

MAYER • BROWN

C. Paul Miller
GE Aeroderivative Energy

8TH ANNUAL

Global Energy Conference

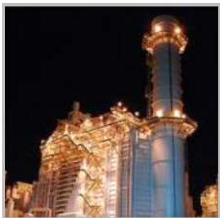






THE WORLD TURNED
UPSIDE DOWN

May 2013

GE's portfolio ... structured for growth

- 8 businesses operating in more than **100** countries ... **125+** years
- **>300,000** employees worldwide
- 2012 revenue **\$147.4B**

2012 Revenue

Power & Water \$28.3B	Oil & Gas \$14.9B	Energy Management \$7.5B	Aviation \$19.7B	Healthcare \$18.3B	Transportation \$5.6B	Home & Business Solutions \$7.9B	GE Capital
							
<ul style="list-style-type: none"> • Thermal • PG Services • Renewables • <u>Aeroderivatives</u> • <u>Water</u> • <u>Gas engines</u> • Nuclear 	<ul style="list-style-type: none"> • <u>Drilling & Surface</u> • Global Services • Measurement & Control • PII Pipeline Solutions • Subsea Systems • <u>Turbomachinery</u> 	<ul style="list-style-type: none"> • Digital Energy • Power Conversion • Industrial Systems 	<ul style="list-style-type: none"> • Commercial • Military • Service • Avionics/ Systems 	<ul style="list-style-type: none"> • Healthcare Systems • Life Sciences • Healthcare IT • Molecular Diagnostics 	<ul style="list-style-type: none"> • Locomotives • Services • Propulsion Systems 	<ul style="list-style-type: none"> • Appliances • Lighting • Intelligent Platforms 	<ul style="list-style-type: none"> • Commercial • Consumer • Real Estate • GECAS • EFS



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Distributed Power – Gas Engines & Aeroderivatives

Power Generation

Jenbacher, Waukesha



- Electrical output: 120 – 9,500 kW
- Electrical efficiency up to 48.7%, overall efficiency over 90%
- 20,500+ engines delivered, 21,800 MW power globally
- Natural gas and CHP, excellence in special gas applications (biogas, LFG, CMG, BFG), oilfield power

Gas Compression

Waukesha



- Output: 160 bhp – 4,835 bhp (119 kW – 3,605 kW)
- 12,000+ compression engines delivered, over 13.2 million bhp power globally (9,850 MW)
- Wellhead, gathering, storage/transmission

Power/Mech Drive

Aeroderivatives



- 18MW – 120MW Turbines and Packages
- Compression, Power Gen, Mechanical Drive, Cogen, CHP
- PowerXpand - Rental Power: rapid deployment. Gas engines, diesel and gas turbine solutions

Global services covering all offerings



GE imagination at work

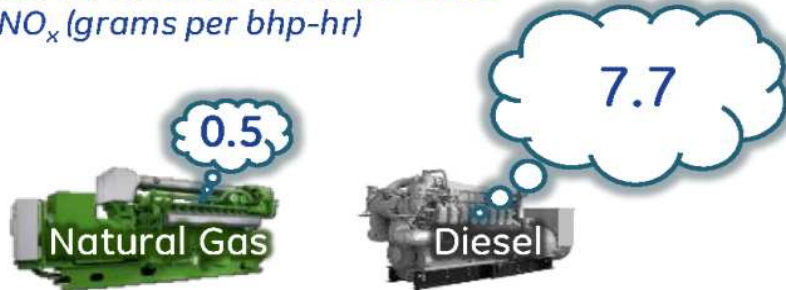
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Natural Gas powered drilling

Why power a drill rig with natural gas instead of diesel?

95% lower emissions

NO_x (grams per bhp-hr)



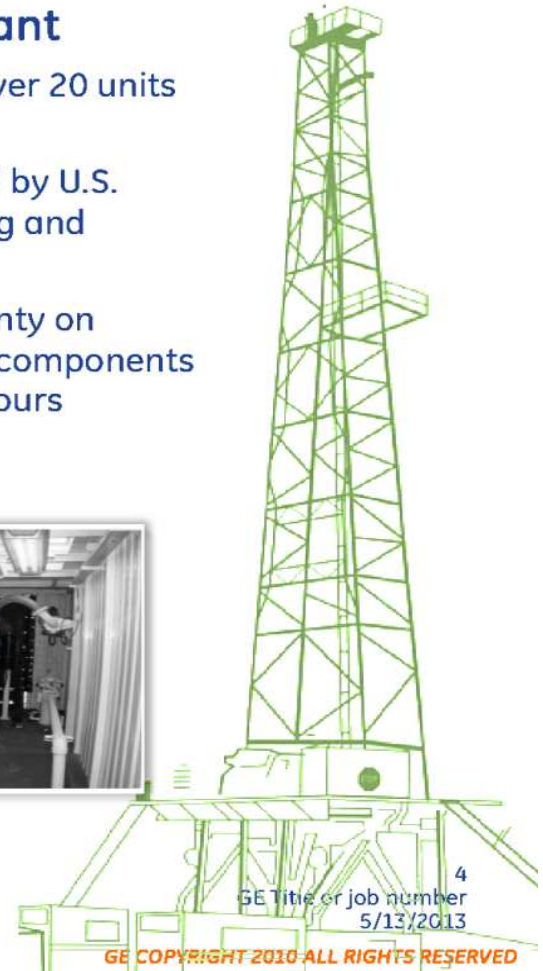
80% lower fuel costs



imagination at work

GE's Jenbacher J320 natural gas drill rig power plant

- Proven technology with over 20 units in the field since 2006
- First to be mobile certified by U.S. EPA = simplified permitting and assures compliance
- Extended "lifetime" warranty on exhaust gas train related components of five years and 21,000 hours



