GAINESVILLE REGIONAL UTILITES
ENERGY SUPPLY DEVELOPMENT
TECHNICAL REQUIREMENTS FOR A REQUEST FOR PROPOSALS FOR BIOMASS-FUELED GENERATION CAPACITY

PURPOSE AND SCOPE

The City of Gainesville, d/b/a Gainesville Regional Utilities ("GRU") is seeking initial proposals for additional renewable base load electric generation to be constructed at its Deerhaven Generating Station ("Deerhaven") site. Off-site opportunities will be considered as well. Biomass and Municipal Solid Waste ("MSW") are the sole primary fuel options for any facility or participation to be considered. Accordingly, GRU is requesting that any entity interested in either developing or participating in these opportunities submit a response to this Request for proposals ("RFP") **by December 14, 2007, 2:00 PM EST**.

GRU anticipates a wide range of technologies and contractual structures to be represented in the proposals. GRU seeks proposals that offer the greatest value to GRU customers based on an evaluation of the new renewable generation resource's ability to provide: i) cost effective renewable capacity and/or energy benefits, ii) environmental attributes consistent with the preferences of the Gainesville community, and iii) enhanced and reliable energy supply for the GRU system.

The process GRU proposes to follow has two steps designed to provide structure while allowing flexibility and creativity in selecting an option or set of options to pursue this element of GRU's Integrated Resource Plan. In particular, GRU understands the significant difference in resources required to prepare a conceptual proposal with indicative pricing, compared to developing a binding proposal that will form the basis of a final contract. Accordingly, the first step of the process is to solicit the widest possible range of non-binding technological and financial structure proposals with this RFP. The second step of the process will be to invite a maximum of three Respondents to submit final binding proposals that will form the basis of contract negotiations. Step 1 of the evaluation process includes:

1. Solicitation of proposals for biomass/MSW-fueled generation capacity via this RFP;
2. A pre-submission workshop and Deerhaven site visit;
3. Submission of initial non-binding proposals;
4. Preliminary evaluation and screening of proposals, including limited discovery to clarify intent and technical details;
5. Selection of Respondents to be invited to make on-site presentations of their proposals to staff and consultants; and
6. Selection of a maximum of three Respondents to be invited to submit binding proposals for final selection.

ABOUT GRU

GRU is a municipally owned and operated electric, water, wastewater, natural gas, and telecommunication utility located in north central Florida. GRU serves approximately 90,000 retail and wholesale electric customers in Gainesville and the surrounding unincorporated areas. GRU reached a record peak demand of 481 net MW on August 8, 2007 and owns 611 MW of net summer generation capacity located at two sites, Deerhaven and John R. Kelly.

THE DEERHAVEN SITE

The Deerhaven site is located north of the City of Gainesville and includes approximately 3,000 acres (some of which is wetlands) with existing infrastructure which includes rail access, coal handling facilities, and 138 kilovolt looped transmission interconnected to both Florida Progress Energy and Florida Power and Light. The transmission system can accommodate additional generation capacity at Deerhaven up to 100 MW, but some upgrades may be required depending on the amount of capacity proposed.

A Florida Gas Transmission ("FGT") pipeline delivers natural gas to GRU. FGT's most recent assessment (November 27, 2006) indicates an available capacity of 10,867 mmBtu/day or 652 mmBtu/hr at the Deerhaven site while maintaining minimum pressures of 325 psig at Deerhaven and 400 psig at Kelly. In late 2003 GRU received a planning level estimate of $14,650,000 for the cost required to upgrade the pipeline to support a re-powering configuration of approximately 225 MW of additional CT capacity at Deerhaven.

The Deerhaven site currently uses approximately half of its 6.5 million gallons per day groundwater allocation. Reclaimed water may be made available to the site in the future. The site is licensed as a zero discharge facility requiring on-site recycling and/or treatment of all process waters via a brine concentrator. This is a requirement any new capacity at the Deerhaven site will be expected to adhere to. The site also has two clay-lined landfills for the management of combustion ash and brine salts as well as several process water ponds. The status and descriptions of the coal, natural gas and/or oil fired units existing on the site, together with anticipated emission control upgrades, may be found in GRU's 2006 Ten Year Site Plan submission to the Florida Public Service Commission available at www.GRU.com. Potential Respondents will be given the opportunity to view the site and ask questions.

ALLOWABLE FUELS

Biomass and Municipal Solid Waste are the sole fuel options for any facility to be constructed or for any participation by GRU in response to this RFP. Proposals may include facilities fueled by 100% biomass or some fuel combination of biomass and MSW.

Biomass fuel is categorized as forest, land clearing, and vegetative management products and by-products, excluding stumps from silviculture. Biomass fuel options to be considered for this RFP include, but are not limited to:

- Logging and Land Clearing Residues
- Urban Wood Waste (non-bagged)
- Forest Thinnings
- Pulpwood

Municipal Solid Waste generating technologies will only be considered if they employ advanced pollution controls. MSW fuel options include:

- Residential Class 1
- Commercial Class 1
- Automobile and Truck Tires
- Sorted Construction & Demolition Debris
- Bagged Urban Wood Waste

Natural gas and/or fuel oil are acceptable as backup fuels. Coal and petroleum coke are not acceptable as either primary or backup fuel options.

CAPACITY REQUIREMENTS

GRU requires economic base load capacity to diversify its energy supply portfolio. The amount of base load capacity that GRU requires under its most conservative set of assumptions (including conservation goals and non-renewal of wholesale contracts) is provided in Table 1 below. This table assumes that the energy produced has all-in production costs (including capital and financing, operation, maintenance, and fuel costs) at or below that of a new, natural gas-fired, F-class combined cycle plant. GRU is willing to consider larger sized units than the capacity requirements listed, especially in the earlier years, if appropriate to capture the benefits of cost and efficiency associated with various sized units balanced against fuel costs. GRU prefers to retain title to the power from any excess capacity and will manage marketing it off-system. For the same reasons, GRU is willing to consider smaller units that could be expanded through time as conditions warrant.

