

Carnival

Costa

P&O CRUISES

P&O AUSTRALIA

PRINCESS CRUISES

Holland America Line

AIDA

CUNARD

SEABOURN

## LNG and Cruise

London Sep 2019



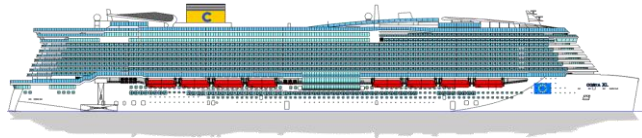
CARNIVAL  
CORPORATION & PLC.

# Carnival Corporation & plc

- 9 cruise brands
- 104 ships in service today
- 21 ships on order
- 120,000 employees
- 11,500,000 guests carried per year
- 225,000 daily cruise guests
- 100,000 shipboard employees
- Bunker 3.3 Million MT fuel / year
- Buy fuel in 175 ports with 120 suppliers in portfolio
- Demand roughly 80% Fuel Oil, 19% distillate & **1% LNG**



# Carnival Corporation - 21 new ships on order, delivery between 2019-2025



- XL class – 8 more LNG powered



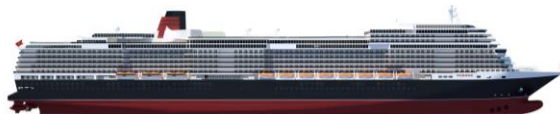
- Sphere class – 2 for Princess LNG powered



