



SAN PEDRO BAY PORTS
CLEAN AIR ACTION PLAN 2017

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

JULY 2017

TABLE OF CONTENTS

SYNOPSIS..... I

1.0 SAN PEDRO BAY PORTS TIER DISTRIBUTION APPROACH 1

 1.1 Observations from Historical Call Data..... 2

 1.2 General Discussion of Factors Influencing Deployment of IMO Tier III Vessels..... 6

2.0 IMO TIER DISTRIBUTION FORECASTING APPROACH..... 10

3.0 2015-2050 IMO NO_x TIER DISTRIBUTION FORECAST RESULTS 13

 3.1 Container Ships 13

 3.2 Tankers 16

 3.3 Cruise 24

 3.4 Auto Carriers 28

 3.5 Dry Bulk 29

 3.6 General Cargo 30

APPENDIX A: FORECAST DETAILS

LIST OF TABLES

Table 2.1: 2015 SPBP and 2030 Forecasted SPBP Annual Container Ship Calls by TEU groups ..	11
Table 2.2: 2015-2040 Non-container Ship Call Growth Rates	12
Table 3.1: Global Container Fleet Counts and Average Model Year	13
Table 3.2: Global Characteristics – Chemical Tankers	17
Table 3.3: Global & 2015 SPBP Call Characteristics – Handy Tankers	18
Table 3.4: Global & 2015 SPBP Call Characteristics – Panamax Tankers.....	19
Table 3.5: Global & 2015 SPBP Call Characteristics – Aframax Tankers.....	20
Table 3.6: Global & 2015 SPBP Call Characteristics – Suezmax Tankers	21
Table 3.7: Global & 2015 SPBP Call Characteristics – VLCC Tankers	22
Table 3.8: Global & 2015 SPBP Call Characteristics – ULCC Tankers	23
Table 3.9: Global Characteristics – Cruise.....	25
Table 3.10: 2015 SPBP Call Characteristics – Cruise	25
Table 3.11: Global & 2015 SPBP Call Characteristics – Auto Carriers.....	28
Table 3.12: Global & 2015 SPBP Call Characteristics – Dry Bulk.....	29
Table 3.13: Global & 2015 SPBP Call Characteristics – General Cargo	30

LIST OF FIGURES

Figure 1.1: 2005-2015 SPBP Container Ship Calls by Size Group & Cargo Throughput Trend	3
Figure 1.2: 2005-2015 SPBP Tanker Calls by Size Group	4
Figure 1.3: 2005-2015 SPBP Other Non-container/Non-tanker Ship Calls.....	5
Figure 1.4: 2005-2016 Global Keels Laid but Not Constructed.....	6
Figure 3.1: SPBP Container 2000 TEU Tier Distribution Forecast	14
Figure 3.2: SPBP Container 6000-9000 TEU Tier Distribution Forecast.....	14
Figure 3.3: SPBP Container 10000-14000 TEU Tier Distribution Forecast.....	15
Figure 3.4: SPBP Container 15000-18000 TEU Tier Distribution Forecast.....	15
Figure 3.5: SPBP Container 19000-20000 TEU Tier Distribution Forecast.....	16
Figure 3.6: SPBP Chemical Tanker Tier Distribution Forecast	17
Figure 3.7: SPBP Handy Tanker Tier Distribution Forecast	18
Figure 3.8: SPBP Panamax Tanker Tier Distribution Forecast	19
Figure 3.9: SPBP Aframax Tanker Tier Distribution Forecast.....	20
Figure 3.10: SPBP Suezmax Tanker Tier Distribution Forecast	21
Figure 3.11: SPBP VLCC Tanker Tier Distribution Forecast	22
Figure 3.12: SPBP ULCC Tanker Tier Distribution Forecast.....	23
Figure 3.13: SPBP Cruise 1000 Tier Distribution Forecast	26
Figure 3.14: SPBP Cruise 2000 Tier Distribution Forecast	26
Figure 3.15: SPBP Cruise 3000 Tier Distribution Forecast	27
Figure 3.16: SPBP Auto Carrier Tier Distribution Forecast	28
Figure 3.17: SPBP Dry Bulk Tier Distribution Forecast.....	29
Figure 3.18: SPBP General Cargo Tier Distribution Forecast	30

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 (NO_x) 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 (NO_x) 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 NO_x 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 Ships¹ (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

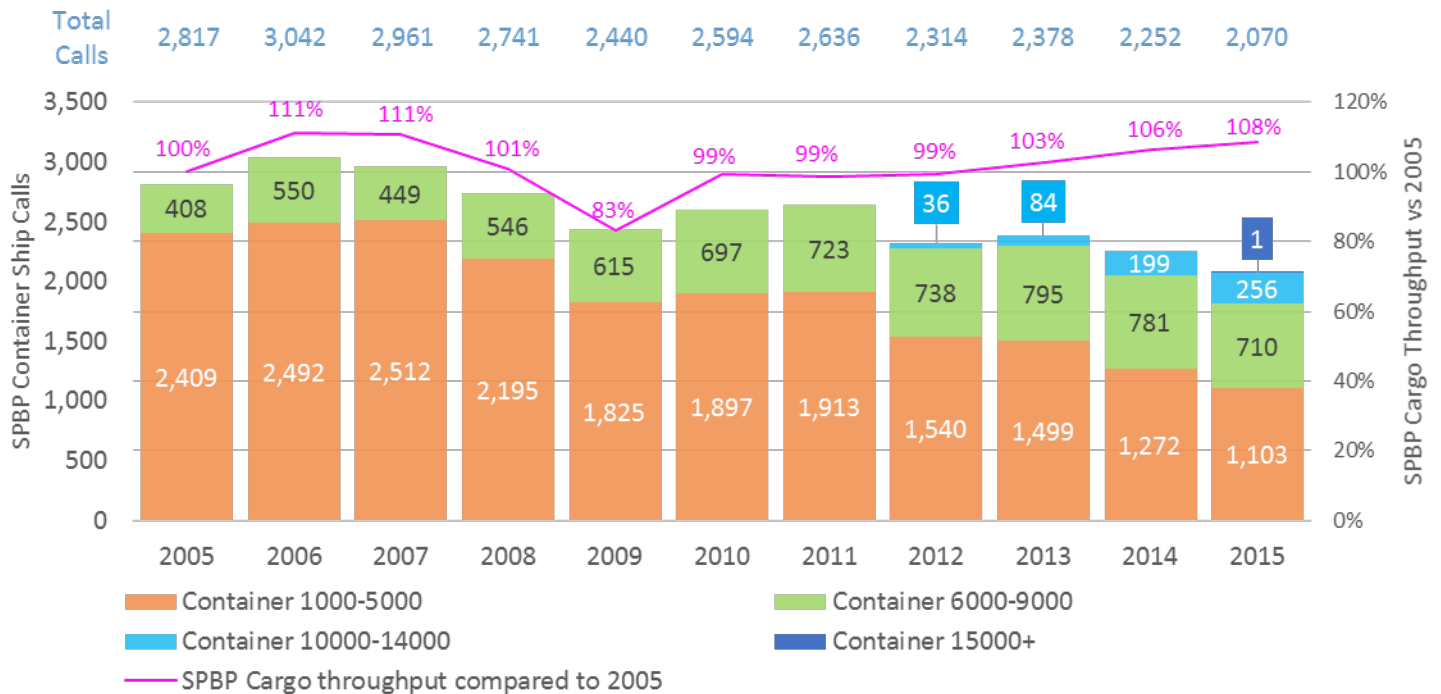
The following section presents a historical review of the call frequency of various ship types back to 2005, the baseline year of the Clean Air Action Plan (CAAP).

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

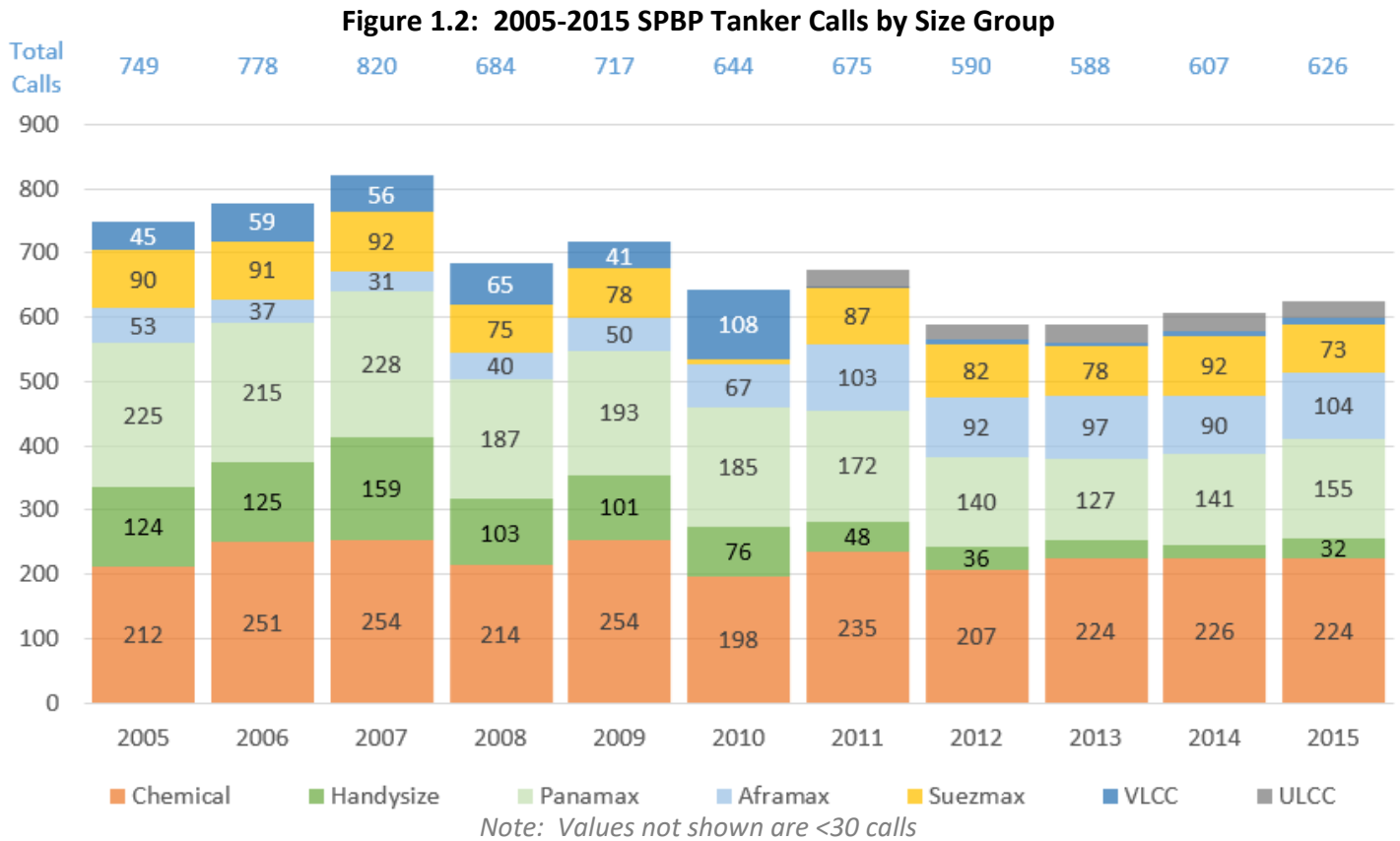


Key observations for container ship call changes include:

- 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.



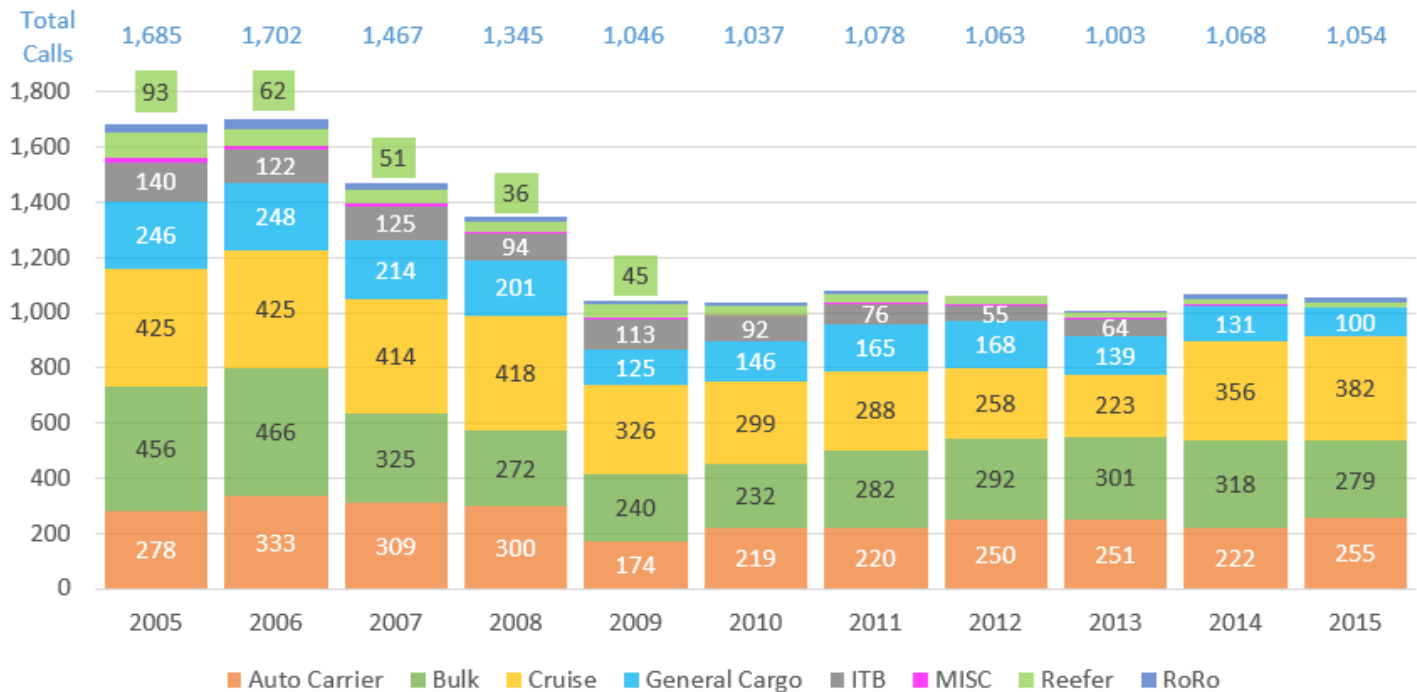
Key observations for tanker call changes include:

- 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:

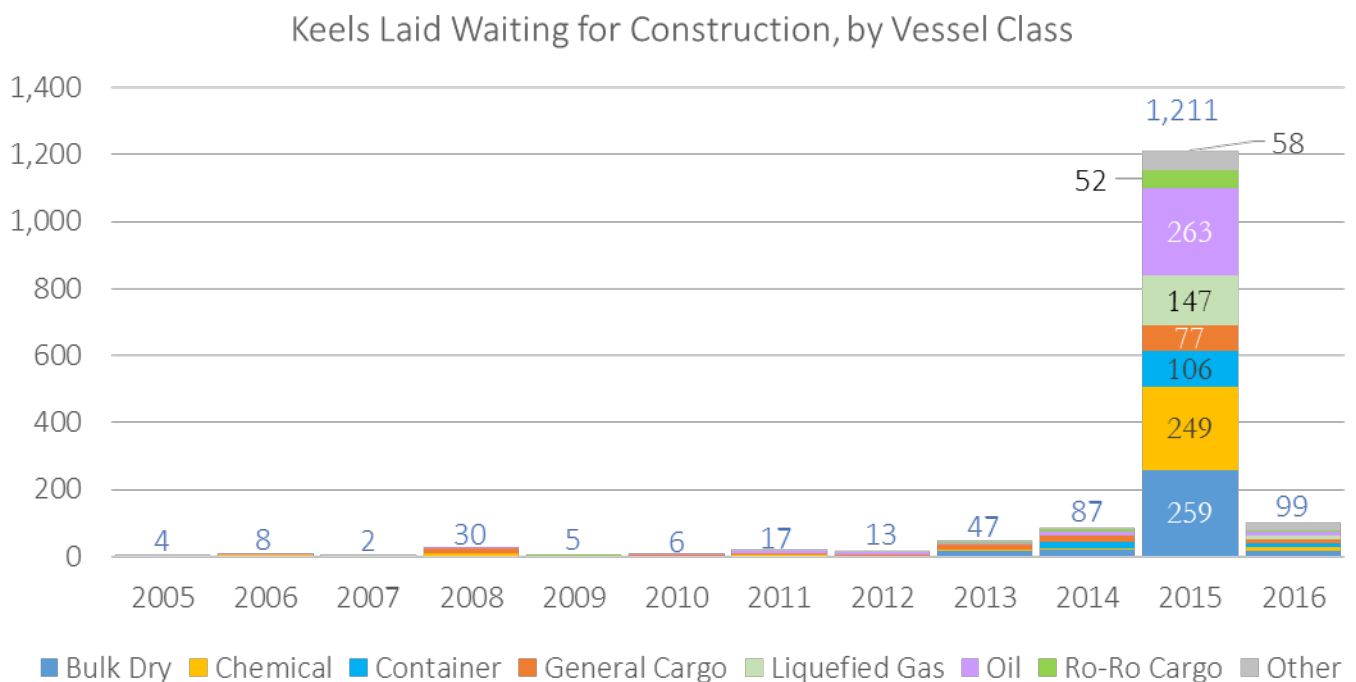
- Across all subclasses annual calls have decreased compared to 2005.
- There has been a change or evolution in the makeup of the fleet calling SPBP, highlights include:
 - Auto carriers and cruise ships have the lowest decreases in calls (8% and 10% respectively) compared to 2005, however cruise vessels 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 2014².
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

