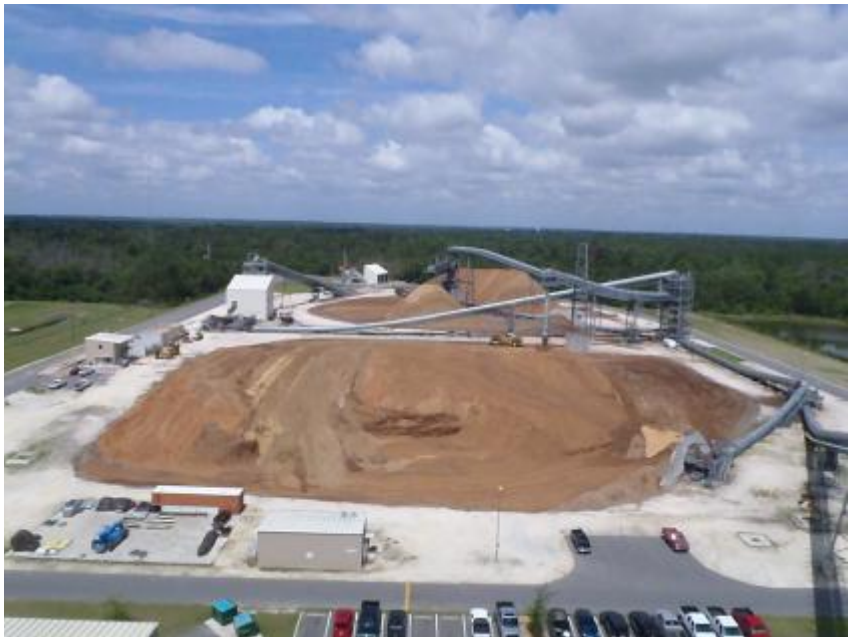
Energy and Engineered Risk

175 Water Street, 29th Floor, New York, NY 10038

Gainesville Renewable Energy Center (GREC)
11201 NW 13th Street
(11201 US 441)
Gainesville, FL 32653



Boiler And Machinery Loss Control Survey Report
May 27, 2015

SUMMARY INFORMATION

RFS No.	18683 Sub 1
Survey date	May 27, 2015
Previous Survey	February 11, 2014
Engineer	L. Martos Luis.Martos@aig.com (305)586-3998
GME Writing Office	Hartford
Owner	Gainesville Renewable Energy Center (GREC), LLP.
Operator	North American Energy Services
Location Address	11201 NW 13th Street (11201 US 441, this is the GPS recognized address) Gainesville, FL 32653 Adjacent to the Gainesville Regional Utilities' Water Treatment Plant
Plant Type	Wood burning boiler and steam turbine generator. Privately owned Independent Power Generator.
Site Contacts **Name, Title, Phone and Email**	Russell Abel, Plant Manager, (386) 315-8014 **Russell.Abel@grecbiomass.com**

CONTENTS

1. SUMMARY OF INSPECTION ACTIVITY

This report documents the boiler and machinery loss and risk control survey conducted May 27, 2015 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 operating.

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. Note the Plant site shows in Google Maps under the address 11201 US 441, the approximate coordinates are, Latitude 29.767231, Longitude -82.406031

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

The GREC Plant consists of:

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

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 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. LOSS PREVENTION DISCUSSION

The Plant is very well maintained. It was surveyed while at operating at full power and no off normal conditions were observed. The wood pile smells is in good condition and appearance with no signs of aging wood. The housekeeping was very good.

The Plant is being dispatched as a base load station, however it is seldom dispatched at its maximum capacity. The minimum load allowed by the Purchase Power Agreement is 70 MW and the Plant is only dispatched at full or close to full load during the hottest summer days of the summer season. The Plant can generate from cold startup in 16 hours. It does not have black start capabilities and requires off site power to start. The maximum gross capacity is 102 MW and 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 cooperation and adherence to OEM maintenance guidelines. Industry's Best Practices are known to Plant personnel and are applied to the maintenance programs.

