

Saving energy and reducing emissions through the supply of power to cruise ships in ports

Max Kommorowski

Director
LNG-Hybrid



Dr. Monika Griefahn

Chief Sustainability Officer
AIDA Cruises



BIOGRAPHY

Max Kommorowski

Responsibility: Technical Management and Operations

With BMS since: 2012

Prior to joining BMS: - Sales director Hoppe Bordmesstechnik

- Managing director TTS Ships Equipment

- Chief Technology Officer at Peters Schiffbau AG and Sunseeker

- Head of repair department at Kröger shipyard

- Project engineer in the repair department at Blohm + Voss AG

Education: - Engineer degree at technical school in Hamburg

- Apprenticeship at Blohm + Voss AG in machine fitting

Dr. Monika Griefahn (Dr. phil., graduate sociologist) was a co-founder of Greenpeace Germany in 1980, and served on the board of Greenpeace International from 1984 to 1990. In 1990, former Lower Saxony Prime Minister Gerhard Schröder appointed her Minister for the Environment in Lower Saxony until 1998. Monika Griefahn then worked in various committees as a member of the German Parliament (1998 - 2009). She founded the Institute for Media, Environment and Culture in Buchholz, Germany, at the beginning of 2012. Monika Griefahn has been Chief Sustainability Officer AIDA Cruises in Rostock since May 2012. Rostock, January 2014



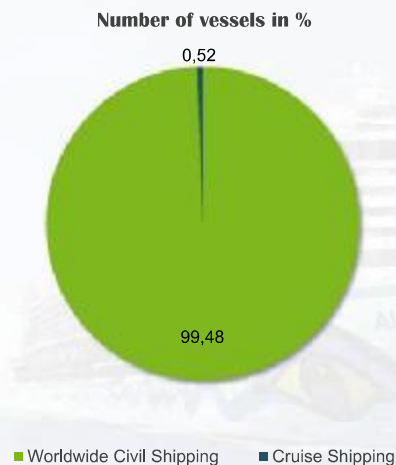
2 Sustainable Growth



- **10 Vessels**
most modern fleet in the world
- **Success**
one of the fastest growing and successful travel companies in Germany
- **Future**
two new vessels until 2016



3 | Worldwide Civil Shipping



- Cruise ships (513 vessels) only equal 0,52% of the civil shipping fleet worldwide (about 99.000 vessels).
- AIDA Cruises: ~0,02% of the entire worldwide civil shipping

Source: Data NABU

4 | Our philosophy



- For AIDA Cruises, acting sustainably is acting responsibly.
- We manage resources carefully and protect the environment, promote cultural and biological diversity and are committed to helping people on board and ashore.
- We are convinced that a sustainable business model is fundamental in allowing us to continue being a successful cruise operator in tomorrow's world.

5 | Our sustainability strategy



- Commitment to preserve the environment and to maintain biological diversity
- Investment in energy efficient technologies
- Close collaboration with science and research partners
- Preserve use of resources and, wherever possible, recycling in technological and biological processes
- “cradle to cradle” approach to procurement and purchasing and wherever possible use of environmental friendly and recyclable products

- We take on social responsibility
- We believe in responsible growth: Protecting the environment and social responsibility are indispensable to future business success.

6 | Technology: We have the 3-Liter-Ship



SUSTAINABLY

conserving resources determines our thinking and our actions.

We have the 3-liter-ship!

The AIDA fleet is one of the cleanest and most modern cruise fleets in the world. An AIDA ship today consumes just three liters of fuel per person over 100 kilometers, confirmed by Germanischer Lloyd. In 2015 an 2016 we will put two ships of a new generation into service. They are going to be equipped with dual-fuel engines and can be powered with liquefied gas in ports. With a comprehensive exhaust gas treatment system, we are going to reduce the emissions of soot particles, nitrogen oxides and sulfur oxides by 90 to 99 percent. For the first time on a cruise ship, the so-called MALS technology will be put to use on our rebuilds 2015/2016. This technology allows our ships to glide along on a carpet of air which reduces friction and such fuel consumption.

