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Repowered Hydrogen Top Handler & Mobile Hydrogen Refueler

Toyota Tsusho - Fenix Marine

THE PORT 
OF LOS ANGELES

Technology
Advancement Program &
Cost Share Agreements

Board Actions

- I. Approval of Technology Advancement Program (TAP) Agreement between Toyota Tsusho America and Port of Los Angeles (POLA)
- II. Approval of TAP Cost Share Agreement between POLA and Port of Long Beach (POLB)



TAP Project Description

- Location: Fenix Marine Services Terminal (FMS)
- Primary Contractor: Toyota Tsusho America (a business development company associated with Toyota Motors North America)
- Repower/Replace the diesel engine in an existing top handler with a hydrogen fuel cell system
- Demonstrate a mobile hydrogen refueler
- Estimated Total Cost = \$4,996,045

All of these demonstration will be good technology validation opportunity



Taylor @ Everport Terminal

- **Battery-Electric Type**
- (1 MW (1,000kWh) Battery)

Status:

- **Already started**

Challenge:

- => **Battery duration**
(last 16hrs (2 shifts?))
- => **Charging station.**
(Future mass deployment maybe challenging for
 - Footprint,
 - Large power requirement
 - High Investment amount



Hyster-Yale @ Fenix Terminal

- **Battery & Fuel Cell Hybrid**
- (350kWh Battery & 27kg H2 tank)

Status:

- **About to start (Nov.2022)**

Challenge:

- => **Battery/Hydrogen duration**
(last 16hrs (2 shifts?))
- => **Charging/refueling station.**
Future mass deployment maybe challenging for
 - Two infrastructure needed,
(Battery & Hydrogen)
 - Footprint,
 - Large power requirement
 - High Investment amount



Toyota Tsusho @ Fenix Terminal

- **Fuel Cell Dominant System**
- (FC: 80kW, H2: 60kg & 105kWh Battery)

Status:

↳ Toyota Fuel Cell Module (Gen2)

- **About to start (Nov.2022)**

Advantage:

- => **Hydrogen dominant:**
(No battery charging station required.)
- => **Hydrogen supplied by mobile refueler**
 - No stational infrastructure needed.
(Quick "Refuel and Go" concept.)
 - Minimum Footprint,
 - No power from terminal needed for power source
 - Low Investment amount

*For future mass deployment, we have additional simultaneous mass refueling system that is currently being developed.

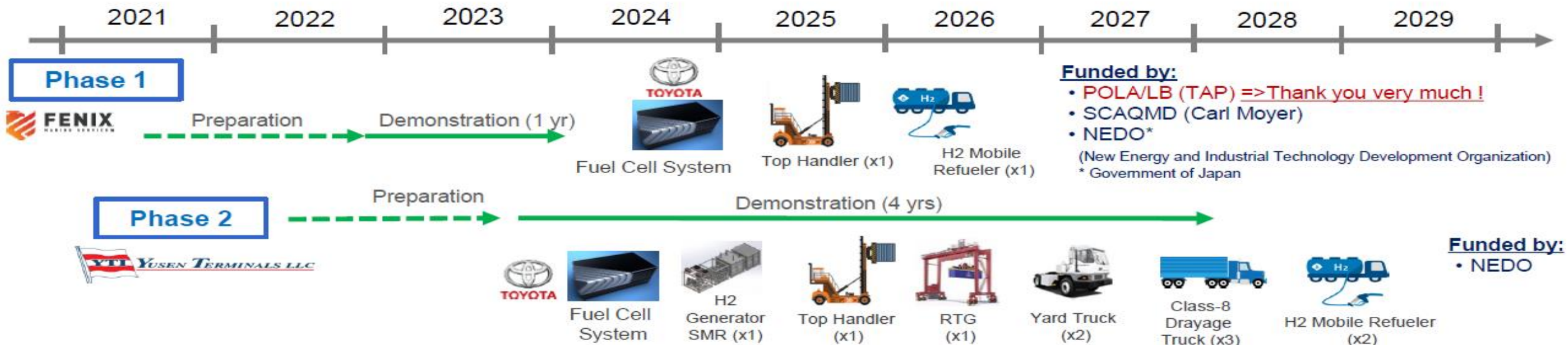
Our
Demonstration
Top Handler
"Green Machine"

Cost Share Agreement

- POLA is financially responsible for \$860,000 under the first Board action
 - POLB will reimburse POLA \$430,000 through the TAP Cost Share Agreement, under the second Board action
- Total Cost of this proposed project is \$4,996,045

Toyota Tsusho	\$	2,822,568
US Hybrid	\$	276,477
FMS	\$	887,000
OneH2	\$	150,000
POLA	\$	430,000
POLB	\$	<u>430,000</u>
TOTAL	\$	4,996,045

Demonstration Schedule & Equipment Preparation



Fuel Cell Powered Top Handler (Repower)

FC Top Handler Design Concept w/ Toyota Components (For Demonstration)



FC Module=Phase 1 & 2, Tank and components = Phase 2 (plan)

Repower Work in Progress (For Phase 1) As of April 29, 2022



Hydrogen Mobile Refueler

Phase 1 (Concept Image)



Phase 2 (Concept Image)





THANK YOU