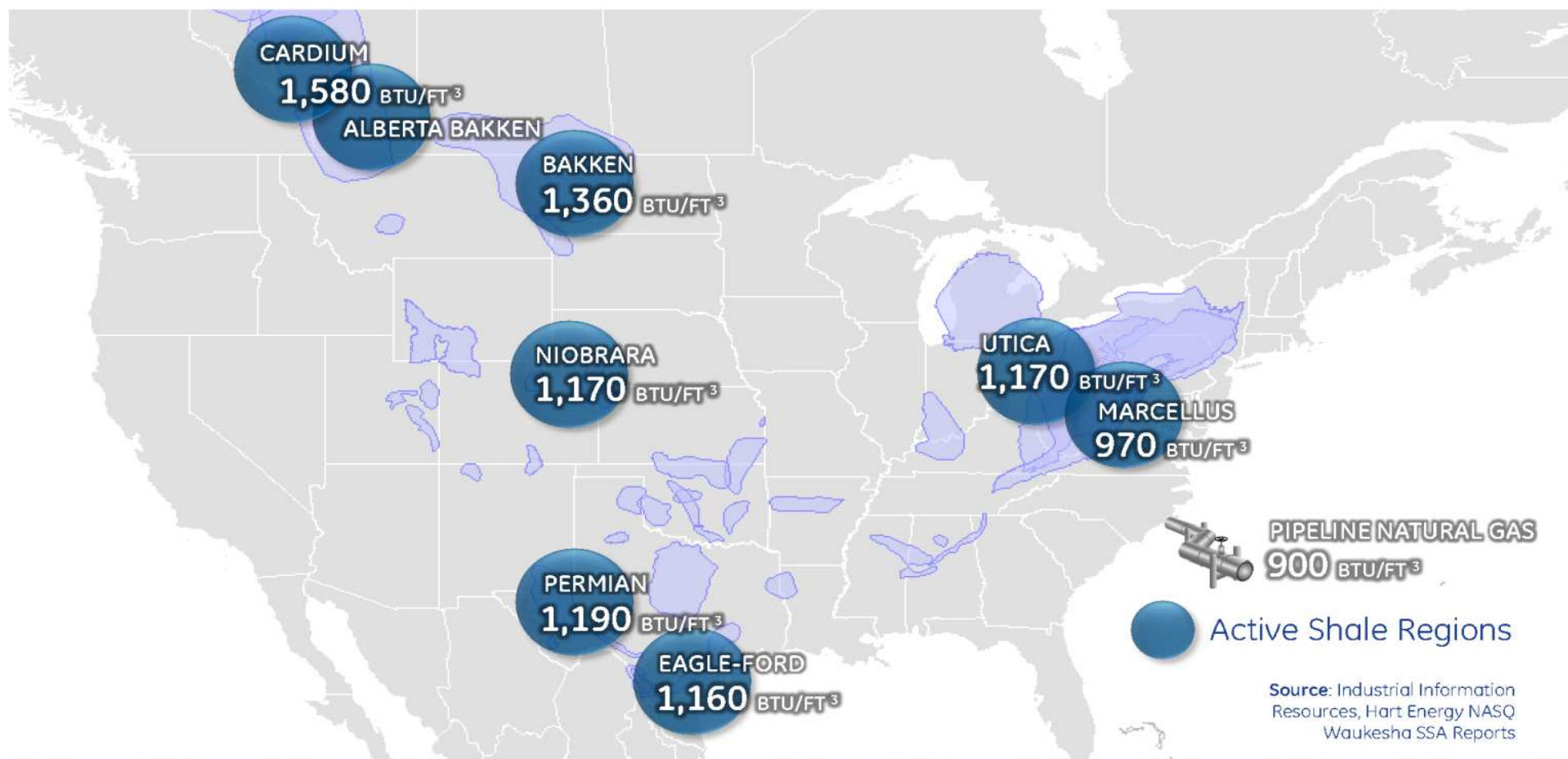
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5/13/2013

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Expanding shale plays and gas quality



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Gas gathering and processing plants see high-BTU gases needed for compression

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Oilfield diesel-to-gas drill rig power

GE's gas engines solutions...

... for results today!