Many forward-looking measures are a matter of course for us already today, so that our guests can enjoy their holiday with first-class services onboard AIDA at good conscience.

- > Economic mode of operation
- > Innovative propulsion
- > Lowest fresh water consumption
- > Fresh water distillation

- > Reduction of exhaust gas
- > Fuel-saving design
- > Waste separation onboard
- > Carpet of air

7 Application of sustainable technologies



- Energy efficiency: Mitsubishi Air Lubrication System (MALS)
- Reduction of air pollution: exhaust gas treatment, shoreside power, LNG Hybrid barge, dual fuel engines
- Protection of biodiversity: ballast water treatment
- Reduction of water pollution: advanced wastewater treatment



- Dual-fuel engine
- Plug-in for shoreside power
- LNG connection for port operation



9 Comprehensive exhaust gas treatment system



▸ Reduction of emissions:

- NOx red. > 95%
- SOx red. > 99%
- PM red. > 90%

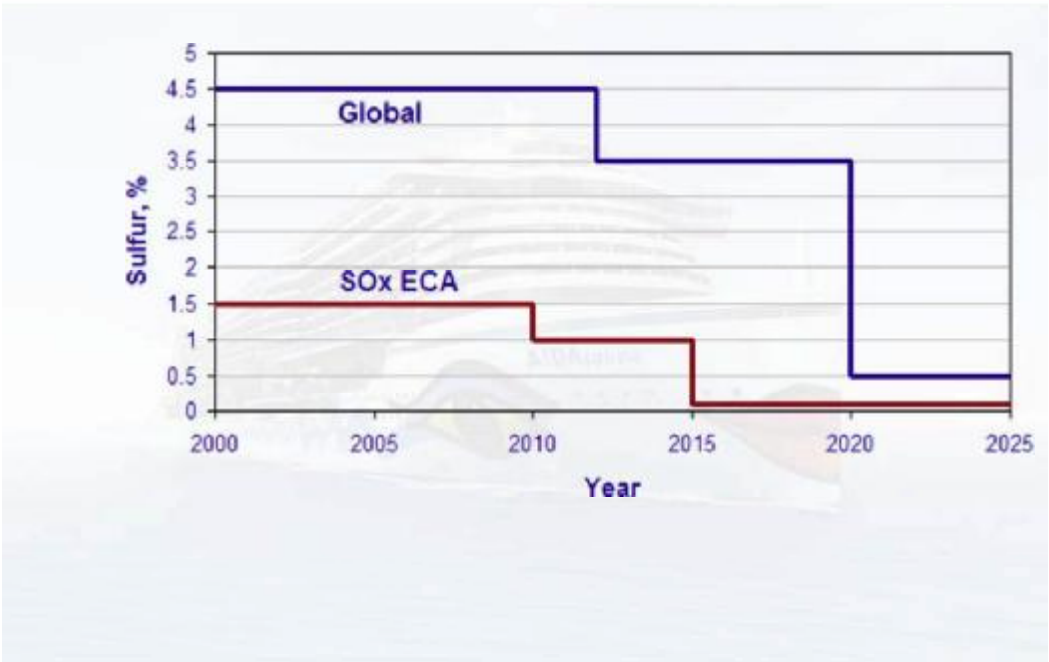
▸ PLUS

- CO red. > 70%
- Unburnt hydrocarbon red. > 85 %

10 Installation first stage – scrubber



11 | IMO timeline



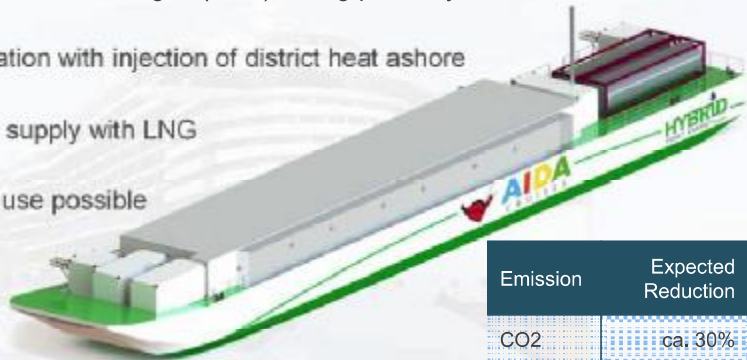
12 | Emission Control Areas



13 | Innovative technology –
