LNG: a game changer for the EU's transport and power sector

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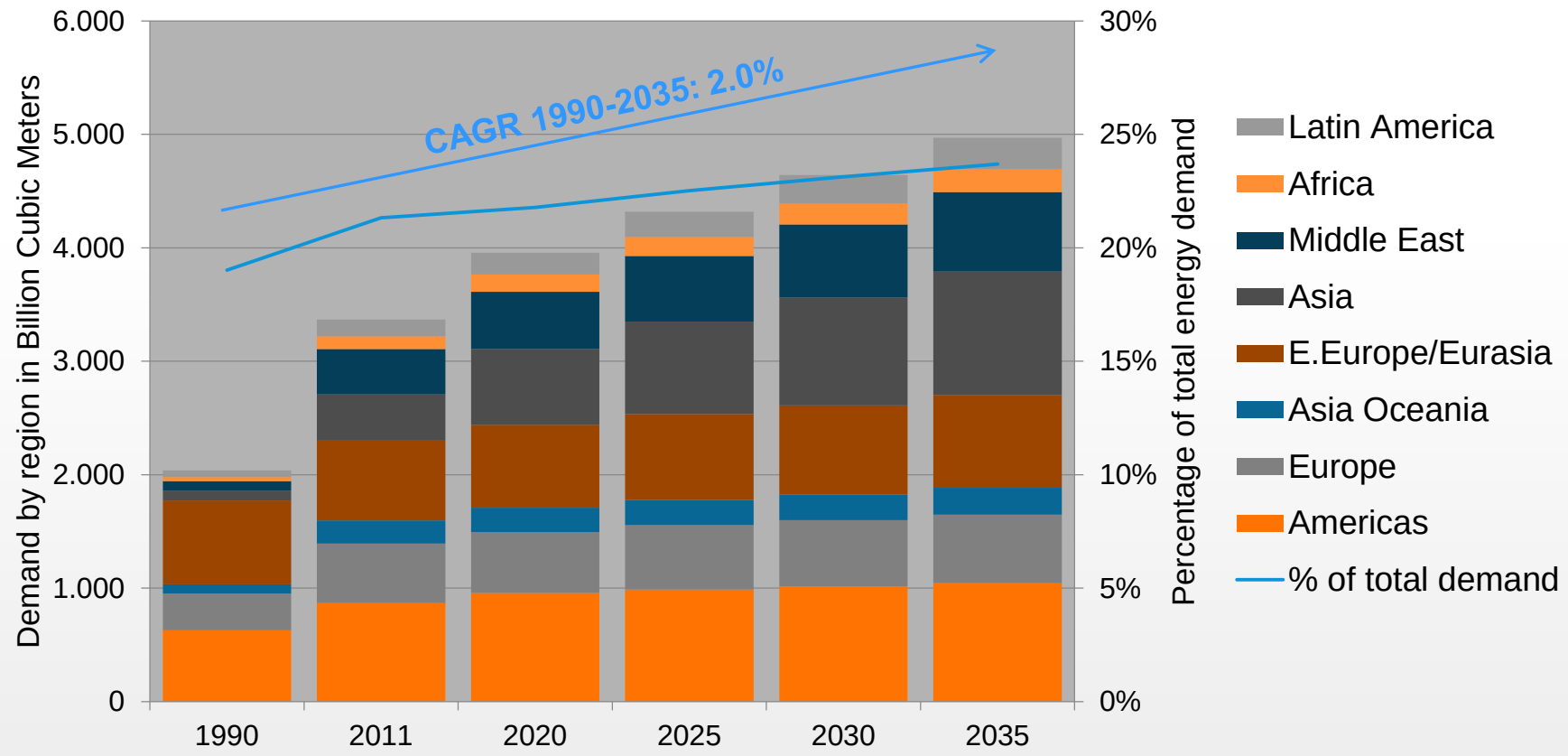
TOWARDS GAS AGE – WHY WE ARE TALKING ABOUT LNG?