Jenbacher* J320

- ✓ Rated output: 1007 kW
Lean-burn
- ✓ Installations on both field gas & LNG
- ✓ 1st U.S. EPA certified for mobile & stationary
- ✓ Up to 37.2% electrical efficiency
- ✓ Up to 25% reduced emissions
- ✓ Over 20 installed in N. America as of 2012

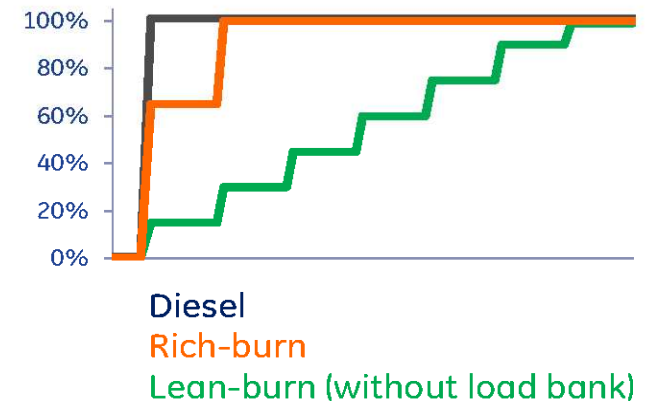


Waukesha* VHP* 7044

- ✓ Rated output: 1200 kW
Rich-burn
- ✓ Fuel flexible for variable btu (Hot Gasses)
- ✓ Capable of running HD-5 propane
- ✓ Diesel like transient load capability
- ✓ Up to 25% reduced emissions
- ✓ First 3 units of 18 order shipped for 1Q 2013

- Up to 60% lower operating costs
- Up to 25% lower NOX/CO emissions

Loading capabilities



End user: Seneca Resources
Marcellus shale, Pennsylvania
Drilling operator: Ensign

- 6 x J320 engines
- 1st U.S. EPA certified technology for mobile and stationary drilling
- Operating on LNG
- Up to 60% lower fuel costs compared to diesel
- Emissions reduction up to 25%

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Mobile Gas Turbine Generator Set

a product of **ecomagination**

TM2500+

Delivering fully
functional, onsite power
plant



Material contained in this presentation is General Electric Proprietary information

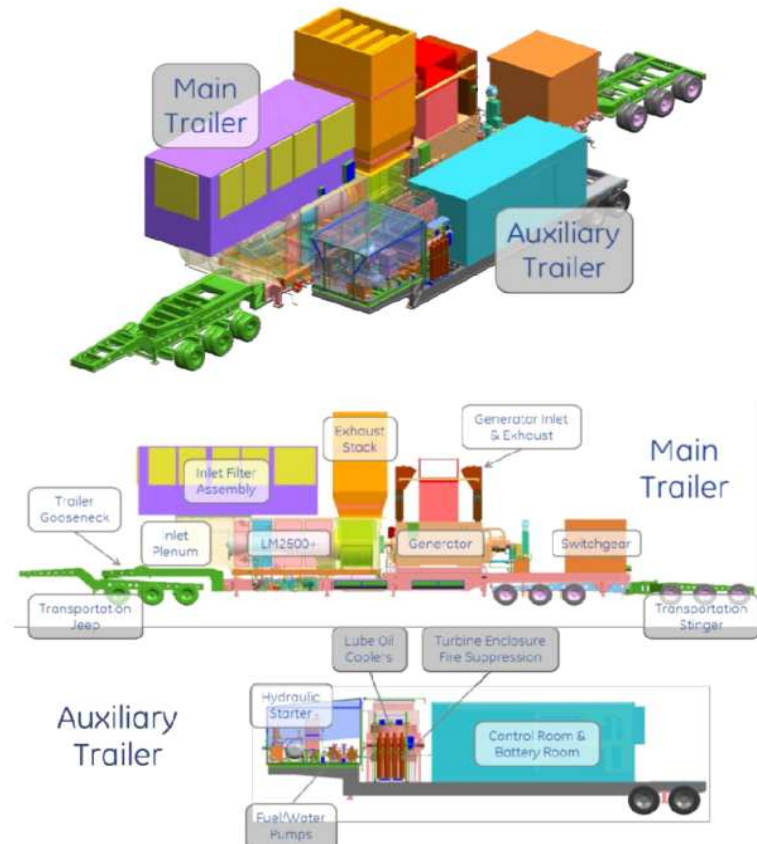
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TM2500+ Technology Overview