Table 1: Base Load Capacity Requirements
(Cumulative Net Megawatts "MW")

YEAR	MW
2008	63
2013	70
2018	92
2022	136

TYPE/COST OF CAPACITY

GRU is seeking firm base load capacity with a design capacity factor of 85% or higher. Capacity must have costs below that of new natural gas-fired, F-class combined cycle units on an all-in basis (including capital and financing, operation, maintenance, and fuel costs) to meet GRU's economic criteria. The variable production cost, used to economically dispatch the resource(s), will be among the factors considered in evaluating the proposals as it affects the ability to market any excess capacity. Finally, the Proposals involving integration with other manufacturing processes, such as ethanol production or wood products, will be considered.

FUEL AVAILABILITY & UNIT SIZE

GRU has conducted a number of studies of biomass fuel availability which are listed in Appendix A and are available from www.GRU.com. The most recent study, conducted by faculty of the University of Florida School of Forest Resources and Conservation in 2007 ("UFSFRC") is considered by GRU to be the most definitive and reliable. The study is still in a draft form as of the date of this proposal, and is subject to change. It takes into account the stumpage, harvesting, and transportation costs of a number of different types of biomass, and in particular, takes into account the competing markets for these resources and the effects of higher transportation fuel costs. This study clearly illustrates that the cost of biomass increases as the size of a unit and corresponding collection area is increased. GRU cannot guarantee the volume or price of the available biomass, with one exception, related to MSW.

The UFSFRC study also addresses MSW from the area within a two hour travel distance from Deerhaven. Information on the contract commitments and plans of each of the agencies responsible for the collection and disposal of this material was not available, suggesting that this information should be treated with caution.

As shown in Appendix A, Table 3 (from the Alachua County department of Public Works) approximately half of the MSW generated in Alachua County is collected from the incorporated area of the City of Gainesville. Accordingly, the City of Gainesville can commit to supply this volume of MSW to the proposed project. The remainder of the MSW from Alachua County is committed to be taken to the New River Landfill through 2018.

An assumption must be made concerning any tipping fees that might be collected, which in turn requires assumptions related to whether or not Gainesville's MSW is routed through the Alachua County waste collection facility (the Leveda Brown Environmental Park and Transfer Station). GRU prefers that the MSW be routed through this facility, which provides valuable and important services in terms of waste inspection, sorting, tire shredding and processing, grinding of wood waste, and compaction into transfer vehicles which will reduce truck trips into the Deerhaven site. Accordingly the tipping fees available at Deerhaven are equal to what the City currently pays at the New River Landfill (currently $23.50 per ton).

GRU prefers proposals in which the project operator is responsible for fuel acquisition and price, and power costs are relatively stable and non-volatile. GRU is willing to consider arrangements in which the fuel cost for power is indexed to conventional commodity costs.

Should a Respondent wish to propose some other arrangement which would require GRU to acquire fuel, it should be noted that staff will not commit to an overly aggressive estimate of fuel availability and cost. For proposals requiring GRU to acquire fuel, options assuming fuel volumes with associated costs more optimistic than those estimated by the UFSFRC study as summarized in Appendix A, Table 2 will not be considered.

Table 2 in Appendix A contains results from the UFSFRC study manipulated by GRU staff to produce the cumulative available volume of biomass fuel in the order of increasing price. The cumulative weighted price per mmBtu is also shown. The data in Table 2 is drawn from UFSFRC scenarios assuming competition for biomass resources and higher transportation fuel costs. Pulp wood availability was adjusted to 0.5% as discussed in the text of the UFSFRC report. Only MSW from City of Gainesville operations as shown in Table 3 is assumed to be available and represented in Table 2. Finally, GRU reserves the right to consider in its evaluations new data regarding biomass availability or the level of commitment that other experienced biomass project developers are willing to make.

TRANSMISSION

No transmission upgrade costs will be incurred for projects up to 100 MW that are located on the Deerhaven site. For projects not located at Deerhaven, the Respondent must secure with the appropriate transmission providers all required interconnection agreements, transmission facilities, and related arrangements required to deliver firm capacity and/or energy to the GRU system on a firm basis for the entire term of the proposal and is responsible for the charges associated with all transmission requirements.

CONTRACT STRUCTURES

GRU would prefer a Long-Term “Take-and-Pay” Purchased Power Agreement (“PPA”) of fifteen (15) years or longer with an option to purchase and own the project at a future date. Under a Take-and-Pay PPA, GRU would be financially responsible only for the energy actually delivered from the project. GRU would also consider a Long-Term Take-and-Pay PPA without the option to purchase.

GRU encourages the submission of innovative contract structures and will consider contractual arrangements other than or additional to those identified above if they are consistent GRU’s needs and requirements.

ENVIRONMENTAL AND TAX CREDITS

GRU wishes to retain the market value for all renewable attributes of the proposed project. Any PPA that results from this RFP must deliver to GRU the renewable attributes of the project including but not limited to Renewable Energy Credits ("RECs") and any associated offsets for carbon as well as oxides of sulfur and nitrogen and any other emission constituents that may be associated with the project either now or in the future.

GRU recognizes that recently enacted tax and production credits and IRS regulations create added value for the development of emerging generation technologies, and are subject to change through time. The Respondent should identify how any such tax or IRS benefits that result from the development of a project pursuant to this RFP will affect GRU's costs as they become available or change.

Respondents should note that privately owned facilities will be subject to ad valorem property taxes, which is a millage rate of 24.6135, of which 4.2544 mills is the City of Gainesville's share. The City of Gainesville's share may be treated as beneficial revenue from the project when computing all-in production costs.

