



HanseWerk Natur GmbH: Optimised electrical power generation

Ronald Müller, 28. September 2015



Ronald Müller

Head of Technical Services at HanseWerk Natur GmbH.

Responsible for about 200 CHP and the supervision of the electrical operating mode of over 1.000 heating and power plants.

Has been with the company for over 20 years.

20+ years experience with CHP and in the field of cogeneration.

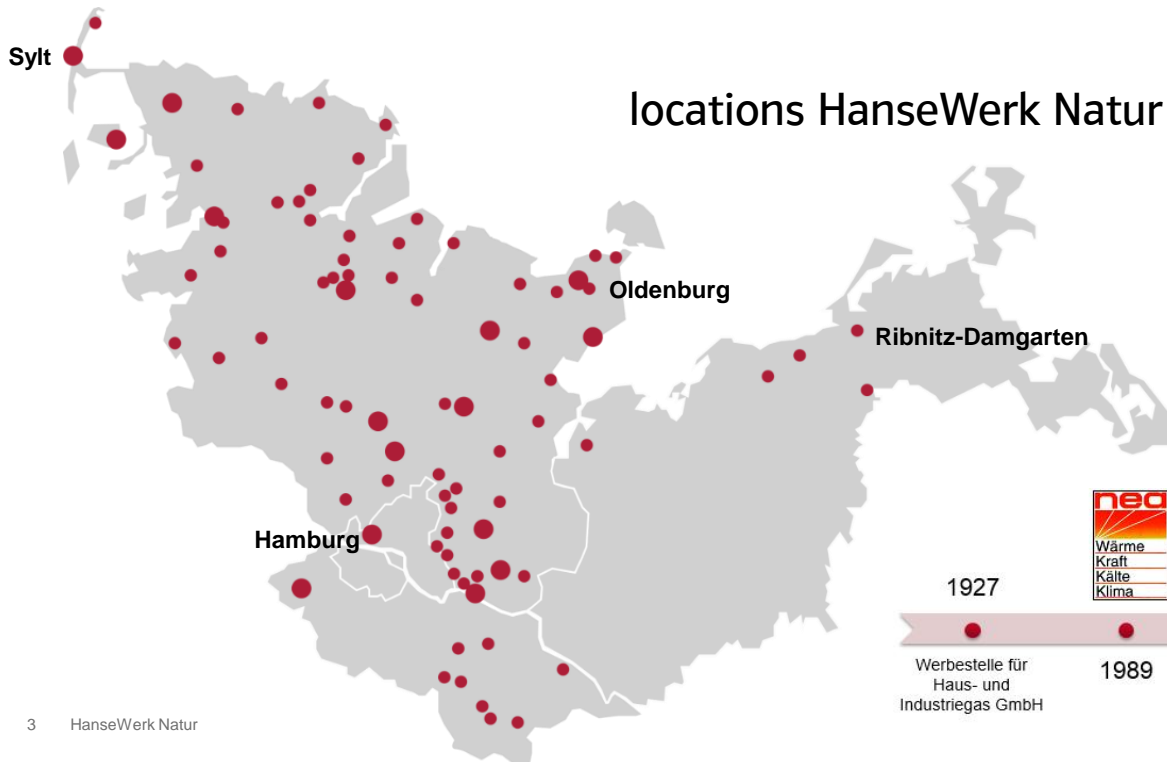
Project manager; rollout of gas engine-optimisation.





