GE Oil & Gas

is a world leader in advanced technologies and services with 43,000 employees in more than 100 countries supporting customers across the industry — from extraction to transportation to end use. Our unrelenting commitment to the environment, health and safety, quality and integrity defines us: it’s The Way We Work.
The GE Oil & Gas business

Operating in 100+ countries

43,000 employees

Revenue ’12: ~$15.2B

Subsea Systems

Drilling & Surface

Lufkin

Measurement & Control

Turbomachinery

Global Services

PII
Building on a strong foundation...

(Orders $ in billions)

1994
- A Turbomachinery company

1997
- Developed a Service model

2004
- Expanded in Inspection Technologies

2007
- Well Support 
  - Pressure Control 
  - Electrical Submersible Pumps 
  - Logging Services

2008
- Entered the Drilling & Production segment

2011
- The “new” GE Oil & Gas

2012
- GE Oil & Gas became stand-alone GE segment

2013
- Continue to build out capabilities to focus on specific segments

...GE Oil & Gas today
SOLUTIONS FOR SMALL SCALE LNG
GE solutions for natural gas fueling infrastructure
LNG infrastructure for marine

**Gas Source**
- Pipeline Gas
- Large LNG terminal
  - LNG Container
  - Marine Transport

**@Port**
- Small-Scale LNG
  - Road Transport
- LNG Storage
- L/CNG Station
  - Power Station
  - LNG Station
  - STS Bunkering
  - TTS Bunkering

**Users**
- Marine fleets
  - Ro-Ro
  - Lo-Lo
  - Ro-Pax
- Industrial fleets
  - Rail
  - Heavy duty
  - Medium duty
- Personal NGV/Fleets
  - Light/medium duty
- Distributed Power
  - Emerging markets
  - Remote power
  - Peaking
  - Marine fleets

**GE Offerings**
- Micro LNG
- Salof MMLS
- LNG In A Box
- CNG In A Box
- Gas Engines
- Drill Motors
- Gas Turbines
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
Small LNG solutions

2011
Micro LNG – Gen 1
- 30-90 Ktpa
- Liquefaction only
- Custom
- API
- EPC heavy
- Construct on site
- 24 months lead time

2012 - 2013
Micro LNG – Gen 2
- 30-150 Ktpa
- Turnkey solution
- Multiple standard packages
- Non API
- Factory tested skids, GC only
- Plug & play, light civil work
- Target 12-15 mo lead time

LNG in a Box
- 6-30 Ktpa
- Turnkey solution
- 1 standard box
- Non API
- Factory tested solutions
- Plug & play, pad prep only
- Target 3-6 mo lead time
- Equipment financing
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 (38 – 190 m³)
- 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
Micro LNG system

Ideally suited for:
- HD truck fueling hub
- Rail
- Marine
- Peaking plants

Performance:
- 100,000-300,000 gallons per day LNG production (380 – 1136 m3)
- 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

**Performance:**
- 10,000-20,000 gallons (1 gallon = 3.8 liter) per day gasoline equiv. production
- Inlet gas: Pipeline

**Features:**
- Portable, Modular design
- Minimal pad prep & quick installation
- 2-4 month lead time
- Highly automated operation
- Gas engine option available
- Equipment financing available

**Ideally suited for:**
- Cars, trucks, buses fueling stations
- Rig-site gas distribution, flare capture
- Storage, remote sites
CNG Portfolio

CNG In A Box - 400
- 10,000 gasoline gallons per day ... 7.5 GGE / min
- Cars, trucks, buses
- Launched in Mar ‘12 ... first unit delivered Sep ‘12

CNG In A Box High-Flow
- 20,000 gasoline gallons per day ... 15 GGE / min
- Rig-site gas distribution, large trucks, flare capture
- Launched in Sep ‘12 ... first unit delivered Mar ‘13

CNG In A Box Stand-alone
- 10-20,000 gasoline gallons per day ... gas-engine driven
- Storage, remote sites
- Under development
BRAIN FOOD
(Low calories)
HILP event – Having a “Plan B”

Various scenarios where LNG supply chain is disrupted

• Demand / Supply balance
• Technical
• (Geo) Political

Prepare for the unexpected!

• Storage solutions (ST)
• Alternative fuels
• (small scale) Liquefaction
  • Conventional gas
  • Unconventional gas

Change in assumptions

Various scenarios where LNG supply & demand changes

- New applications competing for supply
  - Cars, Trucks, Power Gen
- New sources of supply
  - Biogas (BLG)
  - Shale Gas
  - Pipeline
  - Other unconventional gas

Small scale liquefaction provides flexible, modular, mobile solutions

Inventing innovative small LNG solutions

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Small LNG solutions
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Optimizing operations

“Boil off gas” (BOG) along the LNG cycle
- Shipping
- Storage
- Handling ... on/off-loading

Optimization of BOG
- Process
- BOG compression
- Gas engines / boilers
- Re-liquefaction

Re-liquefaction solutions for BOG during periods of low-demand or under-utilization
Also operates as back-up for (main) BOG Compressor
Power (drive) for compressors can be produced using gas-engines

Nano LNG (LNG In A Box)
Gas Monetization... CNG/LNG

**NA transportation fuel share by vehicle type**

- **On-road 85%**
  - Personal vehicles 37%
  - Light-duty trucks 28%
  - Medium 5%
  - Heavy-duty 15%

- **Rail 10%**
  - LNG

- **Marine/off-road 5%**
  - LNG

**GE Gas Monetization Solutions**

- **Large LNG**
  - 1,000,000 Gallons/day
  - Micro & Mini LNG
  - LNG In A Box™ *
  - 50,000 Gallons/day
  - CNG In A Box™ / CNG In A Box™ Hi-Flow
  - 20,000 Gallons/day
  - CNG HFA*
  - (Home Fueling Appliance)
  - 1,000 Gallons/day

* Under development

**Source:** 2007 EIA Transportation Energy Data Book

*2017 estimate by Frost & Sullivan N8CF-18. Medium is average of Class 6 & 7 trucks, Heavy duty is Class 8 trucks

**NTI/BD under exploration**
Summary and conclusions
Small LNG ... key points

• Strong heritage and experience in large scale LNG

• Integrated LNG solutions for wide production capacity range

• Complete life cycle solution utilizing best-in-class GE capabilities

• Product structure ... Single design for multiple plants

• Modular design ... Plug & play

• Flexible ... can be redeployed or scaled up/down if needed

Bringing GE-proven LNG experience
to rapidly deployable, small-scale solutions