Since the 2014 Survey there were two major outages, one in October 2014, the other in early May 2015, the outages so far were covered or were required by the Warranty Program. The Boiler and the STG continue to be covered by the Warranty.

The May 2015 outage principal findings were: Before the October 2014 outage, the boiler's tertiary super heater had experienced tube failures at the weld of the tube stub to the header. This was investigated and found to be a design problem. During the May 2015 outage, the header was replaced (under warranty). In the few weeks the new header has been in service no leaks have occurred. The original boiler OEM, Metso, had been replaced by Valmet since April 2014, the Plant reports Valmet support to be good. As a result of the header replacement, Valmet extended the warranty of the boiler until May 2016.

Also during the May Outage, a design flaw in the combined steam admission and control valve for the STG was addressed: this is a control oil leak through the valve stem, and oscillations in generator output at high power. The control valve is located immediately above the turbine which makes any oil leak unacceptable and had caused several outages just to replace the seal. The permanent repair to the oil leak consisted in replacing the stem seal with a different design.

In the few weeks the new seal has been in service no leaks were reported. The turbine OEM is Siemens who continues to provide assistance, support.

A second issue with the STG is a "flutter" in power output that occurs between 90 MW and full load. This remains an issue. The flutter consist of cyclical power output swings that peak at 1.5 MW (per example: at 95 MW the power will swing between 93.5 and 96.5 MW. The obvious causes such as steam supply, vacuum or control oil variations, have been ruled out. The control valve was disassembled during the October and May outages no unusual conditions were found. Siemens continues to work in this issue, although it was reported the "flutter" (or swing) is now approximately +/- 0.75 MW. It should be noted the "flutter" was first noted during start up and commissioning tests. Plant personnel reported the STG to be seldom dispatched above 70 to 80 MW, and the flutter remains a warranty issue.

Specific outage requirements for the Steam Turbine Generator are presently set for 6 years, major outages 2 to three year minor outages, but this will change as operating experience is gained. The boiler will be inspected and NDE-NDT yearly.

The boiler tubes thicknesses were "mapped" or base lined prior to commercial operation and were re-mapped during the October and May outages, no negative indications were observed.

Plant Maintenance staff consists of a manager, three I&C-Electrical techs, four Mechanical techs, one planner and one warehouse tech. There has been no reduction of Plant staff since the 2014 Survey.

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 the industry name for 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 (AGC), the dispatcher controls load remotely by opening or closing the STG steam admissions valves. The maximum load change rate allowed by the governor 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. Since the start of commercial operation the Plant has been dispatched between 70 and 80 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. During this past year of operations the PPA availability requirements have not been met and penalties were paid.

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. The level of details on the structures and the equipment is among the best for a Plant this type, per example, the Plant transformers have overvoltage counters.

There is redundancy in most Plant Auxiliary and Fuel Processing equipment. Per example there are three truck un-loaders (tippers), two hoggers; in boiler auxiliaries there are 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 no Risk aggravating conditions were observed. A recommendation is issued.

The Plant's Insulation is Asbestos free.

Battery capacity and safety relief valves tests will be addressed in future surveys. There is a gas powered, 750 kw, emergency diesel generator for emergency power and light.

Manpower is somewhat larger than this surveyor expected from a power plant this size, and may decrease in future years. Plant personnel is experienced.

There are maintenance agreements ranging from one to five years with all major OEMs.

3.1 CONCLUSION

The GREC is a power plant designed and built to good engineering and industry practices. It was observed in excellent upkeep and housekeeping although it had been 2-3 weeks since the last major outage was completed. No risk aggravating factors were observed. Operators, supervisors and managers are experienced and knowledgeable.