HanseWerk Natur GmbH

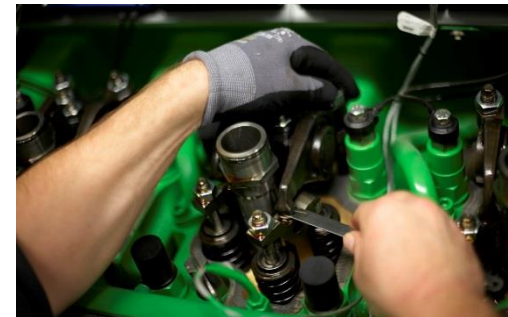
plants		energy sales and installed output	
Boilers	1.150	Heat sales	1.363 GWh
CHP	190	Electricity sales (KWK, EEG)	234 GWh
Chillers	6	Thermal output	966 MW _{th}
Emergency Power Systems	4	Thermal output (CHP)	76 MW _{th}
EEG (Water, Sun, Wind)	7	Electrical Power (CHP)	69 MW _{el}





From Heat Supplier to Energy Services Provider

- **CHP-maintenance contracts** scheduled maintenance to full service incl. periphery (>25 years experience, > 1million Bh/year, field trials with well-known producers)
- **Cooperation in service between producers** GE Jenbacher and 2G Energietechnik
- **Business operations** of heat supply facilities, CHP and district heating supply grids for a variety of **communal suppliers.**
- **Heat-accounting services** for third parties under „NTS Suite“
- **Construction and operation** of customers' heat, cold and energy supply facilities.





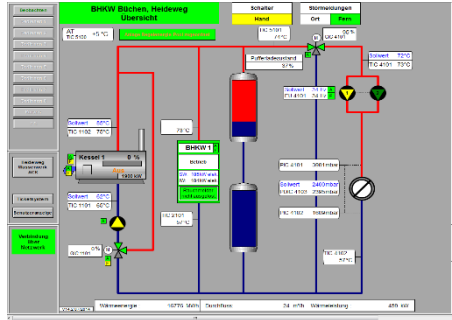
Development and Testing of Technical Innovations

- Since 2013 participation on control energy market and energy marketing of “*virtual power plant*” (*VPP*), (65 CHP, 3 E-boilers in 2 pools)
- Since 2013 *HEPG* “*high efficiency power generation*” as operating principle
- Since 2014 economic CHP/ Combined Heat and Cold Power through two-tiered waste gas heated absorption chillers
- 2012 **multifunctional storage units** (store warmth from solar thermal systems, waste-CHP and natural gas-driven CHP)
- 2015 **CHP service for LNG-Hybrid-Barge**
From 2016 on heat transfer into district heating system.





Software Support: ZLT, BEAVER and Kassandra



ZLT – web-based central digital instrumentation

- central digital instrumentation extends to over 300 plants and 6 plant networks „online“
- Virtual access into specific plant from work or when on the job (via desktop computers, notebooks, I-Pads, and smartphones)

BEAVER – facility- and plant management

- Database includes all plants and corresponding data
- Legal and regulation-conforming plant operation through closed processes (e.g. automated reminders for legally mandated maintenance)
- intuitive, “easy to handle“
- Applications, e.g.: Error management, administration of investments, administration of error notifications, interface to other systems



Kassandra – Cogeneration plant service system

- Kassandra matches data entered with the respective plant (LOKNr) and tests for deviations.
- Data (PDF) on potential escalations are communicated to BEAVER through the interface.



Gas Engine Optimization: Reduction in Operating Materials

Through the project “Reduction in Operating Materials” we have been able to substantially cut costs over the last couple of years.

- ➔ Improving the use of lubricating oils by 60 – 200%
- ➔ Reduction of amount of waste oil by 40 – 60%
- ➔ Saving of fuel by 5 – 8% through use of condensing boiler technology and burner Residual oxygen control during plant renovation
- ➔ 70% conversion of vehicle fleet to natural gas and and reduction of annual milage



Gas Engine Optimization: Improving Service Intervals

The second part of the project dealt with maintenance costs and service intervals. Also in this area we were able to significantly cut back costs.

- ➔ Improving CHP service intervals by 100 – 200%
(reduction in material costs, less personnel, and lower losses in income due to maintenance downtimes)
- ➔ Improving the operation time of engine parts by up to 40% by optimizing structural and wear components.
- ➔ Error reduction and reduction of downtimes caused by errors through CHP monitoring through a neuronal database.

