Natural gas in the transportation sector

- environmentally friendly, economic and available today -

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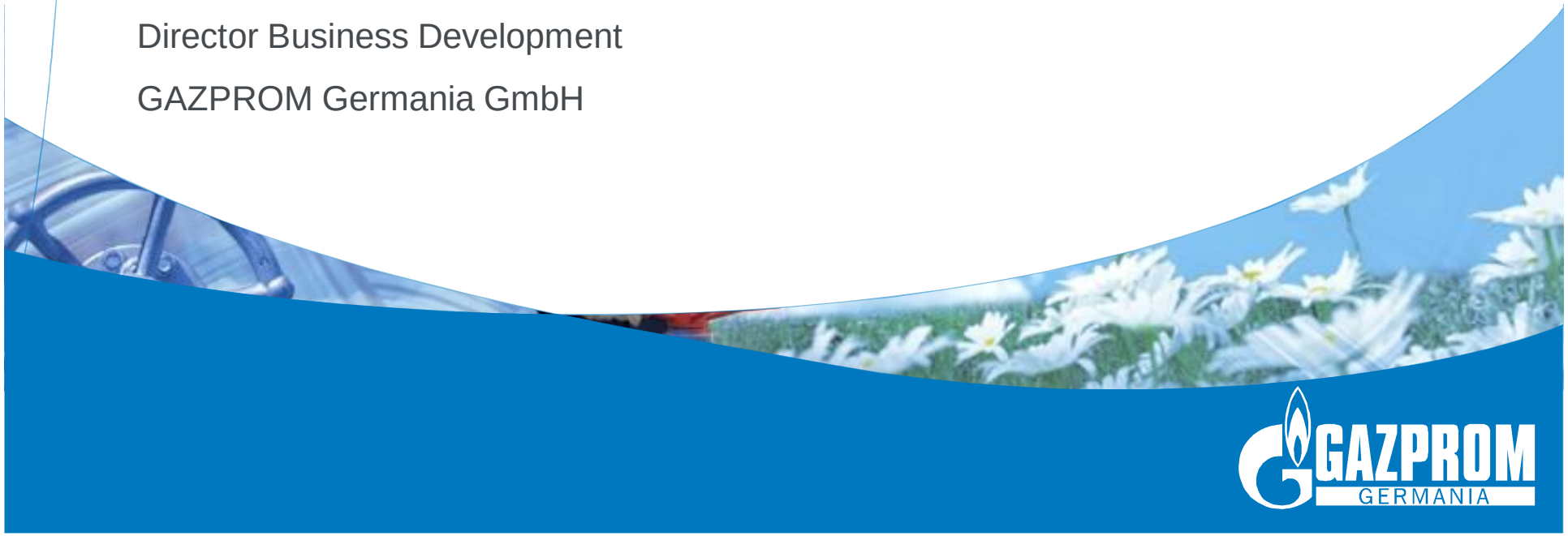


Do we have an environmental issue?