LNG Hybrid Barge at Hamburg Port



- › Eco-friendly energy supply with liquefied natural gas (LNG) during port stay
- › Combination with injection of district heat ashore
- › Modular supply with LNG
- › Flexible use possible



- › AIDA Cruises is pioneer

Emission	Expected Reduction
CO2	ca. 30%
NOx	ca. 80%
SOx	100%
PM	nearly 100%

14 | LNG HYBRID Barge

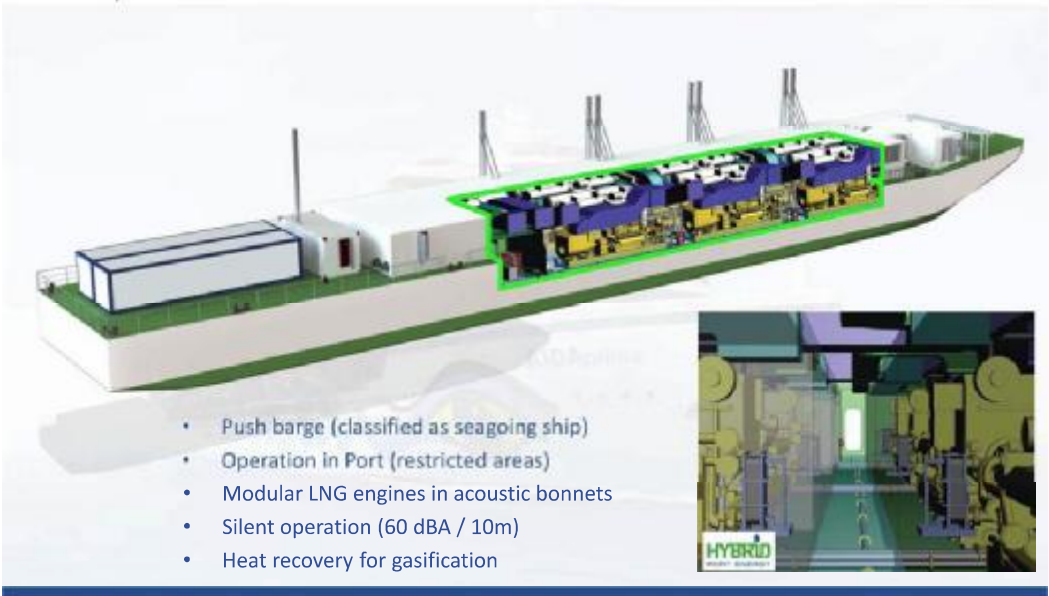


Dimensions: 76 x 11,4 x 2,5 m
Capacity: 2 x 17 t LNG Containers
Power: 7,5 MW - Gasmotoren
10,5 MW (Ausbaustufe)
Classified as seagoing ship

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15 | LNG HYBRID Barge



- Push barge (classified as seagoing ship)
- Operation in Port (restricted areas)
- Modular LNG engines in acoustic bonnets
- Silent operation (60 dBA / 10m)
- Heat recovery for gasification

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16 | LNG HYBRID Barge



<u>Standard</u>			<u>Option</u>		
5 x	1.500 kW	7.500 kW	7 x	1.500 kW	10.500 kW
	11 kV	Barge/Ship		11 kV	Barge/Ship
	60 Hz			60 Hz	
5x	~1.400 kW	~7.000 kW	7x	~1.400 kW	~9.800 kW
	10 kV	Barge/Shore		10 kV	Barge/Shore
	50 Hz			50 Hz	
Thermal Capacity:		~7.500 kW	Thermal Capacity:		~10.500 kW