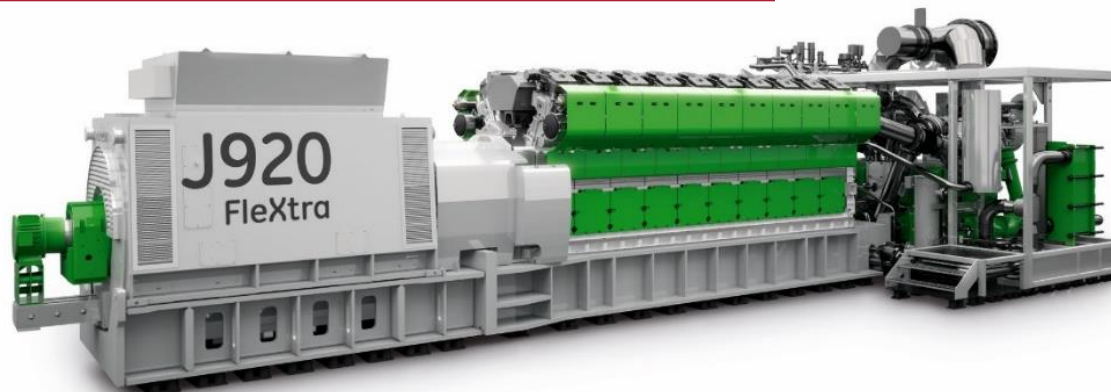
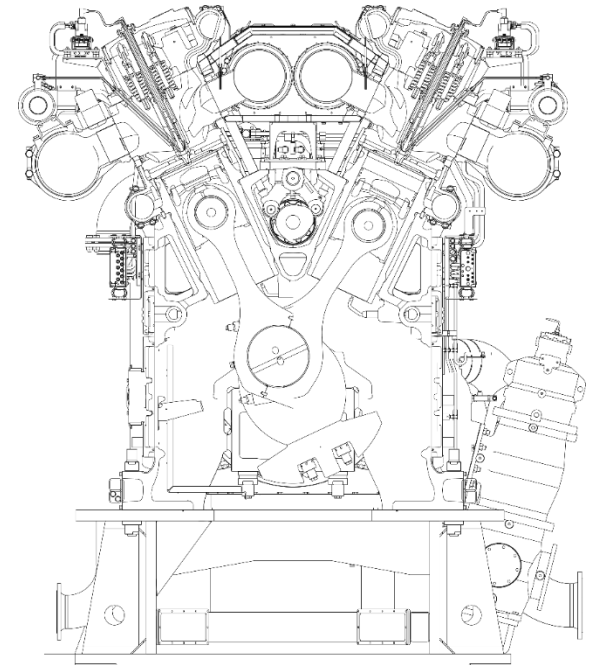
High-efficiency CHP Stapelfeld

- CHP to secure heat supply of MVA Stapelfeld
- Engine: J 920 FleXtra
- Installation 2014, begin of operations 2015
- Planned operations:
winter: ~ 4.000 Bh
summer:< 1.000 Bh
- Use of heat pump for heat recovery → increase of efficiency levels to 96%
- Two further **HEPG**-engines in operation