news.jeebboo.com

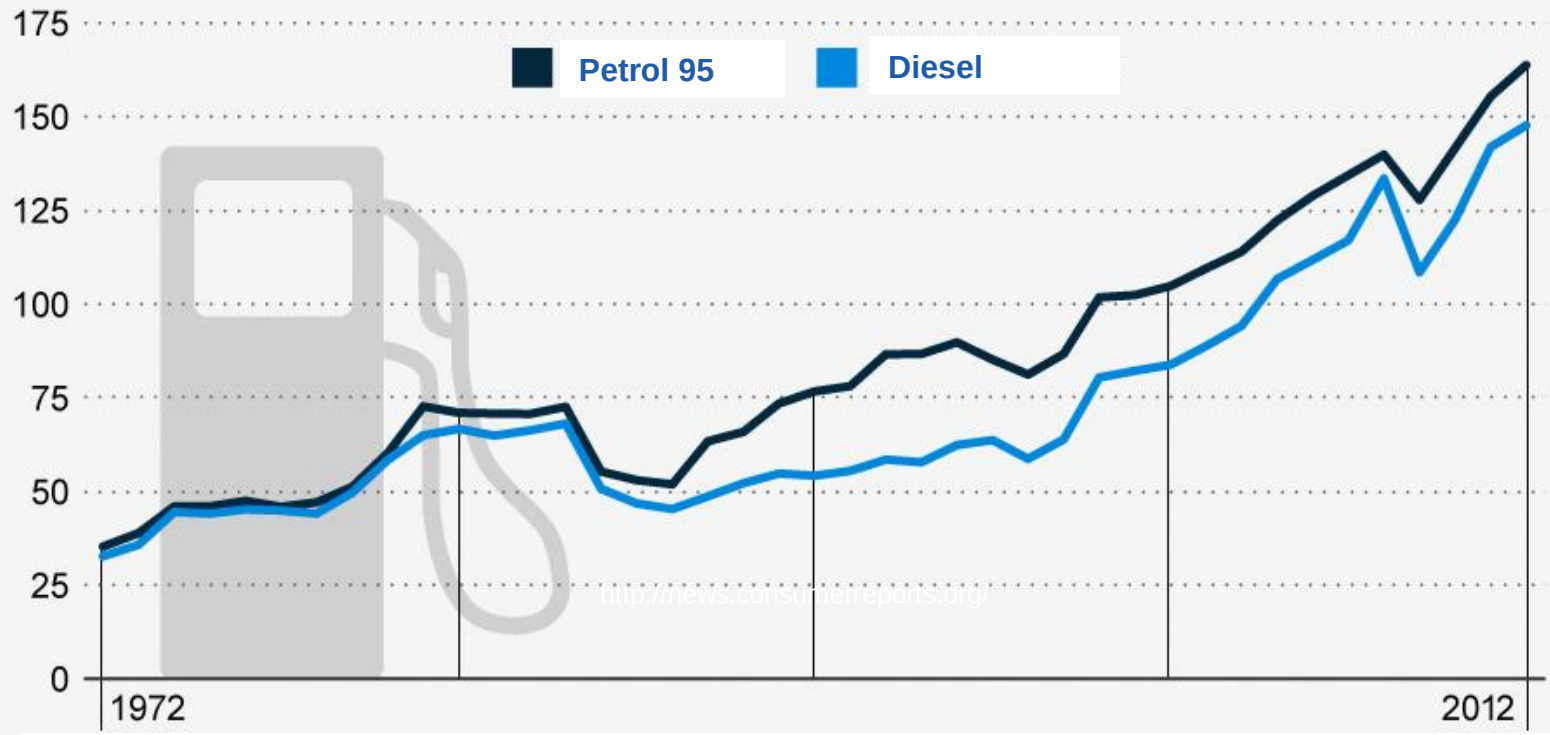
www.ozzienews.com

charleston.thedigitel.com

wired.com

autocarindia.com

Do we have an economic issue?