Natural gas – a strongly growing market

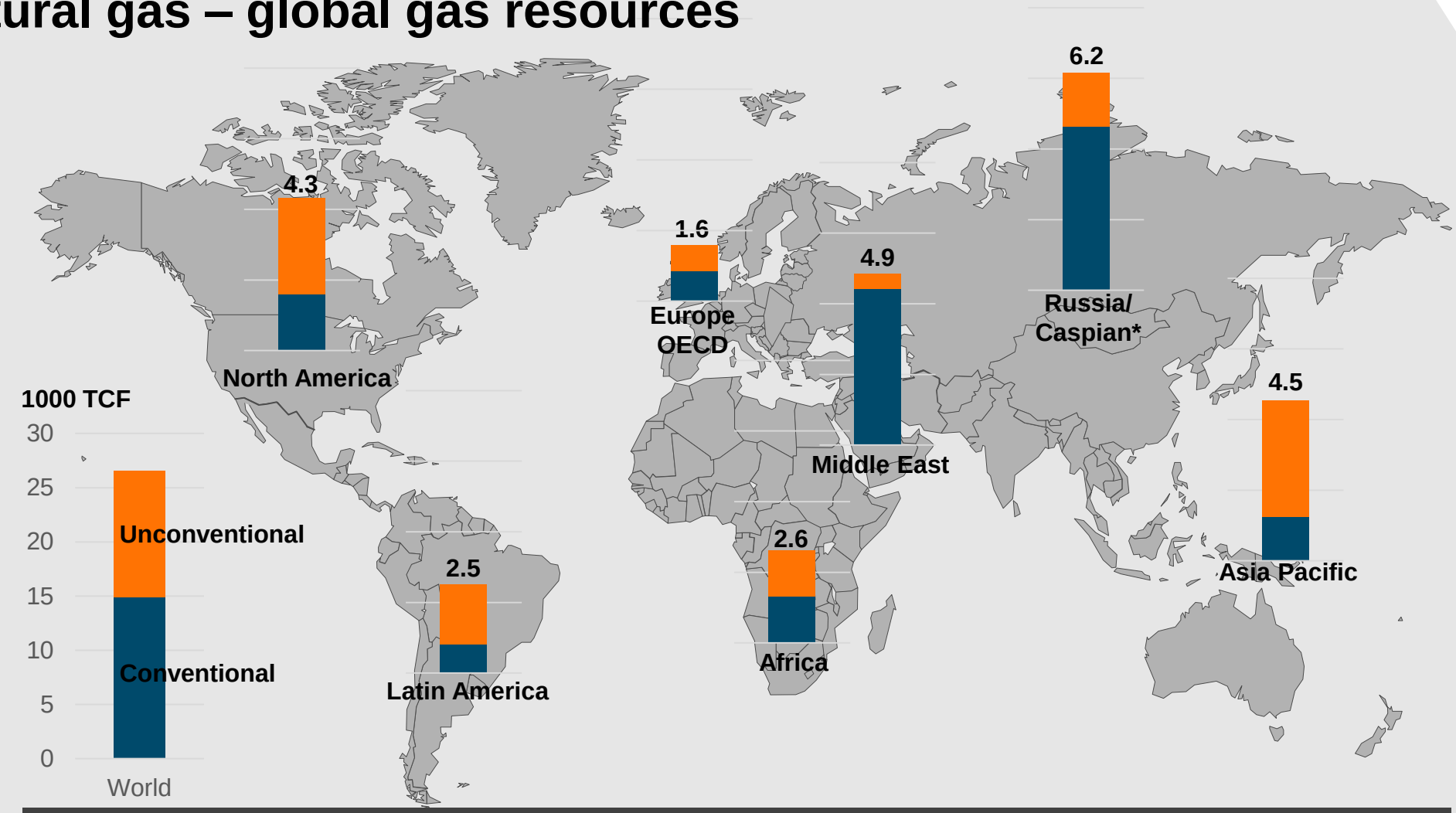
World Energy Outlook by IEA: NATURAL GAS DEMAND DEVELOPMENT



- Driven by non-OECD countries gas demand is expected to increase by ~50% to 2035
- The adoption of gas is driven by both economics and environmental factors

NOTE: IEAs (International Energy Agency) ”New Policies Scenario” takes into account broad policy commitments and plans that have already been implemented to address energy-related challenges as well as those that have been announced, even where the specific measures to implement these commitments have yet to be introduced

