Port of LONG BEACH
The Green Port

THE PORT OF LOS ANGELES

SAN PEDRO BAY PORTS

CLEAN AIR ACTION PLAN 2017

Bay Wide Ocean-Going Vessel International Maritime Organization Tier Forecast 2015-2050

JULY 2017

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SYNOPSIS

In order to estimate the potential benefits to the South Coast Air Basin from existing International Maritime Organization (IMO) regulations that will help reduce ocean-going vessel (OGV) oxides of nitrogen (NOx) emissions in the future, a tier distribution forecast is needed. Due to the numerous variables that are both supportive and inhibitive of fleet turn to newer, cleaner ships, a conservative air quality approach was used in order not to overstate the timing of future reductions. The findings of the San Pedro Bay Ports' OGV IMO Tier Forecast show that nearly across all ship types, significant numbers of calls from the cleanest Tier III powered ships are expected to occur in the mid to late 2030s through mid to late 2040s.

1.0 San Pedro Bay Ports Tier Distribution Approach

The International Maritime Organization (IMO) has established diesel engine standards for oxides of nitrogen (NOx) emissions from ocean-going vessels (OGVs or ships) that are applicable based on a ship's keel laid date (KLD). These standards are applicable to both propulsion and auxiliary engines. The IMO NOx engine standards and applicable KLD are as follows:

- Tier 0: ships with KLD pre-2000
- Tier I: ships with KLD 1 January 2000 through 31 December 2009
- Tier II: ships with KLD 1 January 2010 through 31 December 2015
- Tier III: ships traveling into the North American and United States Caribbean Emissions Control Area (ECA) with KLD 1 January 2016 or newer

Since the establishment of the North American Emissions Control Area (ECA), no port-specific or regionally specific forecasts have been published that would provide an estimate of engine tier mixes out to 2050. This document presents an approach to forecasting the San Pedro Bay Ports (SPBP) IMO Tier distributions for all ship types calling SPBP through 2050. The ships calling SPBP terminals can be grouped into two overarching segments: container and non-container. These two segments can be further divided into the following classes:

- Container ships – divided into container capacity size groups
- Non-container ships – divided into the following classes:
    - Bulk liquid tankers (tankers) – further divided into the following groups: chemical, handy or Handysize, Panamax, Aframax, Suezmax, very large crude carriers (VLCC), and ultra large crude carriers (ULCC)
    - Cruise – further divided into passenger size groups
    - Auto carriers
    - Roll on/roll off (RoRo)
    - Dry bulk (bulk)
    - General cargo
    - Integrated tug-barge (ITB)
    - Miscellaneous

The approach looks at the existing global fleet and how that fleet can accommodate forecasted calls at SPBP ports in the future. This approach is based on the premise that the existing global fleet, which consists almost entirely (approximately 99.9%) of Tier 0 through Tier II ships, will operate with both capital investment and operation cost advantages compared to Tier III ships. The approach documented in this paper should be considered conservative from an air quality planning perspective related to the assumptions made (i.e., should tend to predict a delayed Tier III penetration into the SPBP port calls so as not to overstate the air quality benefits). The key years that the study tries to predict are the years when a significant number of calls (50% and up to 100%) will be made by Tier III powered ships.

Determination of future penetration of Tier III vessels into the various fleets serving the SPBP is informed by understanding the key business case variables that vessel operators consider to start ordering Tier III vessels that could enter service at the Ports. These variables depend on many factors described in the following sections.

The document is organized into the following:

- Historical call data for various vessel types
- Discussion of factors influencing deployment of Tier III vessels
- Projections of Tier III vessel calls to San Pedro Bay by vessel class

This analysis is based on information from various datasets, including IHS Markit Maritime World Register of Ships[1] (formerly Lloyds Registry) the Ports emissions inventories, and the SPBP Long-term Unconstrained Cargo Forecast as well as interviews with ship engine manufacturers and industry experts.

1.1 Observations from Historical Call Data

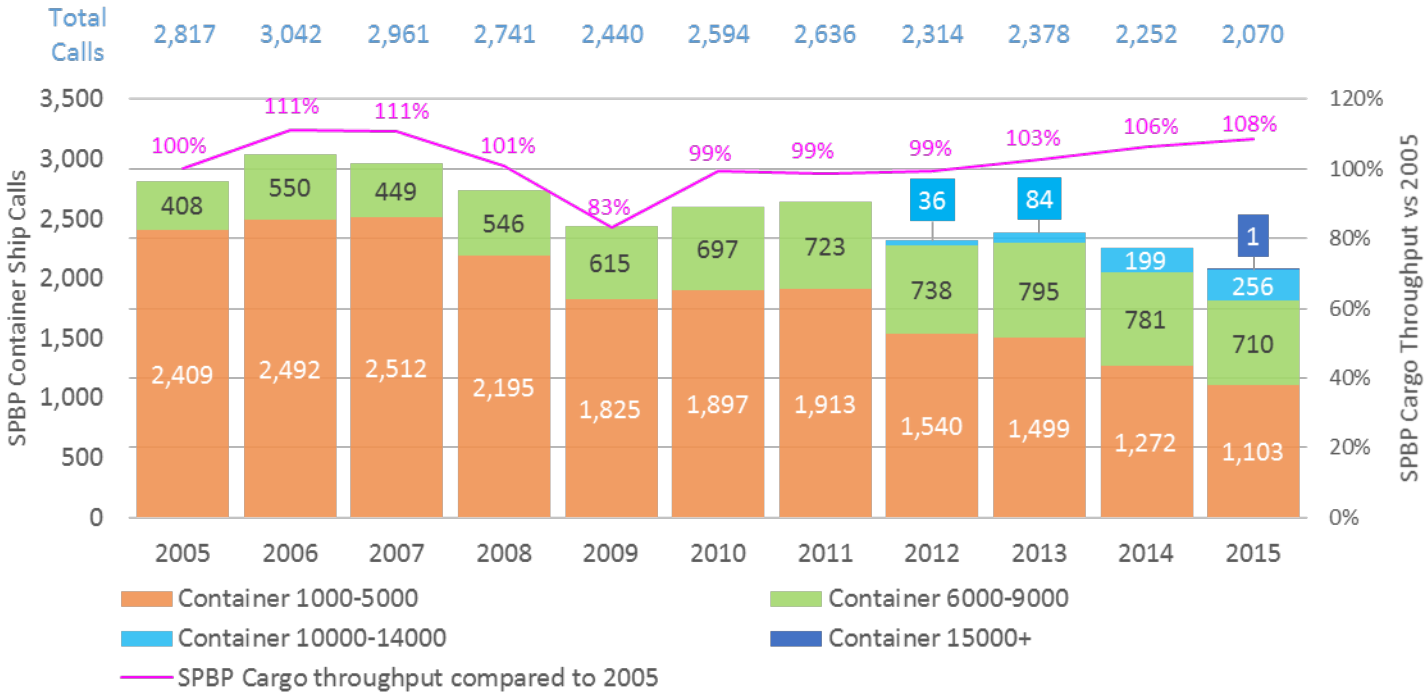
The following section presents a historical review of the call frequency of various ship types back to 2005, the baseline year of the Clean Air Action Plan (CAAP).

[1] IHS, *https://www.ihs.com/products/maritime-world-ship-register.html*, through first quarter 2017, [IHS 2017]

Container Ships

A review of the historical container ship call data for SPBP (CY 2005 to 2015) and container cargo volume changes since 2005 shows that total call numbers have significantly decreased while cargo volumes have increased, as presented in Figure 1.1.

Figure 1.1: 2005-2015 SPBP Container Ship Calls by Size Group & Cargo Throughput Trend



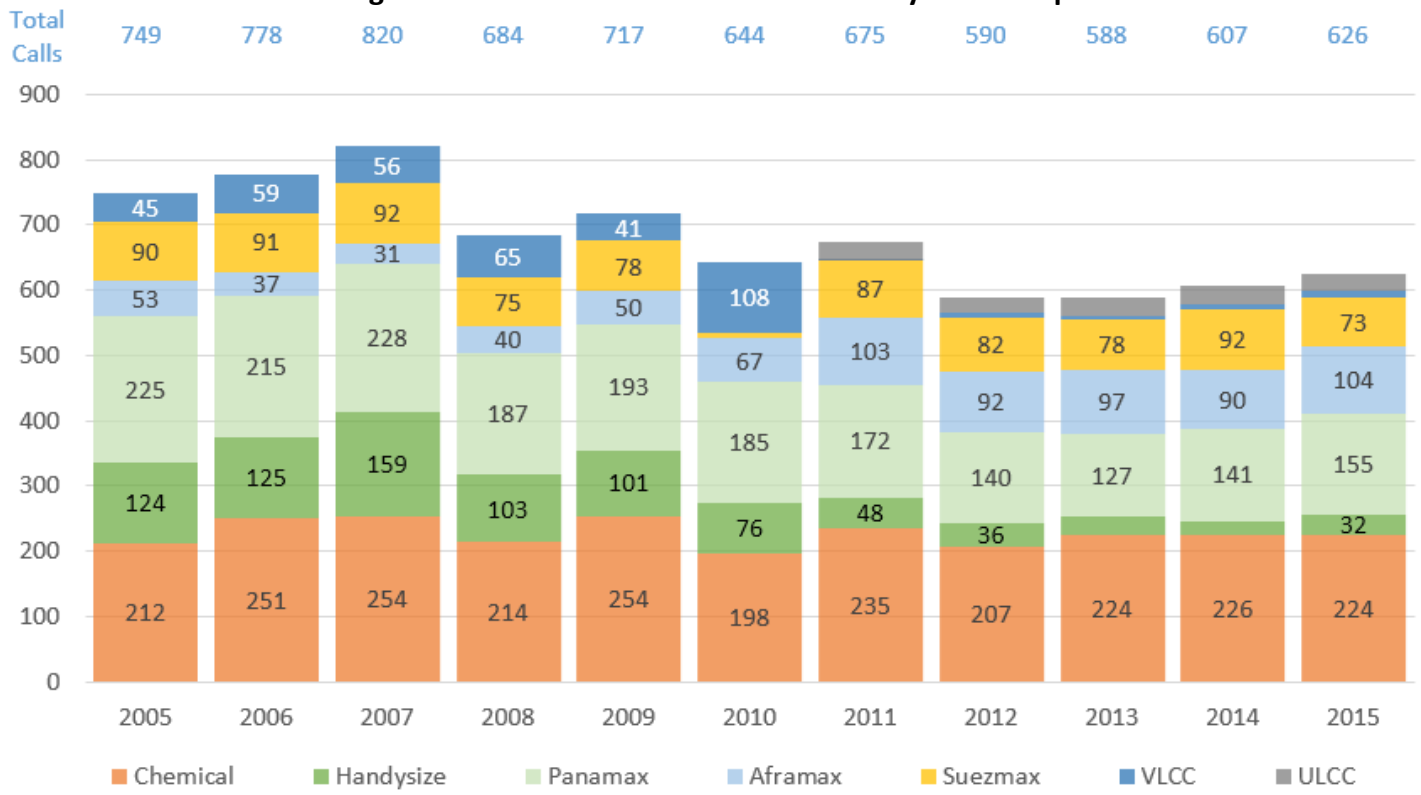
Key observations for container ship call changes include:

- Overall SPBP container ship calls have decreased from 2,817 in 2005 to 2,070 calls in 2015, a 26% reduction, while cargo volumes have increased 8%.
- There has been a change or evolution in the makeup of the container ship fleets calling SPBP, highlights include:
  - The number of small container ship calls (Container 1000-5000) have significantly reduced (over 50% drop in calls) and their share of the SPBP fleet has shrunk from over 85% to just over 50%. The reduction in calls has been offset by increased calls by larger capacity container ships.
  - The number of calls of medium container ships (Container 6000-9000) have increased since 2005, from 14% to 34%; however, the number of calls has stabilized in the low 30's since 2012.
  - Large container ships (Container 10000-14000) started calling in 2012 and have increased to over 12% of the calls in 2015.
  - The largest container ships (Container ships greater than 15000 TEUs) started to arrive in 2015.

Tankers

The SPBP tanker call distributions and trends from 2005-2015 are illustrated in Figure 1.2.

Figure 1.2: 2005-2015 SPBP Tanker Calls by Size Group



Note: Values not shown are <30 calls

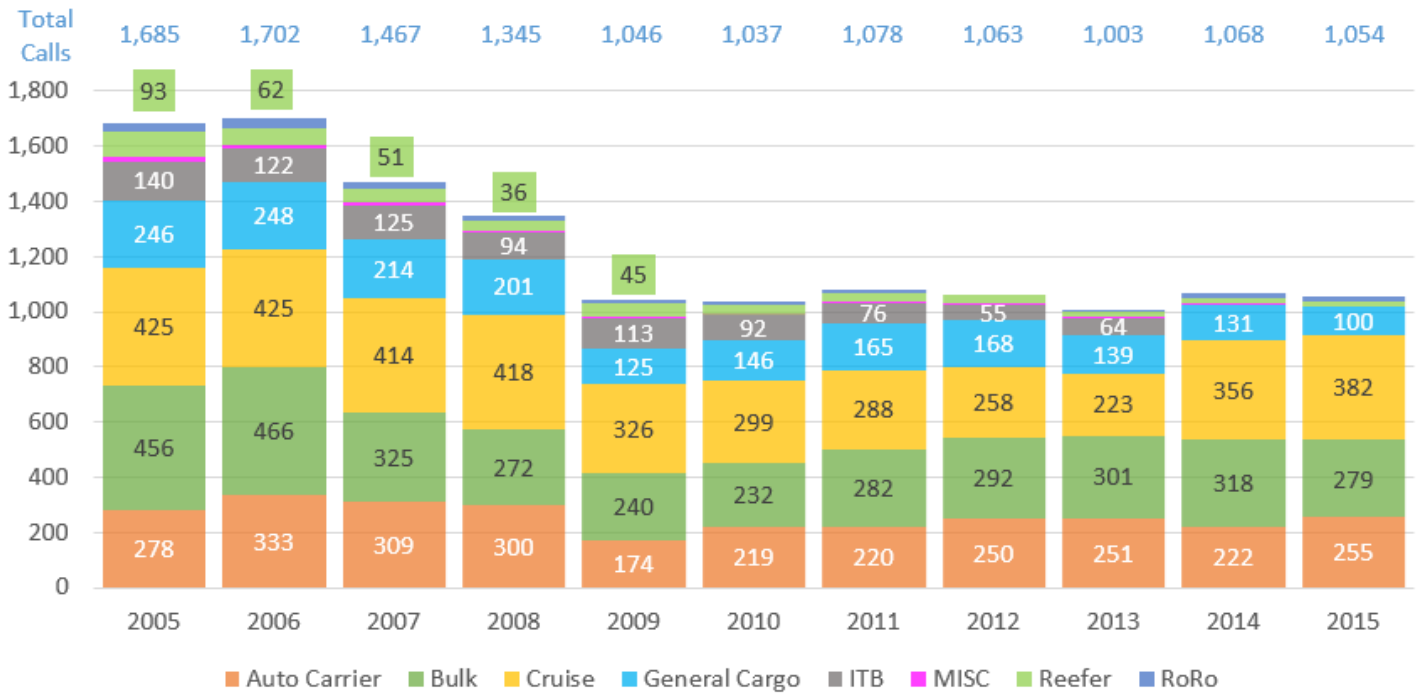
Key observations for tanker call changes include:

- Overall SPBP tanker ship calls have decreased from 749 in 2005 to 626 calls in 2015, a 16% reduction, while cargo volumes have decreased by 12%.
- There has been a change or evolution in the makeup of the tanker ship fleet calling SPBP, highlights include:
  - Chemical tanker calls have remained generally consistent with number of calls.
  - Handysize tanker calls, the smallest tankers, have significantly declined from the low to mid 100s to less than 40 calls per year.
  - Panamax tanker calls have also significantly declined from low 200s to mid-100s per year.
  - Aframax tanker calls have doubled since 2005.
  - Suezmax tanker calls have been generally consistent in the low 90s to mid-70s per year.
  - VLCC calls since 2011 have significantly been reduced to <15 calls per year.
  - ULCC tanker calls have been in the mid to high 20s per year since 2011.

Other Non-Container/Non-Tanker Ships

The SPBP non-container/non-tanker call distributions and trends from 2005-2015 are illustrated in Figure 1.3.

Figure 1.3: 2005-2015 SPBP Other Non-container/Non-tanker Ship Calls



Note: Values not shown are <35 calls

Key observations for other non-container/non-tanker ships:

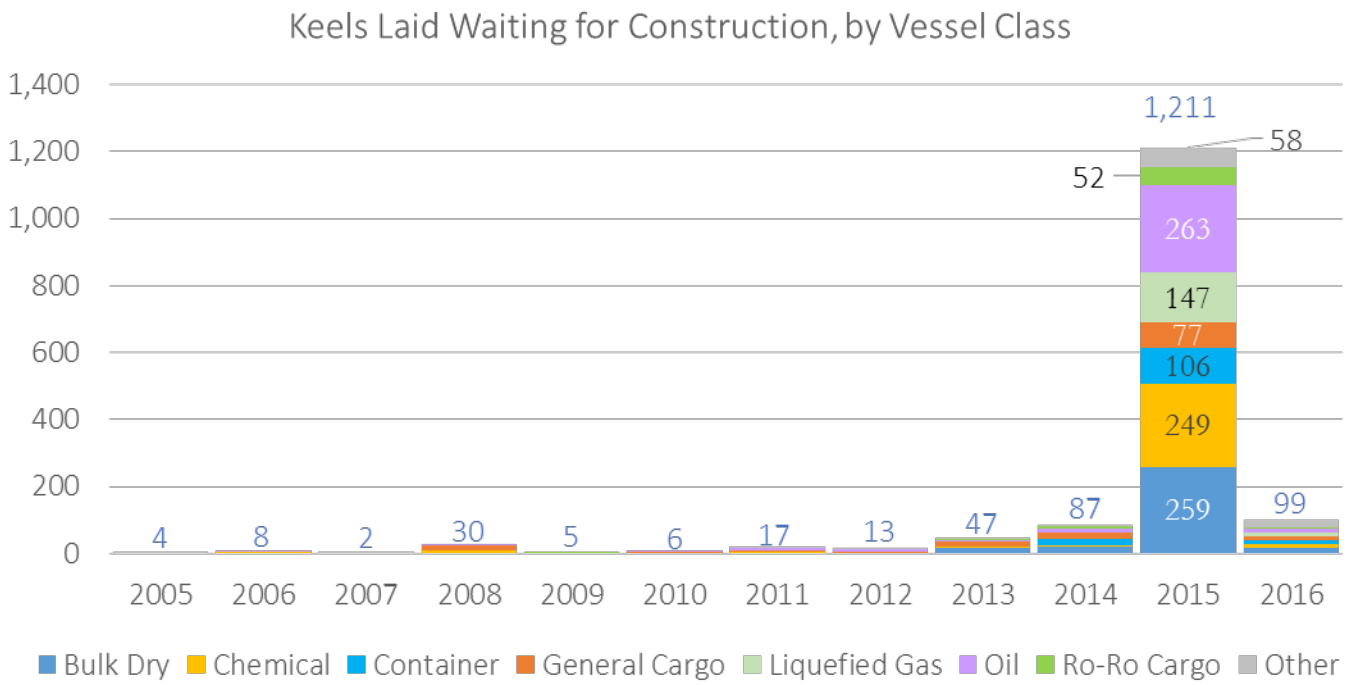
- Across all subclasses annual calls have decreased compared to 2005.
- There has been a change or evolution in the makeup of the fleet calling SPBP, highlights include:
  - Auto carriers and cruise ships have the lowest decreases in calls (8% and 10% respectively) compared to 2005, however cruise vessels had a significant call increase in 2014 (60% compared to 2013) and another 7% increase in 2015.
  - The following four ship classes all have had significant decreases in the number of calls compared to 2005: bulk ships down 39%, RoRo ships down 48%, general cargo ships down 59%, and reefer ships down 77%.
  - ITBs stopped calling in 2014 and are not anticipated to call in significant numbers again, because this class of vessel is being phased out of the market.
  - Miscellaneous vessels did not call in 2015, however it is anticipated that they will continue to call in low numbers (<20 calls per year) and not be Tier III.

1.2 General Discussion of Factors Influencing Deployment of IMO Tier III Vessels

It is important to understand that Tier III standards are not currently required worldwide, only in the North America ECA. For future designated ECAs, their applicable KLD for requiring Tier III will be the date the ECA comes into force, and ships with KLD prior to that year will be exempted from Tier III.

An evaluation of the global fleet and order data via IHS 2017 data revealed that over 1,200 keels were laid, but were not under construction, as of the third quarter of 2016. All of these are exempt from Tier III requirements in the North American ECA, as illustrated in Figure 1.4. Based on the data, approximately 1,430 keels have been laid between 2005 and 2015, which will all be delivered some time post 2015 that will also be exempt from Tier III requirements. As the regulations are currently written, one would expect that a similar phenomenon would occur on the lead up to a new ECA coming into force – that is, a backlog of keels will be laid to predate the Tier III applicability date.

Figure 1.4: 2005-2016 Global Keels Laid but Not Constructed



For the forecasting analysis, ships were divided into the following simplified operational profiles:

- Liner services – in general, ships that operate on a fixed schedule with a sequence of repetitive ports being called (also called a string). These schedules can be changed for numerous reasons but they are typically changed to another sequence of repetitive ports. Ships types operating in liner services generally include container and cruise. Container ships typically call throughout the year while cruise ships can have shorter schedules and move in and out of SPBP based on the season.
- Spot market or tramper – in general, ships that are contracted for movement of cargoes from 'point A' to SPBP or vice versa. These contracts can be for one-time movements or many movements, but not reaching a fixed schedule as with a liner service. Ship types operating in spot market services include auto carriers, bulk (dry), general cargo, and tankers.

Liner Services

Economic and business drivers are the key factors that shipping lines, operating liner services, take into consideration when deciding the deployment of vessels within the various strings they operate and when it's time to order new ships. These considerations are divided into supportive factors for the construction and deployment of Tier III ships and, conversely, inhibitive factors that would limit the future deployment of Tier III ships.

Supportive Factors

1. If there are significant increases in cargo throughputs to support the business case for larger vessels and the shipping line(s) has no appropriately sized pre-2016 ships (owned or chartered) to contribute to the string.
2. If new vessels are significantly more energy efficient compared to existing vessels (pre-2016) and makes the business case sufficient to replace existing vessels with 2016+ built vessels. Significant increases in the price of fuel would help support the business case if the new ships are more efficient.
3. Container alliance string configurations requiring vessel sizes or numbers not currently calling SPBP and the associated shipping line(s) has no pre-2016 ships (owned or chartered) to contribute to the string; thus, new ships would be needed.
4. Building vessels that cannot call on the US and Canada will limit the ships' operational domain and this would limit the routes they could serve (i.e., limits a line's or owner's operational flexibility).
5. For cruise ships, if the SPBP cruise market grows and matures, newer ships may be required to provide a higher level of onboard amenities and experiences.
6. Existing vessels are no longer viable to operate and need to be replaced.

Inhibitive Factors

1. There are incremental increased capital and operational costs associated with building and operating a Tier III ship compared to existing exempt vessels.
2. Vessel owners that have keels laid prior to 1 January 2016 will utilize these exempt vessels prior to building Tier III ships.
3. Shore power requirements are unique to California ports. Shipping lines have started equipping vessels serving California with on-board shore power infrastructure and are bearing the increased operational costs associated with meeting California Air Resources Board's (CARB's) shore power regulation. The CARB requirements include: 50% of the shipping line's vessel calls in 2014 and 80% of vessel calls in 2020 to be shore powered or achieve equivalent emissions reduction by employing other strategies. These additional costs already spent on existing vessels calling California versus for new vessels calling California (infrastructure and operational costs) have to be considered in the business case for vessel deployments that involve California ports. It is yet to be seen whether these additional costs will artificially extend the life of service of existing ships that have been retrofitted to meet the CARB regulations at California ports.
4. In general, the Asia-US West Coast route is typically not a service that receives new containerships, although exceptions do occur. In general, the Asia-Europe route typically sees deployment of new larger vessels which are later "handed down" to the Asia-US West Coast routes. This means that lines that service both routes have relatively new pre-Tier III-grandfathered large capacity ships that can be moved from Asia-Europe into the Asia-US West Coast strings at lower cost than building new Tier III compliant vessels. This could result in the delay of Tier III vessel deployments until the business case for the continued use of existing pre-Tier III ships is overcome and/or the existing ships reach the end of their useful lives. Useful life is defined as the average life of a vessel when it is taken out of the service; for this evaluation it was assumed to be 30 years, which is the age used by MAN Turbo & Diesel, the leading ship engine manufacturer, and was the vessel average life in the Third IMO GHG Study 2014[2].
5. Panama Canal expansion provides shipping lines access to alternative ports with larger vessels (maximum ~13,000 TEUs) in the US Gulf Coast and East Coast, which may negatively affect vessel deployments of these ships to the US West Coast.
6. There is very limited information on Tier III engine performance and maintenance over time in the commercial marine sector, especially for 2-stroke engines; this uncertainty may discourage investments in these engines from risk-averse shipping lines.
7. Future ECAs in other parts of the world will set their own dates for Tier III engine compliance (later than 2016). Therefore, shipping lines may wait until they know ECA requirements for other areas.

