and provide brief description of work, including any size or dimensions of the project).

Type of Project	Yes	No	Project Description
Construction (including grading, paving, etc.)	☒	☐	Add hydrogen dispensing equipment with an estimated footprint of 10,000 ft2 and excavation area of 12,000 ft2 to an existing Petro truck stop located at 4325 E Guasti Rd. Ontario Ca.
Trenching	☒	☐	Trenching will be required between the hydrogen storage, compression equipment, and the dispenser.
New or replaced pipelines	☐	☒	
Modification or conversion of a facility	☒	☐	The addition of hydrogen compression, storage and dispensing equipment to a vacant lot.
New or modified operation of a facility or equipment	☒	☐	The addition of hydrogen compression, storage and dispensing equipment to a vacant lot.
On-road demonstration	☐	☒	
Paper study (including analyses on economics, feedstock availability, workforce availability, etc.)	☐	☒	
Laboratory research	☐	☒	
Temporary or mobile structures (skid-mounted)	☐	☒	
Design/Planning	☒	☐	Engineering drawings for the installation of hydrogen fueling equipment will be prepared and submitted to the AHJ's for approval and authority to construct.
Other (describe and add pages as necessary)	☐	☒	

2. **Where is the project located or where will it be located? (Attach additional sheets as necessary.)**

Address	County	Type of Work to Be Completed at Site
4325 E Guasti Rd. Ontario, Ca.	San Bernardino	Addition of hydrogen, storage, compression and dispensing equipment with an estimated maximum footprint of 10,000 ft2 and trenching to the existing Petro Truck Stop in Ontario, Ca.

3. **Will the project potentially have environmental impacts that trigger CEQA review? (Check a box and explain for each question.)**

Question	Yes	No	Don't Know	Explanation
Is the project site environmentally sensitive?	☐	☒	☐	The proposed hydrogen compression, storage and dispensing systems to be installed at existing retail fueling stations are not expected to have any pre-existing environmental sensitivity issues.
Is the project site on agricultural land?	☐	☒	☐	
Is this project part of a larger project?	☐	☒	☐	
Is there public controversy about the proposed project or larger project?	☐	☒	☐	
Will historic resources or historic buildings be impacted by the project?	☐	☒	☐	
Is the project located on a site the Department of Toxic Substances Control and the Secretary of the Environmental Protection have identified as being affected by hazardous wastes or cleanup problems?	☐	☒	☐	The proposed hydrogen compression, storage and dispensing systems to be installed at existing retail fueling stations are not expected to have any pre-existing environmental sensitivity issues.
Will the project generate noise or odors in excess of permitted levels?	☐	☒	☐	
Will the project increase traffic at the site and by what amount?	☒	☐	☐	Initial estimated increase in traffic at the site will be approximately 15 Class 8 Hydrogen drayage trucks.

4. Will the project require discretionary permits or determinations, as listed below?

Type of Permit	No	Modified	New	Approving Agency	Reason for Permit, Summary of Process, and Anticipated Date of Issuance
Air Quality Permit	☒	☐	☐		
Water Quality Permit	☒	☐	☐		
Conditional Use Permit or Variance	☒	☐	☐		
Building Expansion Permit	☒	☐	☐		
Hazardous Waste Permit	☒	☐	☐		
Rezoning	☒	☐	☐		
Authority to Construct	☒	☐	☐		
Other Permits (List types)	☐	☐	☒	Local Authorities Having Jurisdiction	Planning, building, electrical, mechanical, pressure vessels, Fire Department, Health Department and other permits may be required. This will be determined by the AHJ's. The permitting process will take 4-8 months to complete.

5. **Of the agencies listed in #4, have you identified and contacted the public agency who will be the lead CEQA agency on the project?**

☒ **Yes**. Provide the name of and contact information for the lead agency.

Pre-application meeting held on June 27th, 2018 between the City of Ontario, Shell and FiedlerGroup. Met with Cathy Wahlstrom (909 395-2422), Planning Director and Rudy Zeledon (909 395-2282), Assistant Planning Director at the City of Ontario, 303 East B Street Ontario, Ca. 91764.

☐ **No.** Explain why no contact has been made and/or a proposed process for making contact with the lead agency.

6. **Has the public agency prepared environmental documents (e.g., Notice of Exemption, Initial Study/Negative Declaration/Mitigated Negative Declaration, Environmental Impact Report, Notice of Determination) under CEQA for the proposed project?**

☐ **Yes**.
Please complete the following and attach the CEQA document to this worksheet. (For "Not a project," the title of the document may be an e-mail, resolution, or letter.)

Type of Environmental Review	Title of Environmental Document	State Clearinghouse Number	Completion Date	Planned Completion Date (must be before approval of award)
"Not a project"		N/A		N/A
Exempt (Resolution of public agency or Agenda Item approving Exemption)		N/A		N/A
Exempt (Notice of Exemption)		N/A		
Initial Study				
Negative Declaration				
Mitigated Negative Declaration				
Notice of Preparation				
Environmental Impact Report				
Master Environmental Impact Report				

Notice of Determination				
NEPA Document (Environmental Assessment, Finding of No Significant Impact, and/or Environmental Impact Statement)				

☒ **No**. Explain why no document has been prepared. Propose a process for obtaining lead agency approval and estimated date for that approval (must occur before the Energy Commission will approve the award).

Relevant information to evaluate CEQA and make an applicability determination will be prepared as part of the process for completing the detailed design for the proposed work and will be submitted to the lead agency as part of their normal permit process. Based on the meeting held June 26th, 2018 it would appear that this project would most likely qualify for a categorical exemption.

Certification: I certify to the best of my knowledge that the information contained in this worksheet is true and complete. I further certify that I am authorized to complete and sign this form on behalf of the proposing organization.

Name: **James C. Martin, P.E.**

Title: **Hydrogen Retail Projects Advisor**

Signature: *J C Martin*

Phone Number: **925-766-0906**

Email: **james.c.martin@shell.com**

Date: **7-15-2018**

In addition, please find the below supporting information and site photos:

Minutes of meeting with the City of Ontario and Shell (06/27/2018)

A Legacy of Success | MEETING MINUTES | 06/29/2018 03:39 PM

Shell Oil Products US
/ Shell - Ontario
4325 E. Guasti Rd.
Ontario, CA 91761

Project No: 16260

MEETING OVERVIEW: **MEETING DATE:** 06/27/2018

Discussing proposed Hydrogen Addition at Travel Center - East

ATTENDEES:

COMPANY NAME	CONTACT NAME	PHONE	E-MAIL
Shell Hydrogen	James Martin	(925) 766-0906	james.c.martin@shell.com
Fiedler Group - Pasadena Office	Ben Steckler, AICP, PMP	(213) 381-3243	Ben.Steckler@FiedlerGroup.com
City Of Ontario	Cathy Wahlstrom	(909) 395-2282	cwahlstrom@ontarioca.gov
City Of Ontario	Rudy Zeledon	(909) 395-2422	rzeledon@ontarioca.gov

ITEMS DISCUSSED:

Item No.	Description	Discussion / Resolution
01	Project Overview	Mr. Jim Martin (assisted by Mr. Ben Steckler) presented the conceptual project and an overview of the Hydrogen program in Southern California to the City Planning Director Ms. Cathy Wahlstrom and Assistant Planning Director Mr. Rudy Zeledon.
02	City Concerns	Ms. Wahlstrom and Mr. Zeledon indicated they have a few concerns with the project as proposed but are in support of the program and the proposed project, provided the concerns can be ironed out. The concerns are: - Aesthetics of the screening compound, as well as the location of the compound itself (due to the existing parking and the site being tight). - On-site circulation for the existing fueling portion of the travel center - Parking Relocation for the vehicles currently parked in the proposed area of the compound and the potential ripple impact to the facility. - Fire protection was also a concern, but Mr. Jim Martin mentioned that the NFPA standards for Fire would be complied with. The City responded, requesting that we follow up with Paul Ehrman (Deputy Chief, Fire Prevention), as related to local fire safety/prevention.
03	City Support and CEQA	Overall the City is supportive of the Hydrogen program and the proposed project. Because the site is an existing facility, and this is a minor addition to the existing facility (less than 10,000 SF) and therefore qualifies for a Categorical Exemption.
04	City Process	Due to the site being an existing facility, the proposed scope of work and the anticipated CEQA determination as Categorically Exempt, the City review process is to go straight to permits with an estimated time to be possibly three cycles - 3 Weeks, 2 Weeks and 2 Weeks. The overall time frame for the permitting will be dependent upon the response time from the engineers.

fiedlergroup © 2018 1

Photo # 1 – Project Site Location

Photo # 2 – Entrance of the retail station and vehicle control

Photo # 3 – Egress of 4325 E. Guasti Road, Ontario, CA 91761

Photo # 4 – New Equipment Area for 4325 E. Guasti Road, Ontario, CA 91761

Photo # 5 – Egress of 4325 E. Guasti Road, Ontario, CA 91761

ATTACHMENT 08-02

CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA) WORKSHEET

Site Location: 1926 East Pacific Coast Hwy., Wilmington, CA 90744

1. What are the physical aspects of the project? (Check all that apply and provide brief description of work, including any size or dimensions of the project).

Type of Project	Yes	No	Project Description
Construction (including grading, paving, etc.)	☒	☐	Add hydrogen dispensing equipment with an estimated footprint of 10,000 square feet (ft2) and excavation area of 12,000 ft2 to vacant lot at the Shell Lube Oil Blending Plant
Trenching	☒	☐	Trenching will be required between the hydrogen storage, compression equipment, and the dispenser.
New or replaced pipelines	☒	☐	A pipeline spur will be required between the Air Products hydrogen pipeline and the storage tubes.
Modification or conversion of a facility	☒	☐	The addition of hydrogen compression, storage and dispensing equipment to a vacant lot.
New or modified operation of a facility or equipment	☒	☐	The addition of hydrogen compression, storage and dispensing equipment to a vacant lot.
On-road demonstration	☐	☒	
Paper study (including analyses on economics, feedstock availability, workforce availability, etc.)	☐	☒	
Laboratory research	☐	☒	
Temporary or mobile structures (skid-mounted)	☐	☒	
Design/Planning	☒	☐	Engineering drawings for the installation of hydrogen fueling equipment will be prepared and submitted to the AHJ's for approval and authority to construct.
Other (describe and add pages as necessary)	☐	☒	

2. **Where is the project located or where will it be located? (Attach additional sheets as necessary.)**

Address	County	Type of Work to Be Completed at Site
1926 East Pacific Coast Highway Wilmington, Ca 90744	Los Angeles	Addition of hydrogen, storage, compression and dispensing equipment with an estimated maximum footprint of 10,000 ft2 and trenching to a vacant lot in Shell's Lube Oil Blending Plant.

3. **Will the project potentially have environmental impacts that trigger CEQA review? (Check a box and explain for each question.)**

Question	Yes	No	Don't Know	Explanation
Is the project site environmentally sensitive?	☒	☐	☐	The proposed hydrogen compression, storage and dispensing systems are proposed to be installed on a vacant lot in Shell's Lube Oil Blending Plant. This site is an open case on the California State Water Resource Control Board Geotracker and has environmental remediation. The shallow excavations are not expected to have any environmental sensitivity issues and any contamination will be handled with the AHJ.
Is the project site on agricultural land?	☐	☒	☐	
Is this project part of a larger project?	☐	☒	☐	
Is there public controversy about the proposed project or larger project?	☐	☒	☐	
Will historic resources or historic buildings be impacted by the project?	☐	☒	☐	
Is the project located on a site the Dep't. of Toxic Substances Control and the Secretary of Environmental Protection have identified as being affected by hazardous wastes or cleanup problems?	☐	☐	☒	The proposed hydrogen compression, storage and dispensing systems are proposed to be installed on a vacant lot in Shell's Lube Oil Blending Plant. This site is an open case on the California State Water Resource Control Board Geotracker and has environmental remediation. The shallow excavations are not expected to have any environmental sensitivity issues and any contamination will be handled with the AHJ.
Will the project generate noise or odors in excess of permitted levels?	☐	☒	☐	
Will the project increase traffic at the site and by what amount?	☒	☐	☐	Initial estimated increase in traffic at the site will be approximately 15 Class 8 Hydrogen drayage trucks.

4. Will the project require discretionary permits or determinations, as listed below?

Type of Permit	No	Modified	New	Approving Agency	Reason for Permit, Summary of Process, and Anticipated Date of Issuance
Air Quality Permit	☒	☐	☐		
Water Quality Permit	☒	☐	☐		
Conditional Use Permit or Variance	☒	☐	☐	Local Planning Commission	The planning department will review the use permits and advise during the permit phase. If a permit is required it is estimated to take 2-4 months.
Building Expansion Permit	☒	☐	☐		
Hazardous Waste Permit	☒	☐	☐		
Rezoning	☒	☐	☐		
Authority to Construct	☒	☐	☐		
Other Permits (List types)	☐	☐	☒	Local Authorities Having Jurisdiction	Planning, building, electrical, mechanical, pressure vessels, Fire Department, Health Department and other permits may be required. This will be determined by the AHJ's. The permitting process will take 4-8 months to complete.

5. Of the agencies listed in #4, have you identified and contacted the public agency who will be the lead CEQA agency on the project?

☒ **Yes**. Provide the name of and contact information for the lead agency.

Mr. Alan Como
alan.como@lacity.org
(213) 473-9985
City Planner
200 N Spring Street, Los Angeles, CA 90012

☐ **No.** Explain why no contact has been made and/or a proposed process for making contact with the lead agency.

6. **Has the public agency prepared environmental documents (e.g., Notice of Exemption, Initial Study/Negative Declaration/Mitigated Negative Declaration, Environmental Impact Report, Notice of Determination) under CEQA for the proposed project?**

☐ **Yes**.
Please complete the following and attach the CEQA document to this worksheet. (For "Not a project," the title of the document may be an e-mail, resolution, or letter.)

Type of Environmental Review	Title of Environmental Document	State Clearinghouse Number	Completion Date	Planned Completion Date (must be before approval of award)
"Not a project"		N/A		N/A
Exempt (Resolution of public agency or Agenda Item approving Exemption)		N/A		N/A
Exempt (Notice of Exemption)		N/A		
Initial Study				
Negative Declaration				
Mitigated Negative Declaration				
Notice of Preparation				
Environmental Impact Report				
Master Environmental Impact Report				
Notice of Determination				
NEPA Document (Environmental Assessment, Finding of No Significant Impact, and/or Environmental Impact Statement)				

☒ **No**. Explain why no document has been prepared. Propose a process for obtaining lead agency approval and estimated date for that approval (must occur before the Energy Commission will approve the award).

Relevant information to evaluate CEQA and make an applicability determination will be prepared as part of the process for completing the detailed design for the proposed work and will be submitted to the lead agency as part of their normal permit process. Based on experiences with previous modifications to fueling stations it would appear that this project would most likely qualify for a categorical exemption. A meeting will be held with the AHJ's to discuss and submit the CEQA exemption notifications.

Certification: I certify to the best of my knowledge that the information contained in this worksheet is true and complete. I further certify that I am authorized to complete and sign this form on behalf of the proposing organization.

Name: **James C. Martin, P.E.**

Title: **Hydrogen Retail Projects Advisor**

Signature: J C Martin

Phone Number: **925-766-0906**

Email: **james.c.martin@shell.com**

Date: **7-15-2018**

Photo # 1 – Project Site Location

Photo # 2 – Egress for 1926 East Pacific Coast Hwy., Wilmington, CA 90744

Photo #3 – Ingress for 1926 East Pacific Coast Hwy., Wilmington, CA 90744 (after fence)

East Pacific Coast Hwy., Wilmington, CA 90744

#5 – New Equipment Area for 1926 East Pacific Coast Hwy., Wilmington, CA 90744

Photo #6 – Egress for 1926 East Pacific Coast Hwy., Wilmington, CA 90744

ATTACHMENT 08-3

CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA) WORKSHEET

Site Location: 785 Edison Ave., Long Beach, CA 90813

1. What are the physical aspects of the project? (Check all that apply and provide brief description of work, including any size or dimensions of the project).

Type of Project	Yes	No	Project Description
Construction (including grading, paving, etc.)	☒	☐	Add hydrogen dispensing equipment with an estimated footprint of 10,000 ft2 and excavation area of 12,000 ft2 to an overall facility upgrade to the Toyota facility.
Trenching	☒	☐	Trenching will be required between the hydrogen storage, compression equipment, and the dispenser.
New or replaced pipelines	☐	☒	
Modification or conversion of a facility	☒	☐	The addition of hydrogen compression, storage and dispensing equipment to the Toyota Port Facility.
New or modified operation of a facility or equipment	☒	☐	The addition of hydrogen compression, storage and dispensing equipment to the Toyota Port Facility.
On-road demonstration	☐	☒	
Paper study (including analyses on economics, feedstock availability, workforce availability, etc.)	☐	☒	
Laboratory research	☐	☒	
Temporary or mobile structures (skid-mounted)	☐	☒	
Design/Planning	☒	☐	Engineering drawings for the installation of hydrogen fueling equipment will be prepared and submitted to the AHJ's for approval and authority to construct.
Other (describe and add pages as necessary)	☐	☒	

2. **Where is the project located or where will it be located? (Attach additional sheets as necessary.)**

Address	County	Type of Work to Be Completed at Site
785 Edison Ave. Long Beach, Ca.	Los Angeles	Addition of hydrogen, storage, compression and dispensing equipment with an estimated maximum footprint of 10,000 ft2 and trenching to the existing Toyota Port Facility.

3. **Will the project potentially have environmental impacts that trigger CEQA review? (Check a box and explain for each question.)**

Question	Yes	No	Don't Know	Explanation
Is the project site environmentally sensitive?	☐	☒	☐	The proposed hydrogen compression, storage and dispensing systems to be installed at existing retail fueling stations are not expected to have any pre-existing environmental sensitivity issues.
Is the project site on agricultural land?	☐	☒	☐	
Is this project part of a larger project?	☒	☐	☐	
Is there public controversy about the proposed project or larger project?	☐	☒	☐	
Will historic resources or historic buildings be impacted by the project?	☐	☒	☐	
Is the project located on a site the Department of Toxic Substances Control and the Secretary of the Environmental Protection have identified as being affected by hazardous wastes or cleanup problems?	☐	☒	☐	The proposed hydrogen compression, storage and dispensing systems to be installed at existing Toyota port facility are not expected to have any pre-existing environmental sensitivity issues.
Will the project generate noise or odors in excess of permitted levels?	☐	☒	☐	
Will the project increase traffic at the site and by what amount?	☒	☐	☐	Initial estimated increase in traffic at the site will be approximately 15 Class 8 Hydrogen drayage trucks.

4. Will the project require discretionary permits or determinations, as listed below?

Type of Permit	No	Modified	New	Approving Agency	Reason for Permit, Summary of Process, and Anticipated Date of Issuance
Air Quality Permit	☒	☐	☐		
Water Quality Permit	☒	☐	☐		
Conditional Use Permit or Variance	☐	☒	☐		
Building Expansion Permit	☒	☐	☐		
Hazardous Waste Permit	☒	☐	☐		
Rezoning	☒	☐	☐		
Authority to Construct	☐	☐	☒		
Other Permits (List types)	☐	☐	☒	Local Authorities Having Jurisdiction	Planning, building, electrical, mechanical, pressure vessels, Fire Department, Health Department and other permits may be required. This will be determined by the AHJ's. The permitting process will take 4-8 months to complete.

5. Of the agencies listed in #4, have you identified and contacted the public agency who will be the lead CEQA agency on the project?

☒ **Yes**. Provide the name of and contact information for the lead agency.

Port of Long Beach 4801 Airport Plaza Drive Long Beach, Ca. 90815. Environmental Planning Division, Heather Tomley, Director and Kirsten Berg, Project Manager.

☐ **No.** Explain why no contact has been made and/or a proposed process for making contact with the lead agency.

6. Has the public agency prepared environmental documents (e.g., Notice of Exemption, Initial Study/Negative Declaration/Mitigated Negative Declaration, Environmental Impact Report, Notice of Determination) under CEQA for the proposed project?

☒ **Yes**.

Please complete the following and attach the CEQA document to this worksheet. (For "Not a project," the title of the document may be an e-mail, resolution, or letter.)

Type of Environmental Review	Title of Environmental Document	State Clearinghouse Number	Completion Date	Planned Completion Date (must be before approval of award)
"Not a project"		N/A		N/A
Exempt (Resolution of public agency or Agenda Item approving Exemption)		N/A		N/A
Exempt (Notice of Exemption)		N/A		
Initial Study	TLS Improvement Project Port of Long Beach		April 2018	August 2018
Negative Declaration				
Mitigated Negative Declaration	TLS Improvement Project Port of Long Beach		April 2018	August 2018
Notice of Preparation				
Environmental Impact Report				
Master Environmental Impact Report				
Notice of Determination				
NEPA Document (Environmental Assessment, Finding of No Significant Impact, and/or Environmental Impact Statement)				

☐ **No**. Explain why no document has been prepared. Propose a process for obtaining lead agency approval and estimated date for that approval (must occur before the Energy Commission will approve the award).

Certification: I certify to the best of my knowledge that the information contained in this worksheet is true and complete. I further certify that I am authorized to complete and sign this form on behalf of the proposing organization.

Name: **James C. Martin P.E.**

Title: **Hydrogen Retail Projects Advisor**

Signature: *J C Martin*

Phone Number: **925-766-0906**

Email: **james.c.martin@shell.com**

Date: **7-15-2018**

In addition, please find the below supporting information and site photos:

The notice of availability and notice of intent to adopt an initial study/mitigated negative declaration (MND) was submitted on June 7, 2018 to the lead agency City of Long Beach Harbor Department Port of Long Beach (front page of the report below - *http://www.polb.com/civica/filebank/blobdload.asp?BlobID=14461).* The public review period ended on July 10, 2018. It is anticipated that the final determination should be received in the August/September 2018 timeframe. Progress status can be followed on POLB website (*http://www.polb.com/environment/docs.asp* under the project titles: "Toyota Logistics Services Improvement Project")

INITIAL STUDY/MITIGATED NEGATIVE DECLARATION
TOYOTA LOGISTICS SERVICES IMPROVEMENT PROJECT
PORT OF LONG BEACH

PREPARED FOR:

Port of Long Beach
4801 Airport Plaza Drive
Long Beach, CA 90815

PREPARED BY:

Michael Baker International
5 Hutton Centre Drive, Suite 500
Santa Ana, CA 92707

April 2018

Michael Baker
INTERNATIONAL

Photo #1 – New Equipment Area for 785 Edison Avenue:

Photo #2 – Egress for 785 Edison Avenue:

Photo #3 – Egress for 785 Edison Avenue:

ATTACHMENT 9: CONFLICT OF INTEREST DECLARATION

The Los Angeles Harbor Department finds no conflict of interest with its ability to fulfill the necessary duties as a Zero- and Near-Zero Emission Freight Facilities Project Grantee. In addition, neither the Harbor Department nor its subcontractors, as identified in Attachments 1 and 11 of this application, has any current, ongoing, or pending direct or indirect interest, which poses an actual, apparent, or potential conflict of interest with its ability to fulfill the duties as a Grantee.

ATTACHMENT 10: STD. 204 PAYEE DATA RECORD

State of California—Department of Health Care Services

PAYEE DATA RECORD

(Required when receiving payment from the State of California in lieu of IRS W-9)

STD 204 (Rev. 5/06)_DHCS

1 **INSTRUCTIONS:** Complete all information on this form. Sign, date, and return to the State agency (department/office) address shown at the bottom of this page. Prompt return of this fully completed form will prevent delays when processing payments. Information provided in this form will be used by State agencies to prepare Information Returns (1099). See reverse side for more information and Privacy Statement.
NOTE: Governmental entities, federal, state, and local (including school districts), are not required to submit this form.

2

PAYEE'S LEGAL BUSINESS NAME (Type or Print): City of Los Angeles Harbor Department

SOLE PROPRIETOR—ENTER NAME AS SHOWN ON SSN (Last, First, M.I.)	E-MAIL ADDRESS
MAILING ADDRESS: 425 South Palos Verdes Street	BUSINESS ADDRESS: 425 South Palos Verdes Street
CITY, STATE, ZIP CODE: San Pedro, CA, 90731	CITY, STATE, ZIP CODE: San Pedro, CA, 90731

3 **PAYEE ENTITY TYPE**

CHECK ONE BOX ONLY

ENTER FEDERAL EMPLOYER IDENTIFICATION NUMBER (FEIN): 95-6000735

NOTE: Payment will not be processed without an accompanying taxpayer I.D. number.

- ☐ PARTNERSHIP
- ☐ ESTATE OR TRUST
- CORPORATION:
  - ☐ MEDICAL (e.g., dentistry, psychotherapy, chiropractic, etc.)
  - ☐ LEGAL (e.g., attorney services)
  - ☐ EXEMPT (nonprofit)
  - ■ ALL OTHERS
- ☐ INDIVIDUAL OR SOLE PROPRIETOR ENTER SOCIAL SECURITY NUMBER: ___-___-____

(SSN required by authority of California Revenue and Tax Code Section 18646)

4 **PAYEE RESIDENCY TYPE**

- ■ California resident—qualified to do business in California or maintains a permanent place of business in California.
- ☐ California nonresident (see reverse side)—Payments to nonresidents for services may be subject to State income tax withholding.
  - ☐ No services performed in California.
  - ☐ Copy of Franchise Tax Board waiver of State withholding attached

5

I hereby certify under penalty of perjury that the information provided on this document is true and correct. Should my residency status change, I will promptly notify the State agency below.

