

1                   BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION  
2                   SUPPLEMENTAL TESTIMONY OF RICHARD M. SCHROEDER  
3                   ON BEHALF OF  
4                   GAINESVILLE REGIONAL UTILITIES AND  
5                   GAINESVILLE RENEWABLE ENERGY CENTER, LLC  
6                   DOCKET NO. 090451-EM  
7                   MARCH 15, 2010

8  
9   **Q.    Please state your name and business address.**

10   A.    My name is Richard M. Schroeder. My business address is 3520 NW 43rd St.,  
11           Gainesville, FL 32606.

12  
13   **Q.    By whom are you employed and in what capacity?**

14   A.    I am the owner and founder of BioResource Management, Inc. (BioResource  
15           Management) and I serve as the President.

16  
17   **Q.    Please describe your responsibilities in that position.**

18   A.    I have administrative, financial, operations and marketing oversight for the  
19           Company.

20  
21   **Q.    Please describe the types of projects that BioResource Management works**  
22           **on.**

23   A.    BioResource Management is a leading forestry, agricultural, and organics  
24           recycling company with recent and current projects located throughout the Gulf

1 South and Eastern US. We specialize in connecting agricultural, forestry, and  
2 urban biomass supplies with a variety of end users. We assist in the  
3 development of new projects by evaluating biomass feedstock availability,  
4 assisting with biomass conversion and logistical and material handling  
5 considerations, and managing biomass feedstock production and delivery.

6  
7 **Q. What is the relationship between BioResource Management and GREC**  
8 **LLC?**

9 A. BioResource Management is providing consulting services to GREC LLC  
10 related to assessing the biomass resource availability in the GREC wood basket.  
11 In addition, BioResource Management is assisting GREC LLC in executing its  
12 fuel procurement strategy and negotiating with potential biomass suppliers.

13  
14 **Q. Please state your educational background and professional experience.**

15 A. I received my Bachelor of Science in Forestry degree and my Master of  
16 Agriculture degree from the University of Florida, and I have a Master of  
17 Business Administration from Nova University.

18  
19 Prior to founding BioResource Management, I held a number of positions in the  
20 Florida forestry and agriculture industry. I have over thirty years' experience in  
21 planning, developing, and operating bioenergy facilities throughout the US.  
22 Relevant experience includes:

- 23 • Conducting biomass resource assessments: I worked with the Florida  
24 Division of Forestry for eight years, serving as a County Forester,

1           Reforestation Coordinator, and Forest Products Specialist. During that  
2           time, the Arab Oil embargo created interest and demand in developing  
3           wood energy, and in 1980 I became the Wood Energy Coordinator for  
4           the State of Florida. During that time, the FL Division of Forestry began  
5           to develop the means, methods and calculations for determining long-  
6           term sustainable supplies for wood energy projects. We conducted wood  
7           supply studies on behalf of private companies seeking to build wood  
8           energy facilities, and public agencies such as prisons and hospitals to  
9           design, build and operate wood-fired facilities. One of the first biomass  
10          power plants in the state, the 7 MW power plant in Monticello, Florida,  
11          was assisted by myself and the FL Division of Forestry during their  
12          development and financing.

- 13          • I later helped to start one of the first urban wood recycling centers in  
14          Florida. As part-owner I oversaw delivery of recycled urban wood to the  
15          forest products industries and other facilities. During that time we were  
16          employed under contract with companies exerting major efforts to  
17          develop biomass energy in the state. Our company conducted the first  
18          wood supply studies for the Ridge Generating Station in Auburndale,  
19          Florida, a 40 MW facility fueled by biomass and other materials, and for  
20          Okeelanta Corporation, a 75 MW (now 125 MW) biomass facility in  
21          South Bay, Florida. We were involved in the development of long-term  
22          contracts with suppliers, the presentation of the supply to potential  
23          lenders and owners, and were part of the successful financing,  
24          construction and operation of these facilities.

- 1                   • Later, I was part of the company that delivered biomass to these  
2                   facilities; in a four year period we delivered over three million tons of  
3                   biomass to these facilities in Florida.
- 4                   • As part of that experience, we became a part of a national renewable  
5                   energy firm, and worked on developing supplies and operations for  
6                   stand-alone independent power producers. We successfully created the  
7                   wood supply infrastructure for a 17 MW biomass facility in  
8                   Massachusetts, an 18 MW biomass facility in New York, and assisted in  
9                   the development of other projects throughout the US, in the United  
10                  Kingdom and Puerto Rico. In all, I have been part of developing the  
11                  supplies for many biomass energy projects, of which five were financed,  
12                  constructed, and are still operating; three of which are in Florida.

13

14   **Q.    What is the purpose of your testimony in this proceeding?**

15   A.    The purpose of my testimony in this proceeding is to address questions raised by  
16           the Commissioners during the February 9, 2010 Agenda Conference related to  
17           the availability and sustainability of the biomass material resource. I will discuss  
18           the availability and sustainability of the biomass fuel resource in north central  
19           Florida in general, and specifically within the Gainesville Renewable Energy  
20           Center (GREC) wood basket. I will discuss the competition for woody, biomass  
21           material, including describing both the existing and potential biomass users in  
22           the region as well as describing the existing and potential suppliers of biomass  
23           material. I will discuss the quantity and types of different biomass materials that  
24           GREC will utilize in its process, the procurement strategy Gainesville



1 Renewable Energy Center, LLC (GREC LLC) will employ to acquire its  
2 required biomass fuel, and the status of GREC LLC's negotiations with potential  
3 biomass suppliers.

4

5 Unless specifically noted otherwise, all citations within my testimony will refer  
6 to the transcript from the February 9, 2010 Agenda Conference, Item 5. The  
7 citations will be referenced using the following format of [TR"XX" L"YY"-  
8 "ZZ"], which will refer to page "XX", lines "YY" to "ZZ".

9

10 **Q. Please describe what is meant by the term "GREC wood basket".**

11 A. The GREC wood basket refers to the geographic area from which the facility  
12 can economically obtain biomass material. That is, it refers to the area where the  
13 cost of transporting biomass material is not so high as to preclude its use as fuel  
14 for the project. Other terms commonly used with the same meaning as wood  
15 basket include supply area or supply shed.