[2] IMO, *www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Third%20Greenhouse%20Gas%20Study/GHG3%20Executive%20Summary%20and%20Report.pdf*

8. There is the possibility that existing and Tier III exempt cruise ships can be overhauled and updated to offer amenities consistent with the local markets demand at lower cost than constructing new Tier III cruise ships.

Ultimately the decision when to build Tier III vessels comes down to individual ship owners evaluating their specific business case. At this time engine manufacturers are not seeing strong orders for Tier III engines. MAN has stated that they currently have fewer than 50 orders for Tier III two-stroke engines.

Spot Market

Unlike liner services, such as container or cruise ships, non-container ships may call at SPBP only once and never come back, or may call several times over one to many years. The key factor that ship owners take into consideration when deciding on the purchase of a new vessel is what makes a viable business case. These considerations are divided into supportive factors for the deployment of Tier III ships to the Port and those factors that would inhibit the future deployment of Tier III ships to the Port.

Supportive Factors

1. New vessels become significantly more energy efficient compared to existing vessels (pre-2016) which makes the business case sufficient to replace older existing vessels with 2016+ built vessels.
2. Building post-2015 ships that cannot call on the US and Canada will limit the ships' operational spot market domain and this would limit the routes they could serve (i.e., limits owner's operational flexibility).
3. Existing vessels are no longer economically viable to operate and need to be replaced

Inhibitive Factors

1. Incremental increased capital and operational costs associated with building and operating a Tier III ship compared to existing exempt vessels.
2. Vessel owners that have keels laid prior to 1 January 2016 will utilize these exempt vessels prior to building Tier III ships.
3. Bulk and general cargo ships can typically remain economically viable longer (i.e., have longer useful lives) than ships operating on liner services.
4. There is very limited information on actual Tier III engine performance and maintenance over time in the commercial marine sector, especially for 2-stroke engines; this uncertainty may discourage investments in these engines from risk-averse shipping lines.
5. Future ECAs in other parts of the world will set their own dates for Tier III engine compliance (>2016).

2.0 IMO Tier Distribution Forecasting Approach

The major assumptions used for conducting the forecasting analysis include:

- Ship owners and operators determine fleet deployment and purchases based primarily on a business case-by-business case basis.
- Ship owners and operators will not voluntarily build and bring Tier III ships to SPBP or the US West Coast until the business case makes sense.
- Tier III engines will cost significantly more to purchase and operate compared to the lower tiered engines.
- The IHS 2017 represents the global fleet and specifically: number of vessels by vessel type, KLD, and date of build. KLD data is used to determine existing ships' IMO Tier and if KLD is not available, then date of build is used as a substitute.
- The applicable world fleet provides a 'pool of call capacity' for forecasted SPBP ship calls and that capacity is limited by the maximum number of calls ships can make per year. Only ships that had an IHS operational status of 'in service/commissioned', 'launched', or 'laid-up' were used for the pool.
- In general, ships are assumed to have a useful life of 30 years. For the forecasting analysis, it assumed that ships servicing SPBP would be eventually moved to small cargo volume markets, laid up, or scrapped, thus reducing availability of the existing world fleet. To account for this container, tanker, auto carrier/RoRo, and cruise ships were phased out by linearly reducing their availability from the global fleet when the average age of the fleet spanned from 20 to 30 years. A similar approach was used for dry bulk and general cargo ships; however, these ships can tend to stay in service longer, so their availability was linearly reduced from a global average age from 25 to 35 years.
- Non-container cargo growth rates are used to forecast non-container call changes, which should generate conservatively high call numbers as this approach does not account for changes in the fleet size call distribution since 2015.
- The 1,400-plus keels laid prior to 1 January 2016, which have not started construction as of mid-2016, are not used in the pool of call capacity.

Similar to liner services, ultimately the decision when to build Tier III vessels comes down to individual ship owners evaluating their specific business case. At this time engine manufacturers are not seeing strong orders for Tier III engines. MAN has stated that they currently have fewer than 50 orders for Tier III two-stroke engines.

The forecasted future number of calls for the SPBP are based on the following assumptions:

- The number of container ship calls by size for 2030 is based on the *San Pedro Bay Long-Term Unconstrained Cargo Forecast Final Report*[3] container vessel call update and adjustments as made by both Ports. The projected 2030 weekly strings by container ship size groups, measured in twenty-foot equivalents (TEU), are provided in Table 2.1 below.

Table 2.1: 2015 SPBP and 2030 Forecasted SPBP Annual Container Ship Calls by TEU groups

TEU Range	Annual Calls 2015	2030
1000	107	
2000	261	52
3000	129	
4000	348	
5000	258	
6000	223	52
7000	51	104
8000	316	208
9000	122	104
10000	143	104
11000	54	
14000	3	
15000		
16000		364
17000		
18000	1	52
19000		
20000		52

[3] Port of Long Beach and Port of Los Angeles, *San Pedro Bay Long-term Unconstrained Cargo Forecast Final Report, Mercator International*, LLC, Oxford Economics, revised 12 July 2016 (Mercator 2016)

- Non-container growth rates for tankers, auto carriers, bulk, and general cargo were based on Mercator 2016 report's import and export commodity cargo tonnage forecasts from 2015-2040. Cruise growth rates were taken from the 2009 SPBP Growth Forecast Document. The growth rates used below in Table 2.2 were used to grow actual SPBP 2015 non-container ship calls through 2040 and assumed to be the maximum capacity of the Ports.

Table 2.2: 2015-2040 Non-container Ship Call Growth Rates

Year	Tanker	Cruise	Auto	Bulk	GC	Reefer
2015	1.000	1.000	1.000	1.000	1.000	1.000
2016	1.016	1.037	1.050	0.999	1.061	0.999
2017	1.032	1.074	1.100	0.998	1.122	0.998
2018	1.047	1.111	1.150	0.997	1.183	0.997
2019	1.063	1.149	1.200	0.996	1.244	0.996
2020	1.079	1.186	1.250	0.994	1.305	0.994
2021	1.084	1.224	1.300	0.996	1.320	0.996
2022	1.089	1.263	1.350	0.997	1.334	0.997
2023	1.095	1.301	1.400	0.999	1.349	0.999
2024	1.100	1.340	1.450	1.000	1.364	1.000
2025	1.105	1.379	1.500	1.001	1.379	1.001
2026	1.112	1.418	1.544	1.004	1.391	1.004
2027	1.118	1.458	1.588	1.006	1.402	1.006
2028	1.124	1.497	1.631	1.008	1.414	1.008
2029	1.131	1.537	1.675	1.010	1.425	1.010
2030	1.137	1.576	1.719	1.013	1.437	1.013
2031	1.143	1.576	1.763	1.015	1.453	1.015
2032	1.149	1.576	1.806	1.017	1.469	1.017
2033	1.156	1.576	1.850	1.019	1.485	1.019
2034	1.162	1.576	1.894	1.022	1.501	1.022
2035	1.168	1.576	1.938	1.024	1.517	1.024
2036	1.174	1.576	1.984	1.020	1.533	1.020
2037	1.180	1.576	2.031	1.017	1.549	1.017
2038	1.186	1.576	2.078	1.014	1.566	1.014
2039	1.192	1.576	2.125	1.010	1.582	1.010
2040	1.197	1.576	2.172	1.007	1.598	1.007

The global fleet data were filtered by each SPBP corresponding vessel type's size/capacity ranges based on the 2015 call data. For each applicable SPBP vessel type, the filtered global fleet data were segregated into IMO NOx tier bins for Tiers 0-3 and counted by tier and average age associated with each bin.

The SPBP 2015 IMO NOx Tier distributions observed for Tiers 0 and 1 were held as maximums with regard to future forecasted percentage of calls for these tiers. Future forecasted calls not covered by Tiers 0 and I would be filled by Tier II, as long as the global pool had enough ship calls to cover the call numbers. Tier III is assumed to fill the call capacity shortfalls for Tier II. Additional vessel type related assumptions are detailed in the results section and Appendix A.

3.0 2015-2050 IMO NOx Tier Distribution Forecast Results

This section provides the forecasted results by ship class. Appendix A provides the annual detailed progression of forecasted calls and the calls the existing global fleet can accommodate, along with specific assumptions used.

3.1 Container Ships

Container ships were further divided into size groups based on the forecasted SPBP calls (Mercator 2016). The global fleet counts and average model year by engine tier, based on IHS 2017 is provided in Table 3.1.

Table 3.1: Global Container Fleet Counts and Average Model Year

		Global Fleet Counts			Average Model Year		
Vessel Type Capacity Group	Total	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Container 2000	845	333	428	84	1990	2005	2013
Container 6000-9000	757	31	446	280	1997	2006	2012
Container 10000-14000	311		67	244		2008	2012
Container 15000-18000	60		8	52		2006	2014
Container 19000-20000	24			24			2015
	1,997	364	949	684			

Since the Mercator 2016 study did not provide estimates for interim years between 2015 and 2030, straight line interpolation was used to grow the actual 2015 SPBP container ship calls within the categories above.

For the container forecasts, it was assumed that the global fleet could make the following number of annual calls per container ship to SPBP:

- Container 2000 10 calls
- Container 6000-9000 7 calls
- Container 10000-14000 7 calls
- Container 15000-18000 6 calls
- Container 19000-20000 5 calls

Figures 3.1 through 3.5 show the results of the tier forecast for the above container ship groups. As noted above, the years of importance for Tier III are when that tier equals 50% and 100% of calls.

Figure 3.1: SPBP Container 2000 TEU Tier Distribution Forecast

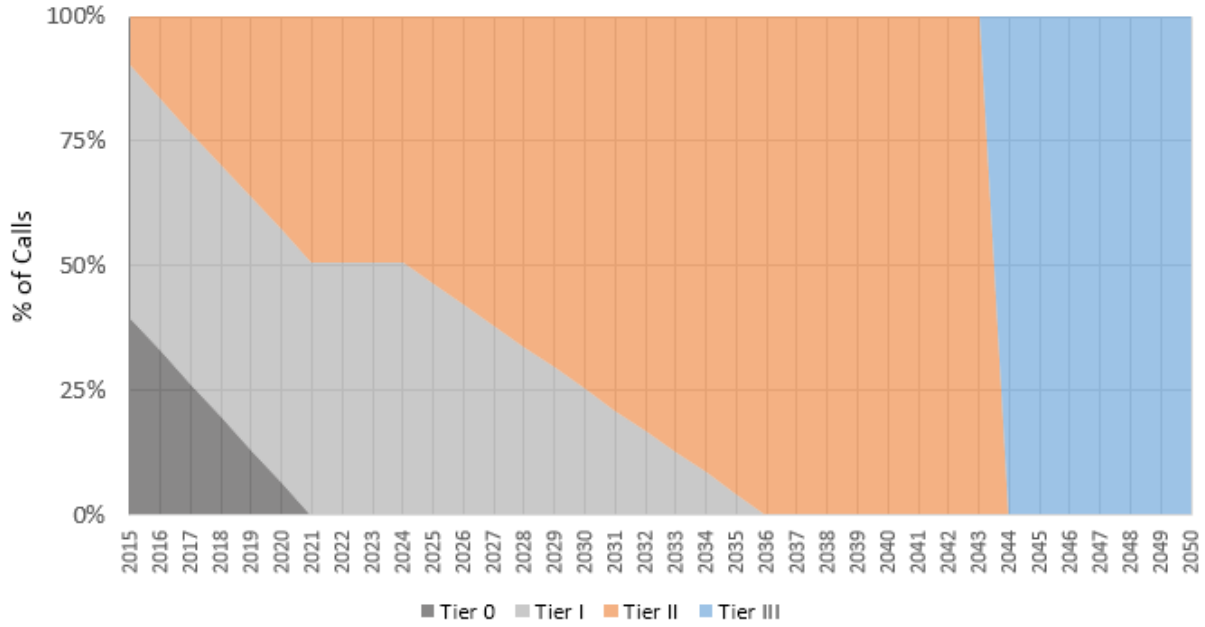


Figure 3.2: SPBP Container 6000-9000 TEU Tier Distribution Forecast

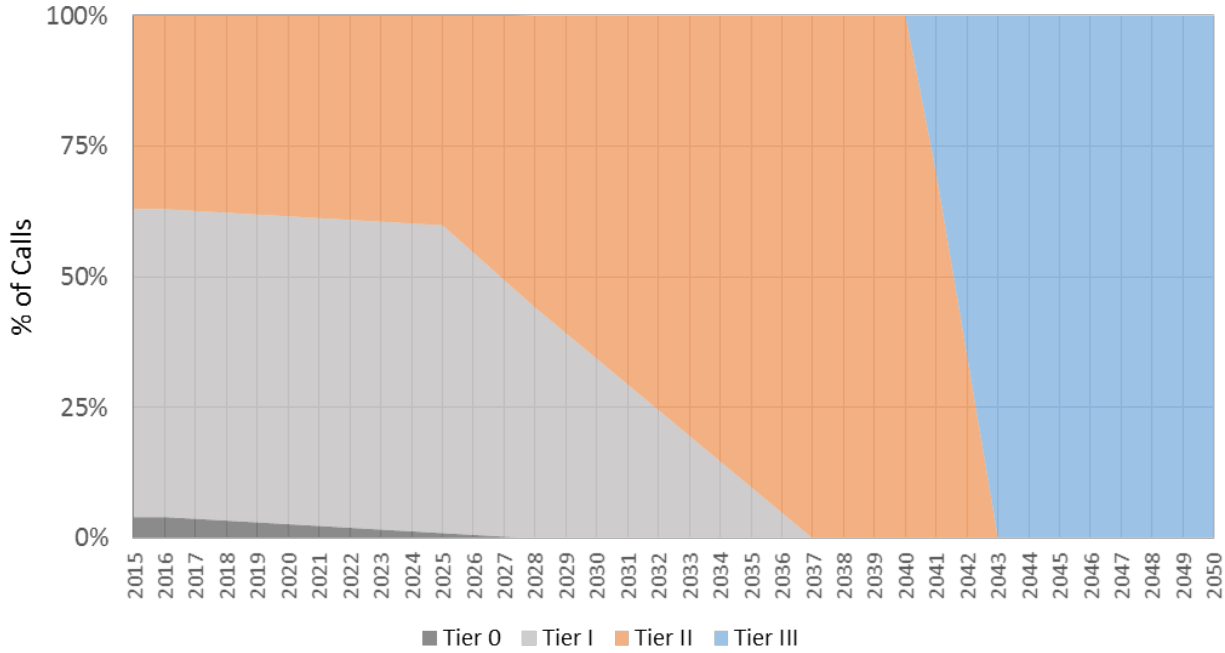


Figure 3.3: SPBP Container 10000-14000 TEU Tier Distribution Forecast

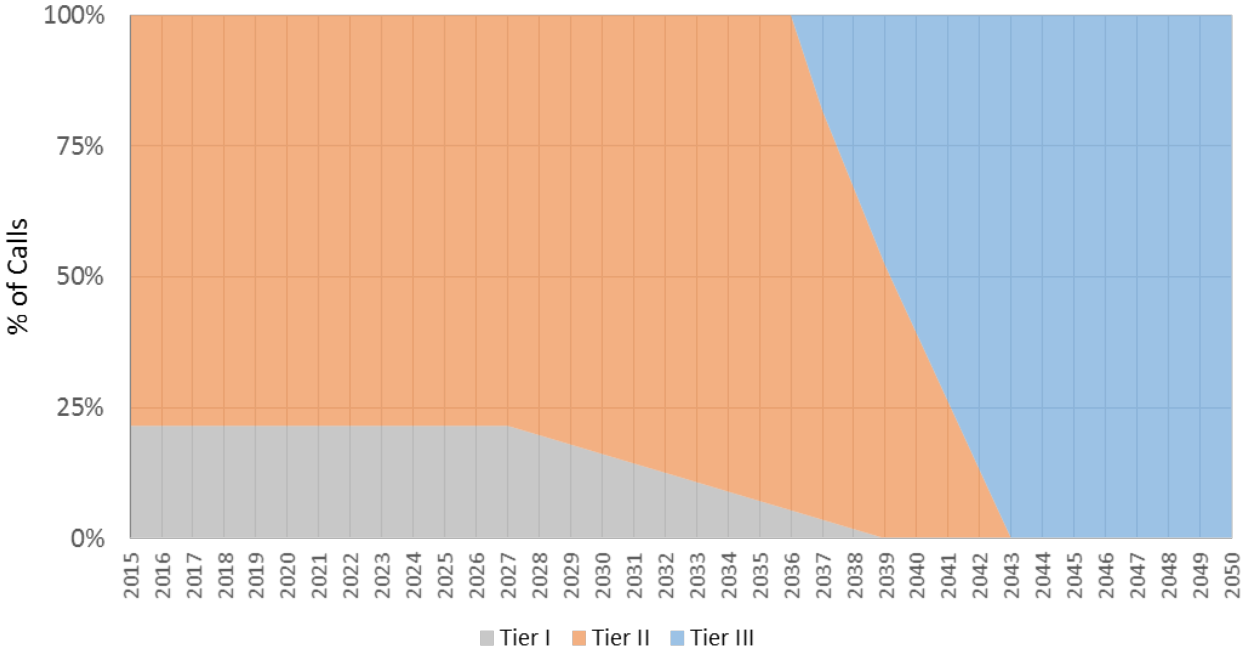


Figure 3.4: SPBP Container 15000-18000 TEU Tier Distribution Forecast

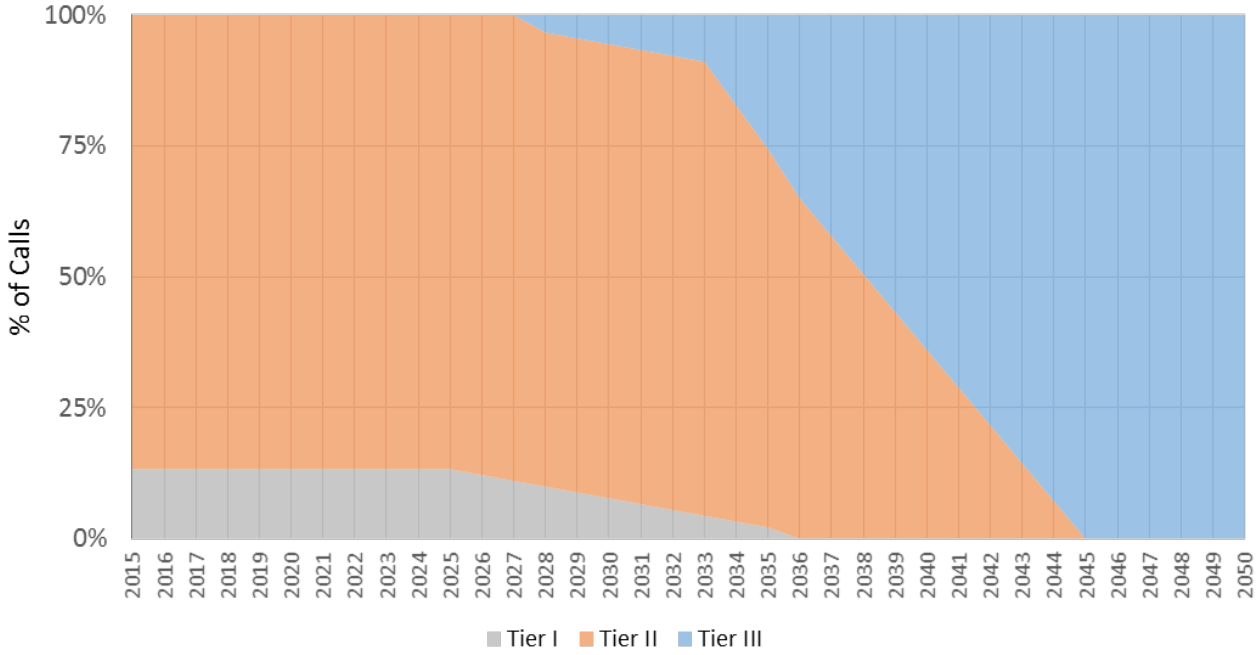
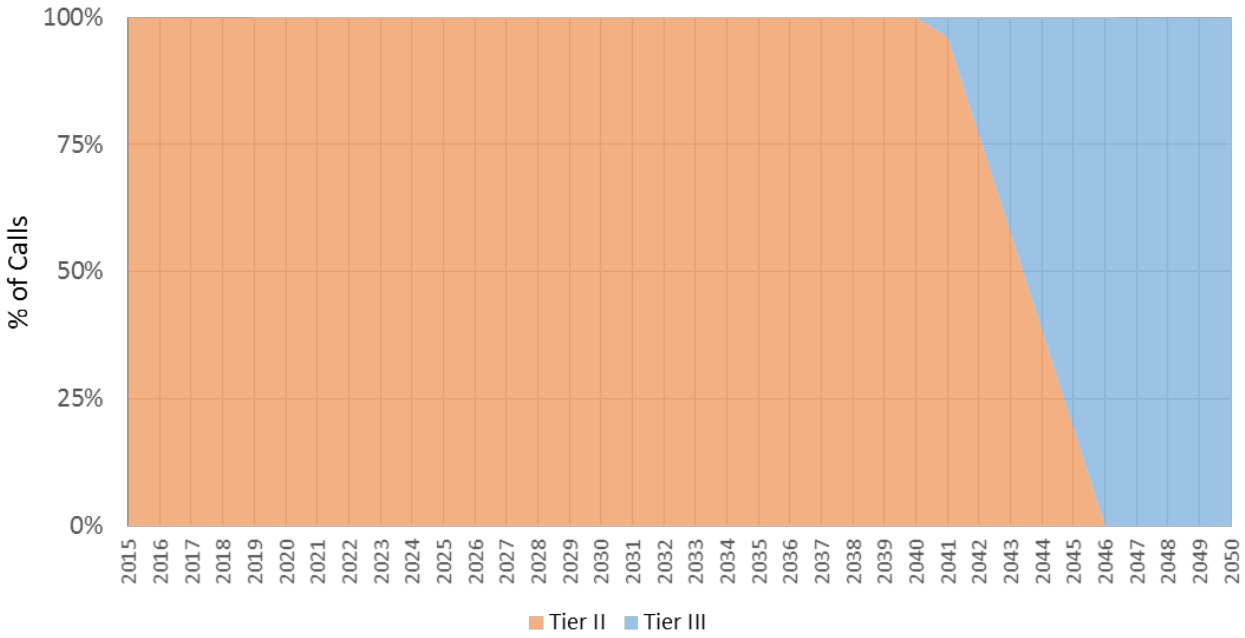


Figure 3.5: SPBP Container 19000-20000 TEU Tier Distribution Forecast



Based on the forecast discussed and illustrated above, it is anticipated that significant numbers of Tier III powered container ship calls will not occur in the SPBP until the late-2030s to mid-2040s.

3.2 Tankers

Two types of bulk liquid ships or tankers call SPBP: chemical and crude carriers. Tankers typically work on a spot market basis being chartered to move cargos of feed stocks or products for the local refineries and chemical plants, to and from all over the world. These are typically not under long term contracts and can be for just one call. Therefore, a generally random selection of tankers call SPBP bulk liquid terminals year over year with little or no discernible pattern.