4. RECOMMENDATIONS

4.1 NEW RECOMMENDATIONS

B20150501	**Transformer Tests Frequency** During the survey it was noted the transformers are DGA tested once per year. Due their criticality, it is recommended the Plant perform DGA tests on the GSU and Auxiliary transformers every six months.
Update	

B20150502	**Transformer On Line Continuous DGA Tests** Due to the transformers' importance to the Plant's reliability, it is recommended the Plant study the installation of continuous DGA monitoring equipment. The Serveron™ monitors are one possibility that should be explored, it is recommended a model that can monitor all eight principal telltale DGA gases be installed. Yearly tests for oil quality should be continued.
Update	

4.2 COMPLETED RECOMMENDATIONS

B20140201	**Consider installation of boiler monitoring cameras** Permanently installed boiler monitoring cameras that allow operators to observe the boiler furnace while in operation are very common in this type of plants through out the industry. It is recommended the Plant reassess the benefits such cameras will provide and if found acceptable install them.
2015 Update	Plant reported discussing the installation and deciding against it due to the excessive amount of movement on the bed, the cameras would have very limited use. This Recommendation is closed.

B20140202	**Lock closed the attemperators bypass valves** It is recommended the Plant chain and lock closed the attemperators bypass valves, this will help minimize the possible water carry over into the STG. It is also a good industry practice.
2015 Update	Plant installed monitoring plastic straps but will not lock the bypass valves closed. This writer agrees with the Plant's arguments for no locking closed the valves. This

	Recommendation is closed.

B20140203	**Transformer Tests Verification** During the survey it could not be determined if the transformers had been tested for Corrosive Sulfur. It is recommended the Plant obtain the results of those tests from the start up documents and verify the transformers are free of corrosive sulfur. If the tests cannot be located it is highly recommended the transformers be tested for corrosive sulfur at the earliest possible time.
2015 Update	The transformers were tested for Corrosive Sulfur. This Recommendation is closed, complete.

B20140104	**Replace ABC Fire Extinguishers with CO2 Fire Extinguishers in the Control Room.** It is recommended the Plant replace all ABC extinguishers servicing Motor Control Centers or electrical rooms with CO2 extinguishers. An ABC extinguisher causes significant collateral damage often exceeding the damage caused by the fire.
2015 Update	Plant installed monitoring CO2 extinguishers as recommended. This Recommendation is closed, complete.

B20140105	**Verify there is a contingency plan to replace the Plant Transformers in short notice.** It is recommended the Plant have in place a contingency plan to facilitate replacement of any of the Plant's transformers in short notice.
2015 Update	The Plant has in place a contingency plan that includes at least yearly review of available used transformers. There are a number of suppliers that have been identified, however the Plant does not have a Transformer under contract and will not have one since it will tie up a large portion of the Plant's yearly O&M budget. The GSU and auxiliary transformers are of standard design. This writer agrees with the Plant's arguments. This Recommendation is closed.

B20140106	**Analyze need for a warehouse to store spare parts.** A number of spare parts were observed on a concrete slab, open to the sky and to weather condition. It is recommended the Plant analyze the suitability of this type of arrangements and the effects it will have on the spare parts' availability and reliability when they are installed in the Plant.
2015 Update	Only parts unaffected by weather, sun is kept outdoors. All other parts are kept under roof. The Plant analyzed the suitability of this type of arrangement and no negative effects on the exposed spare parts was identified. This writer agrees with the Plant's analysis. This Recommendation is closed.

5. HISTORY & OWNERSHIP

The GREC Partnership developed and operate this Plant. 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. The General Contractor was Fagen Inc., and the engineering firm was Zachry Engineering.

6. MAJOR EQUIPMENT

6.1 BOILER

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 1945 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, flue gas quality is monitored 24/7 by a Continuous Emissions Monitoring System, with monthly reports 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 with less than expected sand being lost.

The fuel handling equipment has magnets in several locations to remove magnetic objects, still, a number of iron objects such as nails, wires, etc., make it through the boiler and are removed with the bottom ash. Ash is land filled.

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

BOILER							
Unit	Outage		Safety Valve Testing		Seamed High Energy Piping		
	Last	Freq	Last	Freq	Location	Last NDE	Freq
	May 2015	Yearly	May 2015	Yearly			

*No seamed piping was reported.

