Bryan S. Anderson, Esq.
Florida Power & Light Company
700 Universe Boulevard
Juno Beach, FL 33408-0420
(561) 304-5253
(561) 691-7135 (Facsimile)

December 14, 2007

VIA HAND DELIVERY
Ms. Ann Cole, Commission Clerk
Office of Commission Clerk
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, Florida 32399-0850

Re: Florida Power & Light Company Petition for approval of a negotiated Renewable Energy contract with Manatee Green Power, LLC
Docket No. 070677-EQ

Dear Ms. Cole:

In response to Staff's December 3 informal data request in the above-referenced docket, on December 12 FPL provided Staff with the responses of both FPL and Siemens, including attachments. Attached please find these same documents that FPL provided to Staff on December 12. Thank you for your assistance.

Please contact me should you or your staff have any questions regarding this filing.

Sincerely,

Bryan S. Anderson
Authorized House Counsel No. 219511

BSA:ec
Enclosure

Questions from Staff
Docket No. 070677

1. **Page 1 of contract: "QS intends to sign an interconnection agreement with FPL...assumes responsibility to make transmission related arrangements..."**
   a) Were transmission costs included in the costs considered by the QS in negotiating this contract? (Siemens)
   Both the capital and operating cost to transport the electricity via a 1 mile line to the FPL substation as well as the capital and operating costs of the electrical interconnection have been including in Siemens' plan.

   b) How were the transmission costs determined? (Siemens)
   These costs were determined by performing preliminary engineering and then went through a bid process to procure the final implementation of this design.

   c) Please describe the interconnection arrangements for receipt, by FPL, of the electric energy that will be provided by the LFG generator described in this docket. (FPL)
   A dedicated feeder will be constructed, at the expense of the QS, to connect the generator to an existing FPL distribution substation. FPL will meter receipt of power from the facility at the point that the dedicated feeder connects to FPL's substation.

   d) Does FPL intend to provide all voltage support and ancillary services associated with, or required, for this interconnection? (FPL)
   The interconnection agreement requires specific voltage support and reactive performance by the QS as measured at the point where the power is delivered to FPL's substation (the substation end of the dedicated feeder). Ancillary services associated with Network Integration Transmission Service are going to be provided by FPL.

   e) What arrangements, beyond those that are provided by FPL and the generating company, would be required for the interconnection with FPL? (FPL)
   None.

2. **a) What initial LFG production is expected from the landfill? (Siemens)**
   The landfill is expected to produce 2,389 SCFM of gas in 2009. The landfill has consistently been producing between 1600-and 2000 SCFM for the last year. In addition the landfill is currently expanding the collection system by adding wells to the open cell. This should increase flows to over 2300 SCFM when the expansion is completed in June 2008.

The 1750 SCFM flow required to run all three engines equals 53 MMBTU/hr.

b) What heat rate is expected from this generator installation? (Siemens)
The heat rate of the unit is 9,167 BTU/kwhr.

3. **Committed Capacity: what is the expectation for attenuation of the landfill gas available from the Manatee County landfill site?**
a) How is the attenuation expected to impact the 5.25 MW projected committed capacity over the contract period ending in 2023? (Siemens)
Having enough landfill gas to operate the plant at full load, above 93% capacity factor, and for the duration of the 15 year contract is critical to the financial success of this project. To ensure that there is enough gas, Siemens engaged Golder to perform a detailed gas projection analysis. The conclusion of this report is that there is significantly more gas than needed to run this project. See page 10 of the attached summary that lists the annual projected gas flows.

The three engines require a total of 1750 SCFM of LFG to operate at full load. Golder predicts that the Lena Road landfill will produce 2,389 SCFM of gas in 2009 and this volume will grow to 3,352 SFM by the end of the term. Gas volumes increase because the landfill is still actively taking large amounts of municipal solid waste.

Finally the gas volume is continuously being measured, and the landfill is currently producing more than the plants fuel requirements.

b) If there is a change in the generating capability of the installation due to the attenuation of available fuel over the life of the contract, explain how that will be included within the provisions of the contract?
In the event gas volumes decrease and the units can not produce the projected capacity, the capacity targets would be reset at the lower level and the subsequent future capacity payments would be reduced accordingly. (Siemens)

Pursuant to Section E, 3 of the contract FPL has the right to request the facility to validate the Committed Capacity by means of subsequent Committed Capacity Tests. Such right includes, but is not limited to, once every summer and once every winter period. Should FPL have any reason to believe the facility's output has degraded it can request that a test be undertaken. The result of the test is determinative of the Committed Capacity going forward. In other words, the Committed

Capacity is reset to a lower level if the output of the facility degrades due to attenuation of available fuel. (FPL)

4. **Will the proposed generating operation eliminate the need for the flare at the Lena Road Landfill, mentioned in H, 2, page 11 of the contract? (Siemens)**
   The plant will not totally eliminate the need for a flare. The flare will still be required to flare the gas not used by the project and when the project is down for maintenance.

5. **On page 11, the paragraph H4c deals with communication between FPL and the QS in the situations where the QS facility is reconnecting with the FPL system. Explain what the parties envision as "prior written approval" and how that differs from the standard offer requirement for "first obtaining FPL's specific approval." (FPL)**
   As part of the negotiations the Parties agreed to rely on "written" approval as opposed to, for example, "verbal" approval to reconnect the facility to FPL's system. The medium however could be electronic. In other words, email is an acceptable means of communicating "written" approval by FPL for the facility to reconnect to its system. Moreover, FPL does not believe that the revised language differs in meaning from the Standard Offer Contract Language.

