DFW Airport Project – Barnett Shale Drilling Rig Electricity

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Presentation Outline

- DFW Airport Project Review
- Drilling Rig Electricity Project
- Electricity Continuous Improvement
- Conclusions

DFW Airport Project Overview

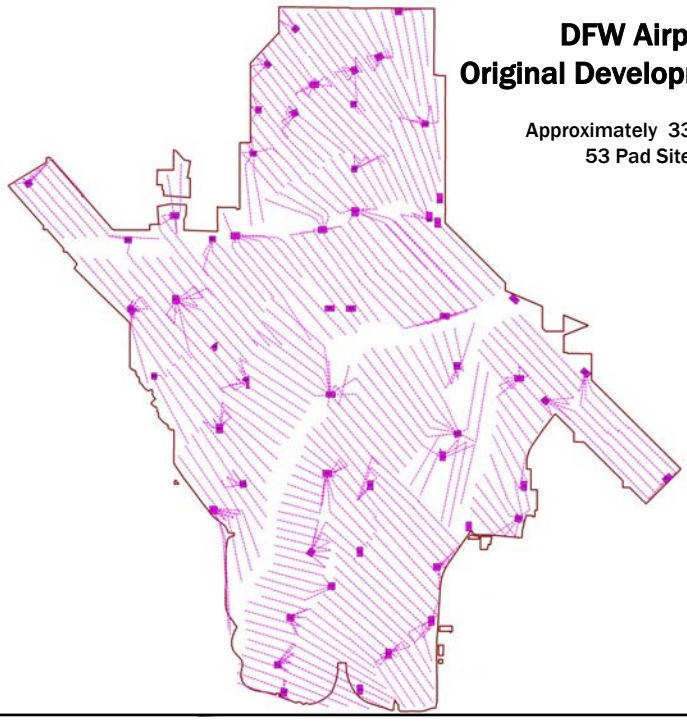
- 2nd Largest Airport in United States
- 3rd Busiest Airport in United States
- 18,453 Acres
- Up to 5 Drilling Rigs
- 53 pad sites
- 330 Horizontal Barnett Shale Wells
- 2 Salt Water Disposal Wells

DFW Airport Project Milestones

● 10/2006	Lease signed for $186 million
● 12/2006	Started seismic survey
● 5/2007	First well drilled
● 8/2007	First gas production
● 9/2007	First drilling rig electricity test
● 5/2008	Full implementation of electricity

