



October 6, 2017

Mr. Tom Brown  
Chief Operating Officer  
Gainesville Regional Utilities  
301 SE 4<sup>th</sup> Avenue  
Gainesville, Florida 32601

Re: GREC Independent Engineer's Report – Phase 2  
Analysis of Operating Alternatives for GREC  
Burns & McDonnell Project No. 101300

Dear Mr. Brown:

Burns & McDonnell Engineering Company, Inc. (“Burns & McDonnell”) was retained by Gainesville Regional Utilities (“GRU”) to prepare an Independent Engineer’s Report (“IE Report”) on the Gainesville Renewable Energy Center (“Plant” or “GREC”). The Plant is a biomass-fired power production facility with a nameplate capacity of approximately 100 MW located in Gainesville, Florida. GRU is considering purchasing the Plant.

Burns & McDonnell recently completed the IE Report which evaluated whether the Plant was designed, permitted, and constructed in a manner that can provide a long-term, dependable power generating resource. In addition to the conclusions reached during the IE Report, GRU requested that Burns & McDonnell review potential operation and maintenance practices and engineering solutions that may allow GRU to better utilize GREC within its power supply fleet.

## **BACKGROUND**

The Plant is a biomass-fired power production facility with a nameplate capacity of approximately 100 MW located in Gainesville, Florida, adjacent to GRU’s Deerhaven Generating Station. The Plant includes one 100 percent woody biomass bubbling fluidized bed (“BFB”) boiler with selective catalytic reduction (“SCR”), baghouse, sorbent injection, zero-liquid discharge (“ZLD”), and a steam turbine generator (“STG”).

Burns & McDonnell reviewed the current staffing levels at the Plant to assess how the Plant’s staffing may be incorporated into GRU’s existing resources. Burns & McDonnell evaluated four operating scenarios that may allow GRU to better utilize GREC within its power portfolio.

## **STAFFING AND OPERATIONS REVIEW**

The current owner of the Plant, Energy Management, Inc (“EMI”), has contracted operation and maintenance activities for both the Plant and fuel supply to North American Energy Services, Inc. (“NAES”) and Biomass Resource Management (“BRM”), respectively. A total of 39 employees currently make up the staff of NAES for GREC. BRM has a staff of four (4) employees dedicated to GREC. NAES provides all things necessary for the proper operation and maintenance of the Plant

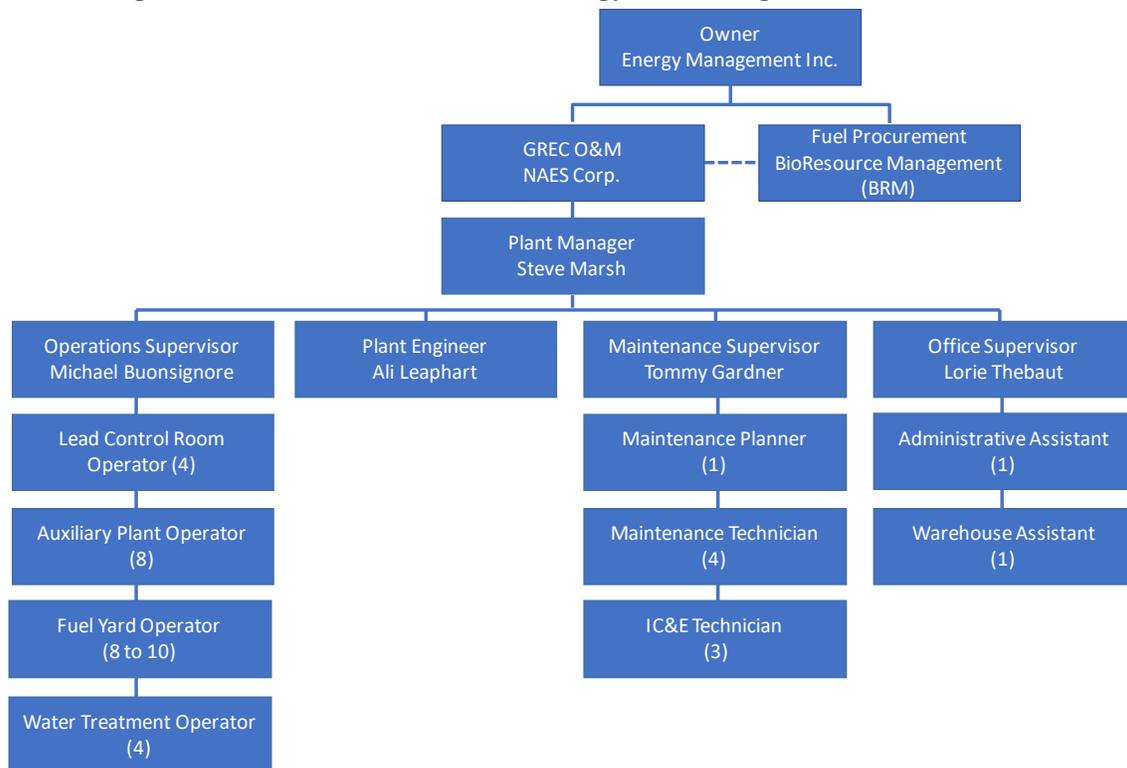
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including day-to-day operation and maintenance, long-term maintenance planning, spare parts management, and other responsibilities required to maintain the Facility in proper working order.