* **Yearly averages Germany in €ct (2012: Jan-July)**

Source: Statistisches Bundesamt, Germany

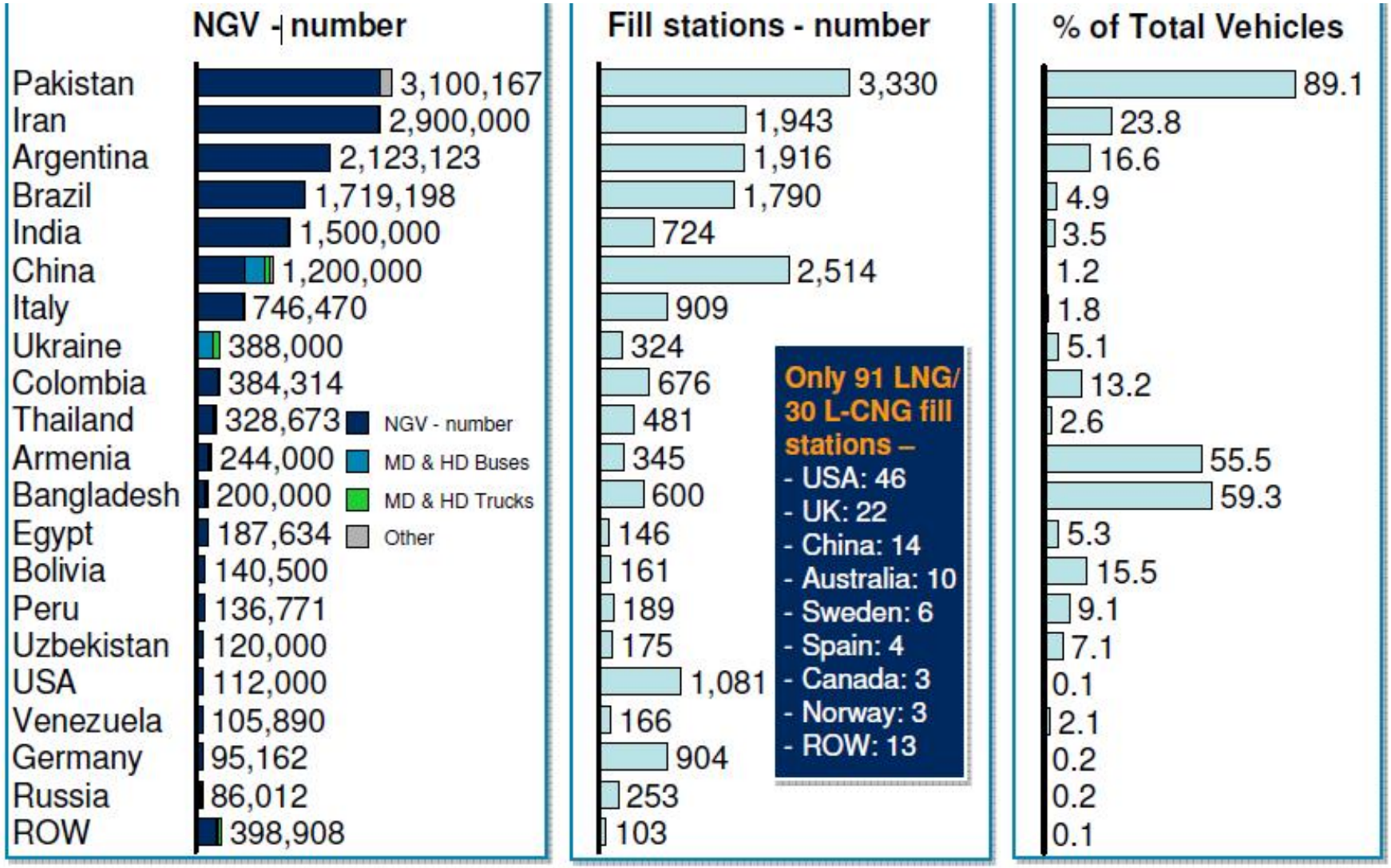
Natural gas as fuel compared to other alternative fuels

	✓	(✓)	(✓)				
	(✓)	(✓)					
			✓	✓	✓	(✓)	(✓)
	✓	✓	✓	✓			
		(✓)	(✓)				
	✓	✓	(✓)	(✓)			

✓ - available (✓) - subject to technical, commercial or operational challenges

Natural gas is suitable for all transport sectors

A heterogene market segment on the rise



European emissions reduction agenda drives development of alternative fuels

- EU-6 (2013/2014) drives development of CNG and LNG as fuel for light, medium and heavy-duty road transport (CO2, NOx, particulate matter)
- Automotive industry investing in CNG and LNG models to achieve EU-imposed average CO2-fleet targets (120g CO2/km by 2015 and 95g CO2/km by 2020)
- Furthermore: Sulphur Emission Control Areas (SECA from 2015 in Baltic & North Sea) drive development of LNG as bunker fuel opposed to MGO or scrubber-technology (SOx)

Natural gas for transport is an available and environmentally friendly solution to Europe's ambition to significantly reduce emissions.

Our firm believe: natural gas is the best fuel!