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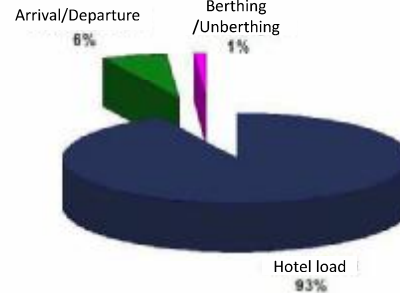


17 Why a LNG HYBRID Barge makes sense?



Present challenges: Reduction of emissions

One average cruise ship (2.000 Pax) caused about 93 % of the emissions during a typical stay in the port while it's lying at the berth.



Percentage of total emissions in the port of an average Cruise Ship abt. 2000 Pax

Source: Study Germanischer Lloyd: „Reduction of emissions from cruise ships in Hamburg“

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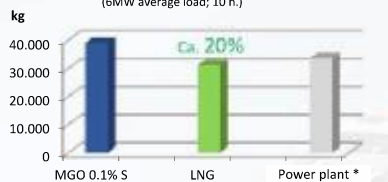
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18 LNG stands for clean energy !

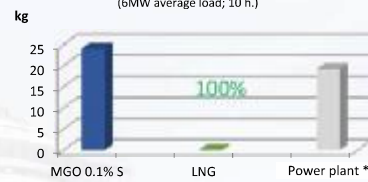


CO₂ Emissions per call (6MW average load; 10 h.)



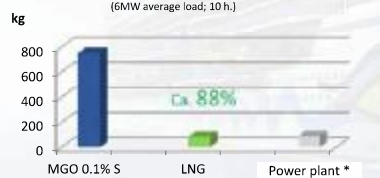
* Federal Environment Agency - Energymix Germany

SO_x Emissions per call (6MW average load; 10 h.)



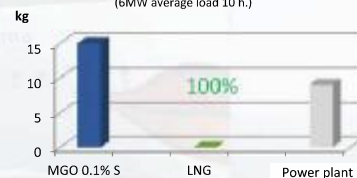
* EON - Data 2011

NO_x Emissions per call (6MW average load; 10 h.)



* Federal Environment Agency - Energymix Germany

PM Emissions per Call (6MW average load 10 h.)



* Federal Environment Agency - Energymix Germany

Data based on the electrical power !

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19 | Innovative technology –
LNG Hybrid Barge at Hamburg Port



Savings potential AIDAsol, Season 2014, Hamburg



AIDAsol	March – December	34 Calls	10-13 h
AIDAluna	April – August	22 Calls	10-13 h
AIDAstella	May – August	9 Calls	10-14,5 h

Savings 6 MWel. Average load Time in port 10h	CO ₂	320,2 Tons	ca. 22	Percent
	NO _x	22,6 Tons	ca. 88	Percent
	SO _x	0,8 Tons	100	Percent
	PM	0,5 Tons	100	Percent

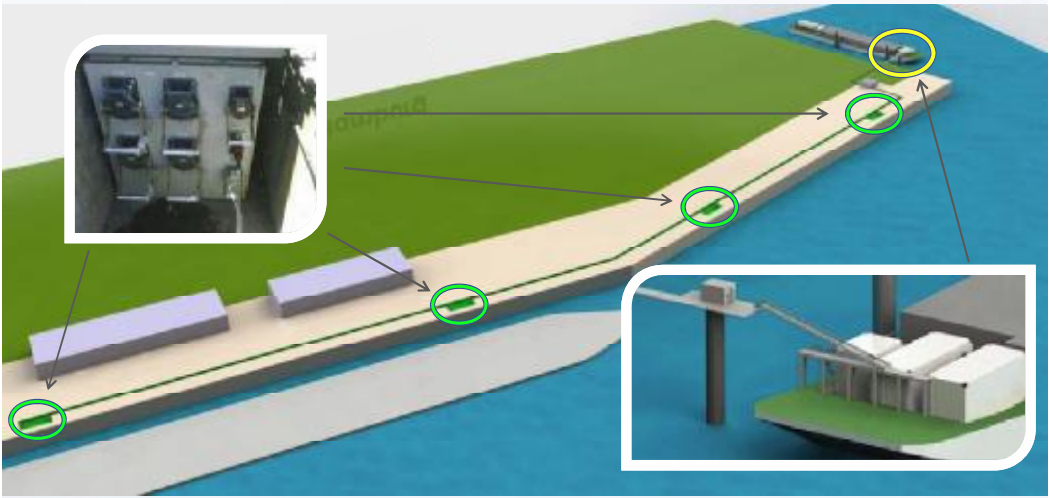
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20 | LNG HYBRID Barge