Tankers were divided into size groups based on the 2015 SPBP tanker calls and as reported in each Port's annual emissions inventory. The total number of assumed annual calls was set to 1 for each tanker size group (i.e., each tanker vessel calls only 1 time to SPBP), which was done to be conservatively low on the total global fleet's call capacity to SPBP.

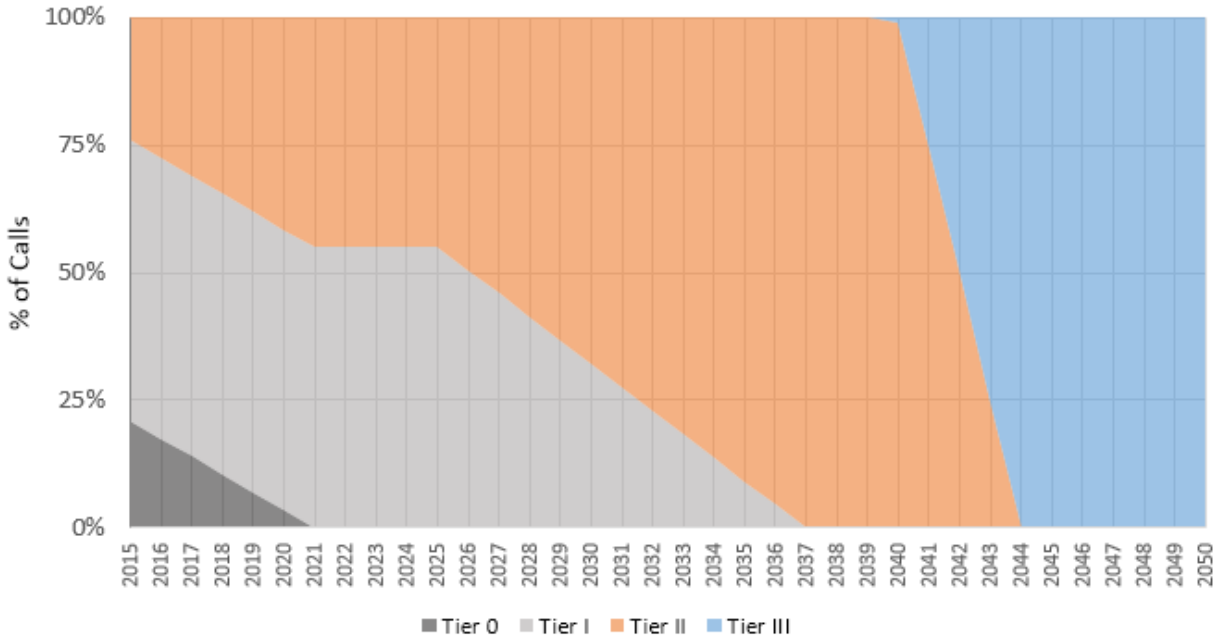
The applicable global fleet and 2015 SPBP calls for chemical tankers are presented in Table 3.2. The global pool of available chemical tankers is limited to those greater than 10,000 dead weight tons (dwt) based on the range of chemical tankers that called SPBP in 2015.

Table 3.2: Global Characteristics – Chemical Tankers

	Counts/	Fleet Counts			Fleet Average Model Year		
>10,000 dwt	Calls	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Chem Tanker - Global	3,252	668	1,789	795	1990	2006	2013
2015 SPBP	224	11	169	44	1998	2007	2012
		Fleet Distribtuion			Fleet Average Age		
>10,000 dwt		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Chem Tanker - Global		21%	55%	24%	25	9	2
2015 SPBP		5%	75%	20%	17	8	3

The forecasted tier distribution scenario for chemical tankers is illustrated in Figure 3.6.

Figure 3.6: SPBP Chemical Tanker Tier Distribution Forecast



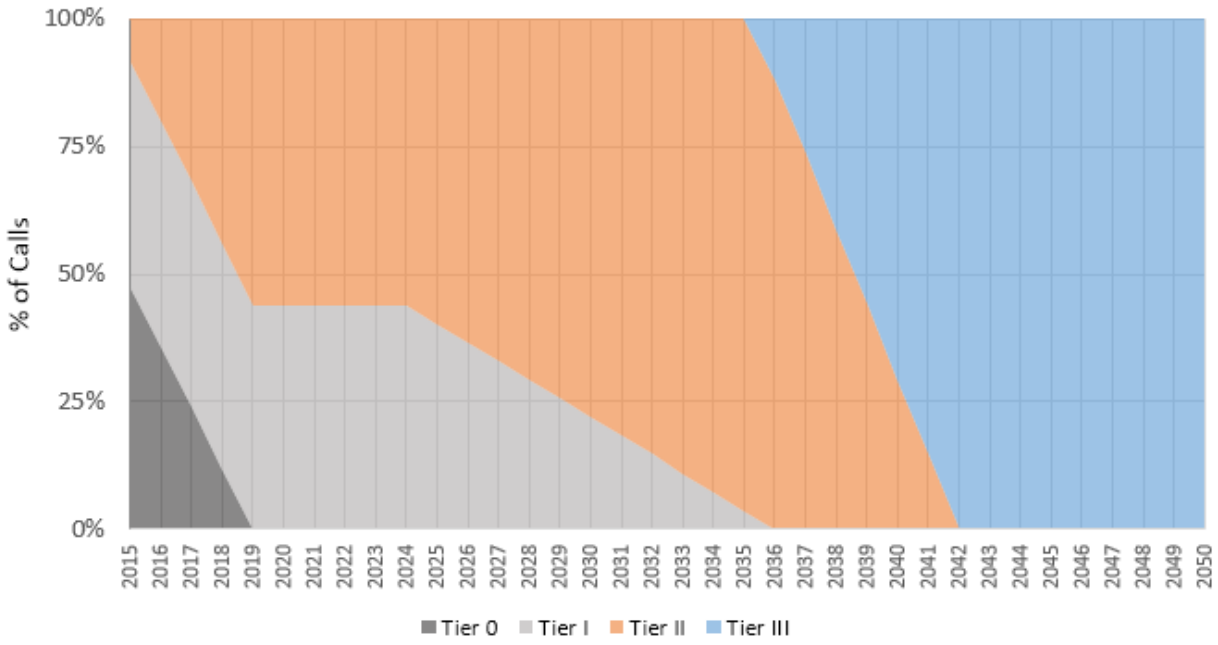
The applicable global fleet and 2015 SPBP calls for handy tankers are presented in Table 3.3. The global pool of available handy sized tankers is limited to those greater than 20,000 dwt based on the range of handy tankers that called SPBP in 2015.

Table 3.3: Global & 2015 SPBP Call Characteristics – Handy Tankers

	Count/	Fleet Counts			Fleet Average Model Year		
>20,000 dwt	Calls	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Handy - Global	815	389	359	67	1988	2005	2011
2015 SPBP	32	10	22	0	1997	2005	2010
		Fleet Distribtuion			Fleet Average Age		
>20,000 dwt		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Handy - Global		48%	44%	8%	27	10	4
2015 SPBP		31%	69%	0%	18	10	5

The forecasted tier distribution scenario for handy tankers is illustrated in Figure 3.7.

Figure 3.7: SPBP Handy Tanker Tier Distribution Forecast



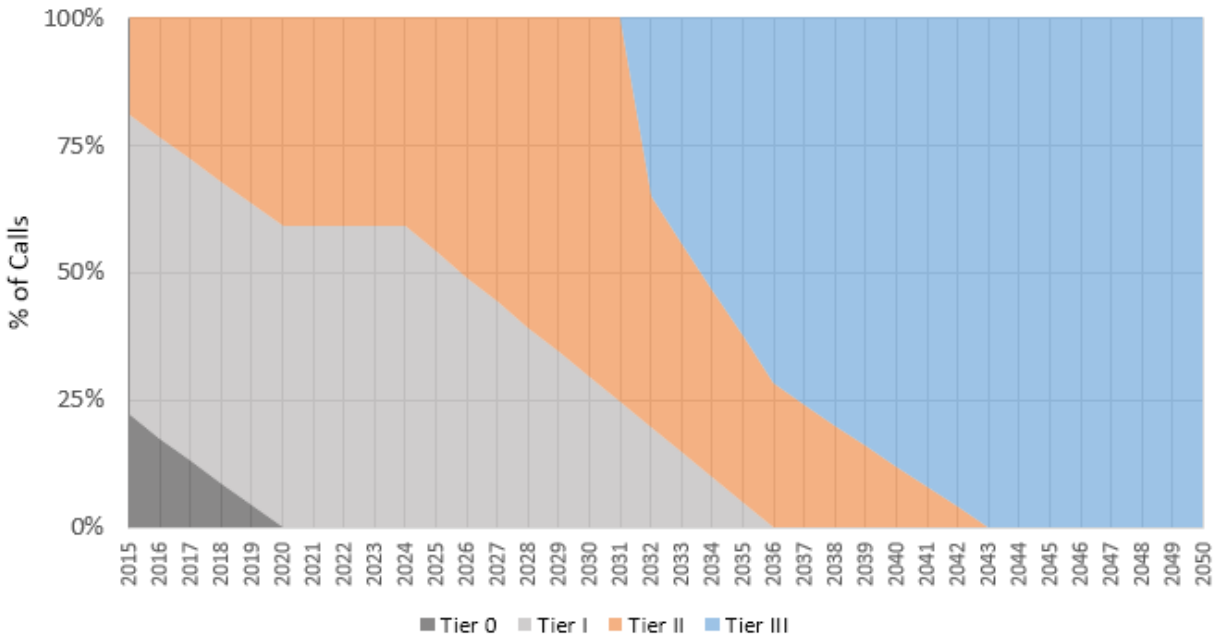
The applicable global fleet and 2015 SPBP calls for Panamax tankers are presented in Table 3.4. The global pool of available tankers is limited to those tankers designated as Panamax in IHS 2017.

Table 3.4: Global & 2015 SPBP Call Characteristics – Panamax Tankers

	Count/	Fleet Counts			Fleet Average Model Year		
Panamax	Calls	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Panamax - Global	483	108	287	88	1989	2005	2012
2015 SPBP	155	2	147	6	1999	2004	2011
		Fleet Distribtuion			Fleet Average Age		
Panamax		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Fleet %/Years		22%	59%	19%	26	10	3
Fleet %/Years		1%	95%	4%	16	11	4

The forecasted tier distribution scenario for Panamax tankers is illustrated in Figure 3.8.

Figure 3.8: SPBP Panamax Tanker Tier Distribution Forecast



Due to the advent of the new larger Panama Canal locks, the original Panamax ships (as shown above) will no longer be built in significant numbers; they will be replaced by "Neo-Panamax" sized ships based on the new locks. Since Neo-Panamax tankers have not called SPBP, they were not taken into account in the forecast.

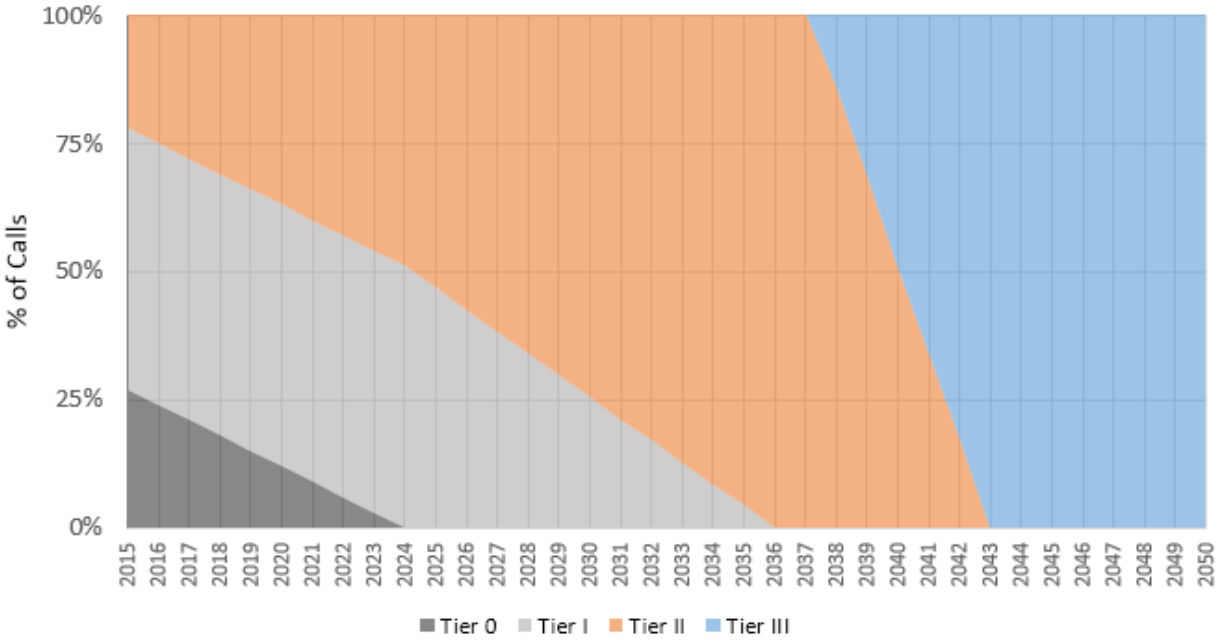
The applicable global fleet and 2015 SPBP calls for Aframax tankers are presented in Table 3.5. The global pool of available tankers is limited to those tankers designated as Aframax in IHS 2017.

Table 3.5: Global & 2015 SPBP Call Characteristics – Aframax Tankers

	Count/	Fleet Counts			Fleet Average Model Year		
Aframax	Calls	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Aframax - Global	1,121	299	567	255	1993	2005	2012
2015 SPBP	104	0	51	53		2006	2011
		Fleet Distribtuion			Fleet Average Age		
Aframax		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Aframax - Global		27%	51%	22%	22	10	3
2015 SPBP		0%	49%	51%		9	4

The forecasted tier distribution scenario for Aframax tankers is illustrated in Figure 3.9.

Figure 3.9: SPBP Aframax Tanker Tier Distribution Forecast



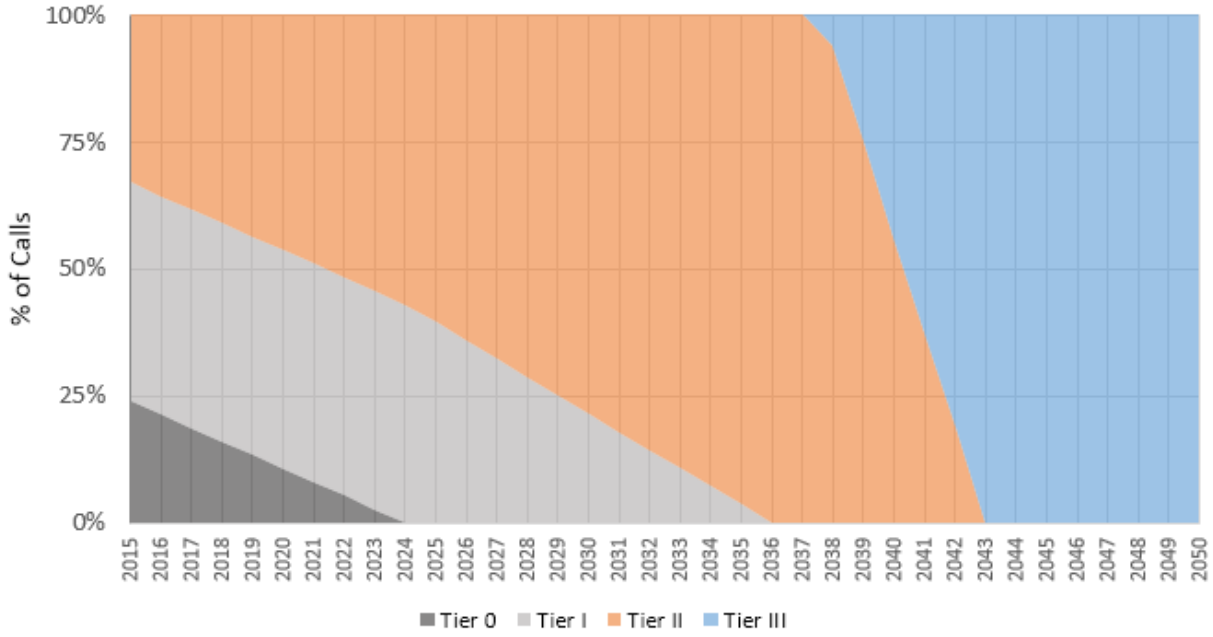
The applicable global fleet and 2015 SPBP calls for Suezmax tankers are presented in Table 3.6. The global pool of available tankers is limited to those tankers designated as Suezmax in IHS 2017.

Table 3.6: Global & 2015 SPBP Call Characteristics – Suezmax Tankers

	Count/	Fleet Counts			Fleet Average Model Year		
Suezmax	Calls	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Suezmax - Global	608	148	264	196	1993	2005	2012
2015 SPBP	73	3	62	8	1999	2004	2012
		Fleet Distribtuion			Fleet Average Age		
Suezmax		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Fleet %/Years		24%	43%	33%	22	10	3
Fleet %/Years		4%	85%	11%	16	11	3

The forecasted tier distribution scenario for Suezmax tankers is illustrated in Figure 3.10.

Figure 3.10: SPBP Suezmax Tanker Tier Distribution Forecast



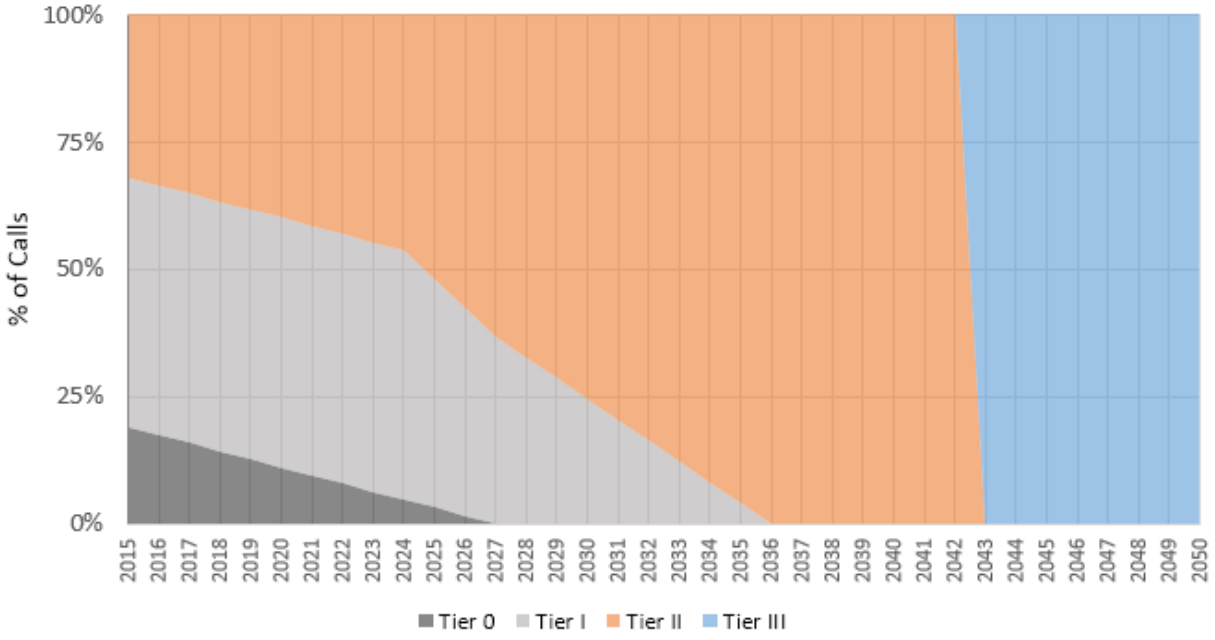
The applicable global fleet and 2015 SPBP calls for VLCC tankers are presented in Table 3.7. The global pool of available tankers is limited to those tankers designated as VLCC in IHS 2017.

Table 3.7: Global & 2015 SPBP Call Characteristics – VLCC Tankers

	Count/	Fleet Counts			Fleet Average Model Year		
VLCC	Calls	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
VLCC - Global	708	132	348	228	1996	2005	2012
2015 SPBP	12	0	10	2		2005	2011
		Fleet Distribtuion			Fleet Average Age		
VLCC		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
VLCC - Global		19%	49%	32%	19	10	3
2015 SPBP		0%	83%	17%		10	4

The forecasted tier distribution scenario for VLCC tankers is illustrated in Figure 3.11.

Figure 3.11: SPBP VLCC Tanker Tier Distribution Forecast



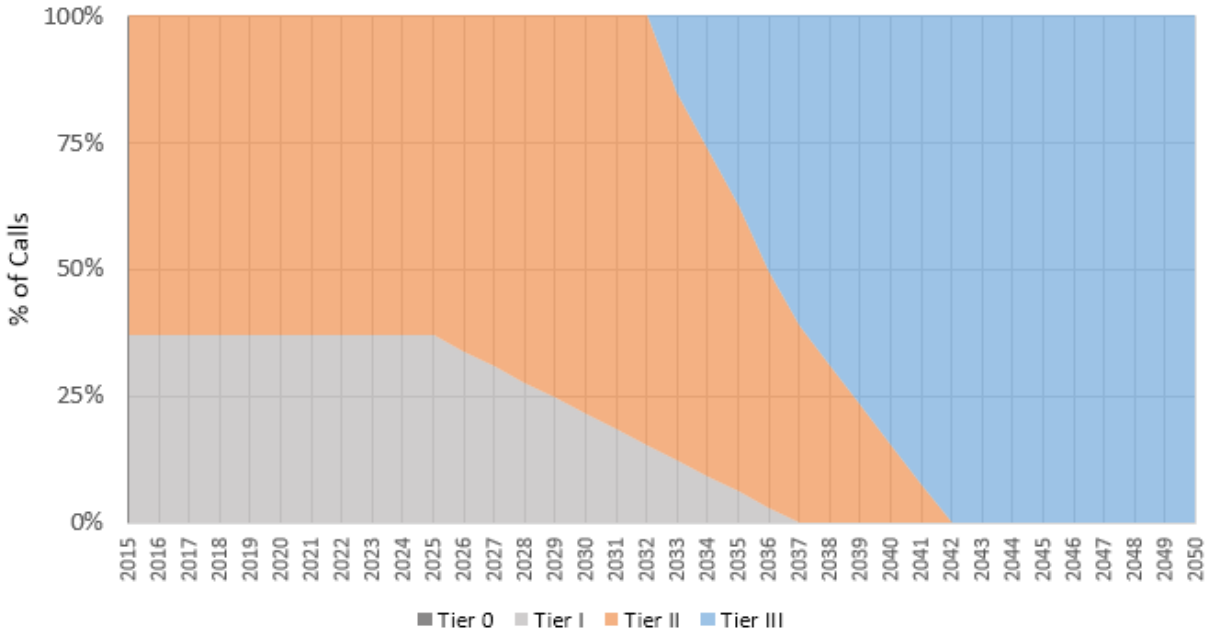
The applicable global fleet and 2015 SPBP calls for ULCC tankers are presented in Table 3.8. The global pool of available tankers is limited to those tankers designated as ULCC in IHS 2017.

Table 3.8: Global & 2015 SPBP Call Characteristics – ULCC Tankers

	Count/	Fleet Counts			Fleet Average Model Year		
ULCC	Calls	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
ULCC - Global	46	0	17	29		2006	2011
2015 SPBP	26	0	22	4		2009	2010
		Fleet Distribtuion			Fleet Average Age		
ULCC		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
ULCC - Global		0%	37%	63%		9	4
2015 SPBP		0%	85%	15%		6	5

The forecasted tier distribution scenario for ULCC tankers is illustrated in Figure 3.12.

Figure 3.12: SPBP ULCC Tanker Tier Distribution Forecast



Based on the forecast discussed and illustrated above, it is anticipated that significant numbers of Tier III powered tanker ship calls will not occur in the SPBP until the mid-2030s to mid-2040s.

3.3 Cruise

Cruise ships operate in seasonal liner-like service and call SPBP when switching between seasonal itineraries. Cruise ships were divided into three passenger capacity size groups based on the characteristics of the 2015 SPBP cruise fleet and by then broadening that range to include global cruise ships with capacity sizes ±20% of the smallest and largest cruise ships calling in each group. The passenger size groups used are as follows:

- Cruise 1000 – ranging from 310 to 1,200 passengers
- Cruise 2000 – ranging from 1,800 to 2,999 passengers
- Cruise 3000 – ranging from 3,000 to 4,538 passengers

The groups Cruise 2000 and Cruise 3000 were kept intact and each group does not 'share' cruise ships even though their capacity ranges with the ±20% margin overlap.