In addition to the NAES staff, four employees are contracted through BRM for fuel management and procurement. The four employees consist of a Fuel Procurement Manager, Biomass Forester, Quality Control Technician, and Scale Attendant. BRM is charged with fuel procurement and delivery operations among other tasks.

The organizational structure of the Plant is included in Figure 1. The overall staffing of the Facility appears to be similar to other biomass projects within the industry.

**Figure 1: Gainesville Renewable Energy Center Organizational Structure**



After the acquisition of the Plant, GRU may have the ability to slightly reduce O&M costs specifically at GREC. Mainly, this is due to some of the roles and functions currently performed at the Plant having the ability to be provided by existing staff at other GRU facilities as part of a larger generation portfolio as opposed to a standalone plant. However, GRU indicated it has several positions that are currently unfilled across its overall staff for generation and operations. Personnel at either GREC or existing GRU facilities



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may need to be augmented to reduce O&M costs specifically at GREC after the acquisition while also filling the positions that are currently open and fulfilling those needs.

After the acquisition, GRU should assess the roles and functions that are currently performed at GREC as a standalone unit that may be able to be performed within GRU's portfolio. Additionally, GRU will need to assess the overall GREC staff to best position those personnel at either the Plant, GRU's other plants, or potentially in other roles within GRU's operations and maintenance staff that may currently be unfilled. Overall, the Plant is effectively and efficiently operated and maintained and Burns & McDonnell did not identify areas to significantly reduce the O&M costs.

#### **ALTERNATIVE OPERATING SCENARIOS**

GRU requested Burns & McDonnell evaluate several operating scenarios that GRU may be able to utilize the Plant within its portfolio, both in the short-term and long-term.

Burns & McDonnell developed screening level estimates for costs and performance parameters for five operating scenarios. These parameters are to be used by GRU to conduct financial analyses and evaluation of these options. The scenarios that were evaluated include:

1. Emergency reserve status: This scenario evaluates placing the Plant in a status of emergency cold-standby, similar to the operating status GREC has recently experienced.
2. Baseload: The Plant would be dispatched and operated as a baseload unit.
3. Retirement: This scenario evaluates the decommissioning and demolition of the Plant.
4. Long-term layup: This scenario evaluates placing the Plant in a status of a long-term layup, sometimes referred to a "mothballed" status.
5. Lower minimum load: This scenario evaluates potential capital improvements that can provide an increased amount of turndown to improve the operational flexibility of the Plant.

The following sections discuss each of these operating scenarios.

#### ***Emergency Reserve Status***

Due to low wholesale market prices driven largely by lower natural gas prices, the dispatch cost of the Plant is typically higher than that of other resources. Thus, the economic benefits of the energy produced by GREC is less than other lower cost resources. However, maintaining the Plant in an emergency reserve status may be required to provide a reliable source of backup power in the event GRU's system experiences higher loads or the loss of power due to a forced outage of a unit or transmission constraints. Most recently, the Plant has been operating in an emergency reserve status, or emergency cold-standby.



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To operate in this manner, the Plant will have to maintain a full O&M staff because the Plant could be dispatched on short notice. Burns & McDonnell assumed the overall capacity factor of the Plant would be 10 percent or less. Utilizing information provided within Phase 1 by the current operator, Burns & McDonnell developed an O&M cost forecast and major capital expenditure projects under an emergency reserve status. Attachment 1 presents the detailed O&M forecast for the emergency reserve status over the full study period from 2018 to 2047. The forecast is presented in real/constant dollars (2017\$) and has not included any inflation.

Generally, the overall annual non-fuel O&M costs for GREC are approximately \$7 million to \$7.5 million per year.

### ***Baseload***

In the event the Plant becomes more economical to dispatch potentially due to higher natural gas prices, the dispatch of the unit may reflect baseload operation in which the Plant is generating power for the entire year outside of scheduled maintenance outages. Baseload operation assumes the Plant is generating power at all times and is not cycling on and off on a regular basis. Under baseload operations, while the Plant may not be cycled, the Plant would likely operate a different operating load points between the minimum and maximum output as load and wholesale energy prices dictated.

