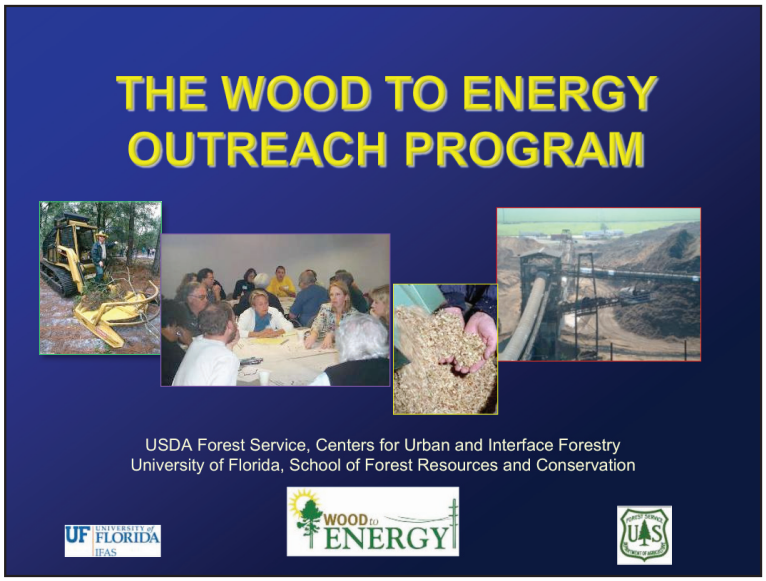
WOOD to ENERGY

Presentation

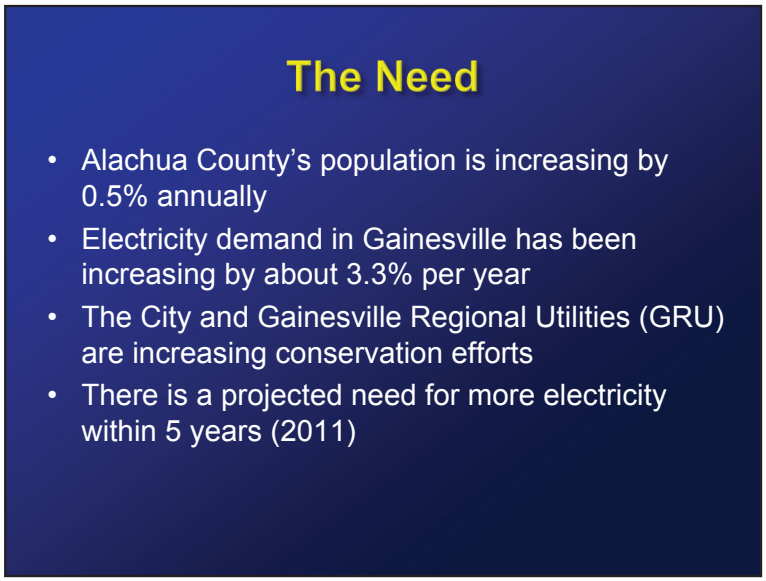
Slide 1



AMBASSADORS: *This sample presentation can be modified to allow Biomass Ambassadors to introduce the concepts of using wood for energy to community leaders or interested citizens. The slides and text for this presentation come from the community presentations that we conducted in Gainesville, Florida. Please modify this presentation to suit your needs.*

Welcome, and thank you for coming. This presentation will introduce you to the possibility of using wood for heat, power, and electricity. The information comes from the Wood to Energy Outreach Program, which was developed by the University of Florida and Southern States Energy Board with the USDA Forest Service – Centers for Urban and Interface Forestry. My name is _____ and I represent _____.

Slide 2



AMBASSADORS: *Please describe the need for increased energy in this location.*

Here in Gainesville the regional utility company projects needing more power production by the year 2011, due to increases in both our population and our per capita electricity use. Of course conservation efforts are important, and are currently being implemented, along with current renewable energy activities. The biomass landfill gas project is generating approximately 1.1 megawatts of electricity. Wind and solar make up approximately 5 percent of the total blend.

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Because there is a need for more electricity and because we currently rely on fossil fuels (coal and natural gas) there has been a sincere interest in looking at a variety of energy sources and options. Scientists suggest that there is no one fabulous answer for our energy situation, but that using many different energy opportunities can help ease us along for several decades without increasing our contribution to carbon in the atmosphere. New ideas are being explored, and some of them could be better answers than the ones we have now.