Cruise ships are unique compared to other ship types in that they call during a season (which varies in length) in limited numbers and make a high number of calls over that time. For example, in 2015, two Tier 0 (1993 vintage) Cruise 2000 cruise ships made 208 of the 382 total SPBP cruise ship calls or 55% of all Cruise 2000 calls. If these two ships were replaced by a different tier level, it would have a profound impact on the future tier distribution. On the other end of the spectrum, a cruise ship can call a SPBP port once and then not return all season. Cruise line move ships to a market based on the passenger loads, maturity of the market, business case, and other considerations; therefore, it is the hardest class to forecast future tier distributions.

In addition, cruise ships can have extended operational lives because they can be refit and updated to keep them in the market place. However, as cruise markets mature, like the one in SPBP, those refits become more comprehensive and eventually the ships are moved out the market by newer ships offering more amenities and efficiencies. Cruise 1000 covers a lot of niche smaller cruise vessels worldwide and has the oldest average age of 33 years for Tier 0 ships, although these older ships would not be marketable in the SPBP area as the average age of these ships in 2015 was 18 years old. The evaluation further filtered the global fleet to ships no older than 30 years old, making the global average for Cruise 1000 22 years.

The applicable global fleet and 2015 SPBP calls for cruise ships are presented in Tables 3.9 and 3.10. The global pool of available Cruise 1000 is limited to those 30 years old or newer, as described above, and assumed to make 2 calls per year based on 2015 SPBP averages for the group. Also, mentioned above, Cruise 2000 was dominated by two ships and therefore that size group was given an annual capacity of 50 calls, which is less than half of the two that made 208 SPBP calls in 2015. Cruise 3000 was limited to an average of 10 calls per year based on the 2015 SPBP average for that group. All cruise ship groups were assumed to have a SPBP operational service life of up to a global average age of 30 years. Further, for all three size groups, the 2015 SPBP tier levels were held under the assumption that older vessels (lower tiers) would replace vessels that called during the baseline year.

Table 3.9: Global Characteristics – Cruise

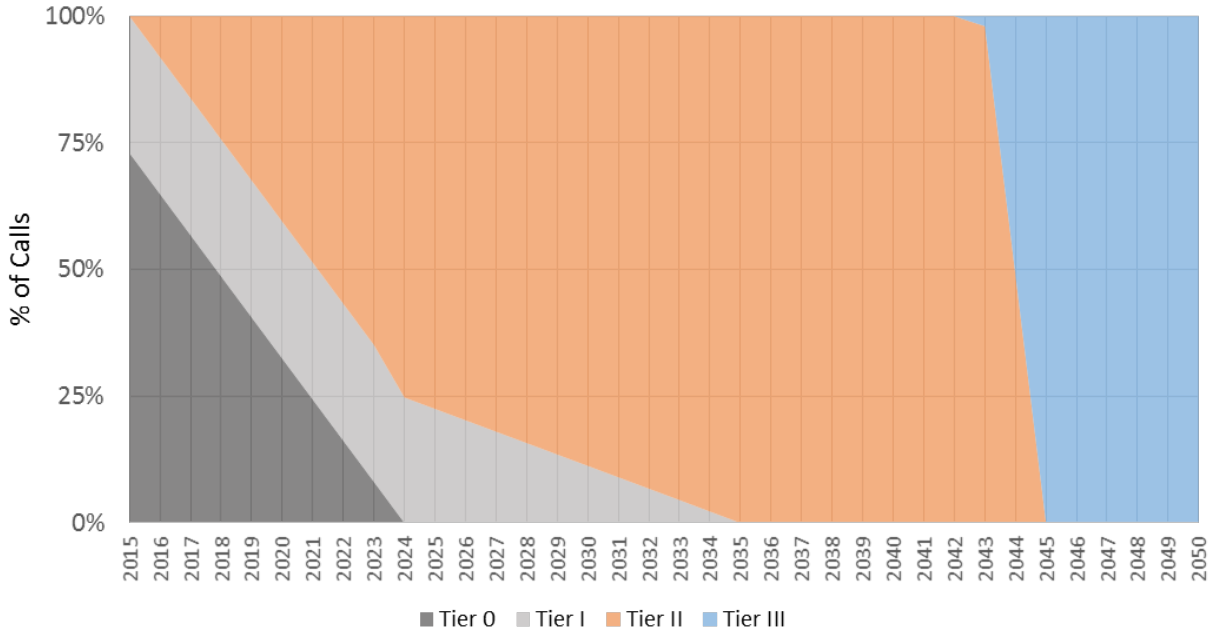
		Fleet Counts			Fleet Average Model Year		
Capacity Range	Count	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Cruise 1000 - Global 310-1200 passengers	560	368	142	50	1993	2004	2014
Cruise 2000 - Global 1800-2999 passenger	105	59	40	6	1992	2004	2013
Cruise 3000 - Global 3000-4538 passenger	68	11	43	14	1998	2005	2012
		Fleet Distribtuion			Fleet Average Age		
Capacity Range		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Cruise 1000 - Global 310-1200 passengers		66%	25%	9%	22	11	1
Cruise 2000 - Global 1800-2999 passenger		56%	38%	6%	23	11	2
Cruise 3000 - Global 3000-4538 passenger		16%	63%	21%	17	10	3

Table 3.10: 2015 SPBP Call Characteristics – Cruise

		Fleet Counts			Fleet Average Model Year		
2015 SPBP	Calls	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Cruise 1000	11	8	3		1997	2008	
Cruise 2000	271	210	61		1993	2001	
Cruise 3000	100	28	72		1998	2004	
		Fleet Distribtuion			Fleet Average Age		
2015 SPBP		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Cruise 1000		73%	27%		18	7	
Cruise 2000		77%	23%		22	14	
Cruise 3000		28%	72%		17	11	

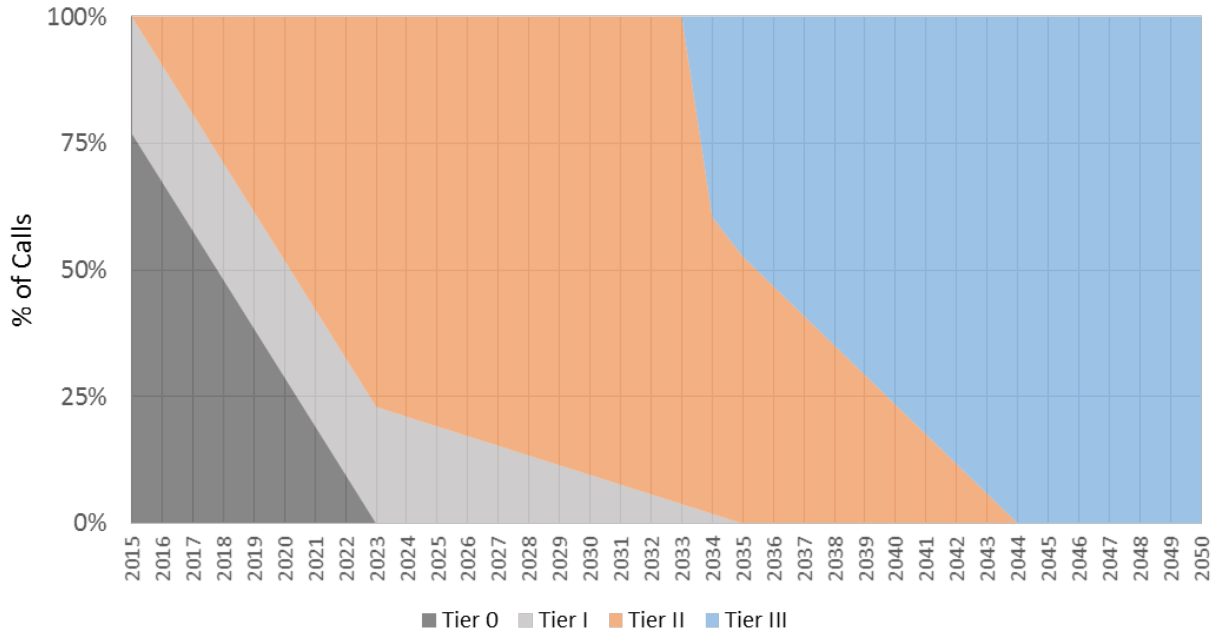
The forecasted tier distribution scenario for Cruise 1000 is illustrated in Figure 3.13.

Figure 3.13: SPBP Cruise 1000 Tier Distribution Forecast



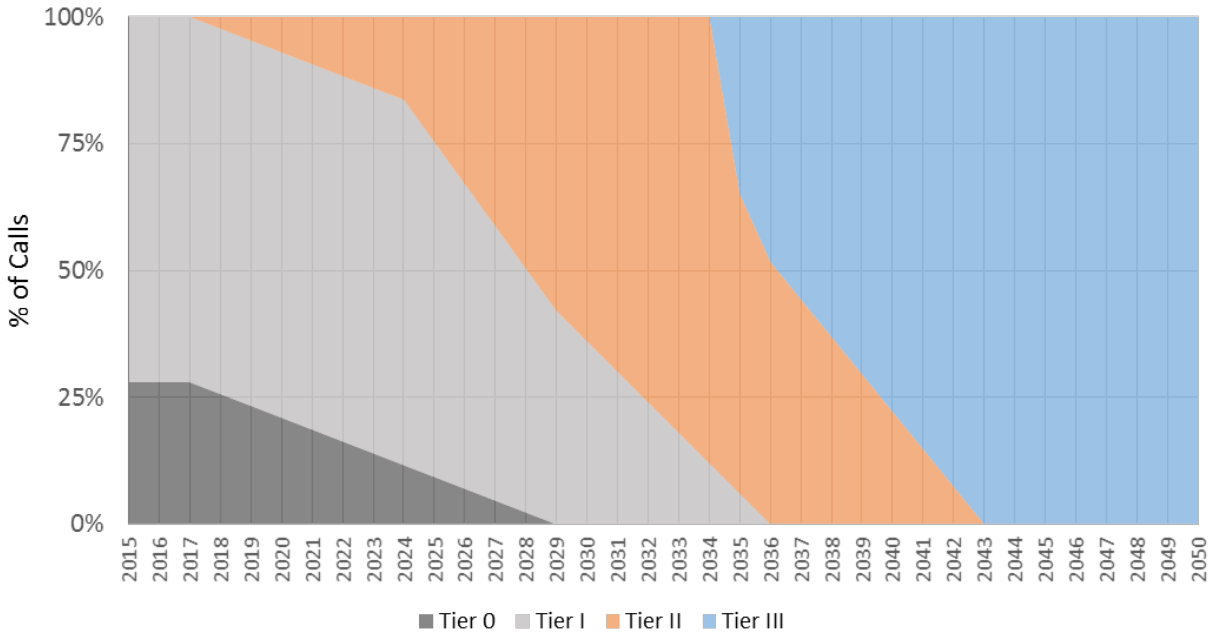
The forecasted tier distribution scenario for Cruise 2000 is illustrated in Figure 3.14.

Figure 3.14: SPBP Cruise 2000 Tier Distribution Forecast



The forecasted tier distribution scenario for Cruise 3000 is illustrated in Figure 3.15.

Figure 3.15: SPBP Cruise 3000 Tier Distribution Forecast



Based on the forecast discussed and illustrated above, it is anticipated that significant numbers of Tier III powered cruise ship calls will not occur in the SPBP until the late-2030s to late-2040s.

3.4 Auto Carriers

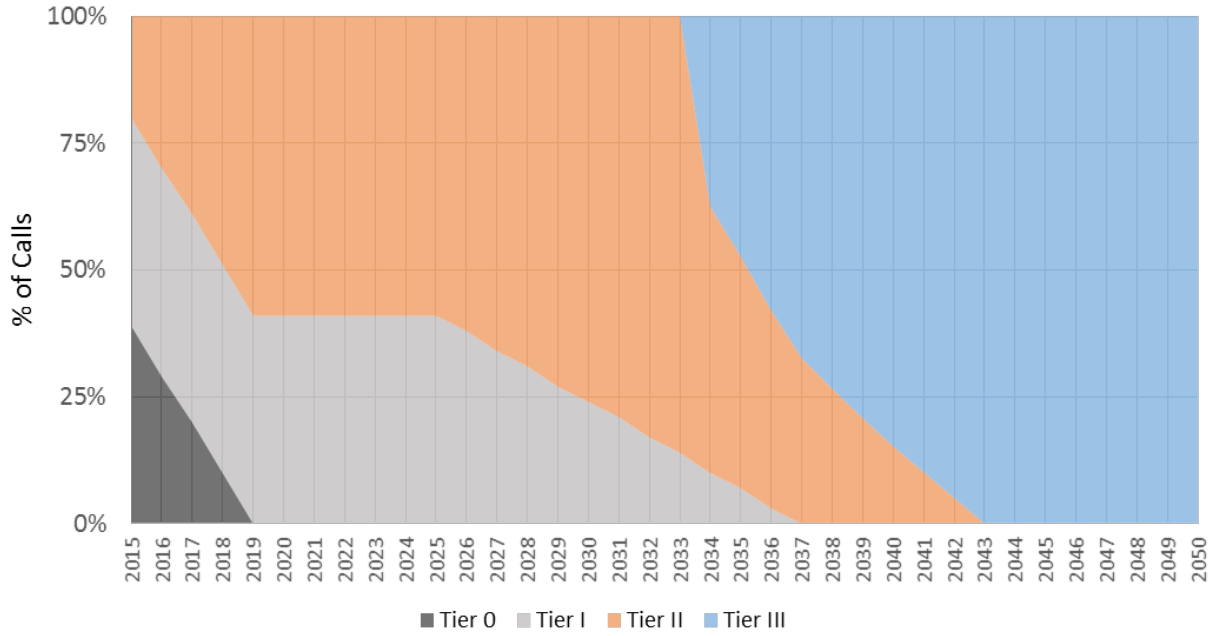
Auto carriers and roll on/roll off (ro-ro) typically operate in a non-liner service and in 2015, each auto carrier averaged just under 2 calls per year across the entire fleet. The size of the 2015 SPBP fleet ranged from a capacity of 3,199 to 8,000 vehicles per ship, based on IHS 2017. For forecasting the available global fleet, the 2015 range was expanded by ±20% resulting in a capacity range of 2,560 to 9,600 vehicles per ship. Auto carriers were assumed to have a SPBP operational service life of up to a global average age of 30 years. The available global fleet characteristics and 2015 SPBP fleet call characteristics are presented in Table 3.11.

Table 3.11: Global & 2015 SPBP Call Characteristics – Auto Carriers

	Count/	Fleet Counts			Fleet Average Model Year		
2,550+ Capacity	Calls	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Auto Carrier - Global	850	335	346	169	1988	2006	2012
2015 SPBP	255	49	200	6	1994	2005	2010
		Fleet Distribtuion			Fleet Average Age		
2,550+ Capacity		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Fleet %/Years		39%	41%	20%	27	9	3
Fleet %/Years		19%	43%	22%	21	10	5

The forecasted tier distribution scenario for auto carriers is illustrated in Figure 3.16.

Figure 3.16: SPBP Auto Carrier Tier Distribution Forecast



Based on the forecast discussed and illustrated above, it is anticipated that significant numbers of Tier III powered auto carrier and roll on/roll off ship calls will not occur in the SPBP until the mid-2030s to early-2040s.

3.5 Dry Bulk

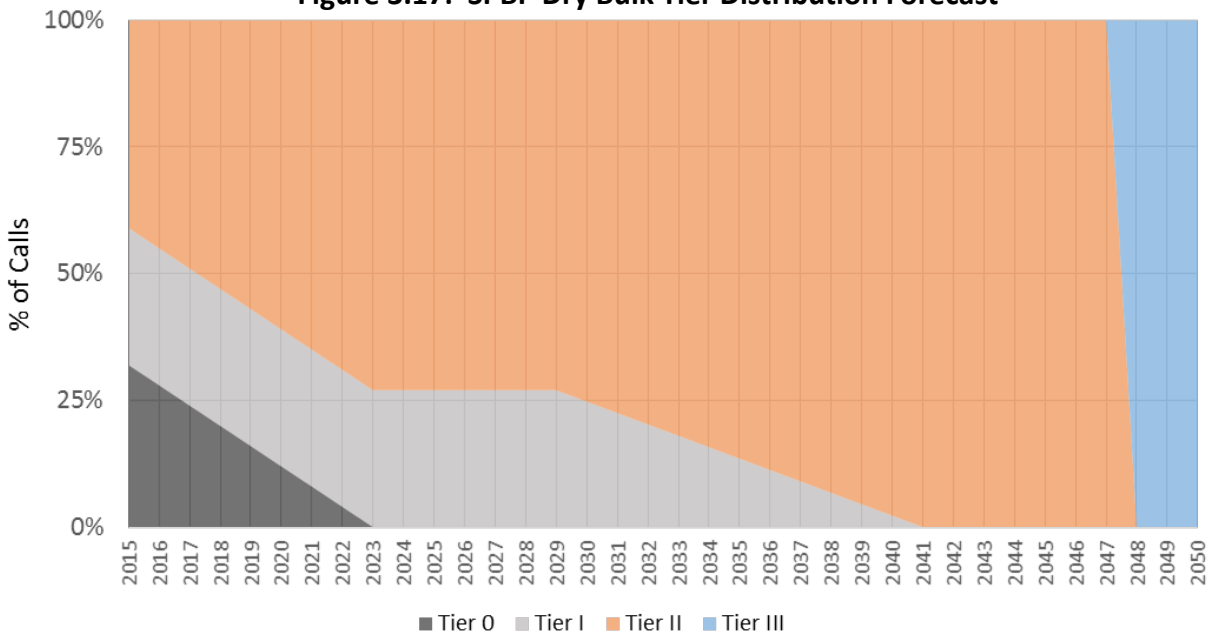
Dry bulk carriers typically operate in a non-liner service and in 2015, each dry bulk ship averaged just over 1 call per year across the entire fleet. The size of the 2015 SPBP fleet ranged from 16,181 to 95,768 dwt per ship, based on IHS 2017. For forecasting the available global fleet, the 2015 range was expanded by ±20% resulting in a capacity range of 12,945 to 114,922 dwt. Dry bulk carriers were assumed to have a SPBP operational service life of up to a global average age of 35 years. The available global fleet characteristics and 2015 SPBP fleet call characteristics are presented in Table 3.12.

Table 3.12: Global & 2015 SPBP Call Characteristics – Dry Bulk

	Count/	Fleet Counts			Fleet Average Model Year		
16,181-114,922 dwt	Calls	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Dry Bulk - Global	10,536	3,409	2,816	4,311	1987	2005	2012
2015 SPBP	269	11	183	75	1997	2004	2011
		Fleet Distribtuion			Fleet Average Age		
16,181-114,922 dwt		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Fleet %/Years		32%	27%	41%	28	10	3
Fleet %/Years		4%	68%	28%	18	11	4

The forecasted tier distribution scenario for dry bulk carriers is illustrated in Figure 3.17.

Figure 3.17: SPBP Dry Bulk Tier Distribution Forecast



Based on the forecast discussed and illustrated above it is anticipated that significant numbers of Tier III powered dry bulk ship calls will not occur in the SPBP until late-2040s.

3.6 General Cargo

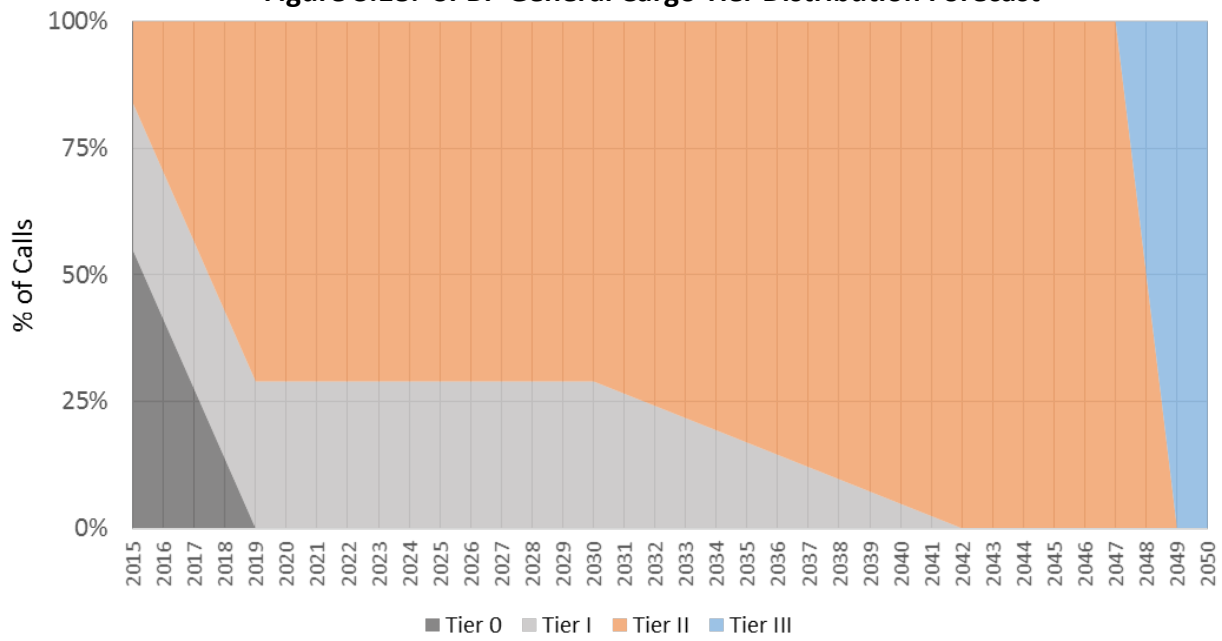
General cargo carriers operate typically in a non-liner service similar to dry bulk ships. In 2015, each general cargo ship averaged just over 1 call per year across the entire fleet. The size of the 2015 SPBP fleet ranged from 7,428 to 69,990 dwt per ship, based on IHS 2017. For forecasting the available global fleet, the 2015 range was expanded by ±20% resulting in a range of 6,000 to 69,990 dwt. General cargo carriers were assumed to have a SPBP operational service life of up to a global average age of 35 years. The available global fleet characteristics and 2015 SPBP fleet call characteristics are presented in Table 3.13.

Table 3.13: Global & 2015 SPBP Call Characteristics – General Cargo

	Count/	Fleet Counts			Fleet Average Model Year		
6,000-84,000 dwt	Calls	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Gen Cargo - Global	6,078	3,325	1,792	961	1983	2006	2013
2015 SPBP	100	22	57	21	1991	2005	2012
		Fleet Distribtuion			Fleet Average Age		
6,000-84,000 dwt		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Fleet %/Years		55%	29%	16%	32	9	2
Fleet %/Years		22%	57%	21%	24	10	3

The forecasted tier distribution scenario for general cargo carriers is illustrated in Figure 3.18.

Figure 3.18: SPBP General Cargo Tier Distribution Forecast



Based on the forecast discussed and illustrated above, it is anticipated that significant numbers of Tier III powered general cargo ship calls will not occur in the SPBP until sometime post-2050.