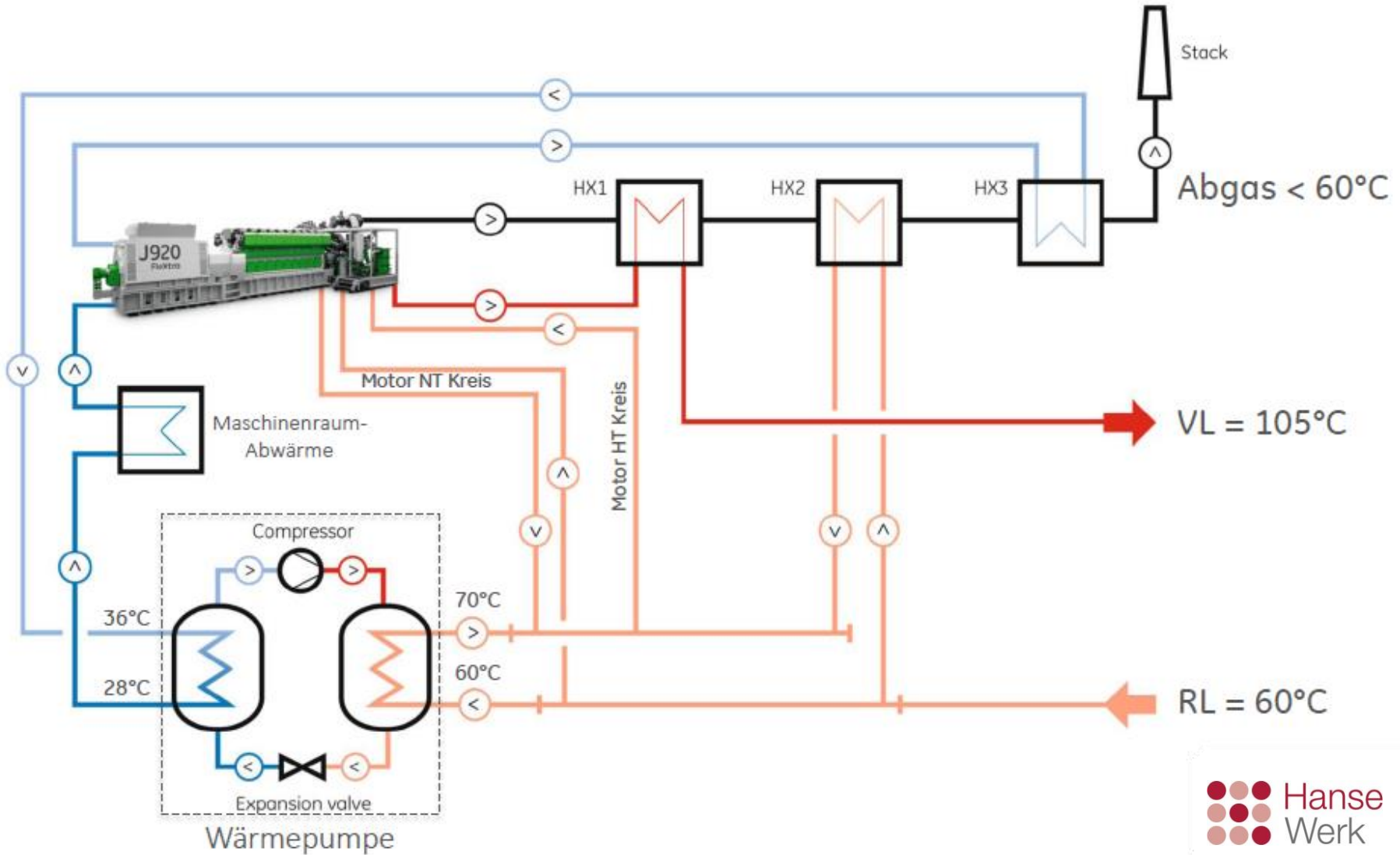
High-efficiency CHP Stapelfeld

		KWK	CHP + heat pump
Natural gas	kW_{th}	19.995*	19.995*
el. power engine	kW_{el}	9.513	9.513
el. power heat pump	kW_{el}		- 150
net el. power	kW_{el}	9.513	9.363
el. efficiency level	%	47,6	46,8
th. output	kW_{th}	9.098	9.098
th. power heat pump	kW_{th}		839
net th. power	kW_{th}	9.098	9.937
th. efficiency level	%	45,5	49,7
Total efficiency level	%	93,1	96,5





Connection Principle High-efficiency CHP Stapelfeld





Gas Engine Usage Aboard and Ashore

Aboard

Gen Set		electricity generator	max. efficiency level at nominal rotational speed
CPP	Controlable Pitch Propellers	propulsion	max. efficiency level for running on a combinator curve