6. **On page 12, paragraphs H4g and H4h deal with situations where FPL will not be required to purchase energy that the QS can provide. Explain how those situations will be included in the required minimum performance standards for delivery of firm capacity set out in paragraph C4, and the provisions for sale of capacity as set out in section E of the contract. (FPL)**
   Appendix B of the contract sets forth how to calculate the hourly factors during periods when due to the occurrence of unusual circumstances specified in Sections H4g and H4h FPL is not able to accept the output of the facility (the hourly factor is to equal 1) or is requesting the facility to reduce its output (the hourly factor is to equal to the energy received divided by the energy requested). The practical result is that the performance of the facility will not be negatively impacted by these occurrences.

7. **The Appendix C included in the contract describes a ramp rate of 2.1 MW/minute and a facility turnaround time of .2 hours from cold shutdown. (FPL)**

   a) Is there any provision for rampup contemplated or included in the contractual arrangements for disconnect / reconnect?
   No. Other than under specified limited circumstances where FPL may request that the facility get off line or that the facility reduce its output, FPL

does not have dispatch and/or control rights over the facility. The operating characteristics are recognized in these limited situations.

b) Is there any provision for rampup contemplated or included in the contractual arrangements for any situation in which FPL declines or reduces purchase of energy?
Appendix B includes 2 additional hours in the definition of Reduced Delivery Hour and of Operational Notice Hour to allow for ramp down and ramp up. The practical result of this is that the ramp up and/or ramp down periods associated with the limited circumstances where FPL requests reduced deliveries or for the facility to get off line do not impact the "performance" as related to capacity payments.

8. **The contract provides for FPL to purchase "defined Green Attributes" associated with the electricity generated by this renewable energy source. (FPL)**

a) Explain how the payments made under this contract will be booked by FPL.
Payments under the contract are for three products from the generator – capacity, energy, and renewable attributes. FPL believes that capacity should be recovered through the capacity clause. Energy payments should be recovered through the fuel clause. Since renewable attributes are tied to energy production, FPL believes that the REC payments should also be recovered through the fuel clause. If the Commission establishes a RPS, then the RECs would be recovered in accord with the procedures established at that time.

b) Explain how the purchase will relate to or be integrated with the "Sunshine Energy Program" operated by FPL.
Purchase under this contract is unrelated to the Sunshine Energy Program.

c) What is involved with "defined Green Attributes" in addition to avoided CO2?
The contract does not limit the green attributes acquired. The value associated with the purchase of green attributes was determined by the price for voluntary RECs currently seen in the market. Should an RPS be established in Florida, these renewable attributes would become compliance RECs, which are typically much higher in value, resulting in a savings for FPL's customers. If an RPS is not established, the RECs associated can be sold in the market, recovering the cost.

9. **Explain how the utility will manage this contract, including payment to the QS and recovery of costs, so as to be in compliance with the provisions of Order No. PSC-92-1059-DS-EQ, issued August 6, 2002,**

in Docket No. 020397-EQ. The explanation provided should include the excess payment for capacity beyond the capacity payment provided in the standard offer contract. (FPL)
Exhibit C of the Petition includes a comparison of the projected payments to Manatee pursuant to the contract and the payments pursuant to FPL Standard Offer Contract filed in 2006. Based on the assumptions made, the analysis shows a difference slightly over $100,000 for the negotiated payment (i.e., the cumulative amount of the negotiated payments is expected to exceed avoided costs on a net present value basis for the contract term by about $100,000). Simplifying assumptions were made for this analysis. The energy payment assumption in the analysis is based on the average projected "As-Available" energy cost on an annual basis as calculated by a model. So, for example, for any hour in which FPL's incremental energy costs exceed the "avoided unit energy costs" there are savings that have not been taken into account in this analysis. While the argument could be made that the "avoided unit" would also achieve these same savings it is noted that the "avoided unit" was not built. Also, there is no indication that the Manatee Project could be built had it not been for the modifications that resulted in the executed individually negotiated contract.

To get a sense for these savings FPL looked at actual hourly avoided energy costs for the peak day this year, August 10. The energy costs of the avoided unit on this day would have been 71.64 $/MWH. On this day FPL's actual avoided energy cost exceeded this value from hour 10 to hour 24 (see attachment). Had the Manatee Facility been on line and generating power (assuming it generated 5.25 MW each of these hours) FPL's customers would have saved approximately $ 2,700 (on this day only). One would only need to have 37 days similar to this one over the 15 year contract period to offset the additional capacity payments (i.e., approximately $100,000 on a net present value basis) with the savings resulting from the energy payments.

In its question, Staff also asks how FPL proposes to manage the contract, including payment to the QS and recovery of costs, so as to be in compliance with the provisions of Order No. PSC-92-1059-DS-EQ, issued August 6, 2002, in Docket No. 020397-EQ. Order No. PSC-02-1059-DS-EQ granted an FPL request for a declaratory statement that a proposal to pay in excess of its avoided costs to a qualifying facility ("QF") for renewable energy for a Green Energy Program, in which FPL's customers would voluntarily agree to higher rates covering the costs above FPL's avoided cost, does not violate PURPA, Section 366.051, Florida Statutes, and state and federal regulations implementing PURPA.

In granting FPL's petition, the Commission stated that "the prohibition under PURPA and the rules implementing PURPA against exceeding the avoided cost applies to circumstances where the rate paid to QFs in

excess of avoided cost is imposed upon the utility and its ratepayers." Order No. PSC-02-1059-DS-EQ at p. 6. The Order went on to state:

> The question of whether circumstances might exist where a request for costs in excess of avoided cost to be borne by the general body of ratepayers would be justified, or the question of the amount FPL or its green electricity customers may pay, is not presented by FPL's petition and is not addressed in this declaratory statement.

Id. Accordingly, the referenced order does not address or preclude whether a utility may offer to pay greater than avoided costs for renewable energy, in order to encourage development and provision of renewable energy for customers.

