GAINESVILLE RENEWABLE ENERGY CENTER, LLC

11201 13th St
Gainesville, FLORIDA, United States, 32653

Property All Risk Survey - Resurvey

Date Visited 31-January-2017

Energy and Engineered Risk

POWER GEN REPORT

POWER GEN REPORT

RFS ID / Location ID:	37934 - 1 /141501
Previous Survey Date :	20-Apr-2016
Engineer :	Martos Luis
Insured :	Gainesville Renewable Energy C
Location Address :	11201 13th St Gainesville, FLORIDA, United States, 32653
Latitude :	29.767600
Longitude :	-82.396200
Class of Risk :	POWERGEN excludes Hydro & Waste incineration
Site Contacts :	Mr. Russell Abel, Plant Manager, (386) 315-8014 **Russell.Abel@grecbiomass.com**
Other Attendees :	Mr. Ronald Hess, GRC Senior Consultant (770) 490-4719 **Ronald.Hess@globalriskconsultant.com**

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1 INTRODUCTION

This report documents the All Risks loss control survey conducted January 31, 2017 of the Gainesville Renewable Energy Center (GREC) in the city of Gainesville, Alachua County, Florida. During the survey, the Plant's generating and balance of plant equipment was on cold standby, awaiting to be dispatched.

As part of the inspection, interviews were held with the Plant personnel listed above. Other persons also assisted during the inspection; all the writer's questions were answered in a transparent and efficient manner. All personnel in the meetings or interviews were professional, experienced and knowledgeable, and the writer is grateful for their assistance and cooperation. A review of selected Maintenance and Operation Documents and a walk down of the Plant were also part of the Inspection.

2 LOCATION OVERVIEW

The Plant occupies approximately 130 acres in Alachua County, FL. The approximate coordinates are: Latitude 29.767231, Longitude = -82.406031, elevation: 186 ft. amsl. The Plant is in an industrial subdivision of Gainesville immediate neighbors are industrial occupancies and the immediate surroundings are fallow, empty fields. The Plant is off highway US 441.

Of the site's 130 acres approximately 60 acres contain the power plant and fuel pile. The Plant perimeter is enclosed with a 6 foot chain link fence. The Plant is

The Principal Plant Components are:

- One wood-biomass burning boiler, with natural gas start up.
- One Steam Turbine – Generator set (STG).
- Fuel processing equipment.
- Ash Handling equipment.
- Balance of Plant (BOP) equipment.

Principal structures are the administration building and the warehouse.

Date of Commercial Operation: December 17, 2013. It is owned by GREC Partners, operated and maintained by North American Energy Services (NAES) Inc., based in Washington State. The General Contractor was Fagen Inc., and the engineering firm was Zachry Engineering. This is a zero discharge Plant.

The Plant's condensers are cooled by a closed cooling system using a five cell, forced draft cooling tower, four cells are expected to be needed for maximum summer load. Make up cooling water is reclaimed water from the municipal sewage treatment facility, well water and waters discharged from the Plant's Reverse Osmosis facility. This is a zero discharge Power Plant.

Plant structures are designed to withstand hurricane force winds. Buildings and structures are concrete block, poured concrete and steel.

3 DISCUSSION AND CONCLUSION

3.1 DISCUSSION

When surveyed the Plant was on wet stand by and was to be placed in dry standby a few days after the Survey; the Plant is ready to be dispatched. When dry, nitrogen (between 0.5 and 1 psi) is used to help exclude air from entering the inside of the tubes, drum, etc. Since mid-2015 the Plant has been dispatched

very little, mostly to maintain its air permits and certifications. In 2016 the Plant operated a total of 476 hours (approximately 24 days) in five different runs. This included regulatory runs to prove availability and capacity factors. In January 2017, the Plant was dispatched for 17 consecutive days, one of the longest in the past three years, there were no trips during this run; at the time of the survey the boiler was still in wet layup and was scheduled to be placed in dry layup the first week of February.

A Plant outage scheduled for April 2017 will include inspections of the boiler, the turbine-generator, the transformers. The transformers will undergo the Doble tests including the bushings, also the DGA and oil quality tests. The generator will undergo visual winding tests, meggered; the batteries will be load tested. The turbine will be borescoped. The turbine was last opened in 2015 and no adverse conditions were found.

The outage work includes NDE NDT of all the large BOP motors: they will be meggered and checked for overall “fitness for duty”. The largest Plant motor is 3,500 HP. To comply with NERC PRC-5 requirements, all the Plant’s relays will be calibrated.

The roof of the cooling tower is made of fiberglass and will be painted or refinished during the upcoming outage.

The wood pile is maintained to an equivalent of 18 to 20 days’ supply. To minimize the likelihood of spontaneous combustion, the wood is turned over using the front loaders and bulldozers regularly. The Plant takes periodic temperature readings of the wood pile. The Plant reported there has been no wood pile fires.

In 2016 the Plant installed a deodorant spray system to help neutralize wood pile odors that may be carried by the wind to the residential areas located approximately two miles from the Plant. Additionally, charcoal is spread on some areas of the wood pile; the charcoal absorbs some of the wood pile odors. The writer is familiar with open biomass storage yards and did not find any off-normal, aging wood or “stale biomass” indications during the survey.

The maintenance and housekeeping of facilities and equipment throughout the whole Plant continues to be very good.

The Plant is required to be on line from dry lay over in 18 to 24 hours from the moment the Plant is dispatched. The air permit allows a limited number of starts, per quarter, the combination of air permit requirements and relatively long time to tie onto the grid, makes it unlikely the Plant will be cycled in and out of service for short periods of time.

No changes were reported to the Purchase Power Agreement. The Plant does not have black start capabilities and requires off site power to start. The maximum gross capacity is 102 MW, the Plant requires 12 to 14 MW to operate.