SUSTAINABLE FOREST RESOURCE MANAGMENT

GRU supports the stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, and vitality. Sustainable forest management involves practicing a multiple-use land stewardship ethic that integrates the reforestation, managing, growing, nurturing, and harvesting of trees for useful products while conserving soil, air and water quality, as well as wildlife and fish habitat and aesthetics.

Forest sustainability involves the continued existence and use of forests to meet human physical, economic, and social needs, the desire to preserve the health of forest ecosystems in perpetuity; and the ethical choice of preserving options for future generations while meeting the needs of the present.

Among the non-economic criteria that GRU will employ in evaluating proposals is whether the fuel procurement practices associated with the proposed biomass-fueled generation projects are consistent with GRU's vision and support of sustainable forest resource management.

TECHNOLOGY CONSIDERATIONS

The following screening criteria establish the minimum requirements for the technology to advance to further consideration in the evaluation process:

- **Readiness.** The technology must be at a commercially proven stage of development. To be considered, a proposal must employ technology that has been demonstrated in commercial operation employing at least 25 tons per day of biomass in continuous operation to produce electricity for at least one year.

- **Reliability.** The number of units in commercial operation of the size being proposed and their reliability record will be considered in evaluating the risk associated with each proposal. The financial strength of the Respondent and proposed risk mitigation plans will be used to balance this factor.
- **Residual Waste.** The technology must not produce residual waste requiring disposal in excess of 15% by weight of incoming fuel.

ENVIRONMENTAL CONSIDERATIONS

The proposed technology must be capable of meeting environmental permitting and regulatory requirements in the State of Florida applicable to the fuels being proposed for use. The facility owner/operator will be responsible for acquiring all necessary environmental authorizations, licenses, or permits from, by or with any governmental or regulatory authority related to a proposal and for maintaining compliance with all obligations that are or will be required by current federal, state, or local laws, regulations, or ordinances of any governmental authority necessary for the implementation of the proposal.

Respondents should provide detailed descriptions of the environmental characteristics of the proposals including, but not limited to:

- **Air Emissions.** Air emission controls must be commensurate with the potential contaminants in the fuels used or products of the process being proposed. Projects must meet all legal and regulatory permitting requirements.
- **Water Use.** Deerhaven is licensed as a zero discharge facility requiring on-site recycling and/or treatment of all process waters via a brine concentrator. Any new capacity at the Deerhaven site will be expected to adhere to this requirement.
- **By-products/Wastes.** Respondents should provide a detailed description of all process by-products and waste materials including class and final disposition.

RISK CONSIDERATIONS

Proposals must include a statement of the Respondent's financial resources and proof of creditworthiness. Respondents should also describe how they would mitigate GRU's financial and performance risk. Describe any contractual approaches to risk mitigation including but not limited to (1) liquidated damages, (2) replacement energy or capacity, or (3) performance standards or guarantees. Risk mitigation may also take the form of backup fuels or systems.

SUBMITTAL REQUIREMENTS

Proposals shall be prepared in accordance with the guidelines set forth in this section. Failure to follow the preparation instructions may result in the exclusion of the proposal from consideration.

Each proposal shall be organized by section as described below. Each page of the proposal shall have the following information in the top right corner.

- GRU Biomass Supply RFP No. 2007-135
- Name of Bidder
- Project Name

All of the following sections shall be completed or identified as "Not Applicable".

Section 1 – Executive Summary

The executive summary should provide an overall description of the proposal. The summary should include the technology and location of the facility or facilities that will be the source of the power supplied for the proposal and should discuss the general contractual and pricing arrangements for the proposal. The summary should be limited to two (2) pages.

Section 2 – Financial Structure of the Proposal

Describe the financial structure being proposed (i.e., PPA, GRU ownership of facility or equity participation). This should include a description of the proposed contractual arrangements.

Section 3 – Technical Information

The following technical information should be included in this section, as applicable for the project being proposed:

a) Description of technology and configuration
b) Major equipment manufacturers
c) Fuel supply and requirements including any backup fuels
d) Net capacity rating
e) Indicative net heat rates
f) Site requirements and layout
g) Projected permitting and construction schedule and in-service date
h) Dispatchability of the project, including facility limitations that may constrain operation or dispatch
i) Environmental characteristics and emission rates (see section above on Environmental Considerations)
j) Ash and other by-products (see section above on Environmental Considerations)
k) Water use (see section above on Environmental Considerations)
l) Electrical interconnection requirements
m) Readiness of the proposed technology (see section above on Technology Considerations)

n) Reliability of the proposed technology see section above on Technology Considerations)
o) Performance guarantees, warranties and risk mitigation
p) Backup systems and fuels
q) Estimated truck traffic associated with fuel supply
r) Description of how fuel procurement practices are consistent with GRU's commitment to Sustainable Resource Forest Management

Section 4 – Economic Information

The following economic information should be included in this section, as applicable for the project being proposed:

a) Capacity offered and all relevant pricing information including, but not limited to:
   - Capacity charge by year
   - Energy charges by year or guaranteed conversion rates and fuel cost index
   - Variable O&M charges and index
   - Start charges and index
   - Transmission wheeling charges
   - Other charges

   If the Respondent is proposing an innovative or non-traditional pricing arrangement that does not easily conform to the categories listed above, a detailed verbal description of the proposed pricing is required.
b) Fuel cost assumptions
c) REC and environmental allowance management (see section above on Environmental and Tax Credits)
d) Treatment of tax credits and other financial incentives (see section above on Environmental and Tax Credits)
e) Liquidated damages
f) Limitations on damages and remedies
g) Replacement power or capacity
h) Other proposed forms of risk mitigation
i) Land purchase or lease assumptions
j) Number of employees on-site under normal operations

Section 5 - Production Cost Information

GRU expects a wide range of contractual structures and technologies that are adapted to various fuel types. Accordingly, GRU requests that indicative all-in production costs (including capital and financing, operation, maintenance, and fuel costs) be given for each of the scenarios presented in Table 2 to clearly illustrate how the proposed contract structures would be applied. If the power is from a site other than Deerhaven, please include transmission wheeling costs. The information in Tables 2 and 3 will be considered proprietary and confidential if submitted in a separate, sealed envelope as described elsewhere in the RFP.