APPENDIX A: FORECAST DETAILS

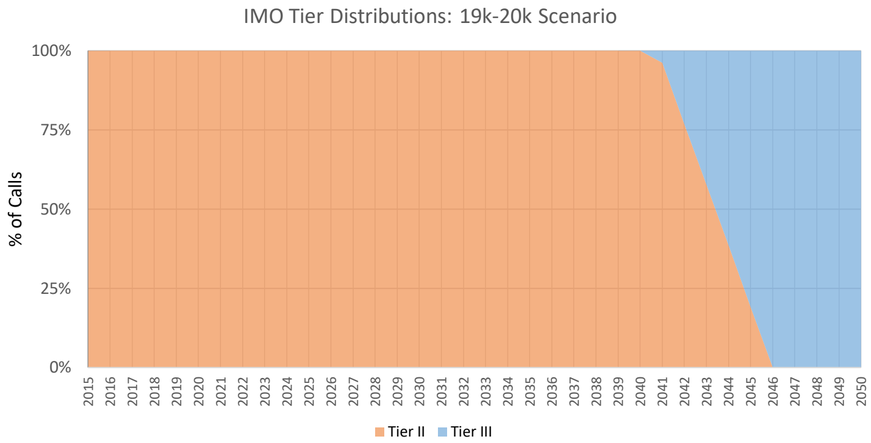
San Pedro Bay Ports
SPBP - IMO Tier Distribution Forecasting
Container Ships - Groups Phase Out
DRAFT

6/1/2017
scg v1

IHS world fleet data & UPDATED SPBP Vessel Call Forecast - IHS Marine Data through Q1 - 2017

		Global Fleet Counts			Average Model Year			2015
Vessel Type Capacity Group	Total	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II	Calls
Container 2000	845	333	428	84	1990	2005	2013	261
Container 6000-9000	757	31	446	280	1997	2006	2012	710
Container 10000-14000	311		67	244		2008	2012	256
Container 15000-18000	60		8	52		2006	2014	1
Container 19000-20000	24			24			2015	0
	1,997	364	949	684				

		Tier II			19k-20k			19k-20k
	Year	avg age	Tier II	Tier II TF	Tier III	fc	ex fleet	52 SPBP max forecasted calls
Baseline	**2015**	**0**	**100%**	**100%**	**0%**	0	120	24 existing Tier II vessels 2015
	2016	1	100%	100%	0%	3	120	0 existing Tier I vessels 0
	2017	2	100%	100%	0%	6	120	5 ship calls/year
	2018	3	100%	100%	0%	9	120	120 max capacity of calls for existing fleet
	2019	4	100%	100%	0%	12	120	
	2020	**5**	**100%**	**100%**	**0%**	15	120	
	2021	6	100%	100%	0%	18	120	
	2022	7	100%	100%	0%	21	120	
	2023	8	100%	100%	0%	24	120	
	2024	9	100%	100%	0%	27	120	
	2025	**10**	**100%**	100%	**0%**	30	120	
	2026	11	100%	100%	0%	33	120	
	2027	12	100%	100%	0%	36	120	
	2028	13	100%	100%	0%	39	120	
	2029	14	100%	100%	0%	42	120	
	2030	**15**	**100%**	**100%**	**0%**	52	120	
	2031	16	100%	100%	0%	52	120	
	2032	17	100%	100%	0%	52	120	
	2033	18	100%	100%	0%	52	120	
	2034	19	100%	100%	0%	52	120	
	2035	**20**	92%	**100%**	**0%**	52	110	
	2036	21	**83%**	100%	0%	52	100	
	2037	22	75%	100%	0%	52	90	
	2038	23	67%	100%	0%	52	80	
	2039	24	58%	100%	0%	52	70	
	2040	**25**	50%	**100%**	**0%**	52	60	
	2041	26	**42%**	96%	4%	52	50	
	2042	27	33%	77%	23%	52	40	
	2043	28	25%	58%	42%	52	30	
	2044	29	17%	38%	62%	52	20	
	2045	**30**	**8%**	**19%**	**81%**	52	10	
	2046	31	0%	0%	100%	52	0	
	2047	32	0%	0%	100%	52	0	
	2048	33	0%	0%	100%	52	0	
	2049	34	0%	0%	100%	52	0	
	2050	**35**	**0%**	**0%**	**100%**	52	0	

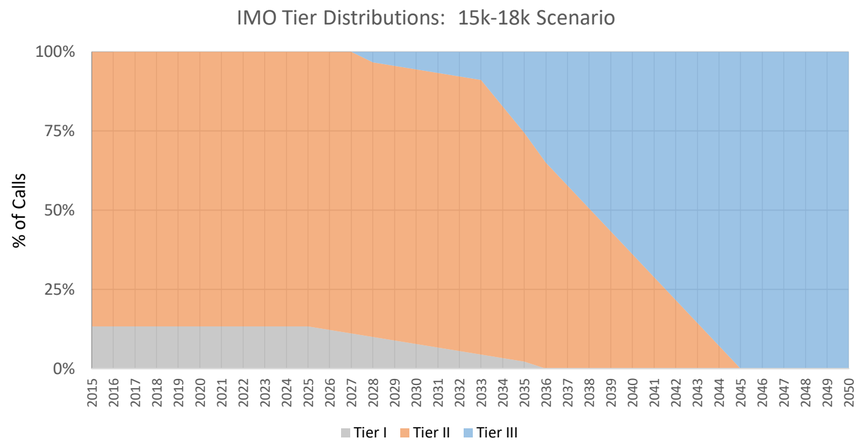


San Pedro Bay Ports
SPBP - IMO Tier Distribution Forecasting
Container Ships - Groups Phase Out
DRAFT

6/1/2017
scg v1

	Year	Tier I T1 avg age	Tier I	Tier I TF	Tier II avg age	Tier II	Tier II TF	15k-18k Tier III	fc	ex fleet
Baseline	**2015**	**9**	**100%**	**13%**	**1**	**100%**	**87%**	**0%**	1	360
	2016	10	100%	13%	2	100%	87%	0%	29	360
	2017	11	100%	13%	3	100%	87%	0%	57	360
	2018	12	100%	13%	4	100%	87%	0%	85	360
	2019	13	100%	13%	5	100%	87%	0%	113	360
	2020	**14**	**100%**	**13%**	**6**	**100%**	**87%**	**0%**	141	360
	2021	15	100%	13%	7	100%	87%	0%	169	360
	2022	16	100%	13%	8	100%	87%	0%	197	360
	2023	17	100%	13%	9	100%	87%	0%	225	360
	2024	18	100%	13%	10	100%	87%	0%	253	360
	2025	**19**	**100%**	**13%**	**11**	**100%**	87%	**0%**	281	360
	2026	20	92%	12%	12	100%	88%	0%	309	356
	2027	21	83%	11%	13	100%	89%	0%	337	352
	2028	22	75%	10%	14	100%	87%	3%	365	348
	2029	23	67%	9%	15	100%	87%	4%	393	344
	2030	**24**	**58%**	**8%**	**16**	**100%**	**87%**	**6%**	416	340
	2031	25	50%	7%	17	100%	87%	7%	416	336
	2032	26	42%	6%	18	100%	87%	8%	416	332
	2033	27	33%	4%	19	100%	87%	9%	416	328
	2034	28	25%	3%	20	92%	79%	17%	416	298
	2035	**29**	**17%**	**2%**	**21**	**83%**	**72%**	**26%**	416	268
	2036	30	8%	0%	22	75%	65%	35%	416	238
	2037	31	0%	0%	23	67%	58%	42%	416	208
	2038	32	0%	0%	24	58%	51%	49%	416	182
	2039	33	0%	0%	25	50%	43%	57%	416	156
	2040	**34**	**0%**	**0%**	**26**	**42%**	**36%**	**64%**	416	130
	2041	35	0%	0%	27	33%	29%	71%	416	104
	2042	36	0%	0%	28	25%	22%	78%	416	78
	2043	37	0%	0%	29	17%	14%	86%	416	52
	2044	38	0%	0%	30	8%	7%	93%	416	26
	2045	**39**	**0%**	**0%**	**31**	**0%**	**0%**	**100%**	416	0
	2046	40	0%	0%	32	0%	0%	100%	416	0
	2047	41	0%	0%	33	0%	0%	100%	416	0
	2048	42	0%	0%	34	0%	0%	100%	416	0
	2049	43	0%	0%	35	0%	0%	100%	416	0
	2050	**44**	**0%**	**0%**	**36**	**0%**	**0%**	**100%**	416	0

15k-18k	
416	SPBP max forecasted calls
52	existing Tier II vessels 2014
8	existing Tier I vessels 2006
0	existing Tier 0 vessels 0
6	ship calls/year
360	max capacity of calls for existing fleet

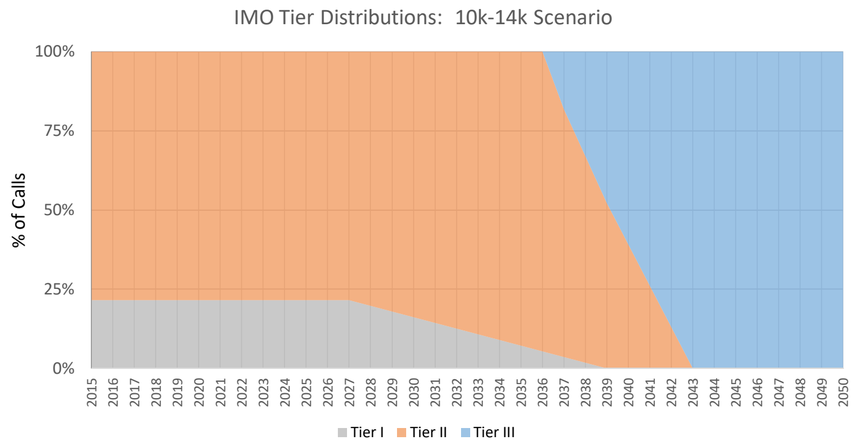


San Pedro Bay Ports
SPBP - IMO Tier Distribution Forecasting
Container Ships - Groups Phase Out
DRAFT

6/1/2017
scg v1

	Year	Tier I T1 avg age	Tier I	Tier I TF	Tier II avg age	Tier II	Tier II TF	10k-14k Tier III	fc	ex fleet
Baseline	**2015**	**7**	**100%**	**22%**	**3**	**100%**	**78%**	**0%**	256	2,177
	2016	8	100%	22%	4	100%	78%	0%	312	2,177
	2017	9	100%	22%	5	100%	78%	0%	368	2,177
	2018	10	100%	22%	6	100%	78%	0%	424	2,177
	2019	11	100%	22%	7	100%	78%	0%	480	2,177
	2020	**12**	**100%**	**22%**	**8**	**100%**	**78%**	**0%**	536	2,177
	2021	13	100%	22%	9	100%	78%	0%	592	2,177
	2022	14	100%	22%	10	100%	78%	0%	648	2,177
	2023	15	100%	22%	11	100%	78%	0%	704	2,177
	2024	16	100%	22%	12	100%	78%	0%	760	2,177
	2025	**17**	**100%**	**22%**	**13**	**100%**	**78%**	**0%**	816	2,177
	2026	18	100%	22%	14	100%	78%	0%	872	2,177
	2027	19	100%	22%	15	100%	78%	0%	928	2,177
	2028	20	92%	20%	16	100%	80%	0%	984	2,138
	2029	21	83%	18%	17	100%	82%	0%	1,040	2,099
	2030	**22**	**75%**	**16%**	**18**	**100%**	**84%**	**0%**	1,092	2,060
	2031	23	67%	14%	19	100%	86%	0%	1,092	2,021
	2032	24	58%	13%	20	92%	87%	0%	1,092	1,839
	2033	25	50%	11%	21	83%	89%	0%	1,092	1,658
	2034	26	42%	9%	22	75%	91%	0%	1,092	1,476
	2035	**27**	**33%**	**7%**	**23**	**67%**	**93%**	**0%**	1,092	1,295
	2036	28	25%	5%	24	58%	95%	0%	1,092	1,114
	2037	29	17%	4%	25	50%	78%	18%	1,092	932
	2038	30	8%	2%	26	42%	65%	33%	1,092	751
	2039	31	0%	0%	27	33%	52%	48%	1,092	569
	2040	**32**	**0%**	**0%**	**28**	**25%**	**39%**	**61%**	1,092	427
	2041	33	0%	0%	29	17%	26%	74%	1,092	285
	2042	34	0%	0%	30	8%	13%	87%	1,092	142
	2043	35	0%	0%	31	0%	0%	100%	1,092	0
	2044	36	0%	0%	32	0%	0%	100%	1,092	0
	2045	**37**	**0%**	**0%**	**33**	**0%**	**0%**	**100%**	1,092	0
	2046	38	0%	0%	34	0%	0%	100%	1,092	0
	2047	39	0%	0%	35	0%	0%	100%	1,092	0
	2048	40	0%	0%	36	0%	0%	100%	1,092	0
	2049	41	0%	0%	37	0%	0%	100%	1,092	0
	2050	**42**	**0%**	**0%**	**38**	**0%**	**0%**	**100%**	1,092	0

1092	SPBP max forecasted calls	
244	existing Tier II vessels	2012
67	existing Tier I vessels	2008
0	existing Tier 0 vessels	0
7	ship calls/year	
2,177	max capacity of calls for existing fleet	

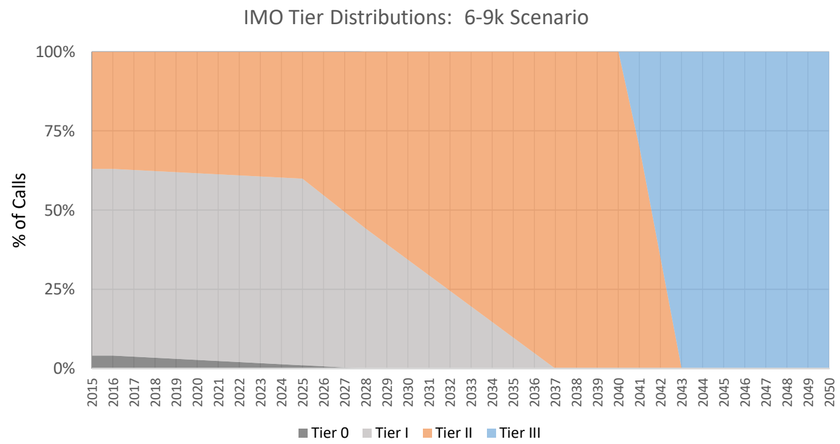


San Pedro Bay Ports
SPBP - IMO Tier Distribution Forecasting
Container Ships - Groups Phase Out
DRAFT

6/1/2017
scg v1

	Year	Tier 0 T0 avg age	Tier 0	Tier 0 TF	Tier I T1 avg age	Tier I	Tier I TF	Tier II avg age	Tier II	Tier II TF	6k-9k Tier III	fc	6k-9k ex fleet
Baseline	**2015**	**18**	**100%**	**4%**	**9**	**100%**	**59%**	**3**	**100%**	**37%**	**4%**	710	5,082
	2016	19	100%	4%	10	100%	59%	4	100%	37%	4%	694	5,082
	2017	20	92%	4%	11	100%	59%	5	100%	37%	4%	678	5,082
	2018	21	83%	3%	12	100%	59%	6	100%	38%	3%	662	5,082
	2019	22	75%	3%	13	100%	59%	7	100%	38%	3%	646	5,082
	2020	**23**	**67%**	**3%**	**14**	**100%**	**59%**	**8**	**100%**	**38%**	**3%**	630	5,082
	2021	24	58%	2%	15	100%	59%	9	100%	39%	2%	614	5,082
	2022	25	50%	2%	16	100%	59%	10	100%	39%	2%	598	5,082
	2023	26	42%	2%	17	100%	59%	11	100%	39%	2%	582	5,082
	2024	27	33%	1%	18	100%	59%	12	100%	40%	1%	566	5,082
	2025	**28**	**25%**	**1%**	**19**	100%	**59%**	**13**	**100%**	**40%**	**1%**	550	5,082
	2026	29	17%	1%	20	92%	54%	14	100%	45%	1%	534	4,822
	2027	30	8%	0%	21	83%	49%	15	100%	51%	0%	518	4,562
	2028	31	0%	0%	22	75%	44%	16	100%	56%	0%	502	4,302
	2029	32	0%	0%	23	67%	39%	17	100%	61%	0%	486	4,041
	2030	**33**	**0%**	**0%**	**24**	**58%**	**34%**	**18**	**100%**	**66%**	**0%**	468	3,781
	2031	34	0%	0%	25	50%	29%	19	100%	71%	0%	468	3,521
	2032	35	0%	0%	26	42%	25%	20	92%	75%	0%	468	3,098
	2033	36	0%	0%	27	33%	20%	21	83%	80%	0%	468	2,674
	2034	37	0%	0%	28	25%	15%	22	75%	85%	0%	468	2,251
	2035	**38**	**0%**	**0%**	**29**	**17%**	**10%**	**23**	**67%**	**90%**	**0%**	468	1,827
	2036	39	0%	0%	30	8%	5%	24	58%	95%	0%	468	1,404
	2037	40	0%	0%	31	0%	0%	25	50%	100%	0%	468	980
	2038	41	0%	0%	32	0%	0%	26	42%	100%	0%	468	817
	2039	42	0%	0%	33	0%	0%	27	33%	100%	0%	468	653
	2040	**43**	**0%**	**0%**	**34**	**0%**	**0%**	**28**	**25%**	**100%**	**0%**	468	490
	2041	44	0%	0%	35	0%	0%	29	17%	70%	30%	468	327
	2042	45	0%	0%	36	0%	0%	30	8%	35%	65%	468	163
	2043	46	0%	0%	37	0%	0%	31	0%	0%	100%	468	0
	2044	47	0%	0%	38	0%	0%	32	0%	0%	100%	468	0
	2045	**48**	**0%**	**0%**	**39**	**0%**	**0%**	**33**	**0%**	**0%**	**100%**	468	0
	2046	49	0%	0%	40	0%	0%	34	0%	0%	100%	468	0
	2047	50	0%	0%	41	0%	0%	35	0%	0%	100%	468	0
	2048	51	0%	0%	42	0%	0%	36	0%	0%	100%	468	0
	2049	52	0%	0%	43	0%	0%	37	0%	0%	100%	468	0
	2050	**53**	**0%**	**0%**	**44**	**0%**	**0%**	**38**	**0%**	**0%**	**100%**	468	0

694 SPBP max forecasted calls
280 existing Tier II vessels 2012
446 existing Tier I vessels 2006
31 existing Tier 0 vessels 1997
7 ship calls/year
5,299 max capacity of calls for existing fleet

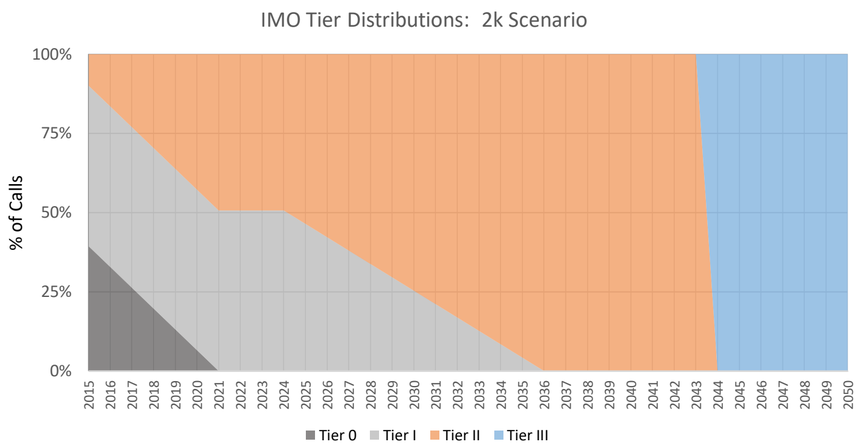


San Pedro Bay Ports
SPBP - IMO Tier Distribution Forecasting
Container Ships - Groups Phase Out
DRAFT

6/1/2017
scg v1

		Tier 0			Tier I			Tier II			2000		2000
	Year	T0 avg age	Tier 0	Tier 0 TF	T1 avg age	Tier I	Tier I TF	avg age	Tier II	Tier II TF	Tier III	fc	ex fleet
Baseline	**2015**	**25**	**100%**	**39%**	**10**	**100%**	**51%**	**2**	**100%**	**10%**	**0%**	261	8,450
	2016	26	83%	33%	11	100%	51%	3	100%	17%	0%	247	7,895
	2017	27	67%	26%	12	100%	51%	4	100%	23%	0%	233	7,340
	2018	28	50%	20%	13	100%	51%	5	100%	30%	0%	219	6,785
	2019	29	33%	13%	14	100%	51%	6	100%	36%	0%	205	6,230
	2020	**30**	**17%**	**7%**	**15**	**100%**	**51%**	**7**	**100%**	**43%**	**0%**	191	5,675
	2021	31	0%	0%	16	100%	51%	8	100%	49%	0%	177	5,120
	2022	32	0%	0%	17	100%	51%	9	100%	49%	0%	163	5,120
	2023	33	0%	0%	18	100%	51%	10	100%	49%	0%	149	5,120
	2024	34	0%	0%	19	100%	51%	11	100%	49%	0%	135	5,120
	2025	**35**	**0%**	**0%**	**20**	**92%**	**46%**	**12**	**100%**	**54%**	**0%**	121	4,763
	2026	36	0%	0%	21	83%	42%	13	100%	58%	0%	107	4,407
	2027	37	0%	0%	22	75%	38%	14	100%	62%	0%	93	4,050
	2028	38	0%	0%	23	67%	34%	15	100%	66%	0%	79	3,693
	2029	39	0%	0%	24	58%	30%	16	100%	70%	0%	65	3,337
	2030	**40**	**0%**	**0%**	**25**	**50%**	**25%**	**17**	**100%**	**75%**	**0%**	52	2,980
	2031	41	0%	0%	26	42%	21%	18	100%	79%	0%	52	2,623
	2032	42	0%	0%	27	33%	17%	19	100%	83%	0%	52	2,267
	2033	43	0%	0%	28	25%	13%	20	92%	87%	0%	52	1,840
	2034	44	0%	0%	29	17%	8%	21	83%	92%	0%	52	1,413
	2035	**45**	**0%**	**0%**	**30**	**8%**	**4%**	**22**	**75%**	**96%**	**0%**	52	987
	2036	46	0%	0%	31	0%	0%	23	67%	100%	0%	52	560
	2037	47	0%	0%	32	0%	0%	24	58%	100%	0%	52	490
	2038	48	0%	0%	33	0%	0%	25	50%	100%	0%	52	420
	2039	49	0%	0%	34	0%	0%	26	42%	100%	0%	52	350
	2040	**50**	**0%**	**0%**	**35**	**0%**	**0%**	**27**	**33%**	**100%**	**0%**	52	280
	2041	51	0%	0%	36	0%	0%	28	25%	100%	0%	52	210
	2042	52	0%	0%	37	0%	0%	29	17%	100%	0%	52	140
	2043	53	0%	0%	38	0%	0%	30	8%	100%	0%	52	70
	2044	54	0%	0%	39	0%	0%	31	0%	0%	100%	52	0
	2045	**55**	**0%**	**0%**	**40**	**0%**	**0%**	**32**	**0%**	**0%**	**100%**	52	0
	2046	56	0%	0%	41	0%	0%	33	0%	0%	100%	52	0
	2047	57	0%	0%	42	0%	0%	34	0%	0%	100%	52	0
	2048	58	0%	0%	43	0%	0%	35	0%	0%	100%	52	0
	2049	59	0%	0%	44	0%	0%	36	0%	0%	100%	52	0
	2050	**60**	**0%**	**0%**	**45**	**0%**	**0%**	**37**	**0%**	**0%**	**100%**	52	0

247 SPBP max forecasted calls
84 existing Tier II vessels 2013
428 existing Tier I vessels 2005
333 existing Tier 0 vessels 1990
10 ship calls/year
8,450 max capacity of calls for existing fleet



San Pedro Bay Ports
AQMP - IMO Tier Distribution Forecasting
Chemical Tankers
DRAFT

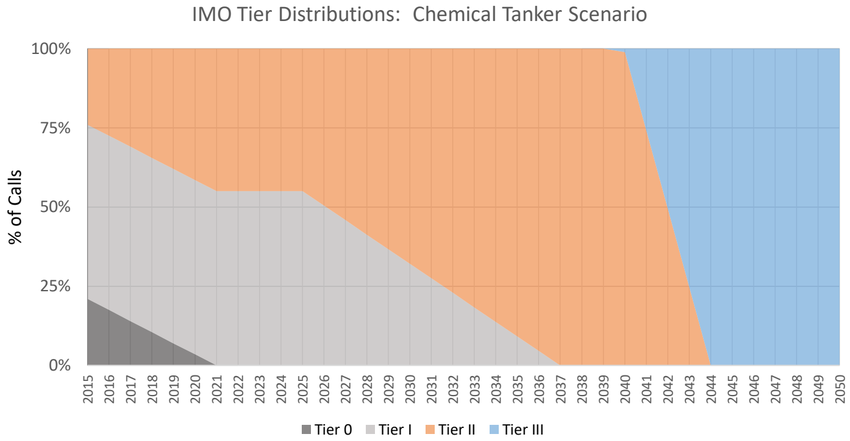
6/1/2017
scg v1

IHS world fleet data & UPDATED SPBP Vessel Call Forecast - IHS Marine Data through Q1 - 2017