The Plant is operated and monitored from a central Control Room. There are two Distributed Control Systems (DCS), one for the STG the other for the boiler; the rest of Plant equipment is PLC controlled with inputs into one of the two DCSs. Boiler, STG and most BOP equipment are fully managed by Programmable Logic Controllers and operators cannot override safety parameters such as warm up times, etc.

Maintenance Overview.
The Plant maintenance is tracked by the MP2 Computerized Maintenance System program. There is close adherence to OEM maintenance guidelines. Industry’s Best Practices are known to Plant personnel and are applied to the maintenance programs.

In 2015 the boiler's tertiary super heater headers were replaced (they were under warranty at the time). The Plant has operated after the replacement, and no leaks were found. The Plant deems this issue resolved. During the time operated in 2016 and 2017, no leaks were reported. It should be noted the original boiler OEM, Metso sold the rights to this boiler to Valmet Inc. To date the Plant is satisfied with Valmet's support and service.

Issues found in the combined steam admission and control valve for the STG were also addressed in 2015 and are considered resolved. The turbine OEM is Siemens who continues to provide assistance, support.

Another issue with the STG is a "flutter" in power output that occurs between 90 MW and full load. The flutter has been observed, measures developed and implemented to minimize it, and although still present the Plant is aware of the condition and works around it. It has been deemed not a critical or damaging condition. It is similar (not the same) as a natural harmonic speed on a turbine generator: it is there, and steps are taken to operate either above or below the load where the flutter occurs. The flutter was not an issue in 2016-2017 and is not expected be an issue in the future.

With the present utilization factors, Steam Turbine Generator major outages are scheduled every 10 years, minors every three years. The Plant tracks its start- stop cycles and its operating hours and uses the data to schedule the outages. There is also extensive NDE NDT on all principal Plant equipment, the results of the NDE NDT are also factored in the outage scheduling.

The boiler tubes thicknesses were "mapped" or base lined prior to commercial operation and spot checks are done yearly. To date no negative indications have been observed.

There is a total of 41 persons staffing the Plant. There has been no reduction of Plant staff as a result of the lower utilization factor.

General Comments

The Plant is licensed to use:

- Locally available wood products from sources certified to meet forest sustainability standards. These include green sawdust and tree bark from tree logs processing mills.
- Urban Biomass: Primarily from private urban based gardens.
- Other clean wood waste such as old pallets that have been turn to wood chips.

Plant personnel stated they are not license to burn wood refuse from construction site nor other woods that may be contaminated in any way. Most of the wood received is in chips ready for use. There are two hoggers (only one is needed). A hogger is a specialized hammer mill that will break down oversized wood. The boiler tube materials are designed for the type of fuel expected to be burned.

Most of the fuel originates within a 75 mile radius from the Plant. There is a contract with Bio Resource Management, Inc. (BRM) to manage fuel procurement and ensure forest sustainability standards are met. BRM is a locally based consulting firm that specializes in biomass supply services.

The Power Purchase Agreement (PPA) is between GREC and Gainesville Regional Utilities (GRU). The PPA is for a nominal 100 MW net biomass fueled power plant and has a term of 30 years. The facility is connected to GRU's 138 kV transmission system. Metering equipment is installed in the GREC substation and is owned by GRU.

The facility is dispatched by GRU's operations using an Automatic Generation control. When the Plant is on line and operating, the dispatcher can control load remotely by opening or closing the STG steam admissions valves. The maximum load change rate allowed by the governor's PLC is 3 MW per minute regardless of the

urgency. The minimum dispatch load is 70 MW and the maximum is the design load of 102.5 MW. The PPA allows a maximum of 16 GRU dispatched shutdowns per year, and requires an unavailability factor of less than 5% for the summer period and 12.5% for the rest of the year. The complete PPA requirements, including financial arrangements, were not discussed.

It has been estimated the available renewable fuel within 75 miles of the Plant can support 500 MW of electric power generation helping minimize the impact of similar power plants that may be built in that region in the future. To date no other plants have been built and there are no known plans for additional wood burning power Plants in this region.

All the equipment observed appeared properly sized and well constructed. It is one of the better built biomass fueled Plants the writer has surveyed. The level of details on the structures and the equipment is among the best for a Plant this type.

There is redundancy in most Plant Auxiliary and Fuel Processing equipment. Per example there are three truck un-loaders (tippers), two hoggers; two boiler feed pumps.

Critical process or equipment considered a choke point or bottleneck, has been identified and the method of restoring it to service has been addressed and spare parts are at hand. An example is the belt of the fuel conveyor from the fuel pile to the power plant, where there is a spare belt. The steel structures are solidly built when compared with other plants in Florida.

The GSU DGA was reviewed and as in prior years, no Risk aggravating conditions were observed. The Plant's Insulation is Asbestos free.

Battery capacity tests following IEEE 450 guidelines will be conducted later this year, somewhat ahead of the required five years. The boiler safety relief valve tests are up to date. There is a natural gas fueled, 750 kw, emergency diesel engine generator for emergency power and light.

There are maintenance agreements with varying scope of coverage with all major OEMs. This may change if Plant utilization remains low.

The Plant was designed and outfitted with two electric motor driven boiler feed pumps (BFPs) to supply its boiler. The pumps motors are powered from different MCCs in opposing parts of the Plant. The MCCs in turn receive power from one single source, the Plant's 4160 service transformer. The service transformer itself is fed from a single line that originates at a nearby substation of the electric utility that purchases the Plant's electric power.

The ASME Boiler & Pressure Vessel Code Section I. Paragraph PG-61.1 states, in part: "boilers fired on solid fuel not in suspension, and boilers whose settings or heat source can continue to supply sufficient heat to cause damage to the boiler shall have at least two means of feeding water", "if the feed supply is interrupted, one such means of feeding shall not be susceptible to the same interruption as the other, and each shall provide sufficient water to prevent damage to the boiler."

The fluidized bubbling bed design of the boiler may have some mitigating factors over other types of boilers where cooling is more critical, this allows an interpretation of the ASME requirements more tailored to this boiler.