Table 2: Illustrative All-in Production Costs ($/MWh)

Unit Capacity Factor	Average Delivered Fuel Cost ($/mmBtu) or Index Value (% of base)				
	$2.25 70%	$2.75 85%	$3.25 100%	$3.75 115%	4.25 130%
90%					
85%					
80%					
70%					
65%					
Off line (Daily Payment)					

Notes: a. If based on index, attach description of index and indicate on table. 100% should represent a current value for the index.
b. Payments while unit is offline will not be in units of $/MWh.

The ability to economically dispatch a unit depends upon its variable production costs. All things being equal, GRU prefers lower variable production costs. Table 3 is designed to allow consideration of this factor.

Table 3: Illustrative Variable Costs for Economic Dispatch ($/MWh)

Unit Capacity Factor	Average Delivered Fuel Cost ($/mmBtu) or Index Value (% of base)				
	$2.25 70%	$2.75 85%	$3.25 100%	$3.75 115%	4.25 130%
90%					
85%					
80%					
70%					
65%					
Off line (Daily Payment)					

Notes: a. If based on index, attach description of index and indicate on table. 100% should represent a current value for the index.

Section 6 – Respondent Information

The following Respondent information should be included in this section:

a) Respondent's qualifications and experience in the provision of energy supply
b) Respondent's qualifications and experience with the technology being proposed including references
c) Respondent's financial capability including, but not limited to:
   - Recent annual report for the Respondent and any other parties involved, or a recent copy of an audited income statement and balance sheet
   - Bond rating of Respondent or its parent company by Moody's, Fitch, Standard & Poor's, and/or Dunn & Bradstreet
   - Description of financing for the project
   - Financial guarantees from affiliates or others, as appropriate

EVALUATION CRITERIA

Foremost among the evaluation criteria for Step 1 will be the proposed project's all-in cost, reliability, environmental impacts, and contribution to GRU's fuel diversity. A detailed list of evaluation criteria includes, but is not limited to:

a) Project All-in Production Cost
b) Project Variable Production Costs
c) Technology Readiness and Project Reliability
d) Environmental Emissions
e) Fuel Requirements and Sources
f) Anticipated Project In-Service Date and/or Energy Delivery
g) Project Commitment to Sustainable Forest Resource Management
h) Project Site Requirements
i) Project Size and Design
j) Experience and Resources of Project Developer/Sponsor
k) Proposed Contractual Terms and Conditions
l) Project Risk Profile
m) By-product/Waste Production and Disposition
n) Ability to execute the project.

SELECTION PROCESS

The objective of the RFP is to solicit proposals that allow GRU to assess the best biomass/MSW generating alternatives that satisfy the RFP requirements on a cost-effective basis. It is anticipated that GRU will receive a variety of proposals that may vary in length of term, capacity, price, technology, fuel, environmental impacts, and other characteristics.

Following the issuance of the RFP, GRU will hold a workshop and Deerhaven site review. Proposal submission will be followed by a discovery and evaluation phase, which will result in the selection of a short list of proposals.

The selection process is summarized below.

Step 1

Proposal submission, discovery, and initial screening
Based on the criteria listed above, GRU will compile a short list of proposals that warrant further consideration. Proposals that best meet GRU's initial evaluation criteria will be selected for further evaluation.

Short listed proposal presentations and further screening
Short listed Respondents selected from the initial screening shall be invited to make an on-site presentation of their proposal. Respondents should be available to present the proposal in a time period designated by GRU (current expectation is early 2008). The short listed Respondents shall have up to 90 minutes to present an overview of their proposal, followed by a question and answer session. Travel and other expenses incurred to make the presentations shall be at the Respondent's expense.

Step 2

Submission of binding proposals and final selection
A maximum of three of the Respondents with the most advantageous proposals and qualifications will be asked to competitively submit binding proposals. The proposal selected from this process will then be used as the basis for final contract negotiations, subject to the approval of the Gainesville City commission.

FINANCIAL AND OPERATIONAL CONSIDERATIONS

GRU is financially strong, with "Aa" bond ratings from Moody's Investor Services and "AA" bond ratings from Standard and Poor's. Although GRU has a long corporate history of owning and operating its own generation capacity, there are a number of factors that would lead GRU to consider other arrangements. For a relatively new and innovative generation technology, GRU recognizes the potential benefits of operation and maintenance by an entity with a long term vested interest in that specific technology. GRU also recognizes that recently enacted tax and production credits, IRS regulations, and emerging opportunities for supplemental grant funding could create value leading to something other than a conventionally owned and financed unit and is willing to consider innovative financial arrangements.

RESERVED RIGHTS

GRU reserves the right to reject any or all submitted proposals.

PROPRIETARY INFORMATION

The body of the submittals will be posted on the web at www.GRU.com. Respondents are responsible for submitting proprietary information in a clearly marked manner separate from the information that will be posted on the web.

SUBMITTALS

All proposals must be received by the GRU RFP contact person identified below by the proposal Due Date. Respondents must submit five (5) hard copies, plus an electronic copy of the completed forms on a CD-ROM by the proposal Due Date and Time.