Natural gas – global gas resources



- Technically recoverable reserves providing more than 200 years coverage at current demand
- However it is estimated that only in North America unconventional gas production is reaching any significant volumes during the period until 2035

Source: Exxon Mobile Energy Outlook

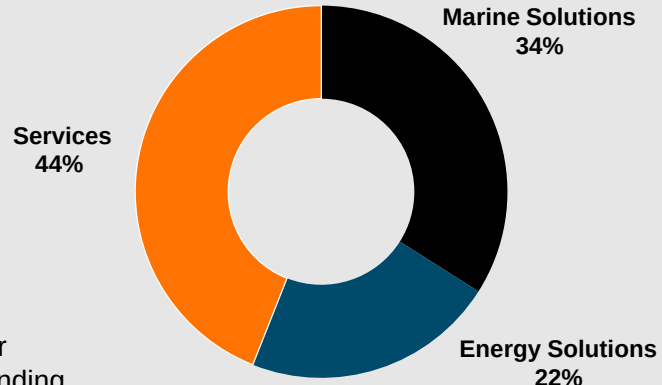
Wärtsilä Corporation

Energy Solutions

Marine Solutions

Services

Net sales by business 2015



- Listed in Helsinki
- 5 billion € turnover
- Solid financial standing

Energy efficient solutions

Gas based technology

Innovative solutions

YOUR SHORTER ROUTE TO THE GAS AGE

Role of LNG in the future

	Past/Today	Future
 **Usage**	Baseload energy generation Household usage Process fuel fo industry	Balancing energy generation Transporation Industry usage Energy storage Others
 **Supply**	Gas reservoirs	Shale gas Bio gas Coal bed methane
 **Infrastructure**	Pipeline gas Large LNG terminals	Small scale LNG Local/Regional redistribution Bunkering facilities
 **Markets**	Fixed terms Large volumes Few suppliers Few customers	Flexible terms New customer segments New suppliers Lower volumes

Benefits of LNG

LNG

1. Reduced emissions:

- NO_x emission reduced by 85%
- SO_x emissions reduced by 99%
- Particulates reduced by 95%
- CO_2 emissions reduced by 20-30%
- No smoke
- Reduced waste streams (liquid waste)