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Clean

- 25% less CO2- and 75% less CO-Emissions compared to petrol
- Practically no particulate matter and no filters or additives (AdBlue) required
- Use of bio-methane reduces CO2-emissions even further

Safe

- Crash-Tests prove that natural gas vehicles are as safe as conventional vehicles
- Natural gas available longer than oil

Quiet

- Natural gas engines significantly reduce noise emissions and make 24/7 operations possible

Proven and economic

- Already today many operators run trucks and buses on “CNG”
- Storing natural gas as “LNG” provides even wider driving range
- Economically attractive alternative to comply with environmental regulation

Automotive industry invests in further development of NGVs

CNG – Natural gas compressed to 200 bar

Established and growing ☑

- Proven technology available here and today
- Cars, light duty vehicles, busses & trucks available with new models being added
- Infrastructure exists or is developing

LNG – Natural gas liquefied by cooling down to -161 °C

New ★

- 2.5 x more energy in the same space
- Targets heavy duty transport
- Refuelling infrastructure yet to be developed
- More complex supply chain than for CNG

Both "CNG" and "LNG" are natural gas and meet EU6 standards at lower cost than competitive technologies

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Comparison CNG vs. LNG

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- **Accessible and proven** technology
- Choice of **vehicles available** with new models being added by the automotive industry
- Generally able to **meet EU 6** standards
- **“Zero” or reduced excise duty** in many European countries, expected to last until 2030

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- Extra weight of gas cylinders decreases fuel efficiency and driving performance
- For buses: sometimes height restrictions for low bridges due to mounting of storage on the roof
- Lower energy density than conventional fuels or LNG
- Excise duty regimes converge towards traditional fuel taxation

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- **Higher energy density** than CNG resulting in smaller tanks, less weight and higher mileage
- **Lower weight of vehicles** resulting in higher utilization of fuel efficiency
- For buses: **lower centre of gravity** due to lighter fuel tank mounted inside the vehicle results in higher driving comfort
- **Reduced excise duty** with high chances of sustainability until 2030 (as for CNG, but in some countries CNG and LNG are treated differently)
- **Independency** of pipeline infrastructure

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- New and well tested technology, but refuelling infrastructure yet to be developed
- More complex supply chain than for CNG requires reliable partners for supply + refuelling
- Choice of OEM vehicles still limited

Gazprom provides Russian natural gas to Europe: CNG + LNG as fuel for transport

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Russia

- OAO Gazprom with 200+ CNG stations in Russia
- Legislative changes to promote natural gas as motor fuel just introduced and extension of CNG refuelling infrastructure started
- Developing of LNG production and retail infrastructure in progress

Europe

- GAZPROM Germania Group extending CNG presence in Germany and the Czech Republic from 28 to >40 CNG stations by end of 2014
- Gazprom export & GAZPROM Germania developing LNG for European road transport with automotive OEMs
- Active communication, education and stakeholder management at national, European and international level