16

17 **Q. Are you sponsoring any exhibits to your testimony?**

18 A. Yes. I am sponsoring the following exhibits:

- 19 • Exhibit No. \_\_ [RMS-1], which is a copy of my resume;
- 20 • Exhibit No. \_\_ [RMS-2] is a biomass resource assessment report
- 21 prepared by Don Post and Tom Cunilio entitled "Biomass Options for
- 22 GRU – Part II";

- 1 • Exhibit No. \_\_ [RMS-3] is a report prepared for GRU by Black &  
2 Veatch entitled "Supplementary Study of Generating Alternatives for  
3 Deerhaven Generating Station";
- 4 • Exhibit No. \_\_ [RMS- 4] is a report prepared for GRU by ICF  
5 Consulting entitled "City of Gainesville Electricity Supply Needs";
- 6 • Exhibit No. \_\_ [RMS- 5] is a biomass feasibility study prepared by the  
7 Institute of Food and Agricultural Sciences (IFAS), University of  
8 Florida, entitled "Economic Availability of Alternative Biomass Sources  
9 for Gainesville, Florida";
- 10 • Exhibit No. \_\_ [RMS- 6] is a report prepared for the Florida Public  
11 Service Commission by Navigant Consulting entitled "Florida  
12 Renewable Energy Potential Assessment";
- 13 • Exhibit No. \_\_ [RMS- 7] is a report prepared by the Institute of Food  
14 and Agricultural Sciences (IFAS), University of Florida entitled  
15 "Economic Impacts of Expanded Woody Biomass Utilization on the  
16 Bioenergy and Forest Products Industries in Florida";
- 17 • Exhibit No. \_\_ [RMS- 8] is a report prepared for the Florida Department  
18 of Agriculture and Consumer Services, Division of Forestry by the  
19 University of Florida, School of Forest Resources and Conservation and  
20 the North Carolina State University, Department of Forestry and  
21 Environmental Resources entitled "Woody Biomass for Electricity  
22 Generation in Florida: Bioeconomic Impacts under a Proposed  
23 Renewable Portfolio Standard (RPS) Mandate";

- 1           • Exhibit No. \_\_ [RMS- 9] is a report prepared by the University of  
2           Florida, School of Forest Resources & Conservation and the University  
3           of Florida, Food & Resource Economics Department for the FL  
4           Department of Agriculture and Consumer Services, Division of Forestry  
5           and the Florida Department of Environmental Protection entitled  
6           “Woody Biomass Economic Study” (includes the cover letters from  
7           Commissioner of Agriculture Charles H. Bronson to Governor Charlie  
8           Crist, Senate President Jeff Atwater and House Speaker Larry Cretul);
- 9           • Exhibit No. \_\_ [RMS-10] is a presentation related to a pending biomass  
10          assessment report being prepared for GREC LLC by BioResource  
11          Management;
- 12          • Exhibit No. \_\_ [RMS-11] is a forest sustainability sheet that describes  
13          the minimum sustainability standards and the GRU forest stewardship  
14          incentive program;
- 15          • Exhibit No. \_\_ [RMS-12] is the Petitioners’ response to Staff’s  
16          Interrogatory 91;
- 17          • Exhibit No. \_\_ [RMS-13] is the Petitioners ’response to Staff’s  
18          Interrogatory 92;
- 19          • Exhibit No. \_\_ [RMS-14] is the Petitioners’ response to Staff’s  
20          Interrogatory 93; and
- 21          • Exhibit No. \_\_ [RMS-15] is a letter of intent between GREC LLC and  
22          Wood Resource Recovery, LLC, stating that the parties intend to execute  
23          a ten-year supply agreement for 300,000 green tons per year of urban  
24          wood waste.

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**Sustainable Woody Biomass Resources in north central Florida**

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**Q. Chairman Argenziano voiced concern about the sustainability [of the biomass resource] especially with competition [TR22 L4-7]. As an employee of the Florida Division of Forestry for eight years, the first Wood Energy Coordinator for the State of Florida, and as an expert in the procurement of biomass material for biomass energy facilities for the last 25 years, do you believe that GREC LLC will be able to sustainably procure the biomass material needed to fuel its facility?**

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**A. Yes. There is more than enough woody biomass material, on a long-term, sustainable basis, to provide all of the fuel supply needs of GREC, without adversely affecting the environment or impacting any existing biomass user. In fact, there is sufficient woody biomass available, again on a long-term, sustainable basis, to provide all of the needs of existing users and to provide sufficient biomass fuel for a total of 200 to 250 MW of new biomass generating capacity in the area.**

18

19

**Q. Do you believe that the addition of GREC will improve the health of the region's forests?**

20

21

22

23

**A. Yes. Biomass energy facilities, like GREC, create a market for low-value biomass material like forest residues and pre-commercial thinnings. Currently, forest residues are burned in the open with no emissions controls or are left in the forest. Pre-commercial thinning involves removing smaller, less desirable**

1 trees at a younger age to allow the remaining trees better access to nutrients and  
2 sunlight, thereby increasing their productivity.

3

4 Perhaps the most important benefit to the region's forests that biomass energy  
5 facilities provide is additional jobs in the industry and increased revenue to  
6 landowners. This allows landowners to keep "forests in forest" and helps  
7 maintain the rural nature of north central Florida which is so highly valued.

8

9 **Q. Chairman Argenziano asked if the PSC staff had copies of the biomass**  
10 **assessment studies referenced during the December 16 hearing [TR23 L2-**  
11 **3]. Has GRU/GREC produced any biomass assessment reports to the**  
12 **Commission?**

13 **A.** Yes. Subsequent to the February 9<sup>th</sup> Agenda Conference, GRU/GREC produced  
14 a number of biomass assessment reports to the Commission. The biomass  
15 resource assessment studies that GRU and GREC produced include the  
16 following studies:

- 17 1. "Biomass Options for GRU – Part II" - Post, Don M. and Cunilio, Tom  
18 C. - November 21, 2003 – Exhibit No. \_\_ [RMS 2];
- 19 2. "Supplementary Study of Generating Alternatives for Deerhaven  
20 Generating Station" – Black & Veatch Corp. – March 2004 – Exhibit  
21 No. \_\_ [RMS 3];
- 22 3. "City of Gainesville Electricity Supply Needs" – ICF Consulting –  
23 March 1, 2006 – Exhibit No. \_\_ [RMS 4]; and

- 1 4. "Economic Availability of Alternative Biomass Sources for Gainesville,  
2 Florida" – Carter, Douglas R., School of Forest Resources and  
3 Conservation Institute of Food and Agricultural Sciences (IFAS)  
4 University of Florida – October 2007 – Exhibit No. \_\_ [RMS 5].