FEEDWATER					
Unit	Dearators		FAC Inspections		
	Last NDE	Freq	Location	Last	Freq
	October 2014				5 years

Comments: The dearator tank is oversized and was reported to hold approximately 12 hours of boiler water at the normal loss rate.

Feedwater
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 feedwater 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.

There are two, 100% capacity each, electric driven feedwater pumps.

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 cushion 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.

6.2 STEAM TURBINE GENERATOR

Steam Turbine-Generator
In the 15 months period between commercial operation and the 2015 AIG Survey, the Winter and Summer reliabilities were 86.5% and 87% respectively, the PPA requires winter and summer reliabilities to be a minimum of 87.5% and 95%; penalties were paid by the Plant. If the forced outages due to boiler header and STG control valve were factored out the Plant, reliability would have exceeded 95% for both winter and summer. In the 15 months period between commercial operation and the 2015 AIG Survey, there were 24 forced outages, and the Plant generated 933,161 gross MW, 813,934 net MW.

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 Feedwater heaters. There is a Turbine Water Induction Protection system that is tested weekly.

6.2.2 Maintenance Overview

The STG will undergo a thorough warranty inspection in October 2014. 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
		*					Annual			Weekly

*New Plant, the inspection frequencies are being evaluated, presently expected to be 6 years between major inspections, overhauls. Steam Valves and NRV's are exercised weekly. The STG complies with the ASME water induction prevention guidelines.

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

*These are air cooled salient type pole generators. **The inspection frequencies are being evaluated, presently expected to be 6 years between major inspections.

6.3 TRANSFORMERS & ELECTRICAL SYSTEMS

Generator Step-Up Transformer (GSU)

All 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 H_2, CO and moisture detector.

6.4 CONTROL ROOMS & CONTROL SYSTEMS

The Plant employs 41 persons. There are 30 persons assigned to four shift groups following 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 is 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.

6.5 FUEL STORAGE & HANDLING

There is one outdoors storage pile divided in two areas unprocessed and boiler ready fuel. Fuel is received by trucks, and unloaded via truck tippers-dumpers. All fuel is processed through the hoggers which are hammer mills that cut oversized fuel into smaller pieces to make it boiler ready. There are screens before the hoggers that allow properly sized fuel to bypass the hogger and be directed to the boiler ready pile in the yard. From the pile the fuel is recovered by an automatic re-claimer and sent to two day silos or bins prior to being used in the boiler. The fuel boiler feed equipment from the day bins to the boiler is metered and controlled.

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 15 days of fuel 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 GRU owned 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.

6.6 ANCILLARY EQUIPMENT & SYSTEMS – BALANCE OF PLANT

The inspection of the facility included walk down all of the major Plant equipment. All equipment observed was operating as expected.

Condensing - Cooling Water

Cooling water is recycled water and well water. The recycled water is received via a pipeline from the municipal sewage treatment plant. Well water is from two deep wells in the withinthe Plant. Approximately 65% of the cooling water is recycled, the rest is from the well or RO cells reject water and backwash. 100% of the makeup demin and potable water used in the Plant is

from the wells. The cooling tower is of carbon reinforced fiberglass construction, forced draft, with five cells. No risk aggravating factors were observed.

Hydrogen
Hydrogen is not used in the Plant.

Ammonia
There is one approximately 10,000 gallons tank that stores 17% aqueous ammonia used for NOx reduction. No risk aggravating factors were observed.

Service Water
Service water to this facility is supplied by wells.

Process Water
The Plant produces its own boiler feed water using an house facility that uses RO and electric ionic removal equipment. Demineralized water is stored in a steel tank.

Waste & Effluent Handling
No risk aggravating factors were observed in the waste and effluent handling facility. Ashes are land filled. This is a zero discharge Plant.

Waste water (primarily from ash handling) is evaporated using a fallen film evaporator that uses a 700 HP compressor to pressurize waste steam. The resultant solids are compressed and land filled.