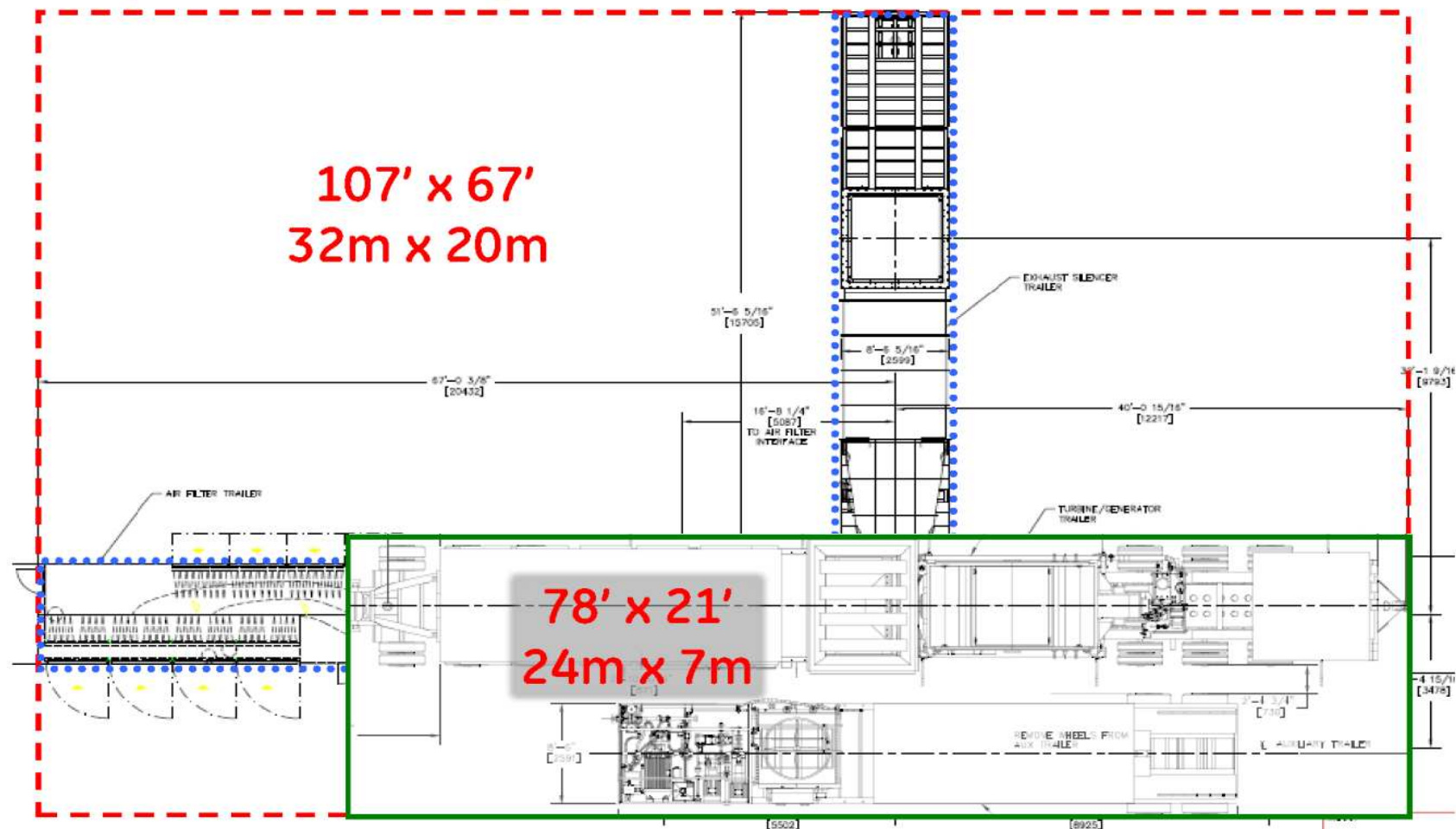
Key Highlights

- Equipped with LM2500+ aeroderivative GT
 - Proven technology, over 42 million operational hours
- 23-31 MW on wheels
- 37% SC efficiency
- Dual frequency - 50 or 60 Hz operation
- Liquid (#2 diesel and jet fuel) and/or gas fuel (natural gas and COG)
- Ambient temperature operational range from -39°C to 50°C
- Installation in days
- Global availability
- Turnkey solutions including O&M
- Fast start - zero to 100% in 10 minutes

TM2500+ Layout



Compact Footprint. Ultra Dense Power



77% reduction in installed footprint
(compared to previous generation TM2500)



Hydraulic Fracturing Site Power



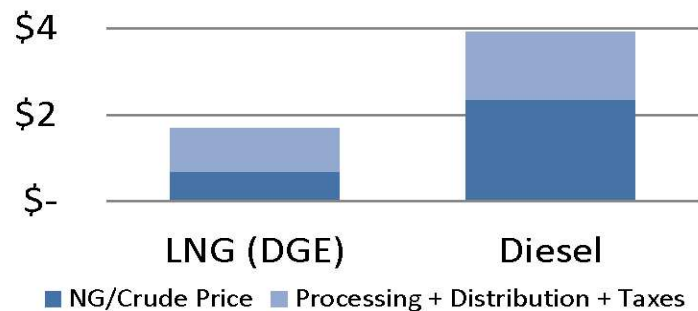
- GE's trailer-mounted TM2500+ aeroderivative gas turbine
- Delivers 25 MW of on-site power using field gas
- Evolution Well Services' Lethbridge, Alberta, well site.

This project demonstrates mobile natural gas technology's emissions-reduction and operational efficiency advantages over conventional diesel engines for powering hydraulic fracturing in unconventional gas fields.

