

Drilling Rig Electrification – Barnett and Beyond

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Presentation Outline:

● Electric Drilling Project

- Project Overview
- Rig Fleet / Equipment
- Current Progress
- Economic Summary

Rig Electrification Overview

- **Originated at DFW Airport in 2007, expanded into entire Barnett district in 2009**

- Use of mobile transformer skids to run diesel-electric rigs on grid power
- 7 transformer skids available in the Barnett (owned by Great Plains, Chesapeake Subsidiary)
- Contracting electrical engineering/consulting through Rapid Power Management; Dallas, TX
- 12 rigs in the Barnett fully capable of utilizing transformer skids
 - Nomac 20 series, Nomac 140 series (Formerly Mountain), Trinidad 110,111, 129 and 130.
- Ideal for pad drilling or an area with power grid in place and nearby
 - Each pad incurs a cost for engineering, layout design, equipment installation, Right of Way, and electrical hookup.

Benefits of Electricity for Drilling Rigs



- Eliminates Drilling Rig Emissions

- CO2 Emissions

- (4.2 Tons per Rig per Day) reduced to +/- 0

- Nox (Nitrogen Oxides)

- 55 TPY (4.6 Tons per Well) reduced to +/- 0 TPY (Tons per year)

- VOC (Volatile Organic Compounds)

- 2.5 TPY (0.2 Tons per Well) reduced to +/- 0 TPY

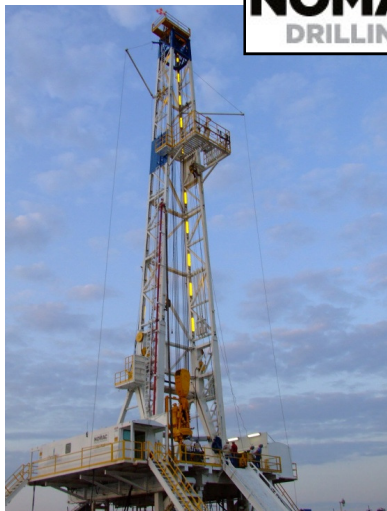
- Eliminates Drilling Rig Noise

- 75 dB reduced to +/- 0 dB

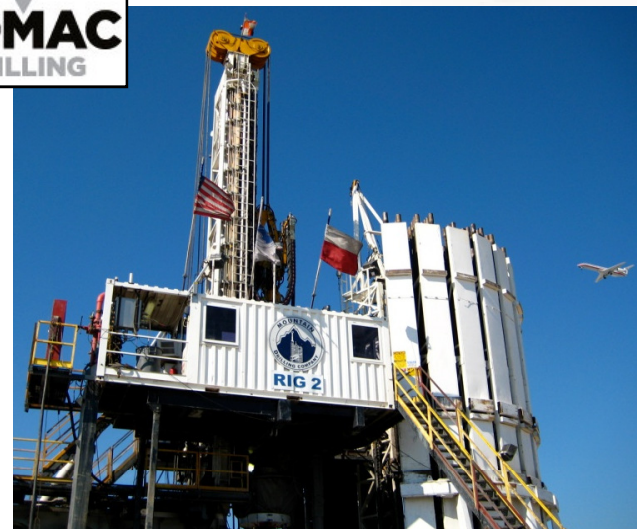
- Economic Benefits: (Saves +/- \$43,000 per well depending on diesel prices)



Electric Drilling Fleet



Nomac Drilling
National 610 Drilling Rigs
Derrick Height: 170'
750 HP
Fuel Usage: 1500 GPD
Electric Power: 1500 kilowatts
Voltage: 600 Volts



Nomac 140 Series
Drillmec HH-220 Drilling Rigs
Derrick Height: 100'
1500 HP
Fuel Usage: 2015 GPD
Electric Power: 2200 kilowatts
Voltage: 600 Volts