AUTHORIZED PAYEE REPRESENTATIVE'S NAME (Type or Print)	TITLE	
Eugene D. Seroka	Executive Director	
SIGNATURE: Michel DeBeck	DATE: 7/18/18	TELEPHONE: (310) 732-3456

6 **Please return completed form to:**

Department/Office: Department of Health Care Services- TPLRD

Unit/Section:

Mailing Address:

City/State/ZIP:

Telephone: ( ) **FAX:** ( )

E-Mail Address:

State of California—Department of Health Care Services

PAYEE DATA RECORD

STD. 204 (Rev. 6/06)_DHCS (Page 2)

1	**Requirement to Complete Payee Data Record, STD. 204** A completed Payee Data Record, STD. 204, is required for payments to all non-governmental entities and will be kept on file at each State agency. Since each State agency with which you do business must have a separate STD. 204 on file, it is possible for a payee to receive this form from various State agencies. Payees who do not wish to complete the STD. 204 may elect to not do business with the State. If the payee does not complete the STD. 204 and the required payee data is not otherwise provided, payment may be reduced for federal backup withholding and nonresident State income tax withholding. Amounts reported on Information Returns (1099) are in accordance with the Internal Revenue Code and the California Revenue and Taxation Code.
2	Enter the payee's legal business name. Sole proprietorships must also include the owner's full name. An individual must list his/her full name. The mailing address should be the address at which the payee chooses to receive correspondence. Do not enter payment address or lock box information here.
3	Check the box that corresponds to the payee business type. Check only one box. Corporations must check the box that identifies the type of corporation. The State of California requires that all parties entering into business transactions that may lead to payment(s) from the State provide their Taxpayer Identification Number (TIN). The TIN is required by the California Revenue and Taxation Code Section 18646 to facilitate tax compliance enforcement activities and the preparation of Form 1099 and other information returns as required by the Internal Revenue Code Section 6109(a). The TIN for individuals and sole proprietorships is the Social Security Number (SSN). Only partnerships, estates, trusts, and corporations will enter their Federal Employer Identification Number (FEIN).
4	**Are you a California resident or nonresident?** A corporation will be defined as a "resident" if it has a permanent place of business in California or is qualified through the Secretary of State to do business in California. A partnership is considered a resident partnership if it has a permanent place of business in California. An estate is a resident if the decedent was a California resident at time of death. A trust is a resident if at least one trustee is a California resident. For individuals and sole proprietors, the term "resident" includes every individual who is in California for other than a temporary or transitory purpose and any individual domiciled in California who is absent for a temporary or transitory purpose. Generally, an individual who comes to California for a purpose that will extend over a long or indefinite period will be considered a resident. However, an individual who comes to perform a particular contract of short duration will be considered a nonresident. Payments to all nonresidents may be subject to withholding. Nonresident payees performing services in California or receiving rent, lease, or royalty payments from property (real or personal) located in California will have 7% of their total payments withheld for State income taxes. However, no withholding is required if total payments to the payee are $1,500 or less for the calendar year. For information on Nonresident Withholding, contact the Franchise Tax Board at the numbers listed below: Withholding Services and Compliance Section: 1-888-792-4900 E-mail address: wscs.gen@ftb.ca.gov For hearing impaired with TDD, call: 1-800-822-6268 Website: www.ftb.ca.gov
5	Provide the name, title, signature, and telephone number of the individual completing this form. Provide the date the form was completed.
6	This section must be completed by the State agency requesting the STD. 204

Privacy Statement

Section 7(b) of the Privacy Act of 1974 (Public Law 93-579) requires that any federal, State, or local governmental agency, which requests an individual to disclose their social security account number, shall inform that individual whether that disclosure is mandatory or voluntary, by which statutory or other authority such number is solicited, and what uses will be made of it.

It is mandatory to furnish the information requested. Federal law requires that payment for which the requested information is not provided is subject to federal backup withholding and State law imposes noncompliance penalties of up to $20,000.

You have the right to access records containing your personal information, such as your SSN. To exercise that right, please contact the business services unit or the accounts payable unit of the State agency(ies) with which you transact that business.

All questions should be referred to the requesting State agency listed on the bottom front of this form.

ATTACHMENT 11: APPLICANT QUALIFICATIONS

1. Harbor Department Qualifications Narrative:

The City of Los Angeles Harbor Department (Harbor Department or POLA) has extensive experience developing, implementing, and administering technology demonstrations and projects that require detailed and active project management and coordination with technology providers, equipment and vehicle manufacturers, equipment operators, as well as other project stakeholders. In addition to the related information provided in Attachment 1, Subsection 1, the following projects demonstrate the Harbor Department's proven ability to efficiently and effectively implement the proposed POLA Zero-Emission Shore-to-Store Project.

The Ports of Los Angeles and Long Beach's landmark joint Clean Air Action Plan (CAAP) guides the Harbor Department in its commitment to reduce the health risks and air emissions associated with port-related operations, while allowing port development and growth to continue. A key element of the CAAP is its Technology Advancement Program (TAP), which works to accelerate the verification and commercial availability of emission reduction technologies to move towards an emissions free port. Active since 2007, the TAP has considered numerous technology proposals covering a broad range of different port sources, ultimately approving 30 projects for TAP funding. Below is a list of key TAP projects that were successfully completed:

- Balqon Lithium-Ion Battery Demonstration (2011)
- Capacity Plug-In Hybrid Electric Terminal Tractor (2010)
- Characterization of Drayage Truck Duty-Cycles (2011)
- Development of a Drayage Truck Chassis Dynamometer Test Cycle (2011)
- Hybrid Yard Tractor Development & Demonstration (2010)
- Hybrid Yard Tractor Development & Demonstration – Beta Test (2011)
- Johnson Matthey Locomotive DPF Demonstration (2014)
- Long Beach Container Terminal Eco-Crane™ (2011)
- SCAQMD HDV In-Use Emissions Testing Program (2013)
- TransPower Electric Drayage Infrastructure and Improvement (EDII) Project (2016)
- TransPower Electric Drayage Pre-Commercial Truck Demonstration (2016)
- US Hybrid On-Board Charger for Zero Emission Cargo Transport Demonstration (2016)
- VYCON REGEN® System for Rubber-Tired Gantry Cranes Testing & Verification (2007)

In addition to the TAP, the Harbor Department has a number of other important projects that demonstrate POLA's ability to manage and complete a number of important technology development and demonstration projects:

- *Electric Yard Tractor Demonstration Project* – In 2013, the Harbor Department was awarded $1 million from ARB's AB 118 Air Quality Improvement Program to integrate TransPower's electric drive technology into two off-road yard tractors. The project was completed in May 2015.
- *Cargo Handling Equipment Retrofit* – The Harbor Department was awarded $469,000 from the 2013 Defense Evaluation and Research Agency program to retrofit 14 pieces of cargo handling equipment with diesel particulate filters. Projects are on schedule and reporting is up to date.
- *Shore Power Program* – In 2012, the Harbor Department was awarded $23.5 million by ARB to co-fund shore power installation. All 10 berths were completed by November 2014.
- *Early Shore Power* – USEPA awarded $1.2 million in June 2010 to supply electricity generated from a Flex-Grid System to container vessels while at berth. The final report was accepted by USEPA.
- *Eco-Crane* – U.S. Environmental Protection Agency (USEPA) awarded a $731,298 Emerging Technologies grant to the Harbor Department to demonstrate the Eco-Crane, a diesel-electric hybrid rubber tire gantry crane.

- *Vehicle Retrofits* – In 2009, USEPA awarded $2 million from the American Recovery and Reinvestment Act to retrofit 27 vehicles including harbor vessels, trucks, sweepers, loaders, cranes, and forklifts. The final report was accepted by USEPA.

The Harbor Department has 27 active cooperative agreements with the Transportation Security Authority and Federal Emergency Management Agency (FEMA) valued at $78 million, as well as 35 other federal and state grants. All government grants active at this time total over $361 million. The Harbor Department is consistent in its quarterly reporting and has successfully completed cooperative agreements with approved final reports submitted on time. In addition, the Harbor Department has a long history of implementing successful government grant partnerships. These include:

- The Air Quality Mitigation Incentive Program (AQMIP), The Air Quality Mitigation Incentive Program (AQMIP), a $29 million program that provided grant funding to port operators to reduce emissions that are surplus to existing regulations or other mandates. A wide range of projects were implemented under the AQMIP, including marine vessel and cargo handling equipment repowers, truck and non-road equipment replacements, diesel emission reduction retrofits, and a number of innovative research and development projects.
- The Vessel Main Engine Fuel Incentive Program, which provided monetary incentive for the use of low-sulfur marine fuel in vessel main engines prior to state regulation.
- In July 2012, the Harbor Department launched the Environmental Ship Index Program (ESI) to provide incentives to ships that obtain certain clean ship scores using an international rating system developed through the International Association of Ports and Harbors and World Ports Climate Initiative.
- The Harbor Department successfully manages the Vessel Speed Reduction (VSR) Program, an incentive program for vessels to reduce speeds in the designated VSR zone. In 2016, the compliance rate was 92% at 20 nm and 80% at 40 nm.
- The Harbor Department, as part of CAAP, oversees the Clean Truck Program, which calls for drayage truck owners to replace about 16,000 polluting trucks working at the ports, with the assistance of a port-sponsored grant or loan subsidy. The Harbor Department has contributed close to $70 million in funding to the Clean Truck Program, including grants.

These programs represent a voluntary, collaborative effort between Harbor Department and equipment owners and technology providers that spans decades. In addition, these projects demonstrate the Harbor Department's ability to successfully implement cooperative agreements, manage resources, meet reporting requirements, evaluate projects/initiatives, and document progress. Its extensive history implementing grant projects from both sides (grantor and grantee) uniquely positions the Harbor Department for this proposed project in that it has both managed and implemented technology development and demonstration programs for zero-emission vehicles and equipment.

2. Data Collection and Analysis Qualifications Narrative (NREL):

National Renewable Energy Laboratory (NREL) will provide field data collection and analysis support for this project. NREL provides unbiased, expert research and guidance—backed by real-world data and analysis as well as proven systems, tools, and processes—needed to accelerate widespread deployment of energy efficient technologies for commercial vehicles. The NREL team has been successfully conducting field evaluations, track tests, and data analytics for new propulsion systems in medium- and heavy-duty vehicles (including drayage vehicles) to characterize performance and inform design for more than 15 years. NREL data analysis examines operation, maintenance, performance, economic, and emissions characteristics of both advanced-technology and conventional fleets. Recent field evaluations have focused on hydrogen fuel cell (FC) passenger vehicles, FC buses, hydrogen fueling infrastructure, MD and HD compressed natural gas vehicles, MD and HD hybrid electric vehicles (HEVs), and MD fully electric vehicles (EVs). These projects include the following examples:

- **DOE Super Truck II Cummins / Peterbilt Team**
  NREL researchers worked working with Cummins/Petebilt's fleet partner to collect and characterize in-field data from fleet vehicles using NREL's data logging hardware. NREL collected data from appropriate duty cycles including short haul, regional haul and line haul applications. Using on-road vehicle data collected from the fleet partner, NREL researchers characterized driving patterns and behavior by vehicle attributes and location using NREL's suite of analytical tools and data processing methods including the Drive-Cycle Rapid Investigation, Visualization, and Evaluation (DRIVE) analysis tool.
- **DOE Super Truck II PACCAR / Kenworth Team**
  NREL is supporting both drive cycle and thermal analysis activities for this project.
- **Zero Emissions Cargo Transport (ZECT I and ZECT II)– SCAQMD**
  NREL is working with vehicle manufacturers to collect and analyze data for operation, maintenance, performance, and cost characteristics of demonstration vehicles in comparison to baseline diesel trucks to provide a comprehensive assessment of the four DOE-funded zero emission drayage truck technologies. Technologies include battery electric, CNG hybrid electric, and fuel cell range extenders from multiple manufacturers and fleets servicing the ports of Long Beach and Los Angeles.
- **Vocational Truck Aerodynamic Device Study – CARB**
  NREL, under an agreement with the California Air Resources Board (CARB), performed a series of coast-down and constant-speed on-highway tests on heavy-duty vocational vehicles with and without aerodynamic improvement devices to assess their performance. This study focused on two accepted methods for quantifying the benefit of aerodynamic improvement technologies on vocational vehicles: the coast-down technique, and on-road constant speed fuel economy measurements.
- **Line Haul Platooning Studies – DOE, FHWA, National Research Council Canada**
  The NREL team has extensive experience conducting independent testing and evaluation of semi-autonomous platooning systems of line-haul, class 8 trucks and has assembled an extensive database of detailed vehicle, engine, and system performance data in platooned formation and control vehicles
- **Enabling High-Efficiency Operation through Next-Generation Control Systems Development for Connected and Automated Class 8 Trucks – ARPAe, NEXTCAR**
  NREL has developed statistical analytics to characterize route, power, and vehicle metrics applied to Fleet DNA data to develop representative driving scenarios used for system development and optimization purposes. NREL will also apply expertise in accurate, independent testing and analysis to verify system performance under real-world conditions.
- **Development of Medium- and Heavy-Duty Vocational Drive Cycles and Segmentation for EPA Phase II GHG rulemaking:**
  NREL conducted clustering analysis to segment U.S. medium- and heavy-duty vocational vehicle driving characteristics into three distinct operating groups or clusters using real world drive cycle data and developed representative test cycles.

More information can be found on NREL's website, *https://www.nrel.gov/transportation/fleettest-fleet-dna.html.*

NREL conducts research and development in all aspects of advanced vehicle technologies for the USDOE and other clients. We have active research in the areas of battery technology, electric motors, power electronics, efficient mobility systems, electric vehicle charging systems, grid integration, fuel cells, hydrogen, hydrogen infrastructure, advanced fuels and combustion research. Our Renewable Fuels and Lubricants Laboratory (ReFUEL) has heavy-duty chassis dynamometer with full emissions characterization that can test up to class 8 vehicles.

NREL has successfully worked with project team members on performance evaluations of zero emission yard tractors and drayage trucks using both field evaluation and their heavy-duty truck dynamometer. NREL is currently working with Kenworth on ZECT II project, DOE's Super Truck II, and DOE-funded project to develop a range extended EV medium-duty delivery vehicle. NREL has worked successfully collecting data and evaluating vehicle technologies with the Ports of Long Beach and Los Angeles, and several fleets (TTSI, Cal Cartage, Dependable Highway Express) ZECT I & II. NREL has successfully executed a number of collaborative research project with Toyota North America. NREL has also worked extensively with California State agencies including Californian Air Resources Board, California Energy Commission, SCAQMD, and others.

Lead NREL –Key personnel

Ken Kelly has over 25 years of experience working on clean transportation research and integrated deployment and currently leads the Commercial Vehicle Technologies team at NREL. Ken will lead the program management and provide technical oversight for the project. Jason Lustbader has over 15 years of experience in efficient transportation energy research and development. He has successfully led multiple DOE and industry funded projects. He will provide project management and technical leadership to the data analysis team. Andrew Kotz is an expert in data collection, analysis, and analytics. He focuses on analysis of large, real-world vehicle operational datasets using spatial computing and big data techniques. Andrew will support data management, processing, and analysis.

Support NREL –Secondary personnel

Leonard Strnad is a data scientist with expertise in mathematics and statistics. Leonard will provide advanced analytical and statistical method expertise which could include advanced clustering methods, deep learning, and geospatial analysis methods.

3. Staff Contact Information

The POLA Zero-Emission Shore-to-Store Project will be led by senior Harbor Department staff that have administered and managed tens of millions of dollars of grant funded projects.

Name: Christopher Cannon	Hourly rate: NA
Phone: (310) 732-3763	Email: CCannon@portla.org
Title: City of Los Angeles Harbor Department Chief Sustainability Officer	
Expected duties: Project Director – Provides overall leadership and executive oversight for the project.	
Name: Jacob Goldberg	Hourly rate: NA
Phone: (310) 732-2675	Email: jgoldberg@portla.org
Title: Environmental Specialist	
Expected duties: Project Manager/Grant Administrator – Manages the project and oversees grant administrative duties and coordination with ARB throughout the project.	
Name: Tim DeMoss	Hourly rate: NA
Phone: (310) 221-4782	Email: TDeMoss@portla.org
Title: Marine Environmental Supervisor	
Expected duties: Technology Demonstration Lead – Oversees and coordinates technology demonstration partners' participation in the project.	

4. Subcontractor and Partner Contact Information

Shell – Technology Provider	
Name: Oliver Bishop	Hourly rate: NA
Phone: +41 41 769 4345	Email: oliver.bishop@shell.com
Title: General Manager Hydrogen	
Expected duties: Overall responsibility for the success of the hydrogen infrastructure deployment	
Shell – Technology Provider	
Name: Wayne Leighty, MBA, PhD	Hourly rate: NA
Phone: +1 907 223 1684	Email: W.Leighty@shell.com
Title: Hydrogen Business Development Manager, North America	
Expected duties: Accountable for hydrogen business development in North America	
Shell – Technology Provider	
Name: Jim C Martin, P.E.	Hourly rate: NA
Phone: +1 (925) 766-0906	Email: james.c.martin@shell.com
Title: Hydrogen Retail Projects Advisor	
Expected duties: project engineering for development of the Hydrogen Refueling facilities. And develop scope of work, engineering standards, permitting, construction and operation of retail facilities.	
Shell – Technology Provider	
Name: Hechem Nadjar	Hourly rate: NA
Phone: +33630349417	Email: Hechem.nadjar@shell.com
Title: Hydrogen Business Development Manager	
Expected duties: Project lead with responsibility for successful project execution.	
Shell – Technology Provider	
Name: Manfred Becker	Hourly rate: NA
Phone: +494102456831	Email: manfred.becker@shell.com
Title: Hydrogen Global Operation Manager	
Expected duties: Supervision of the site delivery and operations	
Kenworth Truck Company – Technology Provider	
Name: Mark Brown	Hourly rate: NA
Phone: (425) 828-5591	Email: mark.brown@paccar.com
Title: Executive Program Manager – Advanced Technologies	
Expected duties: Program Management, Budget, Schedule and Reporting Responsibility	
Kenworth Truck Company – Technology Provider	
Name: John Luoma	Hourly rate: NA
Phone: (425) 828-5368	Email: john.luoma@paccar.com
Title: Assistant Chief Engineer	
Expected duties: Technical Responsibility and Resource Management	
Kenworth Truck Company – Technology Provider	
Name: Brian Lindgren	Hourly rate: NA
Phone: (425) 254-6046	Email: brian.lindgren@paccar.com
Title: Director – Research and Development	
Expected duties: Technical Advisor, Resource Management and Prototype Responsibility	
Kenworth Truck Company – Technology Provider	
Name: Stan DeLizo	Hourly rate: NA
Phone: (425) 430-5747	Email: stan.delizo@paccar.com

Title: Manager – Research Engineering	
Expected duties: Technical Expert	
Toyota Motor North America – Technology Demonstrator / End User	
Name: Andrew Lund	Hourly rate: NA
Phone: (734) 516-4024	Email: andrew.lund@toyota.com
Title: Chief Engineer	
Expected duties: Oversee the research and development activities of the fuel cell electric truck project.	
Toyota Motor North America – Technology Demonstrator / End User	
Name: Tak Yokoo	Hourly rate: NA
Phone: (310) 787-5621	Email: takehito.yokoo@toyota.com
Title: Senior Executive Engineer	
Expected duties: Responsible for product development and execution for fuel cell powertrain system development.	
Toyota Motor North America – Technology Demonstrator / End User	
Name: Craig Scott	Hourly rate: NA
Phone: (310) 787-5646	Email: Craig.Scott@toyota.com
Title: Senior Manager	
Expected duties: Project lead for business and strategy development with responsibility for successful project execution.	
Toyota Motor North America – Technology Demonstrator / End User	
Name: Ash Corson	Hourly rate: NA
Phone: (310) 787-5875	Email: ash.corson@toyota.com
Title: Alternative Fuels Vehicle Manager	
Expected duties: Support business development through active coordination of project stakeholders.	
Toyota Motor North America – Technology Demonstrator / End User	
Name: James Kast	Hourly rate: NA
Phone: (310) 787 5576	Email: james.kast@toyota.com
Title: Fuel Cell Business Analyst	
Expected duties: Support the business and strategy group with project development.	
Air Liquid – Technology Demonstrator / End User	
Name: Aaron Harris	Hourly rate: NA
Phone: (310) 787 5576	Email: aaron.harris@airliquide.com
Title: Technical Director, Hydrogen Energy	
Expected duties: Will serve as the lead technical contact for the Air Liquide stations.	
Toyota Motor North America – Technology Demonstrator / End User	
Name: David Fernandes	Hourly rate: NA
Phone: (310) 787 5576	Email: davida.fernandes@airliquide.com
Title: Business Development Manager, Hydrogen Energy	
Expected duties: Will serve as the prime business contact for the Air Liquide stations.	
Port of Hueneme – Technology Demonstrator / End User	
Name: Christina Birdsey	Hourly rate: NA
Phone: 805-488-3677	Email: cbirdsey@portofh.org
Title: Chief Operations Officer	
Expected duties: Ms. Birdsey will oversee the Port's overall project status and implementation.	

Port of Hueneme – Technology Demonstrator / End User	
Name: Giles Pettifor	Hourly rate: NA
Phone: 805-271-2534 direct	Email: gpettifor@portofh.org
Title: Environmental Manager	
Expected duties: Mr. Pettifor will coordinate with CARB and Port of LA on overall project status and management. He will work with the EV yard tractor vendor on coordinating delivery and timing.	
Port of Hueneme – Technology Demonstrator / End User	
Name: Cameron Spencer	Hourly rate: NA
Phone: 805-488-3677	Email: cspencer@portofh.org
Title: Public & Government Relations Manager	
Expected duties: Mr. Spencer will coordinate with CARB and Port of LA on grant related documentation, logistics, and other tasks.	
Port of Hueneme – Technology Demonstrator / End User	
Name: KJ May	Hourly rate: NA
Phone: 805-488-3677	Email: kmay@portofh.org
Title: Project Engineer	
Expected duties: Mr. May will oversee the coordination of the engineering and construction of the electrical infrastructure.	
National Renewable Energy Laboratory (Data Collection and Analysis Provider)	
Name: Kenneth Kelly	Hourly rate: NA
Phone: 303-275-4465	Email: Kenneth.Kelly@nrel.gov
Title: Team Leader, Commercial Vehicle Technologies	
Expected duties: Data analysis program management and technical oversight	
National Renewable Energy Laboratory (Data Collection and Analysis Provider)	
Name: Jason Lustbader	Hourly rate: NA
Phone: 303-275-4443	Email: Jason.Lustbader@nrel.gov
Title: Senior Research Engineer	
Expected duties: Project management, technical leadership, and planning	
National Renewable Energy Laboratory (Data Collection and Analysis Provider)	
Name: Leonard Strnad	Hourly rate: NA
Phone: 303-275-4460	Email: Leonard.Strnad@nrel.gov
Title: Research Engineer	
Expected duties: Data collection, analysis, and data analytics	
National Renewable Energy Laboratory (Data Collection and Analysis Provider)	
Name: Eric Miller	Hourly rate: NA
Phone: 303-275-4495	Email: Eric.Miller@nrel.gov
Title: Research Engineer	
Expected duties: Assist with data collection, analysis, and data analytics	
National Renewable Energy Laboratory (Data Collection and Analysis Provider)	
Name: Leslie Eudy	Hourly rate: NA
Phone: 303-275-4412	Email: Leslie.Eudy@nrel.gov
Title: Project Leader	
Expected duties: Assist with setting up maintenance data processing system.	
South Coast Air Quality Management District – Technical Advisor	

Name: Matt Miyasato, PhD	Hourly rate: NA
Phone: (909) 396-3249	Email: mmiyasato@aqmd.gov
Title: Deputy Executive Officer for Science & Technology Advancement	
Expected duties: Technical Advisor – Development and commercialization of clean air technologies. SCAQMD is also providing co-funding in the form of cash match.	

Community for a Safe Environment – Community Advisor	
Name: Jesse Marquez	Hourly rate: NA
Phone: (310) 590-0177	Email: jesse@cfasecares.org
Title: Executive Director	
Expected duties: Community Advisor	

Resumes for the key team members included above can be found in Appendix A.

APPENDIX A - RESUMES

Resumes of Key Personnel are provided for the following individuals:

POLA: Chris Cannon, Jacob Goldberg, Tim DeMoss

SHELL: Oliver Bishop, Hechem Nadjar, Manfred Becker, Dr. Wayne Leighty, James Martin

TOYOTA: James Kast, Andrew Lund, Tak Yokoo, Craig Scott, Ash Corson

KENWORTH: Mark Brown, John Luoma, Brian Lindgren, Stan Delizo

AIR LIQUIDE: David Fernandes, Aaron Harris

TOYOTA LOGISTICS SERVICES: Lee Hobgood , Kirk Welch

NREL: Kenneth Kelly, Jason Lustbader, Andrew Kotz, Leonard Strnad, Eric Miller, Leslie Eudy

PORT OF HUENEME: Giles Pettifor, Christina Birdsey, K.J. May, Cameron Spencer

SCAQMD: Matt Miyasato, Ph.D.

CFASE: Jesse Marquez

Total Transportation Services, Inc.: Vic LaRose

Southern Counties Express: Gordon Reimer, Sherry Hertel

CHRISTOPHER CANNON
- Director of Environmental Management
- Chief Sustainability Officer

Christopher Cannon is the Director of Environmental Management for the Port of Los Angeles, a position he has held since October 2010. In 2015, he was named Chief Sustainability Officer of the Port.

In this role, Mr. Cannon is responsible for balancing commerce and growth with ecological sustainability and social responsibility at the nation's busiest container port. The Environmental Management Division provides full environmental services related to water, soils and sediments, air and biological resources, and is responsible for preparation of environmental impact assessments mandated by state and federal law; special studies involving dredging, noise abatement, water quality and air quality; site restoration, remediation and contamination characterizations; wildlife management; and establishment of policies regarding environmental quality issues.

Mr. Cannon first worked at the Port of Los Angeles as a consultant, starting in 2004, where he worked with the Port Environmental Management Division's Air Quality and CEQA groups, supporting the development of key air projects such as the Clean Air Action Plan as well as the Harbor Department's efforts to complete critical environmental impact reports for Port-related projects. In 2008, he helped to develop and served as the Project Manager of the Port's highly successful Clean Truck Program.

Mr. Cannon has 21 years of experience in the environmental services industry, working on a range of projects while employed by ENVIRON International Corporation and TRC Environmental Solutions.

Mr. Cannon also spent two years as a legislative assistant for environmental policy on the Washington, D.C. staff of U.S. Representative Martin Sabo of Minnesota.

Cannon received a bachelor's degree in international relations from Dartmouth College and a law degree from University of California at Berkeley's Boalt Hall School of Law. He currently lives in Los Angeles.

GOLDBERG, JACOB
425 S. Palos Verdes Street | San Pedro, CA, 90731 | (310) 732-2675 | jgoldberg@portla.org

WORK EXPERIENCE

Environmental Specialist I — Oct. 2015 to Present
Port of Los Angeles, Environmental Management Division

- Technical Project Manager for Port of Los Angeles Marina Engine Exchange Incentive Program, Annual Municipal Greenhouse Gas Inventory, VeRail Low-NO_x Locomotive Demonstration, HLT Low-NO_x Drayage Truck Demonstration
- Project Manager for all rail-related projects, coordinate with rail companies and technology developers to develop incentive programs and demonstration projects
- Identifying, researching, and assisting with applications for grants, assisted with application for recently received grant from California Energy Commission to demonstrate 25 zero and near-zero emission yard tractors.
- Data analysis and research

Jun. 2014 to Oct. 2015

Student Professional Worker
Port of Los Angeles, Environmental Division

- Responsible for managing the "Marina Engine Exchange" program.
- Responsible for compiling and processing the Port's annual Greenhouse Gas Inventory.
- Data-entry and analysis work

Volunteer — Sep. 2011 to Dec. 2014
California State University, Long Beach Shark Lab

- Undergraduate volunteer, assisted on various graduate student projects.
- Work on acoustic telemetry, seine nets, data logging, and GPS systems.