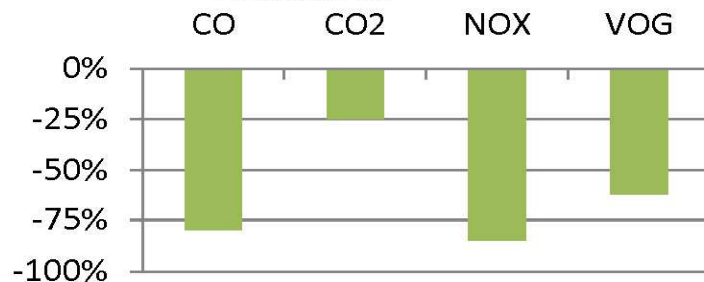
LNG-fueled transportation today

Opportunities

LNG vs Diesel Prices^{1, 2, 3}



NG vs Diesel Emissions Reduction*



Adoption challenges

For vehicle owners



- High conversion costs
- Nascent LNG fueling network

For LNG station operators



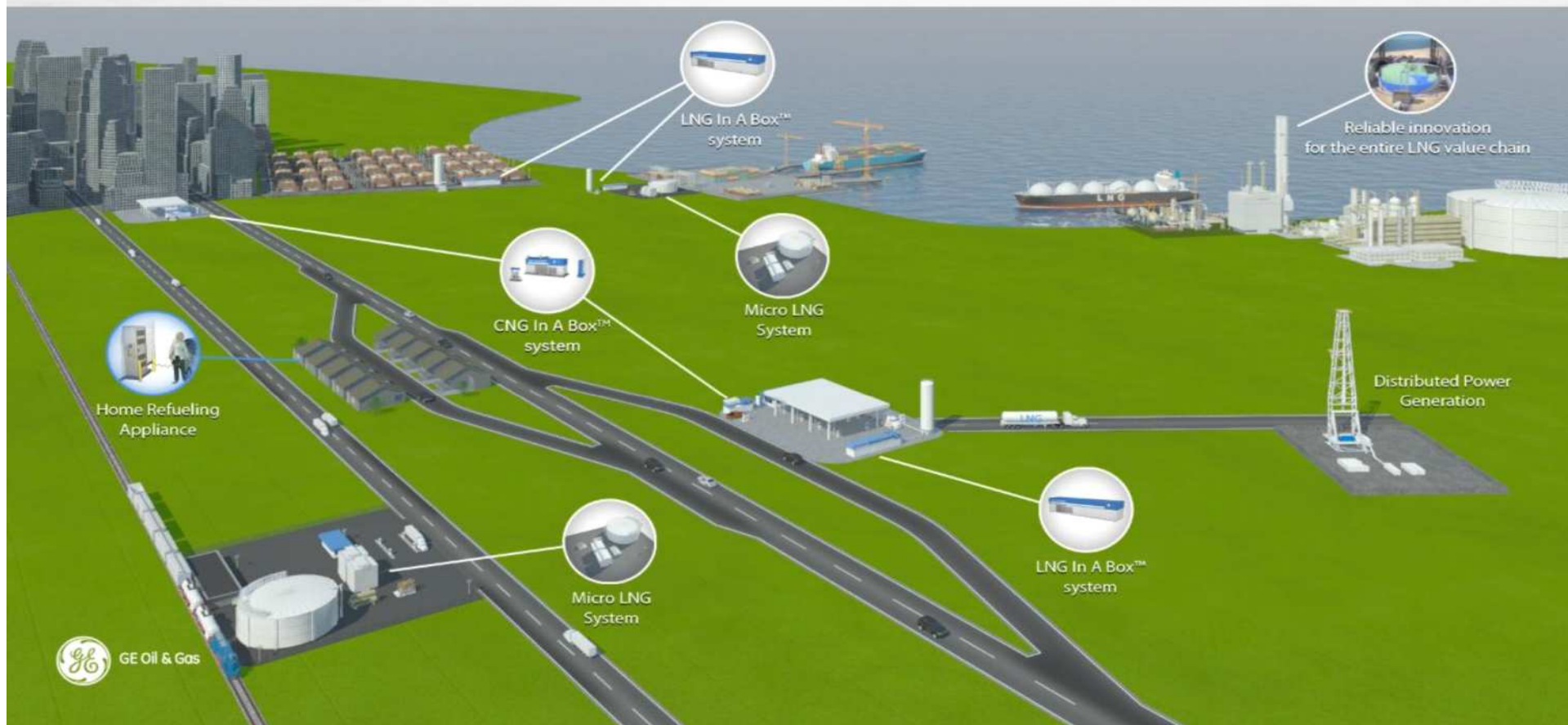
- High CapEx/OpEx
- Location based adoption risk
- Logistics cost & complexity



Sources: ¹IHS CERA – Apr '12, ²Credit Suisse: The Shale Revolution – Dec '12, ³EIA.gov data – Feb '13, data, ⁴NGVA – '13
GE imagination at work

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GE solutions for natural gas fueling infrastructure