All questions, inquiries, and submittals related to this request should be directed to:

Gainesville Regional Utilities
Power Supply RFP
c/o GRU Purchasing Department
Attn: __, __
(alternative contact info)

Mailing address:
P.O. Box 147117, Station A-130
Gainesville, FL 32614-7117

Physical address (hand delivery by firm or express courier):
301 S.E. 4th Avenue
Gainesville, FL 32601

ANTICIPATED SCHEDULE

The anticipated schedule for this RFP is as follows:

Oct 15	Issue RFP
Nov. (early) TBA	Pre-submission Workshop and site review
Dec 14	Proposal due
	Discovery/evaluation Phase
Jan 28, 2008	Short list approval by City Commission
April 14, 2008	Binding proposals due
May 19, 2008	City Commission authorization to negotiate & execute

APPENDIX A

Regional Woody Biomass And Urban Waste Materials

All the information contained in this summary have been extracted (except where explicitly stated otherwise) from: Economic Availability of Alternative Biomass Sources for Gainesville, Florida, Part I and Part II, Principal Investigator, Dr. Douglas R. Carter, University of Florida, School of Forest Resources and Conservation ("UFSFRC"). Co-Principal Investigators, Dr. Matthew Langholtz, University of Florida, School of Forest Resources and Conservation, Drs. Timothy Townsend and Brajesh Dubey, University of Florida, College of Engineering, Department of Environmental Engineering Sciences, and Mr. Richard Schroeder, BioResource Management, Inc., August, 2007, University of Florida.

1.0 Woody Biomass

1.1 Quantity Assumptions

1.1.1 Commercial Pulpwood

1. Pulpwood refers to small diameter trees, typically 3.6 to 6.5 inches diameter at breast height, that are usually harvested for manufacturing paper products.

2. Pulpwood is a major industrial forest product in Florida.

3. Harvesting methods include clear cutting, typically from forest plantations on private lands, and to a lesser extent commercial thinnings, in both plantations and natural stands on public and private ownerships.

4. Unlike pre-commercial thinnings, commercial thinnings provide a profit to the forest landowner.

5. In conditions of low pulpwood stumpage prices and high biomass demand, some portion of this pulpwood supply could be allocated to bioenergy production (Perlack, Wright et al. 2005).

6. Annual pulpwood harvests are also derived from the FIA TPO database.

7. We assume that all current pulpwood commercial harvests are available for use in energy production in the supply assessment.

8. Care should be taken not to interpret these results to suggest that all the current pulpwood harvests are available at current pulpwood prices for bioenergy.

1.1.2 Logging Residue

1. Logging operations leave residues following timber harvests.

2. Logging residues are typically piled and often burned on site for disposal and to allow for replanting.

3. To estimate woody biomass quantities from logging residues, we accessed Timber Product Output ("TPO") reports (http://srsfia2.fs.fed.us/php/tpo2/tpo.php) maintained by the Forest Inventory and Analysis ("FIA") work unit of the USDA Forest Service, Southern Research Station ("SRS").

4. This database provides forest inventory and harvest information, including annual yields of logging residues and pulpwood at the county level.

5. The SRS derives these values by updating FIA harvest data with more frequent regional harvest information based on mill surveys (Tony Johnson, pers. com., January 2006).

6. To account for increased harvesting efficiencies and utilization, we assume current logging residues are **60%** available.

7. Stumps were excluded from this analysis, and represent an additional 435,000 dry tons (6.5 TBtu) per year within the three-facility woodshed (GRU, JEA, and TAL).

1.1.3 Thinnings From Forests

1. Forest growth exceeds forest harvests in Florida by about **35%**.

2. This combined with fire suppression results in high-density forests.

3. 2005 FIA data for Florida reports about **8%** of timberland acres in Florida are classified as "overstocked".

4. Overstocked stands are fairly evenly distributed across age classes in Florida.

5. Removing small diameter trees from overstocked stands can improve forest health and productivity; reduce the likelihood, intensity and costs of forest fires; and help forest landowners meet various forest management objectives (e.g. Perlack, Wright et al. 2005; Condon and Putz 2007).

6. Pre-commercial thinnings were restricted to young stands to avoid competition for larger diameter and higher-value commercial timber.

7. In this analysis we include three scenarios of forest thinnings:

   Longleaf Pine Ecosystem Restoration, Thinning consisting of removing 20 dry tons of invasive hardwoods per acre from 1/40th of longleaf pine forest acreages annually.

   Overstocked Natural, An annual pre-commercial thinning of **36%** of all standing biomass from **1/5th** of overstocked *natural stands* aged 5-15 years old. This 36% of the biomass is based on harvesting every 5th row of trees (20%) plus a selective thinning of 20% of the remaining 80% of the stand (20%*80%=16%), removing a total of 36% of the stand (20%+16%). The harvesting frequency is based on **two pre-commercial thinnings**, one between 5-10 years of age, and one between 11-15 years of age.

   Overstocked Plantation, Pre-commercial thinning of 36% of all standing biomass from **1/5th** of overstocked *plantations* aged 5-15 years old annually. This **36%** of the biomass is based on harvesting every 5th row of trees (20%) plus a selective thinning of 20% of the remaining 80% of the stand (20%*80%=16%), removing a total of 36% of the stand (20%+16%). The harvesting frequency is based on **two pre-commercial thinnings**, one between 5-10 years of age, and one between 11-15 years of age.

1.1.4 Urban Wood Waste

1. The resource identified here is comprised of large-diameter urban wood typically handled by tree servicing companies, rather than yard waste and leaves.

2. Based on Wiltsee (1998) we assume an average of 0.203 green tons (40% moisture content) per person per year.

3. This estimate excludes an additional 0.103 green tons capita^{-1} year^{-1} Wiltsee reported from industrial wood (e.g. cabinet and pallet production) and construction and demolition debris.

4. Wiltsee's study of thirty metropolitan areas across the US showed relative consistency per capita nation wide; values tended to be higher in southern states.

5. To exclude urban wood waste that may be too dirty or already allocated to commercial uses, we assume an availability of **60%**.