Presently the Plant's feed pumps electric supply is from a single transformer (expecting the boiler at full load) if the power is interrupted, both electric motors would stop. Additionally, the circulating water pumps, and all the air fans also are powered from this transformer. In effect the boiler will be "bottled up"; however, the heat

load inside the boiler at the time of the power loss is significantly less than a similar size stoker fired boiler burning refuse or coal. Most of the fuel and sand inside the boiler will drop into the hoppers away from the tubes. There will be enough water in the tubes to take up some residual heat on the overall little damage is expected.

This is referred in NFPA 85 par. A.7.3.3.9(1), which states: “if the air supply is stopped and the bed defluidized, the heat removal from the bed becomes very low because the bed material is a good insulator, and steam production drops to less than 10 percent of full load production in a matter of seconds”. The same paragraph describes additional issues (such as clinker formation) that would arise from loss of air while at full power, the issues will not be as expensive to resolve as boiler tube damage.

The writer has requested the prints and engineering design documents for the Plant’s sequential tripping protection, and will review and offer any comments upon receipt.

Shortly after commercial operation, the Plant’s utilization factor decreased due to availability of lower cost electricity from other power plants. The writer did not see a decrease in the quality or quantity of the maintenance performed on this Plant, originally scheduled when a high utilization factor was expected.

The Plant present staffing is the same as when it began commercial operation. Personnel turnover was reported low. Presently the PPA provisions make the Plant profitable. No indication of a change in the PPA was reported.

3.2 CONCLUSION

The GREC Plant is a well-built power plant.

All areas of the Plant continue to be in excellent upkeep and housekeeping. Operators, supervisors and managers are experienced and knowledgeable. There is a good preventive maintenance program, and the overall level of fire protection is good.

The Plant should consider implementing the suggestions and recommendations provided throughout as the budget allows. Implementation of the suggestions and recommendations will increase the availability and reliability of the Plant and minimize the likelihood of catastrophic equipment failure.

4 RECOMMENDATIONS

The following Risk Improvement Recommendations have been developed based on National and International Codes and Standards, Industry best practices, and/or sound loss control judgment. The recommendations are presented roughly in the order of relative importance to overall hazard mitigation.

4.1 COMPLETED RECOMMENDATIONS

All prior recommendations have been closed.

4.2 NEW & OUTSTANDING PRIOR RECOMMENDATIONS

4.2.1 New Recommendations

No new Recommendations are issued as a result of the 2017 Survey.

5 HISTORY AND OWNERSHIP

Date of Commercial Operation was December 17, 2013. It is owned by GREC Partners, and operated and maintained by North American Energy Services (NAES) Inc.

6 PLANT LAYOUT AND EXPOSURE

6.1 SITE DESCRIPTION

6.1.1 Location

The Plant is in an industrial subdivision of Gainesville immediate neighbors are a municipal sewage treatment plant and a 400 MW coal fired power plant. Immediate surroundings are fallow, empty fields, Highway US 441 is nearby.

The plant is located on approximately 130 acres within the city limits of Gainesville in Alachua County, Florida. Latitude: 29.7676 , Longitude: -82.3962 Elevation: 186 ft. amsl

6.2 EXPOSURES

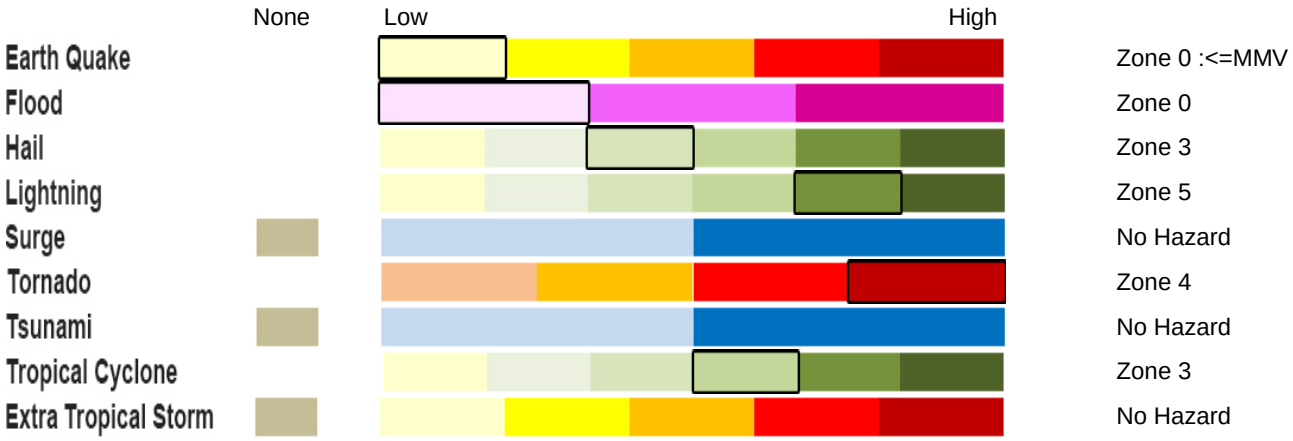
6.2.1 Surrounding Exposures

North: Open land
East: Pond
South: Open land, GRU power plant to the SE > 1000 ft.
West: Wood yard

6.2.2 Natural Perils

Munich Re Natural Perils Summary

Hazard Pointer (29.767600,-82.396200)



FLOOD
This facility is located in a Flood Zone X (Unshaded), placing the plant outside the 100 and 500-year flood elevations. All structures are above the surrounding grade elevation not subject to flood exposures. Flood zone location was taken from FEMA Alachua County/City of Gainesville Flood Map 12001C0145D, dated 06/16/2006 and Munich Re's Map of Natural Hazards.

SURGE
There is no Surge threat.

WIND
The facility is located in an area of Florida categorized by Munich RE as Zone 3 (132 - 156 mph) peak wind speeds) for tropical cyclones. This is the Probable maximum intensity with an exceedance probability of 10% in 10 years (equivalent to a "return period" of 100 years).

