

LNG and Cruise

London Sep 2019

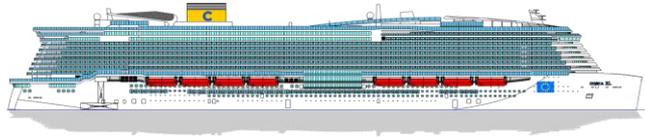


Carnival Corporation & plc

- 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

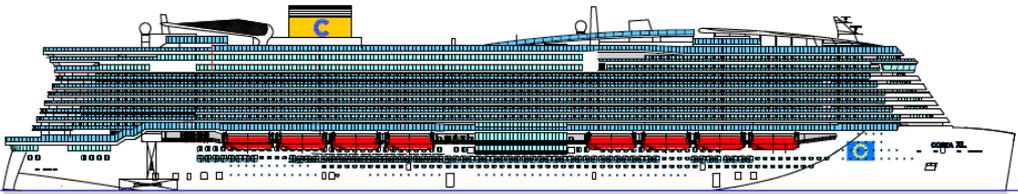


- Venture - MGO

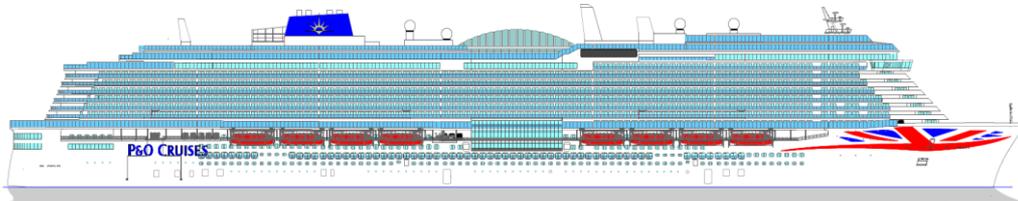
LNG powered ships for delivery



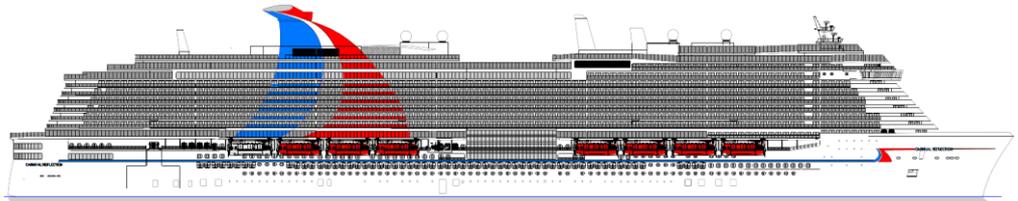
AIDAnova 2018 in operation
&
TBD 2021 + TBD 2023



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

- 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

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 Standard", 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 ²