Ashore

SC	Single Cycle	electricity generator	max. efficiency level at nominal rotational speed
CHP	Combined Heat and Power	electricity generator, heat extraction	max. plant efficiency for CHP
CC	Combined Cycle	electricity generator, heat extraction	max. plant efficiency for electricity generation

Differences Diesel Engine – Gas Engine

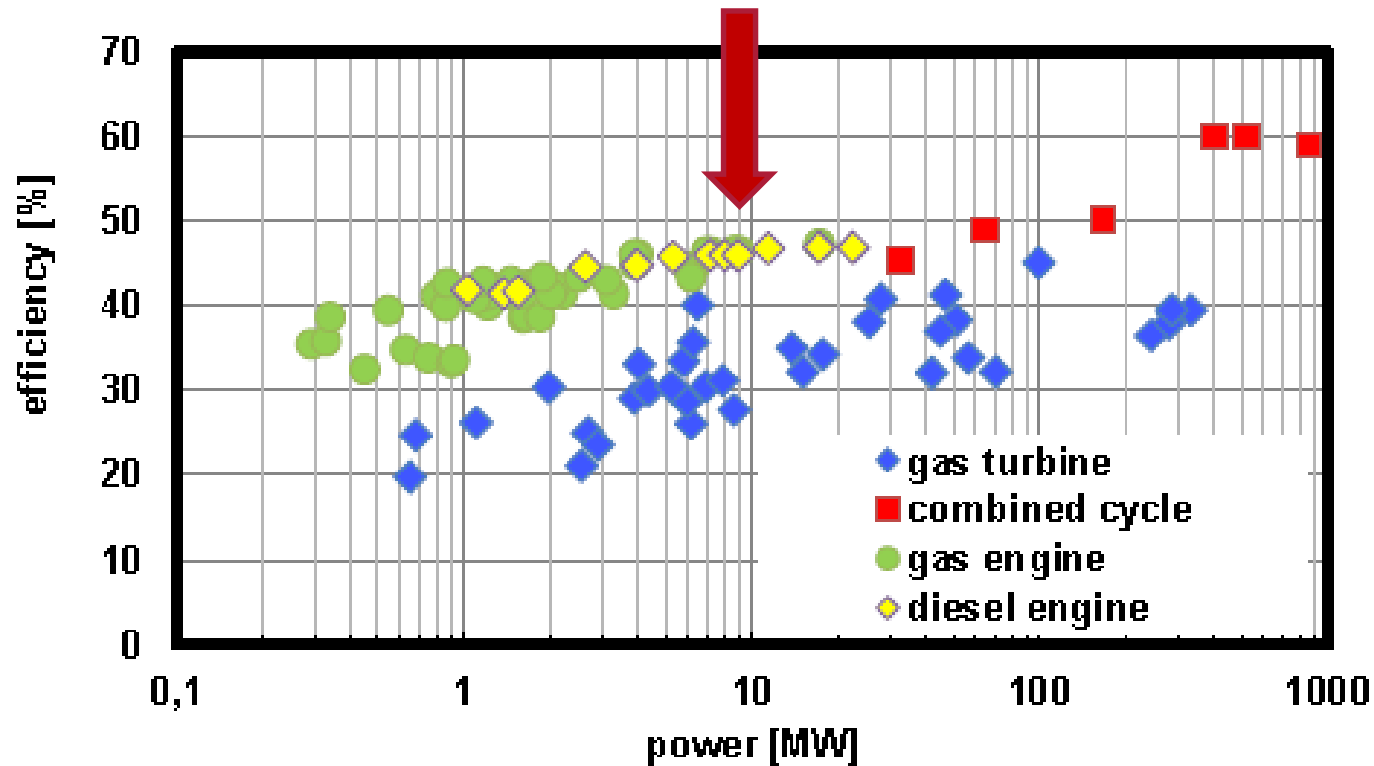


Abbildung 1: Wirkungsgrade verschiedener Konzepte in Abhängigkeit der installierten Leistung(1)