In Docket No. 01093-EQ, FPL sought approval of a Standard Offer Contract that included a paragraph 4.2 containing language that would have given FPL the unqualified ownership and rights to any environmental attributes associated with a qualifying facility, for any qualifying facility that agreed to provide capacity and energy under the terms of the proposed Standard Offer Contract. In its Order in that proceeding, the Commission denied FPL the right to include the clause, stating:

> If a QF signed the proposed Standard Offer Contract, FPL would acquire some quantity of TRECs at zero cost. We are concerned that such language contradicts our decision in Docket No. 020397-EQ that FPL could pay more than avoided cost for renewable energy if the incremental cost was paid by FPL customers who voluntarily agreed to higher rates.... Approval of the proposed Standard Offer Contract language would have the effect of allowing FPL to purchase renewable energy at avoided cost but not compensate the QF for the market value of the TRECs. This would be a discincentive to QFs entering into the standard offer contract as they would be losing the economic benefit of the TRECs. We believe that such an arrangement would discourage QFs from signing the Standard Offer Contract, thereby decreasing the development of renewable energy.

Docket No. 031093-EQ, Order No. PSC-04-0249-TRF-EQ at p. 5.

In addition, Rule 25-17.280, Tradable Renewable Energy Credits (TRECs), provides that:

> Tradable renewable energy credits and tax credits shall

remain the exclusive property of the renewable generating facility. A utility shall not reduce its payment of full avoided costs or place any other conditions upon such government incentives in a negotiated or standard offer contract, unless agreed to by the renewable generating facility.

Rule 25-17.280, F.A.C.

The authorities cited above, considered together, make it clear that the Commission views renewable attributes as having a non-zero positive economic value. Moreover, since Rule 25-17.280 expressly precludes a utility from reducing its payment of full avoided costs in connection with a renewable generating facility, without the facility's agreement, it is clear that a total cost in excess of avoided cost will need to be paid if the renewable attributes are to be accorded any value greater than zero.

As stated in response to question 8(c) above, the value associated with the purchase of green attributes for the subject contract was determined by the price for voluntary REC's currently seen in the market. Should an RPS be established in Florida, these renewable attributes would become compliance RECs, which are typically much higher in value, resulting in a savings for FPL's customers. If an RPS is not established, the renewable attributes can be sold in the market, recovering some or all of the cost.

Accordingly, FPL has requested that the Manatee contract be approved and found to be prudent, and that the costs paid under the contract be recovered through the appropriate clauses, consistent with the Commission's jurisdiction and authority in this matter.

10. **Regarding certification as a qualifying facility, as described in Section A2(e) on page 3 of the contract: outline the plans for this to be done, including the dates for filing and expected certification. (Siemens)**
MGP will file for QF status approximately 30 days after PSC approval.

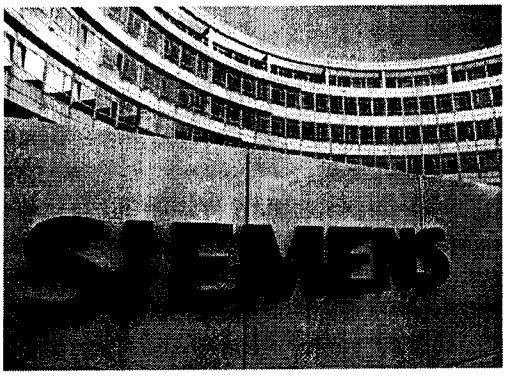
11. **Please describe the generating technology that has been selected for installation in the proposed project, and explain the considerations that support that selection. (Siemens)**
Siemens considered a variety of technologies to produce electricity from the Lena Road Landfill gas including: a steam plant, combustion turbines and reciprocating engines. Steam plants were quickly eliminated due to the very high capital cost of such a small steam plant (over 2700/kw). Siemens then had to perform a more detail analysis to evaluate CT's versus reciprocating engines.

Siemens evaluated both a Solar Turbine and the EGT 6 MW model manufactured by Siemens. Combustion turbines are slightly less efficient but have lower maintenance costs. Other factors considered were reliability, system auxiliary loads, and long term risk factors. A significant economic impact was the operational costs of a gas compressor required by combustion turbines. The final risk element that Siemens considered was the impact of Siloxanes contained in the gas. These silica compounds negatively impact both recip engines and CT's but have a much larger potential impact on CT's, because they operate in higher temperature ranges. At temperatures above 1900 these silica compounds will melt and plate out on turbine blades causing very significant damage to the units. The results of Siemens' evaluation were that Siemens selected reciprocating engines. This is consistent with industry practices. There are over 300 electric projects using LFG and more than 85% of these projects use reciprocating engines.

Siemens then concluded its evaluation process by selecting a specific unit for this project. Siemens eliminated all providers other than CAT and Jenbacher based on experience with landfill gas. Both CAT and Jenbacher have positive experience with LFG. Siemens concluded that the Jenbacher 616 use the best choice for its project. Siemens considered many factors including: efficiency, output, capital cost, operating cost, reliability, delivery times, and uptime guarantees. The evaluation was very close but Siemens selected Jenbacher. Please see a summary comparison of both units.

12. **A capacity factor of 10% is associated with the 160 MW CT used as the avoided unit. Considering that fact, explain the rationale and/or justification for the requirement of a 70% rolling capacity factor for the LFG generator. (FPL)**

FPL does not have dispatch rights over the Manatee facility. While combustion turbines typically have relatively low capacity factors they have very high availability factors. The capacity factor of a unit under FPL dispatch and control is not the same as the "billing" capacity factor of a facility under a purchased power contract. In order to receive the "capacity benefits" the facility has to be available when FPL would have "dispatched" its own unit. In absence of a dispatch right the facility has to provide some assurance that it will be on line and generating its committed capacity at those times that FPL has a need. This is achieved by tying the capacity payment to performance requirements that are similar to the "availability" of the avoided unit. In this contract Manatee needs to meet an annual capacity billing factor of at least 80% and a monthly on-peak capacity factor of at least 90 % in order to receive any capacity payments. These performance requirements are the "assurance" that the facility will be there when needed.