2. Transition fuel to low carbon energy systems

3. Provides an energy storage

4. Emission control area compliant in shipping

LNG infrastructure and markets

1. Improved security of supply

- Diversified sources

2. Enables flexible gas usage

- E.g. for flexible balancing and peaking plants, industrial use of gas, storage

3. Improved functioning of European gas market

- Versitale source of gas and more competition

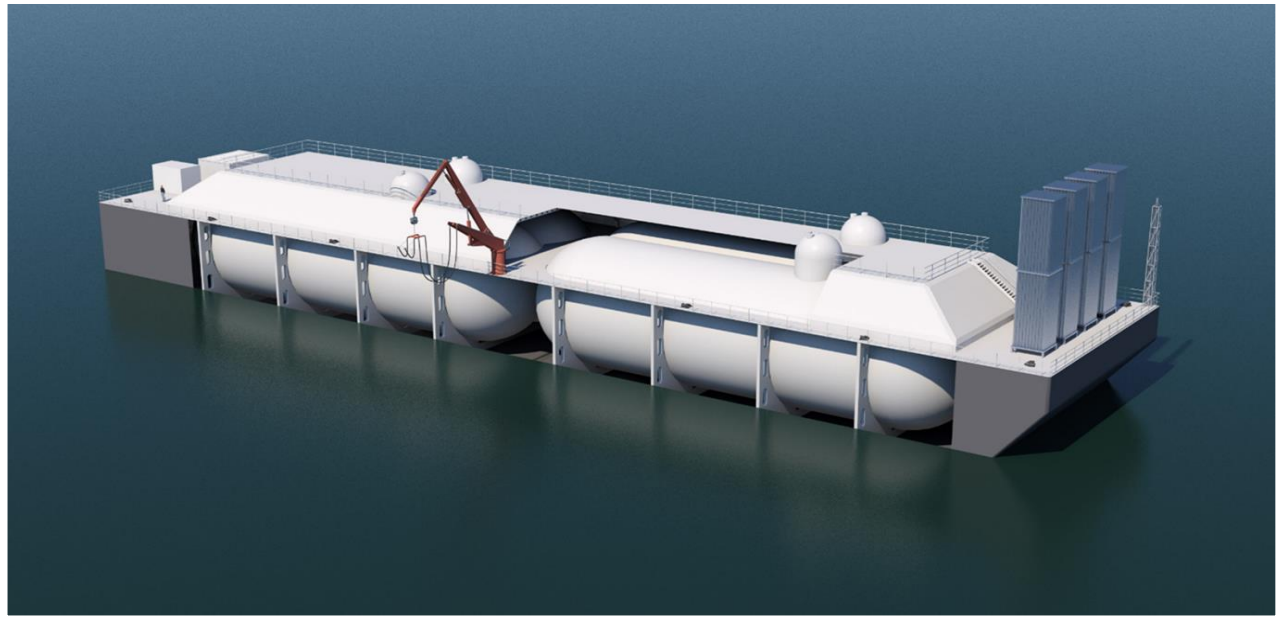
4. Increased competitiveness

- Declining LNG prices
- Flexible gas fired power plants -> energy efficiency and system optimisation

5. Enables the more efficient utilization of more sustainable fuels

- Biogases from various sources

TECHNOLOGY AS ENABLER



Wärtsilä gas engine (DF) references

>1,500 engines > 16 million running hours





MERCHANT

881 ENGINES

204 LNG carriers
14 Tankers
11 LPG carriers
4 Containers
3 Bulk carriers
2 Car carriers

OFFSHORE

132 ENGINES

24 Offshore supply vessels
6 FPSO vessels
2 FSO vessels
1 Jack-Up rig

SPECIALS

46 ENGINES

16 IWW vessels
6 Tugs
1 Navy vessel
1 Icebreaker
1 Hopper Dredger
1 Guide ship
1 Cable Layer vessel

CRUISE & FERRY

66 ENGINES

12 Ferries
3 ROPAX vessels
1 Cruise and ferry

DUAL-FUEL CONVERSION

36 ENGINES

4 FPSO vessels
3 Ferries
2 RORO vessels
1 IWW vessel
1 Chemical tanker

2 STROKE DUAL-FUEL

35 ENGINES

10 Large LNG carriers, **2** engines each
6 Container Feeder vessels
4 Chemical tankers
4 Asphalt Carriers
1 Small LNG carrier

DUAL-FUEL POWER PLANTS

376 ENGINES

82 plants
Output **5,031** MW
Online since **1997**

GAS/LNG

- **Significant source** of energy
- **Available** for the future needs
- LNG enables **worldwide** gas availability
- Over **50% expansion** in global LNG supply over the next few years.
- **Multiuse** in transport, industry and energy

EU

- **Sustainability of transport and power sector**
  - Facilitator of flexible power system, successful integration of solar and wind
  - Clean power for transport
- **Security of supply**
  - Flexible energy storage
  - Diversified energy sources
- **Competitiveness**
  - Declining LNG prices
  - Flexible gas fired power plants -> energy efficiency and system optimisation

Alternatives, if any?

- **Electrification** is an option for transportation, but in terms of heavy-duty vehicles and shipping, LNG is the best viable commercial option.
- **Biogas** (limited scale) → but, gas infrastructures are “renewable”-ready, i.e. biogas can be used in LNG infrastructure.
- **Compressed Natural Gas**
- **Other fuels** for limited uses, e.g. methanol

WHAT IS NEEDED FROM POLICY MAKERS

Develop a stable policy framework

- Highlight the important role of the gas
- Long-term investments require a stable business climate
- Finalize and implement key policies
- Develop functioning gas markets

Develop sufficient LNG infrastructure and services

- Optimized gas network for energy and transport sector
- Including storage and bunkering facilities
- Including also small-scale LNG infrastructure and services

Harmonize LNG regulations in shipping

- Harmonize emissions and safety regulations at least in the European level, preferably globally
- LNG bunkering regulations in ports.

Develop an internal energy market

- Existing system operation principles and market mechanisms do not reveal the full value of flexible power generation
- New EU policies should provide clear market signals for investing in flexibility