5

6 In addition to the studies commissioned by GRU, a number of other  
7 recent evaluations have been completed that provide further context and  
8 information, including:

9

- 10 5. "Florida Renewable Energy Potential Assessment" - Navigant  
11 Consulting, Inc. – December 30, 2008 – Exhibit No. \_\_ [RMS 6];

- 12 6. "Economic Impacts of Expanded Woody Biomass Utilization on the  
13 Bioenergy and Forest Products Industries in Florida" – Hodges, Alan  
14 W., Stevens, Thomas J., and Rahmani, Mohammad, University of  
15 Florida, Institute of Food and Agricultural Sciences, Food and Resource  
16 Economics Department – February 23, 2010 (revised) – Exhibit No. \_\_  
17 [RMS 7];

- 18 7. "Woody Biomass for Electricity Generation in Florida: Bioeconomic  
19 Impacts under a Proposed Renewable Portfolio Standard (RPS)  
20 Mandate" – Rossi, Fredrick J., Carter, Douglas R., and Abt, Robert C.,  
21 University of Florida, School of Forest Resources and Conservation, and  
22 North Carolina State University, Department of Forestry and  
23 Environmental Resources – March 1, 2010 – Exhibit No. \_\_ [RMS 8];  
24 and

1                   8. "Woody Biomass Economic Study" – Florida Department of Agriculture  
2                   and Consumer Services, Division of Forestry, Florida Department of  
3                   Environmental Protection – March 1, 2010 – Exhibit No. \_\_ [RMS 9].  
4

5   **Q.    Have you reviewed all of these biomass assessment reports?**

6   A.    Yes. I have reviewed all of these reports as they pertain to matters related to  
7           biomass feedstock production and supply. For one of those reports, Exhibit No.  
8           \_\_ [RMS 5], entitled "Economic Availability of Alternative Biomass Sources  
9           for Gainesville, Florida", I was one of the co-principal investigators along with  
10          one of my employees, Dr. Matthew Langholtz.  
11

12   **Q.    In your opinion, what is the overall consensus of these reports regarding the**  
13          **feasibility and long-term sustainability of the supply for GREC?**

14   A.    The consistent, general conclusion of all the studies and reports is that Florida  
15           can generate amounts of energy from biomass significantly beyond its current  
16           levels, and that there is a sufficient supply of a variety of biomass materials, on a  
17           long-term basis, in the supply area of GREC, to sustainably support the project  
18           without adversely impacting existing users.  
19

20           Let me first discuss the reports that were commissioned by GRU, [RMS-2]  
21           through [RMS-5]. The first biomass fuel supply study was conducted by Post  
22           and Cunilio [RMS-2], which was a very straightforward look at the biomass  
23           resource. Post and Cunilio effectively asked how much power could be  
24           generated if only the biomass located within a 25-mile radius, was considered.

1 This study concluded that just within that restricted radius, 340,000 tons/yr of  
2 logging residues and other sources of wood waste were available. They also  
3 noted that 175,000 tons/yr of stumps and 260,000 tons/yr of dedicated woody  
4 crops were available in the same radius. Stumps have been excluded from the  
5 GREC fuel supply, while dedicated woody crops are only allowed if of native  
6 species. If we assume our total wood basket to be an area of 75-mile radius,  
7 then this 25 mile radius represents about only 11 percent of the total wood  
8 basket.

9  
10 The next two studies, the Black & Veatch Corporation and ICF Consulting  
11 studies [RMS-3] and [RMS-4], represent approximately 400 pages of work  
12 addressing everything from an evaluation of generation technologies, to demand  
13 side management and long-term fossil fuel price projections. The biomass fuel  
14 portions of the two studies amount to only about a dozen pages as these were  
15 prepared by engineering consultants, not foresters or biomass experts. These  
16 studies both base their biomass supply work on Post and Cunilio, and  
17 supplement it with sources of information from Oak Ridge National Laboratory  
18 and the National Renewable Energy Laboratory. No original data collection was  
19 conducted by either study. The Black & Veatch study reports that nearly 1,900  
20 dry tons per day are available within 50 miles of GREC, which is an  
21 extrapolation of national data. The ICF study did not constrain itself to a specific  
22 radius, but rather developed biomass supply curves as a function of travel  
23 distance.



1 Finally, the Carter, Langholtz, and Schroeder study [RMS-5] was completed in  
2 late 2007. Carter is with the UF School of Forestry and Resource Conservation,  
3 as was Langholtz at the time, although he is now an employee at BioResource  
4 Management. This study evaluated the distribution of a number of forest-  
5 derived biomass resources, as well as urban wood waste. It evaluated the cost of  
6 obtaining the materials, as well as costs associated with processing it to suitable  
7 specifications for boiler fuel, and ultimately transporting it to the Deerhaven  
8 site. It also evaluated competition for wood resources by potential, separate  
9 facilities to be developed (they have not actually materialized) in Jacksonville  
10 and Tallahassee. The study concluded that there was sufficient biomass fuel to  
11 easily supply 120 MW of power across the three facilities, and that indeed there  
12 was sufficient biomass material to comfortably supply a 100 MW facility in  
13 Gainesville.

14  
15 **Q. How do the other reports relate to the feasibility and long-term**  
16 **sustainability of the supply for GREC?**

17 **A.** The remaining studies, [RMS-6] through [RMS-9], were conducted with a  
18 statewide focus, and although they do not address the supply situation for any  
19 specific location within the state they do provide some perspective on the  
20 potential for biomass energy. First, the Florida Renewable Energy Potential  
21 Assessment [RMS-6] completed by Navigant is a comprehensive, thoroughly  
22 researched evaluation of all potential types of renewable energy for the state.  
23 The study's treatment of biomass fuel included everything from crop residues  
24 and manure, to logging residues and other forestry sources, to dedicated energy

1 crops and urban wood waste. Their conclusion is that the technical potential  
2 (which may be well above the actual, practical potential given current  
3 conditions) for biomass energy in Florida is in the range of 5,960-13,750 MW.  
4 Narrowing the biomass focus to fuels of interest to GREC, the study concludes  
5 that the technical potential for electrical generation from logging residues is  
6 354-566 MW; intensification of pine production on 10 percent of planted pine  
7 acreage is 592-948 MW; and from urban wood waste not currently being  
8 recycled is 175-290 MW. In other words, this is a total technical potential in  
9 Florida of 1,121-1,804 MW considering just these very accessible resources.