- Royal class - AAQS



- Horizon class - AAQS



- New Cunard - AAQS

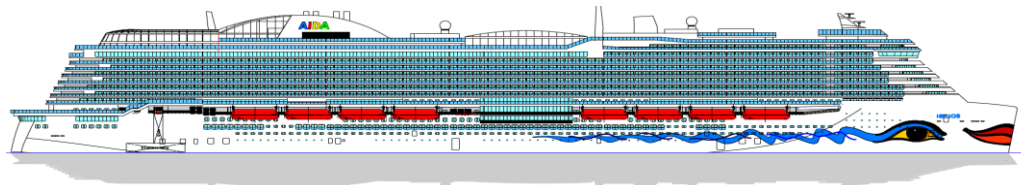


- Koningsdam class - AAQS

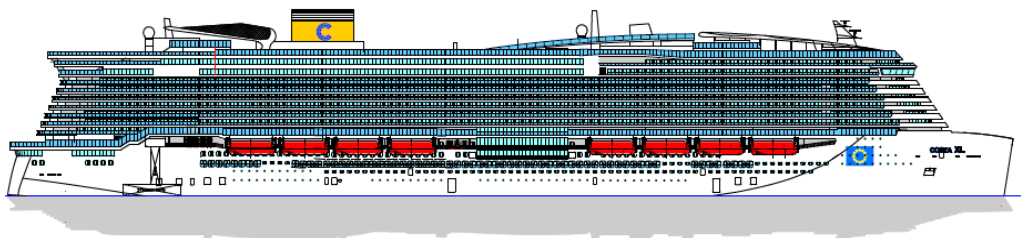


- Venture - MGO

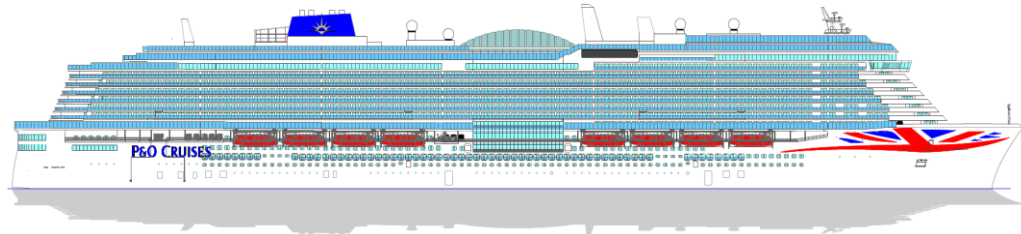
# LNG powered ships for delivery



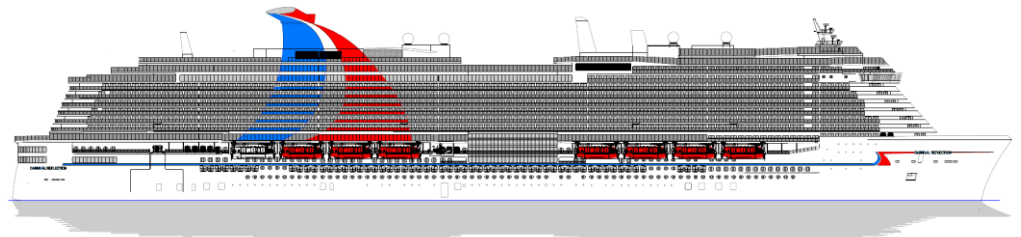
AIDAnova 2018 in operation  
&  
TBD 2021 + TBD 2023



Costa Smeralda (Oct 2019)  
&  
Costa Toscana 2021



Iona (P&O) May 2020  
&  
TBD 2022



Mardi Gras (CCL) Sep 2020  
&  
TBD 2022



Princess TBD 2023  
&  
2025



# Options for 2020 and beyond

- Burn compliant Fuel
  - <0.1 Sulphur content in ECA's and EU ports – MGO/ULSFO etc.
  - <0.5 Sulphur content outside of ECA's
- Use exhaust gas abatement technology – Advanced Air Quality Systems / Exhaust Gas Cleaning Systems / Scrubbers
- Use alternative fuels such as **LNG**, LPG, Methanol, etc
- Increase use of shore power
- Decarbonisation is the next big challenge
- What part will BLNG and Synthetic LNG play?



**IMO 2020**  
Taking bold action to clean up shipping emissions by reducing sulphur

**+ HEALTH & ENVIRONMENT – THE FACTS**

**HEALTH**

- More than **570,000** premature deaths avoided (2020-2025)
- **68%** overall reduction in shipping's negative effect on human health through air pollution

**Significant reductions in:**

- stroke
- asthma
- cardiovascular disease
- lung cancer
- pulmonary disease

**Environment**

Cutting sulphur emissions helps prevent acid rain, which means:

- less harm to crops, forests and aquatic species
- tackling ocean acidification

**WHERE?**

- Health benefits felt globally
- Strongest in coastal communities
- Major impact in vulnerable areas: Asia-Pacific, Africa and Latin America

**HOW?**

- 0.50%** reduced from 3.50% – significantly less sulphur permitted in ships' fuel
- 77%** drop in overall SOx emissions from ships (2020-2025)

**WHEN?**

- From **1 January 2020**

**#IMOSulphurLimit** **#BreatheLife** **#BeatAirPollution**

(Source: University of Delaware study, February 2018; "Health Impacts Associated with Delay of MARPOL Global Sulphur Standards" presented by Finland to IMO, August 2016)

**IMO** **SUSTAINABLE DEVELOPMENT GOALS**

# Carnival's Global Emissions Approach

- Carnival Corporation supports the implementation of the Global ECA in 2020
- We have selected **LNG** as primary fuel for next generation large ships – 1st in industry to do this
- We have selected **Advanced Air Quality Systems 'AAQS'** /EGCS (aka Exhaust Gas Cleaning Systems 'or scrubbers) - as the primary retrofit solution for the existing fleet and for our existing new build program
  - We believe wash water has negligible impact on the ocean environment; based on years of monitoring and compilation/analysis of the largest EGCS wash water laboratory sample data base in the marine industry.
  - 3rd party testing shows air emissions performance as good as or better than MGO
- Around 40% of fleet is already fitted for **Cold Ironing** - shore power in port
- Our entire fleet can use **MGO** if necessary and we are also investigating use of **ULSFO**
- Continue to invest in energy saving measures and innovations such as fuel cells and batteries
- Zero emissions in port a first target towards decarbonisation

# The Case for LNG as a Marine Fuel

- Best in class performance in terms of air emissions – both regulated and unregulated - while still being competitively priced
- Increasingly available
- Non polluting
- Shipyards ready
- Capex reasonable <sup>2</sup>



Zero sulfur dioxide  
emissions

>75% reduction in  
nitrogen oxides

Up to 100% reduction in  
particulate matter

15% well to wake  
reduction in carbon  
emissions<sup>1</sup>

1 <https://info.thinkstep.com/lng-ghg-study>

2 [https://sea-lng.org/wp-content/uploads/2019/01/190123\\_SEALNG\\_InvestmentCase\\_DESIGN\\_FINAL.pdf](https://sea-lng.org/wp-content/uploads/2019/01/190123_SEALNG_InvestmentCase_DESIGN_FINAL.pdf)