	Counts/	Fleet Counts			Fleet Average Model Year		
>10,000 dwt	Calls	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Chem Tanker - Global	3,252	668	1,789	795	1990	2006	2013
2015 SPBP	224	11	169	44	1998	2007	2012
		Fleet Distribtuion			Fleet Average Age		
>10,000 dwt		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Chem Tanker - Global		21%	55%	24%	25	9	2
2015 SPBP		5%	75%	20%	17	8	3

		Tier 0			Tier I			Tier II			Chemical		Chemical
	Year	T0 avg age	Tier 0	Tier 0 TF	T1 avg age	Tier I	Tier I TF	avg age	Tier II	Tier II TF	Tier III	fc	ex fleet
Baseline	**2015**	**25**	**100%**	**21%**	**9**	**100%**	**55%**	**2**	**100%**	**24%**	**0%**	224	3,252
	2016	26	83%	18%	10	100%	55%	3	100%	28%	0%	228	3,141
	2017	27	67%	14%	11	100%	55%	4	100%	31%	0%	231	3,029
	2018	28	50%	11%	12	100%	55%	5	100%	35%	0%	235	2,918
	2019	29	33%	7%	13	100%	55%	6	100%	38%	0%	238	2,807
	2020	**30**	17%	**4%**	**14**	100%	**55%**	**7**	**100%**	**42%**	**0%**	242	2,695
	2021	31	0%	0%	15	100%	55%	8	100%	45%	0%	243	2,584
	2022	32	0%	0%	16	100%	55%	9	100%	45%	0%	244	2,584
	2023	33	0%	0%	17	100%	55%	10	100%	45%	0%	245	2,584
	2024	34	0%	0%	18	100%	55%	11	100%	45%	0%	246	2,584
	2025	**35**	0%	**0%**	**19**	**100%**	**55%**	**12**	**100%**	**45%**	**0%**	248	2,584
	2026	36	0%	0%	20	92%	50%	13	100%	50%	0%	249	2,435
	2027	37	0%	0%	21	83%	46%	14	100%	54%	0%	250	2,286
	2028	38	0%	0%	22	75%	41%	15	100%	59%	0%	252	2,137
	2029	39	0%	0%	23	67%	37%	16	100%	63%	0%	253	1,988
	2030	**40**	0%	**0%**	**24**	**58%**	**32%**	**17**	**100%**	**68%**	**0%**	255	1,839
	2031	41	0%	0%	25	50%	28%	18	100%	73%	0%	256	1,690
	2032	42	0%	0%	26	42%	23%	19	100%	77%	0%	257	1,540
	2033	43	0%	0%	27	33%	18%	20	92%	82%	0%	259	1,325
	2034	44	0%	0%	28	25%	14%	21	83%	86%	0%	260	1,110
	2035	**45**	0%	**0%**	**29**	**17%**	**9%**	**22**	**75%**	**91%**	**0%**	262	894
	2036	46	0%	0%	30	8%	5%	23	67%	95%	0%	263	679
	2037	47	0%	0%	31	0%	0%	24	58%	100%	0%	264	464
	2038	48	0%	0%	32	0%	0%	25	50%	100%	0%	266	398
	2039	49	0%	0%	33	0%	0%	26	42%	100%	0%	267	331
	2040	**50**	0%	**0%**	**34**	**0%**	**0%**	**27**	**33%**	**99%**	**1%**	268	265
	2041	51	0%	0%	35	0%	0%	28	25%	74%	26%	268	199
	2042	52	0%	0%	36	0%	0%	29	17%	49%	51%	268	133
	2043	53	0%	0%	37	0%	0%	30	8%	25%	75%	268	66
	2044	54	0%	0%	38	0%	0%	31	0%	0%	100%	268	0
	2045	**55**	0%	**0%**	**39**	**0%**	**0%**	**32**	**0%**	**0%**	**100%**	268	0
	2046	56	0%	0%	40	0%	0%	33	0%	0%	100%	268	0
	2047	57	0%	0%	41	0%	0%	34	0%	0%	100%	268	0
	2048	58	0%	0%	42	0%	0%	35	0%	0%	100%	268	0
	2049	59	0%	0%	43	0%	0%	36	0%	0%	100%	268	0
	2050	**60**	**0%**	**0%**	**44**	**0%**	**0%**	**37**	0%	**0%**	**100%**	268	0

268	SPBP max forecasted calls
795	existing Tier II vessels 2013
1,789	existing Tier I vessels 2006
668	existing Tier 0 vessels 1990
1	ship calls/year
3,252	capacity of calls for existing fleet



San Pedro Bay Ports
AQMP - IMO Tier Distribution Forecasting
Handy Tanker
DRAFT

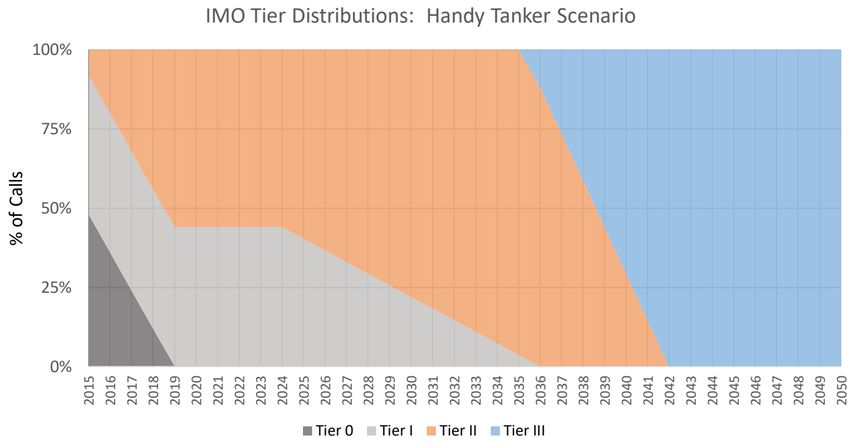
6/1/2017
scg v1

IHS world fleet data & UPDATED SPBP Vessel Call Forecast - IHS Marine Data through Q1 - 2017

	Count/	Fleet Counts			Fleet Average Model Year		
>20,000 dwt	Calls	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Handy - Global	815	389	359	67	1988	2005	2011
2015 SPBP	32	10	22	0	1997	2005	2010
		Fleet Distribtuion			Fleet Average Age		
>20,000 dwt		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Handy - Global		48%	44%	8%	27	10	4
2015 SPBP		31%	69%	0%	18	10	5

		Tier 0			Tier I			Tier II			Handy		Handy
	Year	T0 avg age	Tier 0	Tier 0 TF	T1 avg age	Tier I	Tier I TF	avg age	Tier II	Tier II TF	Tier III	fc	ex fleet
Baseline	**2015**	**27**	**100%**	**48%**	**10**	**100%**	**44%**	**4**	**100%**	**8%**	**0%**	32	815
	2016	28	75%	36%	11	100%	44%	5	100%	20%	0%	33	718
	2017	29	50%	24%	12	100%	44%	6	100%	32%	0%	33	621
	2018	30	25%	12%	13	100%	44%	7	100%	44%	0%	34	523
	2019	31	0%	0%	14	100%	44%	8	100%	56%	0%	34	426
	2020	**32**	**0%**	**0%**	**15**	100%	**44%**	**9**	**100%**	**56%**	**0%**	35	426
	2021	33	0%	0%	16	100%	44%	10	100%	56%	0%	35	426
	2022	34	0%	0%	17	100%	44%	11	100%	56%	0%	35	426
	2023	35	0%	0%	18	100%	44%	12	100%	56%	0%	35	426
	2024	36	0%	0%	19	100%	44%	13	100%	56%	0%	35	426
	2025	**37**	**0%**	**0%**	**20**	**92%**	**40%**	**14**	**100%**	**60%**	**0%**	35	396
	2026	38	0%	0%	21	83%	37%	15	100%	63%	0%	36	366
	2027	39	0%	0%	22	75%	33%	16	100%	67%	0%	36	336
	2028	40	0%	0%	23	67%	29%	17	100%	71%	0%	36	306
	2029	41	0%	0%	24	58%	26%	18	100%	74%	0%	36	276
	2030	**42**	**0%**	**0%**	**25**	**50%**	**22%**	**19**	**100%**	**78%**	**0%**	36	247
	2031	43	0%	0%	26	42%	18%	20	92%	82%	0%	37	211
	2032	44	0%	0%	27	33%	15%	21	83%	85%	0%	37	176
	2033	45	0%	0%	28	25%	11%	22	75%	89%	0%	37	140
	2034	46	0%	0%	29	17%	7%	23	67%	93%	0%	37	105
	2035	**47**	**0%**	**0%**	**30**	**8%**	**4%**	**24**	**58%**	**96%**	**0%**	37	69
	2036	48	0%	0%	31	0%	0%	25	50%	88%	12%	38	34
	2037	49	0%	0%	32	0%	0%	26	42%	73%	27%	38	28
	2038	50	0%	0%	33	0%	0%	27	33%	59%	41%	38	22
	2039	51	0%	0%	34	0%	0%	28	25%	44%	56%	38	17
	2040	**52**	**0%**	**0%**	**35**	**0%**	**0%**	**29**	**17%**	**29%**	**71%**	38	11
	2041	53	0%	0%	36	0%	0%	30	8%	15%	85%	38	6
	2042	54	0%	0%	37	0%	0%	31	0%	0%	100%	38	0
	2043	55	0%	0%	38	0%	0%	32	0%	0%	100%	38	0
	2044	56	0%	0%	39	0%	0%	33	0%	0%	100%	38	0
	2045	**57**	**0%**	**0%**	**40**	**0%**	**0%**	**34**	**0%**	**0%**	**100%**	38	0
	2046	58	0%	0%	41	0%	0%	35	0%	0%	100%	38	0
	2047	59	0%	0%	42	0%	0%	36	0%	0%	100%	38	0
	2048	60	0%	0%	43	0%	0%	37	0%	0%	100%	38	0
	2049	61	0%	0%	44	0%	0%	38	0%	0%	100%	38	0
	2050	**62**	**0%**	**0%**	**45**	**0%**	**0%**	**39**	0%	**0%**	**100%**	38	0

38	SPBP max forecasted calls	
67	existing Tier II vessels	2011
359	existing Tier I vessels	2005
389	existing Tier 0 vessels	1988
1	ship calls/year	
815	capacity of calls for existing fleet	



San Pedro Bay Ports
AQMP - IMO Tier Distribution Forecasting
Panamax Tankers
DRAFT

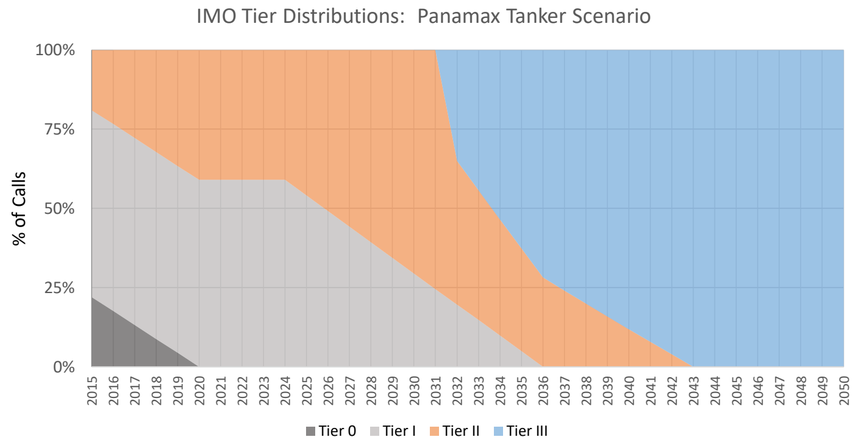
6/1/2017
scg v1

IHS world fleet data & UPDATED SPBP Vessel Call Forecast - IHS Marine Data through Q1 - 2017

	Count/	Fleet Counts			Fleet Average Model Year		
Panamax	Calls	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Panamax - Global	483	108	287	88	1989	2005	2012
2015 SPBP	155	2	147	6	1999	2004	2011
		Fleet Distribtuion			Fleet Average Age		
Panamax		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Fleet %/Years		22%	59%	19%	26	10	3
Fleet %/Years		1%	95%	4%	16	11	4

		Tier 0			Tier I			Tier II			Panamax		Panamax
	Year	T0 avg age	Tier 0	Tier 0 TF	T1 avg age	Tier I	Tier I TF	avg age	Tier II	Tier II TF	Tier III	fc	ex fleet
Baseline	**2015**	**26**	**100%**	**22%**	**10**	**100%**	**59%**	**3**	**100%**	**19%**	**0%**	155	483
	2016	27	80%	18%	11	100%	59%	4	100%	23%	0%	157	461
	2017	28	60%	13%	12	100%	59%	5	100%	28%	0%	160	440
	2018	29	40%	9%	13	100%	59%	6	100%	32%	0%	162	418
	2019	30	20%	4%	14	100%	59%	7	100%	37%	0%	165	397
	2020	**31**	**0%**	**0%**	**15**	100%	**59%**	**8**	**100%**	**41%**	**0%**	167	375
	2021	32	0%	0%	16	100%	59%	9	100%	41%	0%	168	375
	2022	33	0%	0%	17	100%	59%	10	100%	41%	0%	169	375
	2023	34	0%	0%	18	100%	59%	11	100%	41%	0%	170	375
	2024	35	0%	0%	19	100%	59%	12	100%	41%	0%	171	375
	2025	**36**	**0%**	**0%**	**20**	**92%**	**54%**	**13**	**100%**	**46%**	**0%**	171	351
	2026	37	0%	0%	21	83%	49%	14	100%	51%	0%	172	327
	2027	38	0%	0%	22	75%	44%	15	100%	56%	0%	173	303
	2028	39	0%	0%	23	67%	39%	16	100%	61%	0%	174	279
	2029	40	0%	0%	24	58%	34%	17	100%	66%	0%	175	255
	2030	**41**	**0%**	**0%**	**25**	**50%**	**30%**	**18**	**100%**	**71%**	**0%**	176	232
	2031	42	0%	0%	26	42%	25%	19	100%	75%	0%	177	208
	2032	43	0%	0%	27	33%	20%	20	92%	45%	35%	178	176
	2033	44	0%	0%	28	25%	15%	21	83%	41%	44%	179	145
	2034	45	0%	0%	29	17%	10%	22	75%	37%	54%	180	114
	2035	**46**	**0%**	**0%**	**30**	**8%**	**5%**	**23**	**67%**	**32%**	**63%**	181	83
	2036	47	0%	0%	31	0%	0%	24	58%	28%	72%	182	51
	2037	48	0%	0%	32	0%	0%	25	50%	24%	76%	183	44
	2038	49	0%	0%	33	0%	0%	26	42%	20%	80%	184	37
	2039	50	0%	0%	34	0%	0%	27	33%	16%	84%	185	29
	2040	**51**	**0%**	**0%**	**35**	**0%**	**0%**	**28**	**25%**	**12%**	**88%**	186	22
	2041	52	0%	0%	36	0%	0%	29	17%	8%	92%	186	15
	2042	53	0%	0%	37	0%	0%	30	8%	4%	96%	186	7
	2043	54	0%	0%	38	0%	0%	31	0%	0%	100%	186	0
	2044	55	0%	0%	39	0%	0%	32	0%	0%	100%	186	0
	2045	**56**	**0%**	**0%**	**40**	**0%**	**0%**	**33**	**0%**	**0%**	**100%**	186	0
	2046	57	0%	0%	41	0%	0%	34	0%	0%	100%	186	0
	2047	58	0%	0%	42	0%	0%	35	0%	0%	100%	186	0
	2048	59	0%	0%	43	0%	0%	36	0%	0%	100%	186	0
	2049	60	0%	0%	44	0%	0%	37	0%	0%	100%	186	0
	2050	**61**	**0%**	**0%**	**45**	**0%**	**0%**	**38**	**0%**	**0%**	**100%**	186	0

186 SPBP max forecasted calls
88 existing Tier II vessels 2012
287 existing Tier I vessels 2005
108 existing Tier 0 vessels 1989
1 ship calls/year
483 capacity of calls for existing fleet



San Pedro Bay Ports
AQMP - IMO Tier Distribution Forecasting
Aframax Tankers
DRAFT

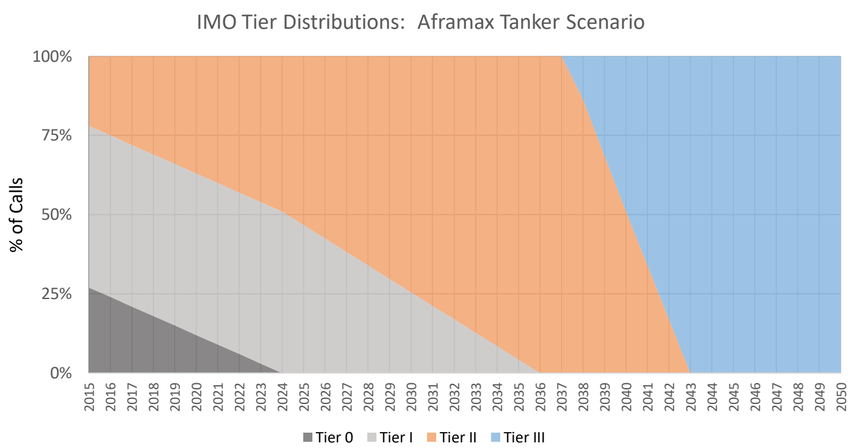
6/1/2017
scg v1

IHS world fleet data & UPDATED SPBP Vessel Call Forecast - IHS Marine Data through Q1 - 2017

	Count/	Fleet Counts			Fleet Average Model Year		
Aframax	Calls	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Aframax - Global	1,121	299	567	255	1993	2005	2012
2015 SPBP	104	0	51	53		2006	2011
		Fleet Distribtuion			Fleet Average Age		
Aframax		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Aframax - Global		27%	51%	22%	22	10	3
2015 SPBP		0%	49%	51%		9	4

		Tier 0			Tier I			Tier II			Aframax		Aframax
	Year	T0 avg age	Tier 0	Tier 0 TF	T1 avg age	Tier I	Tier I TF	avg age	Tier II	Tier II TF	Tier III	fc	ex fleet
Baseline	**2015**	**22**	**100%**	**27%**	**10**	**100%**	**51%**	**3**	**100%**	**22%**	**0%**	104	1,121
	2016	23	89%	24%	11	100%	51%	4	100%	25%	0%	106	1,088
	2017	24	78%	21%	12	100%	51%	5	100%	28%	0%	107	1,055
	2018	25	67%	18%	13	100%	51%	6	100%	31%	0%	109	1,021
	2019	26	56%	15%	14	100%	51%	7	100%	34%	0%	111	988
	2020	**27**	44%	**12%**	**15**	100%	**51%**	**8**	**100%**	**37%**	**0%**	112	955
	2021	28	33%	9%	16	100%	51%	9	100%	40%	0%	113	922
	2022	29	22%	6%	17	100%	51%	10	100%	43%	0%	113	888
	2023	30	11%	3%	18	100%	51%	11	100%	46%	0%	114	855
	2024	31	0%	0%	19	100%	51%	12	100%	49%	0%	114	822
	2025	**32**	**0%**	**0%**	**20**	**92%**	**47%**	**13**	**100%**	**53%**	**0%**	115	775
	2026	33	0%	0%	21	83%	43%	14	100%	58%	0%	116	728
	2027	34	0%	0%	22	75%	38%	15	100%	62%	0%	116	680
	2028	35	0%	0%	23	67%	34%	16	100%	66%	0%	117	633
	2029	36	0%	0%	24	58%	30%	17	100%	70%	0%	118	586
	2030	**37**	**0%**	**0%**	**25**	**50%**	**26%**	**18**	**100%**	**75%**	**0%**	118	539
	2031	38	0%	0%	26	42%	21%	19	100%	79%	0%	119	491
	2032	39	0%	0%	27	33%	17%	20	92%	83%	0%	120	423
	2033	40	0%	0%	28	25%	13%	21	83%	87%	0%	120	354
	2034	41	0%	0%	29	17%	9%	22	75%	92%	0%	121	286
	2035	**42**	**0%**	**0%**	**30**	**8%**	**4%**	**23**	**67%**	**96%**	**0%**	122	217
	2036	43	0%	0%	31	0%	0%	24	58%	100%	0%	122	149
	2037	44	0%	0%	32	0%	0%	25	50%	100%	0%	123	128
	2038	45	0%	0%	33	0%	0%	26	42%	86%	14%	123	106
	2039	46	0%	0%	34	0%	0%	27	33%	69%	31%	124	85
	2040	**47**	**0%**	**0%**	**35**	**0%**	**0%**	**28**	**25%**	**51%**	**49%**	125	64
	2041	48	0%	0%	36	0%	0%	29	17%	34%	66%	125	43
	2042	49	0%	0%	37	0%	0%	30	8%	17%	83%	125	21
	2043	50	0%	0%	38	0%	0%	31	0%	0%	100%	125	0
	2044	51	0%	0%	39	0%	0%	32	0%	0%	100%	125	0
	2045	**52**	**0%**	**0%**	**40**	**0%**	**0%**	**33**	**0%**	**0%**	**100%**	125	0
	2046	53	0%	0%	41	0%	0%	34	0%	0%	100%	125	0
	2047	54	0%	0%	42	0%	0%	35	0%	0%	100%	125	0
	2048	55	0%	0%	43	0%	0%	36	0%	0%	100%	125	0
	2049	56	0%	0%	44	0%	0%	37	0%	0%	100%	125	0
	2050	**57**	**0%**	**0%**	**45**	**0%**	**0%**	**38**	0%	**0%**	**100%**	125	0

125	SPBP max forecasted calls	
255	existing Tier II vessels	2012
567	existing Tier I vessels	2005
299	existing Tier 0 vessels	1993
1	ship calls/year	
1,121	capacity of calls for existing fleet	



San Pedro Bay Ports
AQMP - IMO Tier Distribution Forecasting
Suezmax Tankers
DRAFT

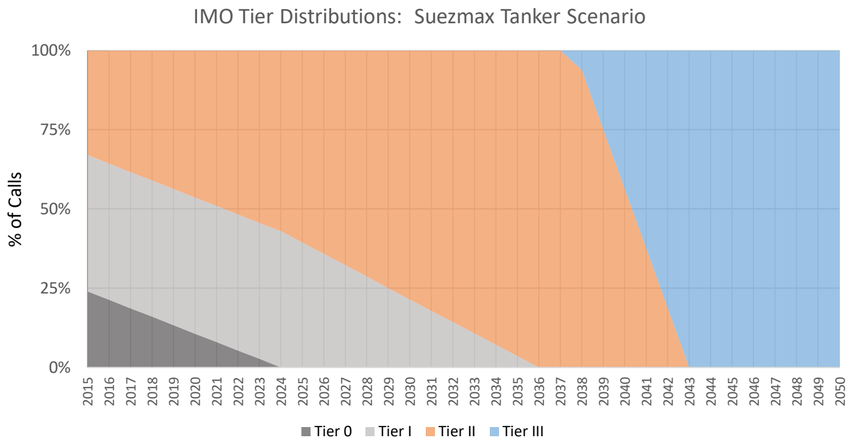
6/1/2017
scg v1

IHS world fleet data & UPDATED SPBP Vessel Call Forecast - IHS Marine Data through Q1 - 2017

	Count/	Fleet Counts			Fleet Average Model Year		
Suezmax	Calls	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Suezmax - Global	608	148	264	196	1993	2005	2012
2015 SPBP	73	3	62	8	1999	2004	2012
		Fleet Distribtuion			Fleet Average Age		
Suezmax		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Fleet %/Years		24%	43%	33%	22	10	3
Fleet %/Years		4%	85%	11%	16	11	3