10  
11 The last three documents were released in February/March 2010 by the Florida  
12 Department of Agriculture and Consumer Services, Division of Forestry and the  
13 Florida Department of Environmental Protection, and consider the implications  
14 of implementation of a renewable portfolio standard (RPS) in Florida. The  
15 Hodges, et al. study [RMS-7] evaluated economic impacts, i.e., GDP and  
16 employment etc., and assumed the sufficient availability of woody biomass, and  
17 as such does not directly contribute to the issue of biomass supply. The Rossi,  
18 et al. study [RMS-8] provides an evaluation of impacts of the RPS on the  
19 existing timber industry, as well as on the productive landscape in the state.  
20 This study used a regional timber model to estimate supply, demand, and timber  
21 prices throughout the state during the decade long scale-up of the RPS. Full  
22 implementation of the RPS is assumed to translate to a contribution by woody  
23 biomass of 15 percent of all of Florida's 2020 generation, relative to the current  
24 354 MW (0.6 percent of all FL generation). The conclusions of both the Rossi,

1 et al. study and the Hodges et al. study are summarized in the Woody Biomass  
2 Economic Study published by the Florida Department of Agriculture [RMS-9].  
3

4 They conclude that to implement a 7 percent RPS for Florida would require  
5 approximately 1,000 MW of biomass energy generation and that this amount  
6 would be more than feasible given the state's forest resources, with little  
7 disruption to the timber supply of the existing forest products industry. This  
8 level of biomass generation could be fueled by urban wood waste and logging  
9 residue, with minimal or no use of merchantable timber ([RMS-8], p. 30, Table  
10 4.4). They further conclude that it would be additionally beneficial to the state  
11 economy and timber producers and associated forestry operations in particular.  
12 As Charles Bronson, the Commissioner of the Florida Department of  
13 Agriculture and Consumer Services, stated in the cover letter that accompanied  
14 these reports, "a significant amount of renewable energy can be developed  
15 through the utilization of woody biomass, while still keeping the forest resources  
16 of Florida sustainable and current forest industries strong."  
17

18 In summary, this sustainable level of biomass power would require, by 2025, an  
19 additional 10 million tons of fuel per year, or ten times GREC's annual need  
20 alone. GREC's annual fuel requirements, 1,000,000 tons, will be a fraction of  
21 this total amount of necessary biomass material that the Florida Division of  
22 Forestry report has found can be implemented sustainably and without adverse  
23 consequence to existing biomass users. Furthermore, this level of biomass power

1 would facilitate increases in the total revenue landowners receive for their  
2 products and increase chances of keeping “forests in forest” ([RMS-9], p.2).  
3

4 **Q. Are there any findings within these reports that would lead you to conclude**  
5 **that there is not enough biomass material within an economic distance to**  
6 **sustainably fuel GREC for the life of the facility?**

7 A. No, the conclusions of all the biomass assessment reports clearly indicate that  
8 sufficient biomass material is generated and available within an economically  
9 feasible distance of the project.  
10

11 **Q. Have you and your associates conducted an independent assessment of the**  
12 **biomass resource availability within the GREC wood basket? If so, what is**  
13 **your conclusion about the availability of biomass fuel within the GREC**  
14 **wood basket?**

15 A. We are presently conducting an independent assessment of the biomass resource  
16 availability within the GREC wood basket. Our preliminary conclusion is that  
17 there is more than enough available biomass material within the GREC wood  
18 basket to sustainably supply GREC, at an economic price level, for the life of  
19 the facility, without adversely impacting existing users.  
20

21 **Q. Chairman Argenziano raised a concern about GREC being able to**  
22 **sustainably acquire the necessary biomass fuel at an economic rate [TR22**  
23 **L15-19]. Please address the Chairman’s concerns.**

1     A.     After reviewing the aforementioned biomass assessment reports, as well as  
2             conducting my own independent assessment of the biomass resource within the  
3             GREC wood basket, I conclude that GREC LLC will be able to sustainably  
4             acquire the necessary biomass material at an economic rate for a number of  
5             reasons. *First*, forest inventory data indicate that utilization of the region's  
6             forests is at or below sustainable levels, and that in fact, growth is currently  
7             exceeding the volumes harvested by the timber industry. *Second*, GREC is able  
8             to utilize a great deal of material that other biomass users cannot, namely  
9             logging residues and other low-value material such as pre-commercial thinnings;  
10            inventory data indicates an abundance of this material is present in the region.  
11            In addition, there is a great deal of unutilized material originating from urban,  
12            mill, and industrial sources that can be captured by the project. Approximately  
13            30 percent of GREC's fuel will come from non-forest resources, such as urban  
14            wood from landscaping activities, tree removal for right of ways or public areas,  
15            and vegetative storm debris. In fact, GREC LLC has signed a letter of intent  
16            with Wood Resource Recovery for the supply of 300,000 green tons per year of  
17            urban wood waste [RMS-15]. *Third*, GREC is in a geographically advantaged  
18            position. It is at a considerable distance from other major users of low-value  
19            wood thus minimizing competition for nearby material and it has a better  
20            softwood forest capacity to draw from than many of the existing biomass users  
21            in the region. *Fourth*, the north central Florida forest resource has provided  
22            steadily increasing volumes of material from the same land base over the last  
23            several decades. Analyses by researchers show that timber harvested at the age  
24            of 25 in 2010 will yield, on average, four times the biomass volume of a 50-year

1 old stand of timber harvested in 1940. Information related to the increased  
2 productivity of the forest resource is presented in the presentation on  
3 BioResource Management's independent assessment of the biomass resources in  
4 the GREC wood basket [RMS-10].