Burns & McDonnell assumed the overall capacity factor of the Plant would be 75 percent under baseload operations. Utilizing information provided within Phase 1 by the current operator, Burns & McDonnell developed an O&M cost forecast and major capital expenditure projects under a baseload dispatch. Attachment 2 presents the detailed O&M forecast for the baseload dispatch over the full study period from 2018 through 2047. The forecast is presented in real/constant dollars (2017\$) and has not included any inflation.

Generally, the overall annual non-fuel O&M costs for GREC are approximately \$10.5 million to \$11.5 million per year. Some years in which large major maintenance is required the overall annual non-fuel O&M costs are over \$15 million per year.

### ***Retirement***

The objective of the scenario was to develop a screening level cost estimate for decommissioning the plant and returning the site to a similar condition that existing prior to development.

### ***Decommissioning Methods***

For purposes of this Study, Burns & McDonnell has assumed that the site will be decommissioned as a single project, allowing the most cost-effective demolition methods to be utilized. A summary of the means and methods that could be employed is summarized in the following paragraphs. It would be the



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contractor's responsibility to determine means and methods that result in safely decommissioning the Plants at the lowest possible cost.

High grade assets would be removed from the site, to the extent possible. This would include items such as transformers, transformer coils, circuit breakers, electrical wire, condenser plates and tubes, and heater tubes. High grade assets include precious alloys such as copper, aluminum-brass tubes, stainless steel tubes, and other high value metals occurring in plant systems. High grade asset removal would occur up-front in the schedule to reduce the potential for vandalism, to increase cash flow, and for separation of recyclable materials to increase scrap recovery. Methods of removal vary with the location and nature of the asset. Small transformers, small equipment, and wire would likely be removed and shipped as-is for processing at a scrap yard. Large transformers, STG, and condensers would likely require some on-site disassembly prior to being shipped to a scrap yard.

Construction and Demolition ("C&D") waste includes items such as non-asbestos insulation, roofing, wood, drywall, plastics, and other non-metallic materials. C&D waste would typically be segregated from scrap and concrete to avoid cross-contaminating of waste streams or recycle streams. C&D demolition crews could remove these materials with equipment such as excavators equipped with material handling attachments, skid steers, etc. This material would be consolidated and loaded into bulk containers for disposal.

In general, the boiler and stack could be felled and cut into manageable sized pieces on the ground. First the structures around the boiler would need to be removed using excavators equipped with shears and grapples. Stairs, grating, elevators, and other high structures would be removed using an "ultra-high reach" excavator, equipped with shears. Following removal of these structures, the boiler would be felled, using explosive blasts. The boiler would then be dismantled using equipment such as excavators equipped with shears and grapples, and the scrap metal loaded onto trailers for recycling.

BOP structures and foundations would likely be demolished using excavators equipped with hydraulic shears, hydraulic grapples, and impact breakers, along with workers utilizing open flame cutting torches. Steel components would be separated, reduced in size, and loaded onto trailers for recycling. Concrete would be broken into manageable sized pieces and stockpiled for crushing on-site. Concrete pieces would ultimately be loaded in a hopper and fed through a crusher to be sized for on-site disposal.

#### *Decommissioning Assumptions*

The following general assumptions were made as the basis for the screening level decommissioning cost estimates.

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1. The estimates are inclusive of all cost necessary to properly demolish all structures, equipment, boilers, tanks, conveying and ancillary buildings, and any other associated equipment and buildings to grade level. For purposes of this Study and the included cost estimates, the sites will be restored to a condition suitable for industrial use.
2. Pricing for all estimates is in 2017 dollars.
3. Site areas will be graded to achieve suitable site drainage to natural drainage patterns and seeded but grading will be minimized to the extent possible.
4. For purposes of this Study, it is assumed that none of the equipment will have a salvage value in excess of the scrap value of the materials in the equipment. All equipment, steel, copper, and other metals will be sold as scrap.
5. A 20 percent contingency is included on the direct costs in the estimates prepared as part of this study to cover unknowns. Owner’s indirect costs are included as 5 percent of the direct costs.
6. Market conditions may result in cost variations at the time of contract execution.

*Decommissioning Estimate*

Burns & McDonnell has prepared a cost estimate in 2017 dollars for the decommissioning of the GREC. These cost estimates are summarized in Table 1. When GRU determines that the Plant should be retired, the above grade equipment and steel structures are assumed to have sufficient scrap value to a scrap contractor to offset a portion of the decommissioning costs. GRU will incur costs in the demolition and restoration of the site less the scrap value of equipment and bulk steel.