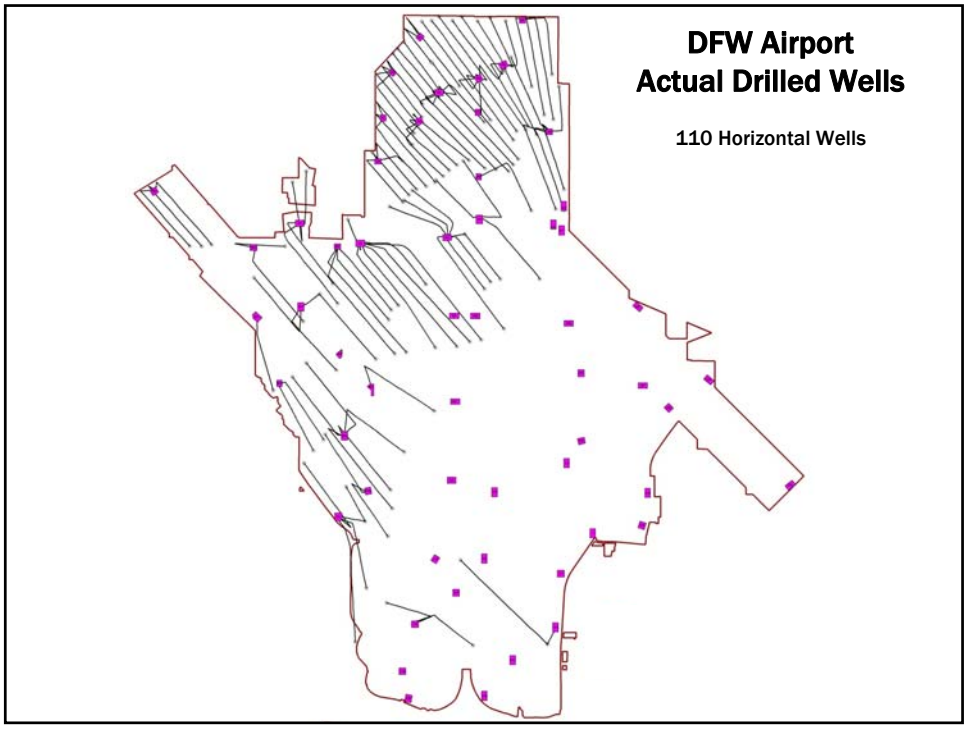
DFW Airport Project Considerations

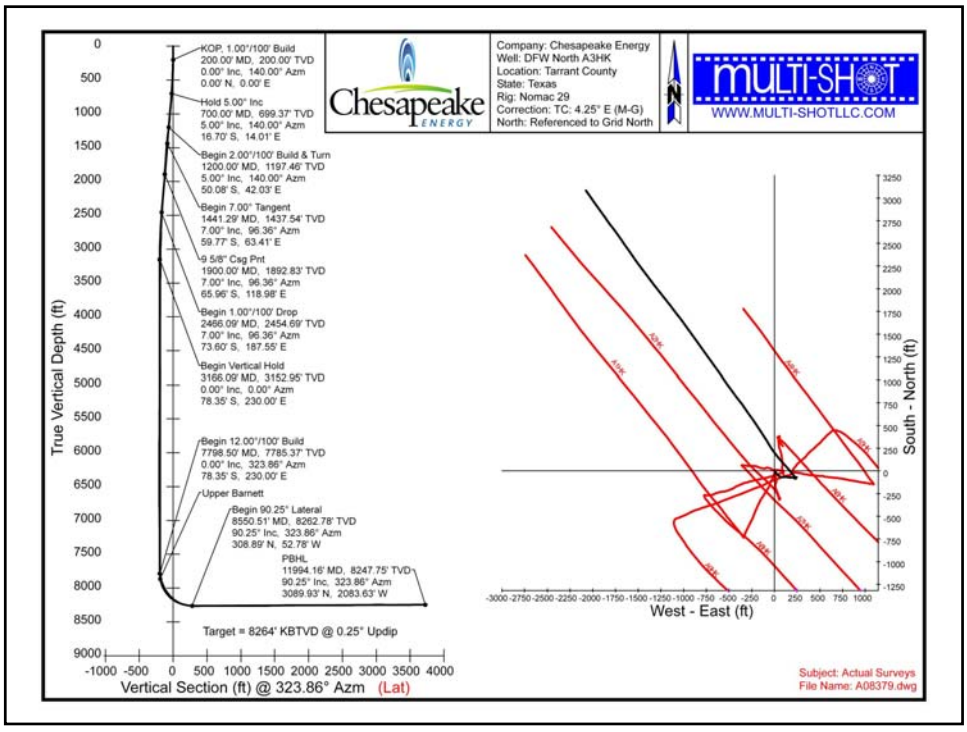
- Safety
- Security
- Environment and Emissions
- Drilling rig heights in restricted airspace areas
- Derrick lighting
- Radar interference



DFW Airport
Original Development Plan

Approximately 330 Wells
53 Pad Sites


DFW Airport
Actual Drilled Wells
110 Horizontal Wells


Chesapeake ENERGY
Company: Chesapeake Energy
Well: DFW North A3HK
Location: Tarrant County
State: Texas
Rig: Nomac 29
Correction: TC: 4.25° E (M-G)
North: Referenced to Grid North
MULTI-SHOT
WWW.MULTI-SHOTLLC.COM
KOP, 1.00°/100' Build
200.00' MD, 200.00' TVD
0.00° Inc, 140.00° Azm
0.00' N, 0.00' E
Hold 5.00° Inc
700.00' MD, 699.37' TVD
5.00° Inc, 140.00° Azm
16.70' S, 14.01' E
Begin 2.00°/100' Build & Turn
1200.00' MD, 1197.46' TVD
5.00° Inc, 140.00° Azm
50.08' S, 42.03' E
Begin 7.00° Tangent
1441.29' MD, 1437.54' TVD
7.00° Inc, 96.36° Azm
59.77' S, 63.41' E
9 5/8" Csg Pnt
1900.00' MD, 1892.83' TVD
7.00° Inc, 96.36° Azm
65.96' S, 118.98' E
Begin 1.00°/100' Drop
2466.09' MD, 2454.69' TVD
7.00° Inc, 96.36° Azm
73.60' S, 187.55' E
Begin Vertical Hold
3166.09' MD, 3152.95' TVD
0.00° Inc, 0.00° Azm
78.35' S, 230.00' E
Begin 12.00°/100' Build
7798.50' MD, 7785.37' TVD
0.00° Inc, 323.86° Azm
78.35' S, 230.00' E
Upper Barnett
Begin 90.25° Lateral
8550.51' MD, 8262.78' TVD
90.25° Inc, 323.86° Azm
308.89' N, 52.78' W
PBHL
11994.16' MD, 8247.75' TVD
90.25° Inc, 323.86° Azm
3089.93' N, 2083.63' W
Target = 8264' KBTVD @ 0.25° Updip
True Vertical Depth (ft)
Vertical Section (ft) @ 323.86° Azm (Lat)
West - East (ft)
South - North (ft)
Subject: Actual Surveys
File Name: A08379.dwg