		Tier 0			Tier I			Tier II			Suezmax		Suezmax
	Year	T0 avg age	Tier 0	Tier 0 TF	T1 avg age	Tier I	Tier I TF	avg age	Tier II	Tier II TF	Tier III	fc	ex fleet
Baseline	**2015**	**22**	**100%**	**24%**	**10**	**100%**	**43%**	**3**	**100%**	**33%**	**0%**	73	608
	2016	23	89%	21%	11	100%	43%	4	100%	36%	0%	74	592
	2017	24	78%	19%	12	100%	43%	5	100%	38%	0%	75	575
	2018	25	67%	16%	13	100%	43%	6	100%	41%	0%	76	559
	2019	26	56%	13%	14	100%	43%	7	100%	44%	0%	78	542
	2020	**27**	44%	**11%**	**15**	100%	**43%**	**8**	**100%**	**46%**	**0%**	79	526
	2021	28	33%	8%	16	100%	43%	9	100%	49%	0%	79	509
	2022	29	22%	5%	17	100%	43%	10	100%	52%	0%	80	493
	2023	30	11%	3%	18	100%	43%	11	100%	54%	0%	80	476
	2024	31	0%	0%	19	100%	43%	12	100%	57%	0%	80	460
	2025	**32**	**0%**	**0%**	**20**	**92%**	**39%**	**13**	**100%**	**61%**	**0%**	81	438
	2026	33	0%	0%	21	83%	36%	14	100%	64%	0%	81	416
	2027	34	0%	0%	22	75%	32%	15	100%	68%	0%	82	394
	2028	35	0%	0%	23	67%	29%	16	100%	71%	0%	82	372
	2029	36	0%	0%	24	58%	25%	17	100%	75%	0%	83	350
	2030	**37**	**0%**	**0%**	**25**	**50%**	**22%**	**18**	**100%**	**79%**	**0%**	83	328
	2031	38	0%	0%	26	42%	18%	19	100%	82%	0%	83	306
	2032	39	0%	0%	27	33%	14%	20	92%	86%	0%	84	268
	2033	40	0%	0%	28	25%	11%	21	83%	89%	0%	84	229
	2034	41	0%	0%	29	17%	7%	22	75%	93%	0%	85	191
	2035	**42**	**0%**	**0%**	**30**	**8%**	**4%**	**23**	**67%**	**96%**	**0%**	85	153
	2036	43	0%	0%	31	0%	0%	24	58%	100%	0%	86	114
	2037	44	0%	0%	32	0%	0%	25	50%	100%	0%	86	98
	2038	45	0%	0%	33	0%	0%	26	42%	94%	6%	87	82
	2039	46	0%	0%	34	0%	0%	27	33%	75%	25%	87	65
	2040	**47**	**0%**	**0%**	**35**	**0%**	**0%**	**28**	**25%**	**56%**	**44%**	87	49
	2041	48	0%	0%	36	0%	0%	29	17%	38%	62%	87	33
	2042	49	0%	0%	37	0%	0%	30	8%	19%	81%	87	16
	2043	50	0%	0%	38	0%	0%	31	0%	0%	100%	87	0
	2044	51	0%	0%	39	0%	0%	32	0%	0%	100%	87	0
	2045	**52**	**0%**	**0%**	**40**	**0%**	**0%**	**33**	**0%**	**0%**	**100%**	87	0
	2046	53	0%	0%	41	0%	0%	34	0%	0%	100%	87	0
	2047	54	0%	0%	42	0%	0%	35	0%	0%	100%	87	0
	2048	55	0%	0%	43	0%	0%	36	0%	0%	100%	87	0
	2049	56	0%	0%	44	0%	0%	37	0%	0%	100%	87	0
	2050	**57**	**0%**	**0%**	**45**	**0%**	**0%**	**38**	**0%**	**0%**	**100%**	87	0

87 SPBP max forecasted calls
196 existing Tier II vessels 2012
264 existing Tier I vessels 2005
148 existing Tier 0 vessels 1993
1 ship calls/year
608 capacity of calls for existing fleet



San Pedro Bay Ports
AQMP - IMO Tier Distribution Forecasting
VLCC Tankers
DRAFT

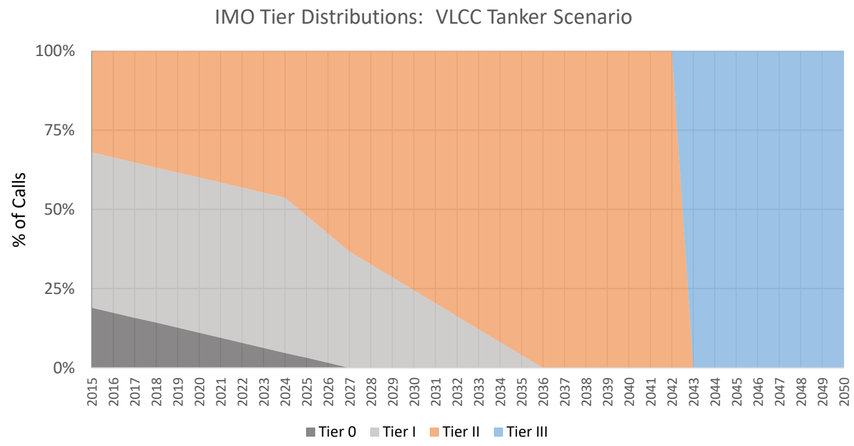
6/1/2017
scg v1

IHS world fleet data & UPDATED SPBP Vessel Call Forecast - IHS Marine Data through Q1 - 2017

	Count/	Fleet Counts			Fleet Average Model Year		
VLCC	Calls	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
VLCC - Global	708	132	348	228	1996	2005	2012
2015 SPBP	12	0	10	2		2005	2011
		Fleet Distribtuion			Fleet Average Age		
VLCC		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
VLCC - Global		19%	49%	32%	19	10	3
2015 SPBP		0%	83%	17%		10	4

		Tier 0			Tier I			Tier II			VLCC		VLCC
	Year	T0 avg age	Tier 0	Tier 0 TF	T1 avg age	Tier I	Tier I TF	avg age	Tier II	Tier II TF	Tier III	fc	ex fleet
Baseline	**2015**	**19**	**100%**	**19%**	**10**	**100%**	**49%**	**3**	**100%**	**32%**	**0%**	12	708
	2016	20	92%	17%	11	100%	49%	4	100%	34%	0%	12	697
	2017	21	83%	16%	12	100%	49%	5	100%	35%	0%	12	686
	2018	22	75%	14%	13	100%	49%	6	100%	37%	0%	13	675
	2019	23	67%	13%	14	100%	49%	7	100%	38%	0%	13	664
	2020	**24**	58%	**11%**	**15**	100%	**49%**	**8**	**100%**	**40%**	**0%**	13	653
	2021	25	50%	10%	16	100%	49%	9	100%	42%	0%	13	642
	2022	26	42%	8%	17	100%	49%	10	100%	43%	0%	13	631
	2023	27	33%	6%	18	100%	49%	11	100%	45%	0%	13	620
	2024	28	25%	5%	19	100%	49%	12	100%	46%	0%	13	609
	2025	**29**	17%	**3%**	**20**	**92%**	**45%**	**13**	**100%**	**52%**	**0%**	13	569
	2026	30	8%	2%	21	83%	41%	14	100%	58%	0%	13	529
	2027	31	0%	0%	22	75%	37%	15	100%	63%	0%	13	489
	2028	32	0%	0%	23	67%	33%	16	100%	67%	0%	13	460
	2029	33	0%	0%	24	58%	29%	17	100%	71%	0%	14	431
	2030	**34**	**0%**	**0%**	**25**	**50%**	**25%**	**18**	**100%**	**76%**	**0%**	14	402
	2031	35	0%	0%	26	42%	20%	19	100%	80%	0%	14	373
	2032	36	0%	0%	27	33%	16%	20	92%	84%	0%	14	325
	2033	37	0%	0%	28	25%	12%	21	83%	88%	0%	14	277
	2034	38	0%	0%	29	17%	8%	22	75%	92%	0%	14	229
	2035	**39**	**0%**	**0%**	**30**	**8%**	**4%**	**23**	**67%**	**96%**	**0%**	14	181
	2036	40	0%	0%	31	0%	0%	24	58%	100%	0%	14	133
	2037	41	0%	0%	32	0%	0%	25	50%	100%	0%	14	114
	2038	42	0%	0%	33	0%	0%	26	42%	100%	0%	14	95
	2039	43	0%	0%	34	0%	0%	27	33%	100%	0%	14	76
	2040	**44**	**0%**	**0%**	**35**	**0%**	**0%**	**28**	**25%**	**100%**	**0%**	14	57
	2041	45	0%	0%	36	0%	0%	29	17%	100%	0%	14	38
	2042	46	0%	0%	37	0%	0%	30	8%	100%	0%	14	19
	2043	47	0%	0%	38	0%	0%	31	0%	0%	100%	14	0
	2044	48	0%	0%	39	0%	0%	32	0%	0%	100%	14	0
	2045	**49**	**0%**	**0%**	**40**	**0%**	**0%**	**33**	**0%**	**0%**	**100%**	14	0
	2046	50	0%	0%	41	0%	0%	34	0%	0%	100%	14	0
	2047	51	0%	0%	42	0%	0%	35	0%	0%	100%	14	0
	2048	52	0%	0%	43	0%	0%	36	0%	0%	100%	14	0
	2049	53	0%	0%	44	0%	0%	37	0%	0%	100%	14	0
	2050	**54**	**0%**	**0%**	**45**	**0%**	**0%**	**38**	0%	**0%**	**100%**	14	0

14	SPBP max forecasted calls	
228	existing Tier II vessels	2012
348	existing Tier I vessels	2005
132	existing Tier 0 vessels	1996
1	ship calls/year	
708	capacity of calls for existing fleet	



San Pedro Bay Ports
AQMP - IMO Tier Distribution Forecasting
ULCC Tankers
DRAFT

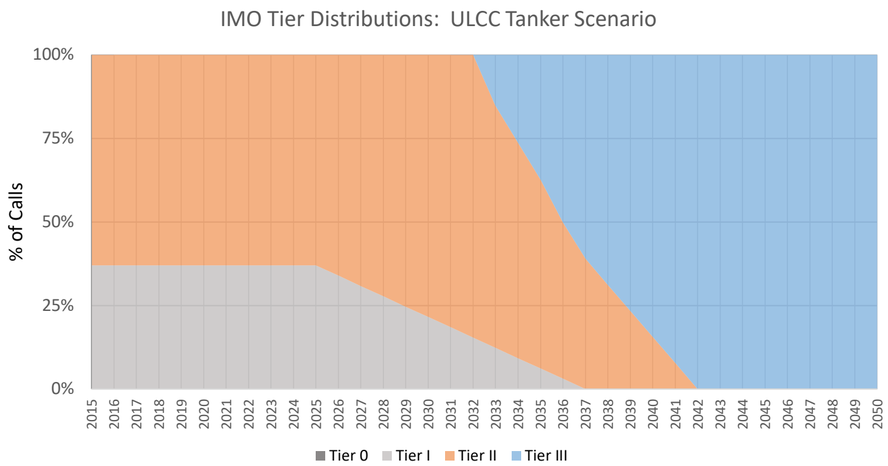
6/1/2017
scg v1

IHS world fleet data & UPDATED SPBP Vessel Call Forecast - IHS Marine Data through Q1 - 2017

	Count/	Fleet Counts			Fleet Average Model Year		
ULCC	Calls	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
ULCC - Global	46	0	17	29		2006	2011
2015 SPBP	26	0	22	4		2009	2010
		Fleet Distribtuion			Fleet Average Age		
ULCC		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
ULCC - Global		0%	37%	63%		9	4
2015 SPBP		0%	85%	15%		6	5

		Tier 0			Tier I			Tier II			ULCC		ULCC
	Year	T0 avg age	Tier 0	Tier 0 TF	T1 avg age	Tier I	Tier I TF	avg age	Tier II	Tier II TF	Tier III	fc	ex fleet
Baseline	**2015**		**0%**	**0%**	**9**	**100%**	**37%**	**4**	**100%**	**63%**	**0%**	26	46
	2016		0%	0%	10	100%	37%	5	100%	63%	0%	26	46
	2017		0%	0%	11	100%	37%	6	100%	63%	0%	27	46
	2018		0%	0%	12	100%	37%	7	100%	63%	0%	27	46
	2019		0%	0%	13	100%	37%	8	100%	63%	0%	28	46
	2020		0%	**0%**	**14**	100%	**37%**	**9**	**100%**	**63%**	**0%**	28	46
	2021		0%	0%	15	100%	37%	10	100%	63%	0%	28	46
	2022		0%	0%	16	100%	37%	11	100%	63%	0%	28	46
	2023		0%	0%	17	100%	37%	12	100%	63%	0%	28	46
	2024		0%	0%	18	100%	37%	13	100%	63%	0%	29	46
	2025		0%	**0%**	**19**	**100%**	**37%**	**14**	**100%**	**63%**	**0%**	29	46
	2026		0%	0%	20	92%	34%	15	100%	66%	0%	29	45
	2027		0%	0%	21	83%	31%	16	100%	69%	0%	29	43
	2028		0%	0%	22	75%	28%	17	100%	72%	0%	29	42
	2029		0%	0%	23	67%	25%	18	100%	75%	0%	29	40
	2030		0%	**0%**	**24**	**58%**	**22%**	**19**	**100%**	**78%**	**0%**	30	39
	2031		8%	0%	25	50%	19%	20	92%	82%	0%	30	35
	2032		0%	0%	26	42%	15%	21	83%	85%	0%	30	31
	2033		0%	0%	27	33%	12%	22	75%	73%	15%	30	27
	2034		0%	0%	28	25%	9%	23	67%	64%	26%	30	24
	2035		0%	**0%**	**29**	**17%**	**6%**	**24**	**58%**	**56%**	**37%**	30	20
	2036		0%	0%	30	8%	3%	25	50%	47%	50%	31	16
	2037		0%	0%	31	0%	0%	26	42%	39%	61%	31	12
	2038		0%	0%	32	0%	0%	27	33%	31%	69%	31	10
	2039		0%	0%	33	0%	0%	28	25%	23%	77%	31	7
	2040		0%	**0%**	**34**	**0%**	**0%**	**29**	**17%**	**16%**	**84%**	31	5
	2041		0%	0%	35	0%	0%	30	8%	8%	92%	31	2
	2042		0%	0%	36	0%	0%	31	0%	0%	100%	31	0
	2043		0%	0%	37	0%	0%	32	0%	0%	100%	31	0
	2044		0%	0%	38	0%	0%	33	0%	0%	100%	31	0
	2045		0%	**0%**	**39**	**0%**	**0%**	**34**	**0%**	**0%**	**100%**	31	0
	2046		0%	0%	40	0%	0%	35	0%	0%	100%	31	0
	2047		0%	0%	41	0%	0%	36	0%	0%	100%	31	0
	2048		0%	0%	42	0%	0%	37	0%	0%	100%	31	0
	2049		0%	0%	43	0%	0%	38	0%	0%	100%	31	0
	2050		**0%**	**0%**	**44**	**0%**	**0%**	**39**	0%	**0%**	**100%**	31	0

31	SPBP max forecasted calls	
29	existing Tier II vessels	2011
17	existing Tier I vessels	2006
0	existing Tier 0 vessels	0
1	ship calls/year	
46	capacity of calls for existing fleet	



San Pedro Bay Ports
AQMP - IMO Tier Distribution Forecasting
Cruise Ships
DRAFT

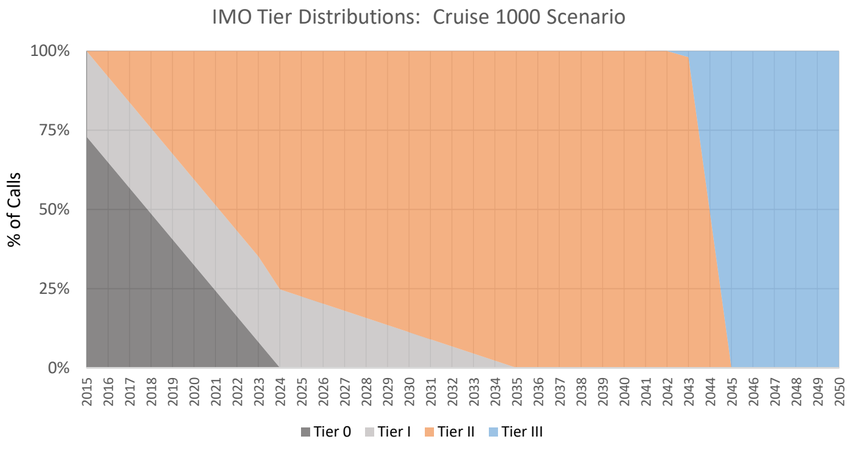
6/1/2017
scg v1

IHS world fleet data & UPDATED SPBP Vessel Call Forecast - IHS Marine Data through Q1 - 2017

		Fleet Counts			Fleet Average Model Year		
Capacity Range	Count	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Cruise 1000 - Global 310-1200 passengers	560	368	142	50	1993	2004	2014
Cruise 2000 - Global 1800-2999 passenger	105	59	40	6	1992	2004	2013
Cruise 3000 - Global 3000-4538 passenger	68	11	43	14	1998	2005	2012
		Fleet Distribtuion			Fleet Average Age		
Capacity Range		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Cruise 1000 - Global 310-1200 passengers		66%	25%	9%	22	11	1
Cruise 2000 - Global 1800-2999 passenger		56%	38%	6%	23	11	2
Cruise 3000 - Global 3000-4538 passenger		16%	63%	21%	17	10	3
		Fleet Counts			Fleet Average Model Year		
2015 SPBP	Calls	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Cruise 1000	11	8	3		1997	2008	
Cruise 2000	271	210	61		1993	2001	
Cruise 3000	100	28	72		1998	2004	
		Fleet Distribtuion			Fleet Average Age		
2015 SPBP		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Cruise 1000		73%	27%		18	7	
Cruise 2000		77%	23%		22	14	
Cruise 3000		28%	72%		17	11	

		Tier 0			Tier I			Tier II			Cruise 1000	Cruise 1000
	Year	T0 avg age	Tier 0	Tier 0 TF	T1 avg age	Tier I	Tier I TF	avg age	Tier II	Tier II TF	Tier III	fc	ex fleet
Baseline	**2015**	**22**	**100%**	**73%**	**11**	**100%**	**27%**	**1**	**100%**	**0%**	**0%**	11	1,120
	2016	23	89%	65%	12	100%	27%	2	100%	8%	0%	11	1,038
	2017	24	78%	57%	13	100%	27%	3	100%	16%	0%	12	956
	2018	25	67%	49%	14	100%	27%	4	100%	24%	0%	12	875
	2019	26	56%	41%	15	100%	27%	5	100%	32%	0%	13	793
	2020	**27**	44%	**32%**	**16**	100%	**27%**	**6**	**100%**	**41%**	**0%**	13	711
	2021	28	33%	24%	17	100%	27%	7	100%	49%	0%	13	629
	2022	29	22%	16%	18	100%	27%	8	100%	57%	0%	14	548
	2023	30	11%	8%	19	100%	27%	9	100%	65%	0%	14	466
	2024	31	0%	0%	20	92%	25%	10	100%	75%	0%	15	360
	2025	**32**	0%	**0%**	**21**	**83%**	**23%**	**11**	**100%**	**78%**	**0%**	15	337
	2026	33	0%	0%	22	75%	20%	12	100%	80%	0%	16	313
	2027	34	0%	0%	23	67%	18%	13	100%	82%	0%	16	289
	2028	35	0%	0%	24	58%	16%	14	100%	84%	0%	16	266
	2029	36	0%	0%	25	50%	14%	15	100%	87%	0%	17	242
	2030	**37**	0%	**0%**	**26**	**42%**	**11%**	**16**	**92%**	**89%**	**0%**	17	210
	2031	38	8%	0%	27	33%	9%	17	100%	91%	0%	17	256
	2032	39	0%	0%	28	25%	7%	18	100%	93%	0%	17	171
	2033	40	0%	0%	29	17%	5%	19	100%	96%	0%	17	147
	2034	41	0%	0%	30	8%	2%	20	92%	98%	0%	17	115
	2035	**42**	0%	**0%**	**31**	**0%**	**0%**	**21**	**83%**	**100%**	**0%**	17	83
	2036	43	0%	0%	32	0%	0%	22	75%	100%	0%	17	75
	2037	44	0%	0%	33	0%	0%	23	67%	100%	0%	17	67
	2038	45	0%	0%	34	0%	0%	24	58%	100%	0%	17	58
	2039	46	0%	0%	35	0%	0%	25	50%	100%	0%	17	50
	2040	**47**	0%	**0%**	**36**	**0%**	**0%**	**26**	**42%**	**100%**	**0%**	17	42
	2041	48	0%	0%	37	0%	0%	27	33%	100%	0%	17	33
	2042	49	0%	0%	38	0%	0%	28	25%	100%	0%	17	25
	2043	50	0%	0%	39	0%	0%	29	17%	98%	2%	17	17
	2044	51	0%	0%	40	0%	0%	30	8%	49%	51%	17	8
	2045	**52**	0%	**0%**	**41**	**0%**	**0%**	**31**	**0%**	**0%**	**100%**	17	0
	2046	53	0%	0%	42	0%	0%	32	0%	0%	100%	17	0
	2047	54	0%	0%	43	0%	0%	33	0%	0%	100%	17	0
	2048	55	0%	0%	44	0%	0%	34	0%	0%	100%	17	0
	2049	56	0%	0%	45	0%	0%	35	0%	0%	100%	17	0
	2050	**57**	**0%**	**0%**	**46**	**0%**	**0%**	**36**	0%	**0%**	**100%**	17	0

17	SPBP max forecasted calls
50	existing Tier II vessels 2014
142	existing Tier I vessels 2004
368	existing Tier 0 vessels 1993
2	ship calls/year
1,120	capacity of calls for existing fleet

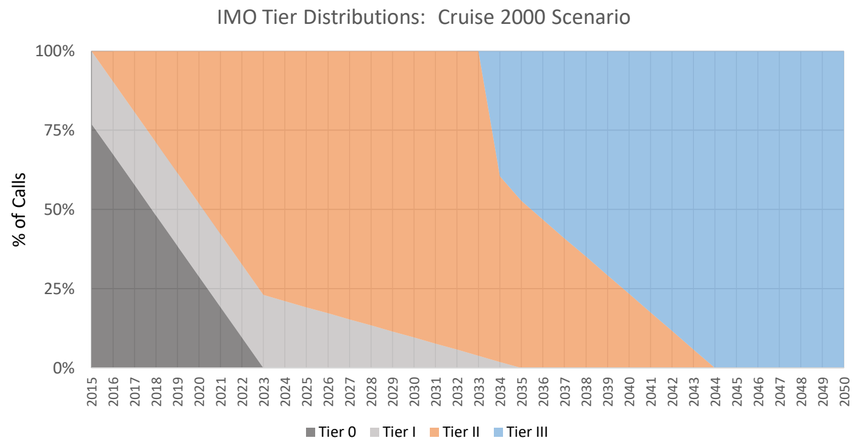


San Pedro Bay Ports
AQMP - IMO Tier Distribution Forecasting
Cruise Ships
DRAFT

6/1/2017
scg v1

	Year	Tier 0 T0 avg age	Tier 0	Tier 0 TF	Tier I T1 avg age	Tier I	Tier I TF	Tier II avg age	Tier II	Tier II TF	Cruise 2000 Tier III	fc	Cruise 2000 ex fleet
Baseline	**2015**	**23**	**100%**	**77%**	**11**	**100%**	**23%**	**2**	**100%**	**0%**	**0%**	271	5,250
	2016	24	88%	67%	12	100%	23%	3	100%	10%	0%	281	4,881
	2017	25	75%	58%	13	100%	23%	4	100%	19%	0%	291	4,513
	2018	26	63%	48%	14	100%	23%	5	100%	29%	0%	301	4,144
	2019	27	50%	39%	15	100%	23%	6	100%	39%	0%	311	3,775
	2020	**28**	38%	**29%**	**16**	100%	**23%**	**7**	**100%**	**48%**	**0%**	321	3,406
	2021	29	25%	19%	17	100%	23%	8	100%	58%	0%	332	3,038
	2022	30	13%	10%	18	100%	23%	9	100%	67%	0%	342	2,669
	2023	31	0%	0%	19	100%	23%	10	100%	77%	0%	353	2,300
	2024	32	0%	0%	20	92%	21%	11	100%	79%	0%	363	2,133
	2025	**33**	0%	**0%**	**21**	**83%**	**19%**	**12**	**100%**	**81%**	**0%**	374	1,967
	2026	34	0%	0%	22	75%	17%	13	100%	83%	0%	384	1,800
	2027	35	0%	0%	23	67%	15%	14	100%	85%	0%	395	1,633
	2028	36	0%	0%	24	58%	13%	15	100%	87%	0%	406	1,467
	2029	37	0%	0%	25	50%	12%	16	100%	89%	0%	416	1,300
	2030	**38**	0%	**0%**	**26**	**42%**	**10%**	**17**	**92%**	**90%**	**0%**	427	1,108
	2031	39	0%	0%	27	33%	8%	18	100%	92%	0%	427	967
	2032	40	0%	0%	28	25%	6%	19	100%	94%	0%	427	800
	2033	41	0%	0%	29	17%	4%	20	92%	96%	0%	427	608
	2034	42	0%	0%	30	8%	2%	21	83%	59%	40%	427	417
	2035	**43**	0%	**0%**	**31**	**0%**	**0%**	**22**	**75%**	**53%**	**47%**	427	225
	2036	44	0%	0%	32	0%	0%	23	67%	47%	53%	427	200
	2037	45	0%	0%	33	0%	0%	24	58%	41%	59%	427	175
	2038	46	0%	0%	34	0%	0%	25	50%	35%	65%	427	150
	2039	47	0%	0%	35	0%	0%	26	42%	29%	71%	427	125
	2040	**48**	0%	**0%**	**36**	**0%**	**0%**	**27**	**33%**	**23%**	**77%**	427	100
	2041	49	0%	0%	37	0%	0%	28	25%	18%	82%	427	75
	2042	50	0%	0%	38	0%	0%	29	17%	12%	88%	427	50
	2043	51	0%	0%	39	0%	0%	30	8%	6%	94%	427	25
	2044	52	0%	0%	40	0%	0%	31	0%	0%	100%	427	0
	2045	**53**	0%	**0%**	**41**	**0%**	**0%**	**32**	**0%**	**0%**	**100%**	427	0
	2046	54	0%	0%	42	0%	0%	33	0%	0%	100%	427	0
	2047	55	0%	0%	43	0%	0%	34	0%	0%	100%	427	0
	2048	56	0%	0%	44	0%	0%	35	0%	0%	100%	427	0
	2049	57	0%	0%	45	0%	0%	36	0%	0%	100%	427	0
	2050	**58**	**0%**	**0%**	**46**	**0%**	**0%**	**37**	0%	**0%**	**100%**	427	0