Vessel Type Capacity Group	Total	Global Fleet Counts			Average Model Year		
		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

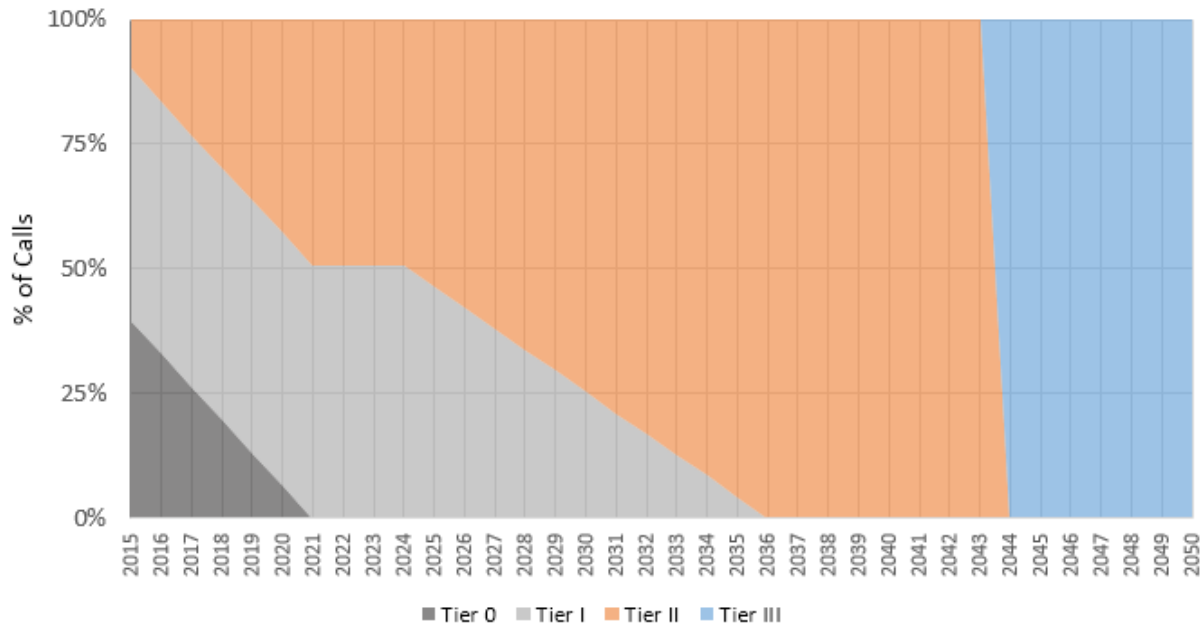


Figure 3.2: SPBP Container 6000-9000 TEU Tier Distribution Forecast

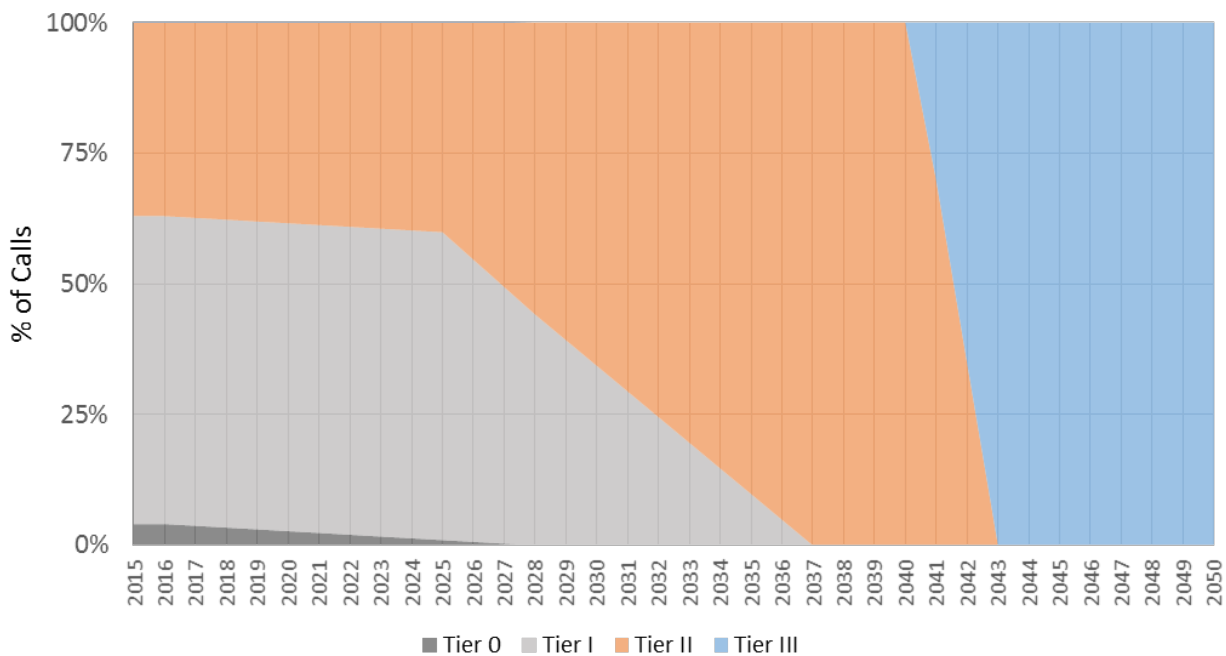


Figure 3.3: SPBP Container 10000-14000 TEU Tier Distribution Forecast

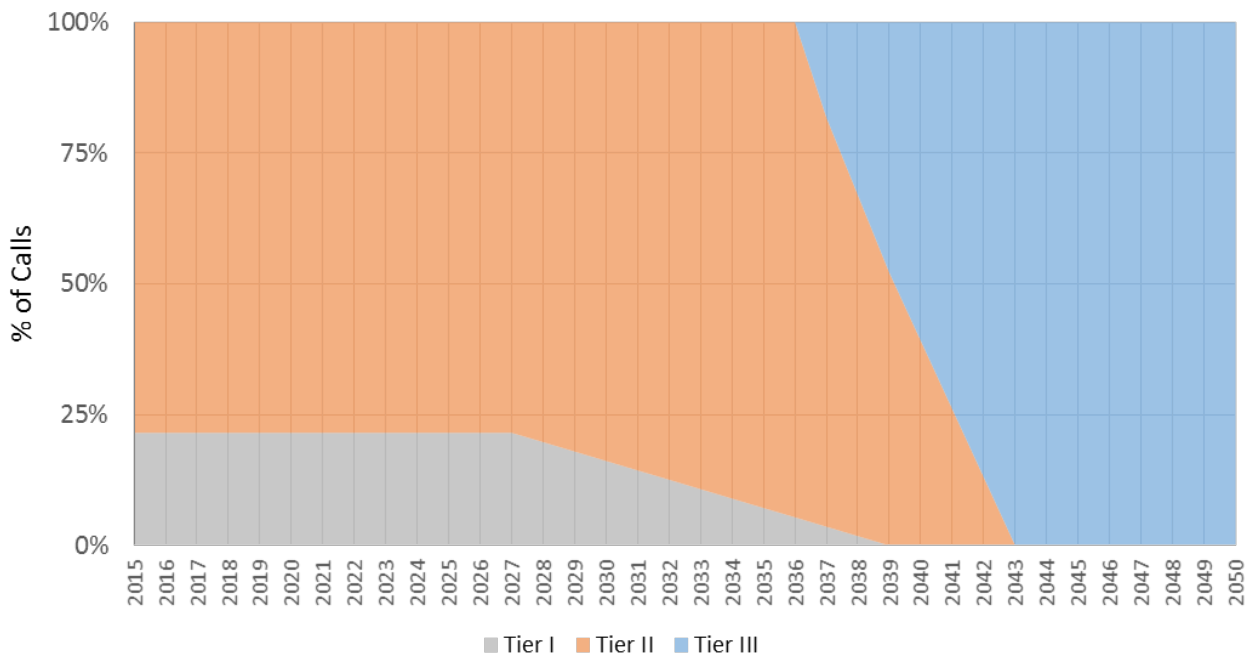


Figure 3.4: SPBP Container 15000-18000 TEU Tier Distribution Forecast

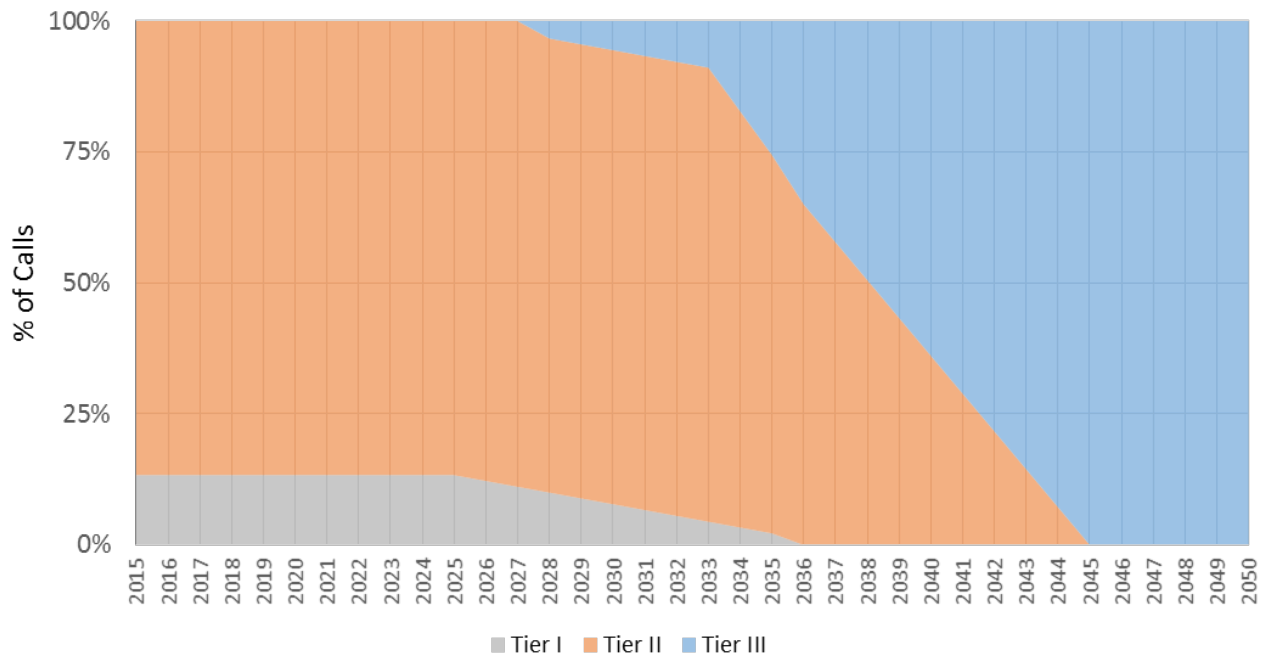
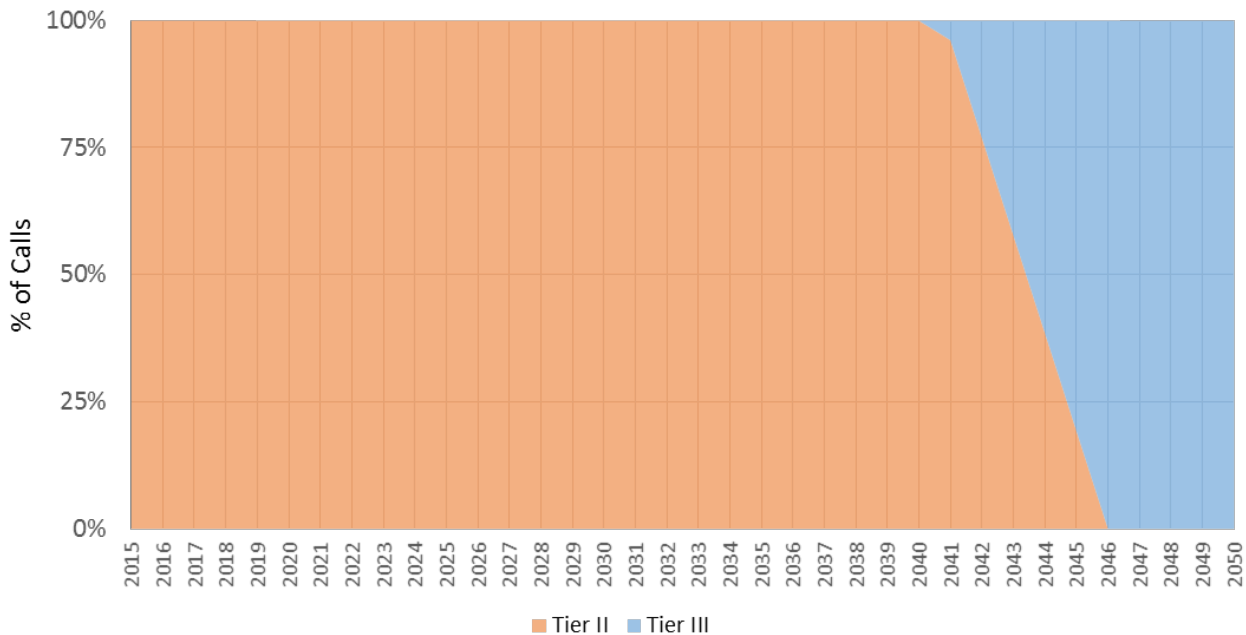


Figure 3.5: SPBP Container 19000-20000 TEU Tier Distribution Forecast



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.

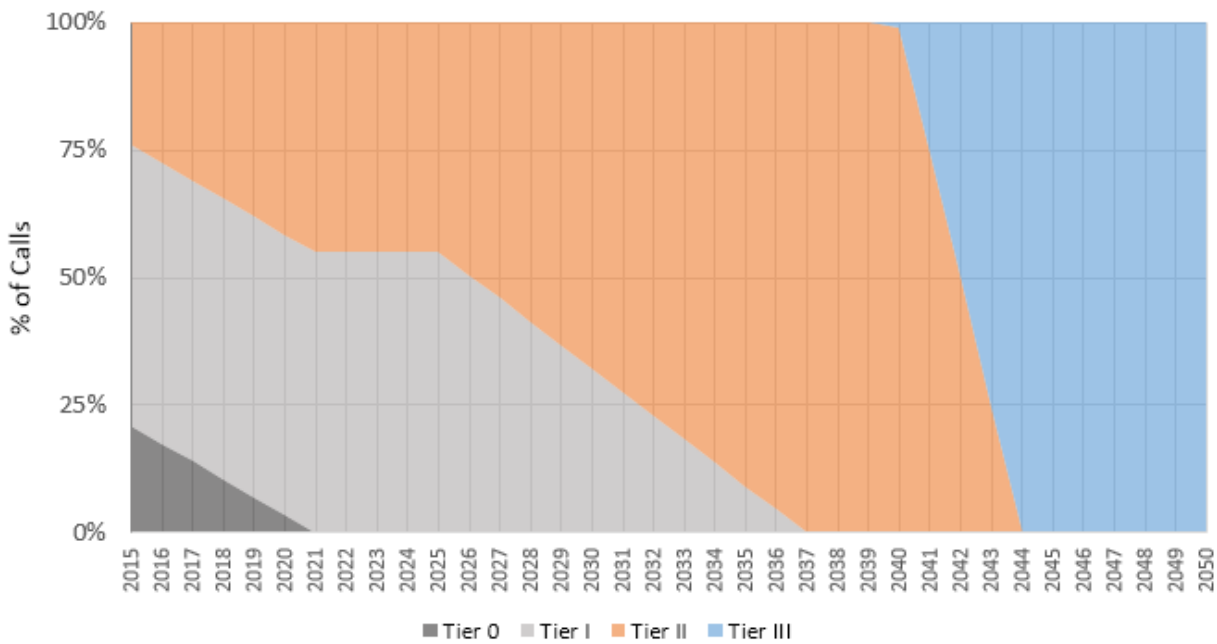
The applicable global fleet and 2015 SPBP calls for chemical tankers are presented in Table 3.2. The global pool of available chemical tankers is limited to those greater than 10,000 dead weight tons (dwt) based on the range of chemical tankers that called SPBP in 2015.