Wood is one of many possibilities that is feasible and possible in some Southern communities. We do not believe it is the only energy source we need, nor that it is the best energy source forever.

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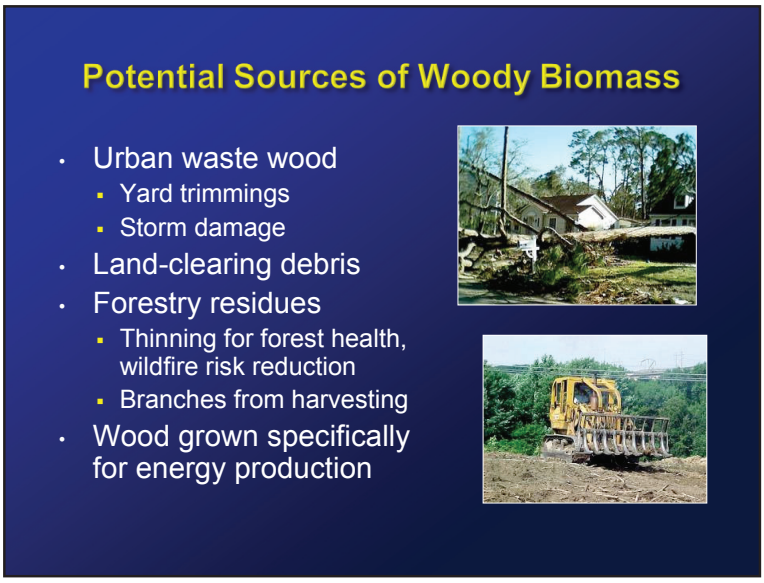

AMBASSADORS: *It is important to be cautious not to "bash" coal or other fossil fuels in your outreach activities. There are costs and benefits to all energy options that communities should weigh carefully. Messages that are overly critical of other options may come across as biased.*

We can obtain wood from a variety of sources. Communities will vary on whether or not they have access to urban waste wood or forestry residue, for example. Thinning forests for wildfire mitigation, forest health, and restoration generates woody biomass that may not have any other market. If a collection system can be designed, this wood could become fuel.

Communities with nearby working forests could have access to woody biomass from thinning and harvesting operations. Urban areas generate wood waste from trimming electrical lines, yard waste, storm damage, and land clearing.

Trees can also be grown in intensively managed plantations for energy.

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AMBASSADORS: *In an effort to avoid appearing to advocate for the use of wood for energy, it is important to be as even-handed as possible when discussing the benefits and costs of wood and when comparing them comparing them to other to other alternatives.*

Developing a market for wood in the wildland-urban interface could help southern landowners maintain their forest lands. In some areas, when pulp mills close, landowners are left with timber but no buyer. For some of them, selling their land for development makes economic sense. The South is forecast to lose 12 million forest acres (8%) to development between 1992 and 2020.

Forest ecosystems, even working forests, provide a number of ecosystem services that we all rely upon: cleaner water, cleaner air, wildlife habitat, recreation opportunities, and stable climate. Thus, using woody fuels for energy could help maintain working forests in the wildland-urban interface, which will benefit everyone in several ways – we gain the environmental benefits of having nearby forests as well as the economic and environmental benefits of using wood. We can take a closer look at some of those benefits…

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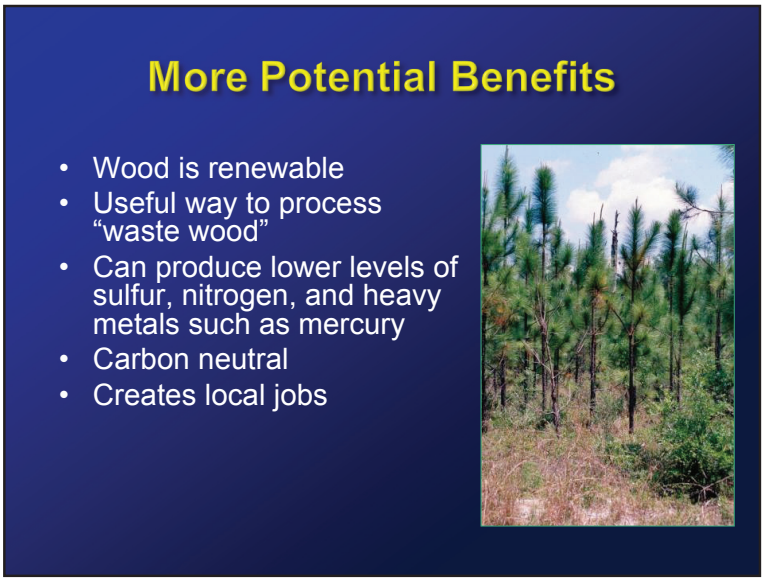