Compressed Air
In house air compressors with adequate supply for both service water and instrument air. Service air was reported to be dried and filtered almost to instrument air quality.

Power Piping
No issues with power piping was reported.

Other Equipment
There is one diesel engine driven electric generator (standby service) to provide emergency power and light. Rated 750 kw, stand by duty. Switching and synchronizing is automatic.

7. MANAGEMENT PROGRAMS

7.1 GENERAL ORGANIZATION

Plant staffing and organization is in line with best practices in the IPP industry.

7.2 ORGANIZATION, QUALIFICATIONS & EXPERIENCE

The Plant is well organized with qualified operating and maintenance personnel. Plant personnel were trained by the OEM of the various plant equipment. Most personnel were reported to have come from similar power plants, all key Plant personnel have power plant experience.

Operator Training
After initial classroom and on-the-job training, additional training on as needed basis.

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

Work Permit
Work permits are generated for maintenance tasks. Hot work permits are used where required. There is a Lock Out/Tag Out procedure, Confined Space procedure.

7.3 MAINTENANCE, INSPECTION & TESTING

Organization, Qualifications & Experience
The Plant Maintenance personnel is experienced. Maintenance personnel is qualified by education, training and experience.

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.

Records & Analysis
The Plant is new, record keeping will be analyzed in future surveys.

Boilers and Steam Generators
The boiler is will undergo yearly internal inspections and NDE NDT.

Prime Movers and Generators
All rotating equipment maintenance protocols industry standards and OEM recommendations.

Transformers & Electrical Systems
Transformer DGA results were reviewed no aggravating factors were observed, however recommendations are issued.

Auxiliary Equipment & Systems - Balance of Plant
All other equipment in the plant was observed in good operating condition, well maintained.

Spare Parts & Contingencies
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 2.4 million USD.

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

Workshop & Repair Facilities
Major repairs will be performed by outside concerns. Plant staff is adequate to handle Preventative maintenance.

Contractors & 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.

7.4 RISK & SAFETY MANAGEMENT

Organization & Safety Programs
The Plant follows NAES' safety programs which comply with all regulating agencies requirements and industry best practices.

Safety Awareness & Auditing
Audit frequencies are being established. All personnel are responsible for safety.

Management of Change
There is a formal procedure for both engineering and operational changes. All changes are reviewed by appropriate personnel and signed off by the plant manager.

Environmental Issues and Operational Permits
There were no environmental or operational issues reported by the facility during this inspection

Housekeeping
Excellent Housekeeping throughout the Site.

8. LOSS HISTORY

No losses were reported.

9. LOSS ESTIMATES

9.1 BOILER AND MACHINERY LOSS ESTIMATES

Worst Case Boiler & Machinery Loss Estimates			
Event	**USD million**	**BI Time Element**	**Equipment Affected & Possible Event(s)**
PML	**49.2**	8 months	Steam Turbine + Generator; 116MW Capacity; Major blade, rotor or gearbox failure caused by mechanical failure, overspeed or loss of lube oil.
PD	9.1		
BI	40.1		
EML	**235.9**	30 months	CFB - Sub-critical Circulating Fluidised Bed Boiler; 930000 lbs/hr steam Capacity; Massive tube failure resulting in steam explosion and damage to peripheral plant
PD	85.9		
BI	150.0		

BI Notes: BI calculated from average fixed mthly/annual revenue. Recovery periods are without regard to the availability of spare equipment. Any contractual or independent system operator penalties were not considered.

9.2 INSURED VALUES

TOTAL INSURABLE VALUES			
PD		**TIME ELEMENT**	
Buildings	**$8,998,603**	**BI**	**$90,185,000**
M&E	**$280,396,236**	**EE**	
Contents	**$4,839,000**	**Rents**	
Stock			
Tanks			
Other			
TOTAL	**$294,233,839**	**TOTAL**	**$90,185,000**

Note: The reported BI value is for a period of 18 months.

10. APPENDIX

General Map, red marker indicates Plant location.