5  
6 **Q. Over the course of the 20th century, and still continuing today, the demand**  
7 **for a variety of forest products has increased harvest pressure on the**  
8 **region's forest resources. Please comment on how the forestry industry and**  
9 **forest landowners have responded to this increasing demand.**

10 **A.** Over the past six decades, southern pine productivity has advanced a great deal.  
11 In simple terms, landowners in the Southeast have been able to produce more  
12 wood in less time on less land. This advance in productivity is well-documented  
13 in the peer reviewed literature, and indeed shows many similarities to the  
14 progress exhibited in increased yields with agricultural crops. Large gains in  
15 southern pine productivity have arisen from silvicultural practices like  
16 appropriate site preparation and weed control during the early years. These two  
17 practices allow the newly established plantation the opportunity to take full  
18 advantage of the soil profile, while shielding them from intense competition  
19 from herbs, grasses, and hardwoods. Fertilization has also become a valuable  
20 silvicultural practice in many areas, where one or two well-timed applications of  
21 a critical nutrient such as phosphorous over the course of an 18-22 year rotation  
22 can markedly improve performance.

1 As with agricultural crops, plant breeding through selection of superior  
2 specimens has not only resulted in faster growth, but has improved other traits  
3 such as fiber quality and tree form. Seedlings produced now are into the third  
4 generation of improvement, and historically each successive generation of  
5 improvement has resulted in productivity increases of 8 to 12 percent. This has  
6 been accomplished without genetic modification or introduction of exotic  
7 species. The result of the genetic and cultural advances in southern pine  
8 production mean that stands established today can grow twice as much volume  
9 in about half the time as those planted in the 1950s. Interestingly, this result has  
10 paralleled the growth of the forest products industry in Florida, whose  
11 production has doubled from 10 million tons per year in 1948 to 20 million  
12 today. The forestry industry and forest landowners have historically responded  
13 to increased demand by getting better at growing trees, and I believe they will  
14 do so in the future as well.

15  
16 **Q. Chairman Argenziano asked if the biomass material needed for GREC can**  
17 **be sustainably supplied without negatively impacting existing biomass users**  
18 **in north central Florida [TR23 L11-14]. Please address the Chairman's**  
19 **question.**

20 **A.** After reviewing the independent biomass assessment reports that GRU/GREC  
21 provided to the Commission, as well as conducting my own independent  
22 assessment of the biomass resource within the GREC wood basket, I can  
23 confidently state that there is good evidence that GREC's biomass procurement  
24 will be sustainable and will not negatively impact the existing biomass users in

1 north central Florida. When I refer to "forest inventory data" in my testimony I  
2 am referring to inventory data obtained from the USDA Forest Service's Forest  
3 Inventory and Analysis (FIA) database. This is an ongoing inventory of the  
4 nation's forest resources that has been conducted for at least fifty years and is the  
5 definitive source of forest inventory data in the US. It is an impressive  
6 undertaking that has few or no peers in other countries, either industrialized or  
7 developing. In summary, the FIA database establishes a grid pattern of  
8 permanent inventory plots on the landscape that are revisited and measured  
9 every 5 years; in Florida alone this grid includes a few thousand sample plots.  
10 FIA data forms part of the basis for our independent supply study conducted for  
11 GREC as well as for the other studies mentioned above.

12  
13 A second data source employed in our assessment and others is the USDA  
14 Forest Service's Timber Products Output (TPO) database. This is a semi-annual  
15 survey of wood using facilities that is also nationwide in scope. The TPO  
16 survey measures the volume of timber that is purchased by mills, as well as the  
17 type and quantity of products that those mills generate, including residuals.

18  
19 A third data source that BioResource employs in its supply evaluation is the  
20 National Land Cover Dataset (NLCD) maintained by the US Geological Survey.  
21 The NLCD is derived from recent satellite imagery, and is a high-resolution  
22 (0.25 acre) dataset that classifies the landscape into a variety of forest,  
23 agricultural, developed, and other categories that form the basis for biomass  
24 generation in the supply area. In our experience ground-truthing this data, we



1 have found the NLCD to be extremely reliable at correctly identifying the land  
2 cover types most important to biomass supply.

3

4 In order to estimate supplies of urban sources, we utilize US Census tract data.  
5 Population estimates from the Census Bureau for 2007 are used, and we apply  
6 per-capita urban wood generation rates obtained from the literature, as do most  
7 other assessments. Our operational experience enables us to refine this baseline  
8 estimate according to population density and geographic considerations.

9

10 Finally, it is important to note that all of the above data is spatially explicit.  
11 That is, the biomass generation estimates are pinpointed within the landscape  
12 such that we are able to identify from which specific area material is originating.  
13 This avoids using statewide averages that often distort local generation  
14 estimates, and allows us to better predict costs as well as our ability to capture  
15 the material generated.

16

17 Combining the tools and datasets mentioned above, with our knowledge and  
18 experience in the biomass industry, allows me to confidently state that there is  
19 excellent evidence that GREC's biomass procurement can be sustainable and  
20 will not negatively impact the existing biomass users in north central Florida.

21

22 **Q. Did your independent assessment estimate the potential supply of different**  
23 **types of biomass material that are currently available within the GREC**

1        wood basket? If so, please provide your estimate for how much of each type  
2        of biomass material is currently available within the GREC wood basket.

3        A.    Yes, our independent assessment estimated the potential supply of different  
4        types of biomass material that are currently available within the GREC wood  
5        basket. We estimate annual sustainable generation rates for four general biomass  
6        categories within the GREC wood basket as follows:

- 7            • 1,600,000 green tons of biomass material from logging residues,
- 8            • 540,000 green tons of biomass material from pre-commercial thinnings,
- 9            • 3,300,000 green tons of coarse and fine residue from primary wood-  
10          using mills, and
- 11          • 410,000 green tons of biomass material from various types of urban  
12          wood waste.

13        This totals to 5.85 million green tons of biomass material from these four  
14        categories generated annually within the GREC supply area; *note that this does*  
15        *not include any pulpwood or other types of higher-value forestry products.* With  
16        GREC needing approximately 1,000,000 green tons of biomass material per  
17        year, there is a safety factor of almost 6 times.

18  
19        Additional information on the estimates provided above is presented in the  
20        BioResource Management presentation [RMS-10].