**Table 1: Decommissioning Cost Summary (2017\$)**

Plant	Decommissioning Costs	Scrap Value	Total Project Cost (Decommissioning less Scrap)
GREC	\$9 million to \$12 million	\$4 million to \$5 million	\$5 million to \$7 million

The total net project costs presented above include the costs to return the site to an industrial condition suitable for reuse for development of an industrial facility. Included are the costs to dismantle the power generating equipment at GREC as well as the costs to dismantle balance of plant (“BOP”) facilities and grading and reseeding the site to return it to a condition usable for industrial use.

The decommissioning costs are based on an estimate model that Burns & McDonnell uses for decommissioning studies. The estimate model has been developed internally over the years using help from demolition contractors, as well as experience with actual contractor bids on projects where Burns & McDonnell has been the owner’s engineer. Specifically, Burns & McDonnell used a decommissioning cost study model that was internally prepared for a similar sized unit and adjusted this for some GREC

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specific issues, such as the appropriate AQCS equipment. This was a screening level estimate to be used within planning studies.

### ***Long-Term Layup***

The objective of the scenario was to develop a plan for economically placing the Plant into layup status, maintaining the equipment until it is called on to restart, and restarting the Plant when called upon during the layup period.

### *Initial Plant Layup*

Burns & McDonnell estimated the overall one-time cost to place the Plant in a condition to restart later. Burns & McDonnell leveraged existing experience off evaluating long-term layups on similar facilities as the basis for this assessment.

The following general assumptions were the basis of the screening level cost estimate for placing the Plant in long-term layup status.

1. GRU will burn all biomass fuel in the storage yard prior to commencement of layup activities.
2. Any remaining chemicals will be removed from the site as part of the layup activities.
3. All rolling stock, remaining spare parts, tools, inventory, or minor equipment in the buildings will remain on-site to be available for future plant operation if necessary.
4. No hazardous material abatement will be performed as part of the plant layup activities.
5. The boiler, steam turbine, and steam cycle will be laid up dry with nitrogen from the on-site nitrogen generator, consisting of the following activities:
  - a. Chemical clean boilers
  - b. Inspect and repair fans
  - c. Clean and patch ductwork
  - d. Clean condenser water boxes
  - e. Clean precipitator
  - f. Clean ash handling system
  - g. Purge hydrogen in generators
  - h. Clean and cap chimney
6. The on-site nitrogen generator is assumed to be used on the boiler, on the water/steam cycle system, and on the turbine. The systems will operate continuously throughout the layup period to prevent corrosion.
7. The circulating water system will be drained. The auxiliary cooling system will continue to draw water from wells to provide cooling to auxiliary equipment required to remain in operation during layup period.
8. The demineralized water treatment system will be taken out of service and the system drained. No demineralized water will be required during the layup period.

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9. An allowance is included in balance of plant costs to cover modifications necessary for fire protection system modifications as needed. A specific plan has not been developed at this time. It will likely include modifications to the service water system and fire protection system to drain portions of the service water system not required to remain in service during the layup period and either closing valves or installing blanking plates to isolate the closed portions of the system. All fire protection systems will remain in service.
10. No additional freeze protection has been included.
11. costs have been included to address site clean-up of contaminated soils, hazardous materials, or other conditions present on-site having a negative environmental impact. No allowances are included for unforeseen environmental remediation activities.
12. The fuel pile area and any ponds will remain as-is.
13. An allowance for indirect costs and contingency have been included for engineering, project management, and corporate overhead costs.
14. Pricing for all estimates is based on 2017 dollars.

Based on Burns & McDonnell's experience and the general assumptions provided above, a cost estimate range was prepared for the activities associated with placing the Plant into a long-term layup status. Burns & McDonnell estimates a one-time cost of approximately \$750,000 to \$1,250,000 to place the Plant in a condition to restart later.

#### *Operations & Maintenance*

GRU will need to address certain requirements and incur associated costs for operations and maintenance activities recommended for the Plant during the layup period. This will help preserve the long-term operation of the Plant. These steps outlined below are typically utilized with the intention of reducing equipment failure and overhauls required at the time of Plant restart. The following general assumptions serve as the basis of the screening level cost estimate range for operations and maintenance activities for the Plant during the layup period.

1. The plant will be staffed by three full-time employees that will perform routine operation and maintenance (O&M) activities on the equipment, including manually rotating small motors and pumps and maintaining equipment required to support the layup period. Unlike the emergency reserve status, a full staff is not required as the Plant will not be dispatched without significant lead time.
2. An allowance for third-party costs are included to cover items such as stack inspections, CEMS maintenance, etc.
3. No costs are included in the third-party costs to cover the cost of power for station service or other utilities during the layup period. Although costs for station utilities have not been estimated by Burns & McDonnell, they should be considered in the operating and maintenance costs of the facility during the layup period. This will include station electric service, potable water, etc.

