OPERATING A RIG ON ELECTRIC POWER IN ELK CITY, OK

ABE DABBS

AADE, OKC

11 FEB 2015

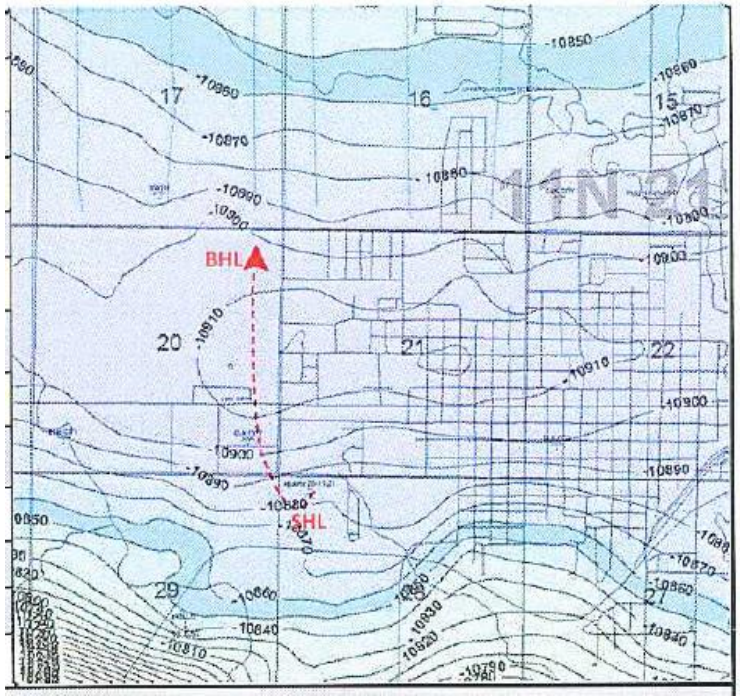
RIG OPERATION ON UTILITY POWER

Operation Video

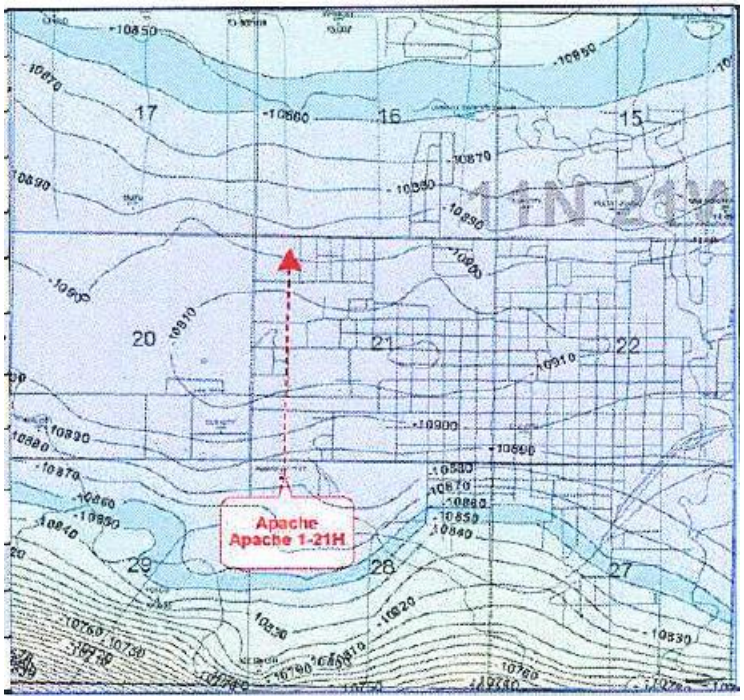
2518 MWH hours, 155 Days, 272k gallons of diesel avoided, $650k saved

