

# BREA POWER PROJECT



**Gas Processing Experiences**



## Executive Summary

- The Olinda-Alpha Landfill Gas to Electricity Generation Project (“Project”):
  - State-of-the-art combined cycle generating facility that became operational in late 2012.
    - 4 Solar Gas Turbines, 1 Steam Turbine (4 x 1 configuration)
    - 3 Cooper Recip Engines, 1980’s vintage machines with upgraded combustion
  - Project has been under development since 2006
  - Achieved Commercial Operation in November, 2012
  - Currently the 3rd largest landfill gas (LFG) fueled power plant in the country.
  - Envisioned to lead this sector of LFG to energy in both high efficiency and low emissions
  - Envisioned to be an example of the goals and purpose of the U.S. EPA’s Landfill Methane Outreach Program.

***"Creativity is thinking up new things. Innovation is doing new things."***

***-- Theodore Levitt***

## **Energy Production**

- At FULL rated capabilities
  - The New Project generates up to 32.5 MW of low cost renewable energy
  - Internal energy consumed to produce output is about 5 MW
  - With the existing facilities at the site can produce 37.5 MW.
  - *Environmental Emissions assured based on SCR technology*
- Roughly ten times the size of the average LFG to electricity project
  - Clearly implies added gas treatment challenges and equipment

## **Gas Treatment**

- Nominal Gas Treatment Description & Process:
  - 3 vessels/treatment train. 2 trains. One in service, one in regeneration at all times
  - Upstream knock outs and particulate filters
  - Downstream Carbon Polishing beds & a particulate filter
  - Treated Gas Conditions:
    - 9,800 – 11,000 SCFM @ 50% CH<sub>4</sub>, 100 psig, 100°F
    - Treatment Rate: >100 SCFM/sq ft of media available

## Performance Expectations and Results

- At the stated design operating conditions the system is expected to achieve :
  - 99.94% or better removal efficiency on a continuous basis
- Through extensive testing, redesign and operations:
  - Media 1 Concept : Three media scheme (Mole Sieve, Activated Alumina & Silica Gel)
  - Media 2 Concept: All media in column as Silica Gel
  - Results of gas cleanup do not meet required specifications
  - Most Recent sample results:

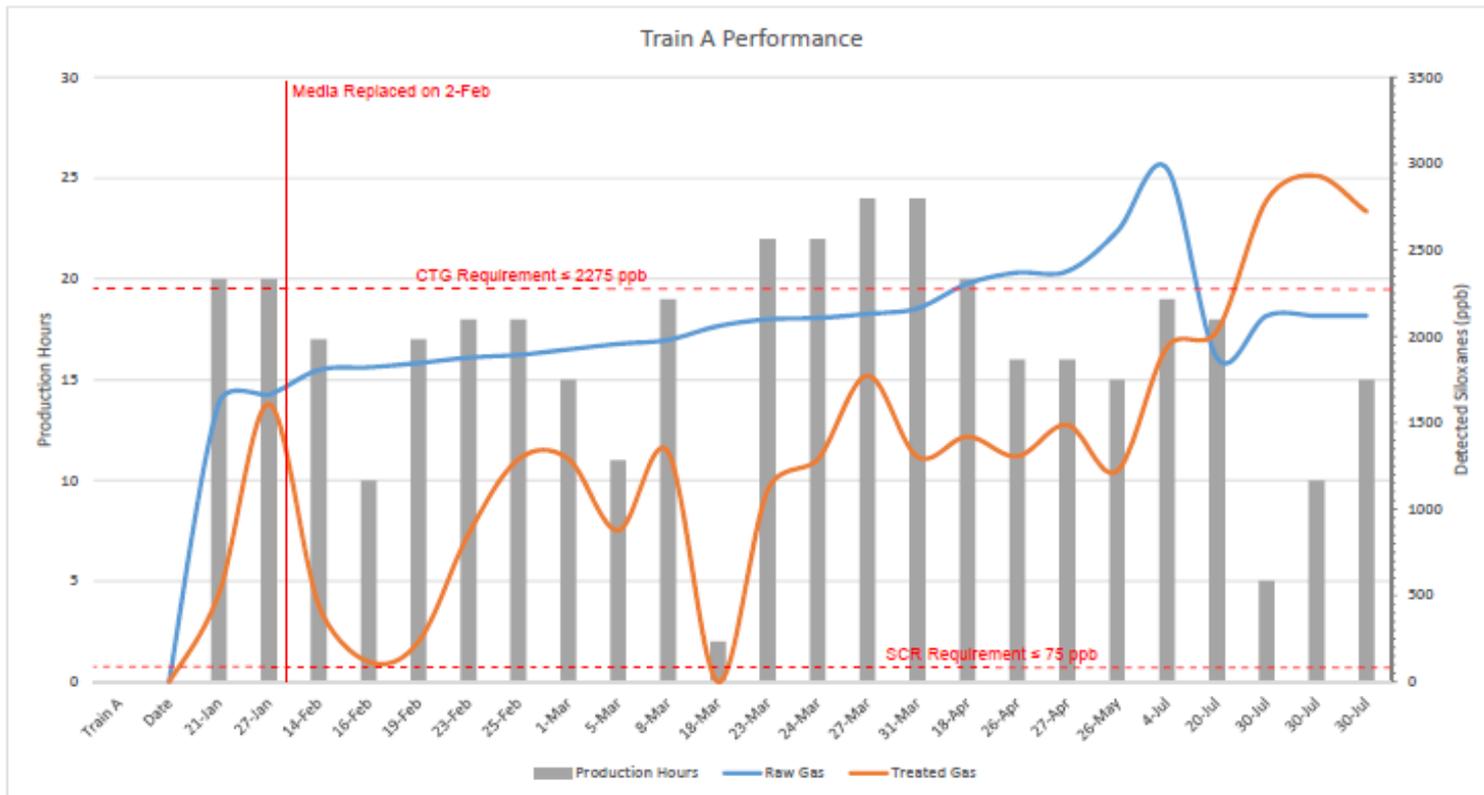
LAB Reference	Sampling Date	Siloxanes mg/m <sup>3</sup>	Silicon Si Equivalent mg/m <sup>3</sup>	Treatment Efficiency % (Siloxanes)	Treatment Efficiency % Silicon	True Silicon Si Equivalent ppm
A1-I20	1012142230	111.85	34.262	89.62	88.68	29.847
A3-E20	1012142230	11.609	3.878	89.62	88.68	3.378
B1-I20	1014140230	112.76	33.526	91.12	90.24	29.206
B3-E20	1014140230	10.011	3.272	91.12	90.24	2.85