Shore Junction Box & Cable Channel



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21 | LNG HYBRID Barge



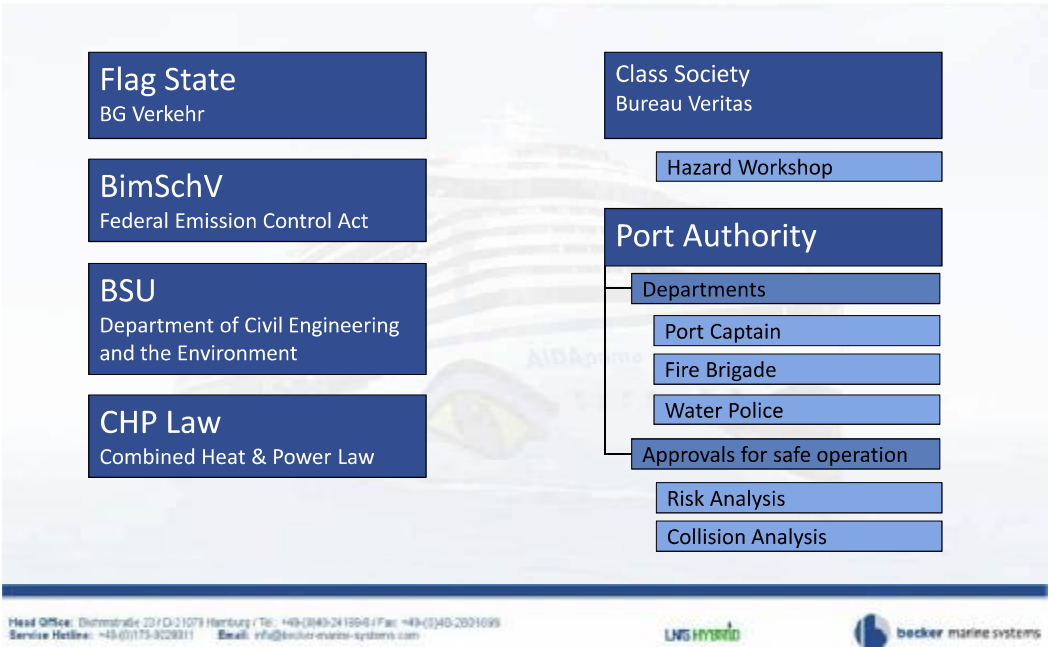
Cable Handling System / Shore to Ship



22 | Concept Summer & Winter
operating 365 days/year



23 | Approvals from Authorities



24 | AIDAsol – ready for shoreside power
Cable handling



25 | Since 2007 annual sustainability report



▸ For more information please visit www.aida.de/aidacares

Thanks for your attention!

26 | Ergänzungen



27 Advantages of a LNG HYBRID Barge...



...and why a stationary installation isn't the right solution !