WELLS: APACHE 20-11-21 AND 21-11-21

Apache 20-11-21
- Marmaton Wash
- 12960 TVD
- 4880 Lateral
- 18500 TD

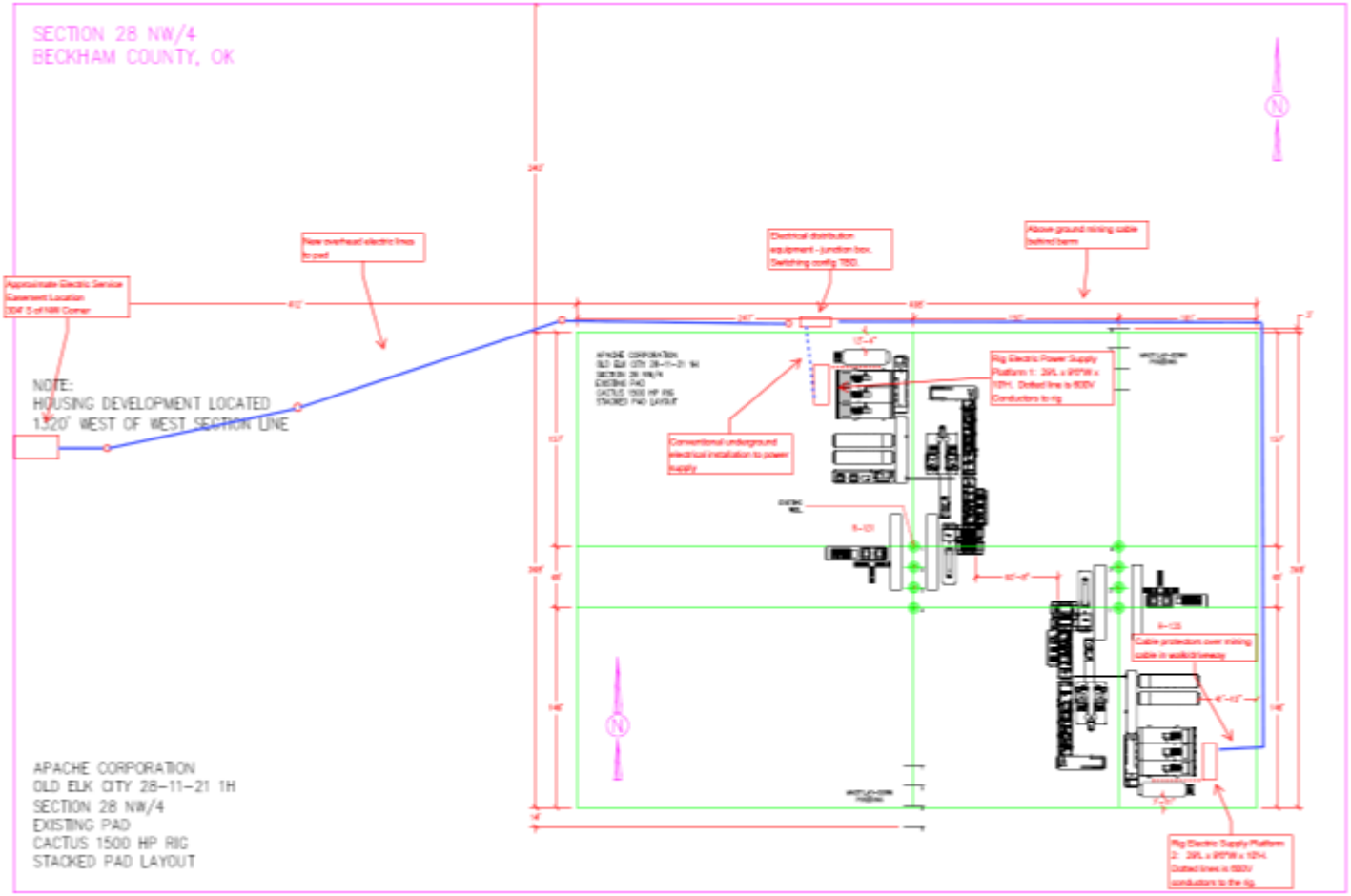


Apache 21-11-21
- Marmaton Wash
- 13010 TVD
- 4880 Lateral
- 17720 TD



BACKGROUND

Original Pad design

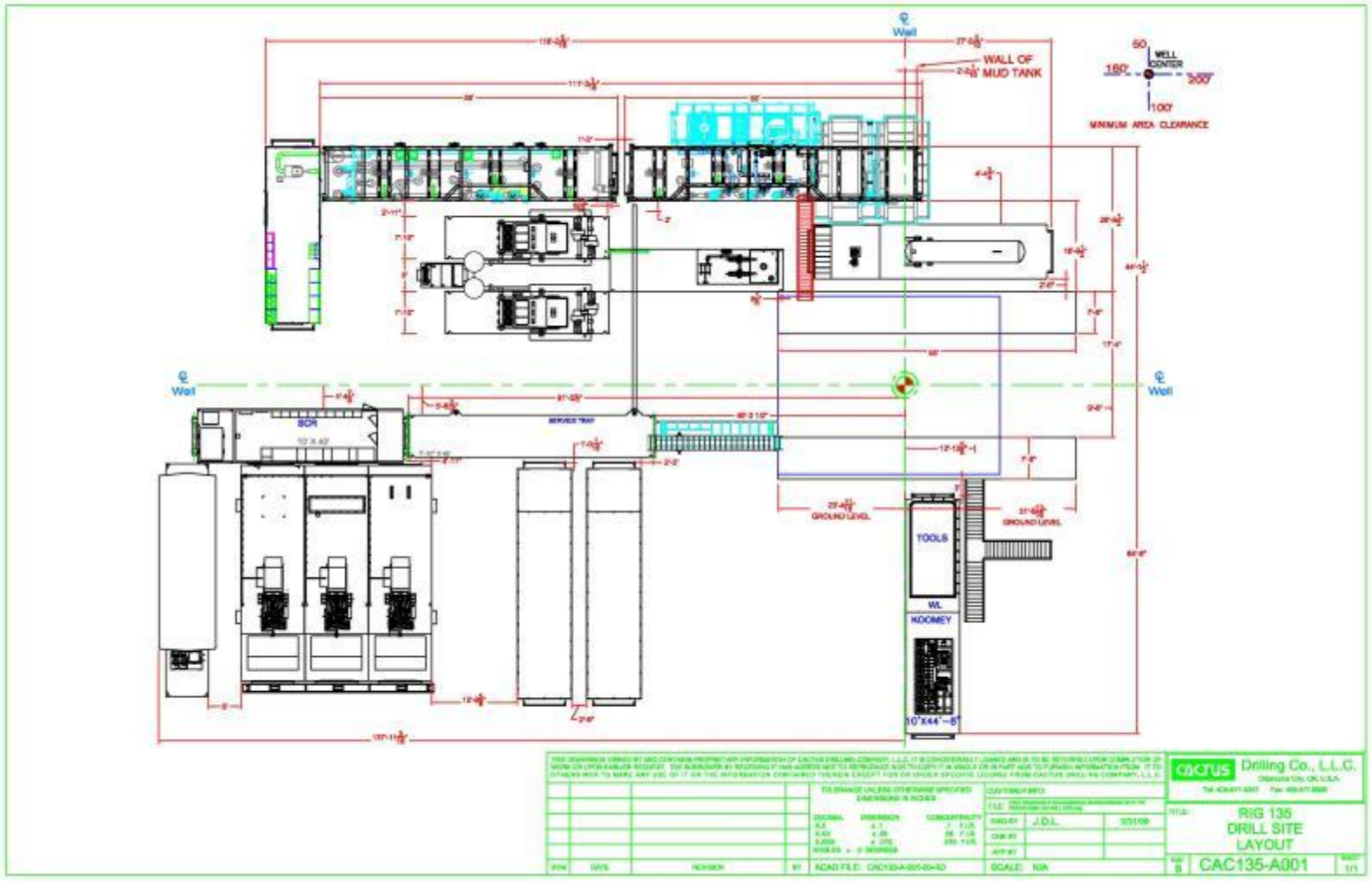


2 Drilling Rigs to be operated simultaneously on PSO utility power.

Cactus 135 batched drilled 2 wells on the Elk City pad site from March 10th to August 11th 2014

CACTUS 135

Rig Layout



ELECTRIC INFRASTRUCTURE

- Transfer Switch between grid power and diesel engine power
- Power Supply/Harmonic Filter/metering equipment

- Elk City easement, new build Apache poles
- Dedicated high line circuit for rig power