Manatee County Lena Road Landfill
BRADENTON, FLORIDA
Facility ID#: 0810055

SITE VISIT REPORT

Submitted to:

Mr. Jeff Laco
Siemens Building Technologies, Inc.
Major Energy Projects
3203 Planters Ridge Rd., Suite 100
Charlotte, NC 28270

Submitted by:

Golder Associates
3719 Saunders Ave.
Richmond, Virginia 23227
(804) 358-7900

April 27, 2007
Project Number: 063-6551

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SECTION 1

EXECUTIVE SUMMARY

Golder Associates Inc. (Golder) has been retained by Siemens Building Technologies, Inc. (SBT) to perform various services as requested to include; a Due Diligence site visit as it relates to a proposed Landfill Gas (LFG) to energy project, at the Lena Road Landfill, located in Manatee County, Bradenton, Florida and; a second follow-up visit for re-sampling of landfill gas. The work as described below is pursuant to a Golder proposal dated October 4, 2006 and related Master Services Agreement between Golder and SBT.

This summary report discusses the findings and results of all site visits performed to date. The Scope of Services for these visits described herein includes:

- Collect gas samples, package and ship to qualified laboratory for analysis;
- Measure Gas constituents to include Methane, and NMOC as Hexane;
- Analyze for VOC, Sulfides and Siloxanes;
- Provide all analytical and a summary report upon receipt of sample results.

This report summarizes in detail, the results of the Golder November 2006 site visit, sampling and analysis efforts, findings and analytical results. Below, please find a short summary of critical findings.

SUMMARY OF FINDINGS

Gas Quality and Flow:
Golder originally visited the Lena Road Landfill site on June 13 through June 14, 2006, November 2 and 3, 2006 and January 25, 2007. The monitoring results (Shown in Table 1) present a summary of the LFG extraction well monitoring results. In general, the wells located on the 1st and 2nd side slope bench were closed. Golder did not detect significant methane concentrations and measured flow until the third bench level, with the best gas quality found in the wells located on the top of the waste mass. Significant air intrusion was noted as measured at the flare inlet that accounts for the reduced methane content detected at the flare inlet. During the November and January visits, Golder noted that the total applied vacuum to the extraction well field had been reduced by 30% resulting in lower total flows and much reduced air intrusion. In general, Golder found only a limited vacuum loss throughout the system indicating that the vacuum piping integrity is good.

Upon arrival onsite, Golder commenced field activities by sampling gas quality, vacuum and noting LFG flow as measured via the flare system flow meter, which is only collecting gas from Stage I of the landfill. Gas quality on June 13, 2006 as compared to the November site visit was as follows:

June 13, 2006	**June 14, 2006**	**November 2, 2006**	**January 25, 2007**
CH4 – 36.6%	CH4 – 35.4%	CH4 - 53.3 %	CH4 – 49.2%
CO2 – 28.5%	CO2 – 26.6%	CO2 – 39.4%	CO2 – 37.9%
O2 – 4.9%	O2 – 4.2%	O2 – 0.6%	O2 – 2.3%
Balance gases – 30%	Balance gases – 33.2%	Balance gases – 6.6%	Bal. gases – 10.6%
Vacuum @ -35 inches H2O	Vacuum @ -36 inches H2O	Vacuum @ - 22 inches H2O	Vac @ - 24 inches
Flow – 1732 CFM	Flow – 1742 CFM	Flow – 628 CFM	Flow – 728 SCFM

A detailed discussion regarding Golder observations in the field and system issues can be found in Section 4 of this report. Golder noted significant air intrusion in the LFG extraction system primarily due to apparent leaking extraction well control valves and excessive applied vacuum. Installing new control valves and extraction well system balancing will likely cure this issue.

Golder measured flow via S-type Pitot Tube, traverse method at one inch intervals at two locations 90 degrees apart. Pipe sample ports located on the pressure side of the blower prior to the flare stack were utilized. These locations were existing sampling ports installed by the flare manufacturer. A significant pressure surge was noted emanating from the blower that was related to the apparent failure of a bearing set associated with the fan blower. Pressures ranged from +1.2 inches H2O to a high of 2 inches H2O were measured. In addition, Golder noted that the blower amperage meter also showed fluctuations. The unstable nature of the blower performance presented difficulties in achieving accuracy with the Pitot Tube measurement procedures. Data presented below shows a range of measured flows at each measurement point in the pipe that is a direct result of the blower performance issues. Two flow measurement events were performed (6/13 & 6/14/06). The results are as follows:

June 13, 2006, 3:40 P.M.