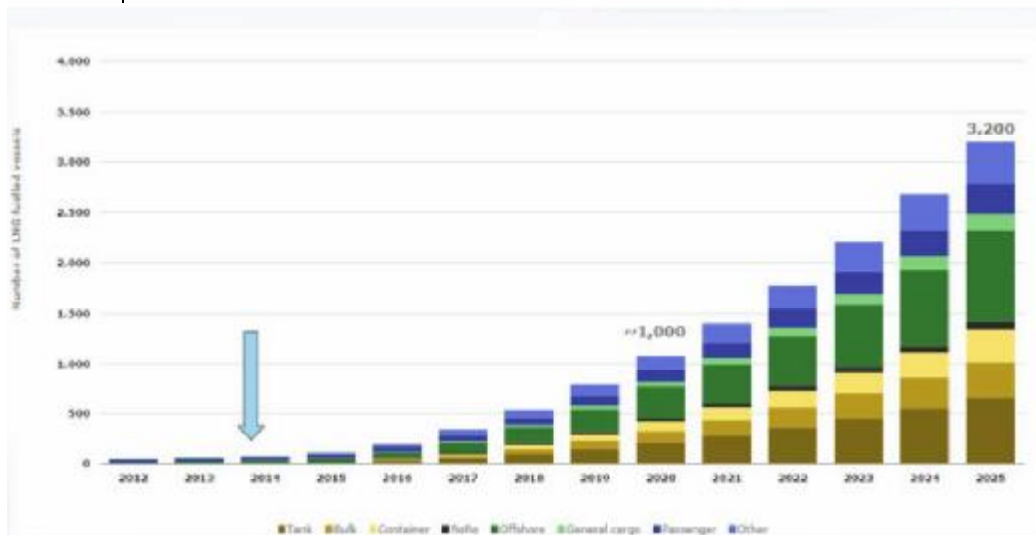
- | | |
|--|--|
| <ul style="list-style-type: none"> • Fast realization • Reduction of Emissions • Mobility • Flexibility • No or less investment • Completely self-sustainable • Hamburg plays a pioneering role | <ul style="list-style-type: none"> • Complex and slow implementation • Transfer of emissions from ship to power plant • Stationary use • Seasonal use • High investment costs |
|--|--|