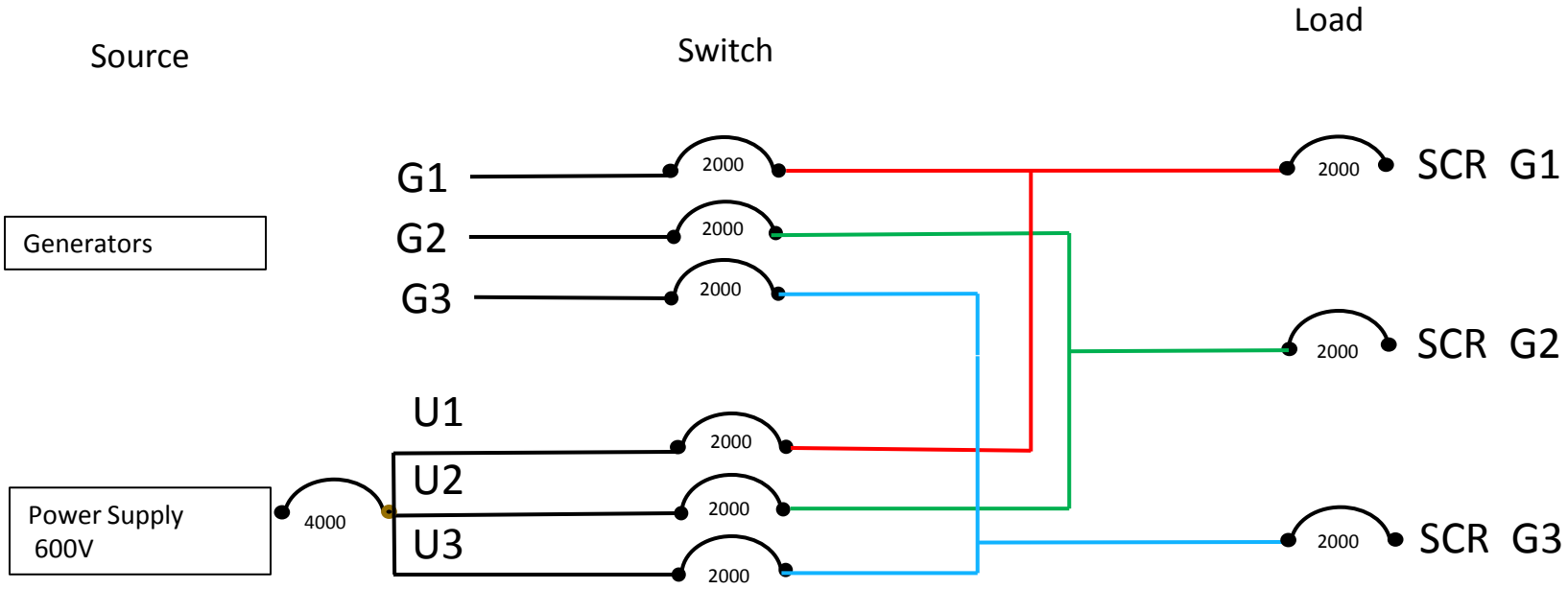
PROTECTIVE EQUIPMENT

ONSITE VOLTAGES

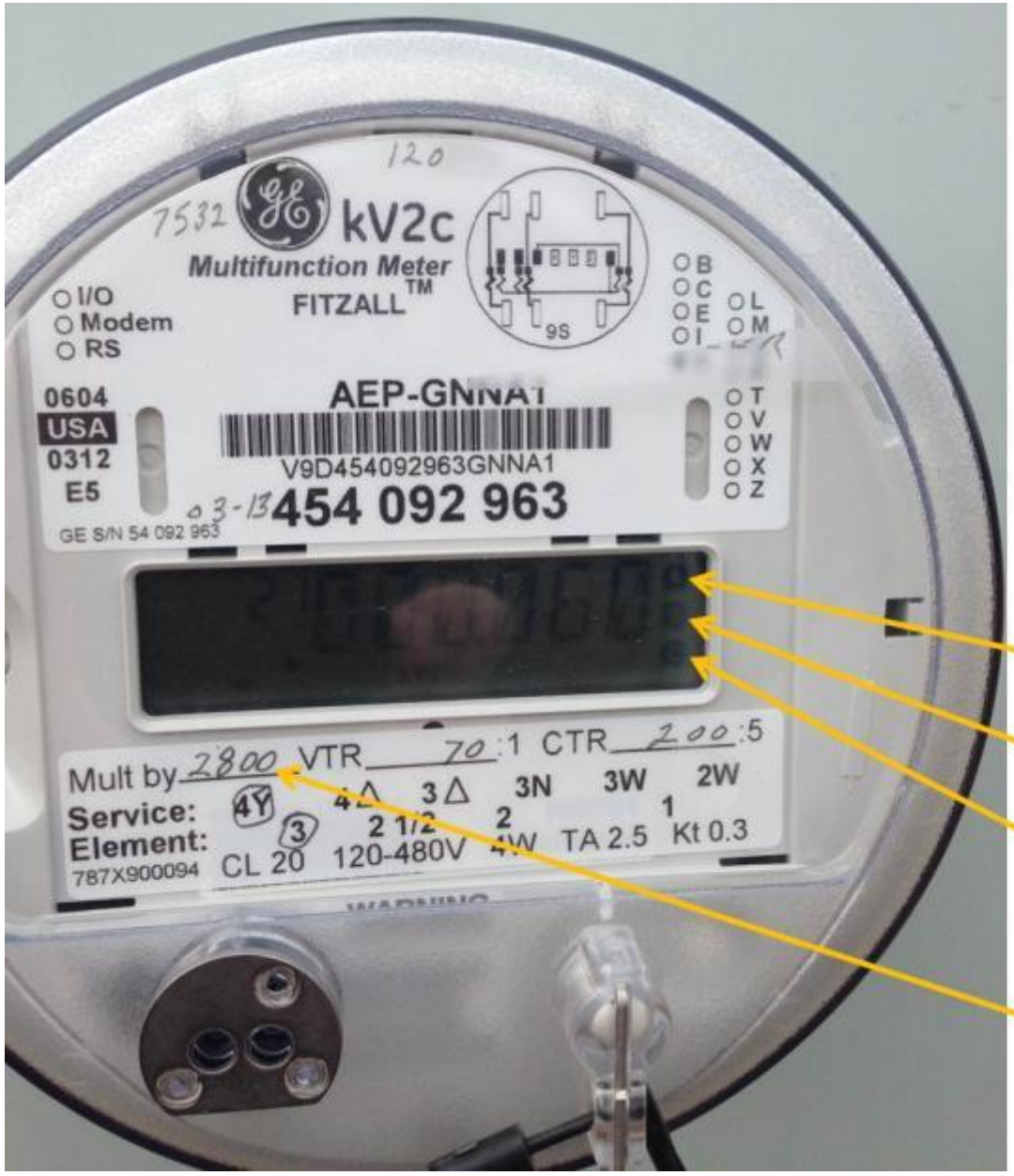
13800V

600V

TRANSFER SWITCH ONE-LINE



METERING AND FUEL TRACKING

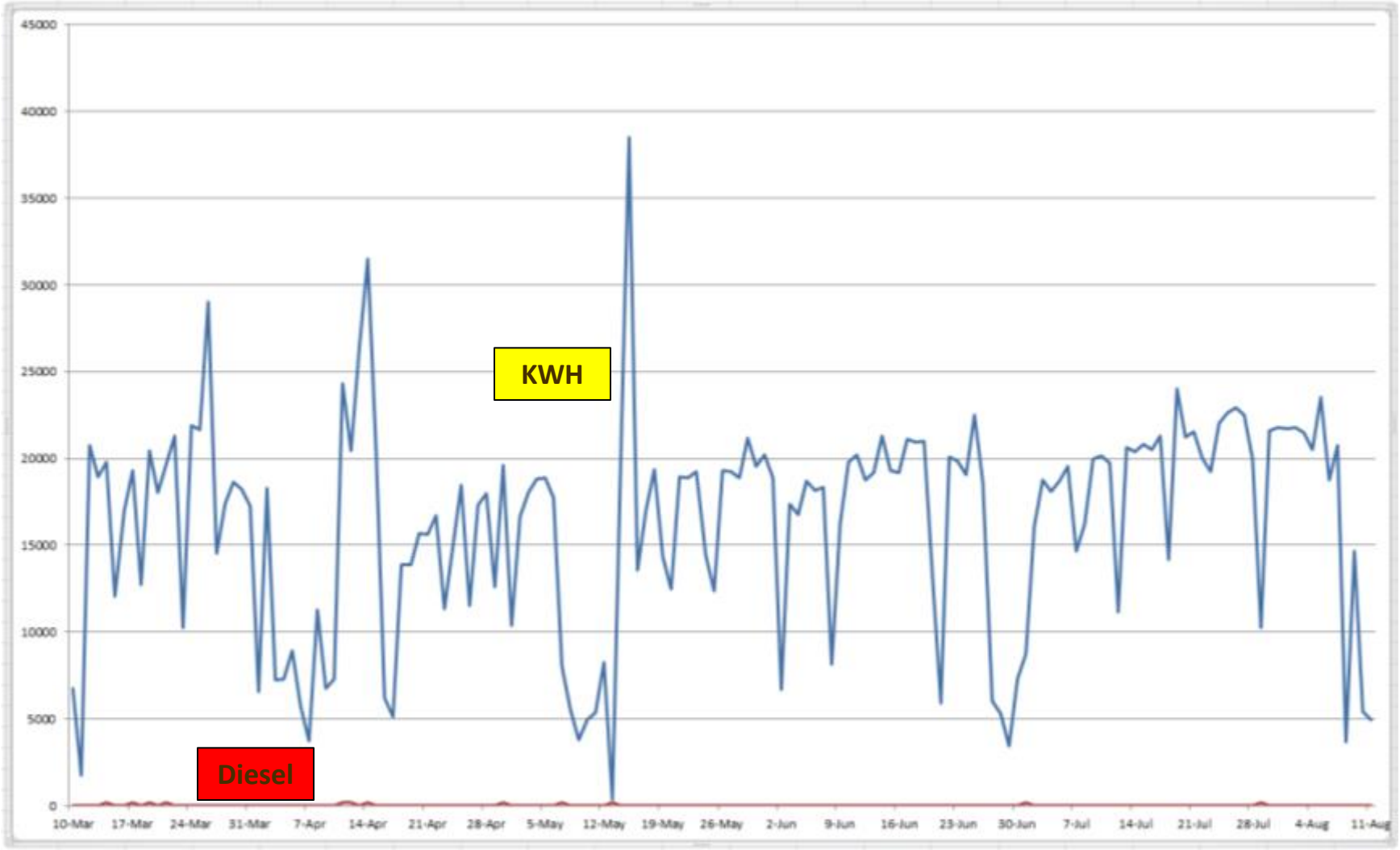


kW vs. kWh