Trinidad Drilling

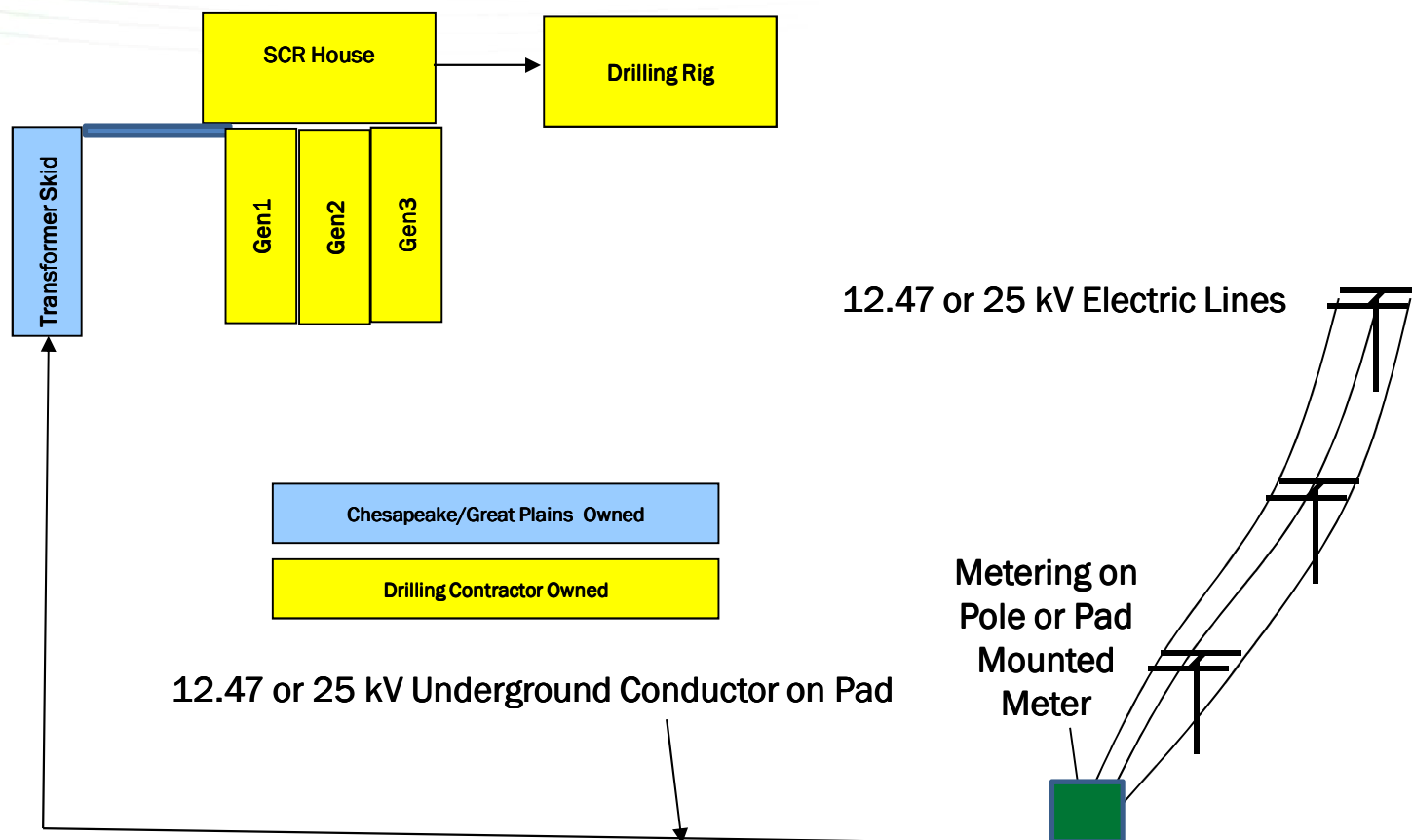
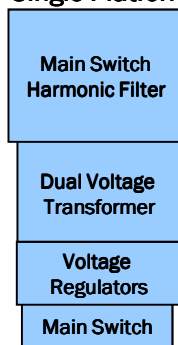
Victory 1500 AC Drilling Rigs
Derrick Height: 142'
1,500 HP
Fuel Usage: 1800 - 2200 GPD
Electric Power: 1500 kilowatts
Voltage: 600 Volts