EDUCATION

Master of Science, Environmental Science (*In progress*) — Fall 2015-Present
Loyola Marymount University

Bachelor of Science, Marine Biology
January, 2015
California State University, Long Beach

TIM De MOSS

28518 Vista Madera, Rancho Palos Verdes, California 90275
Phone: (310) 221-4782 E-mail: tdemoss@portla.org

WORK EXPERIENCE

MARINE ENVIRONMENTAL SUPERVISOR

Port of Los Angeles, Environmental Management Division June 2014 - Present

- Supervises the Air Quality Section with the major focus of reducing air pollutant emissions from the 5 major sources (Ocean Going Vessels, Heavy Duty Vehicles, Cargo Handling Equipment, Locomotives and Harbor Craft) that move freight in and out of the Port of Los Angeles.
- Zero Emissions Project Manager since June of 2013. Duties involve studying, recommending, implementing, and demonstrating near zero and zero emission equipment in and around the Port complex.
- Project Manager for the preparation of the Port of Los Angeles Zero Emission White Paper
- Assists in the development of Port policy for major air quality programs with the regulatory agencies including the California Air Resources Board's (ARB) Sustainable Freight Strategy Program, ARB's reduction of greenhouse gases Cap and Trade Program, and the South Coast Air Quality Management District (SCAQMD) Air Quality Management Plan

ENVIRONMENTAL SPECIALIST III

Port of Los Angeles (POLA), Environmental Management Division May 2007 – June 2014

- Clean Truck Program Manager since October of 2010. Duties involved managing the implementation, monitoring and enforcement of the program.
- Managed POLA's private consultants in order to complete various air quality projects.
- Maintained a professional link of communication with members of the ARB, SCAQMD, private consultants, business contractors, environmental advocacy groups, and Port of Long Beach staff.
- Prepared various Division Memos, Board Reports, and Letters.

ENVIRONMENTAL SPECIALIST II

Los Angeles World Airports (LAWA), Environmental Management Division January 2005 – May 2007

- Project Manager for Air Quality projects. Duties involved researching air quality and environmental compliance regulations, coordinating regulatory compliance projects for all 4 LAWA Airports, and representing LAWA on annual and periodic SCAQMD audits of LAWA facilities.

SANITARY ENGINEERING ASSOCIATE II

City of Los Angeles, Bureau of Sanitation, Various Divisions June 1991 - January 2005

- Worked in the Wastewater Capital Improvement group managing funding for Capital Improvement projects.
- Worked in the Regulatory Affairs Division's Permits group managing various Water Quality projects.
- Worked in the Human Resources Development Division's Safety group managing various Hazardous Waste/Materials projects.
- Worked in the Recycling and Waste Reduction Division managing various Recycling projects.

EDUCATION

LOYOLA MARYMOUNT UNIVERSITY, LOS ANGELES, CA August 2000

- Master of Science in Civil Engineering with emphasis on Environmental Science

Course work: Air Pollution Analysis, Environmental Engineering and Science Laboratory, Aquatic Chemistry, Principals of Water Quality Management

LOYOLA MARYMOUNT UNIVERSITY, LOS ANGELES, CA May 1991

- Bachelor of Science in Civil Engineering

Course work: Analytical Methods in Civil Engineering, Introduction to Environmental Engineering, Water Resources Planning and Design, Water and Wastewater Treatment

Oliver Bishop
General Manager Hydrogen
+41 417 694 345
+41 796 426 642
Oliver.Bishop@shell.com

PROFILE

Global leader of Shell's hydrogen activities in the Alternative Energy sector as General Manager. Negotiated Shell's participation in the world's largest hydrogen infrastructure JV in Germany which is building 400 hydrogen refuelling stations in Germany.

18 years of experience in the energy industry, with broad experience rolling out infrastructure, negotiating world-class deals in multiple geographies from Iran to South Africa, Germany to US.

Oliver believes in a strong commercial focus with priority on early delivery as this creates credibility.

He leads a broad team of talented individuals based in different countries around the world, covering station operations, research & development, finance and business development.

He is also Director at Shell (Switzerland) AG (Zug), Shell Trading Switzerland AG (Zug), Shell & Vivo Lubricants Company SA (Geneva) and Shell Hydrogen Deutschland GmbH (Hamburg).

EDUCATION

1997 The Open University
Bachelor of Science (BSc), Electronics

WORK EXPERIENCE

2013-present — General Manager, Shell Hydrogen

Shell, Switzerland/global remit

Negotiated and Implemented H2 Mobility Germany - world's largest hydrogen infrastructure play involving equity, German and EU funds, as well as a multitude of automakers as key stakeholders.

Responsible for:

- Shell's shareholding in H2Mobility in Germany
- Operations at Shell retail sites equipped with hydrogen dispensers (Germany and the West Coast US),
- Setting the Research & Development direction
- Stakeholder engagement in the alternative energy space with a global remit.
- Management of staff and budgets
- Setting strategic direction

2011-present — Director

Shell and Vivo Lubricants Company SA

2007-2012 — Mergers & Acquisitions Portfolio Manager Europe, Middle East and Africa

Shell, Switzerland

2000-2007 — Several Roles in Management and Business Development

Shell, London, UK

1998-2000 — Financial Analyst

Shell Services International Ltd, London, UK

Hechem Nadjar
Hydrogen Business Development Manager
Shell, 307 rue Estienne d'Orves, 92708 Colombes Cedex (France)
+33 157 606 765
+33 630 349 417
Hechem.nadjar@shell.com

PROFILE

Mr. Nadjar has 16 years of experience in petrochemicals as technical manager, global product manager, M&A and New Energies. He has five years of experience in hydrogen economics and business development in California and Europe. He works closely with equipment suppliers, retail, OEMs and start-ups involved in new technologies. Mr. Nadjar has an MSc in Chemistry and an MSc in Chemical Engineering.

EDUCATION

2001 ECOLE NATIONALE SUPERIEURE DU PETROLE ET DES MOTEURS, IFP-SCHOOL, Paris, France & MCGILL UNIVERSITY, Montreal, Canada

M. Sc in Chemical Engineering

Advanced Technology in Petrochemicals, Polymers and Plastics

2000 ECOLE DE CHIMIE, POLYMERES ET MATERIAUX, ECPM, Strasbourg, France

M. Sc in Chemistry

WORK EXPERIENCE

2016-present — Business Development Manager, New Energies, SHELL

Acts as business opportunity manager for the hydrogen infrastructure deployment in Europe and California
Responsible for:

- GFO-15-605: Alternative and Renewable Fuel and Vehicle Technology Program - Light Duty Vehicle Hydrogen Refueling Infrastructure
- GFO-17-603: Renewable Hydrogen Fueling at Scale for Freight (H2Freight)
- European CEF Innovation Call: Hydrogen Fueling Stations in BENELUX
- Shell's representative at the Hydrogen Council

2014-2016 — Economics and Commercialization Manager - New Energies,
Shell, Paris, France

Acts as business opportunity deputy manager for California
Hydrogen retail network preparation, Develops and executes economics and business plans for Californian and European projects
Responsible for:

- Interactions with OEMs, IGCs and start-up
- Support the execution of projects as part of multifunctional project teams
- Execute both divestment and growth related projects
- Asset restructuring mainly of existing JVs

2013 — Downstream Strategy, Portfolio Integration Manager
Shell, Paris, France

2009-2013 — Global product manager
Shell, Paris, France

2006-2009 — Technical & Development manager
Shell, Paris, France

2002-2006 — Technical & Development engineer,
TOTAL, Belgium

Manfred Becker
Global Hydrogen Operations Manager
Shell Deutschland Oil GmbH, Suhrenkamp 71-77, 22335 Hamburg
(+49) 4102 456831
(+49) 171 229 46 96
Manfred.Becker@shell.com

PROFILE

Broad experience of Retail business acquired via different roles in Marketing, Network and Sales & Ops, e.g. Bottom line accountability, Relationship management, Stakeholder Management, Self-Mastery, Coaching, Negotiations, Leading teams, Project management, Development of partnership models and marketing campaigns.

High customer focus: As proven in different activities and projects within my Retail Sales District Manager Role.

Deep engineering competencies and knowledge, such as: Retail site design, Design& Construction optimization, HSSE in design and site work. Management of assurance processes in all engineering related subjects.

Management of projects and programs, deliver the results through others (PMC / FMC) and manage business outcome / results.

EDUCATION

1987 — University of Applied Science East Westphalia (Lippe-Detmold)
Graduate civil engineer

WORK EXPERIENCE

2015-present — Global Hydrogen Operations Manager
Shell New Energies, Hamburg, Germany

Manager for the Hydrogen Commercial and Operations activities within Shell's New Energies Business.

- Manage the full life cycle of Shell's Hydrogen Retail stations, including the planning of hydrogen stations, the safe and efficient operations of the stations
- Manage the HSSE aspects of the hydrogen business as well as a high-level oversight of HSSE in biofuels, GTL marketing and electric vehicle trials.
- Participate in the technical improvement of hydrogen stations: reliability, safety, root cause analysis of failures, as well as investigations into emerging technologies.
- Shells representative in different Hydrogen interest groups, like Clean Energy Partnership in Germany
- Manage different stakeholders in the H2 Mobility JV as well as interested bodies such as the German Government, certain EU bodies (FCH-JU, TEN-T) and California (CARB, AQMD), standards bodies (ISO, SAE) as well as various other associations (TUV).

2009-2015 — Retail Engineering Manager Germany – Austria – Switzerland
Shell Deutschland Oil GmbH, Hamburg, Germany

2007-2009 — Retail Network Engineering Team Leader – Germany – Austria – Switzerland
Shell Deutschland Oil GmbH, Hamburg, Germany

2005-2007 — Global Engineering Standard Advisor
Shell Deutschland Oil GmbH, Hamburg, Germany

1988-2004 — Different roles in Retail Shop Development and Management
Shell Deutschland Oil GmbH, Hamburg, Germany

Wayne Leighty
Hydrogen Business Development Manager, North America
600 Montgomery St, San Francisco, CA 94111
+1 907 223 1684
Wayne.Leighty@shell.com

PROFILE

Wayne joined Shell in 2010 after graduate study at the UC Davis Institute of Transportation Studies. He holds bachelor degrees in environmental science and economics from Brown University, masters degrees in transportation technology and policy and in resource economics and in business from UC Davis, and a doctorate in transportation technology and policy from UC Davis.

In addition to 4 years' study of hydrogen vehicle drivetrain and fuel infrastructure at UC Davis, Wayne has been in the role of Hydrogen Business Development Manager with Shell since November 2016. Previous experience with Shell includes roles in business planning and commercial finance.

Wayne holds accountability for the hydrogen business development in North America, reporting to Oliver Bishop.

EDUCATION

UNIVERSITY OF CALIFORNIA, DAVIS 2006 – 2010
- PhD, Sustainable Transportation Energy Program
- MBA, Graduate School of Management
- MS, Transportation Technology and Policy
- MS, Agricultural and Resource Economics

BROWN UNIVERSITY, PROVIDENCE, RI
- BS, Environmental Science
- BA, Economics

WORK EXPERIENCE

2016-present — Business Development Manager Hydrogen, *Shell New Energies*

Accountable for business development for hydrogen mobility in North America, including hydrogen refueling stations and molecule supply chain.

2014-2016 — M&A and Commercial Finance Manager, *Shell Oil Company*

Finance lead for joint venture formation and dissolution, divestments and acquisitions, and swaps. Internal investment banker, chief financial officer, and transaction service provider for deals. Lines of business including exploration, upstream (unconventionals, deepwater), and downstream (MS&D, chemicals, retail).

2012-2014 — Business Planner, Alaska Venture, *Shell Exploration and Production Company*

Led business and operational planning, reporting, latest estimate, economics and financial planning activities, including exploration prospect portfolio. Design and facilitation for effective engagements (VP and EVP level); designed governance, decision-making and performance monitoring structures with KPI linked to business objectives and key performance factors. Planning section chief for Kulluk incident response.

2010-2012 — Commercial Regulatory Analyst, Alaska Venture, *Shell Exploration and Production Company*

Ran an effective third party advocacy program and led the Shell Alaska economics working group. Developed regulatory and legislative strategy, policy messaging and position papers.

2010 — Professional Trainee, Advanced Technology, *Southern California Edison*

Wrote business case and regulatory analyses for smart grid and plug-in vehicle infrastructure.

2009 — High Potential MBA Intern, Commercial Excellence, *Shell Chemicals*

Led development of case studies for a successful global training program, wrote sales channel selection guidance, coordinated user adoption of new customer relationship management system.

2003-2006 — Chief of Staff, *Alaska State Senator*

Collaborated to analyze Alaska natural gas pipeline contract, key advisor on major changes to oil and gas tax policy passed in 2006.

James C. Martin
Hydrogen Retail Projects Advisor
3301 BOLLINGER CREST SAN RAMON, CA 94583
925 766-0906
James.C.Martin@shell.com

PROFILE

Broad experience with major petroleum company development and operations. Experience ranges from upstream petroleum exploration and production, engineering and major project management, to downstream refinery project engineering, retail products engineering, maintenance and construction.

Key areas of expertise include:

- Project team leadership skills • Contractor evaluation and supervision
- Capital project management • Equipment std.'s and specifications
- Gasoline/Hydrogen fuel systems • Retail convenience store construction

EDUCATION

B. S. Mechanical Engineering, University of California, Davis
M.B.A. University of California, Irvine
Registered Professional Engineer, Mechanical M28422, State of California

WORK EXPERIENCE

2006-present

Project Manager

Shell Hydrogen LLC, Asset Development and Operations

Perform project engineering for development of Hydrogen Refueling facilities for DOE and California Highway Infrastructure Project. Develop scope of work, engineering standards, permitting, construction and operation of retail facilities. Project Manager for four west coast projects.

2000-2006

Facilities Engineer

Shell Oil Products U.S., Retail Engineering and Construction

Perform field engineering and construction for all capital improvement projects for Northern California territory including tank and line replacements, dispenser upgrades, food mart store remodels and facility rollout of new programs.

Projects completed in 2001: 3 new stores, 6 raze and rebuilds, and 12 environmental projects.

Projects completed in 2002: 60 environmental projects.

Projects completed in 2002-2006: 400 environmental projects.

1975-2000

Several major engineering projects

ARCO Products Company, Retail Engineering, Construction and Maintenance, La Palma, CA

Andrew Lund
Chief Engineer, Product Development Office
Toyota Motor NA R&D, 8777 Platt Road, Saline, MI 48176
+1 (734) 695-2159
+1 (734) 516-4024
andrew.lund@toyota.com

PROFILE

Extensive Product development experience and leadership as chief engineer of global R&D vehicle team.

- Vehicle concept development based on hands-on market investigation.
- Vehicle specification setting, performance criteria determination.
- Engineering management, drawing approval.
- Prototype build and evaluation leadership.
- Budget management, ROI management.
- Quality plan and confirmation leadership.

Paint and anti-corrosion material development experience.

International marketing experience.

Strategic planning experience for product development and corporate merger and acquisitions.

English and Japanese bilingual, 20 years living in Japan.

EDUCATION

1985 — University of Michigan College of Engineering
BS in Mechanical Engineering

WORK EXPERIENCE

2000-present — Chief Engineer, Product Development Office
Toyota Motor North America
Saline, MI
Portal Project (2017 -)
Hydrogen fuel cell powertrain development for heavy duty trucks.
One Toyota Competitiveness Project (2016 – 2017)
Corporate cross functional project leadership to improve company competitiveness and efficiency.
Sienna Minivan Development (2000 – 2016)
Market investigation, product concept development, vehicle performance criteria setting, business case development, engineering management, quality management, production support.

1994-2000 — Manager, Materials Engineering Department
Toyota Motor North America
Ann Arbor, MI
Paint and Anti-corrosion design and evaluation engineering and management.

1985-1994 — International Marketing Manager
Henkel Corporation
Madison Heights, MI (including 2 years in Toyohashi, Japan)
Adhesives, sealants, and anit-corrosion chemical technical service, product development, international marketing, strategic planning.

Tak Yokoo
Senior Executive Engineer, Product Development Office-Advanced Fuel Cell

Toyota Technical Center, 1630 186th Street, Gardena, CA 90248
+1 (310) 787-5621
+1 (310) 489-0007
takehito.yokoo@toyota.com

PROFILE

Tak Yokoo's background includes managing suitability testing of advanced powertrain configurations in North America, coordinating development of new or improved alternate powertrain system controls for Fuel Cell Hybrid Vehicles (FCHV), Gasoline Hybrid Vehicles (HEV), Plug-in Hybrid Electric Vehicles (PHEV) and Battery Electric Vehicles (BEV). Also includes strategic planning focusing on technologies that enable sustainable transportation systems.

Currently his responsibilities have been extended to large scale Fuel Cell powertrain feasibility in North America.

Mr. Yokoo earned a Master of Science degree in Mechanical Engineering from the Hosei University, Japan, then began his career at Toyota Motor Corporation (TMC) in 1981. He moved to TTC in 1990 to begin his new career in the US, where he was responsible for managing suitability testing and development of gasoline powertrain control systems in North America.

EDUCATION

1981 — Hosei University (Japan)

M.S. in Mechanical Engineering

Thesis: Measurement of burning velocity near the lower flammability limit by using spherical flames under zero gravity

1979 — Hosei University (Japan)

B.S. in Mechanical Engineering

WORK EXPERIENCE

1990-present — Powertrain control system

Toyota Motor North America, R&D

Gardena, CA

Alternate powertrain system controls for Fuel Cell Hybrid Vehicles (FCHV), Gasoline Hybrid Vehicles (HEV), Plug-in Hybrid Electric Vehicles (PHEV) and Battery Electric Vehicles (BEV).

1981-1990 — ICE control system development

Toyota Higashi-Fuji Technical Center,

Shizuoka, Japan

US product internal combustion engine control system development and the calibration.

Craig Scott
Senior Manager, Advanced Business Strategy
Toyota Technical Center, 1630 186th Street, Gardena, CA 90248
+1 (310) 787-5646
+1 (469) 292-4297
Craig.scott@toyota.com

PROFILE

Extensive project management & implementation leadership as part of global cross-functional team.

Strategy ideation, development & execution of nascent technologies & business models.

Extensive experience cultivating & managing third-party relationships including with domestic & int'l governments.

Wide-ranging experience forming & managing highly visible & global strategic alliances & partnerships.

Direct budget responsibility for programs exceeding $15mm annually.

Broad capability to systemically conceive, develop & deliver intricate new business programs & opportunities.

EDUCATION

2001 — University of Southern California, Marshal School of Business
MBA with Strategy/Finance focus

1996 — California State University
B.A. in Business Administration, Finance
Minor in Japanese Language Studies

WORK EXPERIENCE

2001-present — National Manager, Advanced Technologies Group
Toyota Motor North America
Torrance, CA

Advanced Technology Planning (2007 -)

Product & strategic planning for all Toyota alternative fuel vehicles including Prius, Mirai & BEVs

Advanced Product Strategy (2003 – 2006)

Ideation & development of new product & business plans supporting Toyota's long-range strategic goals

Business Planning Group (2001-2002)

Developed Toyota's first 10-year business plan clarifying company initiatives & ensuring corporate strategy alignment

1998-2000 — Portfolio Management Associate
Pacific Investment Management Company
Newport Beach, CA

ASH CORSON

(424) 634-1644 • 211 Yacht Club Way Apt 345, Redondo Beach, CA 90277 • ash.corson@toyota.com

EDUCATION

GEORGETOWN UNIVERSITY, The Robert Emmett McDonough School of Business — **Washington, DC**
Master of Business Administration — *May 2002*

- Strategy, Marketing, Customer Growth, New Product Development, 730 GMAT

CONNECTICUT COLLEGE — **New London, CT**
Bachelor of Arts, Economics and Chinese — *May 1995*

- Summa Cum Laude, Phi Beta Kappa, Frederick Sykes Scholar, Top 10 in Class, Language & Writing Awards

EXPERIENCE

TOYOTA MOTOR SALES, U.S.A., INC. — **Torrance, CA**
Alternative Fuels Vehicle Manager—Advanced Technology Group — *June 2014 – Present*

- Managing Fuel Cell Vehicle (FCV) product, infrastructure, business, & customer development.
- Supporting Toyota's environmental leadership, sustainable mobility, and advanced technology initiatives.

Senior Product Planner for Lexus — *February 2003 – March 2006*

- Planned Lexus RX, IS, and ES model lines (60%+ of total Lexus vehicle volume).
- Helped formulate concept, shape design, negotiate price/volume, define features, evaluate development, & oversee launches of '06 RX400h, '06 IS250/350, '07 ES350, '09 IS-F, '10 RX350/RX450h, & '10 IS250/350C.
- Achieved approval for all key vehicle plans & strategies via presentations to President, CEO, and COO.
- Recognized by executive management as top vehicle planner at company.

Product Planning Graduate Management Associate — *August 2002 – February 2003*

- Supported annual Joint Product Discussion with senior Toyota Motor Company management.
- Assisted planning of Scion tC and developed product recommendations for '07 Tundra and '08 Sequoia.

KONAMI DIGITAL ENTERTAINMENT, INC. — **El Segundo, CA**
Associate Director of Strategic Planning & Online Marketing — *December 2011 – June 2014*

- Directed Konami's interactive marketing campaigns, online expansion strategies, and business intelligence.
- Advised production, brand, & online group marketing strategies for North & South American sales regions.
- Led Konami's worldwide Social Media teams, engagement efforts, & 22-million-fan community growth.
- Managed project tasking, daily production, and career mentorship of 14-member online development team.

Senior Manager of Strategic Planning — *April 2011 – December 2011*

- Helped guide company expansion into key Brazil & Mexico markets via high-ROI localized regional strategies.
- Led conceptualization, creation, & launch of metalgearsolid.com with Kojima Productions & SPIKE.com.
- Achieved customer engagement gains of 400+% and outperformed all competitors at E3 & Comic-Con events.

Social Media Manager — *February 2010 – April 2011*

- Managed Konami's worldwide social media strategy & team to industry-best growth (20K→10M Facebook fans).
- Built 6+ million PRO EVOLUTION SOCCER Facebook fan base and introduced social & peer-to-peer sales.
- Developed innovative SILENT HILL & METAL GEAR campaigns with Sony, Best Buy, & Universal Studios.

AMERICAN MANAGEMENT SYSTEMS, INC. [INTERNATIONAL CONSULTING FIRM] — **Fairfax, VA**
Principal (promoted a year and a half ahead of schedule) — *June 1999 – September 1999*

- Helped create corporate strategy & $4MM in contracts while receiving special recognition award for "exemplary leadership, superior performance, & measurable contribution to business unit's financial bottom line."

Design & Implementation Team Leader — *December 1998 – August 1999*

- Led the innovative design & on-time implementation of $3 million welfare reform system for the State of Ohio.
- Managed 9-member design team, met all deadlines & deliverables, & trained senior staff in software operations.

Business Analyst — *March 1996 – December 1998*

- Recognized for enhancing product design & improving client relations on New Mexico Child Welfare project.

INTERESTS

Automobiles, Mobility Solutions, Advanced Technologies, Alternate Fuels, F1, Driving, Writing, Reading, Athletics

James Kast
Fuel Cell Business Analyst, Advanced Business Strategy
Toyota Technical Center, 1630 186th Street, Gardena, CA 90248
+1 (310) 787-5576
+1 (310) 753-3668
James.kast@toyota.com

PROFILE

James has diverse public and private sector experience with a strong focus on fuel cell and hydrogen technologies. He continues to develop a broad skillset including business development and strategy, engineering, policy, and workplace diversity and improvement. James currently supports Project Portal, a class 8 fuel cell truck demonstration, and hydrogen infrastructure development projects with the Advanced Business Strategy group at Toyota.

James holds a M.S in Mechanical Engineering from the University of California Irvine and a B.S. in Mechanical Engineering from the University of Idaho.

EDUCATION

2014 — University of California, Irvine

M.S. in Mechanical Engineering

Thesis: Dynamic modeling, design, and performance evaluation of large scale high temperature fuel cell tri-generation systems

2012 — University of Idaho

B.S. in Mechanical Engineering

WORK EXPERIENCE

2017-present — Fuel Cell Business Analyst

Toyota Motor North America

Gardena, CA

Supports business development and strategy for Toyota's fuel cell business in North America. Focus areas include class 8 fuel cell truck development and supporting hydrogen infrastructure.

2015-2017 — Science and Technology Policy Fellow

U.S. Department of Energy, Fuel Cell Technologies Office

Washington, D.C.

2012-2014 — Graduate Student Researcher

National Fuel Cell Research Center

Irvine, CA

2012 — Research Assistant

U.S. Department of Energy, Argonne National Laboratory

Chicago, IL

MARK BROWN
- Executive Program Manager, Advanced Technologies
Kenworth Truck Company

Mark Brown is an executive program manager for advanced technologies at Kenworth Truck Company, a position he has held since April, 2018.

In this role, Mr. Brown is responsible for investigating new technology for commercial application, developing industry partnerships and leading project teams to develop and implement new technologies into Kenworth's product line up.

Mr. Brown works cross-functionally in the organization to gain alignment and support for new projects, participates in strategic planning for new product development and leads teams of engineers to execute development projects. Most of Mr. Brown's work is not able to be shared publicly but one of his programs that is exciting and can be shared is the Super Truck-II program, sponsored by the U.S. Department of Energy, that is focused on achieving significant improvements in engine thermal efficiency and total vehicle freight efficiency.

Mr. Brown's 25-year career with PACCAR includes engineering positions at Peterbilt, Kenworth and the DAF truck division in the Netherlands. He has also held positions in product planning, sales operations, and operations.

Mr. Brown holds a Bachelor of Science degree in Mechanical Engineering from California Polytechnic State University at San Luis Obispo, a Masters of Business Administration from Southern Illinois University, and is a registered Professional Engineer.

JOHN LUOMA
- Assistant Chief Engineer, Electrical/Chassis/Med Duty
Kenworth Truck Company

John Luoma is Assistant Chief Engineer for Kenworth Electrical, Chassis, Sustaining Cab and Medium Duty Development.

John has been with Kenworth since 1995. During his career he has held positions of increasing responsibility including, Sales Operations Manager, Manufacturing Engineering Manager, Program Manager, and Engineering Section Manager. His most recent assignment was Engineering Section Manager over the New Medium Duty group and Core Cab/Interior/Outerbody groups. In his current role John is responsible for leading a large segment of the Kenworth engineering organization to provide support for current production, develop and implement new product features, and lead continuous improvement initiatives.

John holds both a Bachelor of Science degree in Mechanical Engineering and a Master's degree in Business from Seattle University. He is also a certified Professional Engineer in Washington State.

BRIAN LINDGREN
-Director, Research & Development
Kenworth Truck Company

Brian Lindgren is director of research & development for Kenworth Truck Company, a position he has held since March, 2018.

In this role, Mr. Lindgren is responsible for guiding the technology roadmap for Kenworth's commercial vehicle product line, identifying and developing concepts to improve vehicle aerodynamics, freight efficiency and sustainability, and providing technology to assist drivers in improving on-road safety.

Mr. Lindgren leads a team of engineers and technicians in designing, developing and demonstrating proof-of-concept prototypes of new technologies. He is Lead for Kenworth's DOE- and SCAQMD-sponsored ZECTII projects to design, build and demonstrate zero- and near-zero-emission heavy trucks, and has led previous hybrid truck programs funded by the State of California.

Mr. Lindgren's 39-year career with PACCAR includes engineering positions at Peterbilt, Kenworth and PACCAR International, plus positions in Kenworth's Marketing and Fleet Sales groups where he served the North American vocational truck market.

Mr. Lindgren holds a Bachelor of Science degree in Mechanical Engineering from California Polytechnic State University at San Luis Obispo, and is a registered Professional Engineer.