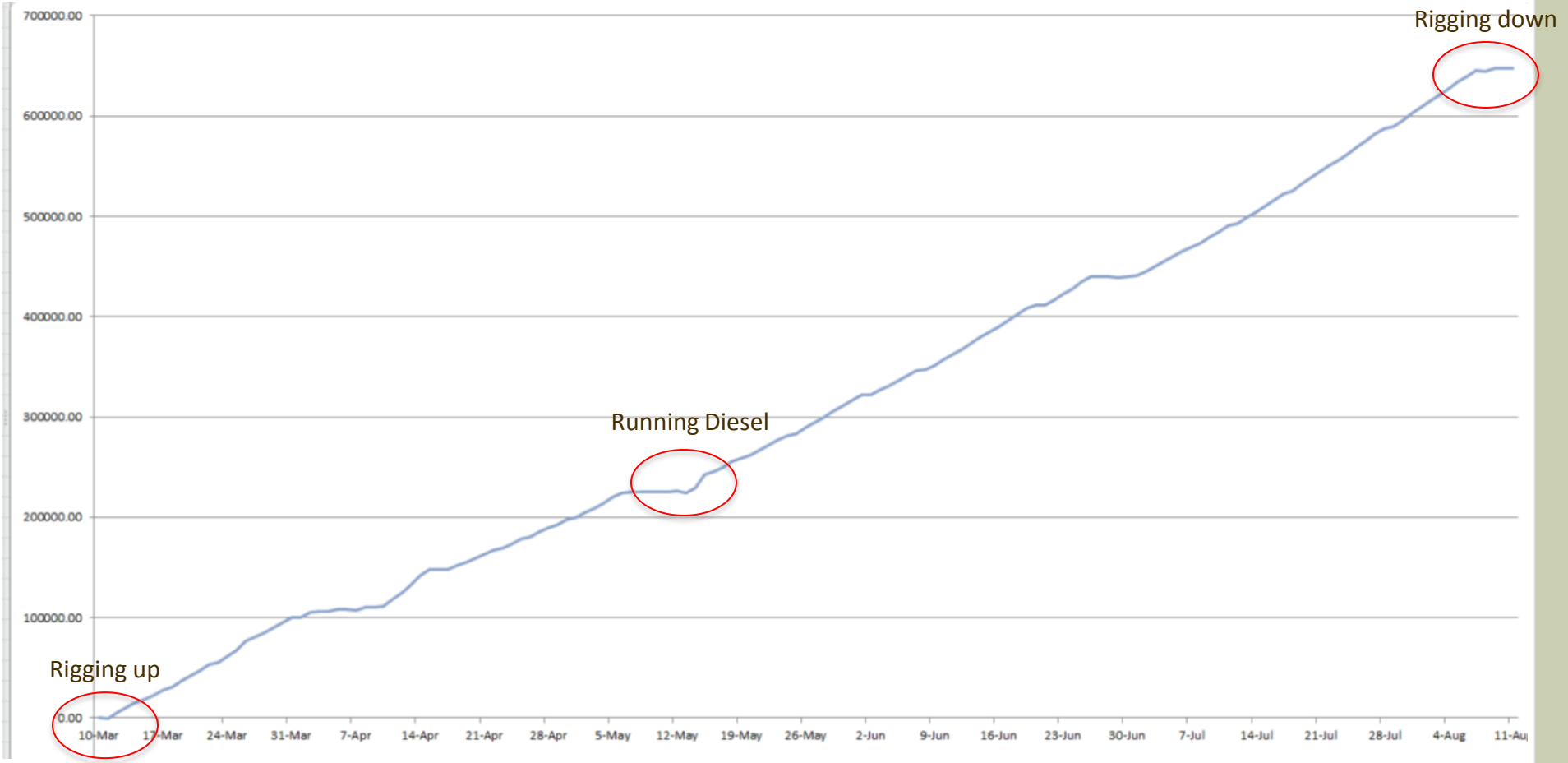
kW is *power*, the rate at which energy is generated or used (MPH, joules/second, etc.)

kWh is *energy*, fuel contained or consumed (Calorie, BTU, gallon of diesel, etc.)

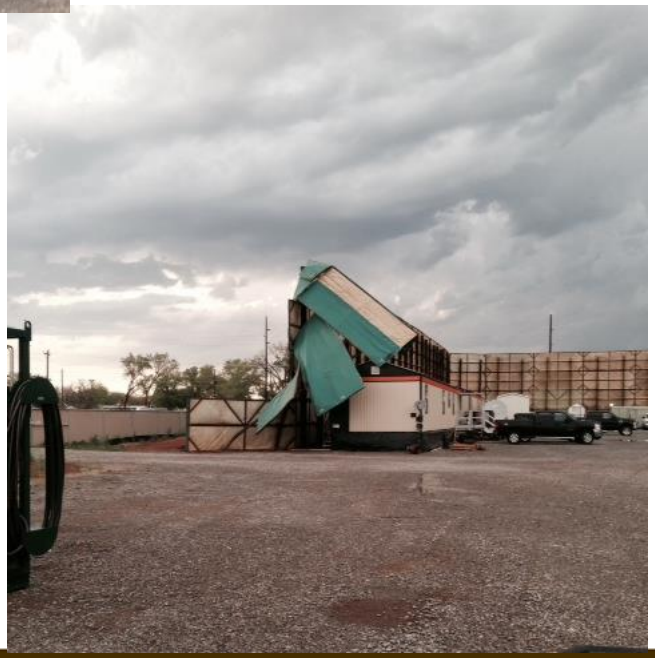
POWER USAGE


45000
40000
35000
50000
25000
20000
15000
10000
5000
0
KWH
Diesel
10-Mar
17-Mar
24-Mar
31-Mar
7-Apr
14-Apr
21-Apr
28-Apr
5-May
12-May
19-May
26-May
2-Jun
9-Jun
16-Jun
23-Jun
30-Jun
7-Jul
14-Jul
21-Jul
28-Jul
4-Aug
11-Aug

