

# TM2500+ Power for Hydraulic Fracturing

Tom Hausfeld  
GE Power & Water

Eldon Schelske  
Evolution Well Services

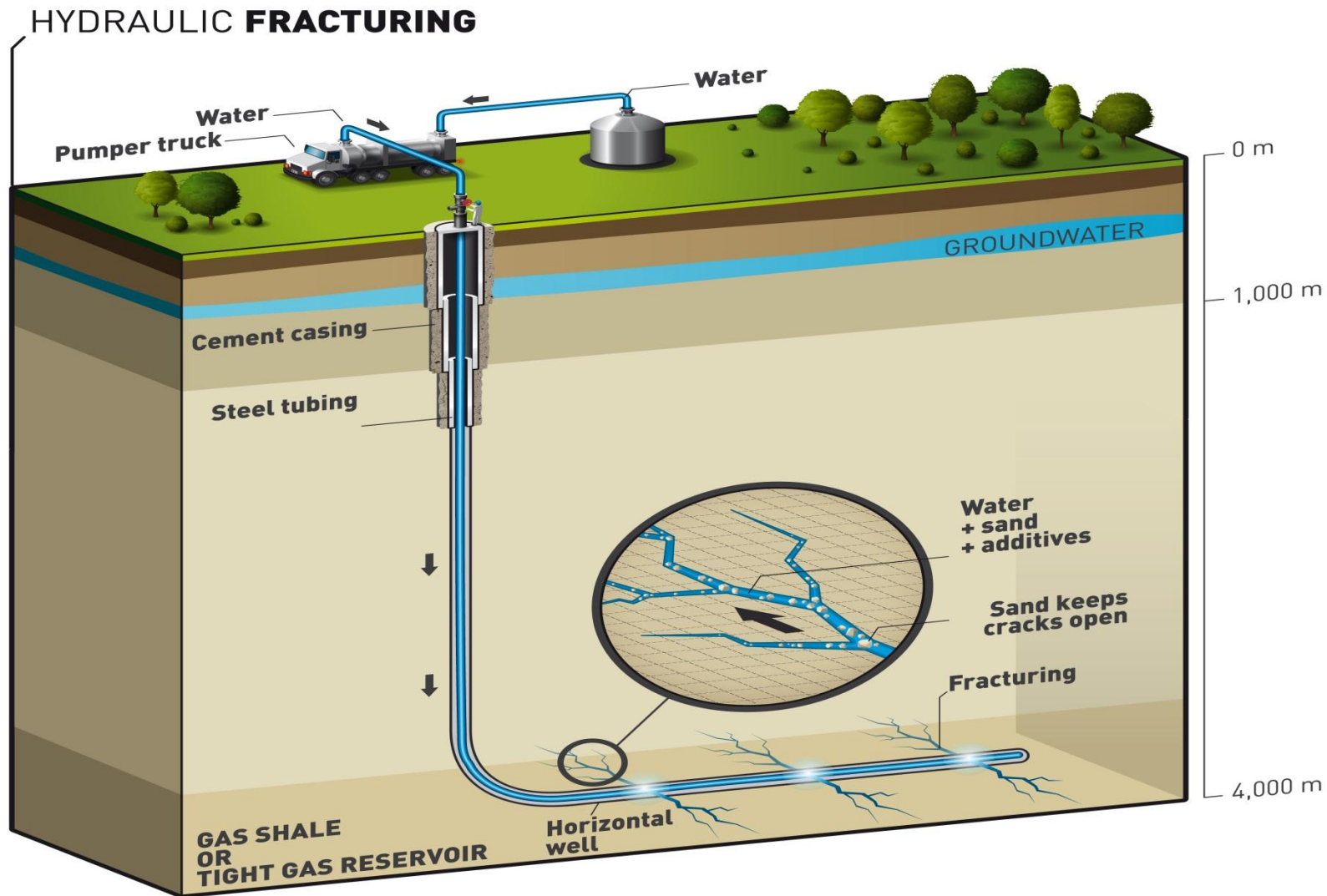


imagination at work



**EVOLUTION WELL SERVICES**

# Fracking 101



# Current Technology Hydraulic Fracturing Site



# Current Technology Equipment



# Evolutionary Well Services Equipment

# EWS Demonstration Hydraulic Fracturing Site



- A) Frac Pump Modules