Using wood for energy instead of or in combination with fossil fuels can make good sense economically and environmentally. When this renewable resource is burned it generates lower levels of sulfur, nitrogen oxides, and mercury than coal. The carbon emitted from the combustion or decomposition of wood is already part of the current carbon cycle. Particularly if the trees that are used as an energy fuel are replanted, wood is considered a carbon-neutral fuel source. Using local fuel also creates local jobs, as we'll see later.

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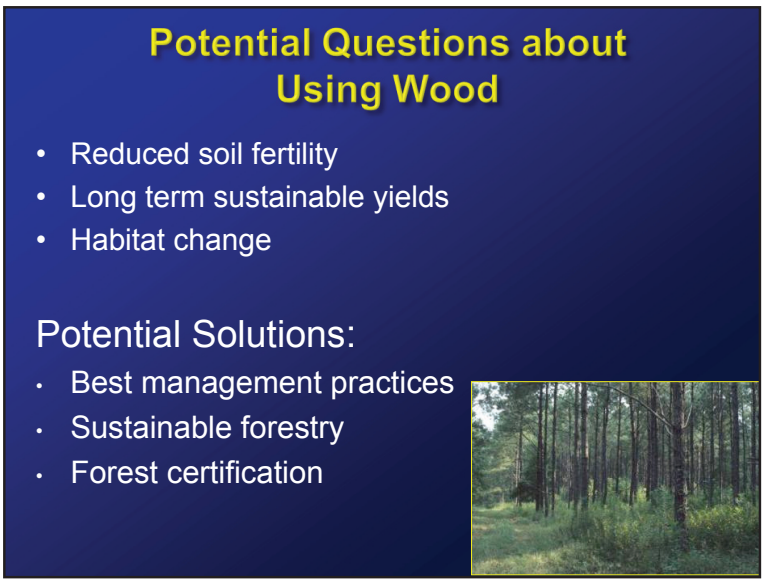

Many people are concerned that taking woody biomass out of the forest would reduce the nutrients that could be returned to the soil if that wood were left to decompose. People are also concerned about the sustainability of forests if harvesting increases and the impacts it could have on wildlife.

Answering these questions involves making assumptions about the source of wood. If it is urban waste wood, for example, those nutrients will be removed. If the wood would have been burned in open piles, burning it in combustion chambers is better for air quality. If the wood would have been mulched and composted and made available to homeowners, then the nutrients would be going back into the urban ecosystem. If the wood is coming from forest harvesting operations, it is possible for the harvesters to let the branches dry out enough for the leaves and needles to fall off. So the foliar nutrients could be returned to the soil. Removing wood from a forest takes about 1/10 of the nutrients out of the system, compared to annual agricultural crops. Nordic countries have protocols for returning wood ash to the forests as fertilizer and this may be worth trying in the South.

Managing forests sustainably should result in long term yields and the conservation of wildlife habitat. It may be important to manage adjoining forested properties with different management schemes so that there is landscape diversity.

In general, bioenergy from wood is much different from bioenergy from corn. (Wood has a much lower nutrient removal, provides more vegetative cover, involves less tilling and less erosion.)

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AMBASSADORS: *It would be helpful to add information about local examples of industries and facilities that use wood for energy. You can use our case studies or your own connections for this information.*

Some people may think that wood is a new energy source and that the reliability of wood-to-energy technology has not yet been proven. However, some utilities and virtually all sawmills and pulpmills have been using wood for power for many years. In facilities that generate less than 50 MW of power, wood can be comparable in cost to coal. It is not possible, however, to compete with coal at facilities that generate 200 to 1000 MW.

Wood is more feasible and reasonable, at this time, than solar and wind technologies, as they are still being tested or are quite expensive.