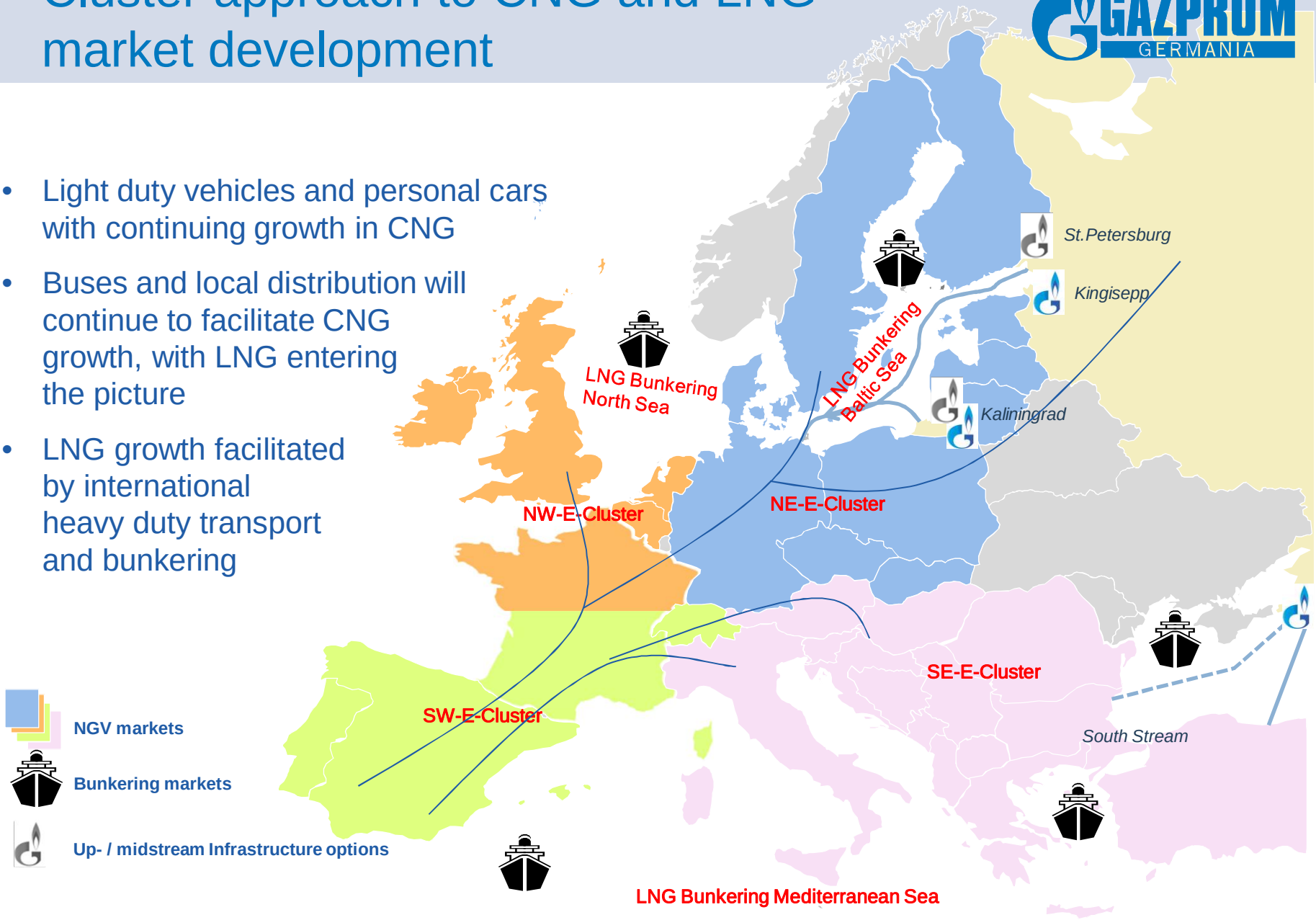
IGU INTERNATIONAL GAS UNION

for sustainable mobility NGVA europe

ERDGAS Natürlich mobil

Cluster approach to CNG and LNG market development

- Light duty vehicles and personal cars with continuing growth in CNG
- Buses and local distribution will continue to facilitate CNG growth, with LNG entering the picture
- LNG growth facilitated by international heavy duty transport and bunkering



2013: 4-weeks field test with Volvo FM460 Methane-Diesel with ALBA (Berlin)

- Cooperation with erdgas mobil and Berlin waste management service ALBA
- Trial of Volvo FM460 Methane-Diesel under real-live conditions
- Medium distances with 40t trailer
- Market development in Germany currently in progress

2013: First 11 LNG buses in Europe running since October in Poland

- First ever OEM produced LNG buses operational in Europe since 01 October 2013 in the city of Olsztyn (Poland)
- Cooperation of GAZPROM Germania and Solbus
- Buses run 7 days per week from 04.30 a.m. until 23.45 p.m.
- Ca. 65.000 km per bus p.a.
- Solbus Solcity LNG 12m with Cummins ISGL natural gas engine and Chart Ferox LNG onboard-equipment

- Extension to further cities in progress

Thank you very much for your attention!

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