

# HOW SHELL LNG FUEL IS SUPPORTING CARNIVAL'S "GREEN CRUISING" STRATEGY AND SUSTAINABILITY AMBITION



## ABOUT CARNIVAL

Carnival Corporation, the world's largest leisure travel company, provides travelers around the globe with extraordinary vacations. They have a portfolio of nine cruise lines with a fleet of over 100 ships visiting more than 700 ports around the world. Carnival Corporation has led the cruise industry in the adoption of LNG, with a total of 11 next-generation "green" cruise ships ordered which can be powered by LNG. Carnival Corporation is strongly committed to help protect the environment and support the UN Sustainable Development Goals by reducing their air emissions and improving air quality in the places they visit. Find out more about Carnival at [www.carnival.com](http://www.carnival.com)

## ABOUT SHELL LNG FUEL

Global greenhouse gas emissions from marine vessels can be significantly reduced by switching to LNG as a fuel.<sup>1</sup> Shell LNG can help improve air quality from ships, compared to heavy fuel oil, as it contributes virtually zero Sulphur emissions and can help reduce particulates and NO<sub>x</sub> emissions.<sup>2</sup> Shell LNG also offers a cost comparative solution for ship-owners compared to traditional fuel oils. Find out more about Shell LNG Fuel at [www.shell.com/gasfortransport](http://www.shell.com/gasfortransport).



Shell  
LNG



# WE ARE PROUD TO BE ON THE FOREFRONT OF ADVANCING LNG AS A FUEL SOURCE FOR THE CRUISE INDUSTRY

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CARNIVAL CORPORATION, PLC



## WHY DID CARNIVAL CHOOSE LNG AS A MARINE FUEL FOR YOUR SUSTAINABILITY STRATEGY?

LNG is an economic, clean and safe marine fuel with increasing global availability that also complies with existing and scheduled emission requirements. By building new ships that will be powered by LNG both while in port and at sea, we believe we are setting ourselves up to future-proofing our fleet.

Compared to marine diesel oil, LNG offers a 95 to 100% reduction in sulfur oxides (SOx), up to 85% reduction in particulate matter, up to 85% reduction in nitrogen oxides and up to 22%\* tank to wake\*\* greenhouse gas emissions reduction in our cruise ships.

## WHY DID YOU CHOOSE TO PARTNER WITH SHELL AROUND LNG AS A MARINE FUEL?

One of the keys to establishing LNG as an industry standard for powering cruise ships is building an extensive, safe and reliable infrastructure for the fuel across the globe. It is important to partner with people who are very reliable and who really understand their side of the business. Shell has supported us to make LNG a viable option for the entire industry.

Shell will also be our supplier of LNG to power North America's first fully LNG-powered cruise ships coming in 2020 and 2022, through its LNG Bunker Barge (LBB) which will allow these ships to refuel with LNG at ports along the southern U.S. East Coast.

## WHAT DO YOU SEE AS THE BENEFITS OF PARTNERING WITH SHELL?

Shell has the technical experience and shared commitment to quality, safety and operational efficiency needed to help us bring this innovative LNG initiative to life. A considerable effort is being made to ensure that the crew are very well prepared and have all the necessary training and experience. As part of our strategic relationship with Shell, we have the opportunity for our crew to get hands-on real-time experience onboard LNG cargo carriers. This enables them to witness operations such as LNG bunkering and related LNG activities.

## WHAT HAS BEEN YOUR EXPERIENCE OF OPERATING THESE LNG FUELED VESSELS?

The LNG operations and bunkering processes have been very successful for AIDAnova – the world's first ship of this kind, delivered in December 2018 – going in some cases even better than we expected. **The engines are cleaner and quieter, but the most obvious effect has been the reduction in emissions – including, almost no visible emissions from the funnel!**

## HOW DO YOU SEE LNG PLAYING A ROLE IN THE EXPANSION OF CARNIVAL'S FLEET?

Following the path of AIDAnova – the largest cruise ship ever built at a German shipyard – we have 10 additional next-generation cruise ships on order. These new ships will have the ability to use LNG to generate 100 percent of their power both in port and on the open sea – an innovation that will reduce emissions to help protect the environment.

## DO YOU HAVE ANY MESSAGES FOR OTHERS IN THE MARITIME INDUSTRY WHO ARE EXPLORING LNG FUELED VESSELS FOR THEIR FLEET?

The use of LNG meets and exceeds all current and proposed emissions regulations adopted by the International Maritime Organisation (IMO) through 2025. With the development of new LNG bunkering facilities and terminals, the maritime industry can commit to employing this technology.

To Carnival, LNG is seen as an important short-term and long-term solution. As organisations continue to enact safety regulations and codes demanding cleaner emissions, it is crucial for the cruise industry to adapt. **LNG is currently the most cost-effective solution that offers emission reductions TODAY.** What we can achieve today with fossil LNG plus an increasing introduction in the percentage of renewable liquefied methane – either from Bio or synthetic sources – could see ships being effectively carbon neutral in the future.

1 "Well-to-wake" greenhouse gas emissions reductions are based on current ISO 9001 standards for analysis and EPA & GREET emissions values. "Greenhouse gas emissions" include CO<sub>2</sub>, methane and N<sub>2</sub>O.

2 Particulate emissions from natural gas combustion can be reduced by up to 90 percent.

\*For 4 stroke engines compared to current oil-based marine fuels.

\*\*On a Tank-to-Wake (TiW) basis, the combustion process for LNG as a marine fuel show GHG benefits of up to 28 % compared with current oil-based marine fuels. On an engine technology basis, the TiW emissions reduction benefits for gas fueled engines compared with HFO fueled engines are between 18 to 28 % for 2-stroke slow speed engines and between 12 to 22 % for 4-stroke medium speed engines.