Table 3.2: Global Characteristics – Chemical Tankers

	Counts/ Calls	Fleet Counts			Fleet Average Model Year		
		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
>10,000 dwt							
Chem Tanker - Global	3,252	668	1,789	795	1990	2006	2013
2015 SPBP	224	11	169	44	1998	2007	2012
		Fleet Distribution			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



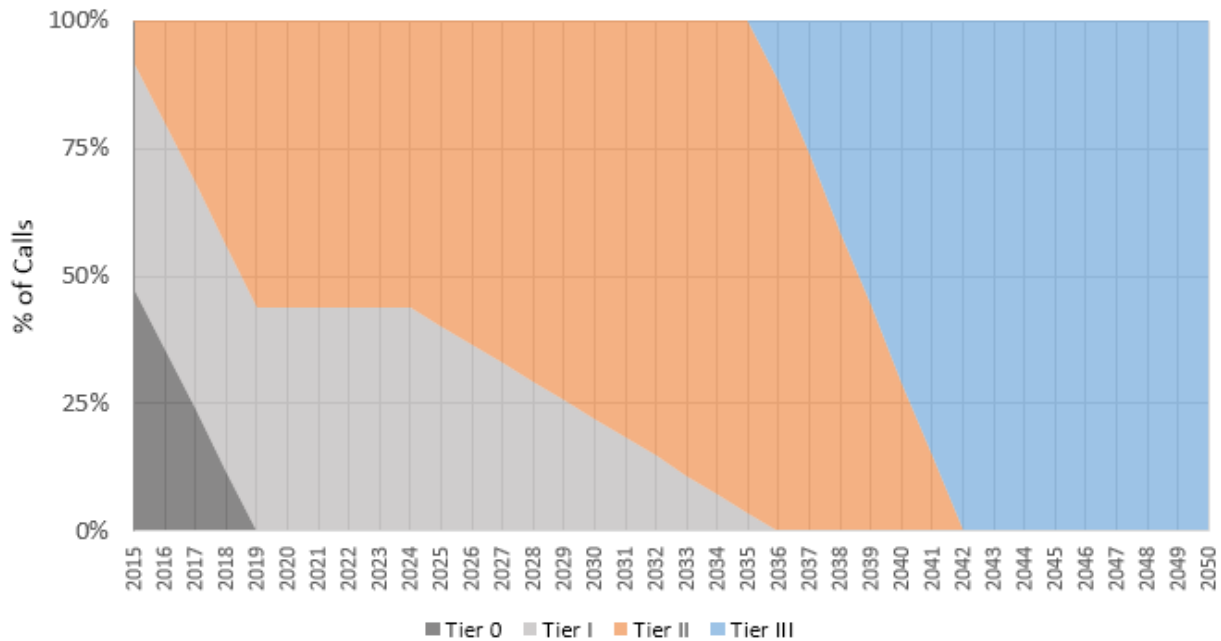
The applicable global fleet and 2015 SPBP calls for handy tankers are presented in Table 3.3. The global pool of available handy sized tankers is limited to those greater than 20,000 dwt based on the range of handy tankers that called SPBP in 2015.

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

>20,000 dwt	Count/ Calls	Fleet Counts			Fleet Average Model Year		
		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
>20,000 dwt		Fleet Distribution			Fleet Average Age		
		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



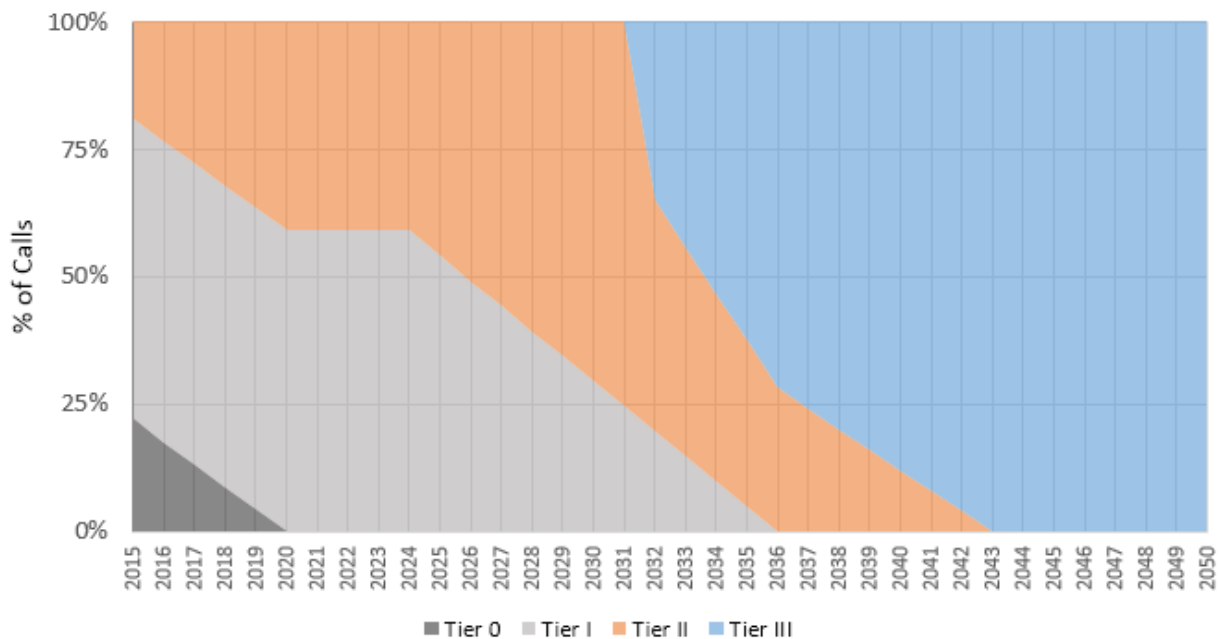
The applicable global fleet and 2015 SPBP calls for Panamax tankers are presented in Table 3.4. The global pool of available tankers is limited to those tankers designated as Panamax in IHS 2017.

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

Panamax	Count/ Calls	Fleet Counts			Fleet Average Model Year		
		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
Panamax	Fleet %/ Years	Fleet Distribution			Fleet Average Age		
		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.

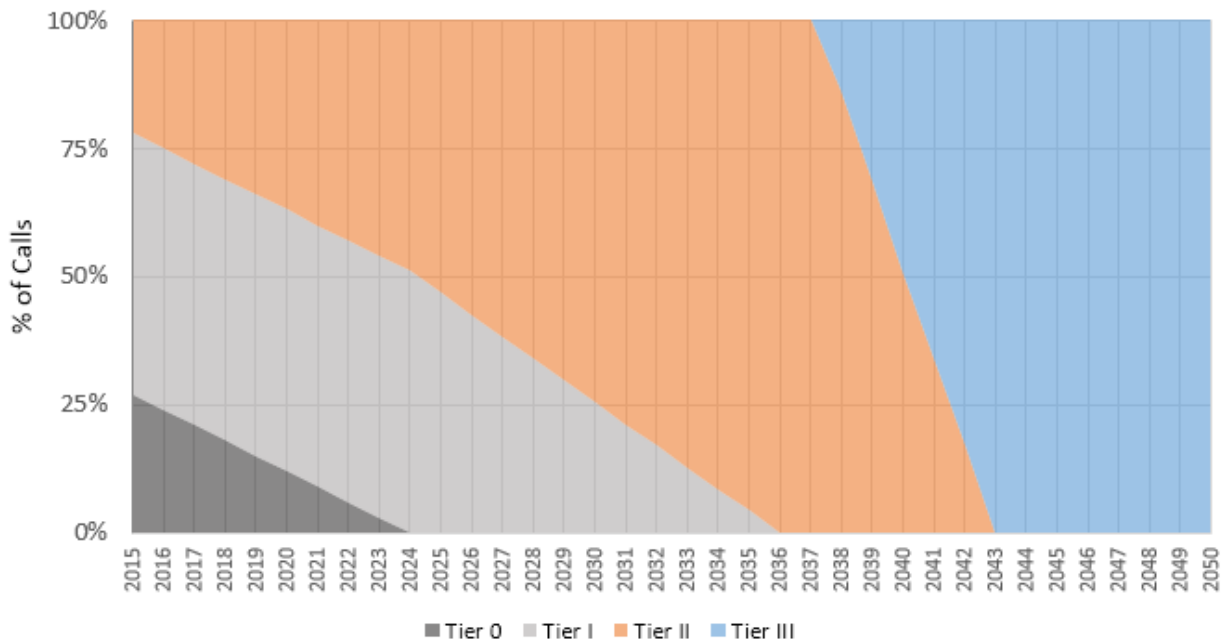
The applicable global fleet and 2015 SPBP calls for Aframax tankers are presented in Table 3.5. The global pool of available tankers is limited to those tankers designated as Aframax in IHS 2017.

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

	Count/ Calls	Fleet Counts			Fleet Average Model Year		
		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Aframax							
Aframax - Global	1,121	299	567	255	1993	2005	2012
2015 SPBP	104	0	51	53	2006	2011	
		Fleet Distribution			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



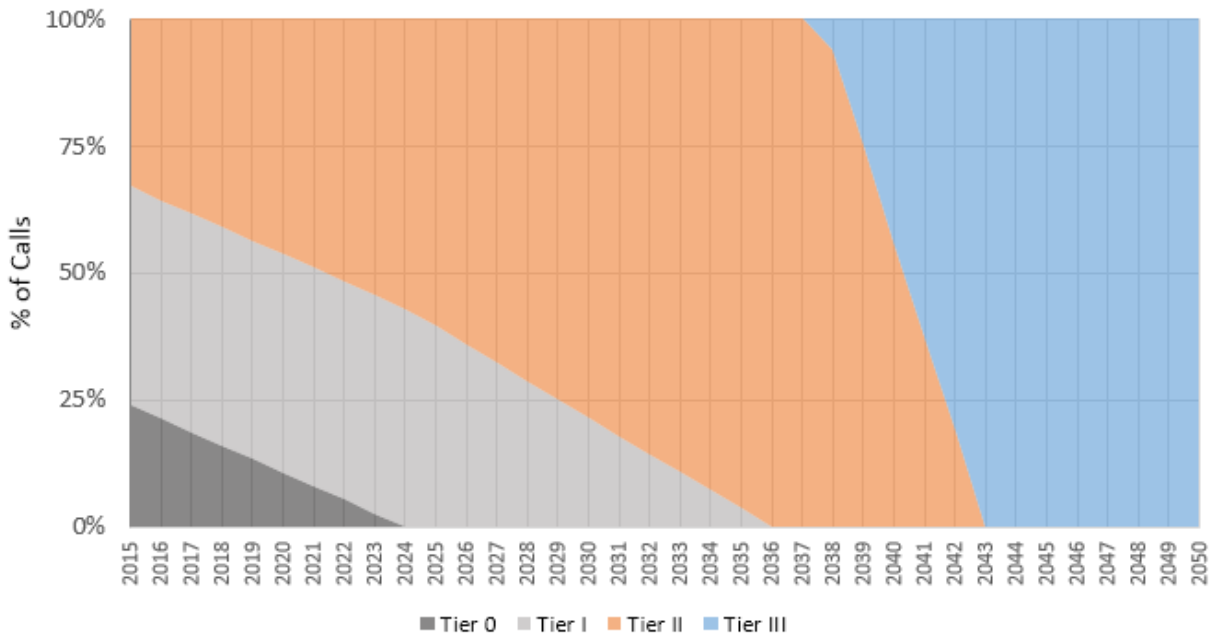
The applicable global fleet and 2015 SPBP calls for Suezmax tankers are presented in Table 3.6. The global pool of available tankers is limited to those tankers designated as Suezmax in IHS 2017.

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

Suezmax	Count/ Calls	Fleet Counts			Fleet Average Model Year		
		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
Suezmax	Fleet %/ Years	Fleet Distribution			Fleet Average Age		
		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



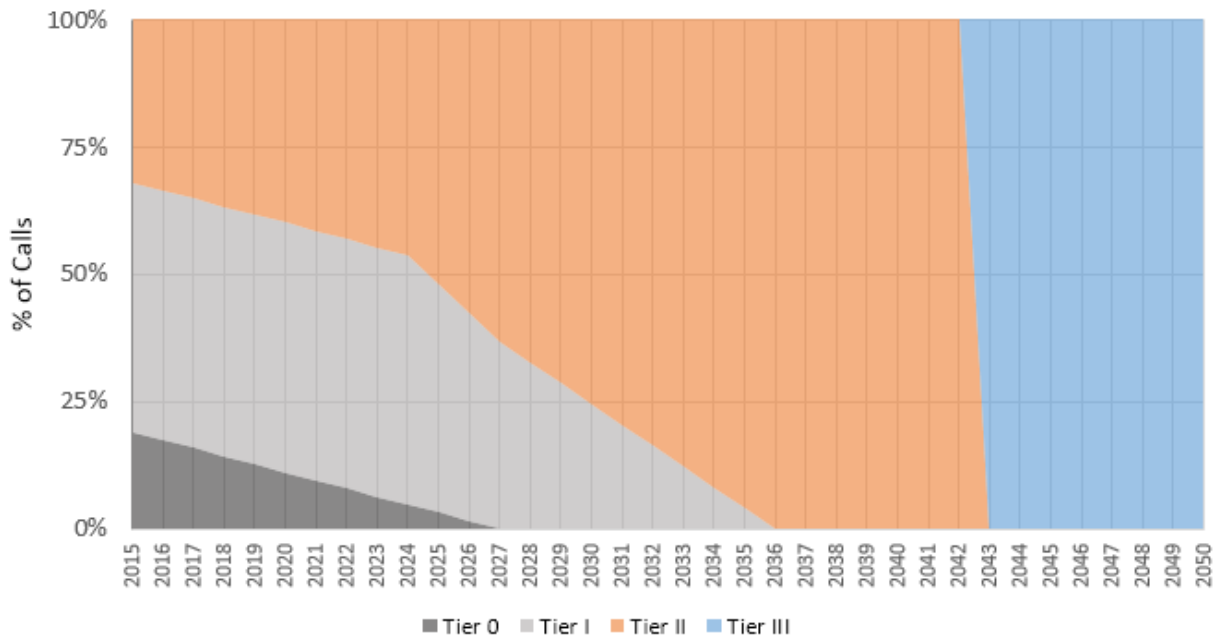
The applicable global fleet and 2015 SPBP calls for VLCC tankers are presented in Table 3.7. The global pool of available tankers is limited to those tankers designated as VLCC in IHS 2017.

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

VLCC	Count/ Calls	Fleet Counts			Fleet Average Model Year		
		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
VLCC		Fleet Distribuion			Fleet Average Age		
		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



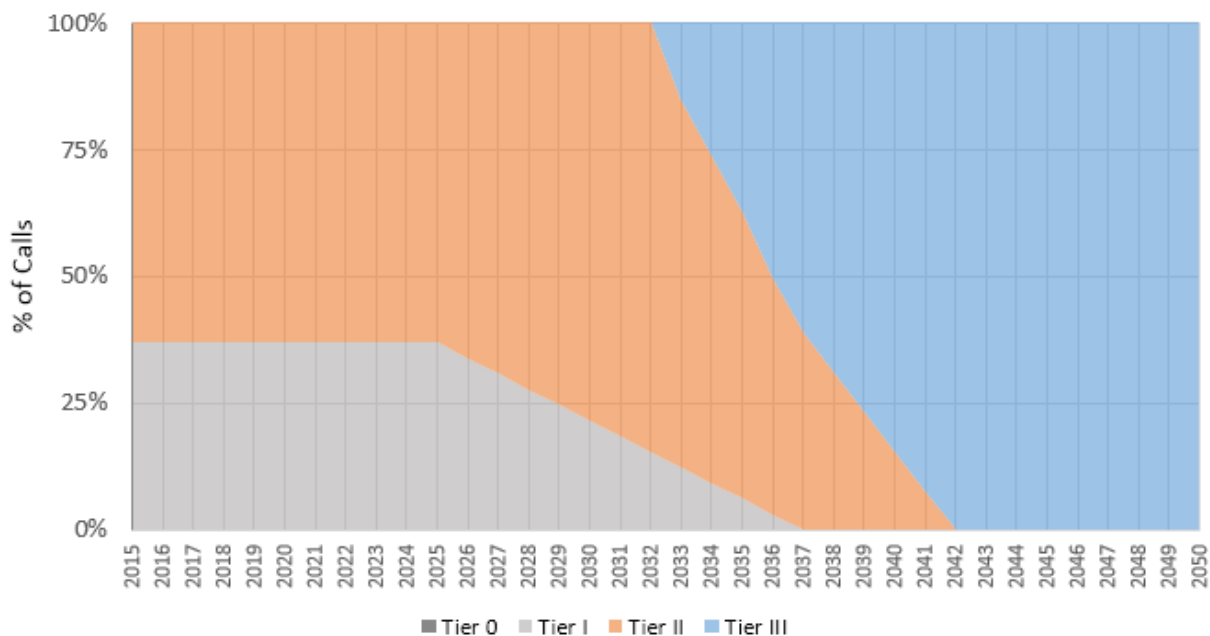
The applicable global fleet and 2015 SPBP calls for ULCC tankers are presented in Table 3.8. The global pool of available tankers is limited to those tankers designated as ULCC in IHS 2017.