Top Traverse location	**90 Degree Traverse Location**
6" - 944 - 1,234 CFM	6" – 962 – 1312 CFM
5" - 1,000 – 1,200 CFM	5" – 998 – 1,212 CFM
4" – 1472 - 1600 CFM	4" – 1,244 – 1,642 CFM
3" – 1,300 – 1,545 CFM	3" – 1,298 – 1, 499 CFM
2" – 1,430 – 1600 CFM	2" – 1, 490 – 1,612 CFM
Flow Average – 1,279 – 1,435.8 CFM	Flow Average – 1,198 – 1,455 CFM
(Low Methane Event, Stage I)	(Low Methane Event, Stage I)

Summary of Key Analytical Results (June and November, 2006 events):

Parameter	Compound	June	November	January
Siloxanes	Octamethlycyclotetrasiloxane	784 ppbv	860 ppbv	1400 ppbv
	Decamethylcycloperntasiloxane	357 ppbv	210 ppbv	260 ppbv
	No other isomers detected			
Sulfides		35.1 PPM	110 PPM	112 PPM
NMOC		511 PPM	100 PPM	NA

Gas quality parameters as listed above are within normal expected ranges for typical LFG. The NMOC (Non-Methane Organic Carbon) result for the November sampling event is significantly lower due to the total reduction of flow coming to the flare station. The presence of both sulfides and siloxanes should be carefully considered as it relates to the proposed gas-to-energy project. Sulfide content in a wet gas stream can result in significant corrosion. Careful selection of materials of construction as well as possible pre-treatment of the gas prior to utilization should be considered. The siloxane results are within normal range for a LFG gas stream. Precipitates from siloxanes can result in system impacts to include initial effects on efficiency followed by increased maintenance needs caused by significant buildup of siloxane combustion by-products.

Flow Modeling:

A detailed discussion of approach and methodology as it relates to predictive LFG flow modeling for this site can be found in Section 7 of this report. Golder used both LandGem (EPA model) and our Golder GasSim program to generate predictive flow numbers. A summary table of model outputs follows.

LFG Model Output Summary

	LFG Flow – 2007 SCFM @ 50% CH4	**85% Efficiency Factor**	**Peak LFG Flow – 2029 SCFM @ 50% CH4- Generated**	**85% Efficiency Factor- Collectible**
Stage I	2,012 CFM	1,710 CFM	835 CFM	710 CFM
Stage I & III	2,601 CFM	2,211 CFM	4,194 CFM	3,565 CFM

SECTION 2

LANDFILL BACKGROUND

The Manatee County Landfill is owned and operated by Manatee County. The total landfill footprint is estimated at 316 acres at an elevation of approximately 100 feet. The facility is considered a Class 1 disposal facility under Florida law and consists of three (3) disposal areas; Stages I and III are "active" and Stage II which is yet to be constructed. Stage I only, has an active LFG collection system with an open flare control device in place. Stage I is "closed", meaning that no further waste will be placed and permanent closure is pending to include an expanded LFG extraction system and a cap. The landfill receives an average of 2,000 tons per day of municipal refuse according to Landfill personnel.

SECTION 3

LFG COLLECTION AND CONTROL SYSTEM DESCRIPTION

Manatee County collects landfill gas (LFG), and burns it in a flare at the Lena Road Landfill to control odor. The facility is subject to the Title V (Clean Air Act) permitting requirements based on the total waste in place (over 7 million tons) and the related emissions of regulated air pollutants. The facility is subject to the New Source Performance Standards (NSPS) regulations that require active gas recovery systems and the use of a control device (i.e.: flare) The LFG, which is a product of the natural decomposition of organic matter in the landfill, is approximately 50% methane, which has a heat value of 500 British Thermal Units (BTUs) per Standard Cubic Foot (SCF).

The present active system has 74 gas wells, all located in the area known as stage 1. The stage 1 area is estimated at 132 acres in size. At this time only 40 acres of the waste mass is covered by an active LFG extraction system associated with the area that has been capped to date. An expansion of the active LFG extraction system is planned for early 2007 and will include the installation of an additional 102 vertical LFG extraction wells and associated piping. At present, the LFG extraction system effectively collects LFG from only about 40-acres of the 132-acre Stage I Landfill. Only 40 wells of the 74 total wells are open since a number of the wells installed on the landfill's first terrace are no longer producing gas. Also, 30-acres of side slope on the Stage I landfill are capped with a geomembrane, which keeps rain water out of the landfill. This lack of moisture decreases gas generation since the bacteria needs a certain amount of water to convert organic matter into methane. The Stage I Landfill - Partial Closure #2, scheduled for 2007, will extend the gas collection system by adding 102-gas wells, and will effectively collect all the Stage I LFG. Manatee County has stated in their RFP documents that based on the 40-wells collecting 718 SCFM in 2004, or an average of 18-SCFM per well, the County projects that the 102 new wells will add 1,944 SCFM for an estimated total of 2662 SCFM, which is close to the estimate of recovering 50% of the theoretical amount of methane generated. The Stage I Landfill – Partial Closure #2 project will add an

additional 65-acre geomembrane cap over the landfill. If a landfill gas utilization project is feasible, Manatee County may submit a landfill closure permit modification to delay the construction of the landfill cap in order to allow the landfill to produce more landfill gas and help biologically stabilize the solid waste.

The existing LFG Collection system was designed in accordance with NSPS criteria. The NSPS Regulations (40 CFR Part 60.752 (b) (2) (ii)) include the following design objectives for active collection systems:

- The collection system shall be sized to handle the maximum expected LFG flow rate for the landfill area that warrants control over the lifetime of the LFG collection system;
- The system shall collect LFG from each cell in the Landfill in which solid waste has been placed for a period of two (2) years or more in a closed cell, or five (5) years or more in an active cell;
- The system shall collect LFG at a sufficient extraction rate while not causing air infiltration, which could promote a subsurface fire;
- The system shall be designed to minimize offsite migration of subsurface LFG;
- Surface methane emissions are maintained below 500 ppm and ;
- LFG wellheads have sampling ports to allow for the monitoring required under NSPS.

The current LFG collection system layout and well identification are depicted in Appendix C.