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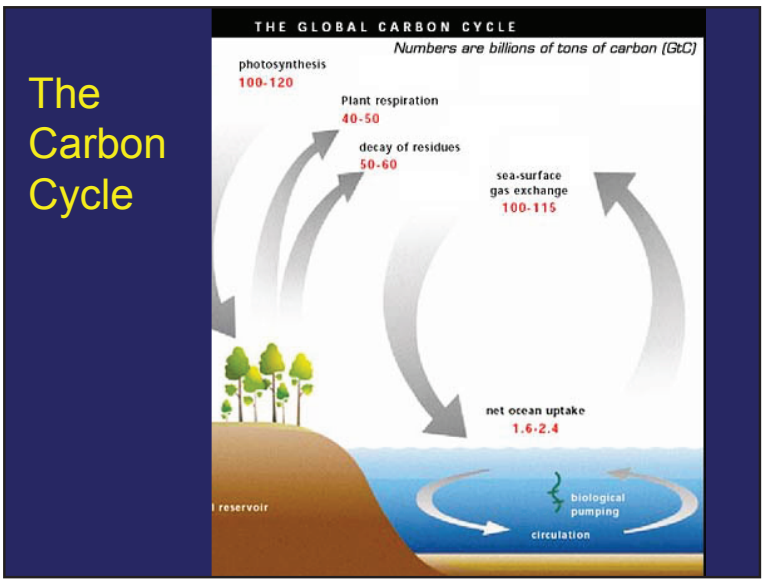

AMBASSADORS: *If people are confused about wood being carbon neutral, these two slides may help explain this concept.*

Carbon is constantly circulating through our ecosystems every day. Every living plant absorbs and releases carbon every day. Every living animal releases carbon every day. Every organism stores some carbon in its body that is released after it dies. This amount of carbon is huge – on the order of billions of tons. This carbon cycle is natural and normal and does not contribute to global warming.

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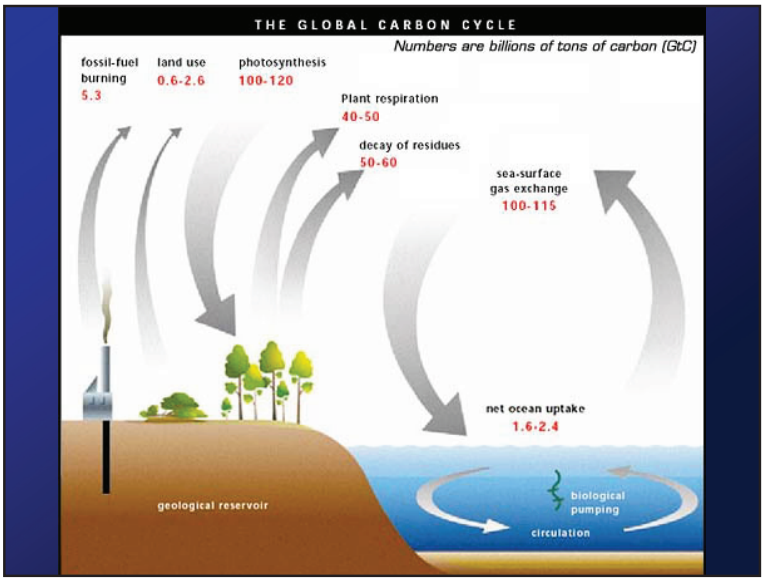
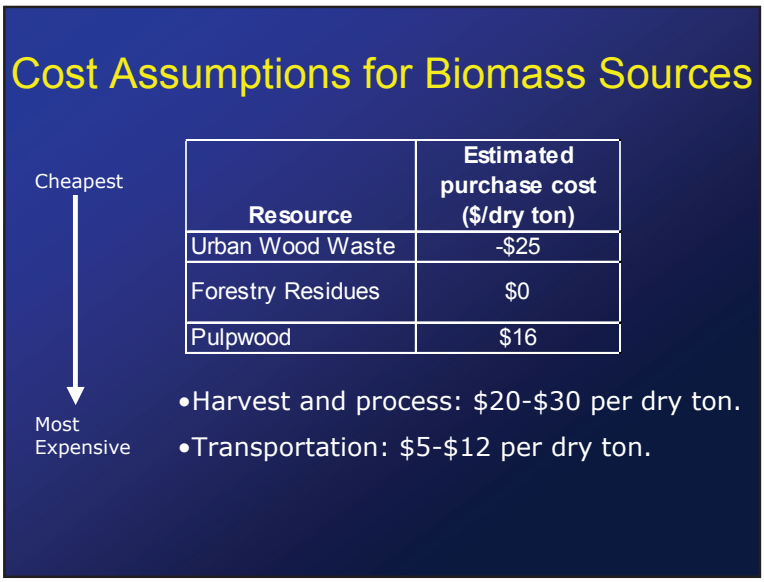


When we take fossilized carbon out of the ground (in the form of natural gas, oil, and coal) and burn it, we add that carbon to the global carbon budget. While we could plant more trees to sequester that carbon, we would need to plant more trees every day and there would not be enough land surface to handle all the carbon in the atmosphere. Scientists suggest that reducing our use of fossil fuels is the best way to avoid adding atmospheric carbon to the system, thus reducing or slowing climate change.