6. We multiply this average annual per capita yield by county level 2005 US Census population estimates (www.census.gov/popest/counties/) to estimate total annual yield of urban wood waste per county.

7. On a per capita basis, these calculations for urban wood waste are lower than those found by Post and Cunillio (2003), which may be explained in part by the large amount of biomass produced by land clearing in Alachua County.

1.2 Cost Assumptions

In addition to physical availability, information about the resource costs is required to construct supply curves. The delivered cost of woody biomass, as with conventional forest products, can be defined as a sum of procurement, harvest, transportation, and miscellaneous management costs. The results of the cost assumptions described below are summarized in Table 1.

1.2.1 Fuel Cost

These costs are assumed relevant for the 1st Quarter of 2007, when diesel prices are quoted as $2.12 and $2.49 per gallon for off-road and highway, respectively.

1.2.2 Procurement Cost

"Procurement cost" is the amount paid to gain ownership of a biomass resource. Procurement cost is equivalent to the term "stumpage price" in the forest industry, i.e. the price paid to a timber owner for the right to harvest.

1.2.3 Logging Residues

1. Forest plantation owners pay post-harvest site preparation costs of about $462 ha^{-1} ($186 acre^{-1}), including raking and piling of logging residues (Smidt, Silveira Folegatti et al. 2005).

2. Removal of logging residues reduces these site preparation costs for replanting plantations (Watson and Stokes 1989).

3. Therefore, logging residues also represent a liability to the resource owner and are currently available at no or low cost (Watson, Ragan et al. 1986).

4. However, some small procurement cost may be required to draw logging residue resources.

5. Therefore, we assume procurement costs of \$3 dry ton^{-1} (\$1.89 green ton^{-1} at 37% moisture content).

1.2.4 Thinnings

1. By definition, pre-commercial thinnings are forest thinnings done at a cost to the forest landowner as a stand treatment, rather than as a profitable harvest.

2. However, to ensure the economic availability of forest thinnings, we assume a stumpage price of \$6 dry ton^{-1} (\$3.18 green ton^{-1}), about half that of current stumpage prices.

1.2.5 Pulpwood

1. Pulpwood is a more expensive woody biomass resource that can be employed to meet demand beyond that available from waste resources.

2. In an initial analysis, we used south-wide averages of softwood pulpwood stumpage for the 4th Quarter of 2006 of \$13.00 dry ton^{-1}.

3. In this analysis we have increased prices to \$15.21 dry ton^{-1} (\$8.06 green ton^{-1}) as reported by Timber Mart-South for Florida in the 1st Quarter of 2007.

4. This price is at the higher end of the range of stumpage prices seen over the past several years.

1.3 Harvest and Processing Costs

1.3.1 Urban Wood Wastes

1. The cost of processing urban wood waste ranges from \$6.45-\$27.50 green ton^{-1} in a 2006 bid request in Florida (Osceola County Board of County Commissioners 2006).

2. We assume that urban wood waste can be received, screened, and chipped for \$30 dry ton^{-1} (\$18.90 green ton^{-1}).

1.3.2 Logging residues, thinnings, and pulpwood harvests

1. To estimate chipping costs, we use Timber-Mart South 1st Q 2007 delivered pulp chip prices (\$30.00 green ton^{-1}) and subtracted average stumpage (\$8.06 green ton^{-1}), harvest (\$11.64 green ton^{-1}), and delivery costs (\$4.65 green ton^{-1}) yielding \$5.74 green ton^{-1}.

2. Adding chipping costs (\$5.74 green ton^{-1}) and reported harvest costs (\$11.64 green ton^{-1}) yields \$33.00 dry ton^{-1} (\$17.38 green ton^{-1}) for total harvest and processing costs.

3. Harvesting and processing costs would increase on a per-ton basis for low-density stands or for widely dispersed logging residues, or may be less where logging residues are handled and piled along with conventional harvesting operations.

1.4 Transportation Costs

1. To calculate transportation cost as a function of road conditions (see Haul Time Calculation below) we estimate transportation cost as a function of transportation time rather than distance.

2. Based on the operational assumptions for each resource shown in Appendix A, we assume one-way transportation costs to be \$3.41, \$3.26, \$2.68, and \$3.00 green ton^{-1} hour^{-1} for urban wood waste, logging residues, pulpwood, and thinnings, respectively.

3. We then double these values to account for return trips with empty loads, and add \$0.86-\$1.25 green ton^{-1} to account for loading and unloading.

4. These values are conservative compared to the hauling rate of \$0.12 green ton^{-1} loaded mile^{-1} reported by Timber Mart-South for the 1st Quarter of 2007.

5. During this period, diesel prices are quoted as $2.12 and $2.49 per gallon for off-road and highway, respectively.

Table 1: Cost Assumptions for Four Woody Biomass Resources

	Urban Wood Waste	*Logging Residue*	*Thinnings*	*Pulpwood*
	($ dry ton^{-1})			
Procurement cost[a]	-25.00	3.00	6.00	15.21
Harvest and process	30.00	33.00	33.00	33.00
Load and unload	1.98	1.80	1.92	1.72
Two-way haul (per hour)	11.86	10.78	11.54	10.30
Example total delivered cost of a one hour haul[b]	18.84	48.58	52.46	60.23

[a] Negative costs for urban wood waste reflect disposal costs, known as “tipping fees”.
[b] Equals the sum of the four cost categories.

1.4.1 Total cost by resource-haul time category

1. Based on the above cost assumptions, we calculate the delivered cost of each woody biomass resource within a given haul time at fifteen minute increments.

2. We feel this approach most accurately reflects site-specific variation in road networks, speed limits, and geographical constraints.

3. By ranking these resources from lowest cost to highest cost, we estimate the progression of most to least economically available woody biomass resources, accounting for travel time from the point of delivery.

