

A Successful South Carolina Landfill Gas Project

Enoree Phase II Landfill
Greenville, SC

Presentation By: William P. Brinker
12th Annual LMOP Conference and Project Expo
Baltimore, MD
January 12-14, 2009

Quick Project Overview:

- **Owner:** Greenville Gas Producers, LLC (GGP) & County of Greenville
- **Location:** Enoree Landfill - 1311 Anderson Ridge Rd – Greer, SC 29651
- **Developer:** William P. Brinker (Jr) & the GGP development Team
- **LMOP Industry Partners Involved:** Greenville Gas Producers, Enerdyne Power Systems, Advance One Development, GC Environmental, Golder Associates, Caterpillar, Caterpillar Financial Services, County of Greenville, & Duke Energy Carolinas.
- **Output:** 3.2 MW
- **Fuel:** Landfill Gas
- **Engines:** Two Caterpillar G3520's

Overview Continued:

- ***Expected Life:*** 15+ years
- ***Operational As Of:*** July of 2008
- ***Power Purchase Agreement:*** Duke Energy Carolinas, LLC – Contract
- ***Renewable Energy Credits (REC):*** Sold to Duke Energy Carolinas, LLC
- ***Carbon Credits:*** Validated, Verified, & Sold Under VCS (Voluntary Carbon Standard)
- ***Section 45 Tax Credit:*** Qualified – 10 yrs

Greenville Gas Producers, LLC & the County of Greenville South Carolina





Enoree Phase II MSW Landfill

- Completely Voluntary GCCS
 - 76 Collection Points
 - 2000 scfm flare
- Greenville County wanted to be a good neighbor!
- 'Beneficial-use' project desired
- GCCS design by Golder Associates
- Built by Advance One Development, LLC & Enerdyne Power Systems, Inc



Major Accomplishments:

- First known US landfill VCS Project
- First successful **non-utility** owned LFG power generation project in SC.
- Very Successful new Siloxane & Gas Treatment System.



Carbon Credits – Getting Started

- Good Thing...
- Helped a small project like this one become a viable option!
- Provides a significant incentive to maximize collection efficiency.
- They Truly Promote a 'Green' Indicative.

Carbon Credits

- First known US landfill gas project to be:
 - Approved,
 - Validated,
 - Certified to earn VER (Verified Emission Reduction) credits, and
 - Traded under VCS (the Voluntary Carbon Standard).
- VCS is one of the most stringent and recognized quality carbon standards in the world.
- This project has already generated and sold 90,000 tonnes of Verified Emission Reductions (VERs).
- Expected to generate over 120,000 tonnes in 2009





Carbon Credits... What's involved?

- Detailed Reporting
 - Daily, Weekly, Monthly Reports
- Continuous recording
- Having the right equipment!
- Redundancy
 - 3 flow meters
- Ex. 4 daily readings
 - Site Operator – GEM 2000
 - Yokogawa Chart Recorder
 - SCADA System
 - Office Dial-in
- Semi-Annual Verifications



Carbon Credit Challenges

- Only CDM methodologies were accepted by VCS when initiating this project
- Few DOE's (Designated Operational Entity) were available
- CDM methodologies are complex & use very conservative calculation values.
- CDM – 'Additionality' – difficult to argue and project specific
- Validation is extremely time consuming

Power Project Barriers:

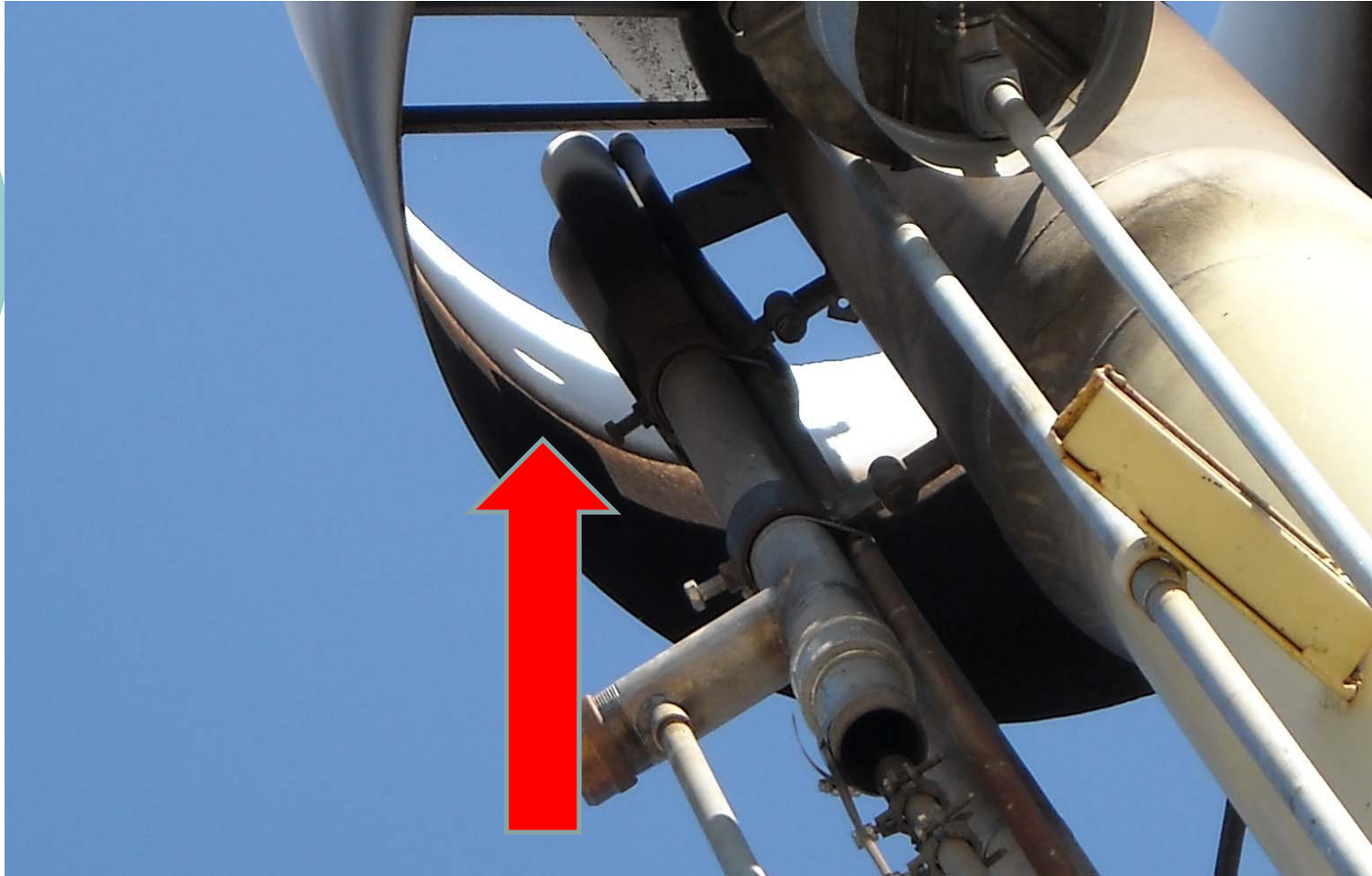


- **The local utility cooperative could not purchase the power...**
- **... and it was not economically feasible to 'wheel' the power to another utility.**
- **GGP had to build a power line directly to a utility that would buy the renewable power (Duke Energy Carolinas, LLC)**
- **This was no small feat. 1 mile of new line & 2.5 of upgrades**
- **Some of the permits and approvals included:**
 - the US Army Corps of Engineers,
 - (two) Wetlands Boards,
 - SC DHEC Bureau of Water – to cross a 'navigable waterway'
 - Crossing under a 230KV main Transmission Line,
 - Crossing over an 800 PSI Gas Transmission Line,
 - Approvals in Greenville & Spartanburg Counties
 - DOT & County road crossing permits, and
 - Private right-of-way acquisitions.

Power Generation Equipment:

- Two Caterpillar G3520 LFG engines.
- 20-cylinder
- 2233HP
- 1.6MW Each
- 30 year Industrial Grade
- Fully enclosed 'package' unit
- ISO Switch Gear
- Modular – 'easy' to move
- These are among the cleanest and most efficient engines available on the market today.
- *Supplied by:* Blanchard Caterpillar (SC dealer)





SILICA BUILD UP INSIDE THE FLARE HOUSING

Gas Treatment System:

- GC Environmental, Inc. Designed & built the state of the art gas treatment skid.
- This patent pending process removes water, siloxanes, and many non-methane hydrocarbons.
- The process has been effective in removing siloxane with some lab results coming back as 'non-detectable.'



Gas Treatment System:

- Siloxane content is being reduced from the 15-20 PPM range to the PPB range.
- The skid employs a proprietary Pressure Swing Adsorption & Temperature Swing Adsorption Technology
- Able to remove light and heavy siloxanes
- We expect to see a substantial increase in the life expectancy of the engine.
- Saving oil changes means more on-line time, and reduced O&M costs.





Benefits to the County

The County will receive several benefits over the life of this project...

A few include:

- Revenue from gas payments
- Revenues from associated credits (Carbon / Tax/ etc).
- GGP will also operate and manage the project at **no** cost to the County.
 - Including capital improvements to the well-field and equipment,
 - general well-field O&M,
 - and all associated responsibilities to the end-use project.
- A 'tonne' of positive PR. Just Google it...

Environmental Benefits



Produces enough power for about 2000 homes!

The **Annual Reduction** of GHG attributable to this project is approximately the same as the annual GHG emissions of:

- More than **25,000** passenger cars
- Carbon Dioxide emissions from **319,000** barrels of oil consumed
- Carbon sequestered by **31,000** acres of pine forest!



Project Financing

- \$3.5 Million Financed by Caterpillar Financial Services for:
 - Engines
 - Gas Treatment Skid
 - Power Lines
 - Transformers
 - Installation & miscellaneous items
- Approx. \$1 Million more By Greenville Gas Producers, LLC.

Plant Operation:

- 24/7 Operation
- 95% + online time @ full capacity
- 3.2 MW
- 1 full time technician
- Scheduled maintenance is on off-peak hours
- 1- runs Synthetic oil
- 1- runs CAT NEGO EL350 oil






Moving Forward...

- If you have a landfill, public or private...
- Use this project and others that have been done as an example...
- LFG projects from medium BTU to high BTU, power, or simply flaring are POSITIVE and beneficial in a number of ways.
- Act ahead of the cure...
- TAKE ACTION!
- ACT NOW!
- Everyday without a project is a day of lost revenue and it causes undo harm our environment!



Thank You!!!

- ***LMOP***
- ***County of Greenville***
- ***Advance One Development, LLC***
- ***Enerdyne Power Systems, Inc***
- ***GC Environmental***
- ***Caterpillar Financial Services***
- ***Caterpillar, Inc***
- ***Duke Energy Carolinas, LLC***
- ***Golder Associates***
- ***Perennial Energy***



Greenville Gas Producers, LLC



Advance **ONE** Development, LLC



Contacts:

- For more information-
 - ***Greenville Gas Producers, LLC***
William Brinker- 704.844.8990
 - ***Greenville County***
Solid Waste Director
Marcia Papin- 864.297.8558

Environmental Engineer
Susan Harrison- 864.268.0226
 - ***GC Environmental***
President, Dick Prosser- 714.632.9969