Site Layout with Current Equipment



Transformer Skid Components – Single Platform



Electrical Skid Design Improvement



June 2008



- 4.16 kV to 600 Volt
- 2500 kVA Transformer
- 525 kVAr Harmonic Filter

March 2009



- 12.5 or 25 kV to 600V
- 3750 kVA Transformer
- 1000 kVAr Harmonic Filter

Electrical Skid – Closer Look

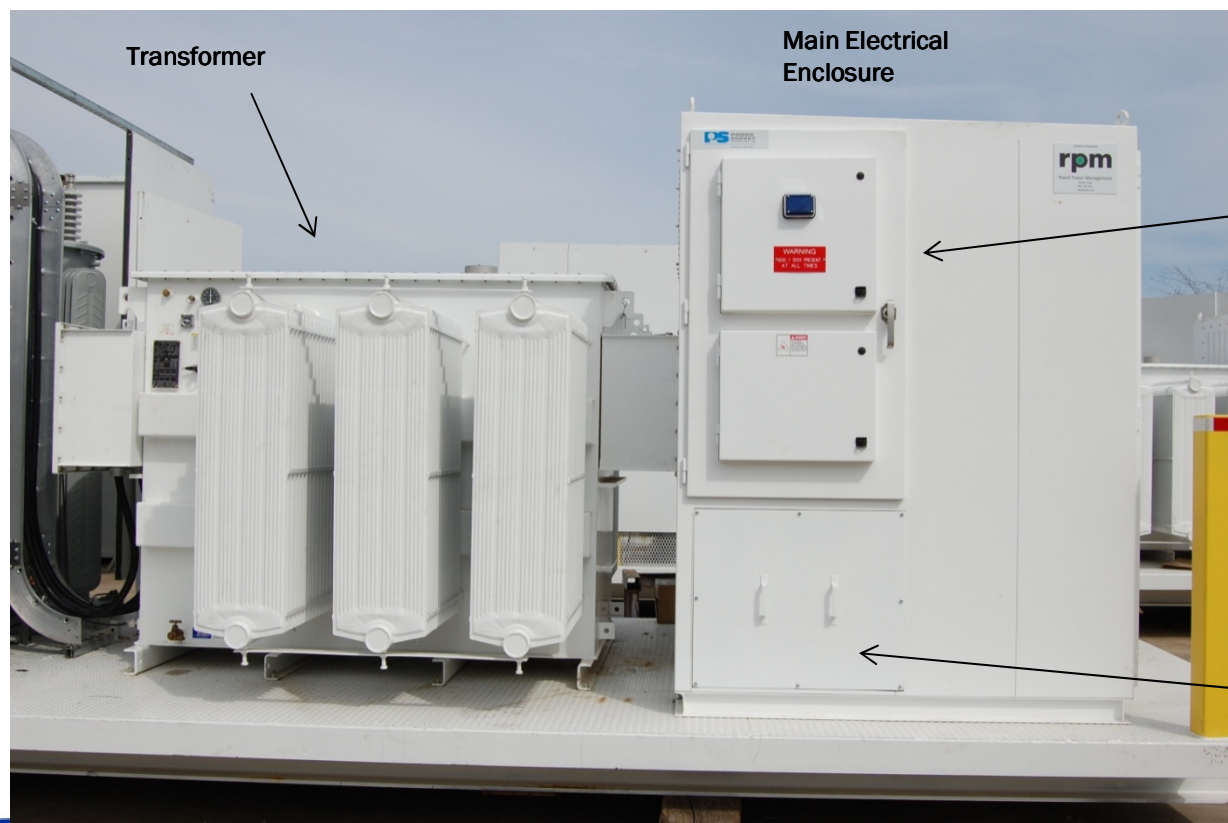


Transformer and Capacitor Bank / Harmonic Filter



- Transforms 12.47 or 24.9 kV to 600V for Rig Power
- Mitigates rig power distortion on utility network
- Provides Main 600 V Disconnect for Rig.

Main 600 V Electric Disconnect
(behind panel) door



Project Evolution



- From 1 padsite outside DFW Airport in 2009 to 102 padsites as of December, 2011
- 56 padsites 100% ready; 46 padsites in progress
- 850 wells planned to be drilled on electricity
- 79 wells drilled on electricity to date (30 padsites) – 1,396 drilling days
- Rig capability taken from 6 rigs to 12

Economic Summary



Diesel Fuel Savings

Engineering, Installation, Right of Way, Hook-Up Cost (per well)	\$34,000
Average Cost of Electricity (13,108 kWh/day)	\$14,160
Average Cost of Drilling Well on Electricity	\$48,160
Average Cost of Drilling Well on Diesel (1,730 gal/day @ \$3.50 per gal)	\$90,825
Net Savings of Drilling Well on Electricity	\$ 42,665
Total Savings of Wells Drilled on Electricity to date (excluding DFW) (79 wells)	<u>\$3,370,535</u>

Estimated Savings for 21 of the pads we've drilled on:
\$8,618,330 (202 wells)



GM Pad Economics (Barnett)



Diesel Fuel Savings (Single Pad)

Construction, Hookup/Disconnect, Engr . (Per well)	\$8,130
Transformer skid rental - Great Plains (\$1000/day)	\$15,000
Average Cost of Electricity (13,108 kWh/day)	\$12,765
Average Cost of Drilling Well on Electricity (15 days)	\$35,895
 Average Cost of Drilling Well on Diesel (Nomac 29 – 1,500 gal/day @ \$3.50 per gal)	 \$78,750
 Net Savings of Drilling Well on Electricity	 \$42,855
Total Savings of Wells Drilled on GM Pad w/ Electricity (15 wells)	<u>\$642,825</u>



Future Plans



- **Continue to bring electricity to padsites that are ideal:**
 - High Impact
 - >7 wells on the pad
 - Grid Power readily available
 - Economical installation
- **Better optimize drilling schedule to keep all 7 skids running**
- **Complete installation on enough padsites to completely fill all rig lines that have electrical capability**
- **Possible expansion into other areas**



Questions?