# No emissions !!

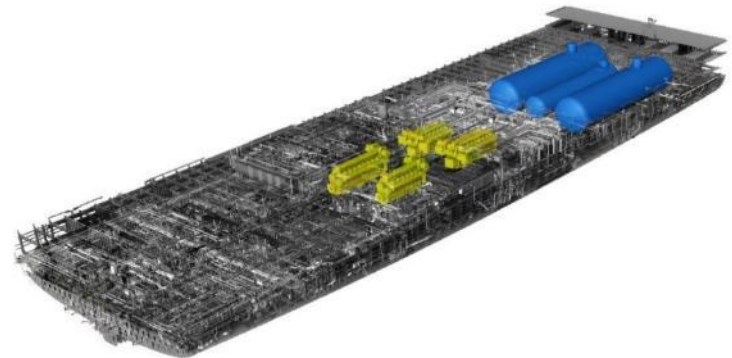




# XL Class - LNG on-board Arrangement



- 4 x 16 Cylinders 46 DF MaK
- 3620m<sup>3</sup> LNG in 3 type 'C' tanks (takes almost double the space of HFO/MGO)
- Operates at 0.7 bar with max pressure 4.5 bar
- Transatlantic range
- Safe return to port via MGO (up to 2200m<sup>3</sup>)
- Strategic Partnership with Shell for LNG supply



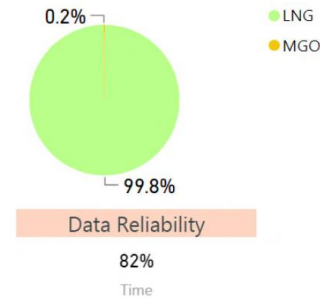
# Experience to Date

- Ship operating on LNG for over 99% of time
- Bunkering every two weeks since delivery
- 900-1100MT per delivery
- No significant issues with transfer system
- Time for bunkering improving steadily

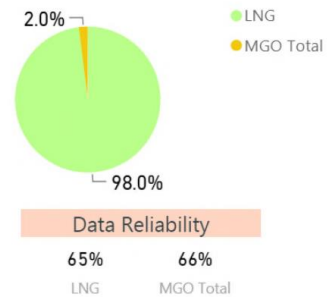
## LNG Usage Monthly monitoring



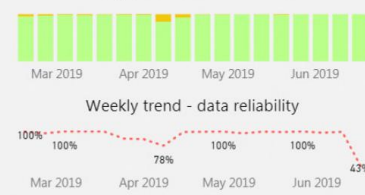
Fuel Mode – Time%



Fuel Consumption %



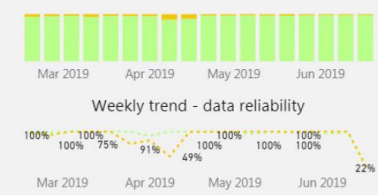
Weekly trend - Fuel Mode Time%



**Note:**

Not reliable records are not included in the evaluation of the Time% of the Fuel Mode analysis.