LOPEZ MENA



PRINCIPAL PARTICULARS

LOA: 99.00 m
LWL: 90.54 m
Beam: 26.94 m
Draft: 2.98 m
Deadweight: 450 tonnes

Capacity:

- Over 1000 passengers and 150 cars
- Duty free shop over 1100 square metres

Engines:

- GE Gas Turbine LM2500
- 2 x 22 MW Total power 44 MW

Waterjets:

- Wartsila LJX 1720SR

Gearbox:

- Renk Bus 175

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Stargate 250 power plant capturing CO2 for Enhanced Oil Recovery (EOR)

GE LMS100 turbine
Sargas patented process technology
DSME commercial wrap

Ultra low emissions 250MW CC plant

- Competitive COE (cost of electricity)
- 80 – 95% Carbon Capture

Customer Value

- Oil Reservoir Production
- Power Generation
- Energy independence

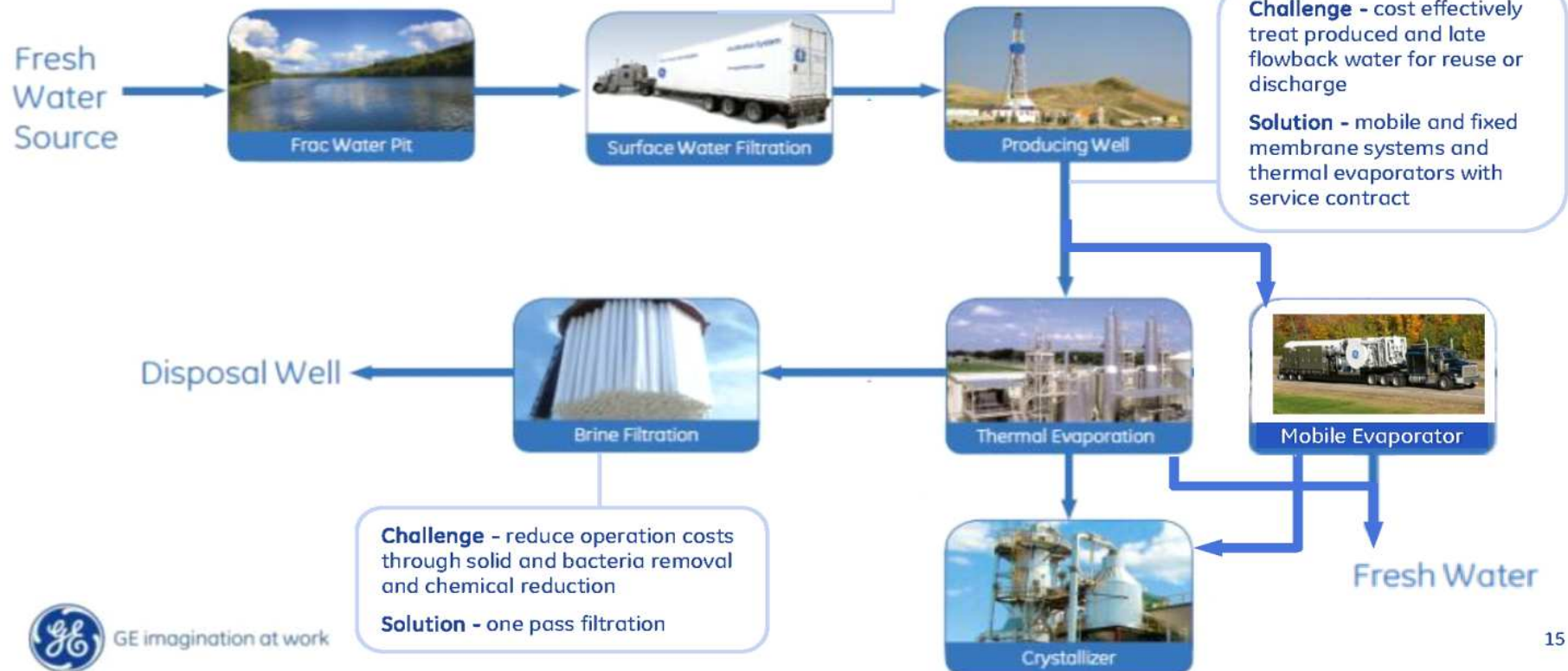


GE solutions for water issues

- Source water filtration to reduce chemical pretreatment
- Water reuse/recycling
- On-site mobile evaporators
- Fixed evaporation & crystallizers

Challenge - filter hydraulic fracturing source water to reduce chemical treatment and cost and meet environmental regulations

Solution - mobile ultra-filtration systems



Transforming LNG fueling infrastructure model

Traditional Large LNG



- Up to 72 months
- Custom, project-based
- Capital intensive
- High logistics complexity & cost

LNG for Transportation



- 6-24 months
- Modular & standard, product-based
- Reduced CapEx & OpEx
- Simplified logistics, on-site production

Breaking down traditional, complex LNG plants into modular, rapidly deployable solutions