4. Transportation costs comprise 10-85% of total delivered costs, depending on the resource type and travel time.

2.0 Other Urban Waste Materials

2.1 Municipal Solid Waste ("MSW") / Refuse Derived Fuel ("RDF")

MSW is usually burned as it is after some preliminary steps (mass burn). However, at some plants refuse derived fuel (RDF) is used. RDF is a fuel produced by shredding MSW or steam pressure treating in an autoclave. RDF consists largely of organic components of municipal waste such as plastics and biodegradable waste (paper, food waste, textiles. etc). RDF processing facilities are normally located near a source of MSW. RDF can be produced and used for energy production from the day to day waste components disposed of from domestic and industrial areas. RDF is produced essentially to facilitate the burning of the waste.

Municipal solid waste (MSW) is incinerated either as a mass burn or as refuse derived fuel (RDF). Though the style most often used has been mass burn, there are quite a few RDF plants in use. These facilities are distinguished from mass burn plants by the presence of waste pre-processing equipment. RDF is the name given both to the residual end product created by the processing and to the plant which burns the material. In RDF plants the truck usually dumps unprocessed MSW onto a conveyor which leads into a facility separate from the incinerator for preprocessing and sorting into resource streams. Though RDF plant designs differ according to the types of resources recovered and the degree of resource purity achieved in the end product, RDF is generally derived by removing noncombustible metals, glass and grit, and subsequently processing the remaining combustible waste to a uniform size. The RDF is a highly combustible and versatile feedstock containing mainly paper and plastic, which can be burned either as-is (a fluffy material) or in a dense, easily transported pelletized form. It can be burned either alone in a dedicated furnace/boiler attached to the processing facility (as most RDF plants are configured) or commingled with another fuel (e.g., sewage sludge, wood) and shipped in pellet form off-site to another facility. For the calculations presented in this report, the fraction of waste that is reported to be combustible includes paper, plastics, textile, food waste, and other organics.

A value of 5,000 Btu/lb was used for the energy conversion.

The processing cost of MSW for fuel applications is approximately $40/ ton.

2.2 Tires

Tires can be used as a fuel alternative. Combustion facilities currently using tires as fuel include: (1) power plants; (2) tire manufacturing plants; (3) cement kilns; (4) pulp and paper plants; and (5) small package steam generators. In

order to prevent discarded automobile tires from damaging the environment, it is highly desirable to recycle this material. However, the total mass quantity of tires currently recycled in a given year (not including reuse, retreading, or combustion) is less than 7% of the annual tire production rate. The number of tires produced each year will continue to far exceed the demand for scrap and used tires. Only a small portion of waste tires are retreaded, and a very small portion is devulcanized by tedious processes. Tires that are not recycled or reused are usually shredded and disposed of in landfills, or stockpiled whole. Stockpiling whole tires creates two significant hazards: mosquitoes and fires.

In 2006, 86% of waste tires produced in Florida were constructively utilized. Potential uses include asphalt modification, playground/sports surfacing, soil covers and incineration, among others.

2.3 Yard Waste

Yard waste is defined as the part of solid waste composed of vegetative matter resulting from landscaping maintenance or land clearing operations and includes materials such as tree and shrub trimmings, grass clippings, palm fronds, trees, and tree stumps (Chapter 62-701, Florida Administrative Code). In Florida yard waste is banned from disposal in lined landfill facilities. It is collected either by separate curbside collection or by the use of drop off facilities where a resident can go and drop off the yard waste. Disposal pathways for yard waste include mulch, composting/co-composting, tilled into the soil, and combustion.

Yard waste projections are in potential Btu of energy if all yard waste produced is used as fuel. A value of 4,200 Btu/lb was used for the energy conversion.

Within a specific region yard waste is collected at several clean wood recycling facilities. Part of yard waste from households also gets dropped off at an active landfill site or at a transfer station. This yard waste gets ground and composted on site and given away to the public free as mulch. The processing cost of yard waste for fuel applications (grinding and producing mulch type end product) is approximately $20/ ton (personal communication, Florida Wood Recycling, Town of Medley, 2007).

3.0 Fuel Volume And Availability: Tables 2 And 3

Table 2 Appendix A contains results from the UFSFRC study manipulated by GRU staff to produce the cumulative available volume of biomass fuel in the order of increasing price. The cumulative weighted price per mmBtu is also shown. The data in Table 2 is drawn from UFSFRC scenarios assuming

competition for biomass resources and higher transportation fuel costs. Pulp wood availability was adjusted to 0.5% as discussed in the text of the UFSFRC report. Only MSW from City of Gainesville operations as shown in Table 3 is assumed to be available and represented in Table 2. GRU reserves the right to consider in its evaluations new data regarding biomass availability or the level of commitment that other experienced biomass project developers are willing to make.

Table 2: Biomass Resources by Type and Collection Distance, Sorted by Price

Developed Using Resource Competition and High Diesel Price Scenario, Limited to the City of Gainesville's MSW