CONTROL SYSTEM DESCRIPTION

The LFG collection system supplies LFG to a candlestick type flare system. The gas moving equipment consists of a 75-hp New York Blower rated at 3,000 SCFM flow capacity and -60 inches H2O vacuum according to site personnel. The Utility Flare has a twelve (12) inch diameter stack and is rated at 3,000 SCFM. In 2006, the flare system control panels, to include the three phase electrical service were upgraded to add PLC controls and new motor starters and breakers. An existing Variable speed drive for the blower was removed. The flare is equipped with a flow meter, thermocouples for temperature measurement and an auto-dialer for system upset notifications. Operation of the flare is monitored and controlled at control panels located on the flare skid. These control panels manage start-up and shutdown activities as wells as recording the flow rate and temperature of LFG via a chart recorder. The flare is equipped with both a manual and automatic inlet header line isolation valve. If the flare shuts down, the control panel automatically closes the isolation valve, closing off all LFG flow and shuts down blower operation. This system is in-place to ensure no free venting of LFG is allowed at the control device. A minimum of weekly monitoring is performed at the flare station to ensure proper operation and to perform preventative maintenance.

SECTION 4
SITE VISIT TRIP REPORT

Golder visited the Lena Road Landfill site on June 13 through June 14, 2006. Weather conditions during the visit were marginal due to the presence of a strong tropical storm system passing nearby the area. High winds and frequent rain squalls occurred during both site visit days. Barometric pressure as measured by the GEM 2000 indicated a low pressure condition consistent with the weather conditions. Activities included an evaluation of the LFG extraction system to include LFG extraction wells, header and lateral piping and the blower/flare. In addition, Golder collected samples of LFG for subsequent laboratory analysis to be discussed in this section.

LFG EXTRACTION WELLHEAD MONITORING

Golder utilized a CES LandTec GEM 2000 Landfill Gas Analyzer for this effort, calibrated in the field using a 50% methane standard, 35% Carbon Dioxide standard and 4% Oxygen standard.
The monitoring results (Shown in Table 1) present a summary of the LFG extraction well monitoring results. In general, the wells located on the 1st and 2nd side slope bench were closed. Golder initially monitored many of these wells. Due to worsening weather conditions, Golder elected to not monitor wells where the valve was in the closed position. Monitoring Results are included in Table 1.

Wellhead Oxygen Concentration

The monitoring results (shown in Table 1) present a summary of the instances when an excess of five (5) percent oxygen (CAA NSPS Regulation exceedance value) was measured at an individual wellhead.

Significant oxygen (air) intrusion was noted. In those wells that were monitored on the first and second bench Golder noted high oxygen levels in most cases and the absence of methane. Measured vacuum was also detected in closed wells showing ambient oxygen levels (>20% O2) indicating leaking control valves.

Wellhead Temperature

No instances occurred when the landfill gas temperature was measured to be greater than 55°C (131°F) at any wellhead. Temperatures in excess of the ambient temperature are an indicator of active methanogenic activity. Temperatures in excess of 90F were found only in those wells located above the third bench and on top of the landfill waste mass.

Gas Quality

In general, Golder did not detect significant methane concentrations and measured flow at individual collection wells, until the third bench level, with the best gas quality found in the wells located on the top of the waste mass. Significant air intrusion was noted as measured at the flare inlet that accounts for the reduced methane content detected at the flare inlet.

VACUUM PIPING EVALUATION

Golder measured the available vacuum at each vacuum lateral riser (system vacuum) associated with extraction wells in the field where a sample port existed. Many of the extraction well vacuum risers were buried below grade in the area above the third bench, so no vacuum measurements on the "system" side were possible. In general, Golder found only a limited vacuum loss throughout the system indicating that the vacuum piping integrity is good.

CONTROL DEVICE OPERATION (LFG Flare)

The flare is equipped with thermocouples indicating the presence of flame. The flare is also equipped with a flow meter. Both flow and temperature are monitored and recorded.

Upon arrival onsite, Golder commenced field activities by sampling gas quality, vacuum and noting LFG flow as measured via the flare system flow meter. Gas quality as measured using a GEM 2000 instrument, was as follows:

June 13, 2006	**June 14, 2006**	**November 2, 2006**	**January 25, 2007**
CH4 – 36.6%	CH4 – 35.4%	CH4 - 53.3 %	CH4 – 49.2%
CO2 – 28.5%	CO2 – 26.6%	CO2 – 39.4%	CO2 – 37.9%
O2 – 4.9%	O2 – 4.2%	O2 – 0.6%	O2 – 2.3%
Balance gases – 30%	Balance gases – 33.2%	Balance gases – 6.6%	Bal. gases – 10.6%
Vacuum @ -35 inches H2O	Vacuum @ -36 inches H2O	Vacuum @ - 22 inches H2O	Vac @ - 24 inches
Flow – 1732 CFM	Flow – 1742 CFM	Flow – 628 CFM	Flow – 728 SCFM

Golder measured flow via S-type Pitot Tube, traverse method at one inch intervals at two locations 90 degrees apart. Pipe sample ports located on the pressure side of the blower prior to the flare stack were utilized. These locations were existing sampling ports installed by the flare manufacturer. A significant pressure surge was noted emanating from the blower that was related to the apparent failure of a bearing set associated with the fan blower. Pressures ranged from +1.2 inches H2O to a high of 2 inches H2O were measured. In addition, Golder noted that the blower amperage meter also showed fluctuations. The unstable nature of the blower performance presented difficulties in achieving accuracy with the Pitot Tube measurement procedures. Data presented below shows a range of measured flows at each measurement point in the pipe that is a direct result of the blower performance issues. Two flow measurement events were performed (6/13 & 6/14/06). The results are as follows:

June 13, 2006, 3:40 P.M. **Top Traverse location**	**90 Degree Traverse Location**
6" - 944 - 1,234 CFM	6" – 962 – 1312 CFM
5" - 1,000 – 1,200 CFM	5" – 998 – 1,212 CFM
4" – 1472 - 1600 CFM	4" – 1,244 – 1,642 CFM
3" – 1,300 – 1,545 CFM	3" – 1,298 – 1, 499 CFM
2" – 1,430 – 1600 CFM	2" – 1, 490 – 1,612 CFM
Flow Average – 1,279 – 1,435.8 CFM	Flow Average – 1,198 – 1,455 CFM

Flow Average as listed above reflect the actual range of fluctuation occurring at the time of measurement, due to the blower surge discussed above.