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28 LNG small scale trends

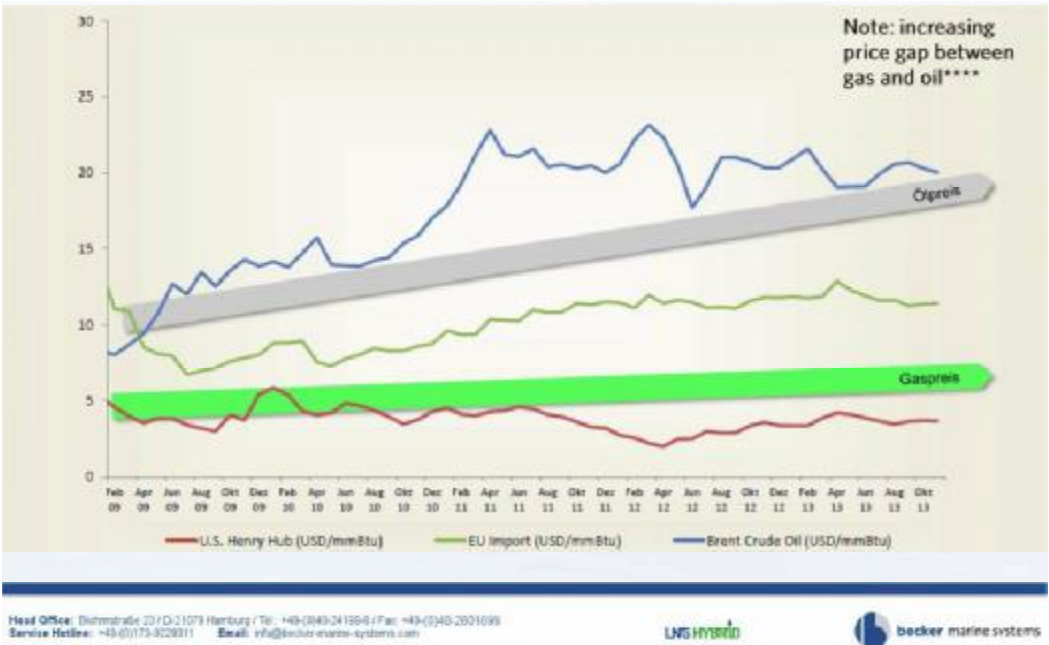


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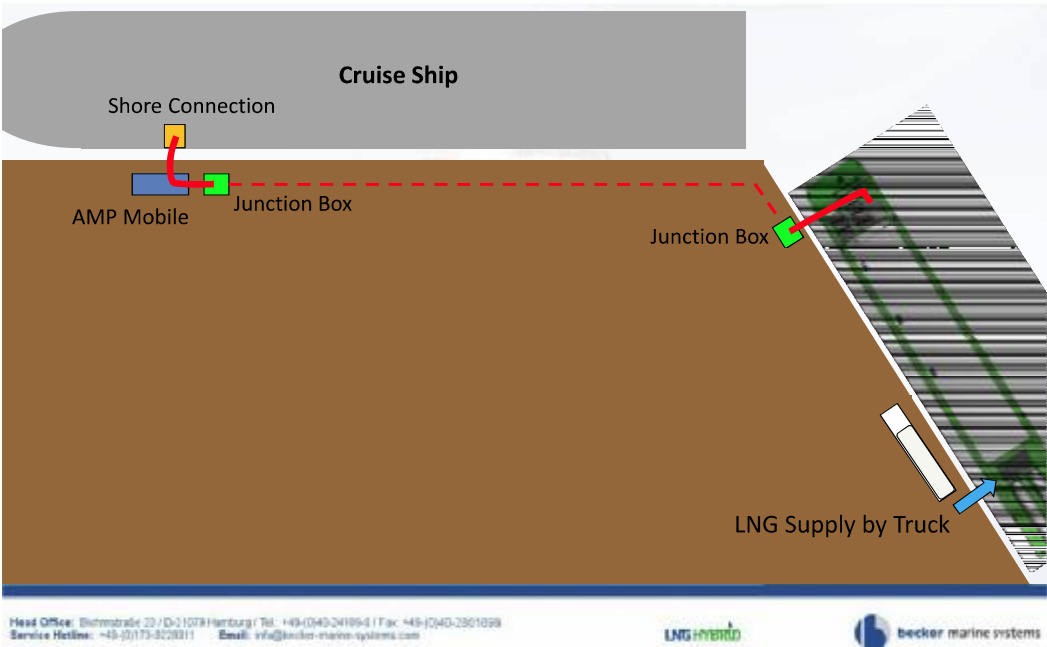
29 | Global Oil & Gas price trends



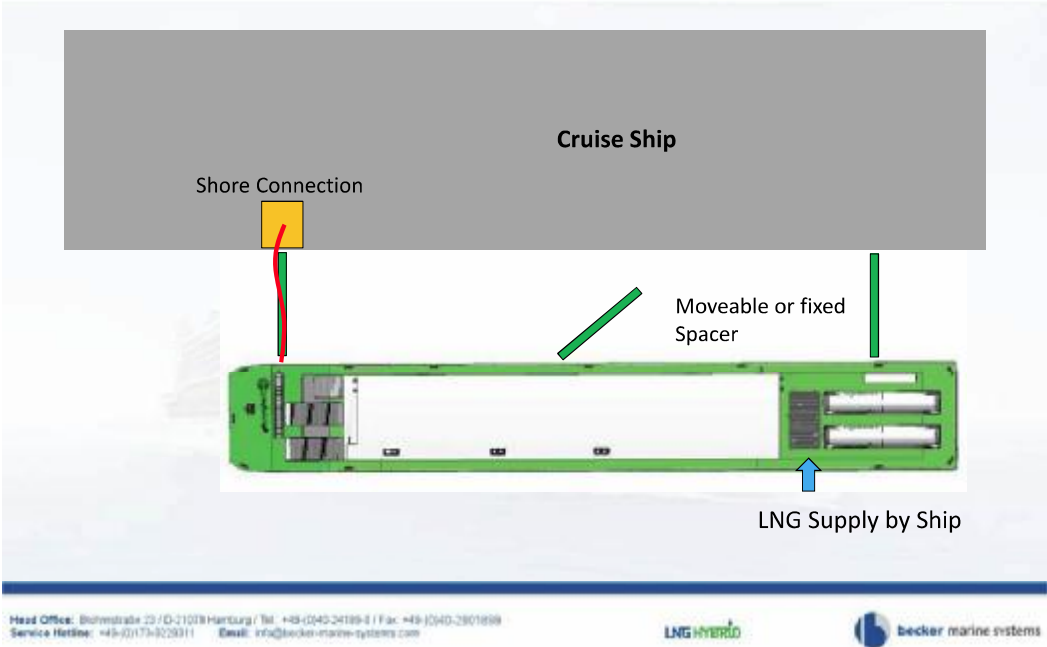
30 | Moving the Barge...