DFW Airport Drilling Statistics

	Average	Record
Drilling Days	21	14
True Vertical	8,500 ft	9,563 ft
Total	12,514 ft	16,547 ft
Horizontal	3,774 ft	7,359 ft
Vertical Lateral Length	4,251 ft	9,356 ft
Build Section		

Drilling Rig Electricity Project

- Why? – To reduce drilling rig emissions at DFW Airport – FAA Rules
- Production facilities sharing electrical installations
- 25,000 Volts on electricity grid at DFW Airport
- Compliance with IEEE-519 Standard for voltage harmonics
- Installation of harmonic filters (capacitors)
- Achieved all 5 drilling rigs running on electricity

DFW Airport Rig Fleet

Nomac Drilling
National 610 Drilling Rigs
Derrick Height: 170'
Horsepower: 750 HP
Fuel Usage: 1600 GPD
Electric Power: 1500 kilowatts
Voltage: 600 Volts

Mountain Drilling
Drillmec HH-220 Drilling Rigs
Derrick Height: 100'
Horsepower: 1500 HP
Fuel Usage: 2200 GPD
Electric Power: 2200 kilowatts
Voltage: 600 Volts

Benefits of Electricity for Drilling Rigs

- Eliminates Drilling Rig Emissions

  NOX (Nitrogen Oxides)

  VOC (Volatile Organic Compounds)

- Eliminates Drilling Rig Engine Noise

- Economic Benefits

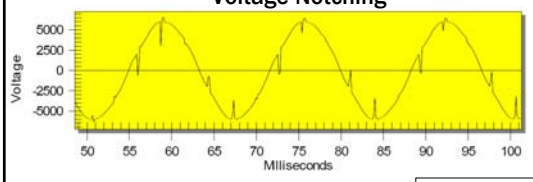
  Saves +/- $60,000 per well with $4.00 diesel prices

Disadvantages of Electricity for Drilling Rigs

- Electric power may not be available at all locations
- Logistics are difficult
- Relies on utility companies
- Requires equipment investment
- Can be interruptions in electric power

Voltage Distortion

Voltage Notching

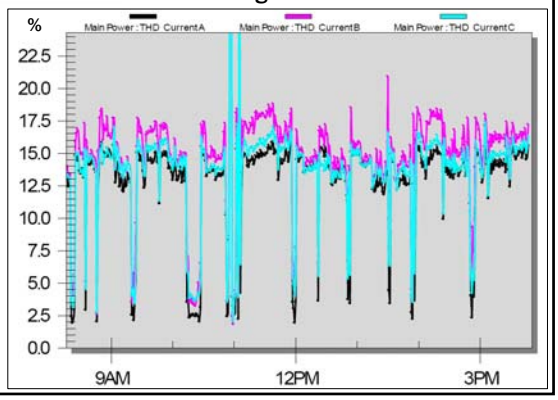


rpm

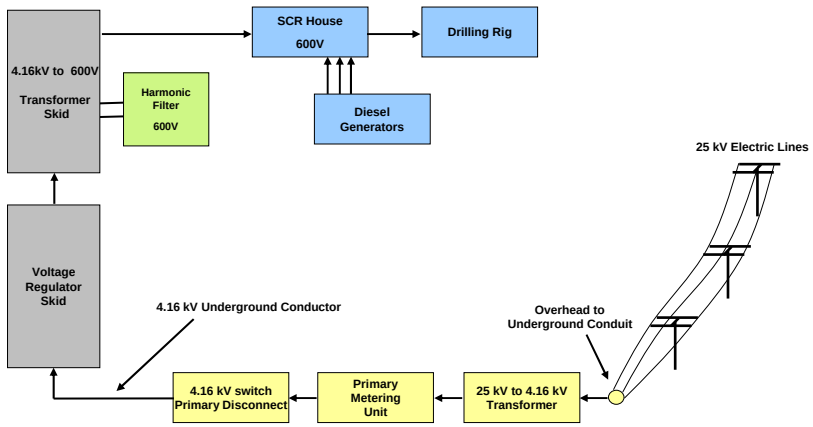
Rapid Power Management
Dallas, Texas

- Regulated by IEEE-519 Standard
- Voltage distortion can disrupt and cause damage to electronics (computers and radar)
- Harmonic filters (capacitors) reduce voltage distortion