Resource/haul time category	*Dry tons [4] recoverable*	*TBtu/year recoverable*	*Cumulative TBtu/year recoverable*	*Price ($/MMBtu)*	*Cumulative Price ($/MMBtu)*
Alachua Co. MSW [2]	73,847	0.738	0.738	$0.00	$0.00
Alachua Co. waste wood [2]	465	0.005	0.743	$0.00	$0.00
Alachua Co. Tires [2]	316	0.009	0.752	$0.00	$0.00
Alachua Co. C&D [1]	12,625	0.148	0.900	$0.00	$0.00
Urban wood, 0-15 min.	1,934	0.030	0.930	$1.28	$0.04
Urban wood, 15-30 min.	8,214	0.120	1.050	$1.52	$0.21
Urban wood, 30-45 min.	10,881	0.160	1.210	$1.76	$0.42
Urban wood, 45-60 min.	10,310	0.150	1.360	$2.00	$0.59
Urban wood, 60-75 min.	10,623	0.160	1.520	$2.24	$0.76
Urban wood, 75-90 min.	12,922	0.190	1.710	$2.48	$0.95
Urban wood, 90-105 min.	16,054	0.240	1.950	$2.72	$1.17
Urban wood, 105-120 min.	21,471	0.320	2.270	$2.96	$1.42
Logging residues, 0-15 min.	4,222	0.070	2.340	$3.32	$1.48
Overstocked natural, 0-15 min.	0	0.000	2.340	$3.32	$1.48
Overstocked plantation, 0-15 min.	4,637	0.070	2.410	$3.32	$1.53
Overstocked natural, 15-30 min.	498	0.010	2.420	$3.50	$1.54
Overstocked plantation, 15-30 min.	18,555	0.280	2.700	$3.50	$1.75
Logging residues, 15-30 min.	21,111	0.330	3.030	$3.55	$1.94
Longleaf restoration, 0-15 min.	552	0.010	3.040	$3.62	$1.95
Overstocked natural, 30-45 min.	2,245	0.030	3.070	$3.68	$1.96
Overstocked plantation, 30-45 min.	16,288	0.240	3.310	$3.68	$2.09
Logging residues, 30-45 min.	41,033	0.640	3.950	$3.77	$2.36
Overstocked natural, 45-60 min.	3,158	0.050	4.000	$3.86	$2.38
Overstocked plantation, 45-60 min.	8,032	0.120	4.120	$3.86	$2.42
Pulpwood [3], 0-15 min.	86	0.001	4.121	$3.94	$2.42
Longleaf restoration, 15-30 min.	3,166	0.050	4.171	$3.98	$2.44
Logging residues, 45-60 min.	41,327	0.640	4.811	$4.00	$2.65
Overstocked natural, 60-75 min.	2,086	0.030	4.841	$4.04	$2.66
Overstocked plantation, 60-75 min.	11,330	0.170	5.011	$4.04	$2.70
Pulpwood [3], 15-30 min.	450	0.007	5.019	$4.14	$2.71
Overstocked natural, 75-90 min.	2,347	0.040	5.059	$4.22	$2.72
Overstocked plantation, 75-90 min.	16,093	0.240	5.299	$4.22	$2.79
Logging residues, 60-75 min.	46,367	0.720	6.019	$4.22	$2.96
Longleaf restoration, 30-45 min.	12,567	0.190	6.209	$4.34	$3.00
Pulpwood [3], 30-45 min.	930	0.015	6.224	$4.35	$3.00
Overstocked natural, 90-105 min.	1,719	0.030	6.254	$4.40	$3.01
Overstocked plantation, 90-105 min.	15,078	0.230	6.484	$4.40	$3.06
Logging residues, 75-90 min.	58,186	0.910	7.394	$4.45	$3.23
Pulpwood [3], 45-60 min.	978	0.016	7.409	$4.55	$3.23
Overstocked natural, 105-120 min.	1,769	0.030	7.439	$4.57	$3.24
Overstocked plantation, 105-120 min.	6,549	0.100	7.539	$4.57	$3.26
Logging residues, 90-105 min.	56,461	0.880	8.419	$4.67	$3.40
Longleaf restoration, 45-60 min.	20,690	0.310	8.729	$4.69	$3.45
Pulpwood [3], 60-75 min.	1,055	0.017	8.747	$4.76	$3.45
Logging residues, 105-120 min.	34,098	0.530	9.277	$4.89	$3.53
Pulpwood [3], 75-90 min.	1,334	0.022	9.298	$4.96	$3.54
Longleaf restoration, 60-75 min.	18,472	0.280	9.578	$5.05	$3.58
Pulpwood [3], 90-105 min.	1,175	0.019	9.597	$5.17	$3.59
Pulpwood [3], 105-120 min.	631	0.010	9.607	$5.39	$3.59
Longleaf restoration, 75-90 min.	23,188	0.350	9.957	$5.41	$3.65
Longleaf restoration, 90-105 min.	28,733	0.430	10.387	$5.77	$3.74
Longleaf restoration, 105-120 min.	27,653	0.410	10.797	$6.12	$3.83

(1) From University of Florida Study

(2) From Alachua County Waste Management records for fiscal year 2006 and only allowing the estimated portion collected from incorporated area of the City of Gainesville to be available for generation of electricity.

(3) Pulpwood limited to 0.5% of resource available from region. Price elasticity adjusted from an average of $15.21 to $15.41 per dry ton.

(4) American standard short (net) tons = 2000 lb.

(5) Diesel prices set to $4.24 and $4.98 per gallon for off-road and highway respectively.

Table 3: MSW Summary for Alachua County

	YTD Fiscal Year 07			YTD Prior year		
	City	County	Totals	City	County	Totals
INBOUND						
Alachua County Residential						
- Household Garbage	20,490.42	42,515.49	63,005.91	20,265.57	41,805.83	62,071.40
- Woodwaste (a)	269.61	559.42	829.03			
- tires (a)	205.77	426.95	632.72			
	20,965.80	43,501.86	64,467.66	20,265.57	41805.83	**62,071.40**
Alachua County Commericial						
***Commercial, Governmental & Institutional (b)	49,936.22	33,290.82	83,227.04	59,510.00	39673.332	99,183.33
Alachua County Total	70,902.03	76,792.67	147,694.70	79,775.57	81,479.16	161,254.73
Waste Management's Transfer Station (c)	26974.704	17,983.14	44,957.84	2401.95	1601.3	4,003.25
	97,876.73	94,775.81	**192,652.54**	82,177.52	83,080.46	**165,257.98**

(a) Woodwaste and tires are broken down into proportion of city and county household garbage
(b) Commerical waste is broken down into portion of 60% city, 40% county
(c) Waste Management MSW is broken down into 60% city, 40% county