COSTS SAVED VS. DIESEL



STORMS



PSO ENERGY MIX

Read Date	Days	Metered KW	Billed KW	Metered KWH	Billed KWH	Load Factor	Bill Amount	¢ / kWh
8/15/2014	15	1,219.96	978.3	190,400	190,400	43.3	$13,402.52	7.04
7/31/2014	31	1,066.8	1,066.8	576,800	576,800	72.6	$36,672.38	6.36
6/30/2014	30	995.4	961.2	473,200	473,200	66	$31,162.99	6.59
5/31/2014	22	2,031.12	1,523.3	344,400	344,400	32.1	$25,568.83	7.42
5/9/2014	09	1,741.6	1,306.2	112,000	112,000	29.7	$8,409.46	7.51
4/30/2014	30	1,741.6	1,306.2	375,200	375,200	29.9	$26,595.89	7.09
3/31/2014	27	1,164.8	873.6	389,200	389,200	51.5	$23,040.72	5.92

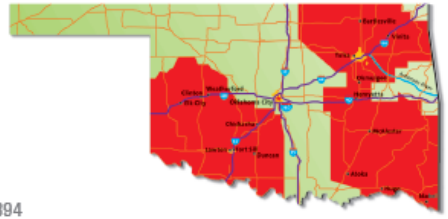
PSO FACT SHEET - 2014

(Data for Public Service Company of Oklahoma as of December 31, 2013)

Operating Information

Total customers: 538,000

- Residential: 462,000
- Commercial: 62,000
- Industrial: 6,500
- Other: 7,500



2013 electric sales in megawatt-hours:	19,239,394
Average use per residential customer:	13,602 kilowatt-hours per year
Average cost per kilowatt-hour (residential):	8.4 cents
System peak:	4,419 megawatts (August 2012)
Size of service area:	30,000 square miles
Cities and towns served:	232
Population of service area:	1.9 million
Plant in service:	$3.2 billion
Size of distribution system:	22,163 miles
Size of transmission system:	3,618 miles
Total number of Oklahoma employees:	1,606

PSOklahoma.com

2013 Financial Information

Operating Revenues:	$1,295.2 million
Net Income for Common:	$ 97.8 million
State and Local Taxes paid:	$ 46.5 million
Franchise fees paid:	$ 17.5 million

PSO Generating Stations

Name	Location	# units operating	Total megawatt (MW) capability	Fuel
Tulsa Power Station	Tulsa	2	309	Natural gas
Northeastern Station Units 1&2	Oologah	2	864	Natural gas
Northeastern Station Units 3&4	Oologah	2	941	Coal
Riverside	Jenks	4	1,048	Natural gas
Comanche	Lawton	1	241	Natural gas
Weleetka	Weleetka	3	156	Natural gas
Southwestern Station	Anadarko	5	613	Natural gas
Oklaunion (PSO's share)	Vernon, TX	1	102	Coal
Total generating capability			4,274 MW	

PSO Energy Mix

Natural Gas	25%
Coal	40%
Wind	15%*
Purchased Power	20%
Total	**100%**

*Wind generation under long-term contract: 690 MW

AEP PUBLIC SERVICE COMPANY OF OKLAHOMA

A unit of American Electric Power

PSO General Office

212 E. Sixth St., Tulsa, OK 74119 | Customer Service 1-888-216-3523

GREENHOUSE GAS (GHG) EMMISSIONS

$$GHG_{Project\ genset} = \int Avoided\ Fuel\ Rate(L/s)dt \times 1\,m^3/1000\,L \times 2.808\,tCO_2e/m^3$$