Zero sulfur dioxide emissions

>75% reduction in nitrogen oxides

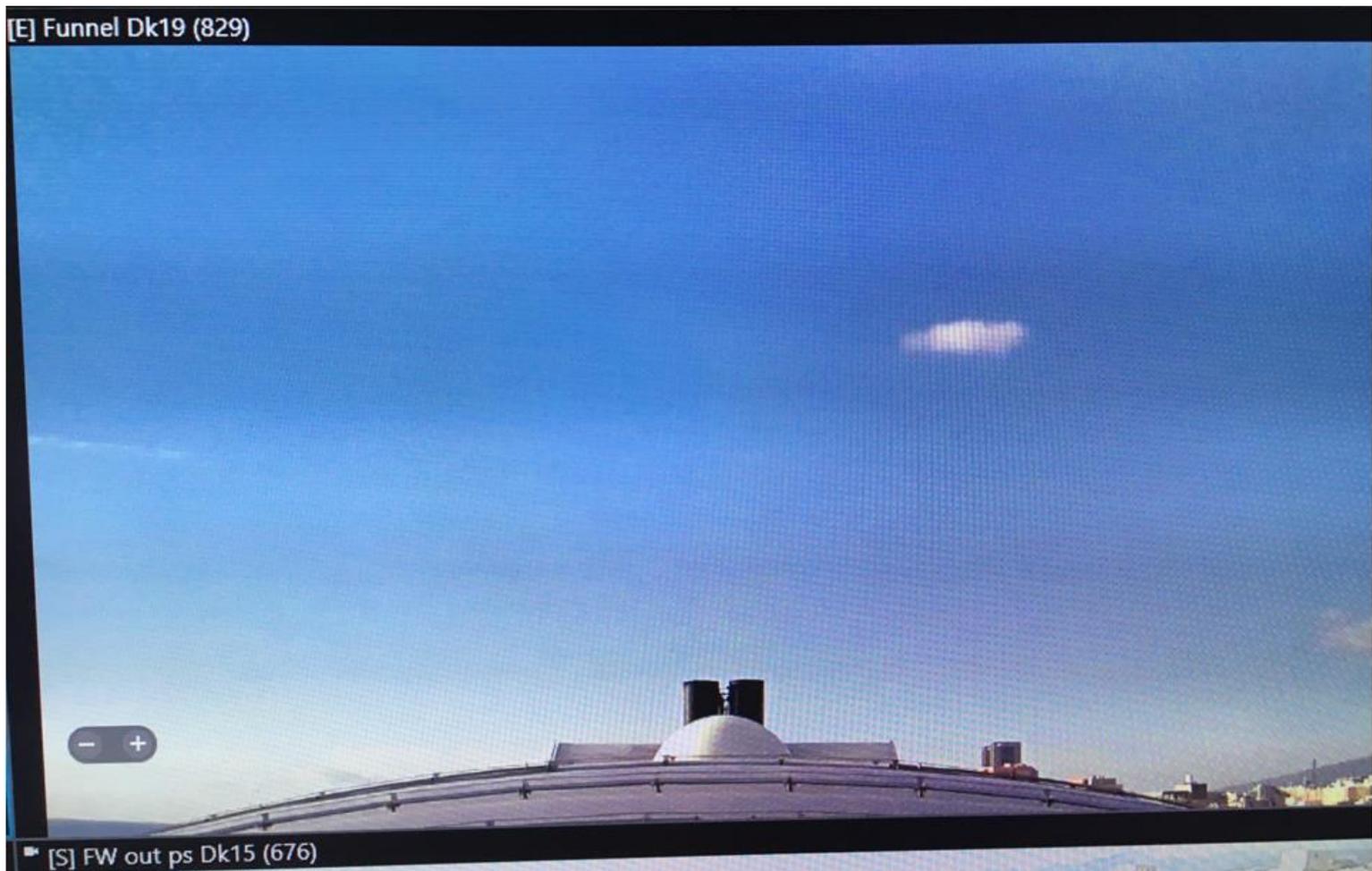
Up to 100% reduction in particulate matter

15% well to wake reduction in carbon emissions¹

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

2 https://sea-lng.org/wp-content/uploads/2019/01/190123_SEALNG_InvestmentCase_DESIGN_FINAL.pdf

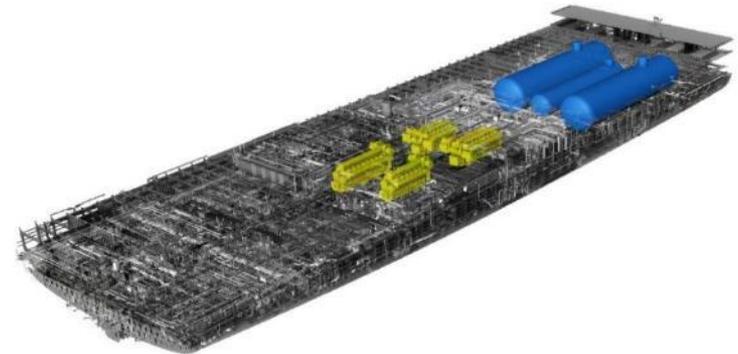
No emissions !!



XL Class - LNG on-board Arrangement



- 4 x 16 Cylinders 46 DF MaK
- 3620m³ 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 2200m³)
- Strategic Partnership with Shell for LNG supply



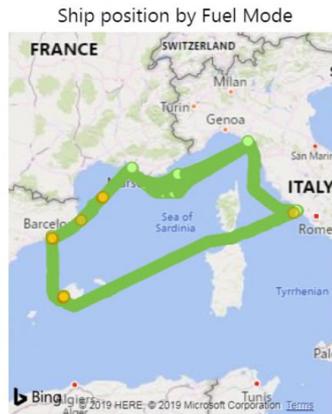
Experience to Date

- 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

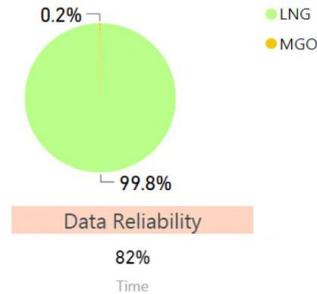
LNG Usage Monthly monitoring

AIDAnova

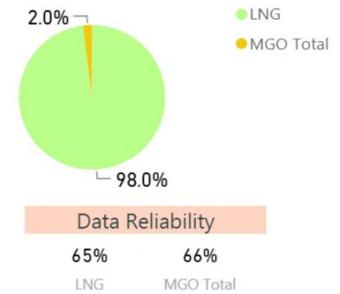
Jun2019



Fuel Mode – Time%



Fuel Consumption %



Weekly trend - Fuel Mode Time%



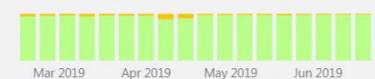
Weekly trend - data reliability



Note:

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

Weekly trend - Fuel Mode Time%



Weekly trend - data reliability



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

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

26

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

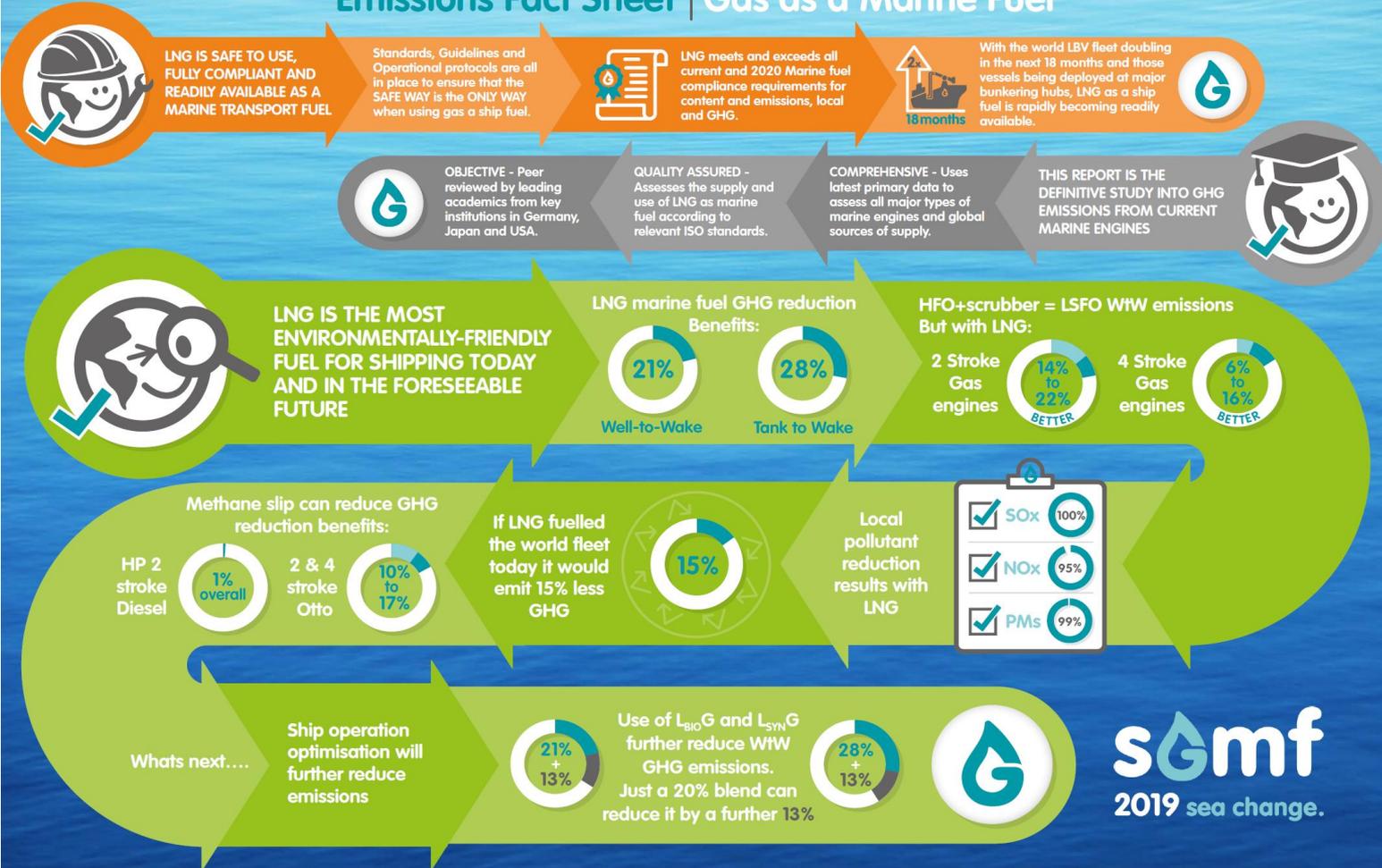
81

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

97.9%

LNG ++

Emissions Fact Sheet | Gas as a Marine Fuel



www.sgmf.info

Download the report: www.sgmf.info/posts

Any questions?