SAMPLING AND ANALYSIS

Golder collected samples at the blower flare station on June 14, 2006 and submitted those samples for subsequent laboratory analysis. Golder requested the following laboratory analytical procedures:

- EPA Method 3C – NMOC to include O2, N2, CH4, CO2
- EPA Method 25C – VOC (Volatile Organic Carbon by GC-MS)
- EPA Method 16 – Total Sulfides
- EPA Method TO-15 – Target List Compounds
- Air Toxics Method 17 - Siloxanes

Complete copies of the Laboratory Analytical Results can be Found in Appendix A of this report. A summary table of significant results is presented below:

Parameter	Compound	June	November	January
Siloxanes	Octamethlycyclotetrasiloxane	784 ppbv	860 ppbv	1400 ppbv
	Decamethylcycloperntasiloxane	357 ppbv	210 ppbv	260 ppbv
	No other isomers detected			
Sulfides		35.1 PPM	110 PPM	112 PPM
NMOC		511 PPM	100 PPM	NA

FLOW MODELING

Golder has carefully reviewed the EPA LandGem modeling provided in the RFP package. Important to this discussion are the selection of model defaults for both LFG generation rates and NMOC. The County engineer (PBS&J) has used the "Clean Air Act" defaults in his modeling effort which is appropriate for both permitting and design issues. These defaults are conservative in nature and generally result in higher LFG generation rates and emissions. However, Golder operations experience and the actual laboratory results from the Golder sampling effort, indicate that the AP-42 default values are far more accurate when considering LFG generation rates. For the purposes of this report Golder has used the AP-42 defaults in our modeling effort.

All modeling (LandGem and GasSim) can be found in Attachment B of this report. Golder ran both models to determine if any site specific factors might influence expected predictive flow rates or efficiencies. Golder's GasSim model factors in waste stream types and actual meteorological factors (Rainfall, Temperature). Comparing both models did not result in a significant effect on expected LFG generation rates or predictive flows.

Therefore, Golder believes that the use of the EPA LandGem model, applying AP-42 default values and using actual NMOC measured values, provides a reasonable accuracy for predicting flow rates at this site.

Since only Stage 1 has an active gas collection system installed at this time, Golder ran the LandGem modeling on Stage 1 separately from the full site LandGem and GoldGas modeling.

Given, the fact that Stage 1 is "closed" and a combination of a Geomembrane Cap and Soil cap is in place, Golder believes that a collection efficiency factor of 85% is expected as it relates to LFG recovery. Stage I is also in the process of receiving approximately 100 new extraction wells and connecting header to provide comprehensive well coverage of the area. Regarding stage III, Golder has estimated that its collection efficiency factor is also 85%, based on standard landfill practices, future wellfield installation schedules, etc. A summary table of model outputs follows.

LFG Model Output Summary

	LFG Flow – 2007 SCFM @ 50% CH4-generated	**85% Efficiency Factor-collectible**
Stage I	2,012 CFM	1,710 CFM
Stage I & III	2,601 CFM	2,211 CFM

Notes:

- LandGem output using AP-42 default.
- Stage I tons in place from data supplied by County Engineer (PBS&J) @ 6.458 Million Tons.
- Stage I & III outputs from LandGem using AP-42 default factors.
- 50% Methane content is assumed by the LandGem model and is a reasonable expected minimum value for this site.
- 85% efficiency factor for collection efficiency selected based on Stage I closure activity and the nature of the County Waste Facility operating procedures and adherence to interim cover requirements.

LFG Model Output Summary – 20 Year Projection- Stage I & III

Year	Model Total Generated Flow	85% Collectible Extraction Efficiency
2007	2,601 CFM	2,211 CFM
2008	2,708 CFM	2,302 CFM
2009	2,810 CFM	2,389 CFM
2010	2,909 CFM	2,473 CFM
2011	3,003 CFM	2,553 CFM
2012	3,094 CFM	2,630 CFM
2013	3,182 CFM	2,705 CFM
2014	3,266 CFM	2,776 CFM
2015	3,346 CFM	2,844 CFM
2016	3,424 CFM	2,910 CFM
2017	3,498 CFM	2,973 CFM
2018	3,570 CFM	3,035 CFM
2019	3,639 CFM	3,093 CFM
2020	3,705 CFM	3,150 CFM
2021	3,768 CFM	3,203 CFM
2022	3,829 CFM	3,255 CFM
2023	3,888 CFM	3,305 CFM
2024	3,944 CFM	3,352 CFM
2025	3,998 CFM	3,398 CFM
2026	4,050 CFM	3,443 CFM
2027	4,100 CFM	3,485 CFM

Notes:

- LandGem output using AP-42 default.
- Stage I & III combined outputs from LandGem using AP-42 default factors.
- 50% Methane content is assumed by the LandGem model and is a reasonable expected minimum value for this site.
- 85% efficiency factor for collection efficiency selected based on Stage I closure activity and the nature of the County Waste Facility operating procedures and adherence to interim cover requirements.
- Expected waste tonnages from County Engineer (PBS&J)

RECOMMENDATIONS FOR IMPROVING LFG EXTRACTION SYSTEM EFFICIENCY

EXISTING SYSTEM

Golder noted during our site visit and subsequent wellfield monitoring that the extraction well control valves did not fully "seat", causing a small amount of vacuum to be applied on extraction wells where no LFG was present. As noted previously, extraction wells located on the first and second bench areas of Stage I were closed. This slight leakage likely results in significant air intrusion.