All Plant structures are well built. The cooling tower is the weakest structure and is not expected to withstand a storm above category 1 hurricane (74 to 95 mph wind speed). Metal buildings, equipment, and insulation would be expected to receive some damage during the windstorm primarily from missiles carried by the wind.

There will be some loss of fuel from the wood pile.

EARTHQUAKE
The earthquake exposure is considered Low. The facility is in an area categorized by Munich RE as Zone 0: (MM V or below) on a scale of 0 to 4. This is the Probable maximum intensity (MM: modified Mercalli scale) with an exceedance probability of 10% in 50 years (equivalent to a "return period" of 475 years) for medium subsoil conditions.

6.2.3 Other Perils

TORNADO
The plant is in an area categorized by Munich RE as Zone 4 for tornadoes on a scale of 1 to 4 (Frequency and intensity of tornados), a high frequency and intensity of tornadoes.

LIGHTNING
The plant is in an area categorized by Munich RE as Zone 5 for lightning on a scale of 1 to 6. Zone 5 represents a frequency of 20 – 40 lightning strokes per km2 per year whether the strikes reach the ground or not. All structures, buildings, equipment are grounded.

SEVERE WEATHER
This facility is located above/north of the freeze line. Damage from severe cold or snow loading is not a concern.

HAIL
The plant is in an area categorized by Munich RE as Zone 3 for hail on a scale of 1 to 6.

OTHER
This area of Florida is considered a low risk for sinkholes. There has been no recent sinkhole activity reported in the immediate area.

SUBSIDENCE AND COLLAPSE
Low Hazard.

FIRE AND EXPLOSION
Explosion Low Hazard. Fire mid Hazard.

BOILER AND MACHINERY BREAKDOWN
Typical of the Industry. Please see discussion Section.

IMPACT AND COLLISION
Low Hazard.

THIRD PARTY LIABILITY
Low Hazard.

6.3 LAYOUT AND CONSTRUCTION

6.3.1 Building And Plant Layout

Layout and construction is as expected of a well designed and constructed power plant.

6.3.2 Construction

Building Name	Year Built	Height (ft.)	Total Area (ft²)	Construction			# Fire Areas	AS	Condition
				Walls	Roof	Floor			
Admin/Control	2013	18	5000	LNC	LNC	Concrete	1	Y	Good
Maint./Whse	2013	24	6250	LNC	LNC	Concrete	1	Y	Good
Water Treatment	2013	24	2000	LNC	LNC	Concrete	1	Y	Good
Hogger/Screen House	2013	40	3300	LNC	LNC	Concrete	1	Y	Good

Pre-fabricated or modular Metal Buildings. Well constructed, no signs of deterioration.

6.3.3 Secondary Containment

All tanks, reservoirs etc., have adequate dikes or secondary containment.

6.3.4 Fire Separation and Compartmentalization

Fire areas are well defined.

6.3.5 Infrastructure

All infrastructure (site roads, larger civil structures), equipment foundations and supports, are well constructed.

7 MAJOR EQUIPMENT

7.1 STEAM GENERATORS

7.1.1 General Information

The boiler was originally manufactured by METSO, it is presently serviced by Valmet. The rated steam send out is 930,000 lbs/hr, at 1,650 psig, and 1,000 F, using approximately 1.2 to 1.4 tons of wood fuel per electric MW. The boiler is a model Hybex bubbling fluidized bed (BFB) with natural gas start. The MAWP is 1,945 psig, the manufacturer's serial number: 103; National Board Certificate: R-8338.

The combustion chamber bottom contains approximately a 5 feet deep (approx. 300 tons) bed of sand through which the combustion air is bubbled up. Natural gas is the startup fuel. The boiler is installed outdoors. The boiler exhaust is equipped with a selective catalyst reduction (SCR) system using 20% aqueous ammonia. There is a bag house sized for twice the actual flue flow. Sodium bicarbonate and pulverized activated coal may be injected as needed to control acidity and mercury levels of the flue gas. The boiler air permit is very strict and flue gas quality is monitored 24/7 by a Continuous Emissions Monitoring System, and reported monthly to the regulating authority.

A portion of the boiler's sand is lost with bottom ash removal, lost sand is continuously replenished, most of the sand in the bottom ash is recovered and recycled. The operating experience is favorable and presently less sand is lost than what originally expected.

The fuel handling equipment has magnets in several locations to remove magnetic objects; even with these precaution, iron objects such as nails, wires, etc., make it through the boiler and are removed with the bottom ash, most of that metal is recovered and sent for recycling. The ash is sent to a land fill.

Boiler tube metallurgy is compatible with the service, most critical boiler tubes are high chrome steels.

STEAM GENERATORS									
Unit	**Size (pph)**	**Type**	**Mfg.**	**Year**	**Fuel 1**	**Fuel 2**	**MAWP**	**Temp (°F)**	**Asbestos**
1	930,000	BFB	Metso	2013	Biomass	N.G.	1945	1005	No

The boiler is a Metso (now Valmet) Hybex wood-fired bubbling fluidized bed (BFB) boiler.
The average burn rate is ~130 tph @ 42% moisture. Burn Rate at 70 Mw is ~2100 tpd.
Burn Rate at 102 MW(net max load) is ~3,000 tpd.

FEED WATER						
Unit	**Boiler Feed Pumps**			**Water Chemistry**		
	Type	**No.**	**Fixed Protection**	**Online**	**Grab**	**Dosing**
1	Elec.	2	Yes	Yes	Yes	-

Each pump is rated for 100% of the boiler's needs.

7.1.2 Maintenance Overview

BOILER							
Unit	**Outage**		**Safety Valve Testing**		**Seamed High Energy Piping**		
	Last	**Freq**	**Last**	**Freq**	**Location**	**Last NDE**	**Freq**
1	May 2016*	Yearly	May 2016	Yearly			

No seamed piping was reported. *Based on condition assessments, and the low utilization factors, the boiler outages may be increased to two years. There will be another outage in 2017.