31 | Barge Solution



32 | Barge Solution



33 | Cable handling Solutions



Fester Übergabepunkt



Schienenführung
Beispiel HH Altona



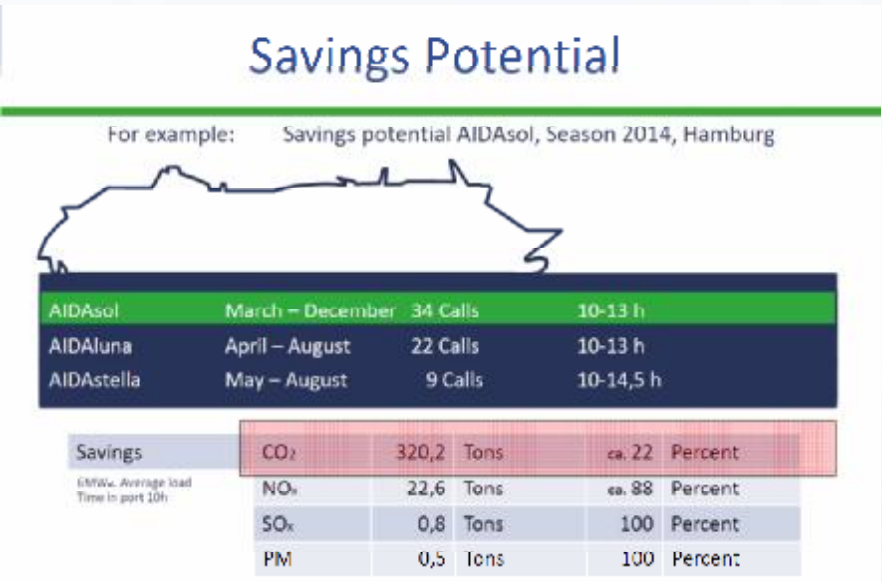
AMP Mobile
Beispiel HH HafenCity

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34 | Innovative technology –
LNG Hybrid Barge at Hamburg Port



35 | Concept Summer & Winter
operating 365 days/year





You're just a few steps away from a greener future!

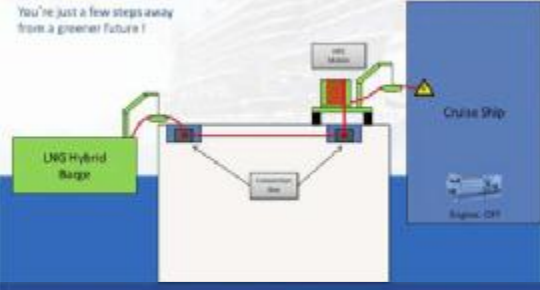


Diagram illustrating the LNG Hybrid Barge system, showing the flow of Natural Gas, Electricity, and Heat between the barge and the cruise ship.



Aerial view of the LNG Hybrid Barge system, showing the barge and the cruise ship connected by a cable.

- Natural Gas
- Electricity
- Heat

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36 | Cable handling





CAVOTEC



Conversion of AIDA Sol finished 2013



Images showing the cable handling process, including the use of CAVOTEC equipment and the conversion of AIDA Sol finished in 2013.

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