STAN DELIZO
-MANAGER, RESEARCH ENGINEERING
KENWORTH TRUCK COMPANY

Stan DeLizo is a manager at the Research and Development Center for the Kenworth Truck Company, a position he has held since March, 2017.

In this role, Mr. DeLizo is responsible for identifying and developing advanced technology and applying these products and processes to Kenworth's commercial vehicle product line, was the lead engineer on previous hybrid truck programs funded by the DOE and the State of California and has led the investigative and engineering effort to develop non-traditional heating-cooling-and-power systems for over-the-road and no-idle applications.

Mr. DeLizo's 29-year career with PACCAR includes multiple engineering positions for Kenworth in product design & development, manufacturing & facilities engineering and managed Kenworth's production tooling; in addition, he has held positions of increasing responsibility on the Renton Plant Team as well as PACCAR's Six Sigma, Supplier Quality and Advanced Quality management teams.

Prior to Kenworth, Mr. DeLizo designed and built sub-surface, surface and atmospheric research and sampling equipment for the National Oceanic Atmospheric Association, Environmental Research Group, Engineering Development Division and is a veteran of the US Coast Guard and Reserve.

Mr. DeLizo holds a Bachelor of Science degree in Mechanical Engineering from the University of Washington and is a PACCAR certified Six Sigma Black Belt.

GILES PETTIFOR

gpettifor@gmail.com
(805) 765-0668

SUMMARY OF QUALIFICATIONS

Environmental professional with over 15 years of experience in water quality, stormwater management, water resources and NPDES permit compliance.

EXPERIENCE

Port of Hueneme, Environmental Manager, (2017 - Present) Port Hueneme, CA

- As the Port's Environmental Manager, Mr. Pettifor has oversight of the Port's active sustainability initiatives which include implementation of the Port's Environmental Management Framework (EMF), our Green Marine Certification, as well as compliance with ongoing state and Federal environmental regulations including air and water quality.
- The Port's EMF outlines the strategic efforts the Port will undertake to protect the environment, and covers eight environmental elements including:
    - 1. Community engagement
    - 2. Sustainability
    - 3. Air Quality
    - 4. Water Quality
    - 5. Soil and sediment
    - 6. Marine resources
    - 7. Energy management
    - 8. Climate change adaptation
- Since adopting this proactive agenda of sustainability, the Port has pursued the integration of the elements of the EMF into its daily operations as well as long term planning. Progress has been made every year since, and in 2016 the Port became the first port in California to be certified by Green Marine, the preeminent third party environmental certification organization for marine facilities. The Port is fully committed to making environmental progress in every way that it can as it grows and changes with the global economy.
- In addition, Mr. Pettifor is helping to lead the development of the Port's long-term energy planning, including the adoption of zero and near zero emission equipment at the Port and associated operational and logistical adjustments. Mr. Pettifor is also lead on the implementation of the Port's NPDES stormwater permit efforts in compliance with the California statewide Industrial General Permit.

Larry Walker Associates, Project Scientist II (2014 - Present) Ventura, CA

- LWA is a specialized water quality management consulting firm supporting municipal clients throughout California. In this role, I advise more than 20+ client Cities and Counties around the State and/or develop materials for their water-related programs and activities. Examples include:
    - NPDES Municipal Stormwater Permit compliance projects for both Phase I and II permittees, for which I develop efficient and effective solutions including creation of and revisions to program documentation (ROWDs, WQIPs, JRMPs, SWMPs, SWPPPs, ERPs) and annual reporting, public education and outreach material development and implementation, monitoring data assessment, and staff training.
    - Regulatory assistance including interpretation and consultation on potential outcomes of new State Water Resources Control Board and Regional Board policies, procedures and documents, and tracking and interpretation of upcoming legislation at both the Federal and State levels.
    - Formal policy tracking and commenting including comment letter development and submittal for both Federal and State policies including 303d lists, triennial reviews and integrated report development, statewide trash amendments, California Stormwater Initiative, industrial permit TMDL revisions, pesticide regulation changes, statewide bacteria policy, and statewide nutrient policy.
    - Water resources project support including salt and nutrient management plan development, assessment of options related to salt control from water softeners, recycled water program development and stakeholder

coordination, anti-degradation analyses of POTW construction and discharge modification, and SGMA related groundwater sustainability plan and agency tracking.
  - Development of Stormwater Resources Plans in compliance with State guidelines to enable pursuit of Proposition 1 grant funds.
  - Completed Proposition 1 Stormwater Implementation Project grant proposals for LID/GSI projects including submittal via State web portal (SMARTS) for clients which were then successfully funded.

King County, Water and Land Resources Division - Program Manager III - (2007 –2013) Seattle, WA

- Managed compliance with the Clean Water Act for Washington State's most populous county through efficient leadership and a deep understanding of both the regulatory environment and underlying science.
  - Oversaw King County's National Pollutant Discharge Elimination System (NPDES) Phase I Municipal Stormwater Permit program through maintaining a network of collaborative relationships with 11 County Departments, 30+ neighboring jurisdictions, Tribal Nations, and regulatory agency staff.
  - Ensured ongoing implementation of nearly 100 permit requirements throughout the County by pioneering new ideas, communicating and meeting deadlines, managing budgets, using judgment to prioritize and leverage resources and navigate political processes to ensure that the County's myriad programs and 13,000 employees were protecting water quality in compliance with our permit.
  - Co-led response to EPA compliance audit of entire stormwater management program, including 2-day site visit audit and 60+ requirement records request applicable to all of the County's staff and programs. Communicated the urgency and influenced other departments' participation in the audit.
  - Developed and instituted a system for tracking the ongoing completion of milestones and tasks required for compliance with permit by all of the County's departments down to the staff level to avoid risk by ensuring that critical path permit compliance work was completed.
  - Advised management on developing policy shifts in the State and Federal regulatory landscape by distilling the most pertinent content, its potential fiscal and procedural implications, and recommended responses.
  - Developed communication tools and led trainings and gave public presentations aimed at raising awareness about stormwater and the County's efforts to improve local water quality at public events, stakeholder and NGO group meetings throughout King County.
  - Conceived of and led development of a series of public education videos explaining in simple language what the permit was and why it matters to water quality, in response to low attendance at public meetings. Public participation in the stormwater program has increased annually since launching the videos in 2009.
- Collaborated with regional cities and counties to found a Puget Sound region-wide stormwater education and outreach campaign on how to protect water quality with simple behavior changes.
  - Co-wrote grant which secured $1MM in funding to develop the campaign and integrate social marketing techniques into design and marketing channel selection, build website and materials, and fund media buys.
  - Helped grow participation amongst neighboring jurisdictions to 40+ jurisdictions in two years through developing strong relationships with jurisdictions, regulatory agency staff and non-profits to achieve consistent messages that transcend jurisdictional borders and reach as widely as possible.
- Regional coordination leader for EPA grant- funded, water quality modeling project. Garnered matching funds from local jurisdictions, presented to cities in watershed and Muckleshoot Tribe on project concepts while soliciting input and data sharing, and presented to the watershed's salmon recovery forum of elected officials from local jurisdictions.
- Co-authored 5 State and Federal water quality and pollution prevention grants, on the topics of public education and outreach, stormwater system mapping, pollution source tracing and elimination, and low impact development (LID).

Triton Environmental Inc. — Project Manager, Coastal Projects Division (2004 – 2006) Guilford, CT

- Managed first-ever marine sediment sampling and characterization study in New England under new EPA/ National Marine Fisheries Service/ U.S. Army Corps regulations. Succeeded through translating between the client (budget/timing concerns), laboratory scientists (testing protocol details), and regulatory agencies (reporting/permitting). Coordinated permitting, sediment sampling, bathymetric surveying crews and toxicology lab subcontractor, and oversaw contractor dredging compliance by working on the dredging barge for three months.
- Managed regional projects including: oil spill prevention and response documentation and planning, coastal permitting for residential and industrial clients, marine dredging permitting.

- Conducted extensive stormwater monitoring and gave pollution prevention training presentations to large groups of industrial manufacturing employees.

EDAW Inc. — Senior Environmental Analyst (2002 – 2004) San Diego, CA

- Sole support to the Managing Principal on a 10-year, $6.5MM regional water resources environmental compliance project.
  - Managed daily alignment of schedules, budgets and project deliverables among resource agencies, client and a diverse team of biologists, archaeologists, engineers, contractors, and habitat restoration specialists.
  - Oversaw environmental compliance for water and air quality, noise, visual, biological and cultural resources in coordination with US Fish and Wildlife Service, Army Corps, CA Dept. of Fish and Game, CA Coastal Commission and local jurisdictions.
- Helped manage multiple projects on water quality, water supply/resources, storm water, and recycled water marketing and distribution. Provided the research and analysis for nationwide projects including: coastal water quality, dry weather water quality monitoring programs, storm water compliance surveys and monitoring programs, and fisheries studies.
- Managed NPDES stormwater compliance and water resources constraints studies for Cherokee and Rincon Tribes.
- Conducted CEQA/NEPA analysis and documentation and compliance for projects including local government, military and infrastructure development construction.

Questa Engineering Corporation — Environmental Specialist/Intern (2001 - 2002) Santa Barbara, CA

- Conducted comprehensive county-wide surface water quality sampling program and intensive research project to help determine extent of potential contamination from septic systems throughout Santa Barbara County.
- Performed extensive stream sampling, GIS and historical photo analysis, interviews, and historical permit review. Presented methodology and results at numerous community meetings.

EDUCATION

Master of Environmental Science and Management. University of California, Santa Barbara, Donald Bren School of Environmental Science and Management, 2002. Santa Barbara, California.

Bachelor of Arts in Government. Claremont McKenna College, 1998. Claremont, California.

The Port
OF HUENEME
Oxnard Harbor District

BOARD OF HARBOR COMMISSIONERS
Mary Anne Rooney President
Jess Herrera Vice President
Jess Ramirez Secretary
Dr. Manuel M. Lopez Commissioner
Jason T. Hodge Commissioner

PORT MANAGEMENT
Kristin Decas CEO & Port Director

Foreign Trade Zone #205

CHRISTINA A. BIRDSEY

Chief Operations Officer • The Port of Hueneme • cbirdsey@portofh.org • (805) 488-3677

EDUCATION, REGISTRATIONS AND AFFILIATIONS

- B.S., Civil/Environmental Engineering, University of Southern California, Los Angeles (2002)
- Society of American Military Engineers – Board of Directors
- Maritime Advanced Systems & Technology – Board of Directors
- AAPA – Multiple Committee Member
- American Society of Civil Engineers
- Coasts, Oceans, Ports and Rivers Institute
- Chi Epsilon – Civil Engineering Honors Society
- Facility Security Officer Certificate by the California Maritime Academy

PROFESSIONAL WORK EXPERIENCE

Oxnard Harbor District, Port of Hueneme, 2009-Current

Metson Offshore, Inc., 2008-2012

Penfield & Smith, 2004-2008

Rincon Consultants, Inc., 2002-2004

Mrs. Birdsey came aboard in 2012 as part of the Port's staff as Director of Operations & Security after sub-consulting through Moffatt & Nichol since 2009 and was promoted to Director of Operations and Engineering. In 2017, Ms. Birdsey was promoted to Chief Operations Officer. She oversees the Operations Department, and is responsible for ensuring the implementation of programs and activities related to all Port engineering, construction, and maintenance activities related to the Port's harbor, terminals and other facilities. She has been effective managing the facilities team as well as outside contractors while working on major infrastructure projects that require vision, patience and perseverance. She works with the Port in the development of their security and environmental programs, including the development of "best practices" for Port operations. She manages grant administration and has been highly successful in obtaining funding through multiple sources. She also assists in the formulation of policies and strategies relating to administration and operational activities that are presented to and approved by the Board of Harbor Commissioners.

Prior to working for the Port of Hueneme, Mrs. Birdsey worked for Metson Offshore, Inc. (MOI) as Program Manager. MOI runs multiple Naval Ports nationwide and she was the contract coordinator. She prepared Government contract proposals, cost estimates and budgets and worked with the site managers to best utilize their funding. She also assisted in contract transitioning for Port Operations and Port Engineering including specification writing and bid preparations. Through MOI she worked with a team internationally to help support clients abroad on the often complex International Ship and Port Facility Security (ISPS) code requirements and helped plan for their impending infrastructure needs. When not working abroad, she was selected as a sub-consultant through MOI for Moffatt & Nichol to oversee grant funded security and infrastructure projects at the Port of Hueneme.

Prior to working for MOI, she spent over six years with Penfield & Smith and Rincon Consultants in the civil and environmental engineering field which allowed experience in development, implementation and project management of environmental impact assessment projects as well as project planning and design, water modeling, water feasibility studies, water master plans, construction inspection and project management.

K.J. May

555 Shell Harbor Lane
Port Hueneme, CA 93041
Email: kmay@portofh.org
(805) 854-4070

HIGHLIGHTS

- 5-years of engineering and project management experience with U.S. Navy Civil Engineer Corps
- 3 ½ years of overseas project management experience with the U.S. Navy in Pacific theater and CENTCOM
- Defense acquisition contracting level 1 certified
- Completed NAVFAC EM-385 40-hour and USACE Construction Quality Management (CQM) training
- Bilingual in Chinese Mandarin (defense language proficiency test certified) and English
- Top secret clearance

EXPERIENCE

Engineering and Project Management

- **NAVFAC Supervisory General Engineer**, Guam, U.S., February 2012 – February 2013
  - Supervised six civilians and four military construction management engineers overseeing $300M worth of projects.
  - Managed day to day construction management activities while providing engineering and contractual guidance.
  - Performed periodic training and midterm/annual performance reviews for construction management engineers.
- **NAVFAC Construction Management Engineer**, Guam, U.S., February 2011 - January 2012
  - Managed fifteen interdisciplinary construction projects under Federal Acquisition Regulation (FAR) and Unified Facilities Criteria (UFC) requirements.
  - Performed quality assurance, cost estimating, financial control, safety, preconstruction, commissioning, and contractual administrative tasks.
  - USACE Construction Quality Management (CQM) qualified, and certified in NAVFAC EM-385 40-hour training.

Leadership and Construction Management

- **Public Works Officer and Assistant OIC of San Nicolas Island (SNI)**, Ventura, CA, January 2009 – January 2011
  - Managed and planned critical facilities engineering requirements.
  - Coordinated weekly logistical supplies for San Nicolas Island, an outlying field.
  - Implemented and enforced SNI policies and regulations.
- **Civil Engineer Corps Officer**, Port Hueneme, CA, May 2007 – Present
  - Led over 150 military personnel within the Naval Construction Forces.
  - Enforced the required state of mission readiness in unit personnel, equipment and material.
  - Managed peacetime and contingency construction projects.

EMPLOYMENT HISTORY

- 2013 – Present **U.S. Navy Civil Engineer Corps Officer**, Naval Base Ventura County, CA
- 2011 - 2013 **Construction Management Engineer**, Naval Facilities Engineering Command, GU
- 2009 - 2011 **Public Works Officer and Assistant OIC**, San Nicolas Island, Naval Base Ventura County, CA
- 2007 - 2009 **U.S. Navy Seabees Officer**, Naval Mobile Construction Battalion Five, CA

EDUCATION

- University of California Santa Cruz; Santa Cruz, CA
  Bachelor's Degree in Electrical Engineering, March 2006
- Naval Civil Engineer Corps Officers School, Port Hueneme, CA
  U.S. Navy Civil Engineer Corps Officer, December 2007

Cameron Spencer, MPP & MDR

276 via Antonio Newbury Park, CA 91320 • 805-551-5638
camspencer805@gmail.com • www.linkedin.com/in/camspencer

Local Gov't • Communication • Analysis • Customer Service • Outreach • Conflict Resolution

Local Gov't	Elections Department Intern | Customer Service | Analysis
Communication	Marketing | Management | Grant Writing | Public Speaking
Analysis	Data Collection | Research | Public Policy Analysis
Customer Service	Office Administration | Conflict Management | Polices & Procedures
Outreach	Community Engagement | Social Media | Volunteer Management
Conflict Resolution	Certified Mediator | Conflict Counseling | Mediated over 100 cases

Education

Master of Public Policy

Pepperdine University — **Malibu, CA**
*Dual specialization in **State & Local Gov't Policy & Economics**; 3.75 GPA* — **2012 – 2015**
Honors & Activities: Pi Alpha Alpha Honors Society, Member
Pepperdine University Annual Scholarship, Recipient
Public Policy Review Journal, Editor
The Churchill Society, Member

Master of Dispute Resolution

Pepperdine University Straus Institute
Specialization in Negotiation, Mediation, & Arbitration; 3.60 GPA
Honors & Activities: CALI Award for highest grade in Psychology of Conflict (Summer 2014)
Mediation Clinic Mediator, Los Angeles Small Claims Courts

J.D., Thomas Jefferson School of Law (Postponed) — **San Diego, CA**
Completed 1.5 years; postponed to pursue MPP & MDR — **2010 - 2012**

Bachelor of Arts, Political Science

Biola University — **La Mirada, CA**
Major in Political Science, Minor in Business Management, & Minor in Biblical Studies; 3.2 GPA — **2006 - 2010**
Honors & Activities: National History Honors Fraternity of Phi Alpha Theta, member.
Student Orientation Services, Student Ambassador (200+ volunteer hours).
The Chimes Student Newspaper, opinion writer.
Student Government, Senator & VP
Biola University Church & Art History Abroad – Italy.

Work Experience

PUBLIC & GOVERNMENT RELATIONS MANAGER, PORT OF HUENEME, OHD
Port Hueneme, CA
2017 - Present

- Specializing in public outreach and engagement with local community members and governing bodies including city, county, and regional elected governments.
- Serving as point person for grant opportunities for the Oxnard Harbor District.
- Provide legislative and political support to CEO & Board of Commissioners.
- Work with state and federal port associations on legislative and marketing efforts.
- Facilitating collaboration with local community stakeholders.
- Point person for community sponsorships.
- Provide direct support to the Chief of Commercial & Public Affairs Officer.
- Encourages public engagement through active community outreach.
- Introduces the public and community members to the Port of Hueneme.

PROGRAM MANAGER, Ventura Center for Dispute Settlement
Camarillo, CA
2015 - 2017

- Partner with the Executive Director in implementing and designing strategic initiatives for the organization.
- Develop new strategic initiatives consistent with the organization mission and vision.
- Collaborate on expansion efforts with the Executive Director.
- Manage the online marketing presence, and produce internal and public marketing and communications. (Including digital marketing)
- Research and assist in preparing Grant Proposals for State & Local Grant opportunities.
- Write Press Releases and introduce speakers at events and trainings.
- Create the quarterly newsletter for the organization.
- Collect, analyze, and present statistical reports for the Board of Directors.
- Create year-end reports to the Board of Directors, maintain accuracy of program's statistics and data.
- Manage the interns and staff of the organization on a daily basis in the office
- and in the courts.
- Continually work with community leaders (County Staff, State Bureaus, Judges, DA's Office, Professors, and Court staff) to build strategic relationships to meet future goals.
- Work directly with the Executive Director & Board of Directors.
- Manage subscriptions and professional memberships.
- Work directly with the CA State Bureau of Real Estate, State Board of Behavior Sciences, Ventura County Bar Association, and the CA State Bureau of Real Estate Appraisers to become certified Education Providers and strategic partners.
- Manage billing, invoicing, and payment for events and mediations.
- Resolve disputes and conflicts for clients telephonically and in Mediations.
- Teach modules at our Semi-Annual Mediation Skills Training.
- Supervise 8-12 interns each semester.
- Proficient in Google Suite.
- Started with the organization in January 2015 as an Extern, and was hired on staff in April.

VP OF MARKETING & COMMUNICATIONS, Associated Students of Biola University
La Mirada, CA
2009 – 2010

- Chief officer of marketing, public relations, and communications.
- Managed a staff of thirteen paid employees, including graphic designers.
- Created monthly surveys for the student body, and analyzed feedback data on events.
- Managed a $400,000 annual budget.
- Worked with each department on applying for and providing grants to students and specific events for the University.

- Developed the organization's brand image, marketing strategy, and website content (as.biola.edu).
- Wrote press releases & gave interviews for both University and outside media.
- Hosted University-wide events and services, while collaborating with University officials on various events for Alumni and the community.

EDITOR, Public Policy Review Journal
Malibu, CA
2013 - 2014

- Worked along side the other editors of the academic journal to select articles for publication.
- Partnered with writers of specific articles to edit and revise their work.

SPEECH WRITER, Todd Royal for CA State Assembly
La Canada, CA
2014

- Wrote campaign speeches for the candidate directly for donor, fundraising, church, constituent, and get out the vote events covering the 43rd District.

EXTERNAL AFFAIRS GRADUATE EXTERN, Sempra Energy (SoCal Gas Company)
Los Angeles, CA
2013

- Worked directly with Regional Vice President of External Affairs, Denita Willoughby.
- Produced talking points, marketing plans, and presentations to be used in expanding industry and business awareness about the utilization capabilities of natural gas.
- Researched and analyzed the profitability and environmental impacts of natural gas from a business and consumer perspective.
- Presented recommendations to the various vice presidents and directors of marketing, environmental affairs, communications, and external affairs.

PAID INTERN, Curt Pringle & Associates
Anaheim, CA
2009

- Specialized in Land Use & Community Development.
- Worked with clients and elected officials, bringing them together on specific projects.
- Assisted in improving the public relations of the company.

SENATOR, Associated Students of Biola University
La Mirada, CA
2008 – 2009

- Represented campus constituents to the student Senate, hosted events, and gave student voice to campus policy issues and reforms.

Certifications

Certified Mediator
California – Statewide
2015 – Present

- Certified through both Pepperdine University School of Law & the Ventura Center for Dispute Settlement.

Certificate in Volunteer Management Training
Camarillo, CA
May 2015

- Course through the Ventura County Community Foundation.
- Training in the best practices of managing volunteers for publicly funded organizations and non-profits.

Digital, Communication, & Public Speaking

I was chosen to give presentations to the Board of Directors and President of Biola University on behalf of the Political Science Department in 2010. I am experienced in **Microsoft Office including Excel, Word, and PowerPoint**. I also am experienced in the **Macintosh versions of Word, Excel, and Power Point, and Google Suite**. I have utilized several modern office procedures such as memo writing, mass emailing, database entry, faxing, scanning documents, conference calling, and organizing staff meetings. I am well versed in the various social media avenues of

communication and marketing such as: **Facebook, Instagram, Twitter, LinkedIn, Constant Contact, MailChimp, and Eventbrite.** Furthermore, I have grant writing experience. I am also familiar with online education and experience with web-based applications.

Kenneth J. Kelly
Team Leader, Commercial Vehicle Technologies
National Renewable Energy Laboratory, Transportation and Hydrogen Systems Center

EDUCATION

Bachelor of Science, Mechanical Engineering, Ohio University, 1986
Master of Science, Mechanical Engineering, Ohio University, 1998
Master's Thesis: *The Effects of Fuels and Test Cycles on Light Duty Vehicle Exhaust Emissions*

SUMMARY:

Ken has over 25 years of experience working on clean transportation research and integrated deployment of renewables at National Renewable Energy Laboratory. He currently manages NREL's Commercial Vehicle Technologies team focused on evaluating and developing medium- and heavy-duty advanced commercial vehicle technologies. While at NREL, Ken has managed and conducted research in a wide array of advanced vehicle and transportation technologies including: vehicle drive and duty-cycle characterization; hybrid electric vehicle systems; thermal management technologies for automotive power electronics; alternative fuel vehicle emissions; computer aided engineering and robust design methods for hybrid vehicle and fuel cell technologies. He has authored or co-authored over 30 technical publications in these research areas. Ken recently spent two years on assignment at the Hawaii State Energy Office as NREL's Senior Project Leader of the Hawaii Clean Energy Initiative (HCEI) and co-chair of the HCEI Transportation Working Group. Ken's industrial experience includes work as a manufacturing engineer at Swagelok Inc. and Ohio Broach and Machine Company.

PROFESSIONAL EXPERIENCE

1991 – Present	**National Renewable Energy Laboratory** (NREL), Golden, CO
2012 – Present	Team Leader, Commercial Vehicle Technologies
2010 – 2012	Senior Project Lead, Hawaii Clean Energy Initiative
2006 – 2010	Task Leader, Advanced Power Electronics and Motors
1995 – 2006	Senior Engineer, Advanced Vehicle Systems
1991 – 1995	Project Engineer, Alternative Fuels Data Center
1987 – 1989	Manufacturing Engineer, **Swagelok Valve and Fittings**, Willoughby, OH
1989 – 1991	Computer Aided Design, **Sunpower, Inc.**, Athens, OH
1980 – 1986	Design Draftsman, **Ohio Broach and Machine Company**, Willoughby, OH

AWARDS AND HONORS

- NREL President's Award: "*Significant technical and leadership achievements in leading the advancement of NREL capabilities in the areas of Heavy Vehicle Technologies*"
- NREL Director's Award: "*Significant technical and leadership achievements in leading the Advanced Power Electronics and Electric Machines research task*"
- NREL Staff Award for Outstanding Performance: "*For extraordinary productivity resulting in significant contributions to the Center for Transportation Technologies and NREL*"
- China Automotive Technology and Research Center – Letter of Appointment "*Consulting Expert: Research and Development of China New Energy Automotive Test Driving Cycles*"
- U.S. Patent: "*Fluid-Cooled Heat Sink with Improved Fin Areas and Efficiencies for Use in Cooling Various Devices*" US patent number 9,010,405

Recent Publications

- The Development of Vocational Vehicle Drive Cycles and Segmentation, AW Duran, CT Phillips, AM Konan, K.J. Kelly, National Renewable Energy Lab.(NREL), Golden, CO (United States)
- Heavy-duty vehicle port drayage drive cycle characterization and development, R Prohaska, A Konan, K Kelly, M Lammert, SAE International Journal of Commercial Vehicles 2016-01-8135)
- Field Evaluation of Medium-Duty Plug-in Electric Delivery Trucks, R Prohaska, M Simpson, A Ragatz, K Kelly, K Smith, K Walkowicz, National Renewable Energy Lab.(NREL), Golden, CO (United States)

Jason A. Lustbader, M.S.
National Renewable Energy Laboratory

Education and Training

B.S., Mechanical Engineering, University of Colorado at Boulder, 2001
M.S., Mechanical Engineering, University of Colorado at Boulder, 2005

Employment History

2001–Present Senior Engineer, National Renewable Energy Laboratory, Golden, CO

- Commercial vehicle team member, responsible for advanced data analytics, data analysis, vehicle modeling, and project management.
- CoolCab heavy-duty vehicle thermal management project task leader: led a team of up to eight researchers (regular employees and interns); included three projects: Heavy-vehicle cab thermal and idle load reduction, CoolCalc rapid HVAC analysis software tool, and CoolSim Thermal System model development in Simulink; led multiple "work for others" projects on vehicle HVAC systems.
- Principal investigator of the Air Cooling for Automotive Power Electronics Project. Led research on Automotive DC link capacitor thermal management.
- Helped plan, design, and secure funding for a new outdoor vehicle thermal test pad; wrote CoolCalc HVAC load estimation program prototype and helped establish collaboration with two heavy-duty truck manufacturers
- Principal investigator for A/C fuel use reduction through efficient delivery; evaluated advanced automotive seats in collaboration with industry partners; estimated their impact on thermal comfort, heat transfer, and fuel use.