Approximately 45 X beyond SCR control spec

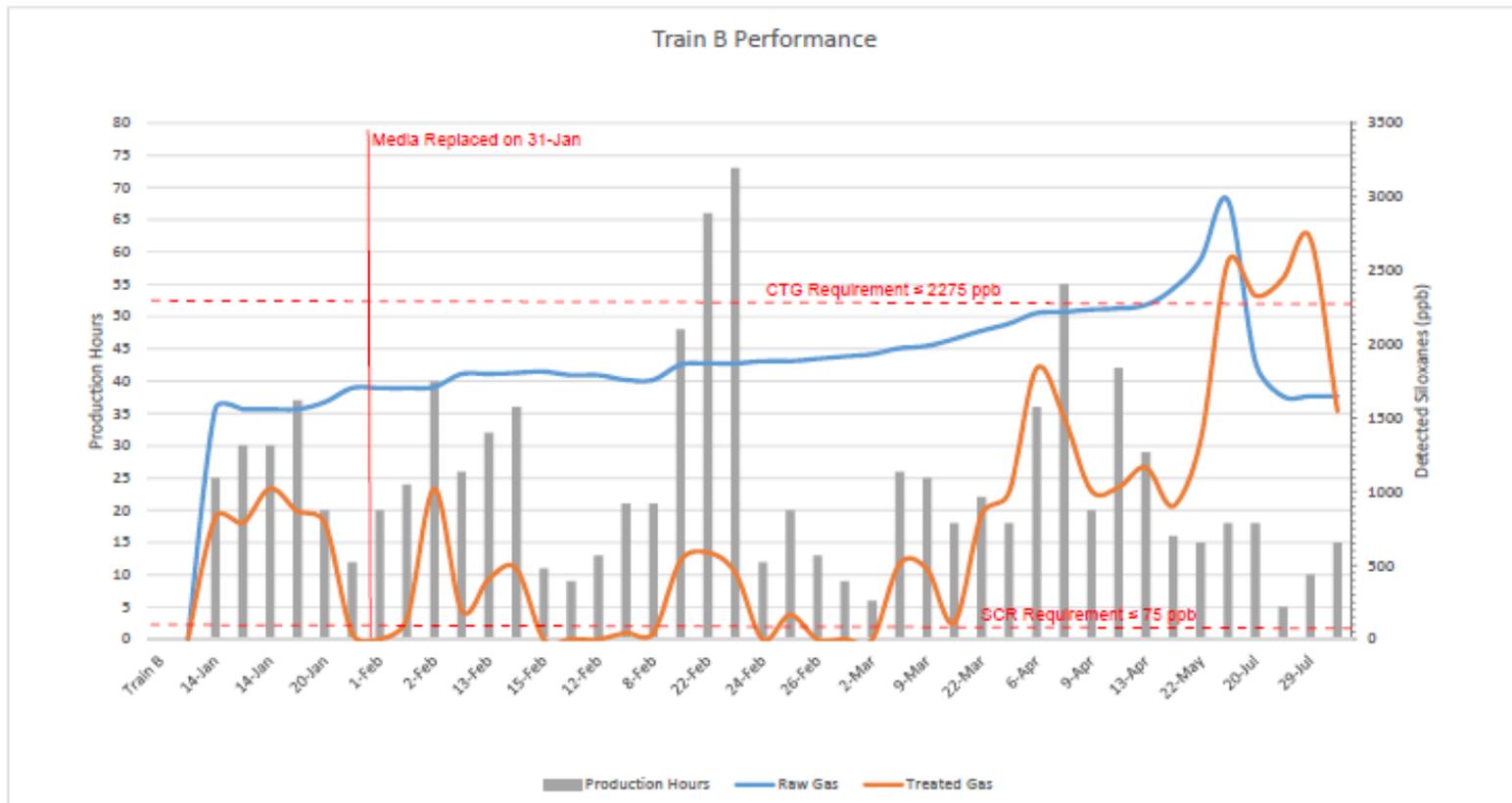
## Performance Expectations and Results

- Historical Trends: Train “A” using 3 Blend media column:
  - Maximum Limits for Turbine and SCR shown by RED dashed line(s)



## Performance Expectations and Results

- Historical Trends: Train “B” using Single media column:
  - Maximum Limits for Turbine and SCR shown by RED dashed line(s)





### **What's Next:**

- Testing all new media and SCR Catalyst since September
- Initial siloxane removal performance approximating previous tests
- Efforts continue, with limited success, to increase regeneration temperatures from 425°F to 475°F

### **Longer Term:**

- Gas clean up technology continues to be more R&D than repeatable operations
- Even under stable & near new media conditions the SCR technical limits are exceeded
- Operating life cycle of the media and catalyst are dramatically less than forecasted primarily due to heavy siloxane loading on the catalyst
- Economic and technical conflicts will require rethinking of the technology or permitting constraints



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