Slide 11



AMBASSADORS: *These slides explain our supply and cost estimates for the 28 counties across the South. Please paste in the slides that are relevant to your county(ies). This slide explains the assumptions about the cost of the three sources of wood that we used.*

Since homeowners typically pay to have trees removed from their yard, urban waste has a negative cost. Forest residue (thinning and slash from harvesting) is normally left behind, and pulpwood has a market value. The cost for all three sources is in collecting, transporting, and processing this wood.

When we calculate urban waste wood, we include wood hauled with trash, municipal yard waste, utility tree trimming, and private tree service trimming. We use these resources in our calculations because they can be quantified. We do not include industrial wood waste, construction and demolition waste, or land-clearing debris, though a facility could be designed to utilize these resources for energy production.

Additional resources may be numerous in this community, such as those from pre-commercial thinnings, mill waste, and thinning from ecosystem restoration.

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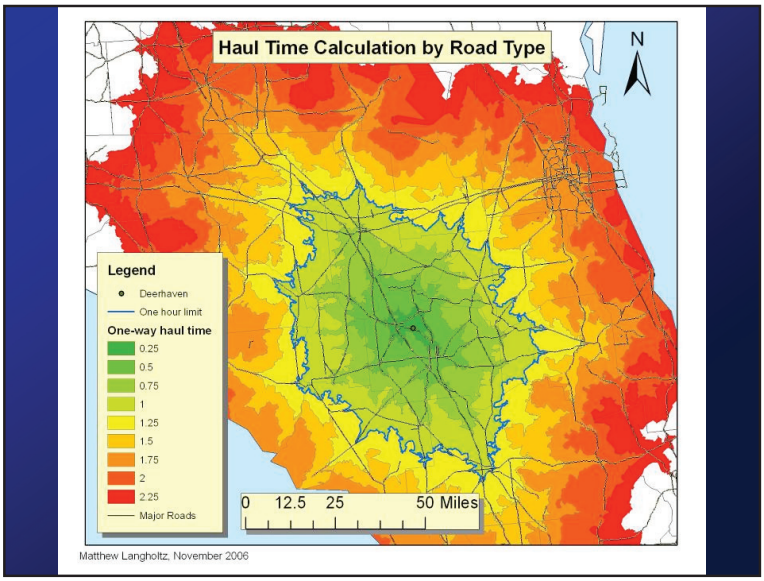
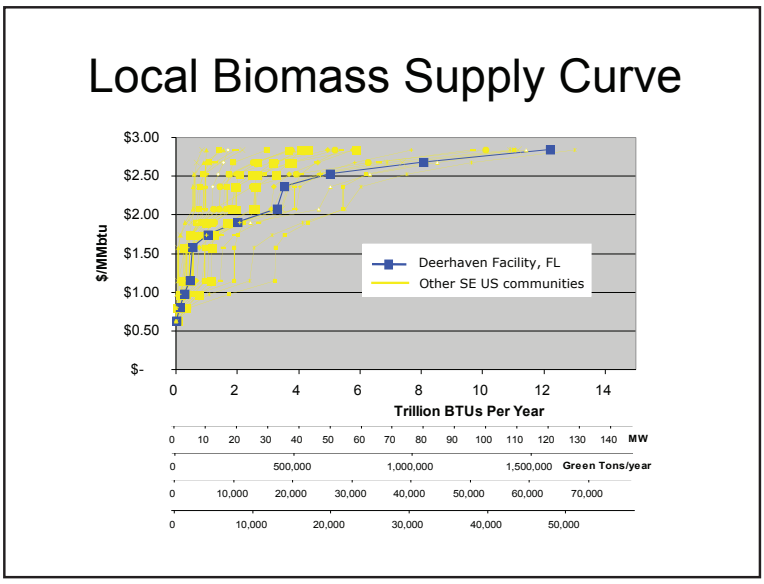


For each of the 28 counties, we calculate transportation cost based on the time it takes to get the wood from the source to the point of delivery (which we assume to be the center of the county), accounting for road speed limits. This example includes urban wood waste, logging residues, and pulpwood resources within a one hour haul of Deerhaven Power Plant, on the north side of Gainesville.