Awards and Honors

SAE Lloyd L. Withrow Distinguished Speaker Award - 2017 / 2 patents, multiple pending

Publications Related to Proposed Projects

1. Meyer, J.J., Lustbader, J., Agathocleous, N., Vespa, A. et al., "Range Extension Opportunities While Heating a Battery Electric Vehicle," SAE Technical Paper 2018-01-0066, 2018
2. Titov, Gene, and Jason Aaron Lustbader. "Modeling Control Strategies and Range Impacts for Electric Vehicle Integrated Thermal Management Systems with MATLAB/Simulink," 2017.
3. Lustbader, J.; Kekelia, B. et al. Long-Haul Truck Sleeper Heating Load Reduction Package for Rest Period Idling. J. SAE Int. J. Passeng. Cars - Mech. Syst. 2016-01-0258. Pending, June 2016.
4. Lustbader, J, C. Kreutzer, M. Jeffers, S. Adelman, S. Yeakel, P. Brontz, K. Olson, J. Ohlinger (2014). "Impact of Paint Color on Rest Period Climate Control Loads in Long-Haul Trucks." 2014 SAE World Congress, Detroit, MI.
5. Titov, G., Lustbader, J., Leighton, D. "MATLAB/Simulink Framework for Modeling Complex Coolant Flow Configurations of Advanced Automotive Thermal Management Systems," SAE World Congress. Paper 2016-01-0230, Detroit MI. April 5, 2016
6. Lustbader, J. Kreutzer, C., Adelman, S., Yeakel, S., Zehme, J., 2015, "Sleeper Cab Climate Control Load Reduction for Long-Haul Truck Rest Period Idling," SAE Technical Paper 2015-01-0351, 2015.
7. Kiss, T., and Lustbader, J., "Modeling of an Electric Vehicle Thermal Management System in MATLAB/Simulink," SAE World Congress. Paper 2015-01-1708, Detroit MI. April 21, 2015
8. He, X., Lustbader, J., Arik, M., Sharma R. "Heat transfer characteristics of impinging steady and synthetic jets over vertical flat surface." International Journal of Heat and Mass Transfer. 2014.

ANDREW J. KOTZ Ph.D.
Commercial Vehicle Research Engineer, Commercial Vehicle Technologies
National Renewable Energy Laboratory, Transportation and Hydrogen Systems Center

EDUCATION

Doctor of Philosophy, Mechanical Engineering, University of Minnesota, 2016
Master of Science, Mechanical Engineering, University of Minnesota, 2015
Bachelor of Engineering, Mechanical Engineering, Stevens Institute of Technology, 2012

PROFESSIONAL EXPERIENCE

October 2017 – Present: **National Renewable Energy Lab** – Golden, CO
Commercial Vehicle Research Engineer

- Evaluate behavior of commercial vehicles that make use of new technologies including fuel cells, hybrids, electrification, autonomous controls and alternative fuels
- Acquire on-road performance data and publish results for the research community and the public.
- Analyze large, real-world vehicle operational datasets using spatial computing and big data techniques

January 2017 – October 2017: **National Renewable Energy Lab** – Golden, CO
Postdoctoral Research Associate

- Develop techniques for identifying idle fuel consumption from in-use data
- Identify vehicle activity distributions to inform national emissions inventories and modeling tools
- Analyze large, real-world vehicle operational datasets using spatial computing and big data techniques

August 2012 – December 2016: **University of Minnesota** – Minneapolis, MN
Graduate Research Assistant

- Manage multiple undergraduates throughout their research activities
- Instrument transit buses with J1939/CAN data-loggers to analyze large, real-world datasets
- Develop data visualization techniques enabling the future of vehicle and spatial emissions big data
- Collaborate with Cummins to assess real-world engine performance and NO_X emissions

August 2015 – July 2016: **FIRST Robotics** – Woodbury, MN
Lead Mentor for High School Robotics Team

- Manage 60+ students, mentors and parents of 1st seeded team and foster STEM interests: grades 9-12

May 2011 – August 2011: **3M Corporation** – Maplewood, Minnesota
Summer Intern, Corporate Process Research Lab

- Evaluated process conditions impacting meltblown fiber laydown to improve web uniformity

May 2010 – August 2010: **MTS Systems Corporation** – Eden Prairie, MN
ASD Mechanical Engineering Summer Intern

- Designed stress tests and procedures to assess frictional properties of surface finishes and coatings

April 2008 – August 2009: **Veterans Affairs Medical Center** – Minneapolis, MN
Lab Technician, Brain and Obesity Research Lab

- Extracted RNA from fat and brain tissue and performed gene expression using PCR

PUBLICATIONS & PATENTS

- Ali RY, Gunturi VM V, Kotz A, Shekhar S, Northrop W. Discovering Non-compliant Window Co-Occurrence Patterns: A Summary of Results. *Adv. Spat. Temporal Databases* **2015**;9239:391-410. DOI:10.1007/978-3-319-22363-6_21.
- Ali, R. Y.; Gunturi, V. M. V; Shekhar, S.; Eldawy, A.; Mokbel, M. F.; Kotz, A. J.; Northrop, W. F. Future Connected Vehicles : Challenges and Opportunities for Spatio-temporal Computing (Vision Paper). *ACM Int. Conf. Adv. Geogr. Inf. Syst.* **2015**, Article No. 14, 20–23 DOI: 10.1145/2820783.2820885.
- Kotz, A. J.; Kittelson, D. B.; Northrop, W. F. Lagrangian Hotspots of In-Use NOx Emissions from Transit Buses. *Environ. Sci. Technol.* **2016**; 50(11):5750–5756 DOI: 10.1021/acs.est.6b00550
- Ali RY, Gunturi V M V, Kotz A, Eftelioglu E, Shekhar S, Northrop W. Discovering Non-compliant Window Co-Occurrence Patterns. *Geoinformatica* **2017**; 21:1-38. DOI: 10.1007/s10707-016-0289-3.
- (Publication Pending) Kotz, A. J.; Kittelson, D. B.; Northrop, W. F.; Shmidt, N. Real-World NOx Emissions of Transit Buses Equipped with Diesel Exhaust Aftertreatment Systems. *Emissions Cont. Sci. Technol.* **2017**
- (Patent Pending) Kotz, A. J.; Kittelson, D. B.; Northrop, W. F., AUTOMATED PASSENGER COUNTER SYSTEMS AND METHODS. US Patent No. 20,170,057,316, **2017**.
- Lee DY, Elgowainy A, Kotz A, Vijayagopal R, Marcinkoski J. Life-cycle implications of hydrogen fuel cell electric vehicle technology for medium- and heavy-duty trucks. *J. Power Sources* **2018**;339:217–229. DOI: 10.1016/j.jpowsour.2018.05.012

Leonard Strnad
Transportation Data Scientist
National Renewable Energy Laboratoy

Education and Training

Master's of Science, Statistics, University of Colorado at Denver, 2018

Bachelor of Science, Mathematics, Cleveland State University, 2015

Professional Experience

8/17–Present Data Scientist, National Renewable Energy Laboratory, Golden, CO. Responsibilities include:

- Development of FleetDNA in a Spark Cluster
- Constructs features for vehicle/fleet characterization
- Machine Learning for Clustering, Classifcaion and Regression
- Vehicle operations analysis
- Fleet operation analysis
- Custom analysis and model development in Python
- Using tools such as Spark, Python, TensorFlow, SkLearn

2/17–6/17 Data Scientist, BoulderAI, Boulder, CO. Responsibilities include:

- Deep Learning and Computer vision
- TensorFlow classification model wth Convolutional Neural Network
- Taking Deep Learning model to production on the edge
- Using tools such as Docker, TensorFlow, Python

3/17–6/17 Data Scientist, HumanCode, Denver, CO. Responsibilities include:

- Prediction of Ancestry using genomic data
- Facial Image generation using generative Deep Learning model
- Taking these Deep Learning models to production
- Using tools such as Docker, TensorFlow, Python

8/16–2/17 Data Scientist, Blue Mountain Arts, Boulder, CO. Responsibilities include:

- Performing inventory product analysis
- Created GUI in python for custom product analysis softwar

Eric Scott Miller
Research Engineer, Data Analysis & Vehicle Energy Modeling
National Renewable Energy Laboratory, Transportation and Hydrogen Systems Center
15013 Denver West Parkway, MS 1634, Golden, CO 80401-3305 Eric.Miller@nrel.gov

EDUCATION

Masters of Science, Mechanical Engineering, University of Cincinnati, 2012
Bachelor of Science, Mechanical Engineering, Southern Illinois University, 2009

EXPERTISE

- Computational engineering for vehicle systems
- Data analysis and statistics for fleets
- Python, Drivetrain Modeling,

PROFESSIONAL EXPERIENCE

JAN 2016 – Present **National Renewable Energy Laboratory**, Golden, CO
Research Engineer, Data Analysis & Vehicle Energy Modeling

- Evaluate fleet data to produce in-situ vehicle evaluation reports: http://www.nrel.gov/transportation/fleettest.htmll
- Generate custom drive cycles using NREL's DRIVE toolset
- Support Fleet-DNA by processing, and managing data: http://www.nrel.gov/transportation/fleettest_fleet_dna.html?print

JAN 2015 – JAN 2016 **National Renewable Energy Laboratory**, Golden, CO
Graduate Intern

- Conducted thermal systems simulations for corporate partners
- Expanded capabilities of CoolSim Vehicle climate control software
- Explored and developed thermal management strategies for electric and hybrid electric vehicles, as well as commercial trucks

JAN 2015 – JAN 2016 **Rensselaer Polytech Troy**, New York
Teaching Assistant Research Assistant

- TA in the student machine shop for Intro to Engineering Design
- Simulated Fluid-Solid Interaction using the Immersed Finite Element Method. Implemented a hyper-elastic solid solver to investigate the role of the left atrial appendage in embolic stroke.
- Used message passing interface to parallelize solver for implementation on RPI supercomputer.

SEPT 09 – JUN 2012 **Thermal Systems Wright-Patterson AFB**, Dayton, Ohio
Research Assistant

- Developed a novel approach to modeling vapor compression cycle systems and implemented it in MATLAB
- Evaluated contractor-proposed thermal management system architectures and models
- Adapted existing thermal models for larger system simulations

PUBLICATIONS

- Bayesian Parameter Estimation for Heavy-Duty Vehicles, SAE World Congress 2017
- Characterization of PTO and Idle Behavior for Utility Vehicles, NREL technical report 2017
- Medium-and Heavy-Duty Vehicle Duty Cycles for Electric Powertrains, APEC 2016

LESLIE EUDY
National Renewable Energy Laboratory

Education and Training
B.A. Geology, University of North Carolina, 1981

Employment History
June 1997–Present: National Renewable Energy Laboratory, Golden, CO

Project Leader IV, Transportation and Hydrogen Systems Center

- Manages projects evaluating advanced technology in transit applications with a focus on fuel cell electric buses (FCEB) and battery electric buses (BEB).
- Developed a standard data collection protocol for third-party evaluations of FCEBs.
- Coordinates with various partners (including transit agencies, vehicle and component manufacturers, and state and federal government agencies) to collect data necessary to assess the progress of the technology in comparison to baseline technology vehicles.
- Analyzes data and prepares reports and presentations for disseminating results.
- Coordinates collaboration and information sharing between various federal and state funding partners including DOE, FTA, and California government agencies.
- Led a team to collect and analyze data from FTA's TIGGER (Transit Investments for Greenhouse Gas and Energy Reduction) Program to quantify the savings and assess the results. The TIGGER program funded 87 projects for transit agencies to reduce energy use and/or greenhouse gas emissions. Projects include solar, wind, and fuel cell power for facilities, building efficiency projects, rail efficiency projects, and advanced bus technologies.

Project Leader II, Transportation Technologies and Systems Center

- Managed projects that evaluate the latest technology in medium- and heavy-duty vehicles including alternative fuel buses and hybrid electric buses.
- Collecting and analyzing operational and performance data on advanced technology vehicles, and reporting the final results.
- Projects included: evaluation of hybrid-electric buses operated by New York City Transit and King County Metro (Seattle), analysis of natural gas use in U.S. Transit Bus fleet, and development of a data collection plan for fuel cell buses.

Project Engineer, Transportation Technologies and Systems Center.

- Provided support to Light-Duty Vehicle Team to evaluate alternative fuel vehicles.
- Technical Monitor for New Vehicle Evaluation Project which included project planning, drafting the statement of work, preparing subcontract documentation, participating in evaluation and selection of subcontractor, monitoring progress of subcontract, and researching qualified test laboratories.
- Technical Monitor for the SuperShuttle Evaluation of CNG vans which included collecting, analyzing, and reporting the results of the year-long study.
- Assisted in writing technical reports, analyzing emissions data, and summarizing light-duty vehicle data in the AFDC database.

March 1985–March 1997: ManTech Environmental Technology, Inc., Research Triangle Park, NC
General Supervisor.

- Managed emissions testing program of the General Services Administration Alternative fueled fleet vehicles for NREL.
- Set up and organized lab for emissions testing. This task included plumbing, testing and calibrating instruments, construction and calibration of systems for collecting samples, input of current analysis methods into new software programs, and training employees to assist in running the lab.

Scott Phillippi

Phone 404.828.6852
E-mail sphillippi@ups.com

55 Glenlake Parkway NE
Atlanta, GA 30328

QUALIFICATIONS

Scott Phillippi is a seasoned UPS executive with vast knowledge in fleet maintenance and advanced propulsion powertrains. Technologies include electrification, hydrogen, natural gas, and traditional ICE powertrains. During my 30 years with UPS I have worked with world-class manufacturers throughout the United States, Europe, Mexico and Asia to represent UPSs perspective. My experience with the UPS Alternative Advanced Technology Fleet (Rolling Laboratory) gives me excellent insight into current and future fleet solutions.

EMPLOYMENT HISTORY

June, 2017 - Current — **UPS**, **Atlanta, GA** — **Sr Director Fleet Maint & Eng. Int. Ops**

Responsible for the international UPS fleet maintenance and engineering outside of US. Additional global responsibilities include fleet related environmental and sustainability. Oversees global fleet alternative and advanced propulsion projects for the organization,

2015-2017 — **UPS**, **Atlanta, GA** — **Automotive Engineering Manager**

Worked with Ford, FCA, Daimler, Navistar, Workhorse, Morgan Olson, Utilimaster and other manufacturers to build and enhance the UPS delivery fleet vehicles for US operations. This role included the development of advanced propulsion solutions and provided methods, intervals and procedures to support these vehicles throughout their lifecycle in the fleet.

2014-2015 — **UPS**, **Atlanta, GA** — **Senior Project Manager**

Responsibilities included US Domestic fleet maintenance cost planning for a budgets exceeding $1B. Global deployment of fleet telematics, including analysis and process improvements discovered from telematics data.

2001-2014 — **UPS** — **Director of Fleet Maintenance**

Responsible for the fleet maintenance programs in Michigan, Pennsylvania, Tennessee, Alabama, and Mississippi. Including compliance, staffing, budgeting and the execution business performance plans.

EDUCATION

Lincoln College of Technology	Associates of Applied Science
Harvard Business School	Executive Education Data Analytics
Goizueta Business School Emory University	Executive Perspective Program

Michael McDonald

55 Glenlake Pkwy NE, Atlanta Ga, 30328 | (404) 828-7760 | mmcdonald@ups.com

Education

BACHELOR OF THE ARTS| MAY 3, 2008 | TREVECCA NAZARENE UNIVERSITY

- Major: Business

MASTERS OF BUSINESS ADMINISTRATION | MAY 22,2013 | SAINT LEO UNIVERSITY

- Major: Business Management

Experience

DIR. OF SUSTAINABILITY & GOV. AFFAIRS | UNITED PARCEL SERVICE | JAN. 2018-PRESENT

· This corporate engineering position is responsible for determining what alternative fuel propulsion systems can be used and the future technology utilized in the UPS fleet. The government affairs portion is to assist the public affairs department in determining the effect of laws governing highways and local roads concerning the UPS ground fleet in the US.

DISTRICT AUTOMOTIVE DIRECTOR | UPS-SOUTH ATLANTIC | JAN. 2015-JAN. 2018

· Director of Maintenance for North Carolina, South Carolina, and Georgia. The position involved the maintenance for entire ground fleet for all three states including the ground support equipment at the UPS gateways. The position also entailed interaction with all departments of UPS of that area as well as the South Georgia Congressional Awareness team.

DISTRICT AUTOMOTIVE DIRECTOR | UPS- NORTH ATLANTIC | JAN. 2012-JAN. 2015

· Director of Maintenance for the New York Metropolitan area, Long Island, New Jersey, and part of Upstate New York. The position involved the maintenance for entire ground fleet for the area. I was also responsible for the ground support equipment at JFK and Newark airports. The position also entailed interaction with all departments of UPS. This district also required a lot of interaction with the Teamsters and Machinist Unions.

DISTRICT OPERATIONS FLEET MANAGER | UPS- MIDSOUTH | JAN. 2012-JAN. 2002

· As lead manager, my responsibilities included compliance, audit schedule, and setting up meetings to set the direction of the district. We were the first district in the history of the UPS department to reach 100% on the balanced score card. I was also in charge of guiding the district on improving reliability.

DISTRICT FLEET SUPERVISOR | UPS- FLORIDA, TENNESSEE | JAN. 1994-JAN. 2002

- As a fleet supervisor my responsibilities included scheduling work, auditing vehicles for DOT compliance. I was also responsible for EPA, and OSHA files. I had the package delivery fleet, tractor fleet, and ground support fleet. The areas I supervised over this time span was central Florida and Knoxville Tennessee. I was responsible for all human and capital assets in my area.

3604 Woodland Hills CT
Flower Mound, TX 75022
(310)503- 7293
Lee.hobgood@toyota.com

LEE HOBGOOD

SKILLS & ABILITIES

Effectively direct multi-functional, highly complex, vehicle logistics group that is responsible to ensure the seamless, efficient, and responsive delivery of 2.4M vehicles across North America and to 47 Toyota export country distributors. Export operations are responsible for final processing and shipment of 100K+ vehicles/year to 47 export countries, from 12 ports of-departure. In-bound marine function processes 600K Toyota/Lexus vehicles, and requires close coordination with TMC Japan and other countries that ship vehicles into the U.S. Rail (1.5M vehicles) /Truck (2.3M vehicles) is responsible for transporting vehicles from point-of-entry at ports or manufacturing plants, to the final destination (dealer, distributor processing center, or export port). Toyota Transport is an in-house trucking company, with 12 salaried and 120 hourly driver field headcount, that delivers 400K vehicles directly to Toyota/Scion/Lexus dealers in the Western U.S. Oversight of all freight payment to Toyota's 53 major finished vehicle logistics providers to include railroads, truck transportation companies and marine steamship line.

EXPERIENCE

GENERAL MANAGER,

VEHICLE LOGISTICS, TRANSPORTATION OPERATIONS

Toyota Logistics Services, Torrance California/ Plano Texas

2008 to Present

- **Developed collaborative partnerships, through genchi-genbutsu (go and see) and benchmarking with executive levels of suppliers (marine, rail, truck, and processors), Toyota affiliate companies (Private Distributors, NA Companies, Export companies), logistics industry groups, and Toyota North America Customers/Stakeholders (Sales, Regions/Areas, Canada, Mexico, Puerto Rico, Export & Quality groups), by: frequently sharing information and identifying solutions to take advantage of, or to avoid problems in the future.**
- **Effectively and efficiently manage a total $1.5B logistics budget (Marine $346M, Export $155M, Rail $580M, Truck $347, Toyota Transport $38M (including responsibility for 91 auto hauler trucks and lease agreements).**
- **Direct overall synchronization and coordination of efforts to ship 2.4M vehicles/year, via 54 marine, export, rail, and truck transportation partners (incl. Toyota Transport), in a timely manner, without damage to domestic, North America, and global customers. Toyota Transport ships over 20% of vehicle volume in the U.S.**
- **Ensure smooth and efficient operation of all modes of the transportation supply chain to ultimately deliver 2.4M from 5 in-bound ports (.6M) and 8 North America production plants (marshalling yards), on rail cars (2.3M vehicles) and/or truck (1.5M vehicles) auto-carrier equipment, to their final**

destination (either a dealer or an export port). Ship over 100K vehicles to 47 export country distributors from 12 outbound ports (includes 10 ports operated by 6 3rd party companies).

- **Review and approve recommendations to award business to transportation partners, with annual spend rates of $25M+, which require Toyota Motors Sales Presidential signature.**

NATIONAL LOGISTICS MANAGER,

VEHICLE DISTRIBUTION CENTER GEORGETOWN KENTUCKY

Toyota Logistics Services

1999 to 2007

Manage the TLS Georgetown Kentucky Vehicle Distribution Center, responsible for finished vehicle logistics processing and accessorization of an annual 500K Toyota US produced Camry and Avalon vehicles. Overall responsibilities encompass production, logistics planning, and administration and a TLS-managed salaried and hourly workforce as well as interactions with multiple on and off-site business partners.

- **Provide guidance for direct-reporting managers necessary to achieve objectives and priorities related to safety, quality, efficiency, customer satisfaction and cost.**
- **Ensure that the right processes are in place to consistently and efficiently produce high quality results.**
- **Encourage growth of 3 direct report managers in Production, Logistics Planning, and Administration, through empowerment, developmental opportunities, cross-training and coaching.**
- **Meet or exceed requirements and expectations of the company's multiple stakeholders and customers.**
- **Clarify desired key performance indicators, milestones, targets, accountability and success measures for the VDC as a whole.**

Years in Previous Job **6 (1993-1998)**
Manager, Toyota Logistics Services
Logistics Operations; Long Beach, California

Years in Previous Job **4 (1989-1992)**
Manager, Toyota Logistics Services
Logistics Operations; Baltimore, Maryland

Years in Previous Job **2 (1987-1988)**
Port Manager, Toyota Import Department
Marine Logistics; Torrance, California

Years in Previous Job **1 (1986)**
Port Manager, Toyota Import Department
Jacksonville, Florida

Years in Previous Job **2 (1984-1985)**
Yard Operations Manager, Foreign Auto Services
Boston, Massachusetts

EDUCATION

1981 BS, BUSINESS ADMINISTRATION
LOWELL UNIVERSITY, LOWELL MASSACHUCETTS USA

Kirk Welch
Senior Compliance Analyst
TOYOTA MOTOR NORTH AMERICA
Toyota Logistics Services | Toyota Transport
6565 Headquarters Drive
Mail Drop W1-1B
Plano, TX 75024
W: 469.292.1335
C: 310.291.8295
E: kirk.welch@toyota.com

Let's go places!

TOYOTA Transport

Kirk Welch is a Safety & Compliance professional with Toyota Logistics, Services, Inc., doing business as Toyota Transport. He earned his Bachelor's degree from Long Beach State University, and went to work for Ryder Distribution Resources in 1986. Kirk was assigned as a dispatcher for Toyota Auto Body Corp., responsible for the distribution of truckbeds to the west coast ports of entries, where they were matched up with the complete built trucks from Japan.

In 1988, Kirk was asked to join Toyota in their endeavor of starting their own trucking company. In 1989, Toyota was delivering their own vehicles to several local dealers in southern California.

In 1991, Kirk moved over the logistics operations at Toyota's Long Beach port, and rotated through multiple departments there for 12 years.

In 2003, Kirk moved to Toyota Logistics Services headquarters in Torrance, CA, supporting the TLS field Health and Safety Engineers and Kaizen Engineers. Over the next 5 years, Kirk assisted the EHS Business Partner in the implementation of environmental and safety management systems at Toyota Logistics ports and domestic factory marshalling yards.

In 2008, Kirk returned to Toyota's Vehicle Delivery Operation, managing the safety and DOT compliance of their 120+ drivers, and ensuring that they have the right equipment to perform their jobs safely and in the most efficient manner.

David Fernandes

DavidA.Fernandes@airliquide.com
+1 (281) 804 – 8118
www.linkedin.com/in/DavidAnthonyFernandes

Work Experience

09/2016 – Present — Houston, TX - USA

Business Development Manager, Hydrogen Energy

Air Liquide

Responsibilities

- Business developer for hydrogen fuel projects ($5M-$60M+)
- Work closely with Automobile OEMs on Fuel Cell Electric Vehicle launches
- Qualify and present business opportunities to senior management
- Develop energy projects with technical and engineering groups
- Maintain complex financial models for project capital approval and P&L management
- Partnership and Joint Venture development with Private Equity, Technology, and Industrial companies

11/2015 – 08/2016 — Houston, TX- USA

Market Segment Manager

Air Liquide

Accomplishments

- Managed a high growth US market ($300M+)
- Developed a market re-entry strategy, which was presented and approved by senior management
- Managed 3 product launches which were a part of a value-added sales strategy

08/2014 – 11/2015 — Houston, TX - USA

Product & Strategy Manager

Air Liquide

Accomplishments

- Managed a $130M+ annual revenue product line which included on-site Nitrogen, Hydrogen, and Oxygen production units
- Eight total signings (representing roughly $5M in annual sales) occurred during my time in the group

07/2012 – 08/2014 — Multiple Locations (Domestic & Intl)

ALLEX Leadership Development Program

Air Liquide

Accomplishments

- Completed Air Liquide's 2 year leadership development program, which assigned four, six month rotations in differing business units and job functions.
- Held roles in the USA & Canada including: Sales, Business Development, Competitive Intelligence, and Operations

Education

Graduated May 2012

Houston, TX – USA

Bachelor of Business Administration in Finance

University of Houston

Aaron Harris Aaron.Harris@airliquide.com (713) 624-8359

Recent Experience

2014- Present - Air Liquide Advanced Technologies - US (ALATUS)

Technical Director Hydrogen Energy - responsible for technical aspects of hydrogen energy systems including light-duty vehicles, industrial trucks and stationary fuel cells. Lead the technical support of the business development, applications engineering and operations of hydrogen energy systems. Lead the technology transfer of new products and product improvements to applications and act as the main conduit for feedback to research and development groups. Provide technical support and identify areas for transfer of hydrogen energy products to other areas of Air Liquide's business portfolio.

2012 – 2014 Sandia National Laboratories

Senior Engineer – responsible for management of project tasks for various customers including US Department of Energy Fuel Cell Technologies sub-programs for Safety, Codes and Standards, Hydrogen Delivery and Technology Validation. Develop operating plans, manage budgets, manage work scopes, provide reports and participate in code and standard development, study of performance of polymer materials in high pressure hydrogen environments and hydrogen fueling infrastructure experimental test activities.