Comparison of Emissions Diesel- and Gas Engines

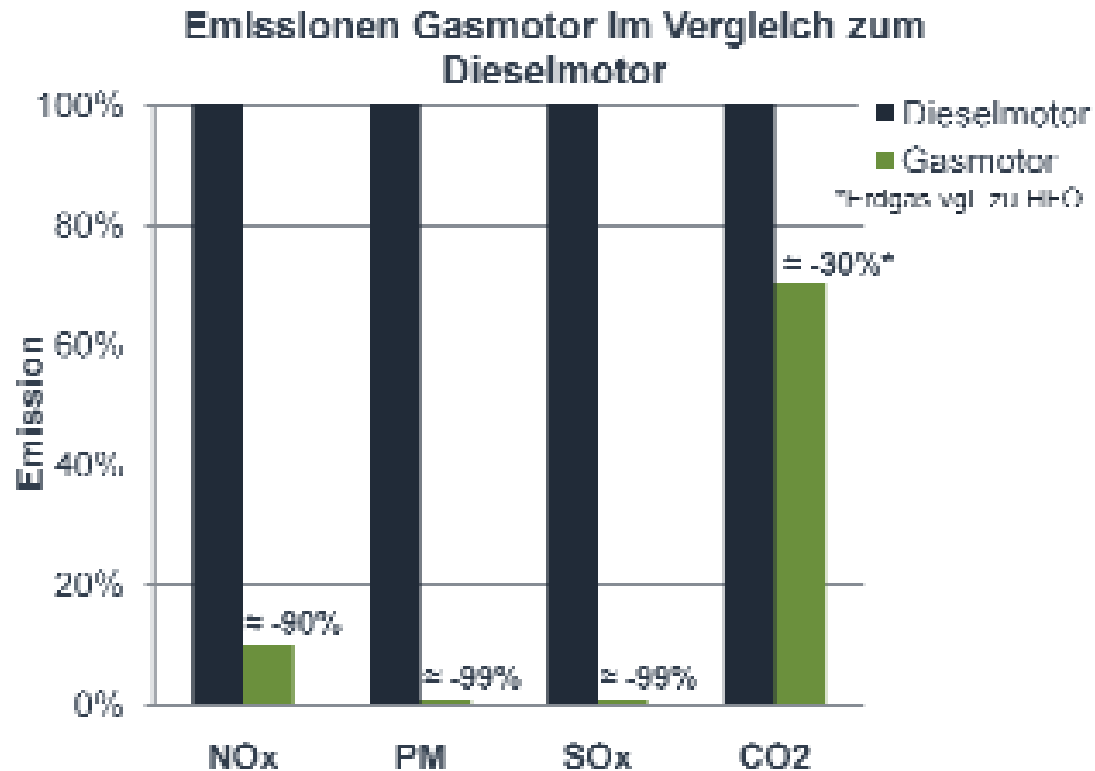


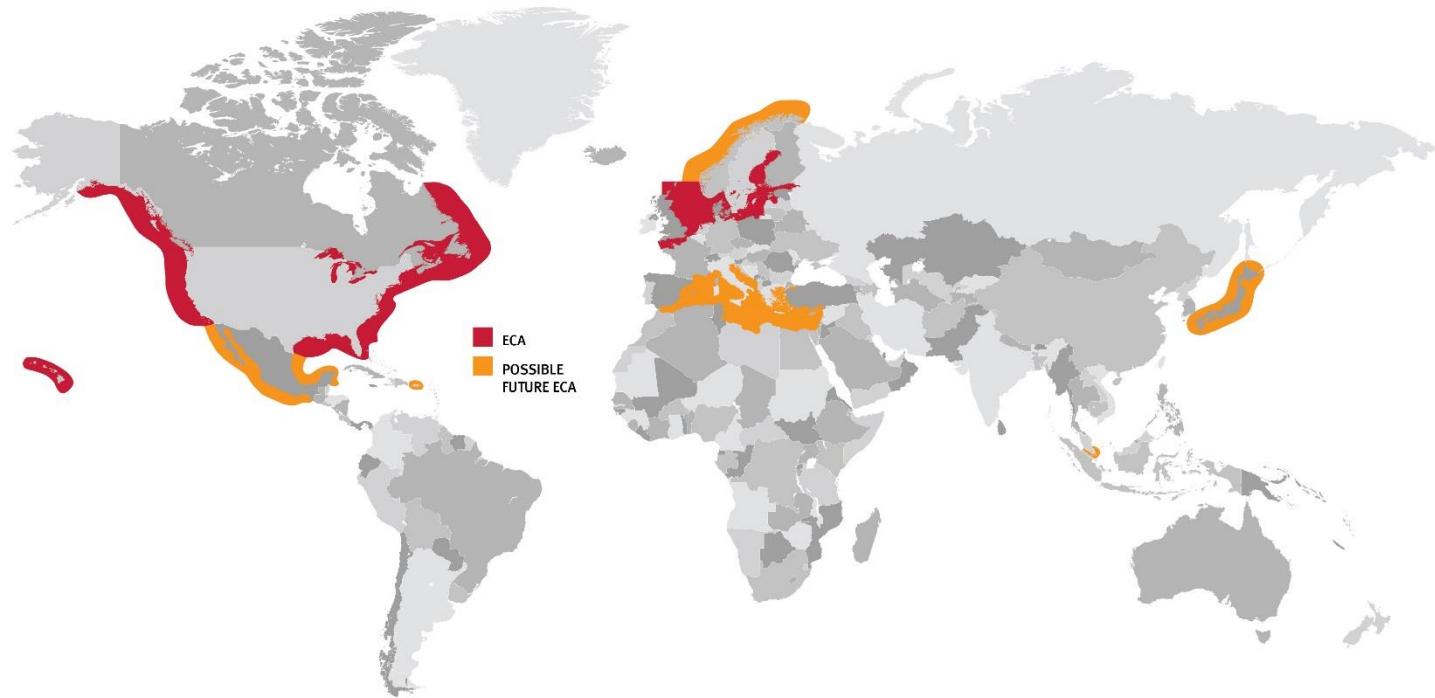
Abb. 2: Vergleich Emissionen Diesel / Gasmotoren



Emission Limits – Problems Aboard and Ashore

Aboard: USA, Europe, Japan, Australia and Singapore launched ECA emission control areas from