Slide 13

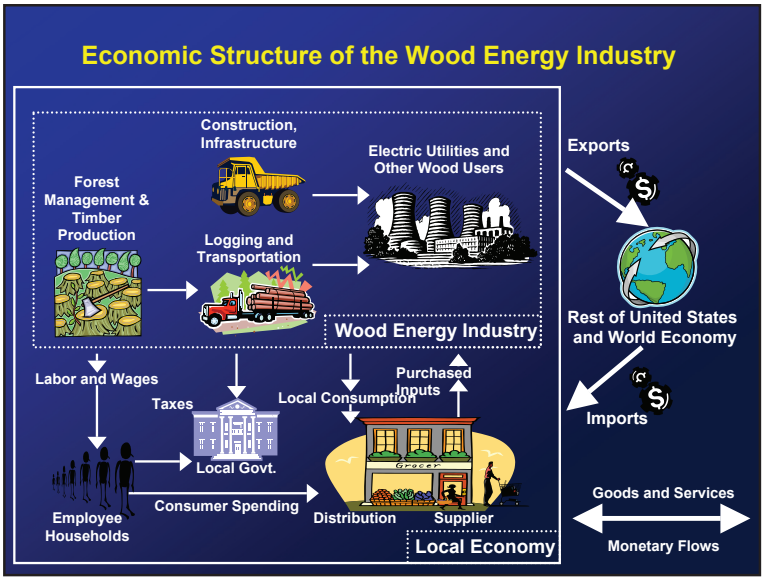


In Gainesville (the blue line), 30-40 megawatts (MW) of generation from urban wood waste and logging residues are available at less than $2.60/million Btu. Additional generation capacity is available from pulpwood at less than $3.10/million Btu. Coal currently costs about $3.00/million Btu. The yellow lines indicate all of the counties in our study. Gainesville has more biomass resources available than most of the 28 counties evaluated here. Scales of Megawatts, Dry tons per year, truckloads per year, and homes electrified per year are included on the X-axis.

These costs are based on south-wide averages. Actual local contracts will vary with local market conditions.

AMBASSADORS: *This scale assumes 400 homes per MW, from the low end of the range shown at http://www.utilipoint.com/issuealert/article.asp?id=1728.*

Slide 14



Use of woody biomass for heat energy and electric power generation is often viewed in the context of local economic development, and it is important to consider the economic impacts of new facilities, in order to determine whether the benefits justify the costs.

Wood-fueled power plants may benefit communities by using locally available resources rather than fossil fuels imported from other countries or regions, thus retaining more money to circulate in the local economy.

New industries or activities may have broad impacts that extend to other sectors of a local economy, through the linkages between local industries, households, governments, and the rest of the world economy.

Inputs purchased by forestry firms and wood energy producers from local suppliers give rise to indirect effects, while spending by industry employees leads to induced effects, which both represent additional economic activity. These impacts may be estimated using a procedure known as input-output analysis.

IMPLAN is a commercially available software tool and database commonly use to construct input-output models for any region in the U.S. We used IMPLAN to evaluate the potential economic impacts of wood power plants for the selected communities in the southeastern U.S.

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Capital Construction Impacts for a 20 or 40 MW Wood-Fueled Power Plant in Selected Florida Counties

County	20 MW Plant			40 MW Plant		
	Revenue ($Mn)	Jobs	Value-added ($Mn)	Revenue ($Mn)	Jobs	Value-added ($Mn)
Alachua	8.0	81	4.3	10.8	107	5.5
Clay	7.6	74	3.7	10.3	98	4.8
Leon	7.8	74	4.1	10.7	100	5.4
Nassau	6.7	63	3.3	9.0	82	4.2
Santa Rosa	37.7	335	15.4	65.5	578	26.3

AMBASSADORS: *These slides explain our economic impact findings for Florida. Please paste in the slides that are relevant to your county(ies).*

Economic impacts were estimated for a typical 20 MW and 40 MW wood-fueled power plant using conventional stoker boiler technology. The impacts were estimated separately for the construction phase and for ongoing operations.

Output represents the sales revenue generated, while value added impacts represent the personal and business owner income generated. The total capital construction impacts varied widely depending on the structure of the local economy.