- B) Blender
- C) Mobile Data Van
- D) Chem Addition Mod
- E) Blender Mtr Contrl
- F) Sand Conv Belt Mod
- G) Sand Storage Mod
- H) GE TM2500+ GTG
- I) Pump Mtr Contrl

Lethbridge, Alberta

# Material Handling





# Mobile Modular Design

## Electric Motor Fracturing Pump Blender

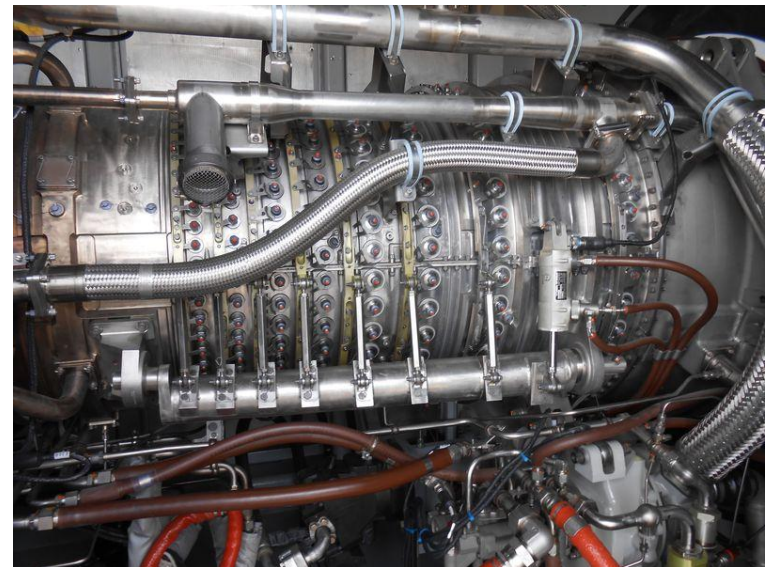
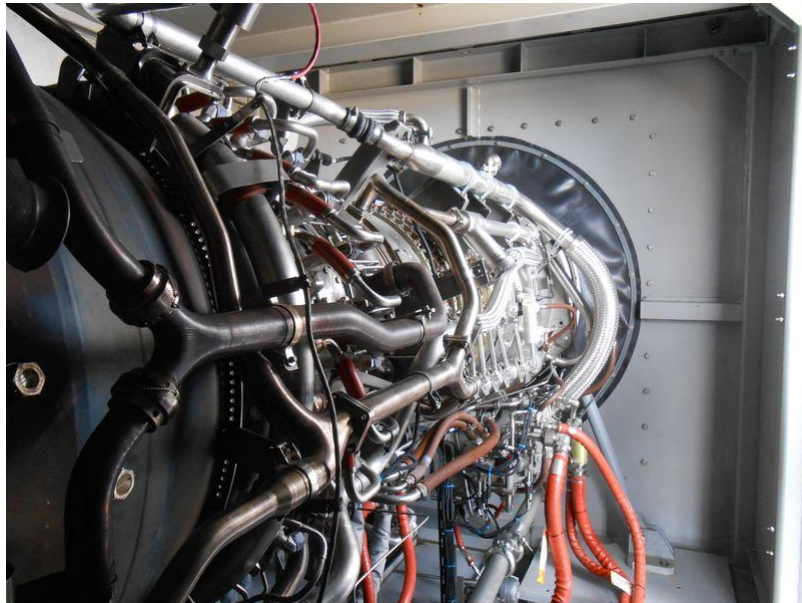