Ashore: TA Luft 2016



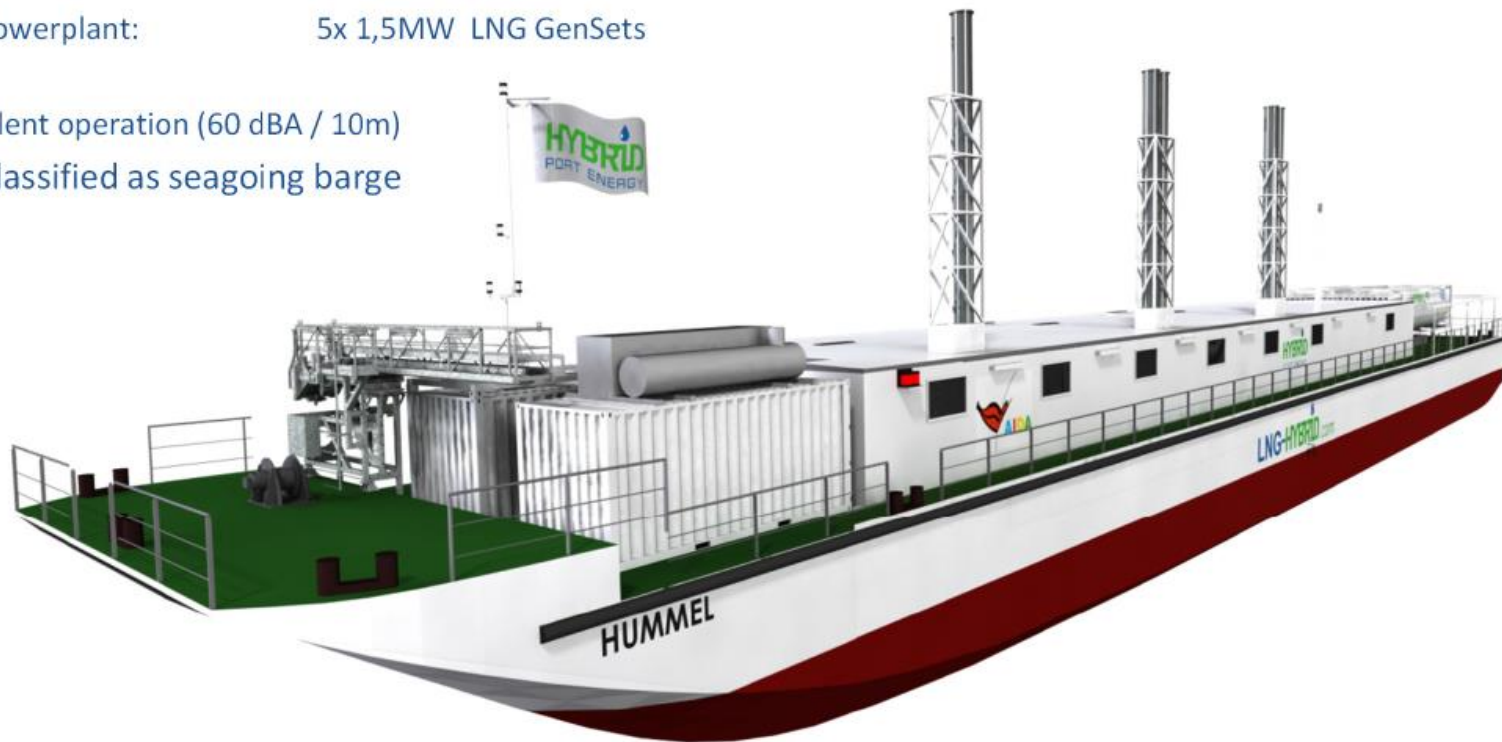


Cogeneration Plant Service LNG Hybrid Barge

LNG HYBRID BARGE



Barge Dimensions: 76 x 11,4 x 2,5 m
Capacity: 2 x 15 t LNG Container
Powerplant: 5x 1,5MW LNG GenSets

Silent operation (60 dBA / 10m)
Classified as seagoing barge



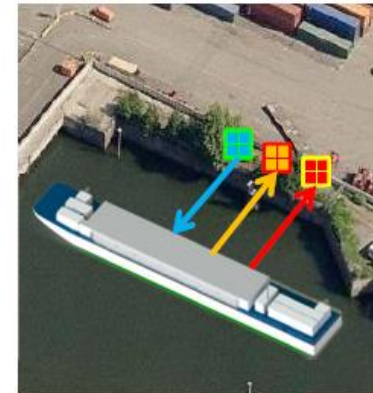





Partnership with HanseWerk Natur

	
Fully developed Power Barge concept	Largest energy service provider in Northern Germany
Cooperation with Carnival Corp./ AIDA Customer access to MSC, RCCL, Star Cruises	Operation of long-distance-heat grids and combined heat and power plants
Global market access to cruise terminal operators	20 years experience with local power plants, heat grids and maintenance
Naval architecture know-how and network	100% daughter of E.ON SE, international energy providing group
Long established cooperation with major classification societies worldwide	International energy market access
Long cooperation with all major ship owners and shipyards worldwide	Know-how energy economy with long term business experience

Winter season:

Industrial Customer
Power supply 50Hz / 10kV
24 hrs. / 7 days



-  Natural gas grid
-  Transfer point - Electricity
-  Long distance heat grid





Thank you for your attention!