In this example, impacts were greater in Santa Rosa County because of the presence of local manufacturers that can provide some of the key plant equipment, boilers, and turbomachinery.

In Alachua County, total output or revenue impacts were $8.0 million (Mn) for a 20 MW plant and $10.8 Mn for a 40 MW plant. Total employment impacts in Alachua County were 81 to 107 jobs.

Slide 16

Annual Operating Impacts (first year) for a 20 or 40 MW Wood-Fueled Power Plant in Selected Florida Counties

County	20 MW Plant			40 MW Plant		
	Revenue (Mn$)	Jobs	Value-added (Mn$)	Revenue (Mn$)	Jobs	Value-added (Mn$)
Alachua	11.9	169	7.4	22.8	334	14.2
Clay	10.2	152	6.2	20.3	323	12.3
Leon	11.4	132	7.3	22.0	257	14.0
Nassau	9.2	116	5.7	18.4	234	11.4
Santa Rosa	10.2	120	6.2	20.2	239	12.5

The operating impacts in the first year are representative of the ongoing annual impacts.

Total output impacts ranges from $9.2 to $11.9 Mn for 20 MW and $18.4 to $22.8 Mn for 40 MW.

Total employment impacts ranged from 120 to 169 jobs for a 20 MW plant, and 235 to 334 jobs for the 40 MW plant.

Slide 17

Employment Impacts by Occupational Group for Ongoing Operations of a 40MW Wood-Fired Power Plant in Alachua County, FL

Occupational Group	Jobs
Farming, Fishing, and Forestry Occupations	98.7
Other Non-specified Occupations	48.8
Office and Administrative Support Occupations	34.2
Transportation and Material Moving Occupations	28.4
Sales and Related Occupations	20.3
Food Preparation and Serving Related Occupations	14.2
Architecture and Engineering Occupations	10.9
Installation, Maintenance, and Repair Occupations	10.0
Management Occupations	9.5
Production Occupations	9.2
Healthcare Practitioners and Technical Occupations	7.4
Building and Grounds Cleaning and Maintenance Occupations	6.5
Business and Financial Operations Occupations	6.3
Construction and Extraction Occupations	5.8
Personal Care and Service Occupations	5.4
Healthcare Support Occupations	4.0
Computer and Mathematical Occupations	3.3
Education, Training, and Library Occupations	2.6
Life, Physical, and Social Science Occupations	2.4
Arts, Design, Entertainment, Sports, and Media Occupations	2.2
Community and Social Services Occupations	1.5
Legal Occupations	1.1
Protective Service Occupations	1.0
Total	333.6

It is important to understand not only how many jobs may be created, but also what kinds of jobs they are.

Using data from the Bureau of Labor Statistics, we estimated the number of jobs generated in each major occupational class.

The largest number of jobs, by far, was in the farming and forestry sector, which of course provides the wood fuel to a power plant.

There were also significant numbers of jobs in office/administration, transportation, sales, food services, architecture and engineering, maintenance and repair occupations, and management.