1     **Q.     Isn't it true that replanting rates within the region's forests have declined**  
2           **over the last decade and shouldn't that cause concern about GREC LLC's**  
3           **ability to sustainability supply GREC?**

4     **A.**     It is true that replanting rates have declined over the last decade, but I do not  
5           believe that this causes a concern about GREC LLC's long-term ability to  
6           sustainability supply GREC. Since about 2000, harvested pine acreage has not  
7           been met with an equivalent replanting rate. It could be interpreted that this land  
8           is perhaps being taken out of forestry production (maybe by as much as 90,000  
9           to 100,000 acres annually) and that critical supply shortfalls are looming for  
10          existing and proposed facilities.

11  
12          The theory that land use is changing at this level is inconsistent with other  
13          highly reputable third-party indicators such as FIA data that report Florida's  
14          forests gaining 910,000 acres over the decade 1995-2005. While I believe that  
15          tree planting data is less reliable than FIA, for numerous reasons, part of the  
16          explanation likely lies in the fact that many forest landowners in the area are not  
17          selling pulpwood due to prices that have been flat in real terms for the past 20  
18          years. Rather than harvesting when their timber reaches pulpwood size, many  
19          landowners are allowing their stands to grow to sawtimber size prior to harvest  
20          in order to achieve a better return on their investment.

21  
22          Therefore, the conclusion should not be that land use is changing, but rather that  
23          rotations have lengthened and replanting rates are not a good indicator of  
24          biomass availability. I am confident that there is a large volume of additional

1 biomass, beyond what is currently being utilized today, that can be sustainably  
2 used for renewable energy facilities like GREC.

3

4 Finally, I want to note that the Minimum Sustainability Standards contained in  
5 the GREC power purchase agreement (see [RMS-11]) specifically state that  
6 biomass material will not be accepted from those suppliers who do not replant  
7 harvested acres, a standard that no other biomass-using facility in Florida has  
8 agreed to.

9

10 **GREC's Fuel Requirements and Sustainability Aspects of the PPA**

11 **Q. Please describe the amount of the biomass material that GREC LLC will**  
12 **need to procure annually.**

13 A. Annually, GREC LLC will need to procure approximately 1 million green tons  
14 of biomass material depending on the moisture content of the wood. GREC LLC  
15 anticipates that the average moisture content of its biomass material will be  
16 between 45 and 50 percent moisture. If the average moisture content is less than  
17 anticipated, GREC LLC will need to procure less than 1 million green tons per  
18 year of biomass material.

19

20 **Q. Chairman Argenziano asked what the primary source of fuel would be for**  
21 **GREC [TR27 L5-7]. Please describe the different types of biomass material**  
22 **that GREC will utilize.**

23 A. GREC will utilize many different types of biomass material for its operations.  
24 GREC will not use as fuel any form of treated, painted, or coated wood;

1 municipal solid waste; construction and demolition debris; coal; petroleum coke;  
2 or tires. All of GREC's biomass material will be clean, woody biomass material.

3 The different types of biomass material primarily consist of:

4 • In-forest residue and slash

- 5 – Tops, limbs, whole tree material and other residues from soft-  
6 and hardwoods that result from traditional silvicultural harvests

7 • Mill residue

- 8 – Saw dust, bark, shavings and kerf waste from the cutting/milling  
9 of whole green trees; fines from planing kiln-dried lumber; wood  
10 waste material generated by primary wood products industries  
11 such as round-offs, end cuts, sticks, pole ends, and reject lumber  
12 as well as residue material from the construction of wood trusses  
13 and pallets

14 • Pre-commercial tree trimmings and understory clearings

- 15 – Material resulting from timber stand improvement operations:  
16 tops, limbs, and whole tree material that result from the removal  
17 of a percentage of the standing volume in order to improve  
18 growing conditions for the remaining stand and to reduce the  
19 hazard of wildfires. Forest understory that includes hardwood  
20 trees, bushes, and saplings

21 • Storm, fire and disease debris

- 22 – Tops, limbs, whole tree material and other residues that are  
23 damaged due to storm and fire events as well as infectious  
24 diseases or insect pest outbreaks

- 1           • Urban wood waste
- 2               – Tree crowns and trunks generated by landscaping contractors
- 3               and power line/roadway clearance contractors that have been
- 4               cleared for right-of-way maintenance; woody material generated
- 5               from the conversion of rural land to urban or suburban uses; and
- 6               the woody fraction of yard waste collected by municipalities
- 7           • Recycled industrial wood
- 8               – Wood derived from used pallets; packing crates and dunnage
- 9               disposed by industrial users.
- 10          • Agricultural residues
- 11               – Peanut shells, rice hulls and other vegetative material

12           In summary, the biomass material that GREC will utilize is either urban or mill  
13           waste wood or the lowest-value biomass material from forestry and agricultural  
14           operations.

15

16   **Q.   What is currently happening with much of the biomass material you**  
17   **described above?**

18   A.   This varies widely depending on the type of biomass material. Use of urban  
19           waste wood is generally limited to the landscape mulch market, although some  
20           is used as boiler fuel in area facilities. Some urban material is also landfilled or  
21           illegally dumped, as is usually the case with storm debris. Most mill residues,  
22           like bark and other coarse residues, are utilized as landscape mulch or boiler fuel  
23           while fine mill residues, like sawdust and planer shavings, are mostly used as  
24           animal bedding in north Florida horse farms. With respect to in-forest material,

1 logging residue is generally piled and open-burned in the field; at present  
2 thinnings have little value, and as a result forest stands in the region are often  
3 not thinned, although the material is generally used as boiler fuel if it is  
4 harvested and marketed.

5  
6 **Q. Is GREC able to utilize different tree species and ages in its operations?**

7 A. Yes. GREC is indifferent with respect to the species and age of the biomass  
8 material. The major driving force from a fuel perspective for a biomass energy  
9 facility like GREC is the moisture content of the wood. The drier the biomass  
10 material, the higher the heating value of the biomass material and the less  
11 biomass material GREC needs to consume.