# Control Building





# TM2500+ Gas Turbine



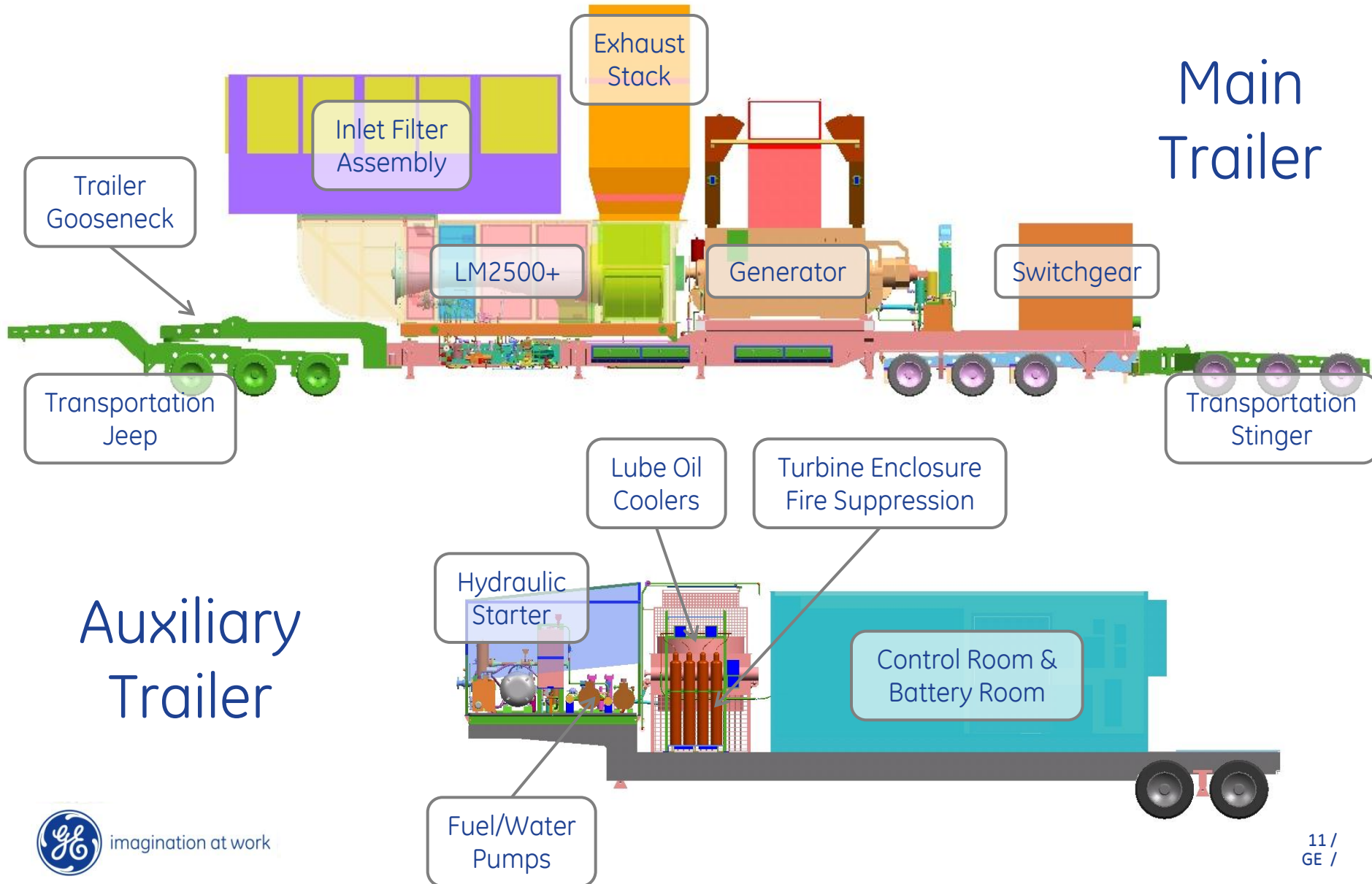
# Compressed Natural Gas (CNG) Fuel

Six hours endurance  
at 50% power for  
the first well



Natural gas from the  
first well then fuels  
subsequent wells

# GE TM2500+ Design



# Primary Components

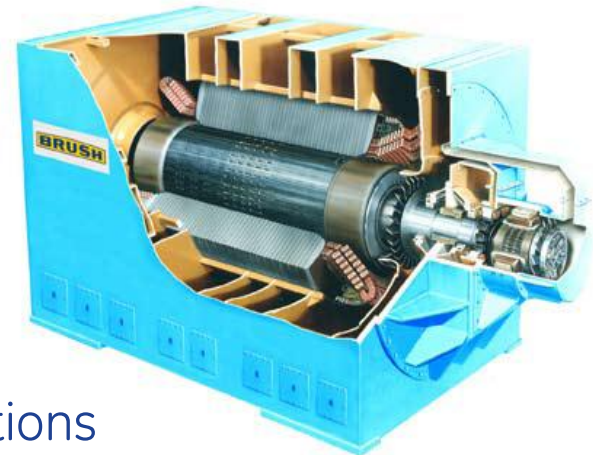
## GE LM2500+ Gas Turbine

- Zero staged version of the LM2500
- 2000+ LM2500 turbines worldwide
- More than 67M operating hours