FEED WATER					
Unit	**Dearators**		**FAC Inspections**		
	Last NDE	**Freq**	**Location**	**Last**	**Freq**
1	October 2014	5 years		2015	5 years

Comments: The dearator tank is oversized and holds approximately 12 hours of boiler water at MCR. There are plans to perform NDE NDT on seam welds etc., in 2018-2019. This timeframe is dependent on the

utilization factor and meets good industry practices and guidelines such as the NACE Standard RP0590-96.

Feed Water

Hotwell condensate is monitored real time. There are on line sensors monitoring hotwell conductivity. Conductivity readings are checked manually every shift. There is a dedicated water chemist on shift.

A boiler water production facility provides boiler feed water make up, the facility uses RO and electric ionic-cationic polishers to treat the boiler water. Make up water is stored in above ground steel tanks.

7.1.3 Fixed Protection Overview

STEAM GENERATORS						
Unit	Burners			Stack		
	No. /Levels/ Pattern	Controls / Trips	Protection	Height	Construction	Lining
1	4 & 6/ 2 / front & back	Complete	N/A	230’	Steel	-

The boiler has automatic natural gas fired igniters(4) for startup and if needed to stabilize the boiler in times the fuel is too wet. There are six wood feeders (3 on front and 3 on back).

BOILER AUXILIARIES							
Unit	Bag House			Precipitator		Air Preheater	
	Temp Rating	Temp Monitor	Protection	O2 Monitor	Protection	Type	Protection
1	500	Yes	No	Yes		Tube	

Includes two bag houses (only one is needed) with 10 compartments each using Teflon bags rated for 500°F. The bag houses are monitored for ΔP and temperature. Normal inlet temperature is 445°F with alarms well below the 500°F level. There is also a Selective Catalyst Reduction (SCR), which uses 19.5% aqueous ammonia.

All ash is trucked to a landfill.

7.2 PRIME MOVERS AND GENERATORS

7.2.1 General Information

Steam Turbine-Generator
The steam turbine generator is maintained per OEM recommendations. Because of its standby status the STG is periodically lubricated and rotated using the turbine gear motor. The generator has space heaters and the lubricating oil is checked frequently for quality and quantity.

The steam turbine is a Siemens condensing turbine coupled to a with a Brush™ generator rated at 116.1 MW, 13.8 kV. The turbine does not have reheat steam. There are three extraction points supplying the Feed water heaters. There is a Turbine Water Induction Protection system that is tested weekly whenever the Plant is operating.

STEAM TURBINES								
Unit	Rating (MW)	Mfg.	Year	Model	Serial	Cases/Flows	Service	TDP-1
1	116.1	Siemens	2013	SST900	-	3	base	Yes

GENERATORS								
Unit	Rating (MVA)	Mfg.	Year	Model	Serial	Volts (kV)	Cooling	Ring Mat'l
1	136.6	Brush	2013	-	971007010	13.8	Air	

The STG is an air cooled unit. No hydrogen used or on site. The unit is located at the north end of the boiler structure inside an elevated metal panel enclosure. Generator rotor does not use retainer rings.

7.2.2 Maintenance Overview

The STG is in a 10 year major maintenance schedule. To date there are no known OEM technical bulletins or advisories on the STG.

STEAM TURBINE										
Unit	Overhaul		Valve Inspection		Borescope		Testing Frequency			
	Last	Freq	Last	Freq	Last	Freq	Overspeed	Valves	NRV	Aux oil
1	*	*	2015	4 years	2016	1/yr	Annual	**	**	Weekly

*Steam Valves and NRV's are exercised weekly whenever the Plant operates for extended periods. The STG complies with the ASME water induction prevention guidelines. The STG was opened in 2015 as part of the warranty program. No adverse or risk aggravating factors were observed, and the STG has had low utilization since then. ** Almost since 2015, the Plant has had short production runs. The frequency during long production runs is weekly.

GENERATOR										
Unit	Disassembled		Ring NDE		Rewind		Testing Frequency			
	Last	Freq	Last	Freq	Stator	Field	Electrical	PD	Flux	Liquid Detectors
1	**	**	NA*		**	**	Yearly	Yes	Yes	Air cooled

*These are air cooled salient type pole generators. **The generator began commercial operations in 2014 and has seen very low utilization and low start-stop cycles. It was disassembled and internally inspected in 2015 as part of the warranty program. Future internal inspections will be determined by the results of yearly NDE and utilization factor. There has been no need to rewind these units.

7.2.3 Fixed Protection Overview

STEAM TURBINE							
Units	Under deck	Lube Oil Unit	Lube Oil Piping	Seal Oil	Bearings	Exciter	Enclosure
1	AS	AS	AS	AS	AS	-	-

7.3 TRANSFORMERS AND ELECTRICAL SYSTEMS

7.3.1 Transformers

Transformers are three phase, shell type, oil insulated, ONAF cooled, manually operated taps.

	Voltage Ratio, kV	Mfg	Year	Serial	Rating, MVA
GSU	13.8/138	*	2012	N4669101	104/139/173

*Pennsylvania Transformers. The GSU has a Calisto™ continuous H2, CO and moisture detector.

MAIN TRANSFORMERS								
Unit	OEM	Year	Rating(kVA)	Serial	Volts(KV)	Form	Phases	Oil Capacity
Aux	Pennsylvania	2012	24,000	C-07992-5-1	13.8 / 4.16	Core	3	5990
GSU	Pennsylvania	2012	173,000	C-07987-5-1	138./ 13.8	Core	3	13250

DGA are performed every six months. Electrical tests every 2-3 years.

PROTECTION

PROTECTION					
Unit	Separation		Protection		
	Transformers	Buildings	Fixed	Barrier Walls	Containment
GSU	Adq.	Adq.	AS	Yes	Yes
SS	Adq.	Adq.	AS	Yes	Yes

The plant is not black start capable.