12  
13 **Q. Please describe the importance of GREC being able to utilize the different**  
14 **types of biomass material you have described above.**

15 A. The ability to use a variety of biomass materials allows GREC to maintain a  
16 diverse portfolio, and this affords the project a number of important advantages.  
17 First, the diversity of fuel sources buffers the project from price fluctuations by  
18 any single type of biomass material or supplier; second, it allows the project to  
19 opportunistically utilize very low cost material such as storm debris; third, it  
20 allows GREC to avoid directly competing with current users by utilizing waste  
21 or residual material rather than logs used for higher-value products.

1     **Q.     Are you familiar with the minimum sustainability standards and the**  
2           **stewardship incentive plan contained within the power purchase agreement**  
3           **between GRU and GREC LLC?**

4     **A.     Yes I am. In fact, one of my employees, Dr. Matthew Langholz participated in**  
5           **the Ad-hoc Forestry Committee that GRU convened to assist with the**  
6           **development of these standards and the incentive plan, along with**  
7           **environmentalists, academics, forestry professionals and regulators.**

8

9     **Q.     Please summarize the minimum sustainability standards and the**  
10          **stewardship incentive plan contained within the power purchase agreement**  
11          **between GRU and GREC LLC.**

12    **A.     The Minimum Sustainability Standards applying to forest-derived material have**  
13          **the following key features, and will be overseen by certified professional**  
14          **foresters:**

- 15           1. All biomass fuel must be obtained from forests in compliance with Best  
16           Management Practices (water resources protection)
- 17           2. Biomass fuel cannot be obtained from the conversion of natural forests  
18           to plantations (biodiversity/native ecosystem protection)
- 19           3. Stumps cannot be utilized for fuel (soil fertility maintenance)
- 20           4. No material from nonnative species except eradication projects can be  
21           utilized (native ecosystem protection)
- 22           5. Land from which biomass has been harvested must be replanted within 3  
23           years (forest cover sustainability)



1       The Forest Stewardship Incentive Payment provides landowners with a financial  
2       incentive to go beyond the Minimum Sustainability Standards via the adoption  
3       of third-party stewardship certification programs. This payment will provide  
4       growers with a guaranteed price premium to those receiving certification from  
5       the Florida Division of Forestry Stewardship Program or the Forest Stewardship  
6       Council. Additional information related to the minimum sustainability standards  
7       and the incentive program is presented in Exhibit No. \_\_ [RMS-11].  
8

9       **Q.   In your opinion, will these minimum sustainability standards and the**  
10       **incentive plan encourage superior silvicultural practices that will result in**  
11       **better managed, healthier forests for the region?**

12      A.   Yes, the minimum sustainability standards and the incentive plan will encourage  
13       superior silvicultural practices. These two features of the power purchase  
14       agreement raise the bar for those supplying biomass material to GREC  
15       compared to other projects or even existing forest products industries. These  
16       provisions will not only improve forest health, they will also help protect  
17       Florida's water resources and native habitats for wildlife species.  
18

19      **Q.   Are you aware of any existing biomass users or proposed biomass users,**  
20       **including the proposed biomass energy facilities in north central Florida,**  
21       **that have agreed to minimum sustainability standards such as the ones that**  
22       **GREC LLC has agreed to?**

23      A.   No. We know of no facility in the state of Florida that has agreed to  
24       sustainability standards like those included in the GREC agreement.

1

2

**Biomass Supply Needs of Existing Users**

3

**Q. Are you familiar with the biomass facilities listed in the table labeled *Response to Interrogatory 91*? If so, please explain whether you view these facilities as potential competitors to GREC for biomass material or as potential suppliers.**

6

7

**A.** Yes, I am familiar with the biomass facilities listed in the table labeled *Response to Interrogatory 91* [RMS-12] and I do not view these facilities as potential competitors but rather as potential suppliers of mill residue. These facilities are primarily sawmills, chip-n-saw mills and pole mills that are located between 1 and 59 miles from the GREC site. In my opinion, GREC will not be competing directly with these facilities for biomass material as these facilities process harvested round wood solely, whereas GREC will use a wide range of wood waste as detailed above for its primary biomass fuel. In making lumber or poles, these mills will produce residues which can be utilized as fuel for the GREC facility. Currently, most of these residues are being utilized by other users, but I expect that a small percentage of this material will be supplied to GREC.

18

19

**Q. Are you familiar with the biomass facilities listed in the table labeled *Response to Interrogatory 92*? If so, please explain whether you view these facilities as potential competitors to GREC for biomass material.**

21

22

**A.** Yes, I am familiar with the biomass facilities listed in the table labeled *Response to Interrogatory 92* [RMS-13] and I do not view these facilities as potential competitors. These facilities are primarily pulp mills, with the exception of

23

24

1       Appling County Pellets, which is a pellet manufacturer and two other facilities  
2       which are electrical generators. One of these electrical generators is extremely  
3       small in size and has frequent shutdowns, while the other facility is fairly small  
4       and utilizes a wide range of fuels that GREC will not use for fuel, including tires  
5       and landfill gas. As for the pulp mills and the pellet mill, in my opinion, they are  
6       not potential competitors to GREC for biomass material since they are primarily  
7       utilizing round pulpwood as their processes require a specific species and age of  
8       biomass material. As mentioned above GREC will utilize a wide range of lower-  
9       value wood as its primary fuel.

10  
11   **Q.   Besides utilizing different types of biomass material, are there any other**  
12       **reasons why you believe that these facilities are not potential competitors to**  
13       **GREC?**

14   **A.**   Yes. Many of the facilities listed in the table labeled *Response to Interrogatory*  
15       92 receive a majority of their biomass material from one large private forest  
16       owner under a long-term contract. It is also unlikely that GREC would contract  
17       with these same private land owners for a significant portion of their biomass  
18       material. Therefore, not only is GREC not targeting the same type of biomass  
19       material as these facilities, GREC is negotiating with completely different  
20       landowners/suppliers of biomass material than these facilities have previously  
21       contracted with.

1     **Q.     Do you believe that GREC will have a negative impact on the existing**  
2           **biomass users in north central Florida?**

3     A.     No, I do not. In addition to the reasons stated above, as stated earlier, the recent  
4           reports submitted by the Florida Department of Agriculture and Consumer  
5           Services, Division of Forestry, and the Florida Department of Environmental  
6           Protection ([RMS-7], [RMS-8], and [RMS-9]), conclude that a 7 percent RPS  
7           would have little impact to the existing forest products industry and Florida's  
8           forest would remain sustainable. It is important to point out that the biomass  
9           energy capacity needed to meet this sustainable 7 percent RPS is many times the  
10          capacity of GREC. Therefore, the impact from GREC alone should have very  
11          little to no impact on the existing forest products industry.