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

ULCC	Count/ Calls	Fleet Counts			Fleet Average Model Year		
		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
ULCC		Fleet Distribution			Fleet Average Age		
		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 $\pm 20\%$ 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 $\pm 20\%$ 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

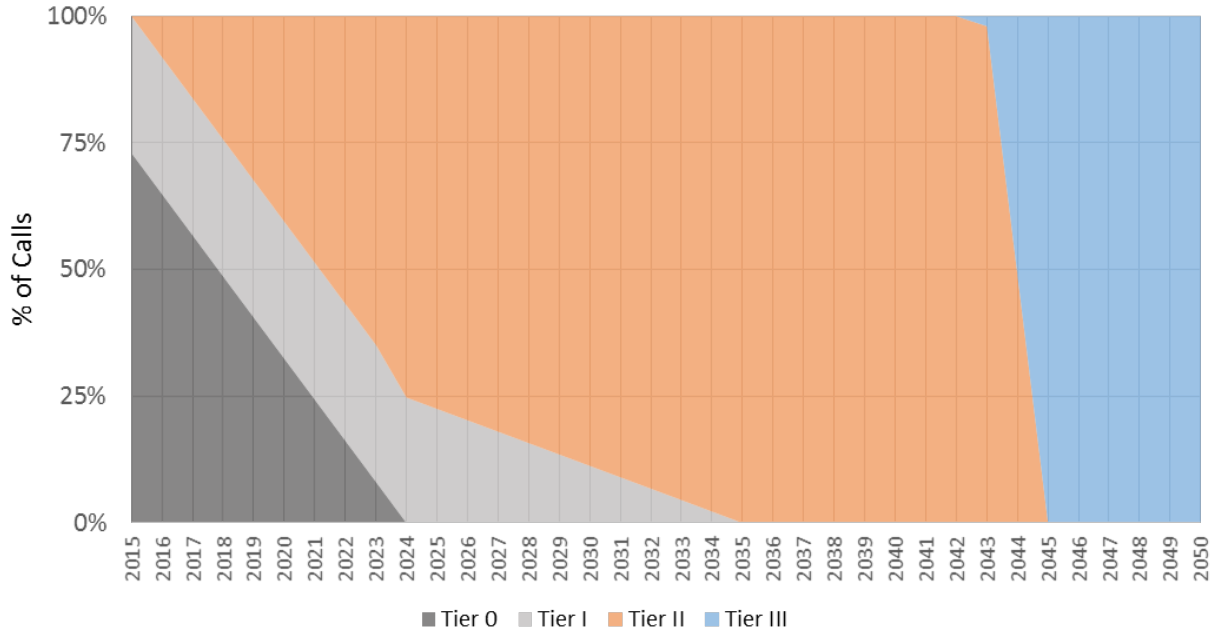
Capacity Range	Count	Fleet Counts			Fleet Average Model Year		
		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Cruise 1000 - Global 310-1200 passengers	560	368	142	50	1993	2004	2014
Cruise 2000 - Global 1800-2999 passenger	105	59	40	6	1992	2004	2013
Cruise 3000 - Global 3000-4538 passenger	68	11	43	14	1998	2005	2012
Capacity Range		Fleet Distribuion			Fleet Average Age		
		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

2015 SPBP	Calls	Fleet Counts			Fleet Average Model Year		
		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	
2015 SPBP		Fleet Distribuion			Fleet Average Age		
		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	

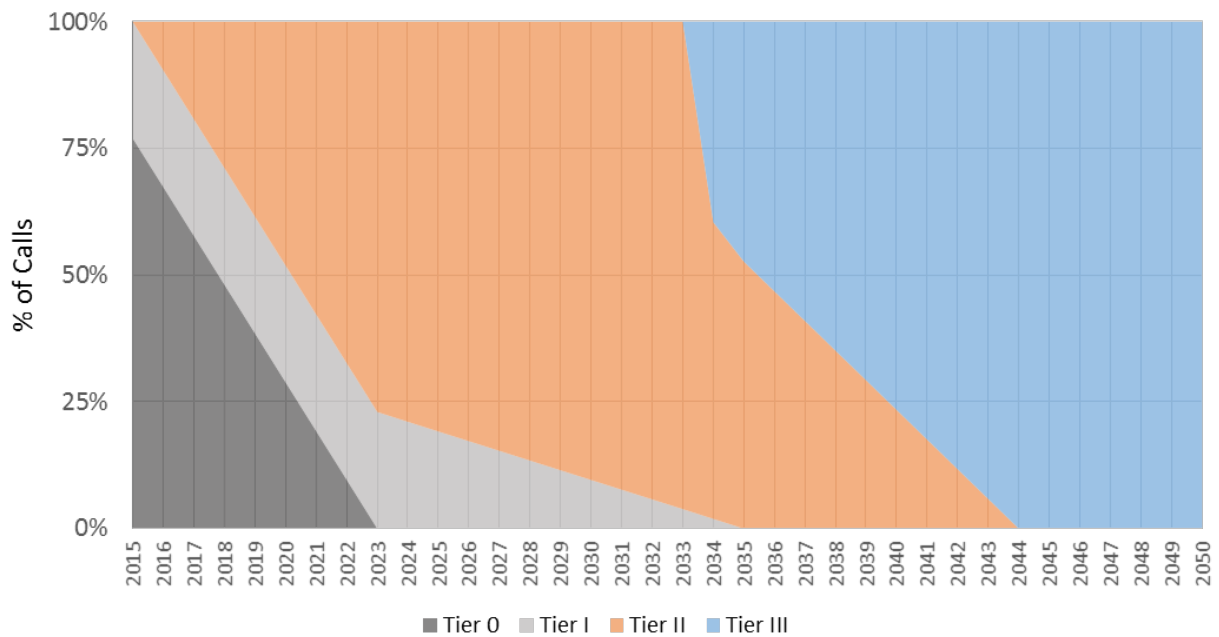
The forecasted tier distribution scenario for Cruise 1000 is illustrated in Figure 3.13.

Figure 3.13: SPBP Cruise 1000 Tier Distribution Forecast



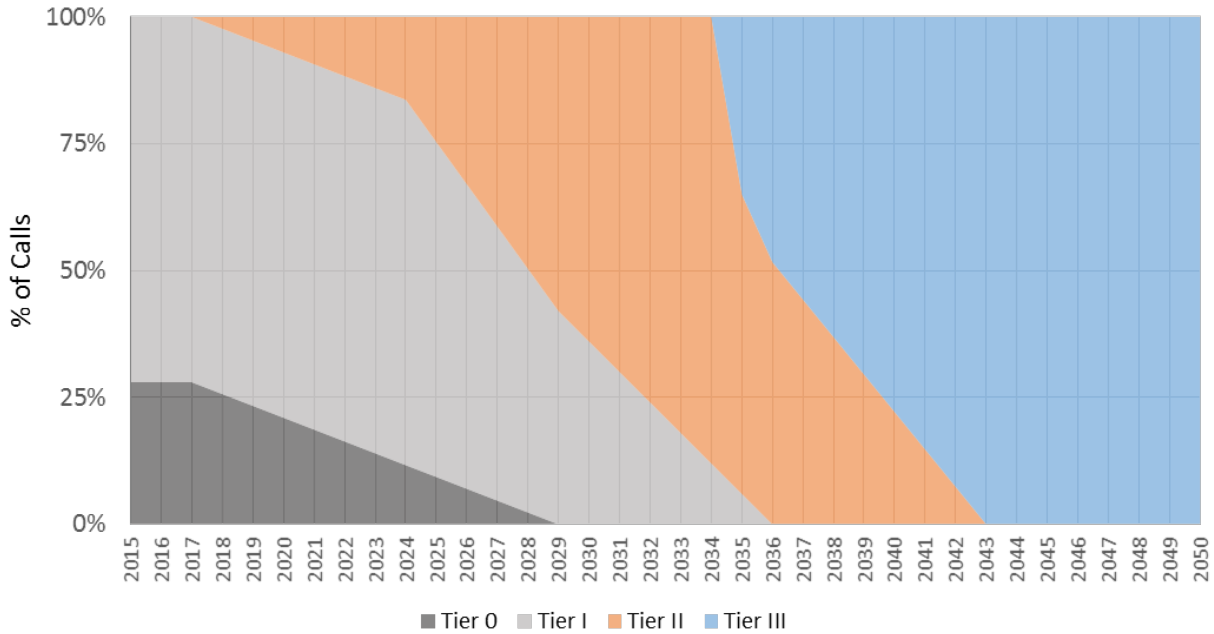
The forecasted tier distribution scenario for Cruise 2000 is illustrated in Figure 3.14.

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

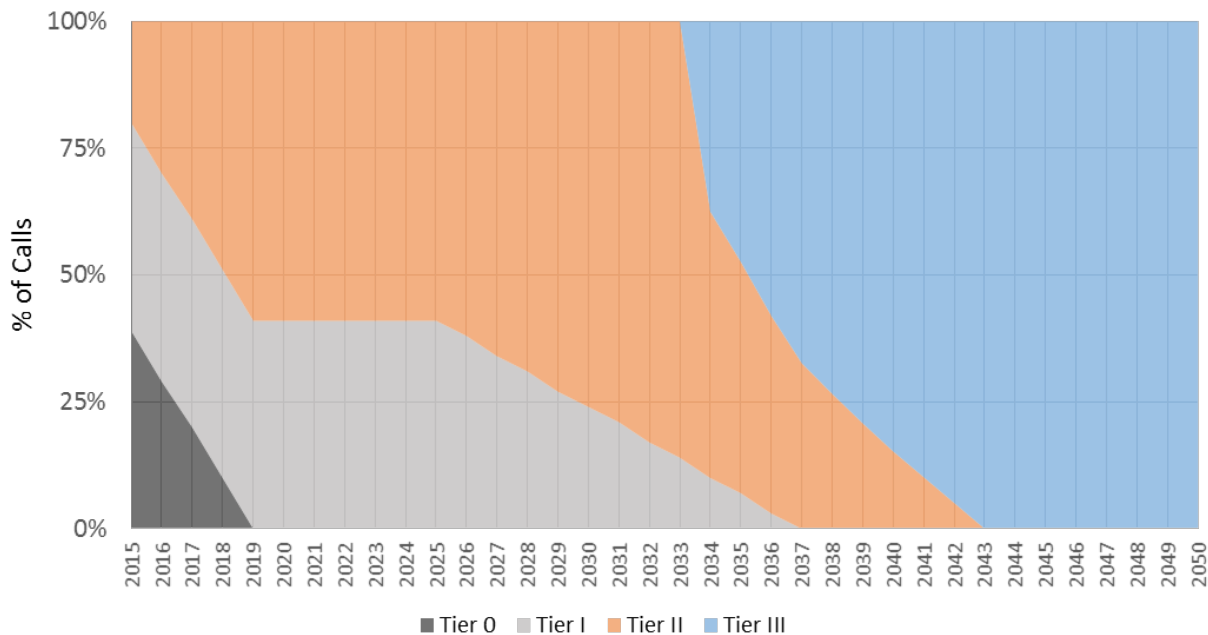
Auto carriers and roll on/roll off (ro-ro) typically operate in a non-liner service and in 2015, each auto carrier averaged just under 2 calls per year across the entire fleet. The size of the 2015 SPBP fleet ranged from a capacity of 3,199 to 8,000 vehicles per ship, based on IHS 2017. For forecasting the available global fleet, the 2015 range was expanded by $\pm 20\%$ 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

2,550+ Capacity	Count/ Calls	Fleet Counts			Fleet Average Model Year		
		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
2,550+ Capacity	Fleet %/Years	Fleet Distribuion			Fleet Average Age		
		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

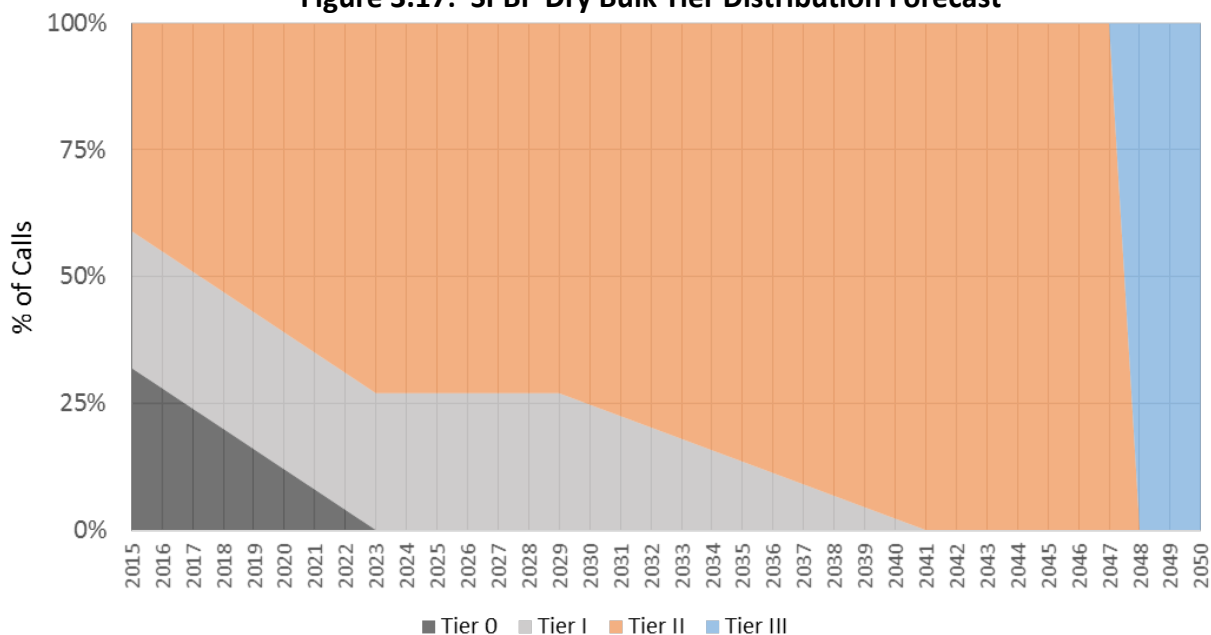
Dry bulk carriers typically operate in a non-liner service and in 2015, each dry bulk ship averaged just over 1 call per year across the entire fleet. The size of the 2015 SPBP fleet ranged from 16,181 to 95,768 dwt per ship, based on IHS 2017. For forecasting the available global fleet, the 2015 range was expanded by $\pm 20\%$ 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

16,181-114,922 dwt	Count/ Calls	Fleet Counts			Fleet Average Model Year		
		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
16,181-114,922 dwt		Fleet Distribution			Fleet Average Age		
		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

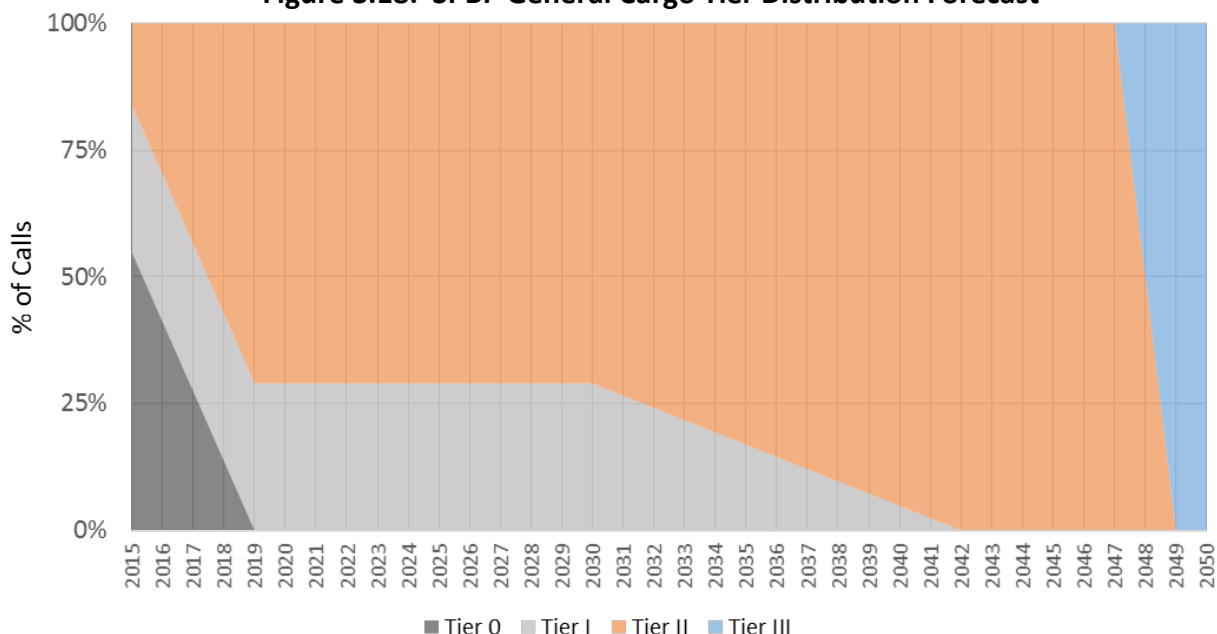
General cargo carriers operate typically in a non-liner service similar to dry bulk ships. In 2015, each general cargo ship averaged just over 1 call per year across the entire fleet. The size of the 2015 SPBP fleet ranged from 7,428 to 69,990 dwt per ship, based on IHS 2017. For forecasting the available global fleet, the 2015 range was expanded by $\pm 20\%$ 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

6,000-84,000 dwt	Count/ Calls	Fleet Counts			Fleet Average Model Year		
		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
6,000-84,000 dwt	Fleet %/Years	Fleet Distribuion			Fleet Average Age		
		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