7.3.2 Cable Spreading Rooms

CONTROL ROOMS							
Unit	Location	System Type	Size	Detection	Protection	Penetrations	Staffing
1	Admin Bldg.	DCS	1500	Smoke	AS	Sealed	Cont.

7.3.3 Other Electrical

The station has an emergency diesel generator to provide backup power for critical equipment and to enable safe shutdown of the plant.

7.4 CONTROL ROOMS & CONTROL SYSTEMS

The Plant employs 41 persons. Operations shift work follow a modified DuPont schedule.

Operators in the Control Room monitor the whole Plant. Although the operator can control, the operator cannot override set equipment safeguards; the safeguards can only be changed by the DCS programmer, with the approval of Senior Plant management. The number of monitors and screens available to the operators is adequate allowing monitoring of equipment simultaneously. A number of less critical parameters are manually logged by the field operators. Operators use paper check lists for their logs.

Shift staffing is adequate. Communications among personnel on shift is via two way radio or cell phones. All principal and most BOP equipment are monitored by the DCS.

There is a management of change procedure consisting of retraining of all personnel on all major changes in Control Systems as well as in equipment are covered in the procedure. DCS logic changes need Management approval.

7.5 FUEL STORAGE AND HANDLING

Fuel is received by trucks, and unloaded via truck tippers-dumpers. Most fuel received is ready to be used in the boiler, oversized fuel is processed through the hoggers, which are hammer mills that cut oversized fuel into smaller pieces and make it boiler ready. Fuel from the pile the fuel is sent to the boiler through an automatic re-claimer. There are two silos that store the fuel near the boiler.

In addition to the automatic re-claimer, fuel can be fed from the pile to the conveyor and into the Plant by front loaders. It should be noted the front loaders are cleaned (pressure washed) every four hours in a dedicated wash station.

The Plant receives on average 120 trucks per day during daylight hours only, usually Monday to Saturday. Each truck carries approximately 22 -24 tons. Fuel is used within 30 days of being received in order to minimize potential for spontaneous fires. The PPA requires a minimum 15 days fuel supply be kept on the pile. Fuel moisture content is on average 39%.

Natural gas is used for boiler start up and for stabilizing combustion. Natural gas is received into the Plant by a pipeline. The boiler could produce approximately 20 MW using only natural gas. No risk aggravating factors were observed in the natural gas fuel trains or burners.

7.5.1 Solid Fuel Handing, Preparation & Storage

Fuel Supply to Boilers
The fuel is delivered by trucks. There are three truck tippers, from the tippers the fuel is piled in the yard prior to being processed by the hoggers. Most fuel arrives to the Plant "boiler ready" therefore most of the fuel passes through the sizing screens before it reaches the hoggers. The hoggers process any oversized wood.

Processed wood is stored in the wood yard until ready to be sent to the boilers. From the yard wood is sent to the two silos located next to the boiler. The silos provide a limited reserve for continued boiler operation in case the feed belt stops operating.

Fuel pile management requires 24/7 supervision and the use of front loaders to pile the wood where the automatic fuel re-claimers can operate at optimum efficiency. Front loaders are cleaned minimum every four hours to prevent biomass accumulation in the undercarriage.

The biomass (wood) is received from various suppliers within the local area (within 70-mile radius). Wood is received Monday – Friday and occasionally on Saturday from 7:00 am – 8:00 pm. The plant averages 100-110 trucks per day (trucks avg. 23 tons of fuel each). The trucks are unloaded by hydraulic dumpers(3). Underground conveyor (belt #1) takes the wood from the unloading bins to the screen house/chipper where it is sized then conveyed to one of two wood piles via stack-out conveyors. The fuel handling equipment has magnets in several locations to remove any iron, or metal objects. The piles have two reclaimers (1 – under pile and a drag chain reclaimer). Front end loaders are used to maintain the piles and push the wood fuel to the under pile reclaimer openings.

With the low utilization, the Plant's target is to maintain 18 to 20 days' worth of fuel on site. There is a contract with a company specializing in this type of fuel. Fuel procurement has a goal to ensure forest sustainability.

CONVEYORS & TRANSFER HOUSES						
Location	**Length**	**Enclosure**	**Protection**	**Detection**	**Trips/Alarms**	**Tramp Metal**
1 Truck Dumper to Hogger	270'	Underground	AS	-	Yes	Yes
2 Hogger to belt 4	80'	Covered	AS	-	Yes	-
3 Hogger to belt 4	80'	"	AS	-	Yes	-
4 transfer to belts 5,6,8	270'	"	-	-	Yes	-
5 to stacker	183'	"	-	-	Yes	-
6 to stock-out	101'	"	-	-	Yes	-
7 to reclaimer	185'		-	-	Yes	-
8 from hogger/stacker to belt 9	180'	Covered	-	-	Yes	-

9 Main feed to plant	285’	“	AS	-	Yes	Yes
10 to surge bins	32’	-	-	-	Yes	-
11 from stock-out reclaim to belt 9	108’	Covered	-	-	Yes	-
Stacker	61		-	-	Yes	-

The main boiler feed belt (#9) has 2-separate drive systems and the Plant has a spare belt on site CCTV cameras allow the control room operator to visually monitor essential areas and processes.

BUNKERS & PULVERIZERS								
Unit	Bunkers		Crushers/Chippers			Pulverizers		
	Protection	Detection	Type	No.	Protection	Type	No.	Protection
1	-	-	Chippers	2	AS	-	-	-

There are two 50% hoggers for chipping oversized wood.

There are two silos/bunkers/surge bins located at the boiler, which if full provide 45 minutes of fuel to the boiler should the feed belt go out of service.

7.5.2 Fuel Storage Tanks

None, except diesel fuel oil tank for emergency generator.

7.5.3 Natural Gas / Other Fuel Gases

Natural Gas is used only to start up the boiler. Delivered to the Plant by a pipeline. No risk aggravating conditions were observed.