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Commercial Fast Ferries

Ship Owner/Ship Name	Number/Type of units	Equipment Location	Propulsion
Mols Linien			
Mie Mols*	2 LM 1600	Deck Zero	Water Jet
May Mols*	2 LM 1600	Deck Zero	Water Jet
Nordic Ferry Services			
Villum Clausen*	2 LM 2500	Deck Zero	Water Jet
Stena Line			
Stena Explorer*	2 LM 2500 + 2 LM1600	Deck Zero	Water Jet
Stena Discovery*	2 LM 2500 + 2 LM1600	Deck Zero	Water Jet
Stena Voyager*	2 LM 2500 + 2 LM1600	Deck Zero	Water Jet
Mega Yacht			
Ecstasea*	1 LM 2500	Deck Zero	Water Jet
Buquebus:			
Lopez Mena	2 x LM2500 <u>Dual Fuel</u>	Deck Zero	Water Jet



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LNG In A Box™ system



Ideally suited for:

- Heavy-duty truck fueling stations
- Virtual pipeline
- Distributed power generation

Performance:

- 10,000-50,000 gallons per day LNG production
- Inlet gas: Pipeline
- Gas recovery: 80-82%
- Specific power 1.4 kWh/gal (1.3MJ/liter)

Features:

- Modular, rapidly (re)deployable design
- Simple methane cycle
- Minimal pad prep & quick installation
- 6-12 month lead time
- Highly automated operation
- Gas engine option available
- Equipment financing available



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Micro LNG system

Ideally suited for:

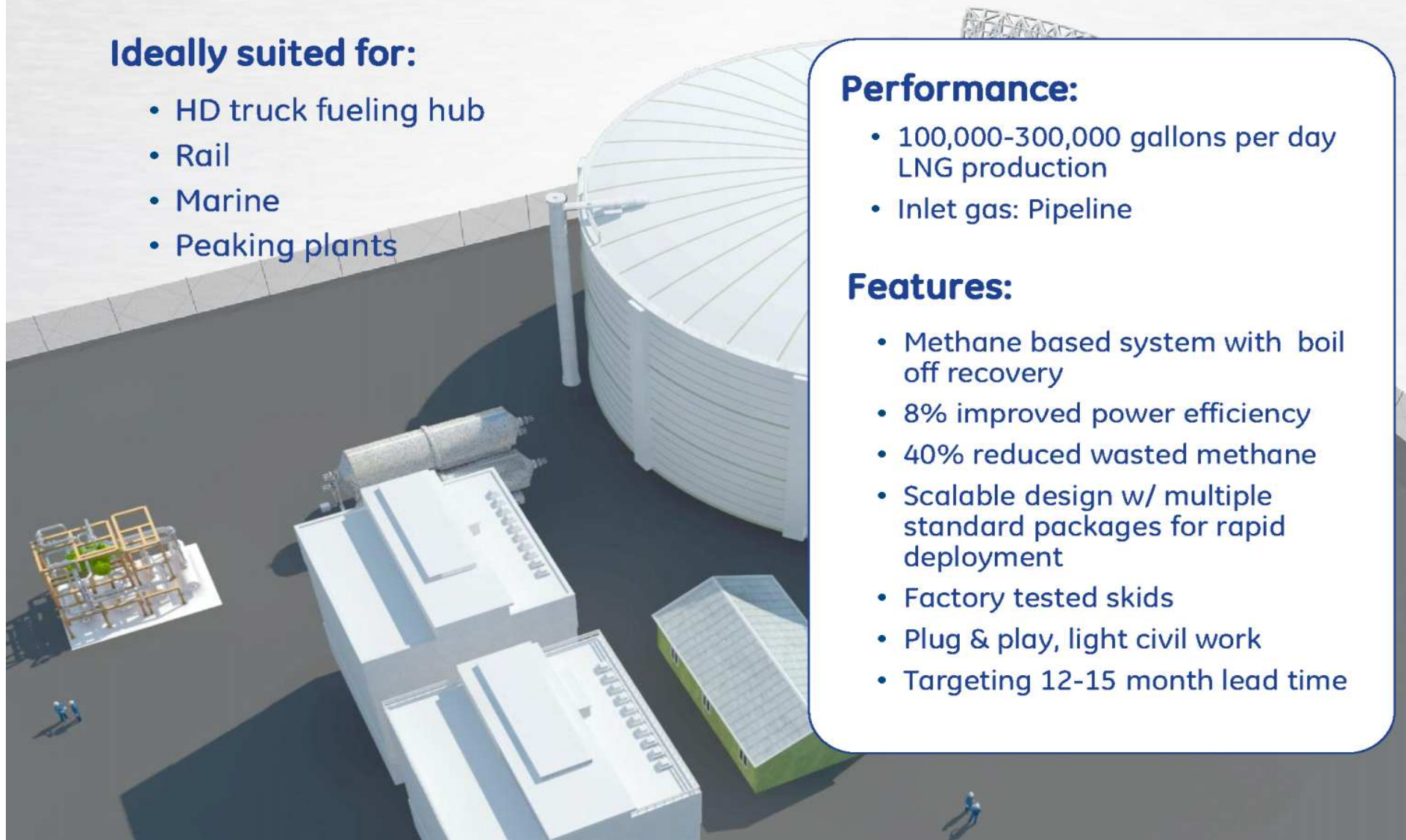
- HD truck fueling hub
- Rail
- Marine
- Peaking plants