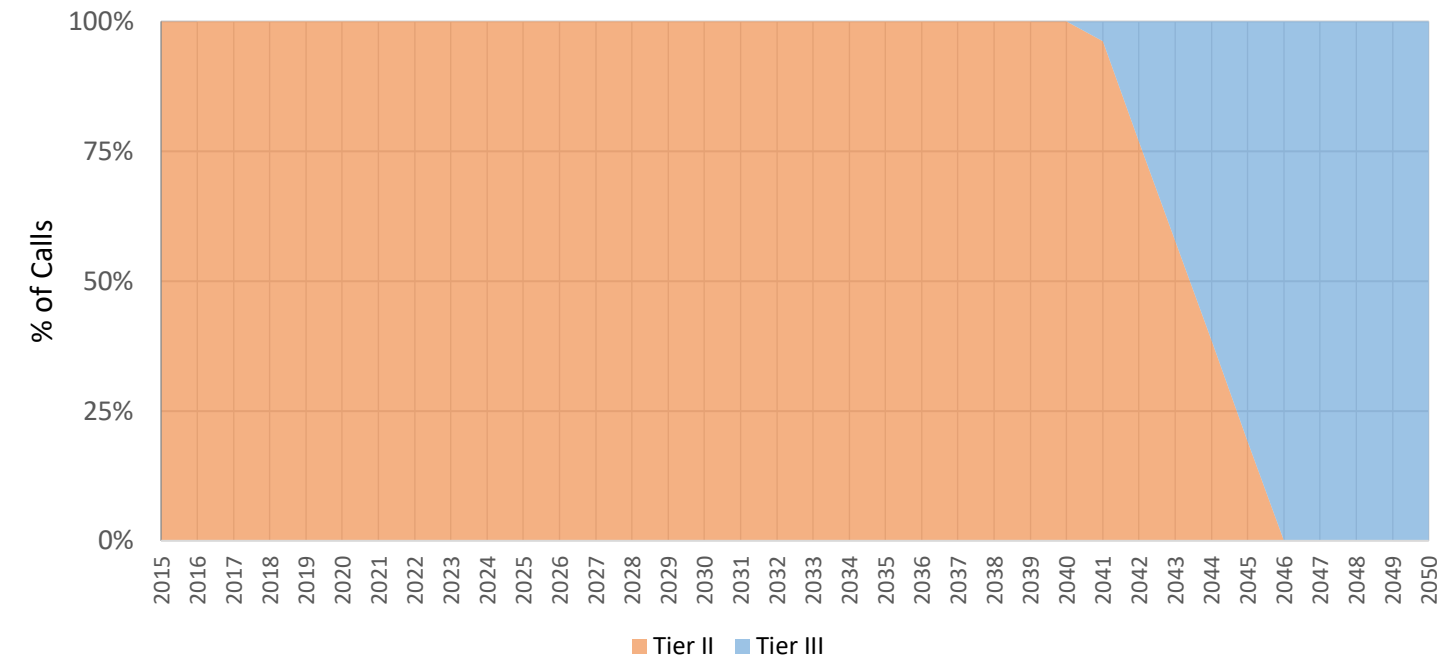
IHS world fleet data & UPDATED SPBP Vessel Call Forecast - IHS Marine Data through Q1 - 2017

Vessel Type Capacity Group	Total	Global Fleet Counts			Average Model Year			2015 Calls
		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II	
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				

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

52 SPBP max forecasted calls
 24 existing Tier II vessels 2015
 0 existing Tier I vessels 0
 5 ship calls/year
 120 max capacity of calls for existing fleet

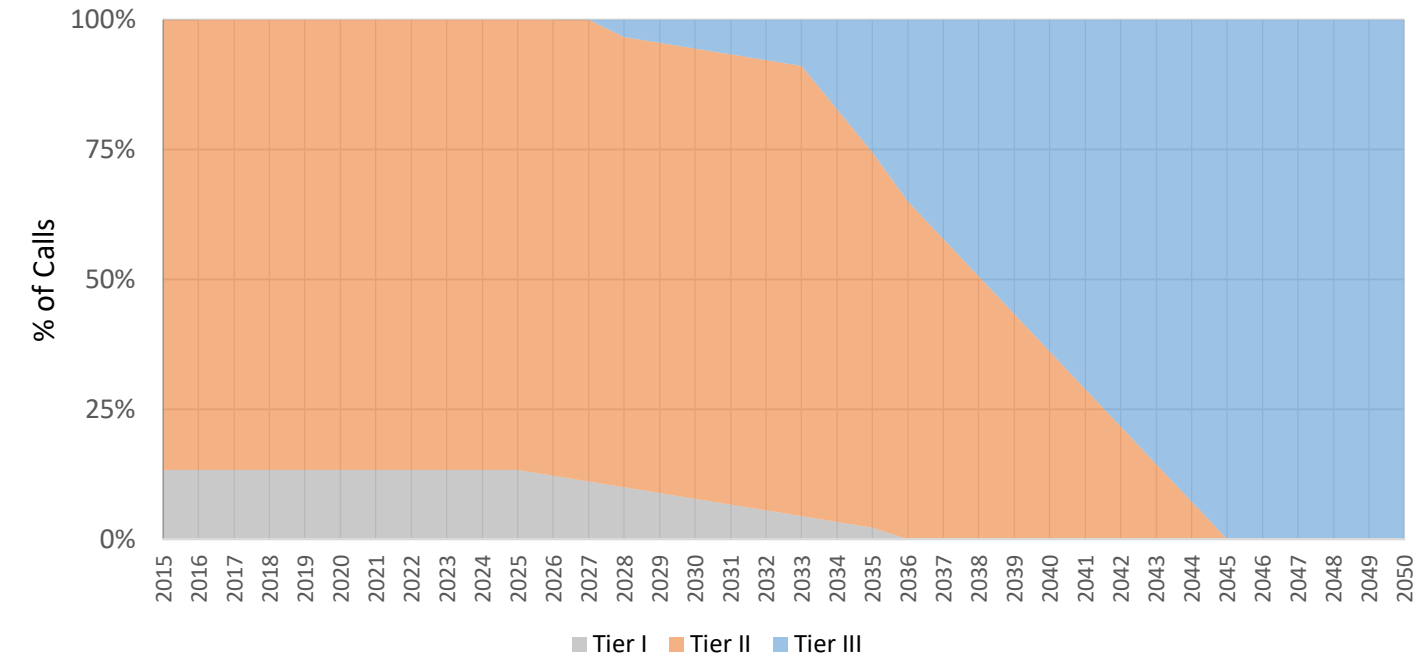
IMO Tier Distributions: 19k-20k Scenario



Year	Tier I			Tier II			15k-18k			15k-18k	
	T1 avg age	Tier I	Tier I TF	avg age	Tier II	Tier II TF	Tier III	fc	ex fleet		
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		

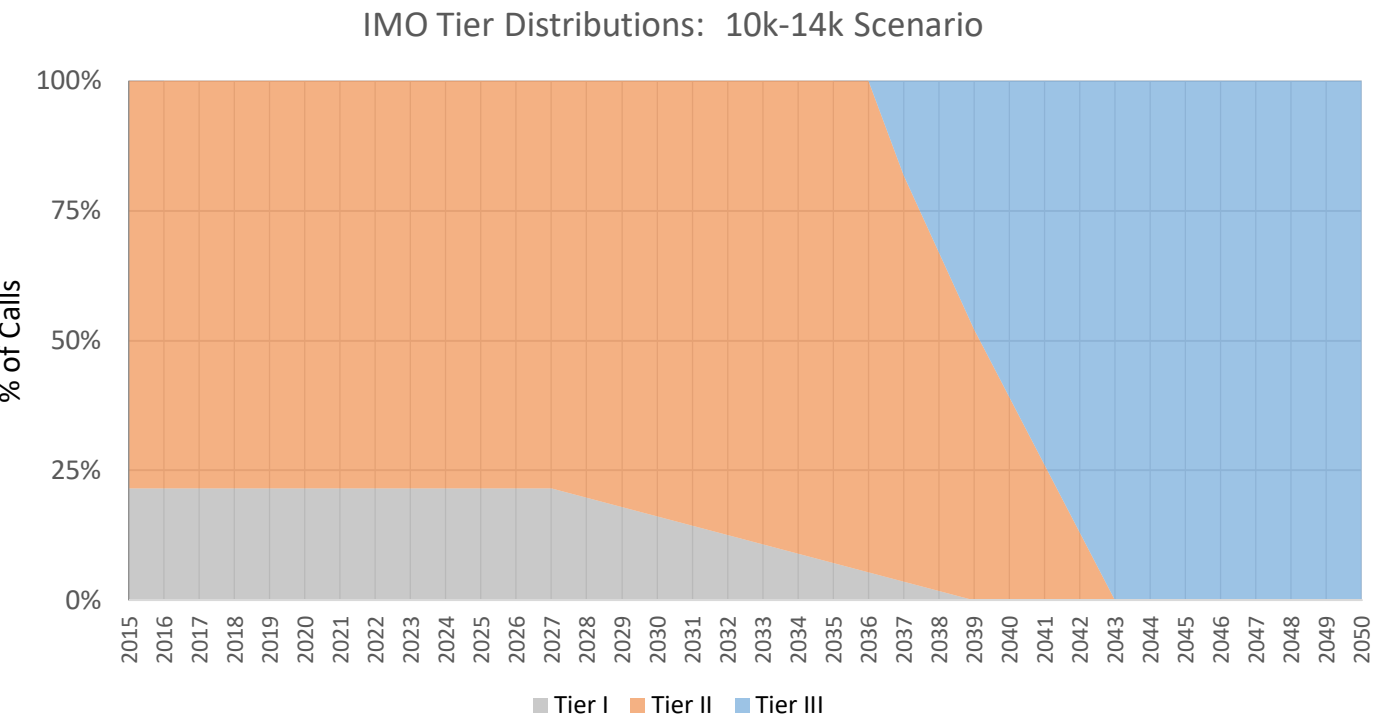
416 SPBP max forecasted calls
 52 existing Tier II vessels 2014
 8 existing Tier I vessels 2006
 0 existing Tier 0 vessels 0
 6 ship calls/year
 360 max capacity of calls for existing fleet

IMO Tier Distributions: 15k-18k Scenario



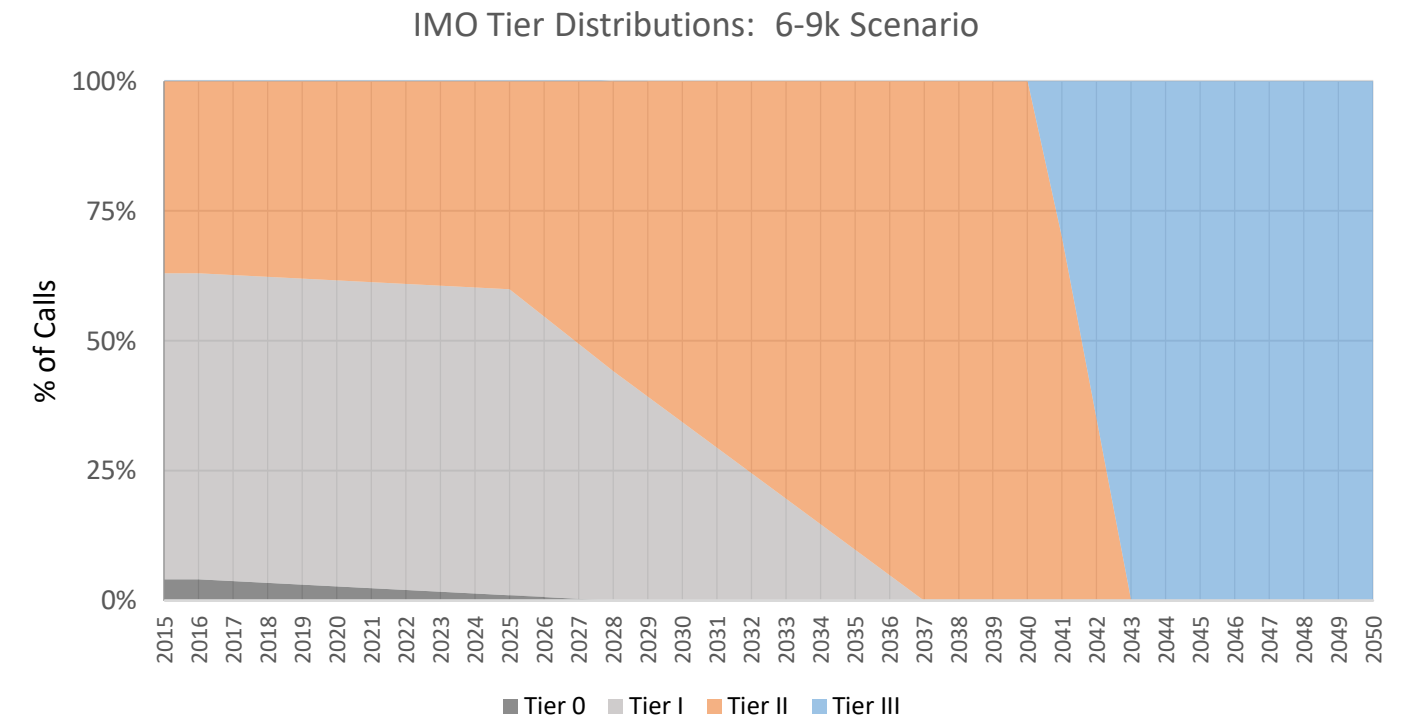
Year	Tier I			Tier II			10k-14k			10k-14k	
	T1 avg age	Tier I	Tier I TF	avg age	Tier II	Tier II TF	Tier III	fc	ex fleet		
2015	7	100%	22%	3	100%	78%	0%	256	2,177		
2016	8	100%	22%	4	100%	78%	0%	312	2,177		
2017	9	100%	22%	5	100%	78%	0%	368	2,177		
2018	10	100%	22%	6	100%	78%	0%	424	2,177		
2019	11	100%	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



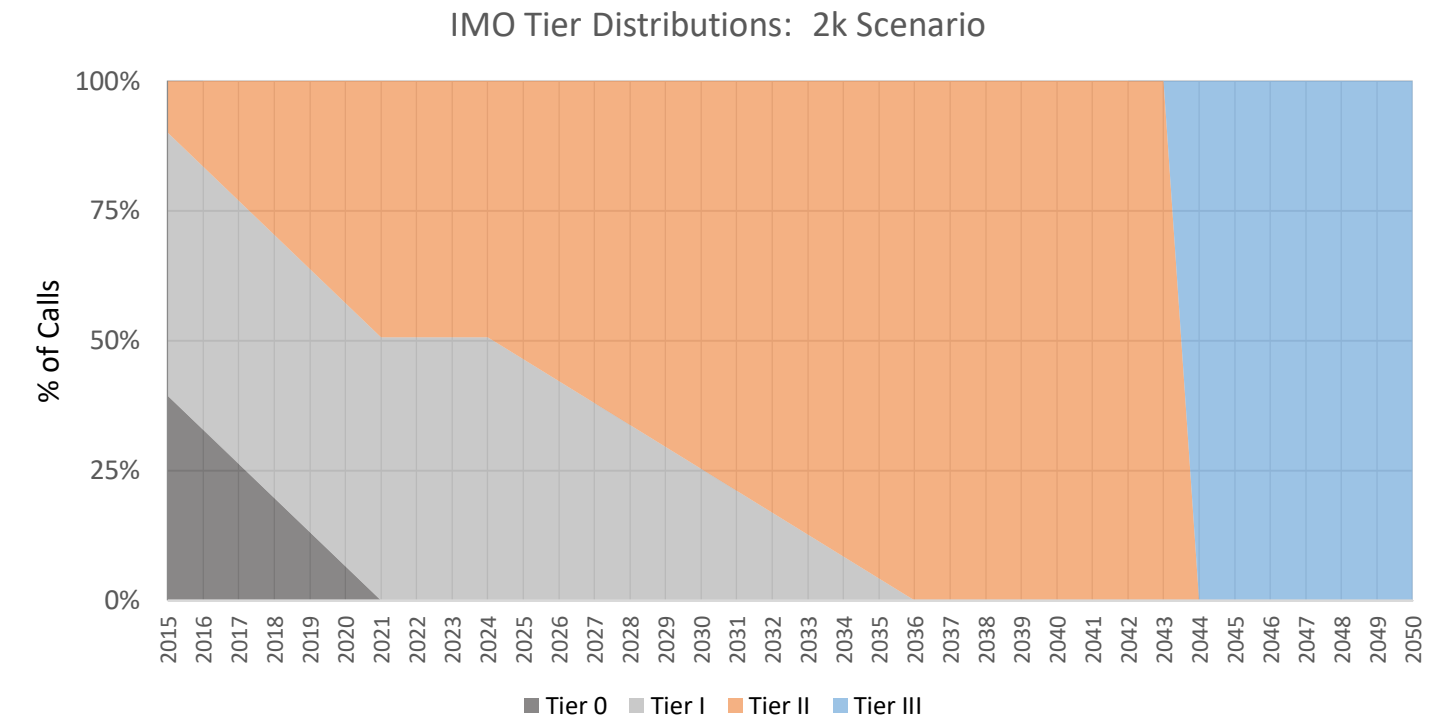
Year	Tier 0			Tier I			Tier II			6k-9k			6k-9k		
	T0 avg age	Tier 0	Tier 0 TF	T1 avg age	Tier I	Tier I TF	avg age	Tier II	Tier II TF	Tier III	fc	ex fleet			
Baseline	2015	18	100%	4%	9	100%	59%	3	100%	37%	4%	710	5,082		
	2016	19	100%	4%	10	100%	59%	4	100%	37%	4%	694	5,082	694 SPBP max forecasted calls	
	2017	20	92%	4%	11	100%	59%	5	100%	37%	4%	678	5,082	280 existing Tier II vessels	2012
	2018	21	83%	3%	12	100%	59%	6	100%	38%	3%	662	5,082	446 existing Tier I vessels	2006
	2019	22	75%	3%	13	100%	59%	7	100%	38%	3%	646	5,082	31 existing Tier 0 vessels	1997
	2020	23	67%	3%	14	100%	59%	8	100%	38%	3%	630	5,082	7 ship calls/year	
	2021	24	58%	2%	15	100%	59%	9	100%	39%	2%	614	5,082	5,299 max capacity of calls for existing fleet	
	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



Year	Tier 0			Tier I			Tier II			2000		2000	
	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	25	100%	39%	10	100%	51%	2	100%	10%	0%	261	8,450	
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