2005- 2012 Nuvera Fuel Cells

2011 Lead Project Engineer - Responsible for system development of concept electrochemical compression product in technology development role

2009 - 2011 Safety and Product Compliance Manager – Expanded involvement in codes and standards in addition to corporate safety. Also responsible for product factory acceptance testing

2008 -2009 Environmental, Health and Safety Manager and Factory Acceptance Test Engineer - Adapted laboratory based EHS policies to ISO 9001-2008 compliant policies

2007-2008 Systems Engineer and Factory Acceptance Test Engineer – reliability and failure investigation administrator, factory acceptance test development and process system research and development

2006 -2007 Site Service Manager and Factory Acceptance Test Engineer- Coordination of material and personnel support for 10 unit 'prototype fleet' at development partner location

2005 – 2006 Field Service and Factory Acceptance Test Engineer - Mechanical, chemical, electrical and control system troubleshooting for prototype units at customer locations.

Relevant Publications

M. Daboya-Toure, R. Burgess, A.P. Harris "Component availability effects for pressure relief valves used at hydrogen fueling stations" International Conference on Hydrogen Safety Proceedings, September 2018.

A.P.Harris, D. Dedrick, C.S. San Marchi, C. LaFluer, "*Safety, Codes and Standards for Hydrogen Installations: Hydrogen Fueling System Footprint Metric Development*" - Sandia National Laboratories Report - SAND2014-3416, April 2014.

J.M. Pratt, A.P. Harris, *"Vessel Cold-Ironing Using a Barge Mounted PEM Fuel Cell: Project Scoping and Feasibility"* Sandia Report SAND2013-0501, January 2013

A.P. Harris, M.Kashuba, *"Discussions of Lessons Learned from a hydrogen release"* International Conference on Hydrogen Safety, September 2013, Brussels, Belgium.

J.O. Keller, M.Gresho, A.P. Harris, A.V. Tchouvelev, *"What is an Explosion?"* International Conference on Hydrogen Safety, September 2013, Brussels, Belgium.

K.Groth and A.P.Harris, "Hydrogen Quantitative Risk Assessment Workshop Proceedings" Sandia Report SAND2013-7888, September 2013

A. P Harris, C.M. San Marchi, *"Investigation of the the Hydrogen Release Incident at the AC Transit Emeryville Facility (Revised)"* Sandia Report SAND2012-8642, Oct 2012.

A. Harris, P. Rao, "*Safety of hydrogen powered industrial trucks, lessons learned and existing codes and standards gaps"* International Conference on Hydrogen Safety, September 2011, San Francisco, United States.

A.P. Harris, "*Simplified Method for Determination of Energy Usage with Economics for an Off-Network Residence*" (Master's Thesis) 2007, University of Washington, Publication Number 173226666

MATT M. MIYASATO
5811 Milgrove Way
Chino Hills, CA 91709
mmiyasato@verizon.net mmiyasato@aqmd.gov
Home: (909) 393-0748 Mobile: (909) 964-3197

EDUCATION:

Degree	Year Conferred	University
Management & Leadership Classes	2002-2005	University of La Verne
Ph.D. in Engineering	1998	University of California, Irvine
M.S. in Mech. Eng.	1993	University of California, Irvine
B.S. in Mech. Eng. (cum laude)	1988	University of California, Irvine

SUMMARY:

- Technical leader with excellent communication skills and successful experience in engaging local, regional, state and federal stakeholders to implement aggressive strategies to synergistically improve air quality, reduce greenhouse gas emissions and enhance national energy security.
- Team-player with proven success in collaborating while maintaining mutually respectful relationships with internal staff as well as external stakeholders.
- Well-regarded and sought-after SCAQMD representative for technical input and agency perspective.

EXPERIENCE:

Apr 13 – present: Deputy Executive Officer. South Coast AQMD

Responsible for the Technology Advancement Office, Mobile Source Division, and Monitoring and Laboratory Analysis Division. Principal charges are to identify, evaluate and stimulate development and commercialization of clean air technologies, develop and coordinate mobile source regulations, and to conduct ambient monitoring, source testing and laboratory analysis.

Feb 08 – Apr 13: Assistant Deputy Executive Officer. South Coast AQMD

Serve as the principal technology and operational lead under the Chief Scientist for the Technology Advancement Office, comprised of the Incentives, Demonstrations, Best Available Control Technologies and Outreach Groups. The funding throughput for these groups totals over $100M annually. Major responsibilities include overseeing daily operations and approvals, representing the AQMD on all major technology initiatives, including zero emission goods movement and plug-in hybrid vehicles, and interfacing with Board members, media and other regional, state and federal stakeholders. Notable accomplishments include lead technical staff for securing reauthorization of the AQMD Clean Fuels (research and demonstrations) Program, Principal Investigator on $45M DOE American Reinvestment and Recovery Act project for plug-in electric work trucks, Principal Investigator on $4.2M DOE Zero Emissions Cargo Movement project, and lead staff on Regional Zero Emissions Freight Movement Collaborative with LAMTA, Ports, SCAG, CalTrans and GCCOG.

Mar 03 – Feb 08: Technology Demonstrations Manager. South Coast AQMD

Administered the Clean Fuels Program for the advancement of clean, alternative mobile and stationary technologies. Managed approximately $12M in awards annually, with 5 technical and 4 administrative staff. Responsible for the Clean Fuels Annual Report and Plan Update to State legislature. Co-managed Blueprint Rollout Team for California Hydrogen Highway Network Blueprint effort. Staff representative to California Fuel Cell Partnership, California Stationary Fuel Cell Collaborative, Plug-in Hybrid activities, CARB Research Evaluation Screening Committee, and Ports Technology Advancement Advisory Committee.

Jun 02 – Mar 03: Program Supervisor, Clean Fuels Program. South Coast AQMD.

Executed advanced technology projects under the Clean Fuels Program from concept to completion. Responsible for the stationary fuel cell projects and heavy duty natural gas engine projects with DOE/NREL, which resulted in commercialized clean products.

Feb 01 – Jun 02: Senior Research Engineer. GE–Energy and Environmental Research Corp.

Conducted and managed commercial, low NO_x technology implementation projects for utility boilers. Oversaw the scheduling, construction, and testing of the physical flow laboratory as well as enhancing

laboratory capabilities. Certified in GE's Six Sigma quality program, led new product development for low-NOx burner and identified as a GE top performer in 2001.

Jul 98 – Jan 01: Senior Research Engineer. Advanced Power and Energy Program, UC Irvine.

Conducted and directed the research for the Industrial Burners Program, encompassing active control implementation, stability sensor development, low NO_x mechanism research, and catalytic piloting as applied to industrial burners on sub- and commercial scales. Other duties included proposal writing, maintaining the five Laboratory Web sites, and serving as representative to the American Flame Research Committee

Jul 90 – Jul 98: Graduate Researcher. UCI Combustion Laboratory

Conducted research on pollutant formation mechanisms in industrial burners, specifically by applying laser diagnostics and CFD modeling to a practical burner system. Experience with laser systems, emissions analyzers, and practical burner hardware. Familiarity with machining and welding.

Jul 88 – Jul 90: Engineer. Nuclear Rate Regulation, Southern California Edison

Provided support to San Onofre Nuclear Generating Stations by interpreting data and writing testimony for rate cases before the Public Utilities Commission such that capital expenditures could be collected in rates.

PROFESSIONAL ACTIVITIES:

Society of Automotive Engineers
American Society of Mechanical Engineers
Air and Waste Management Association
Combustion Institute/Western States Section (Secretary 2003-04)
Adjunct Lecturer at UC Irvine (2001-2003)
Engineer in Training (1987)

AWARDS:

Mechanical Engineering Department Fellowship, 1996
Department of Education Fellowship, 1995
Air and Waste Management Association Fellowship, 1992
Engineering Corporate Affiliates Fellowship, 1990
Golden Key National Honor Society, 1988
Tau Beta Pi, Engineering Honor Society, 1987

RECENT PRESESENTATIONS:

"The Need for Zero and Near-Zero Emission Goods Movement Technologies," SCAG General Assembly, April 25, 2014.

"Transforming Transportation: the Air Quality Need for Zero & Near-Zero Emission Technologies," National Academies of Science study on fuel consumption, July 31, 2013.

"Transforming Transportation: Southern California Challenges, Lessons-learned and National Implications," Transportation Research Board Executive Committee, June 20, 2013.

"Implementing the Vision of Clean Transportation and Energy Technologies," Transportation Research Board Annual Meeting, January 14, 2013. Joint presentation with P. Greenwald.

PUBLICATIONS:

D. Dunn-Rankin, M. Miyasato, and T. K. Pham, Introductory Chapter for *Lean Combustion: Fundamentals, Applications, and Prospects*, Elsevier. March 2007.

M. M. Miyasato, V. G. McDonell, G. S. Samuelsen, "Active Optimization of the Performance of a Gas-Turbine Combustor." *Combustion Science and Technology*, 2005.

R. M. Flores, M. M. Miyasato, V. G. McDonell, and G. S. Samuelsen, "Response of a Model Gas Turbine Combustor to Variation in Gaseous Fuel Composition." *Journal of Engineering for Gas Turbines and Power,* 2000.

T. N. Demayo, M. M. Miyasato and G. S. Samuelsen, "Hazardous Air Pollutant and Ozone Precursor Emissions from a Low-NO_x Natural Gas-Fired Industrial Burner." *Twenty-Seventh Symposium (International) on Combustion*, the Combustion Institute, 1998.

R. K. Cheng, D. T. Yegian, M. M. Miyasato, G. S. Samuelsen, C. E. Benson, R. Pellizzari, and P. Loftus,"Scaling and Development of Low-Swirl Burners for Low Emission Furnaces and Boilers." *Twenty-Seventh Symposium (International) on Combustion*, the Combustion Institute, 2000.

ACADEMIC CONFERENCE PAPERS:

M. M. Miyasato, R. M. Flores, V. G. McDonell, and G. S. Samuelsen, "Active Optimization of a Model Gas Turbine Combustor." *Western States Section/Combustion Institute 2000 Winter Meeting,* Golden, CO March 13-14, 2000.

M. M. Miyasato, V. G. McDonell, and G. S. Samuelsen, "Adaptive Fuel Injection Strategies For Industrial Combustion Sources." *Western States Section/Combustion Institute 1999 Fall Meeting*, Irvine, CA October 25-26, 1999.

M. M. Miyasato and G. S. Samuelsen, "Reaction Chemiluminescence and Its Relationship To Emissions and Stability in a Model Industrial Burner." *American Flame Research Committee International Symposium*, San Francisco, October 3-6, 1999.

M. M. Miyasato and G. S. Samuelsen, "Multivariate Optimization for NO_x and CO Emissions in a Model Industrial, Natural Gas Fired Burner." *American Flame Research Committee International Symposium*, Maui, Hawaii. October 1998.

M. M. Miyasato and G. S. Samuelsen, "Modeling and Velocity Measurements at the Burner Throat: The Relationship to Performance in a Model Industrial, Natural Gas Fired Burner." *American Flame Research Committee International Symposium*, Baltimore, Maryland. October 1996.

REFERENCES:

Available upon request

JESSE N. MARQUEZ

1601 N. Wilmington Blvd., Ste. B, Wilmington, California 90744
jesse@cfasecares.org jnmbus@yahoo.com 310-590-0177

Jesse N. Marquez is the founder and Executive Director of the Coalition For A Safe Environment (www.cfasecares.org) for 16 years. The Coalition For A Safe Environment was established in April 2001 and is an Environmental Justice, Public Health and Public Safety advocacy organization involved in International Trade Ports, Goods Movement, Freight Transportation Corridors, Energy, Petroleum Industry and Wildlife Conservation issues. The Coalition is headquartered in Wilmington a community in the City of Los Angeles where the Port of Los Angeles is located, neighbor to the Port of Long Beach, the Alameda Corridor and home to four major oil refineries. The Coalition has over 500 members in over 25 cities in California.

Domestic & International Travel:

30+ US States, Canada, England, Germany, Netherlands, Russia, Colombia, Mexico

Governmental Agency Committees (Current & Past):

Governor California Freight Advisory Committee
California Department of Toxic Substance Control - Environmental Justice Advisory Committee
Southern California Association of Governments - Goods Movement Advisory Committee
Los Angeles County Planning Dept. Environmental Justice Advisory Committee
California AB 32 Global Warming Environmental Justice Advisory Committee (Past)
METRANS Multi - County Goods Movement Advisory Committee (Past)
Gateway Cities Air Quality Plan Advisory Committee (Past)
City of Los Angeles & City of Long Beach - Ports Clean Air Action Plan Implementation Taskforce (Past)
South Coast Air Quality Management District (SCAQMD) - Refinery Pilot Project Working Group
South Coast Air Quality Management District - Air Quality Management Plan Advisory Committee (Past)
SCAQMD - Clean Port Air Monitoring Partnership (Past)
California Air Resources Board - Children's Environmental Risk Reduction Plan - Project (Past)
Governor's California State Goods Movement Plan - Cabinet Integrated Working Group (Past)
Port of Los Angeles - Port Community Advisory Committee (Past)

Organization Affiliations:

Los Angeles Environmental Justice Network	Member
California Communities Against Toxics	Member
Moving Forward Network	Member
California Clean Freight Coalition	Member
Green L.A. - Port Working Group & Cumulative Impact Working Group	Member
Coalition For Clean & Safe Ports	Member
Trade, Health & Environment (THE) Impact Project	Member
Environmental Justice Network of Southern California	Member
Californian's for Renewable Energy (Past)	Member
Ratepayers for Affordable Clean Energy (Past)	Member
Environmental Justice Water Coalition (Past)	Member
Modesta Avila Coalition (Past)	Member
California Environmental Rights Alliance (Past)	Board Member
Harbor Community Benefit Foundation (Past)	Board Member

Nature & Wildlife Organizations

Sierra Club - Harbor Vision Taskforce	Member

Palos Verdes/South Bay Audubon Society (Conservation Award Recipient)	Member
Burrowing Owl Conservation Network	Member
Center for Biological Diversity	Member

Expertise:

Public Policy:	Environmental Justice, Public Health, Public Safety, Sustainability, Social Equity
Environment Regulation:	Federal Clean Air Act, Federal Clean Water Act, NEPA, CEQA, AB32, UN IMO MARPOL Annex VI, MOTEMS
Air Quality:	Federal, State & SCAQMD Standards, Rules, Regulations, Testing, Analysis, Monitoring, Reporting, Equipment
International Trade Ports:	Green Port Facilities Design/Operation, Logistically Efficient Freight Transportation, Logistically Efficient Import Car/Vehicle, Chassis, Container Storage.
Petroleum Industries	Oil, Gas Drilling, Refining, Storage & Distribution Regulations, Carbon Sequestration
Public Health:	Health Impacts Assessments (HIA), Health Risk Assessments (HRA), Public Health Surveys
Research:	Community Based Participatory Research (CBPR) - Public Health, Air Quality, Water Quality, Land Quality, Wildlife Habitat Quality
Zero/Near Zero Emissions Technologies	Truck, Train, Cargo Handling Equipment, Ship
Emissions Capture & Treatment Technologies	Ship, Train, Truck, Cargo Handling Equipment, Petroleum Industry Vapor Recovery Systems

Publications (Partial List)**:**

Importing Harm: U.S. Ports' Impacts on Health and Communities
THE Impact Project Policy Brief Series January 2012

Driving Harm: Health and Community Impacts of Living Near Truck Corridors
THE Impact Project Policy Brief Series January 2012

THE (Trade, Health, Environment) Impact Project: A Community-Based Participatory Research Environmental Justice Case Study, Environmental Justice, Vol. 6, No. 1, 2013

Trade-Health- Environment: Making the Case for Change and Paying With Our Health-The Real Cost of Freight Transport in California June 2009

Paying With Our Health: The Real Cost of Freight Transport in California November 2006

Former Employment:

20 years experience in the consumer, industrial and military electronics manufacturing industry.
Positions held included: Test Technician, Test Lab Manager, Production Supervisor, Production Manager, Auditor Specialist, Manufacturing Engineer and Quality Engineer.

Hobbies:

Photography/Videography	30 Years Professional Photography, 10 Years Videography, Photo/Video Editing
Archaeology	Aztec History & Culture
Rare Map Collecting	American Southwest Maps
Chicano/Native American	Book & Art Collecting

Victor La Rosa
CEO/President
Cofounder, Total Transportation Services, Inc. (TTSI)

Vic's career spans over thirty years in all facets of transportation including operations and sales development.

In 1989, he cofounded TTSI. Vic's responsibilities include business development as well as strategic planning for TTSI. In addition, he is a founding member of the Coalition for Responsible Transportation (CRT), a member of the Waterfront Coalition Board of Directors, a Board Member of the Harbor Trucking Association, and in a new Board Member of BizFed.

Vic holds his Bachelor of Arts (BA) degree from Rider University in Lawrenceville, New Jersey and a degree in Transportation from Academy of Advanced Traffic, New York City. Victor is an avid outdoorsman who spends all his spare time hunting and fishing in Montana. He believes that we all have a responsibility to promote and protect our environment. His plan is to position his company as a leader in environmentally friendly solutions to support his customers supply chain.

In lieu of the great gains TTSI has made with Clean Diesel and LNG trucks, Vic La Rosa and TTSI have launched a campaign to become a zero emission trucking company through the use of fuel cell and hydrogen technology.

Gordon Reimer, President
Southern Counties Express, Inc.
18020 S. Santa Fe Avenue, Rancho Dominguez, CA 90220
(310) 900-2160 Office, (310) 961-1626 Cell, greimer@scexpress.com

Southern Counties Express, Inc. is a local trucking and drayage company offering harbor, rail, and truckload services throughout the Western states. SCE specializes in ocean container drayage from the ports of Long Beach and Los Angeles to area distribution centers. SCE has been an instrumental partner with both ports and the South Coast Air Quality Management District in implementing the first and largest fleet of LNG (Liquefied Natural Gas) heavy duty trucks in the country. By assisting to create the infrastructure for fueling and maintenance for these alternative fuel vehicles, drayage companies within the harbor were able to follow suit by adding this technology to their fleets as well.

2016-present **Southern Counties Express, Inc.**
President

15 years in international and domestic transportation and warehouse distribution working with third party logistics companies prior to joining SCE.

2013-2016 **OHL International**
Director, Port Services

2010-2013 **National Retail Systems**
Director, West Coast Transportation Operations

2008-2010 **Complete Logistics Company**
Vice President, Warehouse Operations

1998-2008 **Weber Distribution**
Director, Transportation Operations

EDUCATION: Eden Christian College
Brock University

TRADE ORGANIZATIONS: Harbor Trucking Association, Harbor Transportation Club
Council of Logistics Management, Distribution Management Association

Sherry Hertel, Vice President of Sales
Southern Counties Express, Inc.
18020 S. Santa Fe Avenue, Rancho Dominguez, CA 90220
(310) 900-2160 Office, (310) 901-9090 Cell, shertel@scexpress.com

Southern Counties Express, Inc. is a local trucking and drayage company offering harbor, rail, and truckload services throughout the Western states. SCE specializes in ocean container drayage from the ports of Long Beach and Los Angeles to area distribution centers. SCE has been an instrumental partner with both ports and the South Coast Air Quality Management District in implementing the first and largest fleet of LNG (Liquefied Natural Gas) heavy duty trucks in the country. By assisting to create the infrastructure for fueling and maintenance for these alternative fuel vehicles, drayage companies within the harbor were able to follow suit by adding this technology to their fleets as well.

2004-present **Southern Counties Express, Inc.**
Vice President of Sales
Sales Manager

20 years in international transportation working with steamship lines prior to joining SCE in Operations and Sales positions.

1997-2004 **"K" LINE AMERICA, INC., Huntington Beach, CA**
Senior Account Manager

1993-1997 **HAPAG-LLOYD (AMERICA) INC., Long Beach, CA**
Account Manager

1990-1993 **HYUNDAI MERCHANT MARINE (AMERICA), INC., Gardena, CA**
Inside Sales Manager

1987-1990 **ORIENT OVERSEAS CONTAINER LINE, INC., Long Beach, CA**
Traffic Control Manager – Corporate Operations
Administrative / Sales Coordinator

1985-1987 **UNITED STATES LINES, INC., Long Beach, CA**
Export Documentation Clerk

EDUCATION:
South Coast College, Westminster, California
University of Riverside Extension Services, Global Logistics
California State University of Long Beach, Global Logistics Specialist
Professional Designation

TRADE ORGANIZATIONS:
Los Angeles Transportation Club: Past Chairman of the Board, Past President, Director
Harbor Trucking Association, Women in International Trade, Citrus Belt Traffic Club
Inland Empire Transportation Club, Harbor Transportation Club, International Trade Club
Council of Logistics Management, Distribution Management Association

APPENDIX B: POLA BOARD REPORT AND EVIDENCE OF APPROVED GRANT MATCH SUPPORT

POLA Board Report – Informational Item for August 2, 2017 Meeting

"FOR INFORMATION ONLY"

DATE: JULY 17, 2018

TO: BOARD OF HARBOR COMMISSIONERS

SUBJECT: CALIFORNIA AIR RESOURCES BOARD ZERO AND NEAR ZERO EMISSION FREIGHT FACILITIES GRANT APPLICATION

On March 21, 2018, the California Air Resources Board (CARB) released a grant solicitation for Zero and Near Zero Emission Freight Facilities Projects under the Fiscal Year 17/18 Funding Plan for Clean Transportation Incentives. This grant solicitation is designed to fund $150 million worth of projects to support bold, transformative emission reduction strategies that can be emulated throughout freight facilities statewide. A wide variety of zero- and near zero-emission heavy-duty vehicles and off-road equipment, supporting fueling infrastructure, as well as other facility and efficiency improvements that reduce emissions facility-wide, are eligible for funding. The maximum funding award per application is $50 million. 100% of the grant amount must also be provided as match funding. Match funding in slightly more than this amount is provided by the various project partners, as shown in Table 1. The grant application was due to CARB on July 19, 2018. Preliminary grantee award selection is expected to be made in September 2018 with projects expected to begin by January 2019. All work under the projects must be completed by April 15, 2021.

The City of Los Angeles Harbor Department (Harbor Department), together with our project partners, have applied for the $41,122,260 under this grant solicitation. In support of CARB's vision of transformative emissions reduction, the Harbor Department proposes to establish a new forward-looking framework for future goods movement throughout Southern California and beyond. In this proposal, the Harbor Department will partner with Toyota Motor North America (Toyota), Equilon Enterprise LLC (d/b/a Shell Oil Products US (Shell)), Kenworth Truck Company (Kenworth), the Port of Hueneme, the South Coast Air Quality Management District (SCAQMD), and several truck operators. The team is committed to developing this Zero Emissions Freight "Shore to Store" (S2S) Project in several phases, which would ultimately encompass zero emission (ZE) freight movement activity in Southern California, the Central Coast Area, and Merced County.

The initial phase of this proposed S2S Project contains three key elements. First, ten hydrogen fuel cell-powered ZE on-road trucks would be developed through a partnership

between Kenworth and Toyota to move cargo from the Port of Los Angeles (Port) to inland locations such as Riverside County, the Port of Hueneme, and eventually Merced. The second key element of this proposed Project is foundational infrastructure that would be developed by Shell to support the operation of the fuel cell electric trucks throughout the region. Shell proposes to establish two new large-capacity hydrogen fueling stations in Wilmington and Ontario, California as part of this Project. These two stations are in addition to three separately funded stations in Long Beach and Gardena. The establishment of this five-station strategically-developed, -situated, and -integrated hydrogen fueling network will enable ZE freight transport to flow through the Ports of Los Angeles and Long Beach and across the greater Los Angeles basin. The on-road trucks would be operated by United Parcel Services, Toyota Transport, Total Transportation Services Inc., and Southern Counties Express. The third key element of this proposed Project involves development of ZE off-road equipment to be operated at inland warehouses operated by Toyota Logistics Service, and the first ZE cargo handling equipment at the Port of Hueneme. The Project team has selected National Renewable Energy Laboratories (NREL) to perform all data collection and analysis as required by CARB. The Coalition for a Safe Environment, an important activist group in the Port area, will monitor community benefits and provide input and feedback on strategy and project development.

Once the initial phase in completed, subsequent phases will increase the amount of ZE equipment operating in warehouses and between the Port and Southern California inland areas, as well as expand the ZE pathway between the Port and the Inland Empire, the Port of Hueneme and the California central coast. An especially exciting part of the second and third phases of this Project will be their contribution to an already-planned development at the Mid-California International Trade District in Merced County that will include processing activities to help facilitate the movement of cargo to and from the central valley of California by truck and rail. A Memorandum of Understanding with Merced County has already been signed by the Port. Merced County, a supporter of this S2S Project, is particularly interested in seeing expanded efficiencies for movement of cargo in and out of the California Central Valley, which would support development of the Mid-California International Trade District.

If awarded the grant, the Project partners will complete this project through the following tasks:

Task 1) Design and construction of the Shell hydrogen stations;
Task 2) Design and construction of the 10 Toyota/Kenworth hydrogen truck fleet;
Task 3) Procurement of two electric yard tractors and the installation and commissioning of charging stations to support them at the Port of Hueneme;
Task 4) Technology demonstration by the operators of each piece of equipment (Port of Hueneme, Toyota, Southern Counties Express, Total Transportation Services, Inc. United Parcel Service);
Task 5) Data collection and analysis (NREL); and
Task 6) Administrative Costs from Harbor Department staff to manage the grant award.

Task 6 is being provided by the Harbor Department as informal match. Additional match funding is being provided by the Harbor Department and Shell from their ongoing California Energy Commission (CEC) grant projects at Everport and the Port of Long Beach, which is considered an eligible in-kind contribution by CARB. The formal cost share that will be provided is shown below:

Table 1

Project Partner	Cost Share
Port of Los Angeles	$13,999,331*
Toyota (Includes Toyota Logistic Services)	$9,741,848
Shell	$13,400,000
Kenworth	$1,300,000
Port of Hueneme	$200,000
SCAQMD	$1,000,000
SCE	$310,000
TTSI	$545,433
UPS	$930,000
Total Cost Share	**$41,446,612**
Total Grant Request	**$41,122,260**
Total Project Cost	**$82,568,872**

*This amount contains two previously awarded CEC grant funds currently managed by the Harbor Department.

The Harbor Department recognizes the importance of taking a leadership role in demonstrating ZE technologies in the San Pedro Bay Port complex and throughout the region. This Project will add to the legacy of industry-changing innovations developed for advanced technologies demonstrated at the Port. The emission reductions associated with this Project will benefit the communities surrounding the Port.

If awarded, the Harbor Department will return to the Board of Harbor Commissioners for approval to enter into agreement(s) for the implementation of the Project.

EUGENE D. SEROKA
Executive Director

MRC:CC:LW:TD:JG:yo

FILE: Y:_ADMIN_BOARD REPORTS\FOR INFO ONLY\ZANZEFF GRANT\ENV_ZANZEFF GRANT - DRAFT.docx
UPDATED: 7/18/2018 8:47 AM - YO

POLA Grant Agreement ARV-15-069, which includes $7,237,000 being applied to the proposed ZANZEFF project.

STATE OF CALIFORNIA
GRANT AGREEMENT
CEC-146 (Revised 1/2014)
CALIFORNIA ENERGY COMMISSION

RECIPIENT	AGREEMENT NUMBER
City of Los Angeles Harbor Department	ARV-15-069
ADDRESS 425 S. Palos Verdes Street San Pedro, CA 90731	AGREEMENT TERM **6/30/2016** to **4/30/2021** The effective date of this Agreement is either the start date or the approval date by the California Energy Commission, whichever is later. The California Energy Commission shall be the last party to sign. No work is authorized, nor shall any work begin, until on or after the effective date.