12

13                   **Potential Biomass Supply Needs of Future Users**

14    **Q.     Are you familiar with the proposed biomass projects listed in the table**  
15           **labeled *Response to Interrogatory No. 93*? If so, please explain whether these**  
16           **facilities will compete with GREC for biomass material.**

17    A.     Yes, I am familiar with the proposed biomass projects listed in the table labeled  
18           *Response to Interrogatory No. 93* [RMS-14]. It is important to note that none of  
19           the independent electric generating facilities listed in this table have power  
20           purchase agreements as of the time that this testimony was prepared. For  
21           independent electric generating facilities, a power purchase agreement with a  
22           credit-worthy entity is the cornerstone of project development. At this time,  
23           therefore, the further development of these projects remains speculative.  
24           Nevertheless, if these facilities are successfully financed, built, and begin

1 operations, they will be able to utilize similar types of biomass material to fuel  
2 their boilers and could therefore be considered potential competitors. However,  
3 these facilities are over 70 miles away from GREC. Their respective wood  
4 baskets will overlap somewhat, but they will not be directly competing for all of  
5 their biomass material as they are not located directly next to each other. In  
6 addition, it is important to point out that just because a project has filed, or  
7 received, a permit from a regulatory agency is not a good indicator that a  
8 particular project will actually be constructed and placed into operation. Many  
9 other elements, especially for an independent power project that is planning to  
10 sell its output, such as a financeable PPA with a credit-worthy offtaker, are  
11 necessary before a project can begin construction.

12  
13 **Q. Assuming a scenario where all of the currently proposed biomass projects**  
14 **are constructed, do you believe that there is a sustainable amount of**  
15 **biomass material available to support all of these projects?**

16 **A.** Yes, even if all of these facilities are constructed, I believe that there is enough  
17 biomass material for GREC and all the others. However, it is highly unlikely  
18 that all of the proposed biomass projects will be constructed for the reasons  
19 stated above. My independent assessment of the biomass resources in the GREC  
20 wood basket concluded that there is enough sustainably available biomass  
21 material within the area for the development of between 200 and 250 MW of  
22 biomass energy (including GREC).

1 As for the additional proposed biomass energy projects, the recent reports from  
2 the Florida Department of Agriculture and Consumer Services, Division of  
3 Forestry, and the Florida Department of Environmental Protection ([RMS-7],  
4 [RMS-8], and [RMS-9]) state that more than twice the existing amount of  
5 biomass energy capacity for Florida can be added without damaging Florida's  
6 forest resources.

7  
8 **Status of GREC Fuel Procurement**

9 **Q. Please describe GREC LLC's progress in securing woody biomass purchase**  
10 **contracts, options, or agreements with prospective suppliers of woody**  
11 **biomass.**

12 A. GREC LLC is actively discussing supply agreements with numerous local forest  
13 landowners within the area of supply for the project. Collectively these  
14 landowners represent more than 1 million acres and potentially generate over 3.1  
15 million green tons per year of forestry material including logging residue, low-  
16 grade thinning and other material. The negotiation of length, term, and amount  
17 of material for each landowner varies and all parties require confidentiality  
18 during the negotiation process. The targeted term is ten years and the targeted  
19 total volume of GREC fuel from the supply agreements from these landowners  
20 is 575,000 green tons annually.

21  
22 For urban-derived biomass material, Wood Resource Recovery (WRR) and  
23 GREC LLC have signed a letter of intent (LOI) to negotiate a ten year supply  
24 agreement for 300,000 green tons of urban wood waste annually. This LOI is

1 included as Exhibit No. \_\_ [RMS-15]. WRR is a Gainesville-based large urban  
2 wood waste recycling company. WRR operates throughout the US managing  
3 storm debris, and has handled over 1 million tons of woody biomass material per  
4 year.

5  
6 GREC LLC is also actively discussing supply agreements for other sources of  
7 wood material including mill residue, agricultural land clearing tree debris, and  
8 other sources. In addition, GREC LLC wants to maintain the ability to receive  
9 opportunity fuels such as storm debris, diseased/damaged trees and tree debris  
10 from large clearing projects, and therefore will not execute long-term contracts  
11 for more than 90 percent of the estimated maximum supply requirement.

12  
13 **Q. In your experience of assisting in the development and financing of biomass**  
14 **energy facilities over the last thirty years, is it unusual for a biomass energy**  
15 **facility at the development stage that GREC is at now, to not have binding**  
16 **biomass supply agreements**

17 **A.** No. At the development stage that GREC is at now, it would be extremely  
18 difficult and even disadvantageous for GREC LLC to execute competitive,  
19 binding supply agreements with potential landowners/suppliers as GREC LLC is  
20 still working on acquiring the necessary permits to construct and operate GREC.  
21 As soon as it is clear that GREC will be successfully permitted, GREC LLC will  
22 be able to execute binding supply agreements.

1     **Q.**     In your opinion, will GREC LLC be able to execute long-term supply  
2             agreements for a majority of GREC's biomass supply needs before GREC  
3             begins construction?

4     **A.**     Yes. From all of the biomass fuel discussions that GREC LLC is having with  
5             landowners and suppliers of biomass material, I am confident that there is  
6             sufficient interest among them to sign long-term biomass material supply  
7             agreements with GREC LLC.

8  
9             In addition, as Witness Levine testified to earlier, GREC LLC is planning on  
10            pursing a traditional project financing approach which would involve senior  
11            long-term debt and additional equity as necessary, GREC's potential financing  
12            partners will absolutely require that a majority of the necessary biomass material  
13            to operate the facility be placed under long-term contract. The senior bank debt  
14            will be secured by first priority liens on substantially all of the assets and  
15            commercial agreements associated with, as well as a pledge of equity in, GREC.  
16            During the due diligence phase of the financing process, GREC's potential  
17            financing partners will hire an independent third-party to not only analyze the  
18            GREC wood basket, but also review all of the long-term fuel contracts that  
19            GREC LLC has executed.

20

21    **Q.**     Does this conclude your testimony?

22    **A.**     Yes.