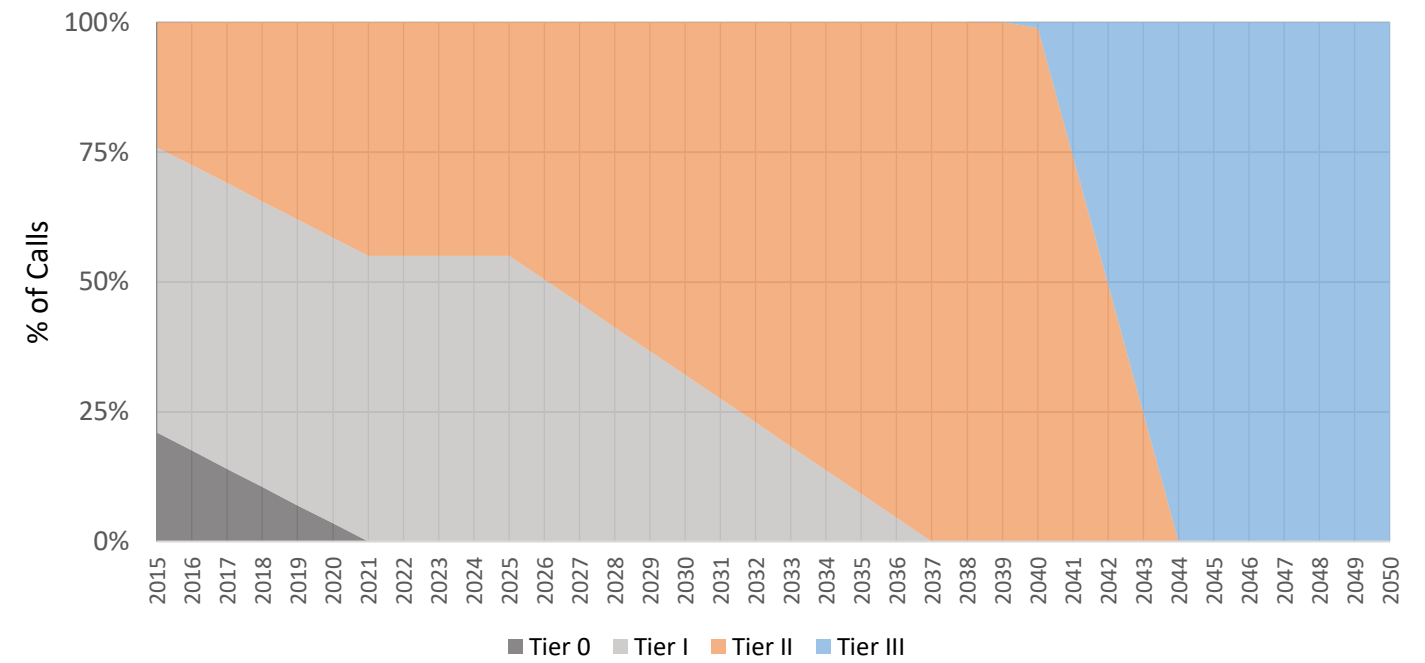
IHS world fleet data & UPDATED SPBP Vessel Call Forecast - IHS Marine Data through Q1 - 2017

>10,000 dwt	Counts/ Calls	Fleet Counts			Fleet Average Model Year		
		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
>10,000 dwt	Fleet Distribuion			Fleet Average Age			
		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

Year	Tier 0			Tier I			Tier II			Chemical			fc	ex fleet	Chemical
	T0 avg age	Tier 0	Tier 0 TF	Tier I avg age	Tier I	Tier I TF	Tier II avg age	Tier II	Tier II TF	Tier III					
Baseline 2015	25	100%	21%	9	100%	55%	2	100%	24%	0%	224	3,252	268 SPBP max forecasted calls		
2016	26	83%	18%	10	100%	55%	3	100%	28%	0%	228	3,141	795 existing Tier II vessels 2013		
2017	27	67%	14%	11	100%	55%	4	100%	31%	0%	231	3,029	1,789 existing Tier I vessels 2006		
2018	28	50%	11%	12	100%	55%	5	100%	35%	0%	235	2,918	668 existing Tier 0 vessels 1990		
2019	29	33%	7%	13	100%	55%	6	100%	38%	0%	238	2,807	1 ship calls/year		
2020	30	17%	4%	14	100%	55%	7	100%	42%	0%	242	2,695	3,252 capacity of calls for existing fleet		
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

IMO Tier Distributions: Chemical Tanker Scenario



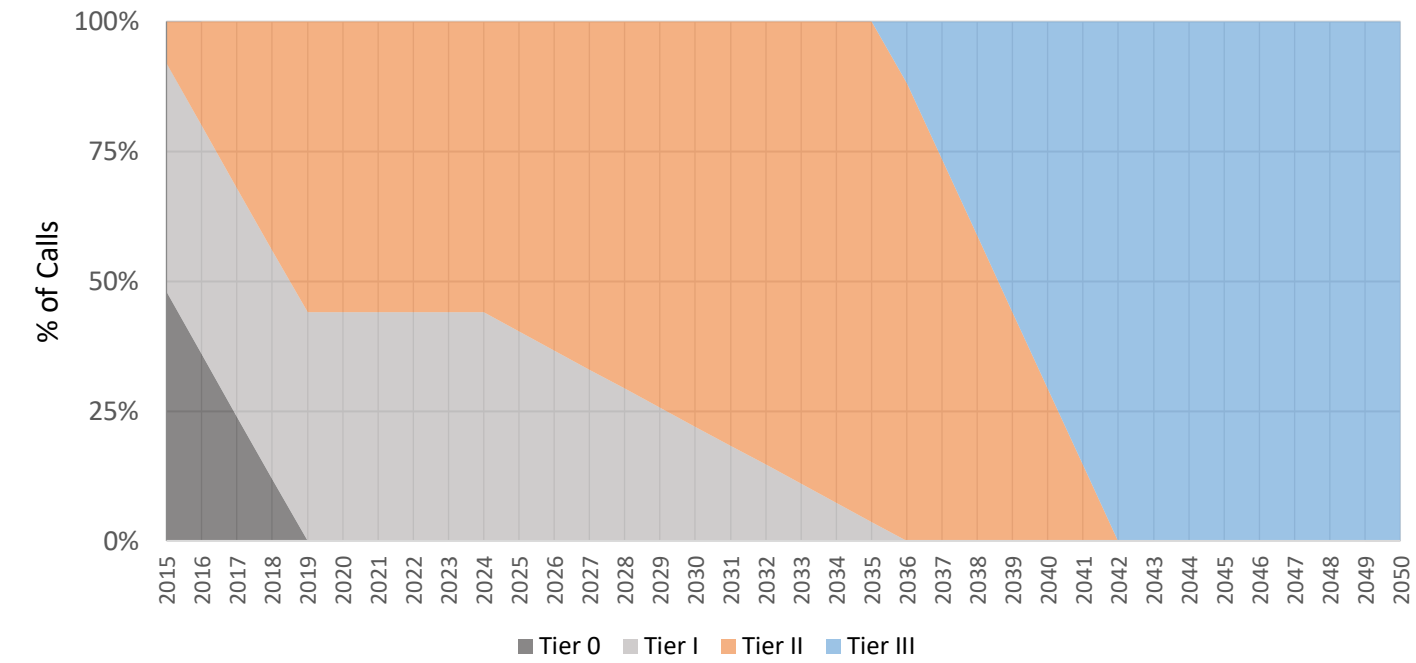
IHS world fleet data & UPDATED SPBP Vessel Call Forecast - IHS Marine Data through Q1 - 2017

>20,000 dwt	Count/ Calls	Fleet Counts			Fleet Average Model Year		
		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
>20,000 dwt	Fleet Distribtuion			Fleet Average Age			
		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

Year	Tier 0			Tier I			Tier II			Handy			fc	ex fleet
	T0 avg age	Tier 0	Tier 0 TF	Tier I avg age	Tier I	Tier I TF	Tier II avg age	Tier II	Tier II TF	Tier III				
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

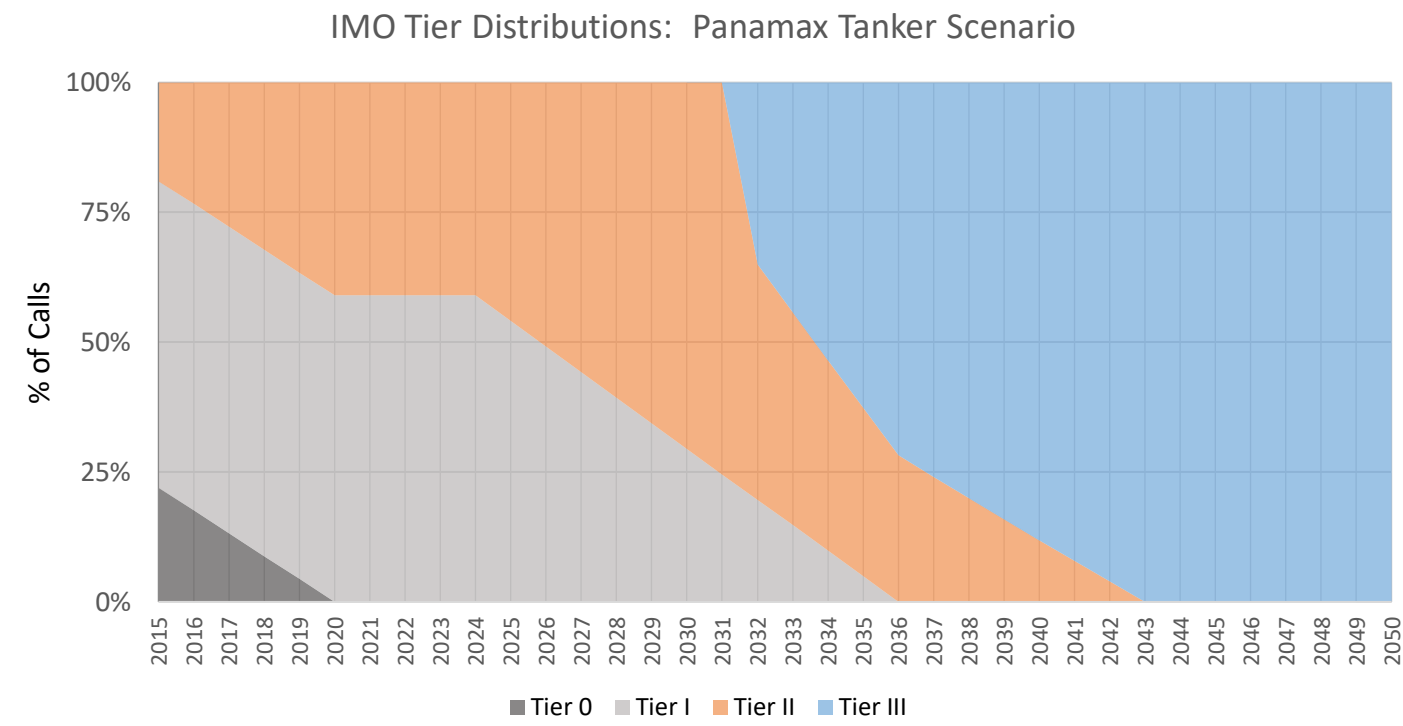
IMO Tier Distributions: Handy Tanker Scenario



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

Panamax	Count/ Calls	Fleet Counts			Fleet Average Model Year		
		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
Panamax	Fleet Distribtuion			Fleet Average Age			
	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	

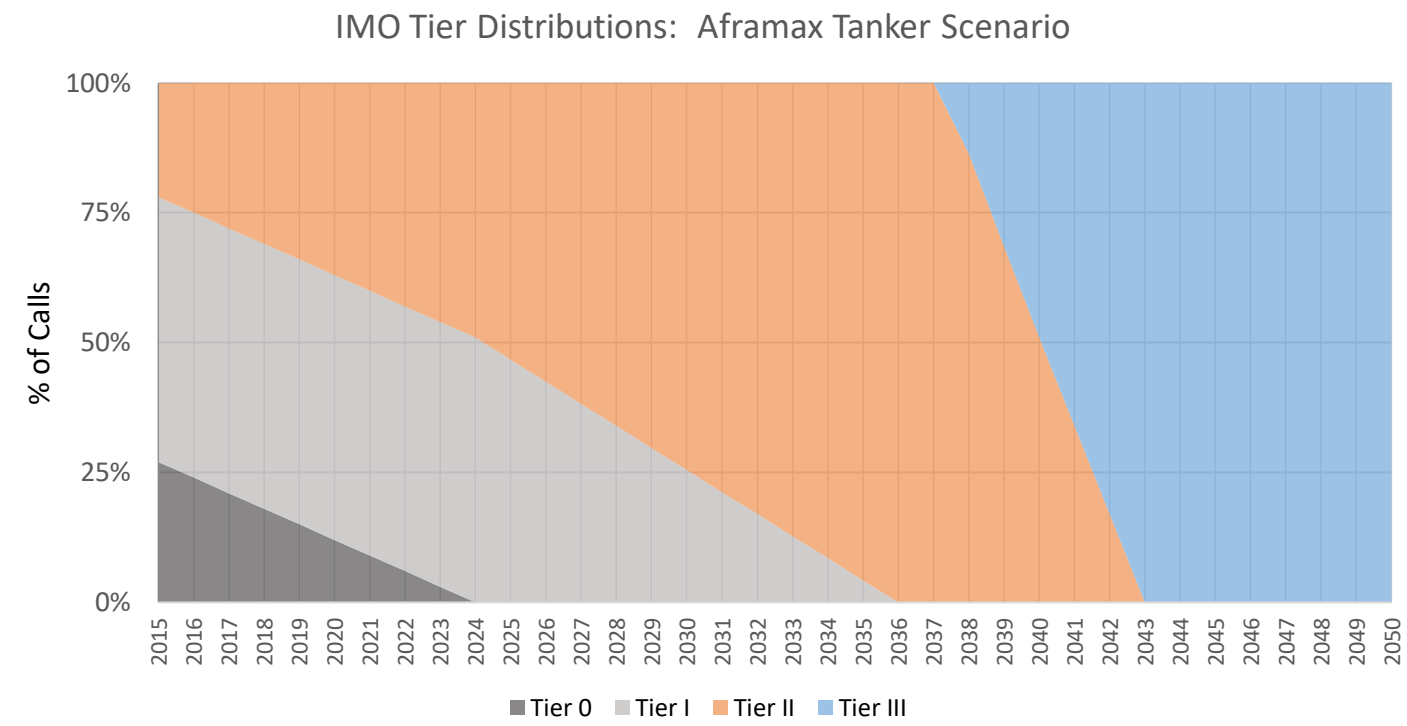
Year	Tier 0			Tier I			Tier II			Panamax			Panamax	
	T0 avg age	Tier 0	Tier 0 TF	Tier I avg age	Tier I	Tier I TF	avg age	Tier II	Tier II TF	Tier III	fc	ex fleet	186 SPBP max forecasted calls	
Baseline 2015	26	100%	22%	10	100%	59%	3	100%	19%	0%	155	483	88 existing Tier II vessels	2012
2016	27	80%	18%	11	100%	59%	4	100%	23%	0%	157	461	287 existing Tier I vessels	2005
2017	28	60%	13%	12	100%	59%	5	100%	28%	0%	160	440	108 existing Tier 0 vessels	1989
2018	29	40%	9%	13	100%	59%	6	100%	32%	0%	162	418	1 ship calls/year	
2019	30	20%	4%	14	100%	59%	7	100%	37%	0%	165	397	483 capacity of calls for existing fleet	
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		



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

	Count/ Calls	Fleet Counts			Fleet Average Model Year		
		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
Aframax							
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