7.6 ANCILLARY EQUIPMENT AND SYSTEMS - BALANCE OF PLANT

Condensing and Cooling Systems

COOLING TOWERS							
Unit	Type	Construction	Fill	Cells	Cell Barriers	Protection	Fan Interlock
1	Counter flow	FRP	PVC	5	Yes	No	No

Hydrogen

No hydrogen on site.

Ammonia

There is one approximately 20,000 gallons tank that stores aqueous ammonia (19.5%) used for NOx reduction.

Water Supplies

From two – full capacity well pumps plus one- potable water well and a reclaim water pipeline from the City of Alachua. Plant design was for 1.2 million GPD.

Process Water

Obtained from the reclaim pipeline and the on-site wells. The Plant produces its own boiler feed water using a house facility that uses RO and electric ionic removal equipment. Demineralized water is stored in a steel tank.

Waste & Effluent Handling

The Plant is a Zero Discharge facility. Wastewater (primarily from ash handling) is evaporated. The resultant solids are compressed and land filled.

Compressed Air

125 HP Atlas/Copco units. Air compressors with redundancy with adequate supply for both service water and instrument air. Service air was reported to be the same quality as instrument air.

Emergency Power

The plant has a 750 KW diesel engine generator for emergency power and equipment safe shut down. The unit is self-contained (has its own fuel tank) and is in an enclosure northeast of the boiler. The enclosure has a fire detection system. Full load testing of the unit generator using a load bank is done every summer.

Warehousing and Storage Areas

WAREHOUSING / STORAGE							
Location	Commodity/ NFPA Class	Storage Height (ft.)	Clearance	Aisle Width (ft.)	Rack Storage		
					Type	Depth	# Tiers
Admin Bldg.	2 – 3	12-15	5’	8	S/DDR	4	3

8 FIRE PROTECTION

8.1 FIRE BRIGADE OR FIRE DEPARTMENT

FIRE BRIGADE / FIRE DEPARTMENT						
Organization	Type	ISO Class	Distance	Response Time	Obstructions	Formal Pre-plan
Gainesville FD	FT – paid	-	~3 miles	10 min	RR	TBD

8.2 FIRE WATER SUPPLY AND FIRE PUMPS

FIRE WATER SUPPLIES				
Source	Size/ Capacity, Gallons	Yard Main Size	No. Available Hydrants (Public & Private)	Adequacy/ Reliability
Service water tank	1 million with a 250K reserve for fire pumps.	12”	22	Adequate & Reliable

Fire Pump Data					
Pump Name	Pump Driver Type	Nameplate Data			Suction Source
		Rated Flow(gpm)	Rated Pressure(psi)	Rated Speed(rpm)	
Electric	Electrical Motor	2000	152	1780	Tank or reservoir
Diesel	Diesel Engine	2000	152	1780	Tank or reservoir

The fire loop was flow tested in 2016 and the results were satisfactory.

8.3 MANUAL FIRE FIGHTING SYSTEMS

Portable fire extinguishers are located throughout the facility and there are nine monitor nozzles located on fire hydrants. The boiler structure has a dry standpipe with hose stations.

8.4 FIXED FIRE PROTECTION SYSTEMS

8.4.1 Sprinkler Systems

SPRINKLER PROTECTION						
Location	Type	Design Density	Required Density	Existing Demand		Adequacy
				GPM	PSI	
Admin/Control Bldg.	Wet	0.25/1502	0.10/1500	593	94	Adq.
Maint/Whse	Wet	0.25/1950	0.20/1950	828	101	Adq.
STG Bearings	Dry	0.25/E.A.	0.25/E.A.	546	70	Adq.
STG Underdeck	Dry	0.3/E.A.	0.3/5000	1282	115	Adq.
STG Lube Oil	Deluge	0.3/E.A.	0.30/E.A.	830	118	Adq.
Boiler Feed Pump	Dry	0.30/E.A.	0.30/E.A.	563	66	Adq.
GSU Transformer	Deluge	0.25/E.A.	0.25/E.A.	1439	121	Adq.
SS Transformer	Deluge	0.25/E.A	0.25/E.A.	1025	135	Adq.
Fire Pump house	Wet	0.25/E.A.	0.25/E.A.	-	-	Adq.
Water Treatment Bldg.	Wet	0.25/1585	0.15/2000	958	84	Adq.
Fuel Unloading – Hyd.	Dry	0.50/E.A.	0.30/E.A.	617	27	Adq.
Fuel Unldg – Below grade conveyor	Dry	0.30/100' linear	0.30/EA	1196	92	Adq.
Screen/Hogger House	Dry	0.30/3277	0.30/E.A.	1926	98	Adq.
Scale House	Wet	0.10/1288	0.10/1500	581	70	Adq.

8.4.2 Gaseous & Clean Agent Systems

GASEOUS EXTINGUISHING SYSTEMS			
Location	Type	Density or Design	Adequacy
None			

8.4.3 Other Extinguishing Systems

8.5 FIRE AND GAS DETECTION SYSTEMS

FIRE & GAS DETECTION SYSTEMS		
Location	Type	Adequacy
PDC/MCC & Elec Rooms	Smoke	Adequate

Emerg. Generator Encl	**Smoke**	**Adequate**
CEM Shed	**Smoke**	**Adequate**
Battery Rooms	**Smoke & H2**	**Adequate**
Admin/Control Bldg.	**Smoke**	**Adequate**

ALARM & /MONITORING SYSTEMS				
Alarm System Type	**Alarms Supervised**	**Alarm Location**	**Test Frequency**	**Adequacy**
Proprietary	**Yes**	**Control Room**	**Annually**	**Adq.**

8.6 FIRE PROTECTION SYSTEMS MAINTENANCE AND TESTING

The plant has a contract with a qualified contractor to inspect and test the fire safety equipment. All testing is per NFPA Standards. Additionally, the Plant performs weekly “churn tests” of the fire pumps and monthly visual inspections of all above ground piping and valves.