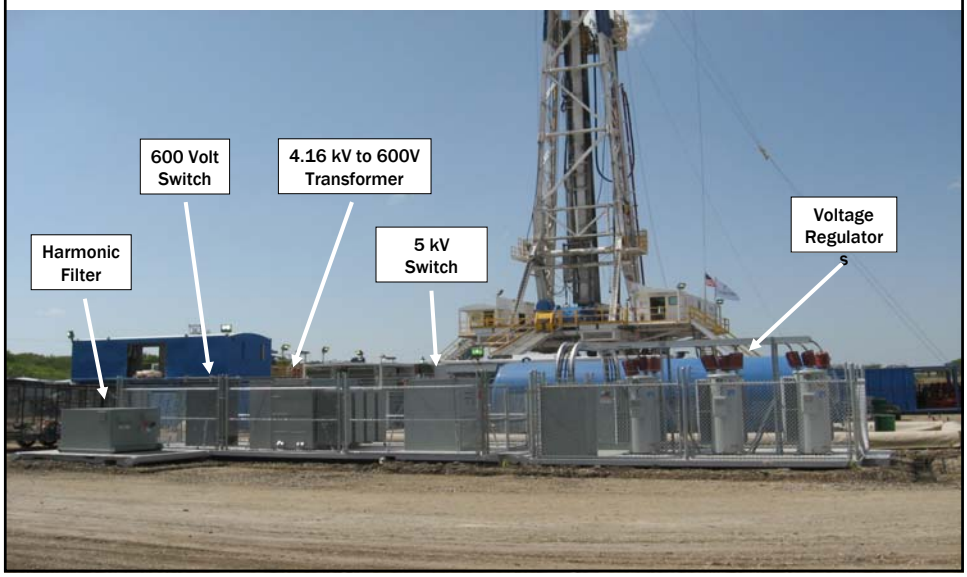
Voltage Harmonics



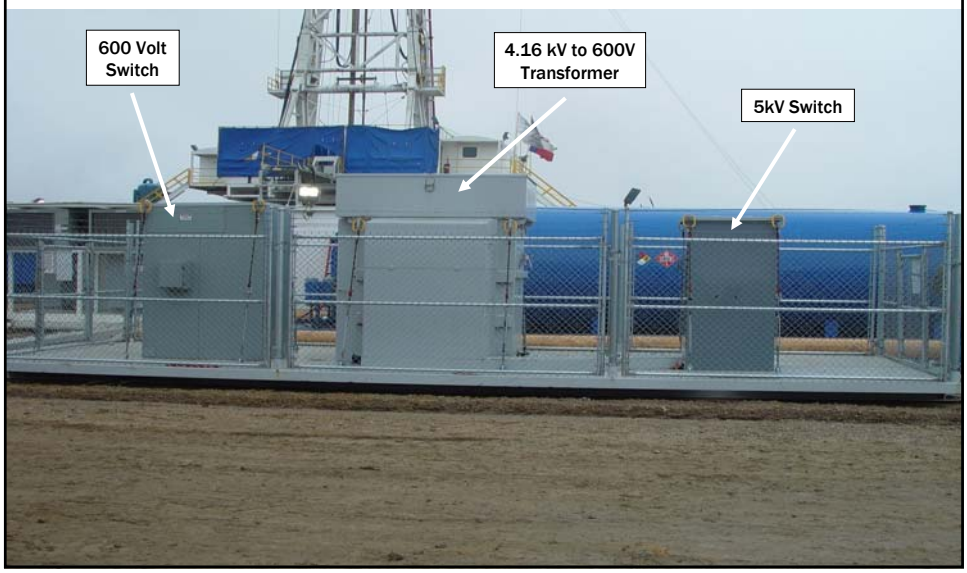
DFW Airport Typical Site Layout



Drilling Rig Electrical Equipment

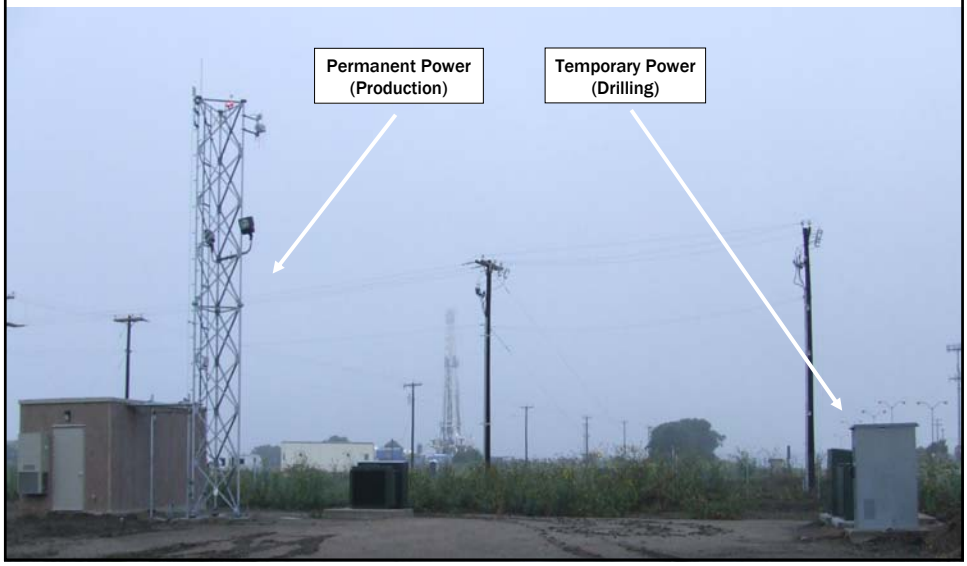


Transformer Skid



Voltage Regulator Skid

Utility Equipment



Utility Equipment

Electrical Equipment Costs

Initial Drilling Rig Equipment Purchases

Transformer Skid	$180,000
Voltage Regulator Skid	$110,000
Harmonic Filter Skid	$100,000
Electrical Wiring	$ 20,000
Primary Disconnect	$ 10,000
Total	$420,000 per rig

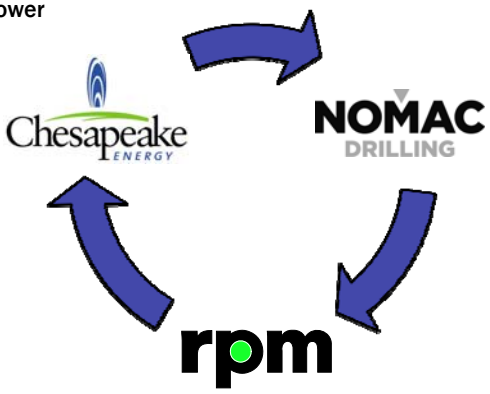
Economic Evaluation

Fuel Savings		
Diesel Cost (1,600 gallons per day $4.00 per gallon)		$6,400 per day
Electricity Cost	-	$2,700 per day
Daily Fuel Savings		$3,700 per day
25 Day Well Fuel Savings		$92,500 per well
Total Electrical Installation – Pad Site	-	$25,000 per well (assuming 3 wells per pad)
Savings on a 25 day well:		$67,500 per well @ $4.00 per gallon
		$35,000 per well @ $3.00 per gallon

Break-Even Economic Diesel Price: $1.65 per gallon

Electricity Continuous Improvement

- Reduce interaction with utility company
- Change from secondary to primary power
- Make incoming voltage more flexible
- Reduce equipment



Improved Design

- Replaces 6 pieces of equipment with one skid
- Capable of connecting to any utility voltage
- Capable of connecting to majority of diesel-electric drilling rigs

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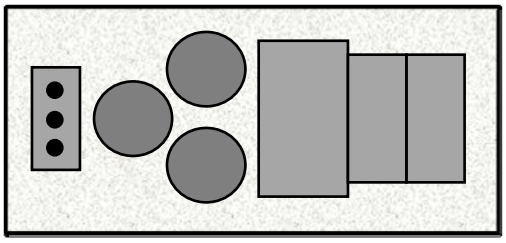
Transformer, Voltage Regulator, Capacitor Skid



Conclusions

- Environmental benefits (emissions and noise)
- Economic benefits
- Logistics are difficult
- Electricity fulfilled drilling requirements at DFW Airport


Could this be the future?