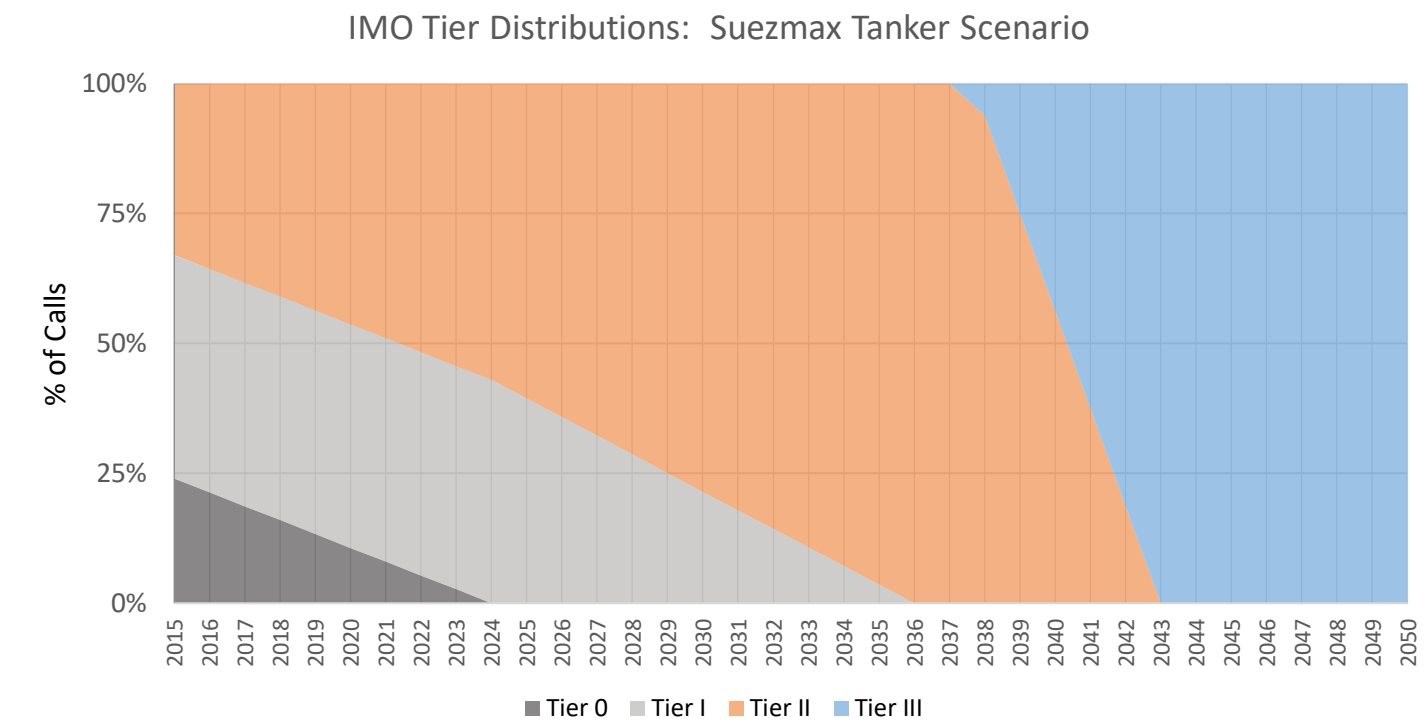
Year	Tier 0			Tier I			Tier II			Aframax			Aframax	
	T0 avg age	Tier 0 TF	Tier 0 TF1	Tier I avg age	Tier I TF	Tier I TF1	Tier II avg age	Tier II TF	Tier II TF1	Tier III	fc	ex fleet		
Baseline 2015	22	100%	27%	10	100%	51%	3	100%	22%	0%	104	1,121	125 SPBP max forecasted calls	
2016	23	89%	24%	11	100%	51%	4	100%	25%	0%	106	1,088	255 existing Tier II vessels	2012
2017	24	78%	21%	12	100%	51%	5	100%	28%	0%	107	1,055	567 existing Tier I vessels	2005
2018	25	67%	18%	13	100%	51%	6	100%	31%	0%	109	1,021	299 existing Tier 0 vessels	1993
2019	26	56%	15%	14	100%	51%	7	100%	34%	0%	111	988	1 ship calls/year	
2020	27	44%	12%	15	100%	51%	8	100%	37%	0%	112	955	1,121 capacity of calls for existing fleet	
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		



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

Suezmax	Count/ Calls	Fleet Counts			Fleet Average Model Year		
		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
Suezmax	Fleet %/Years	Fleet Distribtuion			Fleet Average Age		
		Tier 0	Tier I	Tier II	Tier 0	Tier I	Tier II
		24%	43%	33%	22	10	3
		4%	85%	11%	16	11	3

Year	Tier 0			Tier I			Tier II			Suezmax			Suezmax	
	T0 avg age	Tier 0 TF	Tier 0 TF1	Tier I avg age	Tier I TF	Tier I TF1	Tier II avg age	Tier II TF	Tier II TF1	Tier III	fc	ex fleet		
Baseline 2015	22	100%	24%	10	100%	43%	3	100%	33%	0%	73	608	87 SPBP max forecasted calls	
2016	23	89%	21%	11	100%	43%	4	100%	36%	0%	74	592	196 existing Tier II vessels 2012	
2017	24	78%	19%	12	100%	43%	5	100%	38%	0%	75	575	264 existing Tier I vessels 2005	
2018	25	67%	16%	13	100%	43%	6	100%	41%	0%	76	559	148 existing Tier 0 vessels 1993	
2019	26	56%	13%	14	100%	43%	7	100%	44%	0%	78	542	1 ship calls/year	
2020	27	44%	11%	15	100%	43%	8	100%	46%	0%	79	526	608 capacity of calls for existing fleet	
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		



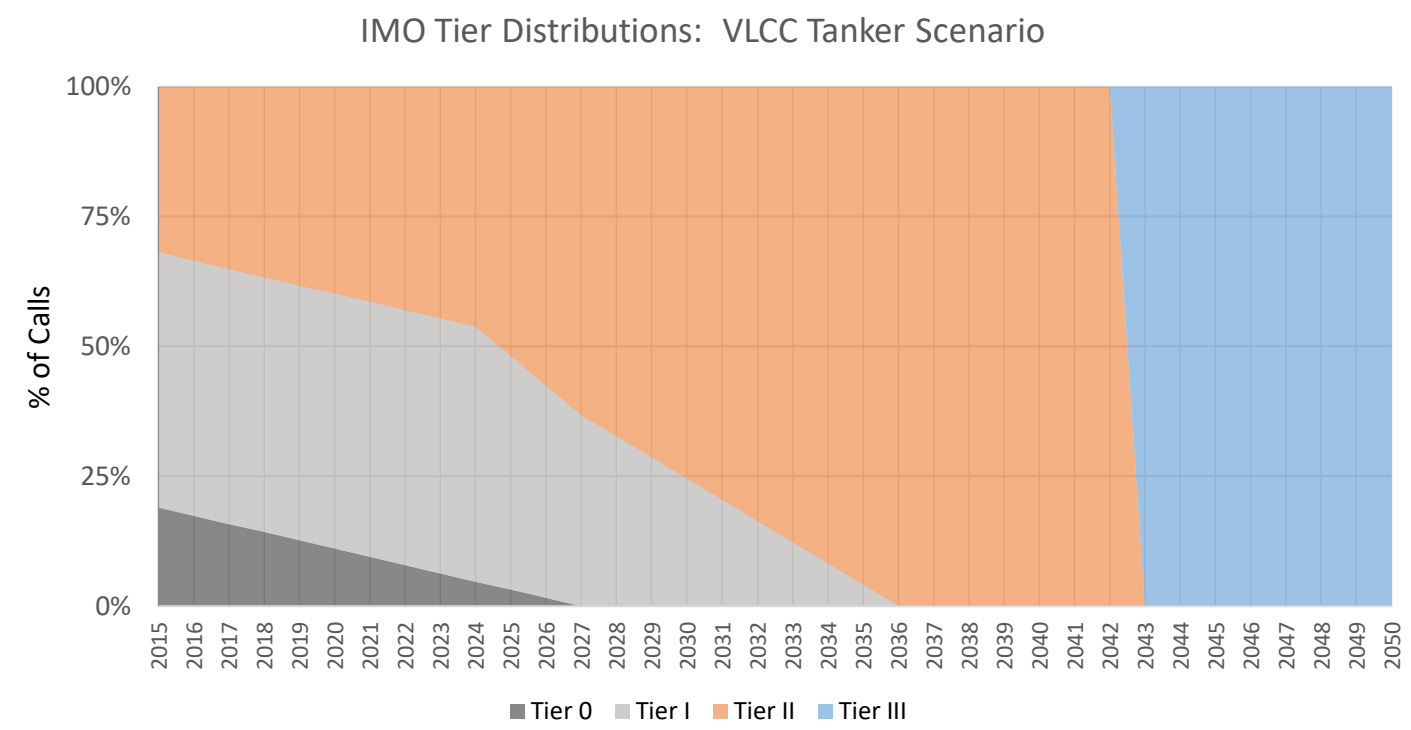
IHS world fleet data & UPDATED SPBP Vessel Call Forecast - IHS Marine Data through Q1 - 2017

VLCC	Count/ Calls	Fleet Counts			Fleet Average Model Year		
		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

VLCC	Fleet Distribuion	Fleet Average Age				
		Tier 0	Tier I	Tier II	Tier 0	Tier I
VLCC - Global	19%	49%	32%	19	10	3
2015 SPBP	0%	83%	17%		10	4

Year	Tier 0			Tier I			Tier II			VLCC			fc	ex fleet	VLCC
	T0 avg age	Tier 0	Tier 0 TF	Tier I avg age	Tier I	Tier I TF	Tier II avg age	Tier II	Tier II TF	Tier III					
Baseline 2015	19	100%	19%	10	100%	49%	3	100%	32%	0%	12	708	14 SPBP max forecasted calls		
2016	20	92%	17%	11	100%	49%	4	100%	34%	0%	12	697	228 existing Tier II vessels	2012	
2017	21	83%	16%	12	100%	49%	5	100%	35%	0%	12	686	348 existing Tier I vessels	2005	
2018	22	75%	14%	13	100%	49%	6	100%	37%	0%	13	675	132 existing Tier 0 vessels	1996	
2019	23	67%	13%	14	100%	49%	7	100%	38%	0%	13	664	1 ship calls/year		
2020	24	58%	11%	15	100%	49%	8	100%	40%	0%	13	653	708 capacity of calls for existing fleet		
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			

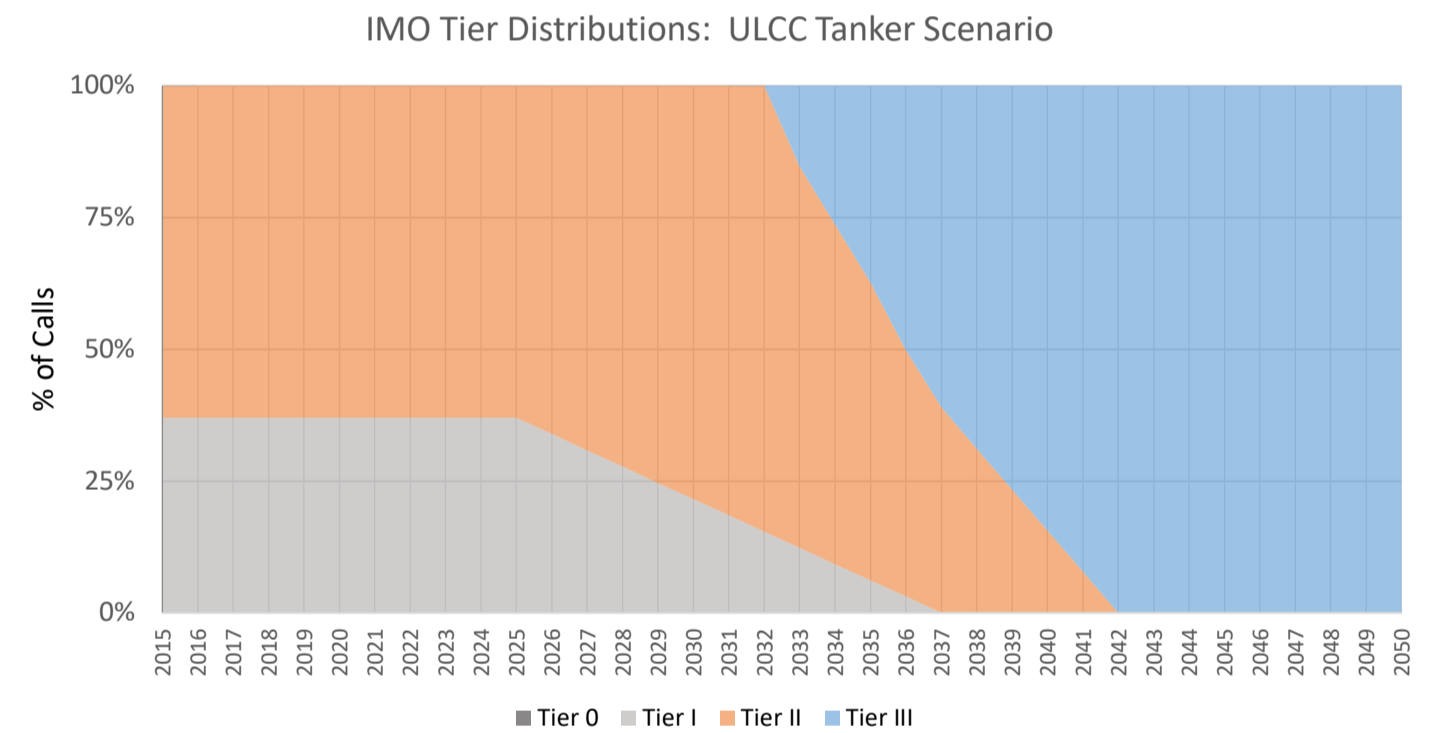
14 SPBP max forecasted calls
 228 existing Tier II vessels
 348 existing Tier I vessels
 132 existing Tier 0 vessels
 1 ship calls/year
 708 capacity of calls for existing fleet



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

ULCC	Count/ Calls	Fleet Counts			Fleet Average Model Year		
		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	
ULCC		Fleet Distribution			Fleet Average Age		
		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

Year	Tier 0		Tier I			Tier II		ULCC			ULCC		31 SPBP max forecasted calls	29 existing Tier II vessels	17 existing Tier I vessels	0 existing Tier 0 vessels	1 ship calls/year	46 capacity of calls for existing fleet
	T0 avg age	Tier 0	Tier I	Tier I TF	Tier I 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						



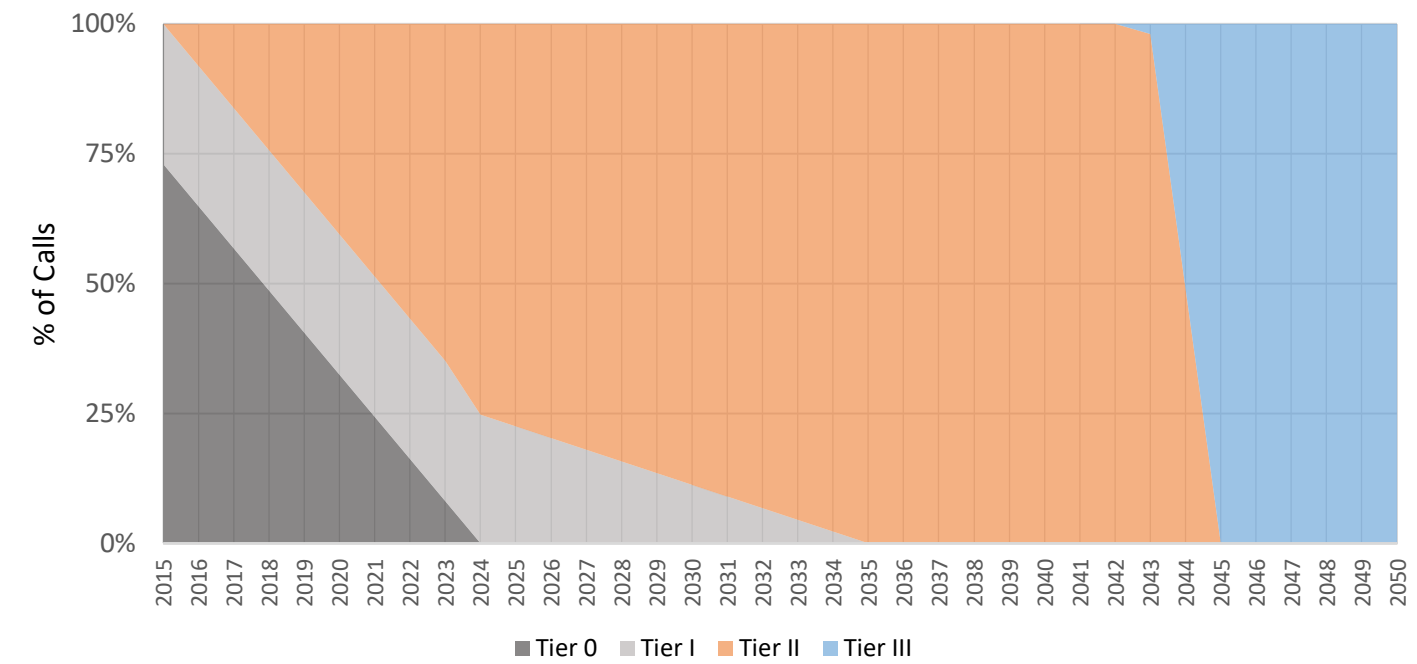
IHS world fleet data & UPDATED SPBP Vessel Call Forecast - IHS Marine Data through Q1 - 2017

Capacity Range	Count	Fleet Counts			Fleet Average Model Year		
		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
Capacity Range		Fleet Distribtuion			Fleet Average Age		
		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
2015 SPBP	Calls	Fleet Counts			Fleet Average Model Year		
		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	
2015 SPBP		Fleet Distribtuion			Fleet Average Age		
		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	