Performance:

- 100,000-300,000 gallons per day LNG production
- Inlet gas: Pipeline

Features:

- Methane based system with boil off recovery
- 8% improved power efficiency
- 40% reduced wasted methane
- Scalable design w/ multiple standard packages for rapid deployment
- Factory tested skids
- Plug & play, light civil work
- Targeting 12-15 month lead time



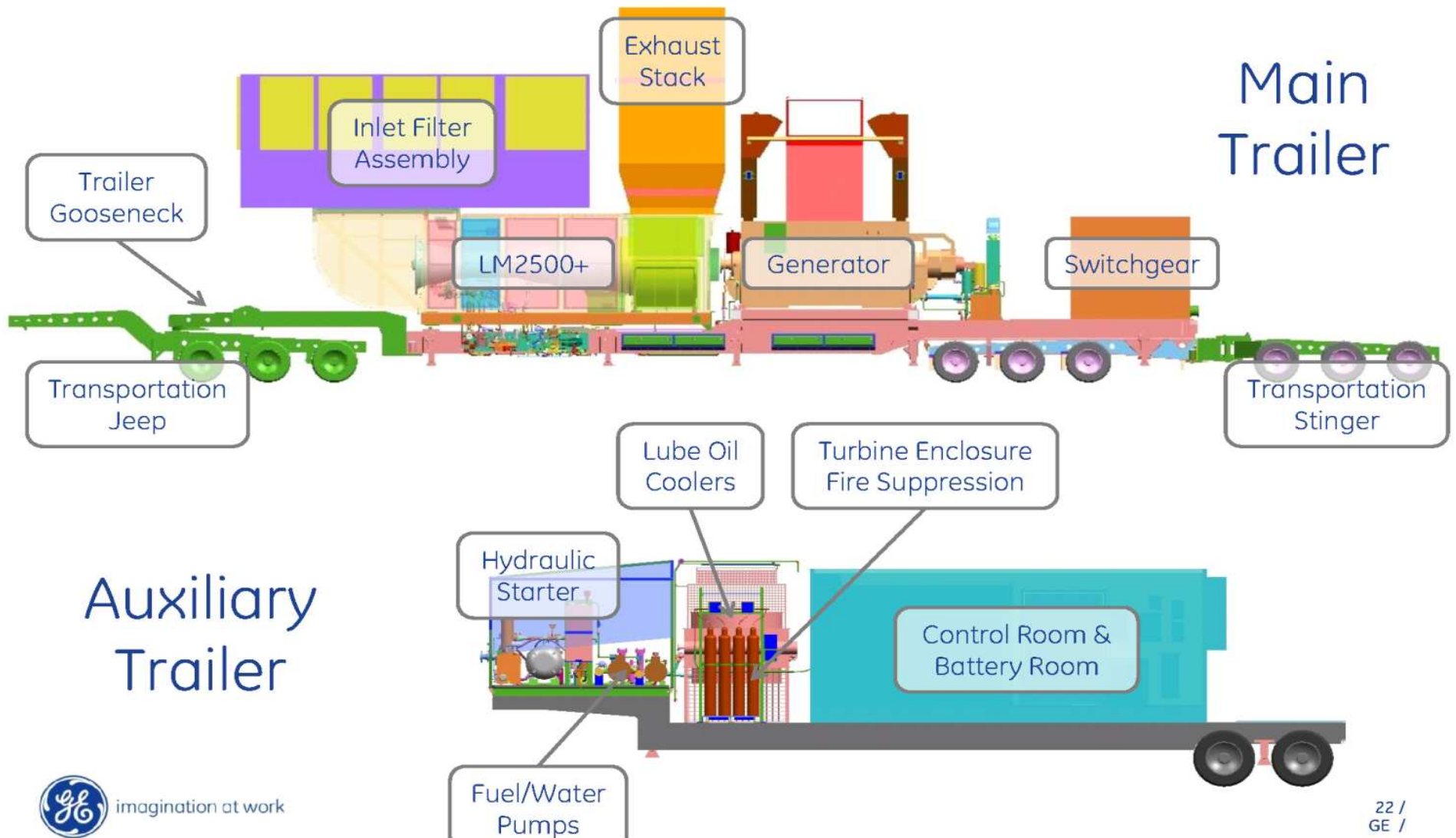
CNG IN A BOX™ SYSTEM

- Collaboration between GE & Chesapeake Energy's Peake Fuel Solutions
- Turnkey technology, modular design, Plug-and-play on site fueling solution
- Look and feel of a traditional diesel or gasoline dispenser
- ~80% emission reductions vs gasoline vehicles



GE's world-class compressor technology, GE Wayne's innovative dispenser technology, with available pay at the pump credit card reader, and a Remote Utility Box, GE Capital Financing

TM2500+ Design



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