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4. Due to its proximity to the existing Deerhaven Generating Station, security costs assume that the Deerhaven staff will be able to provide site security service.
5. Insurance costs have not been estimated by Burns & McDonnell, but will need to remain in place throughout the layup period. Specific insurance coverage and rates should be discussed with legal and insurance representatives to determine appropriate coverage levels.
6. Permit renewals have not been estimated by Burns & McDonnell.
7. An allowance for indirect costs and contingency have been included for engineering, project management, and corporate overhead costs.
8. Pricing for all estimates is based on 2017 dollars.

Based on the assumptions provided above, a cost estimate was prepared for the O&M activities required during the layup period are approximately \$500,000 to \$750,000.

#### *Plant Restart*

Prior to restarting the Plant, GRU will have conduct some activities for restarting the Plant at the end of the layup period. The following assumptions were used as the basis of the screening level cost estimate range for restarting the Plant at the end of the layup period.

1. The restart costs outlined below are only inclusive of activities needed to be performed to take the plant out of layup status and return it to service. These costs do not include bringing in additional staffing to return the plant to pre-layup staffing levels or training new staff members.
2. Costs for fuel used during startup and revenue from power generation during startup are not included in this analysis.
3. Temporary systems put in place to support layup conditions will be left in place; however, modifications to the system will be made to support placing the Plant back into service. This will include taking the dehumidification equipment out of service but leaving the equipment in place, with necessary modifications to the boilers and steam turbines to return them to normal service. Similar provisions will be made to remove other systems from service, such as freeze protection, that have been installed as part plant layup.
4. Boilers will be flushed and refilled.
5. An allowance has been included in the costs to account for unexpected failure of miscellaneous balance of plant equipment upon restart.

Based on the general assumptions provided above, a cost estimate range was prepared for restarting the Plant at the end of the layup period and is approximately \$1,000,000 to \$1,500,000.

#### **Lower Minimum Load**

According to GREC, the minimum operating output for the Plant is 70 MW as defined within the power purchase agreement (“PPA”). Burns & McDonnell inquired with the staff whether the Facility would have the ability to operate at a lower turndown point than is currently defined within the PPA. GREC

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indicated the Facility is limited to a technical turndown point of approximately 60 MW due to a backend temperature requirement located at the injection point of the selective catalytic reduction (“SCR”) system. The injection point of the SCR requires a minimum effective temperature of 375°F. If the unit is operating at less than approximately 60 MW, the backend temperature drops below 375°F and the SCR becomes ineffective. The installation of duct burners, heating coils, or an economizer bypass could be implemented as means to increase the overall temperature at lower load points, however this may require a modification to the air permit.

Burns & McDonnell developed screening level cost estimates ranges to make modifications to allow the plant to turn down to 25 MW (about 25 percent of full output), and corresponding performance characteristics. As identified above, the constraint on turning down the plant below its current lower limit of 60 MW is the temperature upstream of the SCR, which must be 375°F or more for the catalyst to be sufficiently effective to meet emissions limits. Without considerations to the backend equipment the normal turndown for a BFB is 1:4, which would meet the GRU requirement. As the Plant turns down, the heat input into the boiler reduces, leading to lower flue gas temperature out of the boiler. These lower temperatures then lead to lower temperature into the SCR to the point that it gets too low for the SCR to effectively operate. Since eliminating the SCR is not feasible, some means must be implemented to maintain the flue gas temperature at sufficient levels into the SCR.

As mentioned above, three approaches were considered:

1. Adding natural gas-fired duct burners to the flue ducts before the SCR to take advantage of the remaining oxygen in the flue gas and elevate the temperature
2. Adding steam coils in the ducts themselves;
3. Adding a bypass duct around the economizer to reduce the heat extracted from the flue gas before it reaches the SCR.

All three are feasible in principle, although the details of their implementation would have to be further evaluated to determine whether would operate over the turndown range desired by GRU. For this assessment, Burns & McDonnell selected the auxiliary duct burners for further evaluation based on several reasons.

#### *Duct Burner Modification*

Duct burners are a proven technology that has been used for such purposes before which offer several advantages.

1. They require little additional space, as they can be inserted as a replacement section in the existing duct.

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2. They can be easily modulated to warm up the flue gas to the required temperature.
3. There is existing natural gas infrastructure and supply at the Plant for startup that may be utilized since the startup burners are not required once biomass combustion is taking place.
4. They do not materially modify the boiler design, and therefore may avoid a potentially risk of upsetting the boiler operation and the overall heat balance as much as the other two methods would.
5. They are also very likely to be the least expensive to implement, as they avoid extensive piping and re-ducting and consequent routing and possible structural issues of the other two methods.