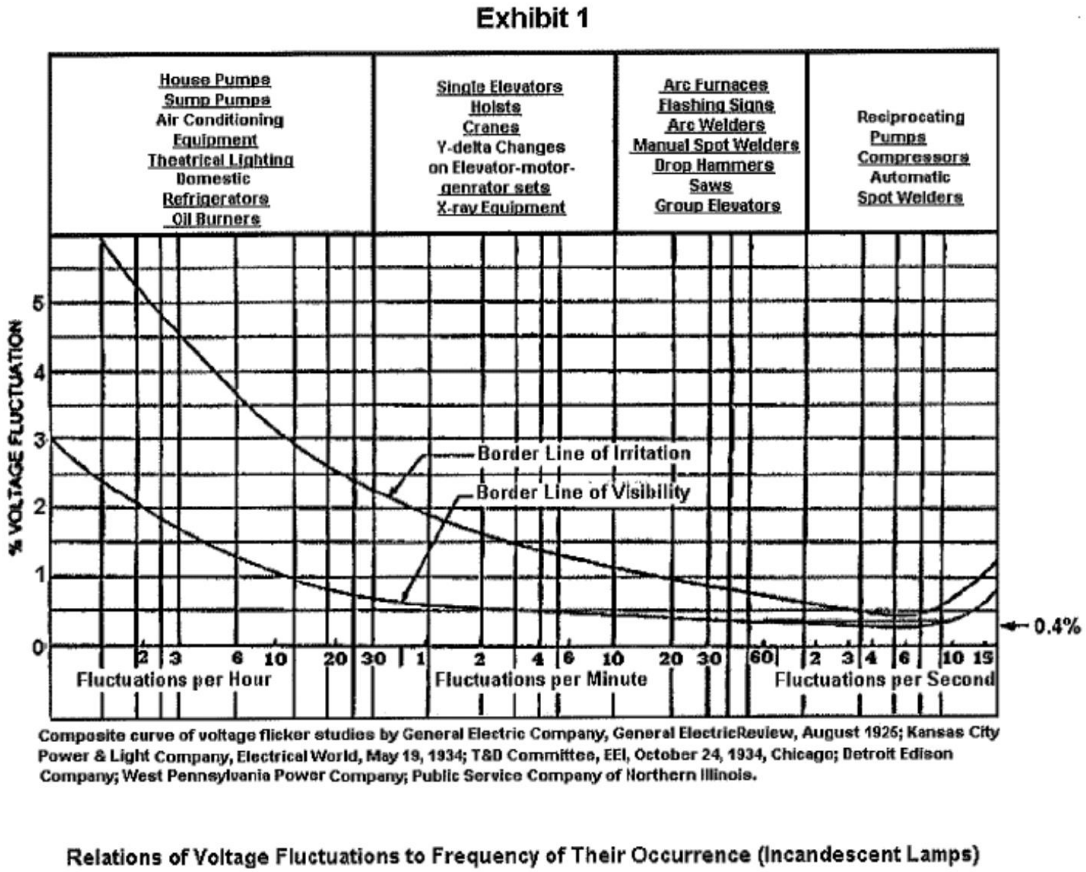
$$GHG_{Project\ High-line} = \int HighLinePower(kW)dt(hours) \times 1MWh/1000kWh \times 0.88tCO_2e/MWh$$

		(t CO_{2e} / 6 sec)
Baseline	B 6 Electricity Supplied by Diesel-Fuelled Generator	0.00178
	Σ Emissions Baseline	0.00178
Project	P 6 Electricity from Grid	0.00158
	Σ Emissions Project	0.00158
Net GHG Reduction = Baseline – Project		*0.00020*

Assuming 155 days of drilling operations at 95% utility uptime, the rig reduced GHG emissions by 424 tonnes CO_2.

Apache

VOLTAGE FLICKER AND HARMONIC DISTORTION



Relations of Voltage Fluctuations to Frequency of Their Occurrence (Incandescent Lamps)

Must remain below the Border Line of Visibility (Exhibit 1), can be permitted to above the Border Line of Visibility unless complaints from other customers are received as long as it does not exceed Border Line of Irritation.

Corrective action must be taken within two (2) hours after notice.

DEMAND RESPONSE PROGRAMS

- Peak demand reduction through curtail of electric load
- Provides benefits to electric customers who can reduce electric rate (power) during demand reduction events

PSO Peak Performers Program

- 2hr – 4hr events
- $32/kW reduction

	ESTIMATE OF SAVING NOT ACTUAL ECONOMICS BASED ON 2014 NUMBERS					
			Average Level of Load Reduction			
			100%	50%	25%	10%
	Annual kWh	Highest Peak Demand	Potential Incentive Levels			
	4,886,400	15[illegible]	$48,736	$24,368	$12,184	$4,874
	kWh	Kw				
Aug-14	190,400	978	[illegible]296	15648		
Jul-14	576,800	1,066	43112	[illegible]056		
Jun-14	473,200	1,066	43112	17056		
May-14	344,400	961	30752	153[illegible]6		
Apr-14	112,000	1,523	48736	2[illegible]68		
Mar-14	375,200	1,306	41792	20896		
Feb-14	389,200	873	27936	13968		
Total kWh	2,461,200					
Projection for annual kWh Total	4,219,200					
Average kW/month		1,110	35520	17760	8880	3552

EXAMPLE

Apache

PRODUCTION

QUESTIONS?

Apache

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