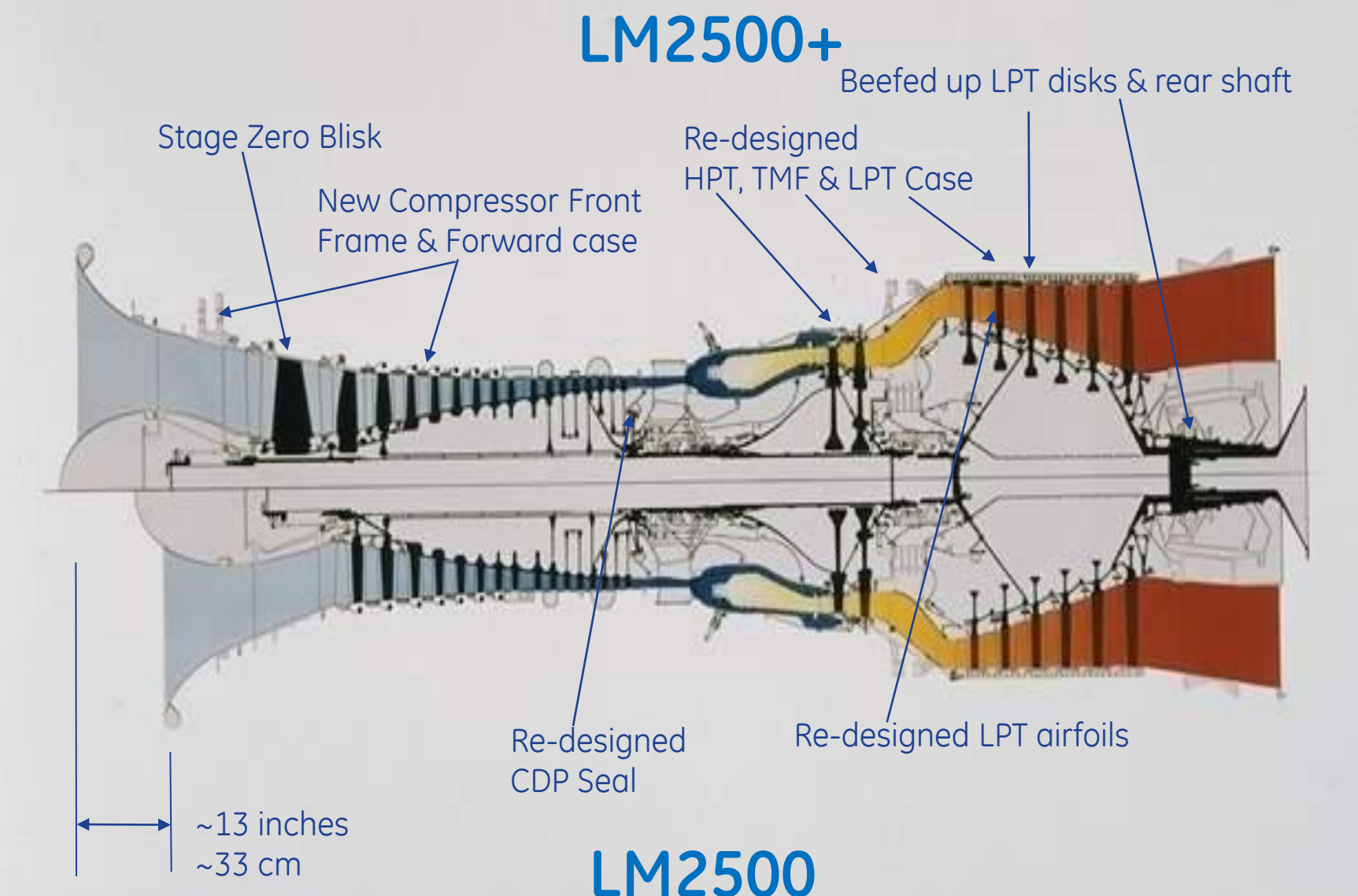


## Brush Electrical Generator

- Air-cooled generator, brushless excitation
- Suitable for Class 1, Group D, Div. 2 areas
- 60Hz (13.8kV) and 50Hz (11.5kV) operation
- Rated at 32,550 kVA @ 0.90pf in ISO conditions



# LM2500 vs. LM2500+ GT Centerlines



# TM2500+

- Up to 38% efficiency @ 100% load
- 10 min fast start
- Small Footprint 78'x21'

- Fleet availability
- Capable of SC application
- Offering turnkey solutions
- Blackstart capability



Attributes	TM2500+
Power Output ISO (MW) <sup>1</sup>	31
SC Efficiency(%) <sup>1</sup>	36.0
Nox Emissions (ppm) <sup>1</sup>	25
Emissions Control	Water
Footprint	78'x21'
Noise Level	90
Fuel	Dual
Weight (lbs)	200k

**References:**

- 1) All Power, heat rate, and efficiency @ ISO conditions with water injection at 60 Hz, natural gas fuel

# Customer Interface Requirements\*

## Fuel

- Gas supply pressure is 520 (+/- 20) PSIG at a rate of 320 MMbtu/hr
- Liquid Fuel (diesel) supply pressure is 30 (+/- 10) PSIG, up to 40 GPM (max)

## Water (for NOx suppression)

- Minimum supply pressure is 15 PSIG up to 28 GPM (max)

## Foundation

- Site levelness less than 6" per 100 feet
- Adequate access/space for maneuvering the trailers