Based on consultation with a burner supplier, the screening cost range of this solution is approximately \$2 million to \$4 million. Regarding the heat rate, the impact should be minor with no more than 1 percent increase even at the lowest turndown, as the amount of natural gas required to maintain temperatures would be small. The ramp rate would not be affected as the burners operate independently of the boiler, and would remain relatively slow in the 2 to 4 MW/min range. The addition of duct burners would require air permit modifications.

#### *Dual Fuel Capability*

Much more flexibility could be gained if the boiler could be converted to burn natural gas instead of biomass, or in addition to it. This is a more complex and expensive solution that would need to be carefully studied. However, conversion to natural gas does appear to be feasible and offers significant advantages in overall flexibility. The burner supplier has had experience with the conversion to gas of two pet coke circulating fluidized bed (“CFB”) boilers, which are more complicated than biomass BFBs. The main issue with the boiler is that heat transfer would change from the existing 60 percent radiant and 40 percent convective to the reverse. This could cause problems with the superheater tubes, which would experience higher temperatures and therefore may have to be replaced with higher strength/lighter weight alloys. Another possible issue is National Fire Protection Association (“NFPA”) 85 furnace implosion considerations due to the quick fuel cutoff that occurs with natural gas, and the resulting negative furnace pressure excursions that could cause structural problems. This is a common issue with coal to gas conversions, and in Burns & McDonnell’s experience it can be addressed with proper shutoff controls to limit the excursions. Furthermore, newer, modern furnaces are typically more robust and can take higher pressure differentials.

Conversion would involve the addition of low NO<sub>x</sub> burners in the intermediate section of the boiler, above the fluidized bed and below the first set of superheaters. Some of the water tube panels would have to be replaced to allow the insertion of the new burners, but that should not be a problem as the required surface area is reduced. Cofiring could be handled by means of a totalizer that adjust biomass addition and natural gas flow to achieve the desired output and ratio of fuels. According to the vendor, cofiring to 70 percent of capacity should be achievable, and possibly to 100 percent. The air for the new burners

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could be diverted from the primary air or new fans could be installed. The new fans would be relatively small and therefore not too difficult to install on an existing site. The natural gas supply piping may have to be replaced with a slightly larger size.

According to the vendor, the expected screening cost range for this approach is approximately \$5 million to \$8 million, plus \$1 million if the super heater tube metallurgy needed to be upgraded. The heat rate when firing natural gas would probably deteriorate by 1 percent to 2 percent. Natural gas results in higher stack losses via water vapor due to its higher hydrogen content (it has a higher ratio of gross to net heating value), but it requires less excess oxygen and therefore less air for a stable combustion, which reduces losses. Ramp rates with natural gas should improve by almost a factor of 10 from the lower heat content biomass, to approximately 10 to 20 MW/min.

**SUMMARY**

Table 2 presents the overall summary of costs for the retirement, long-term layup, and lower minimum load alternatives evaluated within this assessment.

**Table 2: Summary of Costs**

<b>Alternative</b>	<b>Cost (\$, 2017)</b>
Retirement/Decommissioning (one-time)	\$5 million to \$7 million
Long-Term Layup	
Initial Plant Layup (one-time)	\$750,000 to \$1,250,000
Operations & Maintenance (per year)	\$500,000 to \$750,000
Plant Restart (one-time)	\$1,000,000 to \$1,500,000
Lower Minimum Load	
Duct Burner Modifications (one-time)	\$2 million to \$4 million
Dual Fuel Capability (one-time)	\$6 million to \$8 million



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If you have any questions regarding this information, please contact Mike Borgstadt at 816-822-3459 or [mborgstadt@burnsmcd.com](mailto:mborgstadt@burnsmcd.com).

Sincerely,

A handwritten signature in blue ink, appearing to read "Mike Borgstadt".

Mike Borgstadt, PE  
Project Manager

MEB/meb

cc: Dino De Leo, GRU

**ATTACHMENT 1**

Gainesville Regional Utilities  
 Gainesville Renewable Energy Center  
 Operating, Maintenance & Capital Expenditure Forecast - Emergency Reserve Status

Cost projections are presented in real/constant dollars (2017\$), except for percentages (%), hours, and generation (MWh)

Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047
<b>Operating Data</b>																														
Capacity Factor	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Annual Power Generation	MWh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total Run Hours		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>Fuel Cost Break Down</b>																														
Fuel Cost per Unit	\$/GT	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	
<b>Gross Fuel Costs</b>																														
Fuel Cost	\$	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Other Costs	\$	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
<b>Total Fuel Costs</b>	\$	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
<b>Operations &amp; Maintenance Expense</b>																														
<b>Fixed</b>																														
Site Labor & Benefits	\$	4,402,000	4,402,000	4,402,000	4,402,000	4,402,000	4,402,000	4,402,000	4,402,000	4,402,000	4,402,000	4,402,000	4,402,000	4,402,000	4,402,000	4,402,000	4,402,000	4,402,000	4,402,000	4,402,000	4,402,000	4,402,000	4,402,000	4,402,000	4,402,000	4,402,000	4,402,000	4,402,000	4,402,000	
General & Administrative	\$	258,000	258,000	258,000	258,000	258,000	258,000	258,000	258,000	258,000	258,000	258,000	258,000	258,000	258,000	258,000	258,000	258,000	258,000	258,000	258,000	258,000	258,000	258,000	258,000	258,000	258,000	258,000	258,000	258,000
Consumables, Chemicals & Testing	\$	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000
Maintenance-Parts and Equipment	\$	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000
Maintenance-Services	\$	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000
Utilities	\$	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000
<b>Variable</b>																														
Consumables, Chemicals & Testing	\$	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Maintenance-Parts and Equipment	\$	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Maintenance-Services	\$	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Ash Disposal	\$	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<b>Total Operations Expense</b>	\$	\$7,239,000	\$7,239,000	\$7,239,000	\$7,239,000	\$7,239,000	\$7,239,000	\$7,239,000	\$7,239,000	\$7,239,000	\$7,239,000	\$7,239,000	\$7,239,000	\$7,239,000	\$7,239,000	\$7,239,000	\$7,239,000	\$7,239,000	\$7,239,000	\$7,239,000	\$7,239,000	\$7,239,000	\$7,239,000	\$7,239,000	\$7,239,000	\$7,239,000	\$7,239,000	\$7,239,000	\$7,239,000	
<b>Routine Maintenance/Inspection Costs</b>																														
Major Fan Inspection	\$		15,000		15,000		15,000		15,000		15,000		15,000		15,000		15,000		15,000		15,000		15,000		15,000		15,000		15,000	
BFP Inspection	\$				100,000				100,000				100,000				100,000				100,000				100,000				100,000	
Other Major Pump Inspection	\$				75,000				75,000				75,000				75,000				75,000				75,000				75,000	
BFP & Other Major Valves	\$		50,000		50,000		50,000		50,000		50,000		50,000		50,000		50,000		50,000		50,000		50,000		50,000		50,000		50,000	
Transformer Major Maintenance	\$				60,000				60,000				60,000				60,000				60,000				60,000				60,000	
Boiler Inspection	\$		36,000		36,000		36,000		36,000		36,000		36,000		36,000		36,000		36,000		36,000		36,000		36,000		36,000		36,000	
Boiler Chemical Cleaning	\$				250,000				250,000				250,000				250,000				250,000				250,000				250,000	
<b>Major Maintenance Costs</b>																														
SCR Catalyst Replacement	\$																													
Turbine Major Maintenance	\$																													
Turbine Valves	\$																													
Baghouse Replacements	\$																													
Material Handling/Fuel Yard Equipment	\$																													
Miscellaneous Equipment Allowance	\$	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	
<b>Total Maintenance Cost</b>	\$	\$50,000	\$226,000	\$50,000	\$50,000	\$561,000	\$50,000	\$50,000	\$226,000	\$50,000	\$50,000	\$311,000	\$50,000	\$50,000	\$226,000	\$300,000	\$50,000	\$311,000	\$50,000	\$50,000	\$226,000	\$50,000	\$50,000	\$311,000	\$50,000	\$300,000	\$226,000	\$50,000	\$50,000	\$311,000
<b>Total Non-Fuel Operating Expenses</b>	\$	\$7,289,000	\$7,465,000	\$7,289,000	\$7,289,000	\$7,800,000	\$7,289,000	\$7,289,000	\$7,465,000	\$7,289,000	\$7,289,000	\$7,289,000	\$7,550,000	\$7,289,000	\$7,289,000	\$7,289,000	\$7,550,000	\$7,289,000	\$7,289,000	\$7,465,000	\$7,289,000	\$7,289,000	\$7,550,000	\$7,289,000	\$7,289,000	\$7,465,000	\$7,289,000	\$7,289,000	\$7,550,000	
<b>Total Operating Expenses</b>	\$	\$7,289,000	\$7,465,000	\$7,289,000	\$7,289,000	\$7,800,000	\$7,289,000	\$7,289,000	\$7,465,000	\$7,289,000	\$7,289,000	\$7,289,000	\$7,550,000	\$7,289,000	\$7,289,000	\$7,289,000	\$7,550,000	\$7,289,000	\$7,289,000	\$7,465,000	\$7,289,000	\$7,289,000	\$7,550,000	\$7,289,000	\$7,289,000	\$7,465,000	\$7,289,000	\$7,289,000	\$7,550,000	

