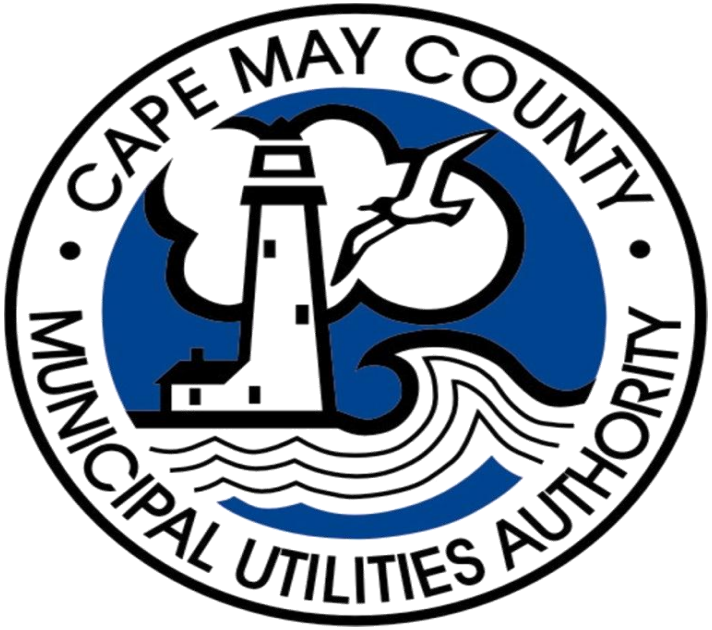


Do It Yourself (DIY) Electrical Generation

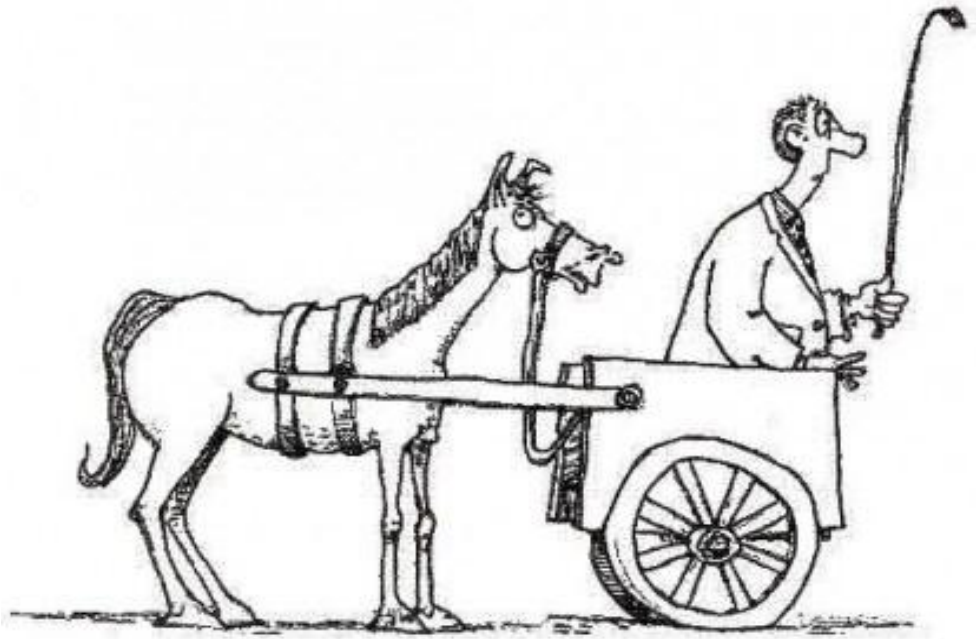
By John R. Baron

Project Initiation – “Twinkle In My Eye”
October 2008

- Twinkle – October 2008
- “Threw the Switch” – October 2013
- So What Happened In Between?

Analysis of Versus:

- What CFM of Landfill Gas can we account for or "Steal" from other projects?
- With this amount of gas, how much generation can be engineered?
- What engines can produce this and meet current emission standards?
- How many Kwh can the local Interconnection Infrastructure accept before expensive upgrades?
- Considering all this, can we maximize generation while staying below new emission threshold criteria?



Problem:

Governmental agencies must procure goods and services through a public bidding process and award to the lowest bidder. Cannot procure engines without appropriate permits and unable to receive permits without knowing what type of engine.

- Application #1 – Pennsylvania, New Jersey, Maryland (PJM) Power Pool
- Submitted March 20, 2009 using lowest Kwh values for range of engines.
- Signed Agreement finalized August 30, 2010.