PROJECT DESCRIPTION
The parties agree to comply with the terms and conditions of the following Exhibits which are by this reference made a part of the agreement.

Exhibit A – Scope of Work	Page(s): 16
Exhibit A – Attachments	Page(s): 2
Exhibit B – Budget	Page(s): 48
Exhibit B – Attachments	Page(s): 0
Exhibit C – General Terms and Conditions	Page(s): 25
Exhibit C – Attachments	Page(s): 0
Exhibit D - Contacts	Page(s): 1

REIMBURSABLE AMOUNT	$ 5,833,000
MATCH SHARE	$ 2,856,547
TOTAL	$ 8,689,547

The undersigned parties have read the attachments to this agreement and will comply with the standards and requirements contained therein.

CALIFORNIA ENERGY COMMISSION		RECIPIENT	
AUTHORIZED SIGNATURE	DATE	AUTHORIZED SIGNATURE	DATE
NAME Rachel L. Grant Kiley		NAME	
TITLE Contracts, Grants and Loans Office Manager		TITLE	
CALIFORNIA ENERGY COMMISSION ADDRESS 1516 9th Street, MS 1, Sacramento, CA 95814			

APPROVED AS TO FORM AND LEGALITY
November 23, 2016
MICHAEL N. FEUER, City Attorney
By _____
Deputy City Attorney

POLA Grant Agreement ARV-16-026, which includes $6,762,331 being applied to the proposed ZANZEFF project.

STATE OF CALIFORNIA
GRANT AGREEMENT
CEC-148 (Revised 1/2014)
CALIFORNIA ENERGY COMMISSION

RECIPIENT	AGREEMENT NUMBER
City of Los Angeles Harbor Department	ARV-16-026
ADDRESS 425 S. Palos Verdes Street San Pedro, CA 90731	AGREEMENT TERM **6/15/2017** to **12/31/2020** The effective date of this Agreement is either the start date or the approval date by the California Energy Commission, whichever is later. The California Energy Commission shall be the last party to sign. No work is authorized, nor shall any work begin, until on or after the effective date.

PROJECT DESCRIPTION
The parties agree to comply with the terms and conditions of the following Exhibits which are by this reference made a part of the agreement.

Exhibit A – Scope of Work	Page(s): 15
Exhibit A – Attachments	Page(s): 2
Exhibit B – Budget	Page(s): 32
Exhibit B – Attachments	Page(s): 0
Exhibit C – General Terms and Conditions	Page(s): 25
Exhibit C – Attachments	Page(s): 0
Exhibit D - Contacts	Page(s): 1

REIMBURSABLE AMOUNT	$ 4,524,000
MATCH SHARE	$ 2,238,331
TOTAL	$ 6,762,331

The undersigned parties have read the attachments to this agreement and will comply with the standards and requirements contained therein.

CALIFORNIA ENERGY COMMISSION		RECIPIENT	
AUTHORIZED SIGNATURE	DATE	AUTHORIZED SIGNATURE	DATE
NAME Rachel L. Grant Kiley		NAME	
TITLE Contracts, Grants and Loans Office Manager		TITLE	
CALIFORNIA ENERGY COMMISSION ADDRESS 1516 9th Street, MS 18, Sacramento, CA 95814			

APPROVED AS TO FORM AND LEGALITY
October 3 20 17
MICHAEL N. FEUER, City Attorney
By _____ Deputy City Attorney

CEC Notice of Proposed Award[18] and Documentation of SCAQMD[19] project match approval for the H2Freight Project.

California Energy Commission

Alternative and Renewable Fuel and Vehicle Technology Program

Solicitation GFO-17-603
Advanced Freight Vehicle Infrastructure Deployment
April 06, 2018

Proposal Number	Applicant	Project Title	Funds Requested	Proposed Award	Match Amount	Score	Recommendation
		Proposed Awards					
9	Equilon Enterprises LLC (dba Shell Oil Products US)	Renewable Hydrogen Fueling at Scale for Freight (H2Freight)	$8,000,000	$8,000,000	$4,001,800	81.3%	Awardee

CONSENT CALENDAR

1. Approve Minutes of May 4, 2018 Board Meeting

2. Set Public Hearing July 6, 2018 to Consider Adoption of and/or Amendments to SCAQMD Rules and Regulations:

   Determine that Proposed Amendments to Rule 1111 – Reduction of NOx Emissions from Natural-Gas-Fired, Fan-Type Central Furnaces are Exempt from CEQA and Amend Rule 1111

   Budget/Fiscal Impact

3. Execute Contracts to Implement Recommendations to Enhance Socioeconomic Assessments for AQMP

4. Execute Contract for Heavy-Duty Hydrogen Vehicle Fueling Station and Receive and File California Fuel Cell Partnership Board Meeting Agenda and Activity Updates

[18] Full NOPA may be accessed at: *http://www.energy.ca.gov/contracts/GFO-17-602_NOPA.pdf*
[19] SCAQMD Board Meeting minutes for this item may be accessed at: *http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2018/2018-july6-001.pdf?sfvrsn=2*

APPENDIX C – HYDROGEN STATION REQUIREMENTS AND SPECIFICATIONS

ARB's ZANZEFF Solicitation, Appendix C, H2 station requirements are met and addressed below.

Station Access

During the project term, the stations are not open to the public and will be used by duly identified trucks (Toyota, Kenworth Class 8 and other demonstration trucks). There will be access to the station from a public roadway and the dispenser will be equipped with a card reader lock system for authorized use via an access card. Shell will organize face-to-face training with fleet operators. At the end of the project, Shell will open the stations to the public as they will be designed such as standard fuel stations, capable of hosting the public.

Hydrogen Quality

Shell will ensure that all hydrogen dispensed at their California stations will comply with the hydrogen quality requirements in CCR Title 4, Division 9, Chapter 6, Article 8, Sections 4180 and 4181, which adopts SAE International J2719:2011 "Hydrogen Fuel Quality for Fuel Cell Vehicles."

SAE J2719 Testing and Compliance

Shell will have each station's hydrogen supply tested for J2719 compliance every three (3) months after the station is operational. Station supplies may be tested more often, as necessary, due to regular maintenance or other operational activities. Hydrogen supply at all stations will be at least 99.97% verified and tested for purity to meet SAE J2719:2011. Monthly Progress Reports showing the date(s) of these hydrogen quality reading(s) and any special condition(s) required to take the reading(s) will also be submitted by Shell to the Energy Commission Agreement Manager (CAM). Shell will utilize the services of an independent, third-party testing laboratory that uses the most currently available testing standards. Through regular, third-party testing of hydrogen samples from each station by a qualified testing laboratory Shell will ensure that all hydrogen complies with SAE and Energy Commission standards and requirements.

Best Practices to Maintain Delivered High Purity Hydrogen

Shell and their hydrogen supply partners have designed their systems and protocols to ensure that hydrogen quality standards are met throughout the entire supply chain, from production to dispensing. Each step is supported by contingency planning, appropriate sensors and filtration systems, and intelligent equipment design to guarantee that no hydrogen contamination occurs at any point in the process. The Hydrogen Operations Manual will have a chapter with a detailed description of the sampling process in order to meet the required hydrogen quality.

Shell maintains a strong track record for quality and consumer trust and will therefore only allow hydrogen of sufficient quality to be delivered to each station and flow through their equipment. Upon hydrogen quality certification from gas supplier delivery, it will be further assured by Shell's own procedures for their Hydrogen Fueling Station equipment. These widely-accepted industry best practices include purging the gas lines with nitrogen gas, and regular inspections for leaks and other issues every six (6) months or more often during routine equipment maintenance.

The architecture of the HRS itself is designed to ensure a contamination-free fueling process. Use of diaphragm compression technology at every HRS offers contamination-free and leak-tight compression due to the physical separation of oil and hydrogen within the system. Additionally, the HRS is designed with a comprehensive filter system in place that captures hydrogen impurities and particulate matter.

Future equipment retrofit and ability to upgrade have been taken into account in the equipment selection and design, allowing the Shell HRS to meet hydrogen fuel quality requirements into the future. Shell is currently working on several R&D projects, like a hydrogen contamination unit in Shell's Amsterdam hydrogen laboratory that will be used to test and further develop hydrogen quality sensor prototypes. Furthermore, it is the first laboratory in Europe that can actually measure some of the impurities in hydrogen according to the

International Organization for Standardization (ISO) specification, including the Sulphur specification of 4 parts per billion (ppb)

Fueling Protocols

Each of the three stations is designed to fuel 12 HDV's during a 12 hours period between 6AM and 6 PM on weekdays, matching the project vehicle requirements. It can fuel up to 4 HDV's per hour from two dispensers. Current HDV's have a tank capacity of 50 kg, but it is expected that future tank capacity will increase to 75 kg. The station design assumes fueling to a state of charge (SOC) of better than 98% and 67 kg per fill for a 75 kg tank.

a) SAE International Standards: The HRS technology which Shell proposes, comply with the latest SAE J2601- 2014 H35T40 and CSA HGV 4.3 standards on fueling protocols and testing. In addition, the HRS also include communications fueling according to the SAE J2799 enabling faster and more complete fueling.

   The fueling of HDV at 70 MPa (~10,000 PSI) will use a second fueling point and be conducted according to the JPEC-S0003 (2016) fueling protocol as developed by the Japanese Automotive Research Institute (JARI). This protocol is similar to SAE J2601 (2014) H70T40 fueling. The station is designed to fuel two HDV's simultaneously. The HDV dispensers will fuel HDV's only. However, the 70 MPa dispenser nozzle will also mechanically connect to an LDV receptacle. As a precaution, the dispenser will be set up to estimate the vehicle tank size during the pre-fill pressure pulse check. If a tank size smaller than 10 kg capacity is detected the dispenser will automatically adjust to the appropriate J2601(2016) H70T40 fueling protocol.

   Shell has been active members of the SAE J2601 standardization working group and contributed to the development the latest 2014 version of the fueling standard. In 2015, a HRS located at a Shell gasoline station in Hamburg was also the first to achieve approval from the German Clean Energy Partnership (CEP), verifying SAE J2601-2014 compliance after extensive third party acceptance and verification tests. CEP approval of SAE J2601 compliance is required in Germany before start of operation of a HRS.

   Each of the HRS manufactured will undergo quality and validation tests at H2 Logic's factory prior to shipment, confirming compliance with the SAE J2601. This helps minimize one potential risk to the HRS operational start date.

b) CSA Group Standards: Shell's HRS equipment supplier participates and contributes on to CSA efforts on the HGV 4.3 Test Methods for Hydrogen Fueling Parameter Evaluation. The quality and validation tests conducted on each of the proposed HRS at factory will include the HGV 4.3 standard.

Similar to the early stages of the light duty FCEV market, a collaborative effort was needed to develop the appropriate fueling protocols and standards to ensure safe, convenient, and compatible fueling for end customers. To ensure this same level of safety, compatibility, and fueling performance for FCETs, a dedicated fueling protocol will need to be developed. The key industry participants in this project including Shell, Air Liquide, Toyota, and Kenworth look forward to collaborating on this development with other stakeholders. The fueling stations developed under the project scope will be some of the first stations designed specifically for heavy duty truck fueling where new fueling protocols and dispensing equipment can be demonstrated in the future.

Fire and Safety Awareness, Prioritization, and Adherence

Shell takes HSSE (Health, Safety, Security, and Environment) very seriously, and has a number of experts involved with our hydrogen refueling stations who are responsible for ensuring that any risks to our customers

are adequately controlled from the initial planning stages to the end of life of the station.

Shell will use its own Hazards and Effects Management Process (HEMP) and Desktop Safety Review (DSR) with Layer of Protection Analysis (LOPA) as elements of its HSSE control framework system to address risk assessment for all hydrogen-fueling stations.

Business and Function Heads are accountable for adherence to Shell's Group Standards for HSSE & Social Performance (SP); the scope for application of each of these standards is specified in the Shell HSSE & SP Control Framework manuals. The HSSE Manager develops and provides a periodic HSSE Performance Report to the leadership team. Shell's leadership team members and line managers use the report to monitor and improve performance. Periodic audits provide assurance to Shell that we are complying with applicable manual sections of the HSSE Control Framework. Periodic HSSE Self-Assessment Reviews are commissioned by the site/project manager and conducted by site/project personnel. The business unit HSSE-Management System and applicable state and local regulations are used as the Terms of Reference for these reviews. Equipment and installation will conform to all applicable federal, state and municipal laws, rules, codes, and regulations.

The HSSE & SP common processes include: significant HSSE & SP Risks associated with Business activities are assessed and controlled to levels As Low As Reasonably Practicable (ALARP); people who have responsibilities for HSSE & SP are competent and have the resources to perform their roles; a Permit to Work process is used to manage the risks of hazardous work; changes to facilities, processes and organizations are managed to maintain risk controls; emergency Response plans, including those for medical emergencies and spills or releases to the environment, are established and exercised to maintain preparedness; incidents are investigated and analyzed to identify improvements; HSSE and SP data is prepared and reported in conformity with the group and relevant regulatory requirements applicable to such data; assurance is provided to the Board of Royal Dutch Shell plc that HSSE & SP Controls, including Process Safety Controls, are effective.

For safety critical equipment, Shell utilizes a Health, Safety, Security, and the Environment (HSSE) case review to identify and track all preventative maintenance to safety critical equipment which is then fully documented. Ensuring the mechanical integrity of the planned station will include inbound inspection of all components of importance prior to assembly, end of line tests during assembly to ensure the quality and function of preassembled modules and the complete HRS system is delivered, third party product certification to all applicable standards for foreseeable safety hazards and suitability for installation or use, fueling protocol testing, and factory acceptance testing.

For process safety, the design and construction of New Assets and Modifications to existing assets are in accordance with the Shell Design And Engineering Manuals, or industry standards in areas outside the scope of these manuals. Technical Authorities are established for the interpretation of the Shell Design And Engineering Manuals. Each Asset has a nominated Asset Manager with accountability for Process Safety in the operation of that Asset. The Technical Integrity of Assets is maintained by systematic inspection, testing, maintenance and Management Of Change. Assets are operated within established operating limits.

For maintaining integrity, Shell will develop a preventive maintenance plan for all components to ensure appropriate and timely maintenance, testing, calibration and inspection procedures. To keep HRS plant in good running order, regular maintenance must be carried out and periodic service checks completed. Specific plans will be developed with Shell's equipment supplier for maintenance and log keeping in accordance with the manufacturer's procedures to prevent failures and to avoid invalidating equipment warranties.

For safety and alarm systems, the station will be designed with safety components and functions to increase safety by avoiding hazardous situations through limiting the risk of hydrogen release and leaks at the station, reducing risk of sparks in areas where there might be hydrogen leaks and releases, and different precautions to limit

leakages of hydrogen and fire and explosions. The station will be continuously monitored using an online system to provide both operation and monitoring and service response on a 24-hour basis.

For personal safety, procedures and safe working practices are established for tasks with personal safety risks. Maintenance personnel understand the hazards, the work procedures and the safe working practices for their tasks, use Personal Protective Equipment appropriate to their tasks, and perform tasks with safety risks supervised appropriately.

For security, the site will be private with access. This includes signage and fueling allowed only via PIN or access card.

For contractor management, contracts to provide services or goods to Shell that have associated HSSE & SP Risks include requirements for the management of those Risks. The ability of contractors and suppliers to manage the HSSE & SP Risks of contracted activities is taken into account in the selection process. Contractors and suppliers are appraised and monitored to verify that they meet the HSSE & SP requirements of the contract.

For training, safety training and retraining is provided, including

- Goal Zero – No Harm, No Leaks: Shell's company-wide HSSE awareness program is titled "Goal Zero – No Harm, No Leaks". Goal Zero sets the goal that we can operate with zero fatalities and zero significant incidents. To reach Goal Zero, we are developing the safety leadership skills of staff, rewarding successful performance and enforcing consequences for rule breaking.
- HSSE control Framework: Shell developed a HSSE Control Framework, which compiles all Shell's standards related to HSSE. This single document is the foundation of HSSE management, training and HSSE performance.
- Shell's Life-Saving Rules identifies high -risk situations that have been historically found to be the source of more serious accidents.

Together the Life-Saving Rules and the Control Framework help to build a culture in Shell where people know and follow the rules that keep us safe, and that moves us closer to Goal Zero. These actions have helped improve Shell's HSSE performance to a position where we have one of the leading safety records in the industry.

In addition, Shell provides to its employees, retailers and contractors different training of fit-for-purpose knowledge and skills in the area of HSSE on a regularly basis. For instance:

- Shell schedules annual global safety days with our employees and contractors to help strengthen our safety culture. With over 250,000 participants, Safety Day in 2016 focused on achieving Goal Zero.
- On-site personnel are also specifically trained in how to determine through sights and sounds if there is an emergency that needs to be reported to 911. Shell also provides emergency response procedures and protocols to on-site personnel with instructions on how to respond to a 911 emergency.
- Service and inspection contractors must pass all relevant safety courses before performing service work at site. These courses contain HSSE and safety procedure education. Changes to procedures and or components are to be performed according to Management of Change Procedures. All service and maintenance visits are documented.

To ensure timely and easily accessible information about the station to First Responders in the event of emergency, Shell will provide first responder training classes for the local fire department and will provide a publicly available station maintenance plan in the form of a First Emergency Response Manual.

Dispenser Pressure

Each HDV dispenser will be equipped with a fueling point for fueling to 350 bar (5,000 PSI) according to the SAE J2601 (2014) H35T40 protocol for fueling large capacity tanks. The fueling of HDV at 700 bar (~10,000 PSI) will use a second fueling point and be conducted according to the JPEC-S0003 (2016) fueling protocol as developed by the Japanese Automotive Research Institute (JARI). This protocol is similar to SAE J2601 (2014) H70T40 fueling. The station is designed to fuel two HDV's simultaneously. The HDV dispensers will fuel HDV's only. However, the 70 MPa dispenser nozzle will also mechanically connect to an LDV receptacle. As a precaution, the dispenser will be set up to estimate the vehicle tank size during the pre-fill pressure pulse check. If a tank size smaller than 10 kg capacity is detected the dispenser will automatically adjust to the appropriate J2601(2016) H70T40 fueling protocol.

Hydrogen Dispensing

Shell already has real-life experience with the design and operation of hydrogen stations both in the US and in Europe. Based on this practical experience and technical know-how Shell will ensure that the HRS design and operation include best practices to ensure the most safe and reliable operation of dispensers possible. The hydrogen dispensers will be equipped with breakaway couplings, tilt sensors and a sophisticated leakage monitoring system in order to ensure the most safe and reliable operations of dispensers possible.

a) California Code of Regulations: Hydrogen Gas-Measuring Devices: Shell will ensure all hydrogen dispensers conform to the specifications and tolerances specified in the CCR, Title 4, Division 9, Chapter 1, Article 1, Section 4002.9 Hydrogen Gas-Measuring Devices (3.39). Concomitantly, Shell will also comply with the most current version of Uniform Regulation for the Method of Sale of Commodities Section 2.32 (as published in the NIST handbook).

b) California Type Evaluation Program (CTEP): Shell's hydrogen dispensers will achieve Type Certification in accordance with the Steps administered by the California Department of Food and Agriculture (CDFA) / Division of Measurement Standards (DMS) well in advance of dispensing hydrogen for retail sale.

   The Dispenser Type Certification will be secured well in advance of the first station installation. This will streamline DMS involvement in commissioning to only the verification of accuracy class by local DMS-Registered Service Agencies (RSAs) and the issuing of a County Weights and Measures seal approving the dispenser for retail use.

c) Verification with local county official(s): Shell will notify each local county DMS within 24 hours of dispenser installation. Shell's hydrogen refueling station supplier, H2 Logic, has been in continuous contact with staff at DMS on how to best facilitate the Dispenser Type Certification.

   Shell will submit the CTEP Application and Application Fees to CDFA-DMS at least six months in advance of the first station installation. This will allow for sufficient time for DMS staff to conduct type testing of the dispenser at station equipment supplier's manufacturing facility. This long period ensures Shell sufficient time for any modifications to the dispenser, if needed, or if more time is needed for the DMS testing.

d) The Point of Sale (POS) terminal will be either integrated into the dispenser or placed adjacent to the dispenser. Both systems are standalone solutions. The POS system will accept credit cards, debit cards and fleet cards. Shell will contract with a 3rd party to complete the business-to-customer electronic transactions.

   Each proposed station includes two purpose-built, standalone dispensers designed solely for hydrogen fueling. This allows for easier site integration and improved user experience compared to retrofitting a hydrogen dispenser into a conventional gasoline dispenser. Only one-third the size of a conventional

dispenser, the Shell hydrogen dispenser can be placed next to the diesel dispenser and turned in the direction needed to serve one or two fueling lanes.

The dispenser features a display and an intuitively designed user interface that ensures easy and simple use. The fueling process is streamlined to only involve a few simple steps:

- Payment at POS terminal
- Connection of nozzle to vehicle
- Activation of dispenser (start button)
- Removal of nozzle

The display provides visual guiding and displays fueling specific information such as:

- Total price ($)
- Total amount of hydrogen dispensed (kg)
- Price per kg ($/kg)

The information in the transaction record will comply with standard public product codes. Required safety instructions will be readily visible on the dispenser or nearby, including an emergency stop button and any other safety equipment that may be required by local authorities.

Hydrogen amount dispensed is measured with high accuracy and is electronically stored for the payment process. The metering system and interface with the POS is designed to ensure compliance with requirements related to achieving Dispenser Type Certification (see section ii above).

The dispenser and its software will be designed to comply with the International Forecourt Standards Forum (IFSF) interface, which enables connection to externally or virtually placed POS system. This provides flexibility in selection of the POS and payment systems ensuring compliance with EMVCo's specifications for automated fuel dispensers. EMVCo's is supported by six member organizations (American Express, Discover, JCB, MasterCard, UnionPay, and Visa) and dozens of banks, merchants, and processors.

Hydrogen Technologies Code

A preliminary site investigation has been conducted for each station site, resulting in a site layout for each station. Each site layout setback requirements which confirm the mandatory separation distance of the station's components to any specific exposure source per local codes, State of California requirements, and regulations in NFPA 2.

The risk assessment process is performed in accordance with relevant standards such as ISO 31000, ISO/IEC 31010, and/or ISO 12100. In addition, the HRS is designed to comply with the newest ISO 19880-1 "Gaseous H2 Fueling Stations General Requirements" and relevant sections within HGV standards and codes such as NFPA 2. Further a risk assessment on the mechanical design is performed.

Station Design Requirements (Network and Equipment Redundancy)

California's hydrogen infrastructure requires redundancy to 1) support fueling for existing FCEV drivers and to 2) establish confidence in the robustness and up-time of the hydrogen refueling network. Hydrogen fueling stations in California have had varying degrees of availability or up-time, which has compromised the consumer confidence in hydrogen fueling. With technology maturation, the up-time of stations should increase. However, there is inherently a certain level of unreliability for all equipment. Therefore, redundancy is necessary in all critical operations.

Vehicle drivers are accustomed to diesel stations with up-times exceeding 99 percent. To increase the up-time of the hydrogen infrastructure network in a region, coverage must be increased. UCI researchers have determined that three hydrogen stations within a region provide a collective up-time of 99 percent that is nearly comparable to the experience that diesel drivers expect. The station locations proposed provide redundancy in areas with existing stations or add coverage in areas where there is a coverage cap.

Each dispenser enables backup fueling if one of the dispenser or compressor should be unavailable for maintenance or repair. Therefore, Shell's single HRS proposed can produce the same level of redundancy and reliability as two HRS.

Backup plan to provide hydrogen to customers is adequate and reasonable: If for any unforeseen reason both modules of the HRS were to go offline at the same time, then:

- A technician can be dispatched and on-site to repair an offline HRS within several hours.
- The equipment provider is bound to Shell to ensure that spare parts are readily available in the region and can be delivered within hours.
- Shell has concentrated its stations in California to ensure its personnel can respond rapidly to HRS downtime.
- If the real estate is available on-site, Shell will dispatch a hydrogen mobile refueler to guarantee hydrogen supply to customers.
- The frequency of hydrogen fuel delivery will be increased at the nearest Shell HRS to accommodate for the increased shift in demand.

If the HRS is faced with hydrogen supply depletion, then:

- Shell can utilize its ample on-site storage facilities allow more than 1000 kg of hydrogen storage at 450 bar
- Shell is able to procure hydrogen from any hydrogen supplier since its storage system is not owned by a third party, nor is it dependent on trailer swaps, giving the company full flexibility.

Renewable Hydrogen

Each HRS proposed in this project will dispense a minimum renewable hydrogen content of at least 33% renewable hydrogen. Shell' supplier of the renewable biogas will meet Public Resources Code Section 2574(b)(1) and put in place a renewable energy accounting system to track and maintain renewable biogas purchases with market demand for the commercial markets that require a renewable energy source.

For each of the three main stations, the renewable feedstock to dispense fuel and operate the station is listed in the below table:

	Feedstock	Central or Distributed Production	Delivery Method	Hydrogen Distribution
4325 E. Guasti Road., Ontario, CA 91761	33.3% Biogas	Central Steam Reformation	Gaseous H_2 Truck	Gaseous
1926 East Pacific Coast Hwy., Wilmington, CA 90744	33.3% Biogas	Central Steam Reformation	Gaseous H_2 Truck	Gaseous
785 Edison Ave., Long Beach, CA 90813	100% Biogas	Tri-gen (Molten Carbonate Fuel Cell)	On-site producti on	Pipeline

In Ontario and Wilmington, the renewable hydrogen will be produced using SMR technology and biogas feed. Biogas will be injected as certified Renewable Natural Gas (RNG) into a common carrier pipeline in North America and reported as an input to hydrogen production. In the SMR process, the hydrocarbons such as methane from natural gas/biogas catalytically reacts with steam at high temperature (700-1,000C) and pressure (3-25 bar) to produce syngas (hydrogen and carbon monoxide). The carbon monoxide in syngas is further oxidized using steam via water-gas shift reaction to produce carbon dioxide and hydrogen. The overall steam methane reforming and water-gas shift reactions consist of the following:

1. Methane Reforming: $CH_4 + H_2O \rightarrow CO + 3\ H_2$
2. Water-Gas Shift: $CO + H_2O \rightarrow CO_2 + H_2$
3. Overall SMR: $CH_4 + 2\ H_2O \rightarrow CO_2 + 4\ H_2$

In the Port of Long beach, the renewable hydrogen will be produced on-site using a molten carbonate the world's first megawatt-scale carbonate fuel cell power generation plant with a hydrogen fueling station. The Tri-Gen facility will use bio-waste gas sourced from California agricultural waste to generate water, electricity, and hydrogen. The renewable biogas produced from the in-state resource will be injected into the natural gas infrastructure. The same amount of gas injected into the pipeline is then extracted from the pipeline onsite at the Toyota Logistics Services facility at POLB. When it comes online in 2020, Tri-Gen will generate approximately 2.35 megawatts of electricity and 1.27 tons of hydrogen per day. The power generation facility will provide 100% renewable power to the TLS facility and support the charging infrastructure of the battery forklifts operating onsite. The renewable hydrogen will be directly provided to the heavy-duty station to support FCET fueling. This fueling station is being developed in parallel with the S2S project with support from the CEC.