427 SPBP max forecasted calls
6 existing Tier II vessels 2013
40 existing Tier I vessels 2004
59 existing Tier 0 vessels 1992
50 ship calls/year
5,250 capacity of calls for existing fleet

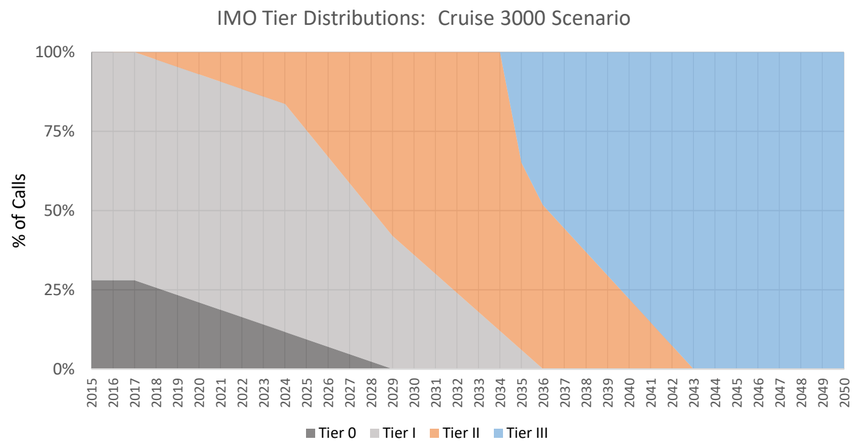


San Pedro Bay Ports
AQMP - IMO Tier Distribution Forecasting
Cruise Ships
DRAFT

6/1/2017
scg v1

			Tier 0			Tier I			Tier II			Cruise 3000		Cruise 3000
	Year	T0 avg age	Tier 0	Tier 0 TF	T1 avg age	Tier I	Tier I TF	avg age	Tier II	Tier II TF	Tier III	fc	ex fleet
Baseline	**2015**	**17**	**100%**	**28%**	**10**	**100%**	**72%**	**3**	**100%**	**0%**	**0%**	100	680
	2016	18	100%	28%	11	100%	72%	4	100%	0%	0%	104	680
	2017	19	100%	28%	12	100%	72%	5	100%	0%	0%	107	680
	2018	20	92%	26%	13	100%	72%	6	100%	2%	0%	111	671
	2019	21	83%	23%	14	100%	72%	7	100%	5%	0%	115	662
	2020	**22**	75%	**21%**	**15**	100%	**72%**	**8**	**100%**	**7%**	**0%**	119	653
	2021	23	67%	19%	16	100%	72%	9	100%	9%	0%	122	643
	2022	24	58%	16%	17	100%	72%	10	100%	12%	0%	126	634
	2023	25	50%	14%	18	100%	72%	11	100%	14%	0%	130	625
	2024	26	42%	12%	19	100%	72%	12	100%	16%	0%	134	616
	2025	**27**	33%	**9%**	**20**	**92%**	**66%**	**13**	**100%**	**25%**	**0%**	138	571
	2026	28	25%	7%	21	83%	60%	14	100%	33%	0%	142	526
	2027	29	17%	5%	22	75%	54%	15	100%	41%	0%	146	481
	2028	30	8%	2%	23	67%	48%	16	100%	50%	0%	150	436
	2029	31	0%	0%	24	58%	42%	17	100%	58%	0%	154	391
	2030	**32**	0%	**0%**	**25**	**50%**	**36%**	**18**	**100%**	**64%**	**0%**	158	355
	2031	33	0%	0%	26	42%	30%	19	100%	70%	0%	158	319
	2032	34	0%	0%	27	33%	24%	20	92%	76%	0%	158	272
	2033	35	0%	0%	28	25%	18%	21	83%	82%	0%	158	224
	2034	36	0%	0%	29	17%	12%	22	75%	88%	0%	158	177
	2035	**37**	0%	**0%**	**30**	**8%**	**6%**	**23**	**67%**	**59%**	**35%**	158	129
	2036	38	0%	0%	31	0%	0%	24	58%	52%	48%	158	82
	2037	39	0%	0%	32	0%	0%	25	50%	44%	56%	158	70
	2038	40	0%	0%	33	0%	0%	26	42%	37%	63%	158	58
	2039	41	0%	0%	34	0%	0%	27	33%	30%	70%	158	47
	2040	**42**	0%	**0%**	**35**	**0%**	**0%**	**28**	**25%**	**22%**	**78%**	158	35
	2041	43	0%	0%	36	0%	0%	29	17%	15%	85%	158	23
	2042	44	0%	0%	37	0%	0%	30	8%	7%	93%	158	12
	2043	45	0%	0%	38	0%	0%	31	0%	0%	100%	158	0
	2044	46	0%	0%	39	0%	0%	32	0%	0%	100%	158	0
	2045	**47**	0%	**0%**	**40**	**0%**	**0%**	**33**	**0%**	**0%**	**100%**	158	0
	2046	48	0%	0%	41	0%	0%	34	0%	0%	100%	158	0
	2047	49	0%	0%	42	0%	0%	35	0%	0%	100%	158	0
	2048	50	0%	0%	43	0%	0%	36	0%	0%	100%	158	0
	2049	51	0%	0%	44	0%	0%	37	0%	0%	100%	158	0
	2050	**52**	**0%**	**0%**	**45**	**0%**	**0%**	**38**	0%	**0%**	**100%**	158	0

158 SPBP max forecasted calls
14 existing Tier II vessels 2012
43 existing Tier I vessels 2005
11 existing Tier 0 vessels 1998
10 ship calls/year
680 capacity of calls for existing fleet



San Pedro Bay Ports
AQMP - IMO Tier Distribution Forecasting
AutoCarriers
DRAFT

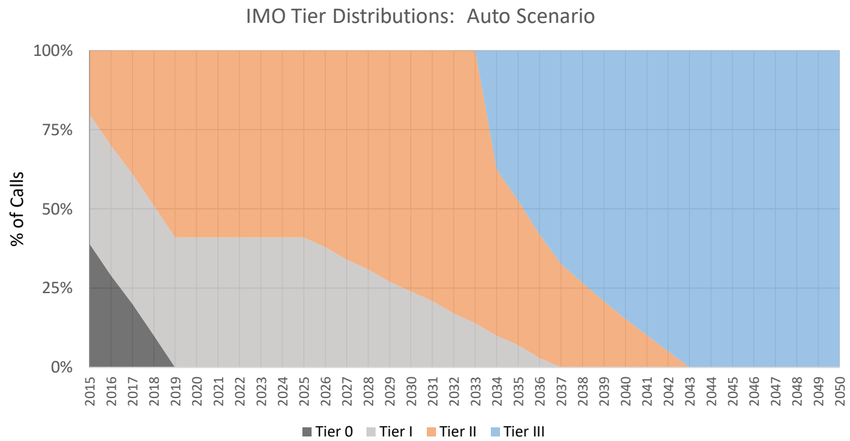
6/1/2017
scg v1

IHS world fleet data & UPDATED SPBP Vessel Call Forecast - IHS Marine Data through Q1 - 2017

	Count/	Fleet Counts			Fleet Average Model Year		
2,550+ Capacity	Calls	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Auto Carrier - Global	850	335	346	169	1988	2006	2012
2015 SPBP	255	49	200	6	1994	2005	2010
		Fleet Distribtuion			Fleet Average Age		
2,550+ Capacity		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Fleet %/Years		39%	41%	20%	27	9	3
Fleet %/Years		19%	43%	22%	21	10	5

			Tier 0			Tier I			Tier II		Auto		
	Year	T0 avg age	Tier 0	Tier 0 TF	T1 avg age	Tier I	Tier I TF	avg age	Tier II	Tier II TF	Tier III	fc	ex fleet
Baseline	**2015**	**27**	**100%**	**39%**	**9**	**100%**	**41%**	**3**	**100%**	**20%**	**0%**	255	1,700
	2016	28	75%	29%	10	100%	41%	4	100%	30%	0%	268	1,533
	2017	29	50%	20%	11	100%	41%	5	100%	39%	0%	281	1,365
	2018	30	25%	10%	12	100%	41%	6	100%	49%	0%	293	1,198
	2019	31	0%	0%	13	100%	41%	7	100%	59%	0%	306	1,030
	2020	**32**	0%	**0%**	**14**	**100%**	**41%**	**8**	**100%**	**59%**	**0%**	319	1,030
	2021	33	0%	0%	15	100%	41%	9	100%	59%	0%	332	1,030
	2022	34	0%	0%	16	100%	41%	10	100%	59%	0%	344	1,030
	2023	35	0%	0%	17	100%	41%	11	100%	59%	0%	357	1,030
	2024	36	0%	0%	18	100%	41%	12	100%	59%	0%	370	1,030
	2025	**37**	**0%**	**0%**	**19**	**100%**	**41%**	**13**	**100%**	**59%**	**0%**	383	1,030
	2026	38	0%	0%	20	92%	38%	14	100%	62%	0%	394	972
	2027	39	0%	0%	21	83%	34%	15	100%	66%	0%	405	915
	2028	40	0%	0%	22	75%	31%	16	100%	69%	0%	416	857
	2029	41	0%	0%	23	67%	27%	17	100%	73%	0%	427	799
	2030	**42**	**0%**	**0%**	**24**	**58%**	**24%**	**18**	**100%**	**76%**	**0%**	438	742
	2031	43	0%	0%	25	50%	21%	19	100%	79%	0%	449	684
	2032	44	0%	0%	26	42%	17%	20	92%	83%	0%	461	598
	2033	45	0%	0%	27	33%	14%	21	83%	86%	0%	472	512
	2034	46	0%	0%	28	25%	10%	22	75%	52%	38%	483	427
	2035	**47**	**0%**	**0%**	**29**	**17%**	**7%**	**23**	**67%**	**46%**	**47%**	494	341
	2036	48	0%	0%	30	8%	3%	24	58%	39%	58%	506	255
	2037	49	0%	0%	31	0%	0%	25	50%	33%	67%	518	169
	2038	50	0%	0%	32	0%	0%	26	42%	27%	73%	530	141
	2039	51	0%	0%	33	0%	0%	27	33%	21%	79%	542	113
	2040	**52**	**0%**	**0%**	**34**	**0%**	**0%**	**28**	**25%**	**15%**	**85%**	554	85
	2041	53	0%	0%	35	0%	0%	29	17%	10%	90%	554	56
	2042	54	0%	0%	36	0%	0%	30	8%	5%	95%	554	28
	2043	55	0%	0%	37	0%	0%	31	0%	0%	100%	554	0
	2044	56	0%	0%	38	0%	0%	32	0%	0%	100%	554	0
	2045	**57**	**0%**	**0%**	**39**	**0%**	**0%**	**33**	**0%**	**0%**	**100%**	554	0
	2046	58	0%	0%	40	0%	0%	34	0%	0%	100%	554	0
	2047	59	0%	0%	41	0%	0%	35	0%	0%	100%	554	0
	2048	60	0%	0%	42	0%	0%	36	0%	0%	100%	554	0
	2049	61	0%	0%	43	0%	0%	37	0%	0%	100%	554	0
	2050	**62**	**0%**	**0%**	**44**	**0%**	**0%**	**38**	0%	**0%**	**100%**	554	0

Auto		
554	SPBP max forecasted calls	
169	existing Tier II vessels	2012
346	existing Tier I vessels	2006
335	existing Tier 0 vessels	1988
2	ship calls/year	
1,700	capacity of calls for existing fleet	



San Pedro Bay Ports
AQMP - IMO Tier Distribution Forecasting
Dry Bulk
DRAFT

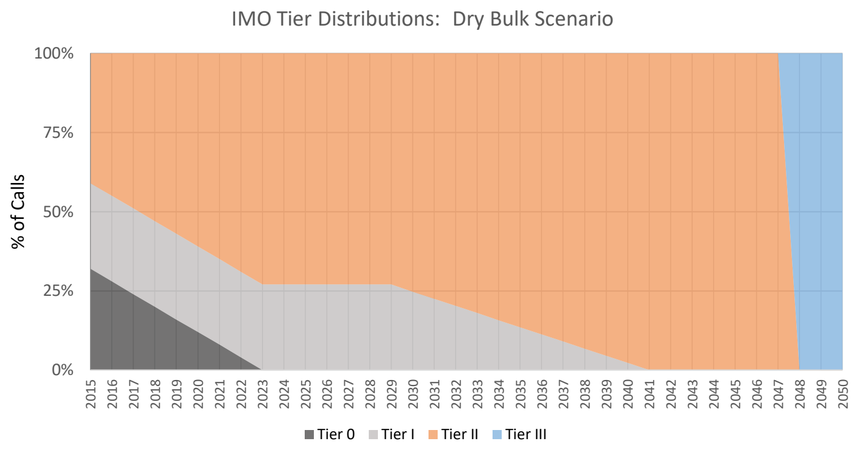
6/1/2017
scg v1

IHS world fleet data & UPDATED SPBP Vessel Call Forecast - IHS Marine Data through Q1 - 2017

	Count/	Fleet Counts			Fleet Average Model Year		
16,181-114,922 dwt	Calls	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Dry Bulk - Global	10,536	3,409	2,816	4,311	1987	2005	2012
2015 SPBP	269	11	183	75	1997	2004	2011
		Fleet Distribtuion			Fleet Average Age		
16,181-114,922 dwt		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Fleet %/Years		32%	27%	41%	28	10	3
Fleet %/Years		4%	68%	28%	18	11	4

		Tier 0			Tier I			Tier II			Dry Bulk		Dry Bulk
	Year	T0 avg age	Tier 0	Tier 0 TF	T1 avg age	Tier I	Tier I TF	avg age	Tier II	Tier II TF	Tier III	fc	ex fleet
Baseline	**2015**	**28**	**100%**	**32%**	**10**	**100%**	**27%**	**3**	**100%**	**41%**	**0%**	269	10,536
	2016	29	88%	28%	11	100%	27%	4	100%	45%	0%	269	10,110
	2017	30	75%	24%	12	100%	27%	5	100%	49%	0%	268	9,684
	2018	31	63%	20%	13	100%	27%	6	100%	53%	0%	268	9,258
	2019	32	50%	16%	14	100%	27%	7	100%	57%	0%	268	8,832
	2020	**33**	38%	**12%**	**15**	100%	**27%**	**8**	**100%**	**61%**	**0%**	267	8,405
	2021	34	25%	8%	16	100%	27%	9	100%	65%	0%	268	7,979
	2022	35	13%	4%	17	100%	27%	10	100%	69%	0%	268	7,553
	2023	36	0%	0%	18	100%	27%	11	100%	73%	0%	269	7,127
	2024	37	0%	0%	19	100%	27%	12	100%	73%	0%	269	7,127
	2025	**38**	0%	**0%**	**20**	**100%**	**27%**	**13**	**100%**	**73%**	**0%**	269	7,127
	2026	39	0%	0%	21	100%	27%	14	100%	73%	0%	270	7,127
	2027	40	0%	0%	22	100%	27%	15	100%	73%	0%	271	7,127
	2028	41	0%	0%	23	100%	27%	16	100%	73%	0%	271	7,127
	2029	42	0%	0%	24	100%	27%	17	100%	73%	0%	272	7,127
	2030	**43**	0%	**0%**	**25**	**92%**	**25%**	**18**	**100%**	**75%**	**0%**	272	6,892
	2031	44	0%	0%	26	83%	23%	19	100%	78%	0%	273	6,658
	2032	45	0%	0%	27	75%	20%	20	100%	80%	0%	274	6,423
	2033	46	0%	0%	28	67%	18%	21	100%	82%	0%	274	6,188
	2034	47	0%	0%	29	58%	16%	22	100%	84%	0%	275	5,954
	2035	**48**	0%	**0%**	**30**	**50%**	**14%**	**23**	**100%**	**87%**	**0%**	275	5,719
	2036	49	0%	0%	31	42%	11%	24	100%	89%	0%	275	5,484
	2037	50	0%	0%	32	33%	9%	25	92%	91%	0%	274	4,890
	2038	51	0%	0%	33	25%	7%	26	83%	93%	0%	273	4,297
	2039	52	0%	0%	34	17%	5%	27	75%	96%	0%	272	3,703
	2040	**53**	0%	**0%**	**35**	**8%**	**2%**	**28**	**67%**	**98%**	**0%**	271	3,109
	2041	54	0%	0%	36	0%	0%	29	58%	100%	0%	271	2,515
	2042	55	0%	0%	37	0%	0%	30	50%	100%	0%	271	2,156
	2043	56	0%	0%	38	0%	0%	31	42%	100%	0%	271	1,796
	2044	57	0%	0%	39	0%	0%	32	33%	100%	0%	271	1,437
	2045	**58**	0%	**0%**	**40**	**0%**	**0%**	**33**	**25%**	**100%**	**0%**	271	1,078
	2046	59	0%	0%	41	0%	0%	34	17%	100%	0%	271	719
	2047	60	0%	0%	42	0%	0%	35	8%	100%	0%	271	359
	2048	61	0%	0%	43	0%	0%	36	0%	0%	100%	271	0
	2049	62	0%	0%	44	0%	0%	37	0%	0%	100%	271	0
	2050	**63**	**0%**	**0%**	**45**	**0%**	**0%**	**38**	0%	**0%**	**100%**	271	0

275	SPBP max forecasted calls	
4,311	existing Tier II vessels	2012
2,816	existing Tier I vessels	2005
3,409	existing Tier 0 vessels	1987
1	ship calls/year	
10,536	capacity of calls for existing fleet	



San Pedro Bay Ports
AQMP - IMO Tier Distribution Forecasting
General Cargo
DRAFT

6/1/2017
scg v1

IHS world fleet data & UPDATED SPBP Vessel Call Forecast - IHS Marine Data through Q1 - 2017

	Count/	Fleet Counts			Fleet Average Model Year		
6,000-84,000 dwt	Calls	Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Gen Cargo - Global	6,078	3,325	1,792	961	1983	2006	2013
2015 SPBP	100	22	57	21	1991	2005	2012
		Fleet Distribtuion			Fleet Average Age		
6,000-84,000 dwt		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Fleet %/Years		55%	29%	16%	32	9	2
Fleet %/Years		22%	57%	21%	24	10	3

		Tier 0			Tier I			Tier II			General Cargo		General Cargo
	Year	T0 avg age	Tier 0	Tier 0 TF	T1 avg age	Tier I	Tier I TF	avg age	Tier II	Tier II TF	Tier III	fc	ex fleet
Baseline	**2015**	**32**	**100%**	**55%**	**9**	**100%**	**29%**	**2**	**100%**	**16%**	**0%**	100	6,078
	2016	33	75%	41%	10	100%	29%	3	100%	30%	0%	106	5,247
	2017	34	50%	28%	11	100%	29%	4	100%	44%	0%	112	4,416
	2018	35	25%	14%	12	100%	29%	5	100%	57%	0%	118	3,584
	2019	36	0%	0%	13	100%	29%	6	100%	71%	0%	124	2,753
	2020	**37**	**0%**	**0%**	**14**	**100%**	**29%**	**7**	**100%**	**71%**	**0%**	130	2,753
	2021	38	0%	0%	15	100%	29%	8	100%	71%	0%	132	2,753
	2022	39	0%	0%	16	100%	29%	9	100%	71%	0%	133	2,753
	2023	40	0%	0%	17	100%	29%	10	100%	71%	0%	135	2,753
	2024	41	0%	0%	18	100%	29%	11	100%	71%	0%	136	2,753
	2025	**42**	**0%**	**0%**	**19**	**100%**	**29%**	**12**	**100%**	**71%**	**0%**	138	2,753
	2026	43	0%	0%	20	100%	29%	13	100%	71%	0%	139	2,753
	2027	44	0%	0%	21	100%	29%	14	100%	71%	0%	140	2,753
	2028	45	0%	0%	22	100%	29%	15	100%	71%	0%	141	2,753
	2029	46	0%	0%	23	100%	29%	16	100%	71%	0%	143	2,753
	2030	**47**	**0%**	**0%**	**24**	**100%**	**29%**	**17**	**100%**	**71%**	**0%**	144	2,753
	2031	48	0%	0%	25	92%	27%	18	100%	73%	0%	145	2,604
	2032	49	0%	0%	26	83%	24%	19	100%	76%	0%	147	2,454
	2033	50	0%	0%	27	75%	22%	20	100%	78%	0%	149	2,305
	2034	51	0%	0%	28	67%	19%	21	100%	81%	0%	150	2,156
	2035	**52**	**0%**	**0%**	**29**	**58%**	**17%**	**22**	**100%**	**83%**	**0%**	152	2,006
	2036	53	0%	0%	30	50%	15%	23	100%	86%	0%	153	1,857
	2037	54	0%	0%	31	42%	12%	24	100%	88%	0%	155	1,708
	2038	55	0%	0%	32	33%	10%	25	92%	90%	0%	157	1,478
	2039	56	0%	0%	33	25%	7%	26	83%	93%	0%	158	1,249
	2040	**57**	**0%**	**0%**	**34**	**17%**	**5%**	**27**	**75%**	**95%**	**0%**	160	1,019
	2041	58	0%	0%	35	8%	2%	28	67%	98%	0%	160	790
	2042	59	0%	0%	36	0%	0%	29	58%	100%	0%	160	561
	2043	60	0%	0%	37	0%	0%	30	50%	100%	0%	160	481
	2044	61	0%	0%	38	0%	0%	31	42%	100%	0%	160	400
	2045	**62**	**0%**	**0%**	**39**	**0%**	**0%**	**32**	**33%**	**100%**	**0%**	160	320
	2046	63	0%	0%	40	0%	0%	33	25%	100%	0%	160	240
	2047	64	0%	0%	41	0%	0%	34	**17%**	100%	0%	160	160
	2048	65	0%	0%	42	0%	0%	35	8%	50%	50%	160	80
	2049	66	0%	0%	43	0%	0%	36	0%	0%	100%	160	0
	2050	**67**	**0%**	**0%**	**44**	**0%**	**0%**	**37**	**0%**	**0%**	**100%**	160	0

160 SPBP max forecasted calls
961 existing Tier II vessels 2013
1,792 existing Tier I vessels 2006
3,325 existing Tier 0 vessels 1983
1 ship calls/year
6,078 capacity of calls for existing fleet