- NJDEP Permit Application upon receiving verbal consensus from PJM, submitted Air Permit Application 10/7/09.
- Preconstruction Permit received 8/16/11.
- Final Permit received 10/9/12.
- What took so long?

EPA and "LAER"

- Half Moon Bay Project in California obstacle
- EPA considered it "Achieved in Practice"
- Emission limits by State dropped below Federal NSPS levels

To meet new emission limits manufacturers either de-rated engine, could not meet “or guarantee” limits, added levels of scrubbing or catalysts.

New limits accepted
@
0.6 g/bhp for No_x
3.5 g/bhp for CO

GE Jenbacher Model JMS-320 LFG Fueled

Finally armed with the knowledge of actual emission rates, bid was finally awarded October 2011 for $2,342,887.00.

Design could finally proceed for all aspects of this project to fit the engine award.

With the CMCMUA acting as GC the following contracts were awarded:

Sulfur Scrubbers: completed 10/11/11		$ 285,625
Siloxane Scrubbers: completed 10/1/13		$ 547,635
Design/Build New Generator Building: completed 3/26/13		$ 329,865
Design/Build New Exhaust Tower: completed 2/15/13		$ 77,440
Power line Construction: completed 12/3/12		$ 93,000
	TOTAL	$1,333,565
	ENGINES	$2,342,887
		$3,676,452

H_2S Scrubbing Tanks

Other Costs:

ACE Interconnection	$ 287,000
PJM Queue and Application	$ 12,682
"Black Box" – Communications to PJM	$ 17,500
Air Permit Consultants	$ 30,000
Electrical Consultants	$ 25,000
Other Costs Total	$ 372,182
Construction Contracts	$3,676,452
Total Contracts	$4,048,634

Incidentals

- Main gas line with Condensate Return Manholes (2900 Lft.)
- Mechanical – All piping for all equipment (mostly stainless steel)
- Electrical – conduit, wires, wiring, computers, data loggers, concrete, gravel, stone, earthwork

  ≈ $ 1,500,000
- Total Construction Costs: $5,500,000

Annual Operating Costs

Maintenance and Repair	$228,629.00
Emissions Testing	$ 30,000.00
Media Change Out	$ 60,000.00
Labor	$181,276.00
	$499,905.00

Annual Income 2014

Generation	$ 889,934.87
NJBPU Grant (0.1/kwh)	$ 164,514.00
REC (Currently $14.65/REC)	$ 240,368.60
Capacitance (1/2 year)	$ 19,495.40
	$1,314,312.87
Electricity Produced	16,471.472 Megawatts
Just Generation	.055/kwh
All Revenue Sources	.080/kwh

Payback

Annual Revenue	$1,314,313
Annual Cost	$ 499,905
Annual Profitability	$ 814,408
Total Construction Costs	$5,500,000 ÷ $814,408
Payback	6.75 Years

SOLID WASTE PROGRAM SUPPORT

TOTAL REVENUE BUDGET 2014	$ 14,577,603
BENEFICAL GAS REVENUE	$ 1,314,313
PERCENT OF ALL REVENUE	9%

WHAT'S DIFFERENT ABOUT OUR PROJECT?

- 3 ENGINES INSTALLED WHILE ONLY OPERATING 2
- LARGER, LOADER ACCESSIBLE BUILDING
- DESIGNED, CONSTRUCTED, OWNED AND OPERATED IN-HOUSE

3 JENBACHERS IN PLACE

- 1 ENGINE AS BACKUP
- UTILYZE 720 TO 800 CFM LANDFILL GAS
- CAPABLE OF GENERATING 1,059 kwh EACH

OVERSIZE BUILDING

- ACCESSIBILITY FOR REPAIR
- HEAVY EQUIPMENT CAN ACCESS ALL AREAS
- PRE-ENGINEERED BUILDING SHELL- $330,000.00


VOLVO

DOWNTIME REPORT FOR ENGINES

JANUARY 1, 2014 THROUGH JANUARY 1, 2015
POTENTIAL HOURS 17,520
ACTUAL OPERATING HOURS 16,866

DOWNTIME – 3.7%

***INCREASE REVENUES – DECREASE PENALTIES**
TOTAL GENERATION

Revisiting the Queue

The original PJM Agreement was for:

- 1.7 Megawatts Capacity
- 1.8 Megawatts Generation

- Jenbacher's capable of producing 1,059 Kwh each

Queue

Application Submitted 4/4/14

Approved Received 11/25/14

Raised both limits to 2.0 Megawatts

One picture is worth 1,000 words…


Engines being set before Exterior Building

Building foundations are formed and poured
<u>Note:</u> Engines are protected

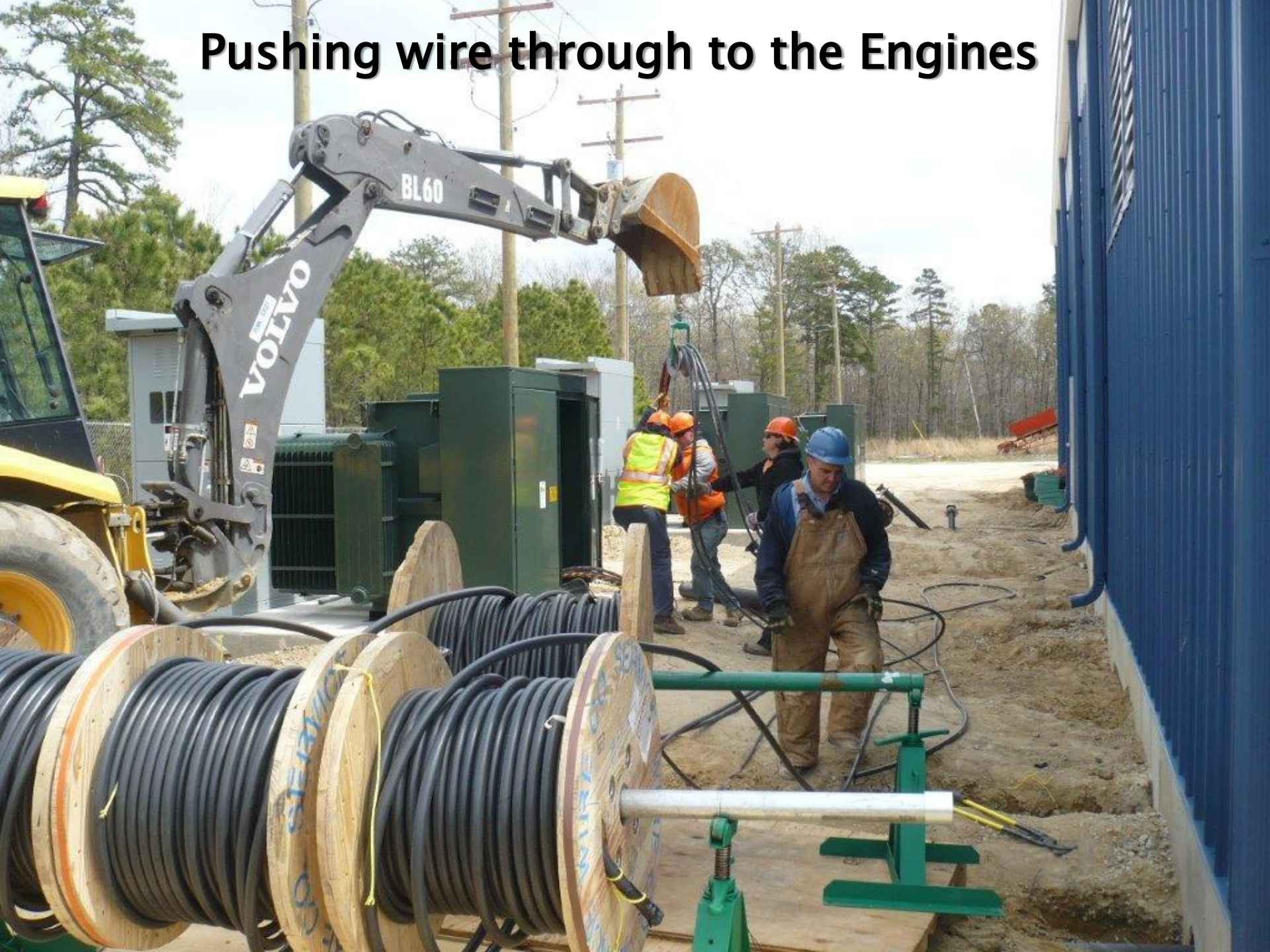
Structural Steel being placed for building

Installation of conduit lines


GROVE
Setting the Engine
Control Rooms
05.01.2013

Welding and setting of exhaust pipe supports

Pushing wire through to the Engines



Coolant lines to the radiators

THE END

Questions?

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