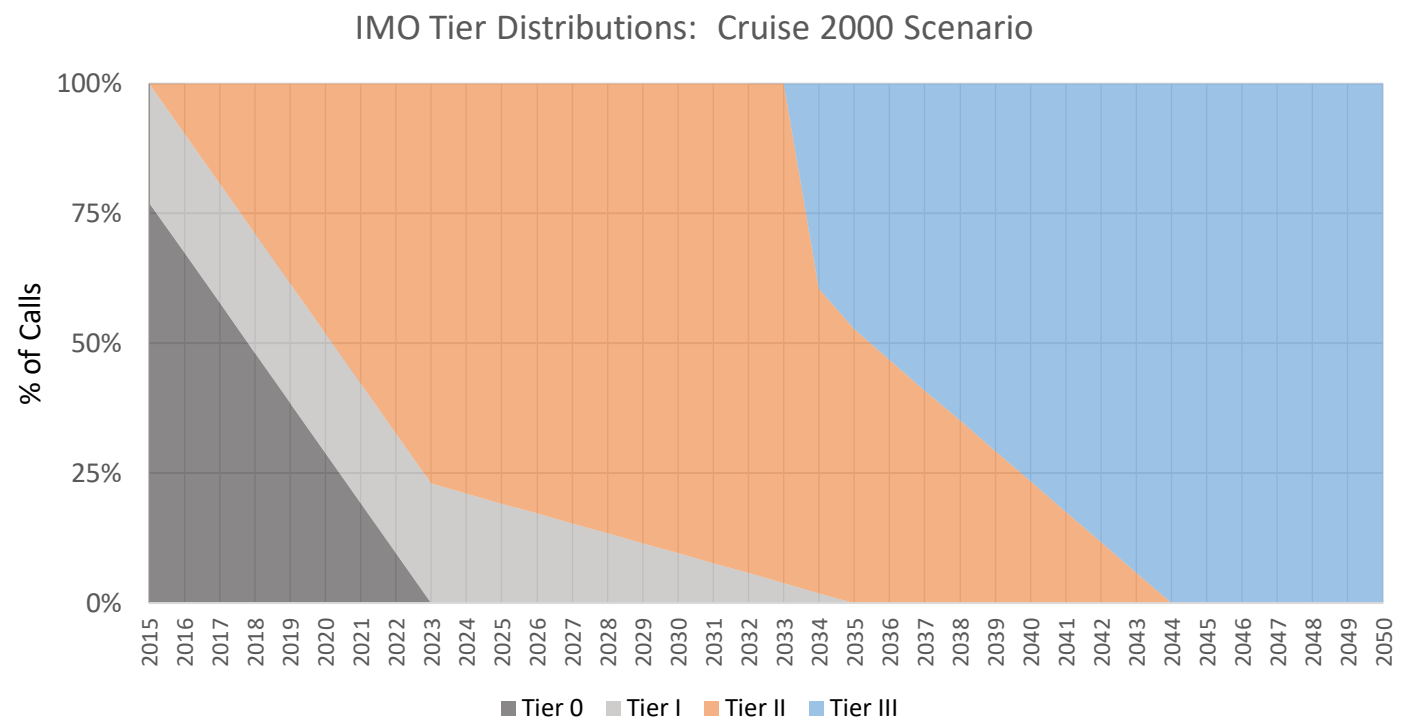
Year	Tier 0			Tier I			Tier II			Cruise 1000			Cruise 1000	
	T0 avg age	Tier 0	Tier 0 TF	Tier I avg age	Tier I	Tier I TF	Tier II avg age	Tier II	Tier II TF	Tier III	fc	ex fleet		
Baseline 2015	22	100%	73%	11	100%	27%	1	100%	0%	0%	11	1,120	17 SPBP max forecasted calls	
2016	23	89%	65%	12	100%	27%	2	100%	8%	0%	11	1,038	50 existing Tier II vessels	2014
2017	24	78%	57%	13	100%	27%	3	100%	16%	0%	12	956	142 existing Tier I vessels	2004
2018	25	67%	49%	14	100%	27%	4	100%	24%	0%	12	875	368 existing Tier 0 vessels	1993
2019	26	56%	41%	15	100%	27%	5	100%	32%	0%	13	793	2 ship calls/year	
2020	27	44%	32%	16	100%	27%	6	100%	41%	0%	13	711	1,120 capacity of calls for existing fleet	
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

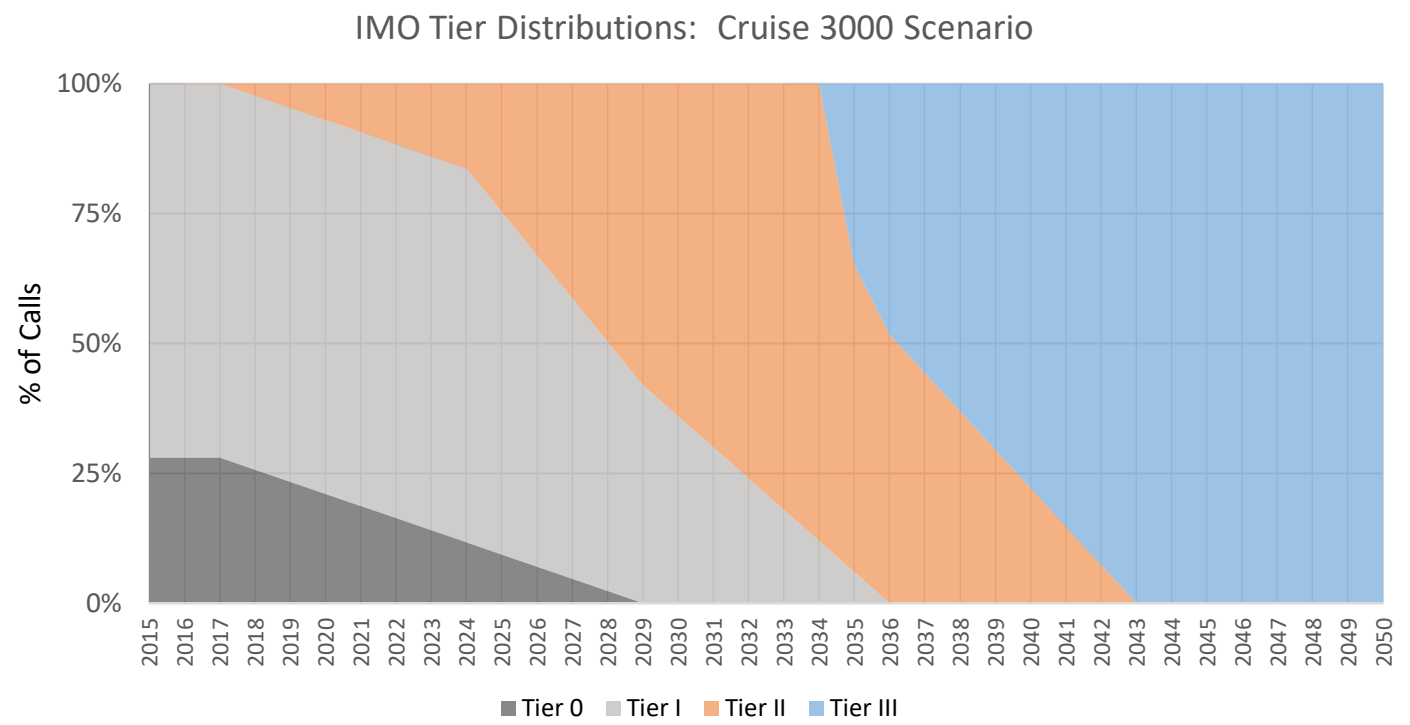
IMO Tier Distributions: Cruise 1000 Scenario



Year	Tier 0			Tier I			Tier II			Cruise 2000			Cruise 2000		
	T0 avg age	Tier 0	Tier 0 TF	T0 avg age	Tier I	Tier I TF	Tier II avg age	Tier II	Tier II TF	Tier III	fc	ex fleet			
Baseline	2015	23	100%	77%	11	100%	23%	2	100%	0%	0%	271	5,250	427 SPBP max forecasted calls	
	2016	24	88%	67%	12	100%	23%	3	100%	10%	0%	281	4,881	6 existing Tier II vessels	2013
	2017	25	75%	58%	13	100%	23%	4	100%	19%	0%	291	4,513	40 existing Tier I vessels	2004
	2018	26	63%	48%	14	100%	23%	5	100%	29%	0%	301	4,144	59 existing Tier 0 vessels	1992
	2019	27	50%	39%	15	100%	23%	6	100%	39%	0%	311	3,775	50 ship calls/year	
	2020	28	38%	29%	16	100%	23%	7	100%	48%	0%	321	3,406	5,250 capacity of calls for existing fleet	
	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		



Year	Tier 0			Tier I			Tier II			Cruise 3000			Cruise 3000	
	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	158 SPBP max forecasted calls
	2016	18	100%	28%	11	100%	72%	4	100%	0%	0%	104	680	14 existing Tier II vessels 2012
	2017	19	100%	28%	12	100%	72%	5	100%	0%	0%	107	680	43 existing Tier I vessels 2005
	2018	20	92%	26%	13	100%	72%	6	100%	2%	0%	111	671	11 existing Tier 0 vessels 1998
	2019	21	83%	23%	14	100%	72%	7	100%	5%	0%	115	662	10 ship calls/year
	2020	22	75%	21%	15	100%	72%	8	100%	7%	0%	119	653	680 capacity of calls for existing fleet
	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	

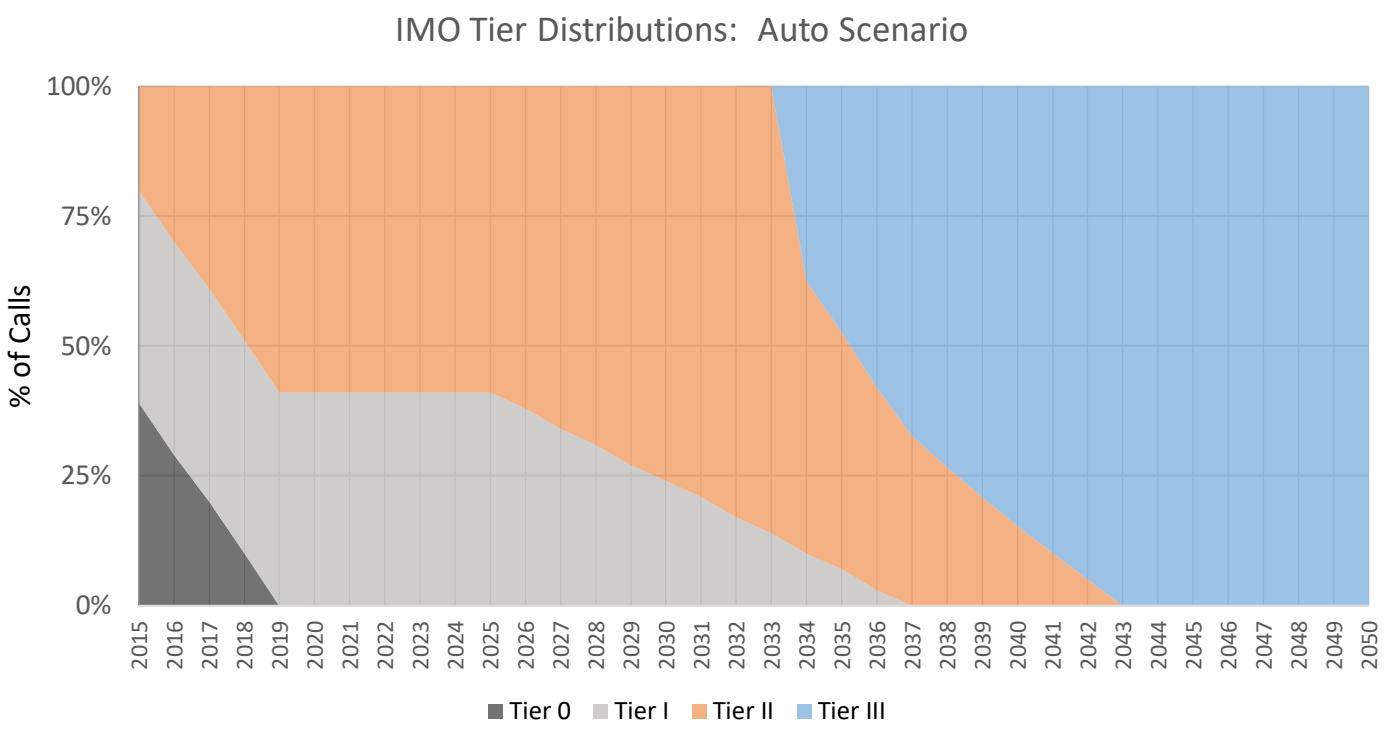


IHS world fleet data & UPDATED SPBP Vessel Call Forecast - IHS Marine Data through Q1 - 2017

2,550+ Capacity	Count/ Calls	Fleet Counts			Fleet Average Model Year		
		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
2,550+ Capacity	Fleet %/Years	Fleet Distribtuion			Fleet Average Age		
		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

Year	T0 avg age	Tier 0			Tier I			Tier II			Auto		Auto
		Tier 0	Tier 0 TF	T0 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	

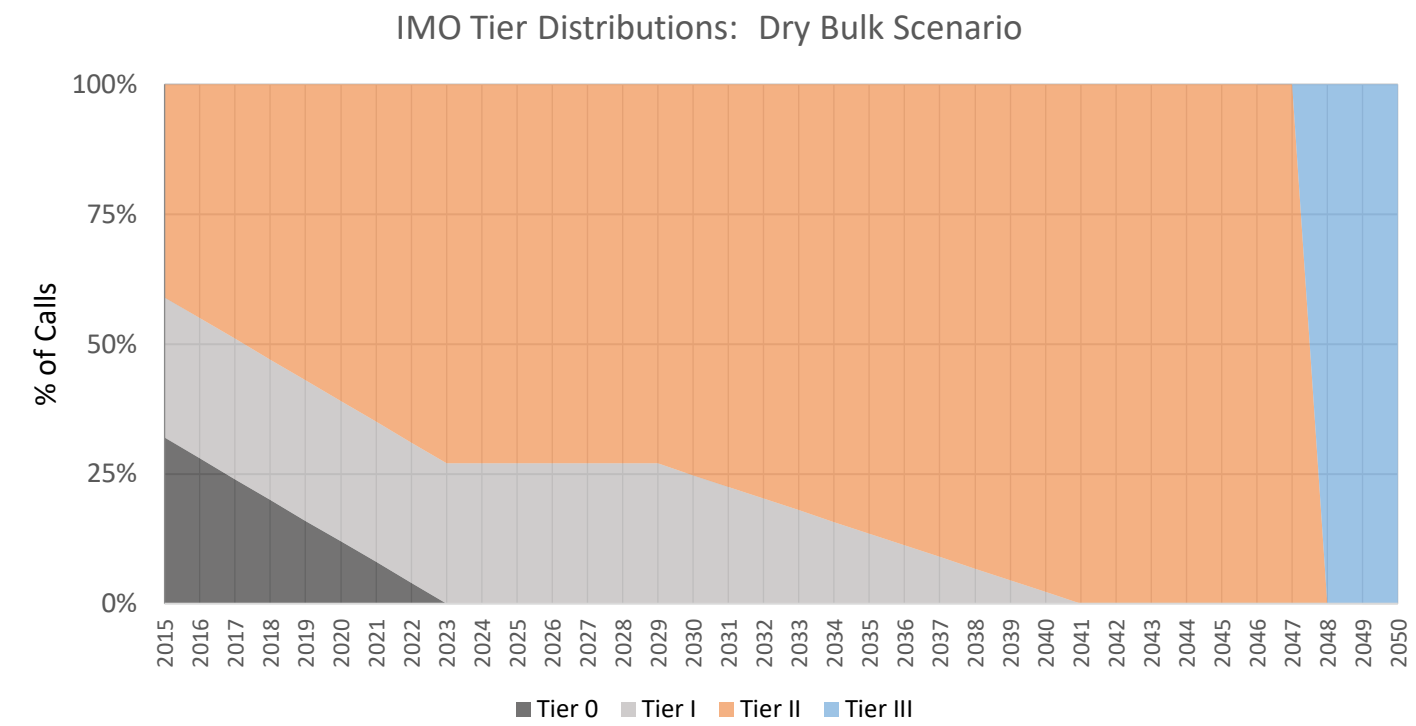
554 SPBP max forecasted calls
 169 existing Tier II vessels 2012
 346 existing Tier I vessels 2006
 335 existing Tier 0 vessels 1988
 2 ship calls/year
 1,700 capacity of calls for existing fleet



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

16,181-114,922 dwt	Count/ Calls	Fleet Counts			Fleet Average Model Year		
		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
16,181-114,922 dwt	Fleet Distribuion	Fleet Average Age					
		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

Year	Tier 0			Tier I			Tier II			Dry Bulk			fc	ex fleet	Dry Bulk
	T0 avg age	Tier 0	Tier 0 TF	Tier I avg age	Tier I	Tier I TF	Tier II avg age	Tier II	Tier II TF	Tier III					
Baseline 2015	28	100%	32%	10	100%	27%	3	100%	41%	0%	269	10,536	275 SPBP max forecasted calls		
2016	29	88%	28%	11	100%	27%	4	100%	45%	0%	269	10,110	4,311 existing Tier II vessels	2012	
2017	30	75%	24%	12	100%	27%	5	100%	49%	0%	268	9,684	2,816 existing Tier I vessels	2005	
2018	31	63%	20%	13	100%	27%	6	100%	53%	0%	268	9,258	3,409 existing Tier 0 vessels	1987	
2019	32	50%	16%	14	100%	27%	7	100%	57%	0%	268	8,832	1 ship calls/year		
2020	33	38%	12%	15	100%	27%	8	100%	61%	0%	267	8,405	10,536 capacity of calls for existing fleet		
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			



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

6,000-84,000 dwt	Count/ Calls	Fleet Counts			Fleet Average Model Year		
		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
6,000-84,000 dwt	Fleet Distribuion			Fleet Average Age			
	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	

Year	Tier 0		Tier I			Tier II		General Cargo			General Cargo		160 SPBP max forecasted calls	
	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		
2015	32	100%	55%	9	100%	29%	2	100%	16%	0%	100	6,078	961 existing Tier II vessels	2013
2016	33	75%	41%	10	100%	29%	3	100%	30%	0%	106	5,247	1,792 existing Tier I vessels	2006
2017	34	50%	28%	11	100%	29%	4	100%	44%	0%	112	4,416	3,325 existing Tier 0 vessels	1983
2018	35	25%	14%	12	100%	29%	5	100%	57%	0%	118	3,584	1 ship calls/year	
2019	36	0%	0%	13	100%	29%	6	100%	71%	0%	124	2,753	6,078 capacity of calls for existing fleet	
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	100%	92%	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

IMO Tier Distributions: General Cargo Scenario