Golder recommends the installation of a manual control valve on the vacuum side of the blower to enable the control of applied vacuum to the extraction system. Since no valve was present and no variable speed drive was available on the blower itself, full blower vacuum capacity was applied to the field. At the time of our visit, only a limited number of extraction wells yielded LFG in significant quantities. Too much applied vacuum causes "over-pulling" and potentially eliminates the wellfield operator's ability to adjust and balance the wellfield.

Golder noted the lack of isolation valves within the onsite extraction system. Isolation valves enable the system operator to isolate portions of the system for repair or maintenance reasons. In addition, isolation valves add another tool for wellfield balancing and adjustment. For example, in areas of the waste mass where LFG generation rates are low, applied vacuum can be minimized by use of the isolation valves to avoid over-pulling on poor performing extraction wells.

PROPOSED 2007 LFG SYSTEM EXPANSION

Golder has reviewed the proposed Lena Road Landfill Stage I Landfill Partial Closure #2 Expansion of the Landfill Gas Collection System design as prepared by the County Engineer (PBS&J). At the time of this report preparation, these design drawings were preliminary in nature and were in draft form. Golder has made numerous recommendations to PBS&J for system improvements to include:

- Addition of isolation valves at strategic locations to enable isolation of areas of the landfill to allow for construction, repair and maintenance in an area without a complete system shutdown.
- Changing the wellhead design to the LandTec 2v wellhead that offers a better quality control valve and a pitot tube flow device.
- Install a manual valve on the vacuum side of the blower.
- Repair the existing blower to reduce surging.
- Consider replacing the existing fan type blower with a multi-stage centrifugal blower. This type of blower is known to provide a better performance curve and is more durable.

It should be noted that the final design and installation is coming soon for the system expansion. Further review and observation of actual construction, conditions found in the field and preliminary LFG yields from the newly installed wells is highly recommended as a means to validate predictive modeling and gas quality as discussed in this report.

APPENDIX A

Company:	**Siemens Building Technologies**
Project:	**Manatee County LFG-to-Electricity**
Facility:	**Manatee Green Power**
RE:	**Comparison of ICE Reciprocating Technology, as-fired on Landfill Gas**

Make / Model	Jenbacher JGS 616	Notes	Caterpillar G3520C	Notes
Comparison Points				
Rating (kW)	1914	*1*	1600	*1*
Horsepower Equivalent (bhp)	2677	*1*	2233	*1*
Heatrate, @ Gen-Set Capacity (mBTUH)	16,668	*1*	13,753	*1*
CALCULATED Heatrate, BTU/bhp	6.2	*2*	6.2	*2*
Availability Guarantee (Hrs per Year)	8059	*3*	8000	*3*
EQUIVALENT % Available	92.0%	*0*	91.3%	*2*
Emissions (NOx, g/bhp-hr)	1.0	*4*	1.0	*5*
Emissions (CO, g/bhp-hr)	3.0	*4*	2.5 / 4.7	*5*
Quoted Price for 3 Outfitted Units	$ 2,780,950.00	*6*	$ 3,144,378.42	*7*
CALCULATED Price per kW	$ 484	*2*	$ 655	*2*

Notes:

1 Specification values are stated at 100% load

2 This is calculation, for comparison purposes.

3 Per quotation for gen-set manufacturer's representative.

4 Jenbacher equipment and set-up provision to include emissions guarantee of stated NOx emissions as accompanied by stated CO emissions.

5 CAT indicates NOx emissions as stated; as accompanied by CO emissions @ 2.5 g/bhp-hr for first 100 hours, then not-to-exceed 4.7 g/bhp-hr

6 Jenbacher quotation for 3 outfitted units, JGS616 @ 1,914 each i.e. 5,742 kW Total Gross Capacity

7 CAT quotation for 3 outfitted units, G3520C @ 1600 each; i.e. 5,400 kW Total Gross Capacity

Example

FPL Summer peak on August 10, 2007

Standard Offer Avoided Unit Energy Cost ($/MWHR) for month of August:
6.81 $/MMBTU - Gas price published in Platts inside FERC Gas Market Report August posting
10.4 MMBTU/MWHr - Heat Rate of avoided unit
.82 $/MWHr - Proxy for variable operation and maintenance expenses
71.644 (Avoided unit Energy Cost for month of August in $/MWHr)

Hourly As-Available Energy Rate on August 10, 2007 for hours 10-24 (West Region)

HOUR	REGION WEST $/MWHr	Avoided UEC. for August $/MWHr	Manatee Committed Capacity (MW)	$ Savings under contract
1	48.97	71.64	5.25	0
2	46.82	71.64	5.25	0
3	45.67	71.64	5.25	0
4	43.74	71.64	5.25	0
5	21.16	71.64	5.25	0
6	43.97	71.64	5.25	0
7	45.59	71.64	5.25	0
8	46.18	71.64	5.25	0
9	50.82	71.64	5.25	0
10	73.73	71.64	5.25	10.95
11	76.41	71.64	5.25	25.02
12	79.41	71.64	5.25	40.77
13	101.87	71.64	5.25	158.69
14	129.95	71.64	5.25	306.11
15	130.94	71.64	5.25	311.30
16	189.14	71.64	5.25	616.85
17	189.65	71.64	5.25	619.53
18	130.33	71.64	5.25	308.10
19	97.13	71.64	5.25	133.80
20	81.33	71.64	5.25	50.85
21	80.89	71.64	5.25	48.54
22	82.69	71.64	5.25	57.99
23	78.62	71.64	5.25	36.62
24	78.75	71.64	5.25	37.31
			TOTAL	**2,762.45** SAVINGS IN ONE DAY