Weekly trend - Fuel Mode Time%



**Note:**

Pilot MGO consumption included in the "MGO Total" estimation

## LNG Port Operations – Current and Planned (2019 - 2021)



- 📍 Possible new locations
- 📍 Under active review
- 📍 Approved

# LNG in Numbers

**316.5**  
Million tonnes

In 2018 316.5M MT  
Of LNG were  
traded globally

AIDAnova has safely  
bunkered approx.  
16000MT of LNG since  
Delivery

**16000**  
tonnes

10 LNG Fuelled  
Ships on order  
for Carnival Corporation  
Brands

**10**

**26**

44% of all cruise  
ships on order  
for delivery by 2026  
will use LNG

**30**  
Kilo tonnes

Each XL will  
consume around  
30,000MT per annum

Advanced certificates  
of competency issued  
by CSMART to officers

**3**

Average Methane  
Number (MN) of  
Bunkered LNG

**81**

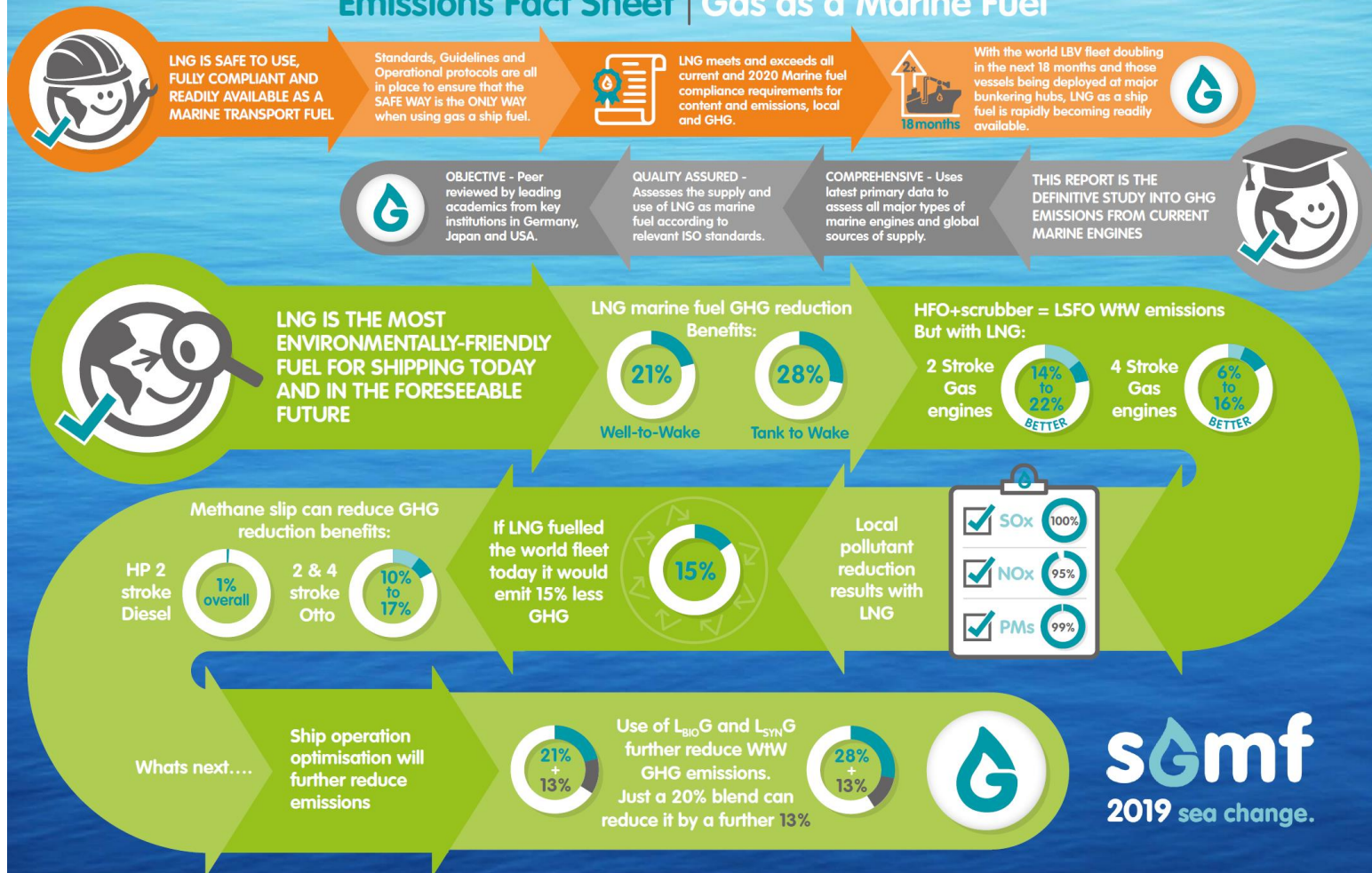
**97.9%**

AIDAnova has run on  
LNG 97.9% of the time  
since delivery in  
Dec 2018



# LNG ++

## Emissions Fact Sheet | Gas as a Marine Fuel



[www.sgmf.info](http://www.sgmf.info)

Download the report: [www.sgmf.info/posts](http://www.sgmf.info/posts)

Any questions?