9 MANAGEMENT PROGRAMS

9.1 GENERAL ORGANIZATION

The owners have contracted with NAES to act as the O&M contractor. The Plant employs 41 persons. 30 persons are assigned to Operations, and man the shift work. Shift schedule follows a modified DuPont schedule. In addition there are 8 contract employees including 1 Valmet employee.

9.2 OPERATIONS

9.2.1 Organization, Qualifications & Experience

NAES has set up an organization and staffing structure that is standard in the power generation industry. All key Plant personnel have extensive power plant experience.

9.2.2 Operator Training

Plant personnel were originally trained by the OEMs of the plant equipment. Personnel had prior power plant experience. Since the original staffing, the Plant reports little personnel turnover.

9.2.3 Operational Procedures and Routines

Operation procedures were reported to cover most Plant operations and maintenance work. There is a library with the equipment information and Plant drawings.

9.2.4 Permit to Work

Work permits are generated for all maintenance tasks. Hot work permits are used where required. There are procedures for Lock-Out/Tag-Out and Confined Space.

9.3 MAINTENANCE, INSPECTION AND TESTING

9.3.1 Organization, Qualifications And Experience

The Plant uses a CMMS (MP2). Maintenance personnel are experienced. Maintenance personnel are qualified by education, training and experience.

9.3.2 Planning

The MP2 Computerized Maintenance System is used at the Plant and widely used throughout the industry. It meets the requirements for issuing Work Orders, archiving, record keeping and spare parts management, facilitating the planning tasks of Plant personnel.

9.3.3 Contractors and Contractor Screening

NAES has a procurement and screening process, which evaluates a contractor's capacity to complete a task on time, safely and efficiently. Contractors are chosen by the Plant using NAES guidelines.

9.3.4 Steam Generators

The boiler is presently inspected yearly (internal inspections and NDE NDT of tubes and drums), this may change due to condition assessment showing favorable results, and low boiler utilization.

9.3.5 Prime Movers

All prime movers maintenance follow better industry standards and OEM recommendations.

9.3.6 Generators

All generators' maintenance follow better industry standards and OEM recommendations.

9.3.7 Transformers and Electrical Systems

Transformer DGA results were reviewed no aggravating factors were observed.

9.3.8 Auxiliary Equipment and Systems - Balance of Plant

All other equipment in the plant was observed in good operating condition, well maintained.

9.3.9 Spare Parts

The Plant's in house spare parts include many critical spares, including one full length conveyor belt. The total value of the spares in the Plant was reported at approximately 3 million USD.

There are no spare transformers, however the GSU and the Plant Service transformers can be readily replaced from stock available through several vendors.

9.3.10 Record and Analysis

The Plant maintains good, legible records. The MP2 CMMS is maintained up to date and the program archives and organizes data very effectively. Additionally Plant personnel maintain excellent records for the benefit of the Plant owners who frequently request the records and audit the Plant.

9.3.11 Workshop And Repair Facilities

Major repairs are performed by outside concerns. Plant staff is adequate to handle Preventative maintenance.

9.4 RISK AND SAFETY MANAGEMENT

9.4.1 Organization and Safety Programs

NAES has safety programs that comply with all regulating agencies requirements and industry's best practices.

9.4.2 Safety Awareness and Auditing

The Plant has established audit frequencies of monthly in-house and NEAS corporate does annual audits. In addition, the owners tour plant regularly and perform safety audits. All personnel are responsible for safety.

9.4.3 Management of Change

There is a formal procedure for both engineering and operational changes. All changes are reviewed by appropriate personnel (NAES & Owners) and signed off by the plant manager.

9.4.4 Hot Work Permit and Control of Ignition Sources

Plant follows NAES's Safety Manual, which covers Hot Work Permitting and also covers smoking, which is limited to designated areas.

9.4.5 Impairment Handling

The plant is using AIG's Impairment Program.

9.4.6 Emergency Planning and Organization

The plant has adopted NAES's Safety Manual

9.4.7 Environmental Issues and Operational Permits

The plant is permitted to generate a maximum of 102.5 MW net, and has to abide by air permit requirements. The Plant is a Zero discharge facility.

9.4.8 Housekeeping

Housekeeping continues to be excellent throughout the facility including around and below the conveyor belts.

9.4.9 Security and Surveillance

There are no on-site security personnel at this facility but passive protection is considered acceptable as the Plant is continuously manned. The Plant perimeter is enclosed by a 6-foot chain link fence with barbed wire above and cameras are strategically located at key areas.

The Plant uses CCTV for security and for monitoring plant processes. CCTV cameras are located throughout the Plant, and the CCTV Monitors are located in the Control Room. Communications is via plant wide PA, portable radio and/or cell phone.

10 LOSS HISTORY

No Loss History was reported.

11 LOSS ESTIMATES

11.1 INSURED VALUES

TOTAL INSURABLE VALUES			
	PD, USD	TIME ELEMENT	
Buildings	**$9,038,603**	**BI**	**$70,980,000 (12 months)**
M&E	**$280,397,633**	**EE**	**0**
Contents	**$2,585,000**	**Rents**	
Inventory	**$3,500,000**		
Other	**$500,000**		
Fuel	**$1,271,000**		
TOTAL	**$297,292,236**	**TOTAL**	**$70,980,000**
Total Ins. Value	**$368,272,236**		

11.2 PROPERTY LOSS ESTIMATE

EXPECTED MAXIMUM LOSS (EML) - USD

P.D. 86,200,000 **B.I.** 177,000,000 **Total** 263,200,000

Boiler: Loss of flame with re-ignition, resulting in furnace explosion. Furnace protection systems inoperative.

PROBABLE MAXIMUM LOSS (PML) - USD

P.D. 13,900,000 **B.I.** 59,600,000 **Total** 72,900,000

STG: Large lube oil fire

PHOTOS

Boiler

Detail: Fuel pile equipment with automatic fire suppression

Typical Plant Construction: Fuel sampling and lab building.

Detail: Area Transformers