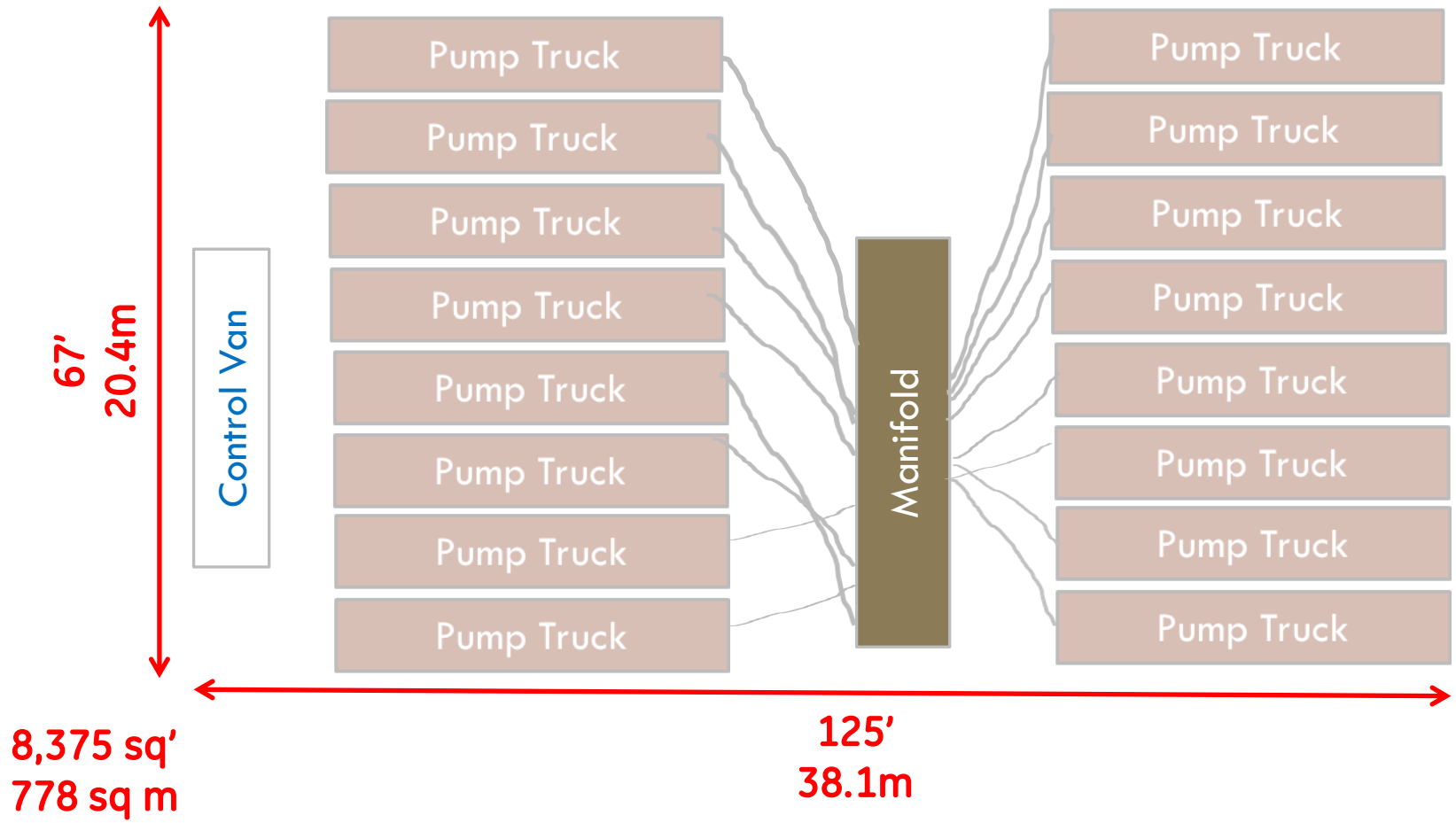
\*These requirements represent general needs of a standard TM2500+ installation. Actual requirements could vary based on site location, site conditions, local ambient conditions, unit configuration, and many other factors.