FuelCell Energy (FCE) has developed the tri-generation technology which was demonstrated at the Orange County Sanitation District (OCSD) wastewater treatment plant in Fountain Valley, CA until 2014. The process demonstrated at OCSD was given a California Air Resources Board Low Carbon Fuel Standard (LCFS) pathway in December of 2015. The hydrogen has a carbon intensity of -0.82 gCO2/MJ. The Tri-Generation plant itself is out of scope for this solicitation.

The capacity of the on-site generator can handle an increase of demand, and even has the possibility to supply other sites within the vicinity with renewable hydrogen. If possible, this option may be tested as it could provide an economical supply of renewable hydrogen to other fueling stations developed within the scope of the S2S project.

The three stations will utilize power supplied by from the California grid, which has a 30% renewable mix.

Shell will be solely responsible for complying with standards and regulations that the California Air Resources Board (CARB) may adopt in the future for HRS pursuant to the authority in Health and Safety Code, Section 43869, as applicable, including funding its compliance with them.

Shell will be responsible for ensuring that data is provided to CARB on a quarterly basis regarding hydrogen production, delivery, and dispensing for the purposes of carrying out the demonstration.
Data collection will include but not be limited to:

- performance data including quantity of fuel produced and dispensed, energy used for hydrogen production, storage, cooling, compression, and dispensing, estimated cost to produce fuel, fueling times, station down time, servicing and maintenance information, and driver/operator feedback on refueling.
- amount of biogas or other renewable feedstock (in mega joules), total amount of fossil natural gas from the pipeline (in mega joules) or other fuel used for hydrogen generation and steam production, and total electricity and water usage for hydrogen generation, storage, compression and dispensing.

All data will be recorded on the NREL Data Collection Tool, or another format as specified by CARB.

APPENDIX D – PORT OF HUENEME BACKGROUND SUPPLEMENT

POLA & POH Zero-Emission Shore-to-Store Project (S2S)

The Port of Hueneme is the only deep water port between Los Angeles and the San Francisco Bay. It services many of the cargo needs of the Central Coast and Valley of California and the Southern California markets. Specializing in the fresh produce and automobile niche markets, the Port of Hueneme is integral to the supply chain of exports and imports throughout California. In fiscal year 2017, about 1.49 million tons of cargo moved via these terminals and were produced and consumed by exporters and importers located within the metropolitan region, the State of California, as well as throughout the Southwest and the Western States. The Port of Hueneme represents a vital economic engine for California and Ventura County, creating:

$9 billion in goods movement
$1.5 billion in economic activity
13,633 trade-related jobs
$93 million in state and local taxes
Servicing 15 states with bananas & autos

The Port of Hueneme is the West Coast hub for bananas importing over 3.3 billion bananas a year. The Port is also the West Coast hub for BMW. Banana's and BMWs imported at Hueneme are then distributed to 15 Western states creating tens of thousands of jobs along the supply chain throughout each of these states. Some of the bananas are also exported by truck or rail to Canada.

This Shore-to-Store Project (S2S) project will fund two significant innovations at the Port of Hueneme:

1. Installation of electrical infrastructure to power a new generation of zero-emission cargo handling equipment
2. Acquisition of the Port's first all-electric, zero-emission cargo handling equipment

The electrical infrastructure and zero-emission (ZE) cargo handling equipment will make possible the starting of a new era of zero and near-zero emission cargo movement at the Port. Once installed, this infrastructure will immediately power the Port's first electric, zero-emission yard tractors.

In addition to the infrastructure and ZE yard tractors at the Port of Hueneme, one of the new hydrogen fuel-cell, zero-emission trucks included in the S2S Project will be dedicated to bringing the world's first zero-emission avocados to and from the Port of Hueneme and the packing facility in Oxnard. This truck will also carry shipments of avocados grown in the Port of Hueneme region to the Port of Los Angeles for export. These elements combine to support a groundbreaking pilot program spanning multiple counties, two commercial seaports, two air quality control districts. The S2S Project will demonstrate how new technology can reduce the carbon emissions from cargo movement while improving air quality throughout disadvantage communities, all while leading the way for the future of zero-emission cargo logistics from ship to the consumer's store.

Why A Zero-Emission Avocado?
The Port of Hueneme has an existing relationship importing and exporting avocados for Mission Produce located in Oxnard, CA. California produces 300-400 million pounds of avocados annually, exporting them all over the world. In California's off season, Mission Produce imports avocados from Mexico, Peru, Chile, and New Zealand. Mission Produce was selected to partner on the delivery of the first ever zero-emission avocado to California markets because of their commitment to technologically driven sustainability, history of innovation, and adoption of the Good Agricultural Practices (GAP) Program and Good Harvesting Practices (GHP). GAP and GHP include sustainable land use practices, use of good quality pathogen free water, ranch security, protection of worker hygiene, field sanitation, and food safety training for all employees. Mission Produce's Oxnard packing facility has sustainability at the forefront of their operations and infrastructure with LED lighting, intelligent control systems for energy efficiency, and a 1-megawatt solar panel energy system to reduce their carbon footprint.

Port of Hueneme's Commitment to Environmental Sustainability
This zero-emission avocado S2S project is consistent with the Port of Hueneme's mission statement of being committed to providing the maximum possible economic and social benefits to the people and communities served by the Port. This project would not just be achieving this mission for today, but it would support the transition to new, zero-emission cargo handling equipment which will help improve local air quality for decades to come.

The Port has made sustainability a central tenet to its operations and will be an essential element of the future growth of the Port. In 2012, the Port adopted a proactive framework of environmental efforts addressing the following focus areas:

- Community Engagement
- Sustainability
- Air Quality
- Water Quality
- Soil & Sediment
- Marine Resources
- Energy Efficiency
- Climate Change

Cleaner Air for Local Disadvantaged Communities
This project is not only a win for goods movement, but it also will bring significant environmental and economic development to the Oxnard Harbor District where the Port is located. Including the cities of Oxnard and Port Hueneme, this District is one of the most economically challenged in the region. This project will address the socioeconomic justice issues of this community where 23.8% of the population live in poverty and only 64.7% of residents have completed a high school education. Both the cities qualify as economically distressed areas under the Recovery Act based on their unemployment rates and per capita income being substantially less than the national average.

The Port has committed to reducing air emissions associated with Port operations, and in coordination with the local air quality regulatory agency, the Ventura County Air Pollution Control District (VCAPCD), has begun development of a comprehensive air quality improvement plan. This plan is called the Port of Hueneme Reducing Emissions Supporting Health (PHRESH) Plan, and in partnership with VCAPCD, the Port will use the PHRESH Plan to develop air quality goals and assess emissions reduction scenarios that can be efficiently achieved. The PHRESH Plan will be tailored to local air quality needs around the Port including attention to particulate matter and NOx to ensure that the Port continues its role as a steward of our precious local environment, especially in our local communities.

Regional Collaboration

The Project influences and strengthens the efficiency of the PIC (Port Intermodal Corridor) and aligns with the corridor's objectives as defined in the Ventura County Transportation Commission (VCTC), Southern California Association of Governments (SCAG) and California Department of Transportation (CalTrans) transportation plans.

The Project:

- Strengthens Port asset utilization and enhances productivity,
- Responds to customer growth and capacity demands, supporting increased export and import cargo flows,
- Integrates green technologies which improve air quality, and cleaner energy

In 2015, the Port of Hueneme provided:

$9 billion in goods movement $1.5 billion in economic activity
13,633 trade-related jobs $93 million in State and Local Taxes

A Vital Link in the State's Supply Chain

The Port of Hueneme is a niche market port complimenting the southern California gateway and the Ports of Long Beach and Los Angeles. In FY2016, the Port showed a mix of cargo tonnage gains and losses as the Port works to balance its available capacity with cargo demands. Automobile imports, automobile exports, heavy equipment imports and fertilizer imports all saw growth (see table). Main exports and imports include automobiles, heavy equipment, bananas, other fruits and vegetables, and bulk liquids (fertilizers). The Port also handles domestic cargos including wetfish (California Market Squid) and vessel fuel. The Port's strategic location makes it a vital offshore oil support center servicing platforms located in the Santa Barbara Channel.

The Port of Hueneme offers 154 acres of maritime land and 279 acres of public/private off-terminal industrial lands. South Wharf has 3 berths equaling 1,800 linear feet. The South Terminal is home to refrigerated cargos, heavy lift, general cargo, and liquid fertilizer. An adjacent 256,000 square-foot refrigerated transit shed, refrigerated container electrical infrastructure, bulk liquid handling, and over 25 acres of cargo marshaling lots are located on the South Terminal.

The North Wharf offers two berths 1,450 linear feet in length, handling the majority of Roll-on/Roll-off (Ro/Ro) cargo, Lift on-lift off (Lo/Lo) cargo and automobiles. A 98,000 square-foot warehouse and over 26 acres of cargo and equipment marshaling area is located on the North Terminal.

The Port has 6 berths, offering 4,250 Linear Feet of berth space. There is also a shallow draft berth of 320 Linear Feet in length. Oxnard Harbor District and the U.S. Navy share one berth measuring 1,000 Linear Feet used by Ro/Ro vessels calling Port of Hueneme. The main channel has an existing maximum draft of 35 feet and will be dredged to a depth of 40 feet in 2018.

Regional & National Significance For America's Marine Highway (AMH)

Under U.S. Coast Guard 2012 and 2014 legislation, the Port is promoting the AMH to Hawaii and along the M-5 corridor. Operating within this corridor, the Port advocates on behalf of the U.S. Maritime Administration and constituent regional transportation authorities to fully develop and leverage the Americas Marine Highway program to better integrate the System's over 29,000 nautical miles of navigable waterways into the greater U.S. transportation system. In doing so, the Port can develop new economic development opportunities for the region while reducing congestion and further strengthening our country's merchant marine. More comprehensive information on the AMH program can be found at: *http://www.marad.dot.gov/ships_shipping_landing_page/mhi_home/mhi_home.htm.*

Hueneme is located along the M-5 Marine Highway Corridor

The system will assist the Port in future asset and infrastructure improvements, reduce operating and maintenance costs, and efficiently support environmental protection funding opportunities.

The technology used within this project will integrate into the Port's larger commitment to being an early adopter of innovative technology. The Port has developed and operates a technology innovation program called the Maritime Advanced System & Technology Lab (MAST) which utilizes Port facilities to advance maritime technology adoption. Its mission is to foster leading-edge technology innovation and integration in a port and maritime environment. The MAST Lab joins a federated network of leading academic, research, test and evaluation, in-service engineering and operational centers to further expand the region's ability to provide solutions to operational challenges, providing the ideal location for ongoing, maritime-based research and evaluation.

Commitment to Innovation

- The Port has recently partnered with Tesla Incorporated to install a series of large capacity batteries on the Port which serve to assist in the operation of the shoreside power system for vessels at berth. Power is purchased at night during periods of low demand and is available for use during the day when demand is higher thus taking strain off of the local energy grid.
- The Port deployed recently developed technologies in low energy lighting, which improves operational capabilities, productivity and safety within the terminal while reducing energy consumption. This saves the Port operating and maintenance costs, which is reinvested to further innovate its operations.
- The Port partnered with the Smithsonian Institution to catalog and monitor the status of marine resources within the Port in an effort to develop a baseline of conditions for monitoring invasive marine organisms.
- The Port is instituting a Traffic Management System based on the ongoing efforts of the Port's Traffic Management Study which integrated the efforts of the Port Operators Group consisting of all Port users and customers, including the Navy. Goals and objectives were outlined in Phase I which will guide the formation of short-, mid- and long term transportation improvements within the Port's gates to assure efficiency, safety and state of-the-art traffic controls for port operations.

The Port of Hueneme embraces innovation as a core value by:

- Increasing Port and customer productivity utilizing technology, practical operations based problem solving and encouraging logistics partners to define industry-recognized best management practices,
- Organically growing economic development opportunities in partnership with existing customers and local industry,
- Creating effective, best in class solutions to maritime issues, and
- Evolving a culture of safety and collaboration.

APPENDIX E – ADDITIONAL BACKGROUND ON SAFETY MEASURES

As an operator and a demonstrator of the equipment, safe working conditions and careful cargo handling are paramount to the demonstration partner fleets. The project partner fleets maintain strong safety standards and safe working conditions at all times. They provide on-going safety training for management, staff, and union labor to ensure federal and state OSHA requirements are not just met but are surpassed. Safety training on the project vehicles and equipment will be provided by the OEM manufacturers to all operations and maintenance personnel. Operations and Maintenance Manuals will contain written safety instructions. Shell will prepare safety manuals and training classes for Shell operations staff and First Responders. Shell will work with Shell's equipment provider and maintenance contractor, the California Fuel Cell Partnership's Safety Officer, and other state and local fire officials familiar with hydrogen fueling, to conduct training sessions prior to full commissioning of each station. In order to ensure the maximum number of trained first responders, classes will be held at nearby fire stations, and an effort will be made to schedule site visits of each fueling station with as many first responders as possible, depending on their availability.

Taking the appropriate safety measures to ensure safe project implementation is a high priority for the entire project team. Service and inspection contractor procedures are to ensure that personnel have passed all relevant safety courses before performing service work at site. These courses contain HSSE and safety procedure education. Changes to procedures and or components are to be performed according to Management of Change Procedures. All service and maintenance visits are documented.

Through our pre-award efforts for initiating CEQA evaluations, Shell has begun community outreach with public officials. Shell met with all AHJs at each of the proposed station locations. In particular, we met with senior advisors to the mayors of Ontario, Los Angeles and Port of Long Beach's Fire Department. Early in the project, station safety and training will be coordinated with Fire Marshalls and first responders at all station locations to facilitate a successful and timely path to station commissioning and open retail service start-up.

Shell will also develop the following documents, plans and procedures for each site:

- A joint HAZOP will be conducted with the equipment supplier.
- A Health, Safety, Security and Environmental (HSSE) case review will be jointly conducted with the engineering firm of record and the equipment supplier.
- An Emergency Response Plan (ERP) will be completed which outlines the procedures and organization structure to respond to emergencies.
- A Hazardous Materials Management Plan will specify the procedures for handling, storing or disposing of any hazardous materials during the life cycle of the project.
- A Permit to Work procedure will identify procedures for safely securing the work area and equipment before work is commenced.
- A Contractor Safety Plan will specify the qualifications, controls, safety programs, training, communication, and metrics for all contractor suppliers.
- The Operations Manual will document the installation, operations procedures and maintenance of the Hydrogen Refueling Station.
- The Management of Change Procedure communicates proposed facility and/or operational modifications to the appropriate stakeholders for review, analysis, documentation and approval.
- A Noise Study will document the noise levels for compliance and identify any mitigation methods to reduce noise levels or provide safety measures for hearing protection.
- A Pre-startup Safety Review checklist will be developed and utilized for commissioning.
- A Waste Management Plan will be developed for handling and properly disposing of waste materials.

Shell's hydrogen Safety Plan describes Shell's risk reduction plans and approach to mitigating operational safety issues:

- *The identification of safety vulnerabilities (ISV) method to be used* - Shell utilizes the Hazards and

Effects Management Process to manage potential hazards to "as low as reasonable practicable" (ALARP).

- *Who leads and stewards the use and results of the ISV* process – Shell's Global Hydrogen Operations Manager is the primary caretaker for implementing the safety reviews and maintaining the documents.
- *Significant risk and accident scenarios identified (e.g., higher consequence, higher frequency)* - The HEMP process identifies the significant risks and consequences as well as the barriers in place to mitigate the risks.
- *Safety critical equipment* - Shell utilizes a Health, Safety, Security, and the Environment (HSSE) case review to identify and track all preventative maintenance to safety critical equipment which is then fully documented.

Shell is provided with an "Operator Manual" which includes analysis of the potential hazards in and around the HRS equipment including requirements to obtain safety to the highest standards. This "Operator Manual" will be incorporated into the Shell operating and safety documents.

The HRS facility will be operated as 24 hour seven days per week integrated within a retail gasoline outlet. Fueling process for FCEVs is similar to those of gasoline, diesel, and compressed natural gas (CNG) vehicles. Operating procedures will be specified in the Shell operations manual and will include normal and emergency procedures for Shell operations personnel.
The cornerstone of Shell's approach to risk reduction for station design and operations is the HEMP process mentioned above. HEMP process is used to identify significant safety vulnerabilities which are then mitigated with the appropriate prevention measures.

The HRS equipment is fully tested and third party certified at the manufacturing facility where the program code is locked before shipment. Having confirmed that the program code is the same as stated on the third party certification documentation, the HRS may be commissioned which includes a range of commissioning procedures such as; start-up procedures, test of safety systems, boosting up of systems and storage containers, leakage testing at different pressure intervals, cooling and refueling tests according to relevant parts within standards such as CSA 4.3, ISO and or other applicable test procedures.

Hazards and Effects Management Process - Shell will use HEMP as an element of its HSSE control framework system to address risk assessment for these HRS. HEMP provides a structured approach to the analysis of safety hazards throughout the life cycle of an installation. The HEMP methodology identifies various hazards at the facility and assesses management of the identified hazards. The HEMP process requires key or critical tasks and/or activities to be identified with the individual who is accountable for maintaining the controls.

Hazard and Operability Study with Layer of Protection Analysis (HAZOP/LOPA) – As part of the design of the HRS the, risk assessment has been upgraded from a standard Failure Mode Effects Analysis (FMEA) process to a risk assessment in accordance with the IEC (International Electrotechnical Commission) standard which includes a Hazard and Operability Study with Layer of Protection Analysis (HAZOP/LOPA). The HAZOP/LOPA process requires substantially more work, but with a standard product, it is possible to conduct this cumbersome process and achieve a product with a higher degree of structured safety.

The risk assessment process is performed in accordance with relevant standards such as ISO 31000, ISO / IEC 31010, and/or ISO 12100. In addition, the HRS is designed to comply with the newest ISO 19880-1 "Gaseous H2 Fueling Stations General Requirements" and relevant sections within HGV standards and codes such as NFPA 2. Further a risk assessment on the mechanical design is performed.

Safety and alarm systems: Shell's hydrogen Safety Plan describes safety and alarm systems. HRS are designed with safety components and functions to increase safety by avoiding hazardous situations through:

- Limiting risk of hydrogen release and leaks at station
- Reduce risk of sparks in areas where there might be hydrogen leaks and releases
- Different precautions to limit leakages of hydrogen and fire and explosions

Each HRS is continuously monitored using an online system to provide both operation monitoring and service response on a 24-hour basis.

Shell provides a 24/7 emergency response phone number that connects to the emergency response team member and the person will be able to guide individuals that need assistance. The emergency response number will also be available for any form of support towards first responders. The emergency response staff will have the possibility for remote access to the HRS and thereby support first responders. In case of emergency, H2 Logic Product Safety Committee is directly informed about the nature and status of the emergency.

A range of operation modes and set of alarms and actions are defined (shown in the table below) with the aim to optimize availability while ensuring that operation is always safe.

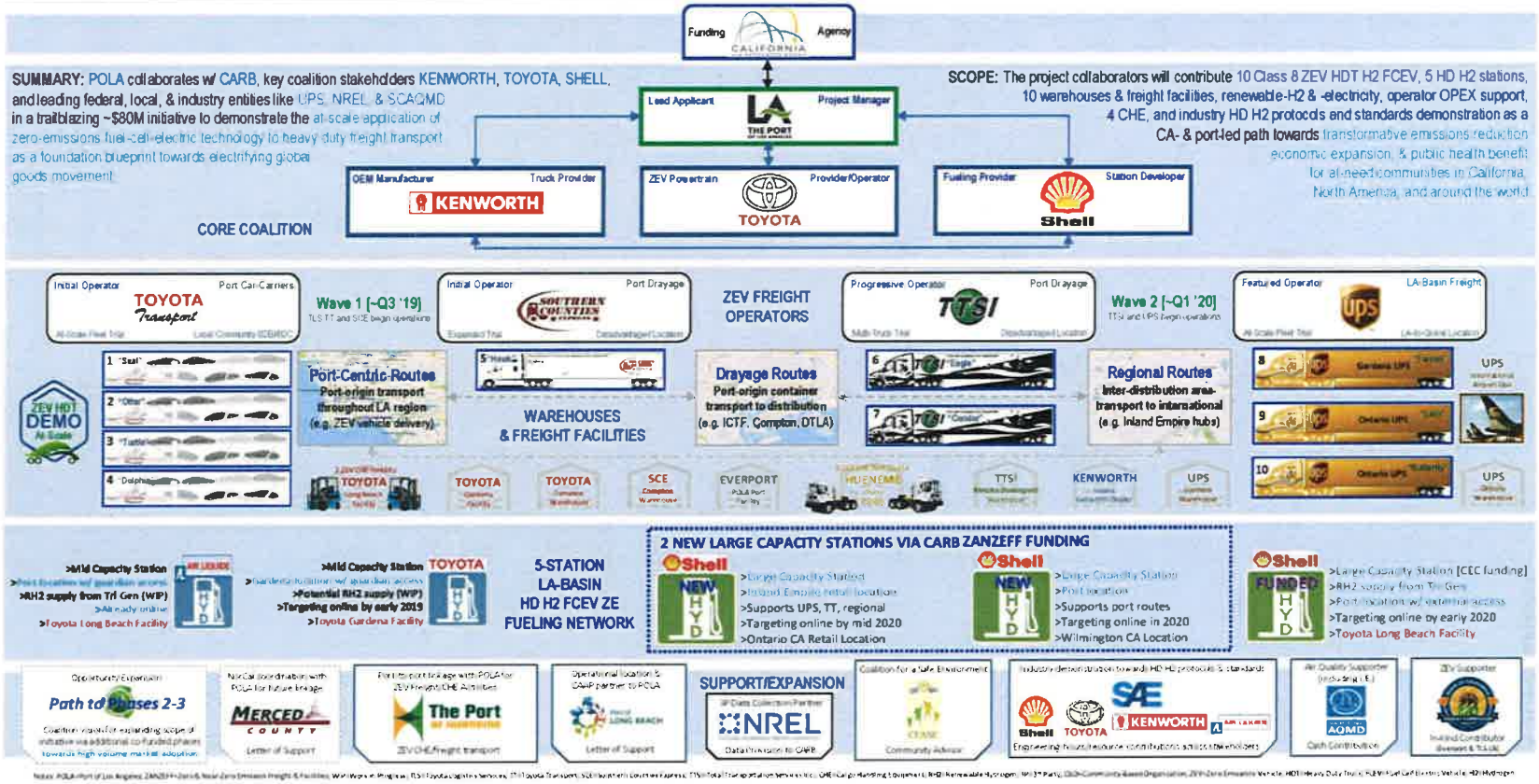
HRS Operations Mode	Status Description	Alarm/Situation Examples
Operation mode	Ready for fueling	None
Warning mode	Ready for fueling – Warning on potential upcoming alarms	e.g., a transmitter has reached a warning level, but not a critical level (alarm) where action is taken.
Alarm mode	Limited fueling – Alarm and/or shot down of sub-systems	e.g., alarm that results in shutdown of compressor, but refueling from cascade is still possible.
Failure mode	Not ready for fueling – Alarm affecting safety – emergency shutdown entire system	e.g. alarms on detection of hydrogen, smoke, flames or other safety critical situations.

Below are listed main safety features provided with the HRS:

- Separated safety controllers ensuring monitoring of safety critical processes during fueling
- Hydrogen dispenser with break away, tilt sensor and a sophisticated leakage monitoring
- Constant monitoring of hydrogen leaks in compressor room with hydrogen detector
- Constant monitoring of flames and sparks in compressor room with UV flame detector
- Isolated tanks with automatic shut off valves to isolate tanks from stations
- Constant monitoring of oxygen level inside compressor room
- Smoke detectors to detect fire in compressor room and control room
- Continuous mechanical EX ventilation in hazard areas to avoid occurrence of an explosive atmosphere
- Higher pressure pipes are connected with C&T fittings (cone and thread)
- Multiple redundancy on critical safety and refueling parameters (pressure and temperature sensors)
- Safe release of hydrogen in case of hazards through hatches, chimneys

APPENDIX F – GRAPHICS SUPPLEMENT

Transformational "Shore-to-Store" Zero Emissions CARB ZANZEFF Project Image



Project Schedule

		Entity	Days	Start	Completion
Administration	Preliminary Grantee Selection	CARB	1	9/6/2018	9/6/2018
	Final CEQA Documentation	SHELL	124	7/1/2018	11/1/2018
	Execute Grant Agreement and Return to CARB	POLA	72	9/6/2018	11/16/2018
	Sub-agreements execution	POLA	166	7/19/2018	12/31/2018
	Draft final report	POLA	16	2/28/2021	3/15/2021
	Final report	POLA	32	3/15/2021	4/15/2021
Infrastructure – Hydrogen Refueling Station in Wilmington	Engineering and Permitting	SHELL	329	9/6/2018	7/31/2019
	Equipment Procurement (secure materials)	SHELL	421	9/6/2018	10/31/2019
	Construction, equipment installations and testing (construction services)	SHELL	213	8/1/2019	2/29/2020
	Stations commissioning and operations start-up	SHELL	92	3/1/2020	5/31/2020
Infrastructure – Hydrogen Refueling Station in Ontario	Engineering and Permitting	SHELL	329	9/6/2018	7/31/2019
	Equipment Procurement (secure materials)	SHELL	390	9/6/2018	9/30/2019
	Construction, equipment installations and testing (construction services)	SHELL	215	7/1/2019	1/31/2020
	Stations commissioning and operations start-up	SHELL	90	2/1/2020	4/30/2020
Truck Fleet	Concept design	Kenworth/Toyota	269	9/6/2018	6/1/2019
	Vehicle build (unit 1-5)	Kenworth/Toyota	208	9/6/2018	4/1/2019
	Validation & Design refinement	Kenworth/Toyota	489	3/1/2019	7/1/2020
	Vehicle build (unit 6-10)	Kenworth/Toyota	247	8/1/2019	4/3/2020
	Demonstration preparation, service, and support	Kenworth/Toyota	1096	1/1/2019	12/31/2021
Yard Tractors & Charging Infra	Engineering and Design	POH	138	12/15/2018	5/1/2019
	Infrastructure Bid Process	POH	62	5/1/2019	7/1/2019
	Utility Permitting and Construction	POH	518	1/1/2019	6/1/2020
	Site Construction and Commissioning	POH	398	7/1/2019	8/1/2020
	Yard Truck Delivery	POH	32	7/1/2020	8/1/2020
Tech. Demos	Truck Fleet Demonstrations	UPS,TTSI,SCE,Toyota	541	7/30/2019	1/20/2021
	Yard Tractor Demonstrations	POH	173	8/1/2020	1/20/2021
	Forklift Demonstrations	Toyota	541	7/30/2019	1/20/2021
Data and Analysis	Data Collection	NREL	572	7/30/2019	2/20/2021
	Data Analysis	NREL	572	7/30/2019	2/20/2021
	Advanced Data Analytics	NREL	206	7/30/2020	2/20/2021