**ATTACHMENT 2**

Gainesville Regional Utilities  
 Gainesville Renewable Energy Center  
 Operating, Maintenance & Capital Expenditure Forecast - Baseload Dispatch

Cost projections are presented in real/constant dollars (2017\$), except for percentages (%), hours, and generation (MWh)

Year		2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047
<b>Operating Data</b>																															
Capacity Factor	%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	
Annual Power Generation	MWh	670,140	670,140	670,140	670,140	670,140	670,140	670,140	670,140	670,140	670,140	670,140	670,140	670,140	670,140	670,140	670,140	670,140	670,140	670,140	670,140	670,140	670,140	670,140	670,140	670,140	670,140	670,140	670,140	670,140	
Total Run Hours		6,570	13,140	19,728	26,298	32,868	39,438	46,026	52,596	59,166	65,736	72,324	78,894	85,464	92,034	98,622	105,192	111,762	118,332	124,920	131,490	138,060	144,630	151,218	157,788	164,358	170,928	177,516	184,086	190,656	197,226
<b>Fuel Cost Break Down</b>																															
Fuel Cost per Unit	\$/GT	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	\$28.00	
<b>Gross Fuel Costs</b>																															
Fuel Cost	\$	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	\$24,393,000	
Other Costs	\$																														
<b>Total Fuel Costs</b>	<b>\$</b>	<b>\$24,393,000</b>																													
<b>Operations &amp; Maintenance Expense</b>																															
<b>Fixed</b>																															
Site Labor & Benefits	\$	5,050,000	5,050,000	5,050,000	5,050,000	5,050,000	5,050,000	5,050,000	5,050,000	5,050,000	5,050,000	5,050,000	5,050,000	5,050,000	5,050,000	5,050,000	5,050,000	5,050,000	5,050,000	5,050,000	5,050,000	5,050,000	5,050,000	5,050,000	5,050,000	5,050,000	5,050,000	5,050,000	5,050,000	5,050,000	
General & Administrative	\$	272,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000
Consumables, Chemicals & Testing	\$	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000	270,000
Maintenance-Parts and Equipment	\$	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000	729,000
Maintenance-Services	\$	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000	801,000
Utilities	\$	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000	779,000
<b>Variable</b>																															
Consumables, Chemicals & Testing	\$	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000	1,038,000
Maintenance-Parts and Equipment	\$	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000
Maintenance-Services	\$	576,000	576,000	576,000	576,000	576,000	576,000	576,000	576,000	576,000	576,000	576,000	576,000	576,000	576,000	576,000	576,000	576,000	576,000	576,000	576,000	576,000	576,000	576,000	576,000	576,000	576,000	576,000	576,000	576,000	576,000
Ash Disposal	\$	675,000	675,000	675,000	675,000	675,000	675,000	675,000	675,000	675,000	675,000	675,000	675,000	675,000	675,000	675,000	675,000	675,000	675,000	675,000	675,000	675,000	675,000	675,000	675,000	675,000	675,000	675,000	675,000	675,000	675,000
<b>Total Operations Expense</b>	<b>\$</b>	<b>\$10,315,000</b>																													
<b>Routine Maintenance/Inspection Costs</b>																															
Major Fan Inspection	\$		15,000			15,000			15,000			15,000			15,000			15,000			15,000			15,000			15,000			15,000	
BFP Inspection	\$		100,000			100,000			100,000			100,000			100,000			100,000			100,000			100,000			100,000			100,000	
Other Major Pump Inspection	\$		75,000			75,000			75,000			75,000			75,000			75,000			75,000			75,000			75,000			75,000	
BFP & Other Major Valves	\$		50,000			50,000			50,000			50,000			50,000			50,000			50,000			50,000			50,000			50,000	
Transformer Major Maintenance	\$		60,000			60,000			60,000			60,000			60,000			60,000			60,000			60,000			60,000			60,000	
Boiler Inspection	\$	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000
Boiler Chemical Cleaning	\$				250,000				250,000					250,000				250,000			250,000					250,000			250,000		
<b>Major Maintenance Costs</b>																															
SCR Catalyst Replacement	\$			800,000				800,000				800,000					800,000				800,000				800,000				800,000		
Turbine Major Maintenance	\$										4,000,000										4,000,000								4,000,000		
Turbine Valves	\$					600,000					600,000										600,000								600,000		
Baghouse Replacements	\$	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000
Material Handling/Fuel Yard Equipment	\$																														