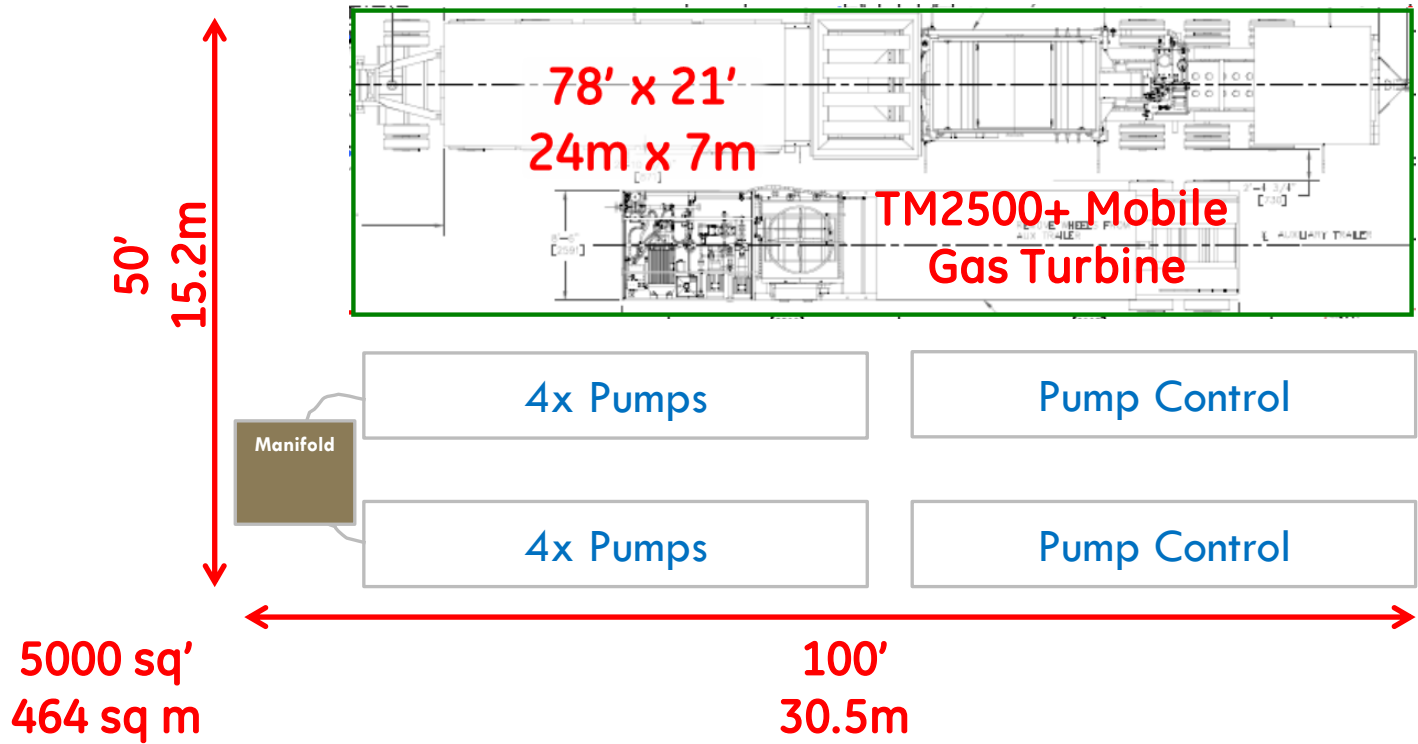
Small details make  
a big difference!







Conventional arrangement  
for a 15 MW site



40% less area required  
for power train and pumps  
using the EWS/GE System

# System Comparison

	Diesel Truck Pumps	EWS System
Prime Movers (15 MW)	14 Diesel Trucks	1 TM2500+
Pump Units	16	8
Fuel	Diesel	#2 Diesel/NG/CNG/LNG
Power Efficiency	38.9%	36.8% (incl -1% elec mtr)
Noise (max pwr)	105 dB*	90 dB
Nox Emissions	52.5 Kg/hr Diesel (dry)**	70.4 Kg/hr #2 Diesel (dry) 43.3 Kg/hr NG (dry) 13.0 Kg/hr #2 Diesel*** 7.6 Kg/hr NG***
Personnel	1 Controller 16 Pump Operators	2 Controllers 1 Gas Turbine Operator
Power/Pump Footprint	8,375 sq' 778 sq m	5000 sq' 464 sq m
People Infrastructure	5x	1x

\* Engine surface noise with attenuated intake noise (filter) - BL (free-field sound pressure level  $L_p$ , 1m distance, ISO 6798)

\*\* Tier 4 limits attained

\*\*\* 42 ppm #2 Diesel, 25 ppm Natural Gas , both with water injection

# Questions