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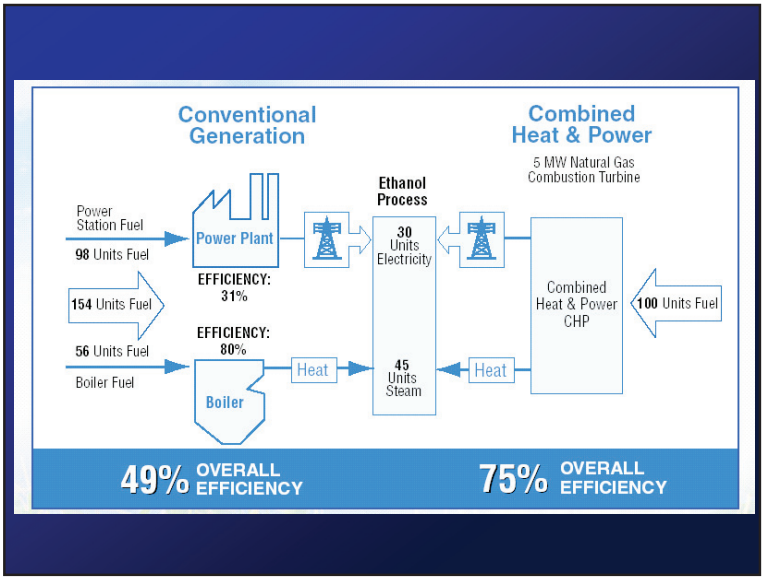
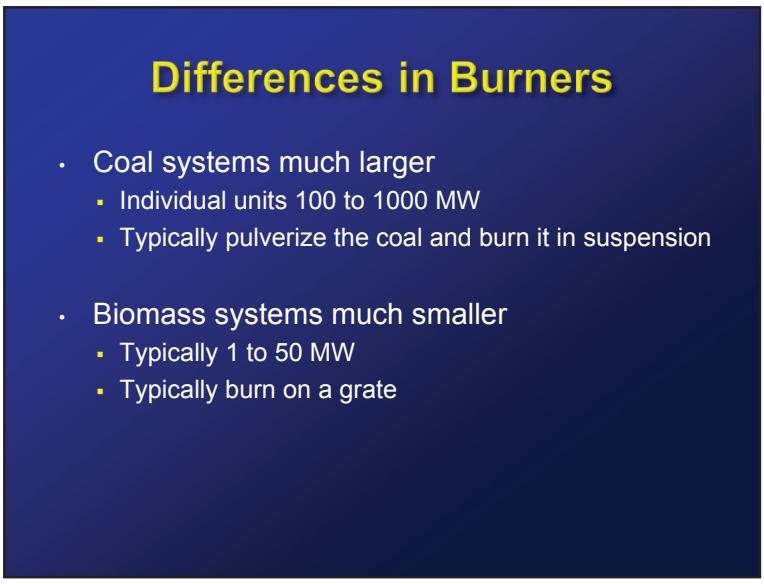


To discuss whether using wood for energy makes sense for this community, it may be helpful to have a basic understanding of some of the technology used to convert wood into energy.

A combined heat and power (CHP) system (also called cogeneration) is the most energy efficient. As shown in the example diagram for an ethanol plant, if only electricity is generated, 98 units of fuel are required to generate 30 units of electricity, which is an efficiency of only 31% because all of the rest of the fuel's energy becomes waste heat. At the same time, the process needs 45 units of thermal energy, which it can obtain from a boiler using 56 units of energy and with a fuel-to-steam efficiency of 80%. Using separate energy conversion systems, the combined efficiency of the thermal energy and electricity systems is 49%. With a CHP system 100 units of energy can supply both the 45 units of heat energy and 30 units of electricity for a combined efficiency of 75%.

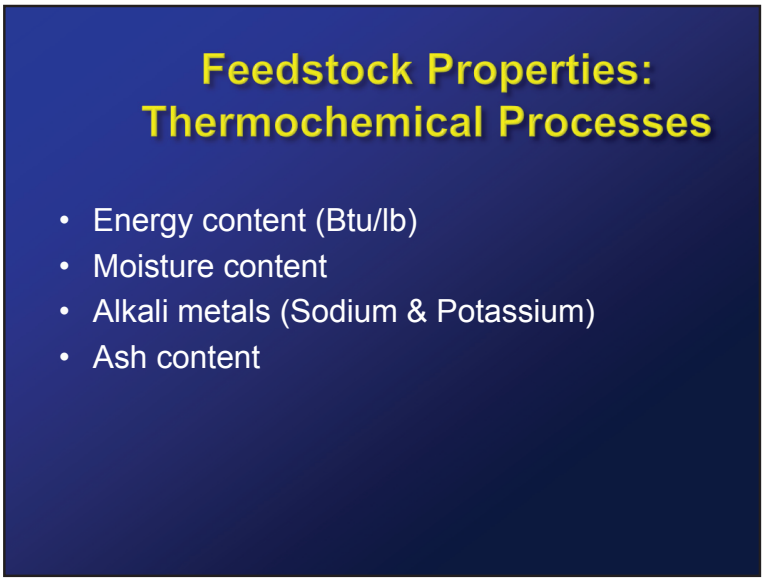
Slide 19



One difference between utility coal plants and wood-fired power plants is their size. Individual generating units for a coal plant can range from 100 MW to 1000 MW, with multiple units at a single plant site. Wood-fired power plants tend to be smaller with individual units sized from 1 MW to 80 MW.

The majority of utility coal-fired plants pulverize the coal and burn it in suspension by blowing the coal into the boiler's firebox. The typical wood fired power plant burns wood particles ranging in size from a sawdust size to a chip size (roughly 1"x1"x ¼") on a traveling grate.

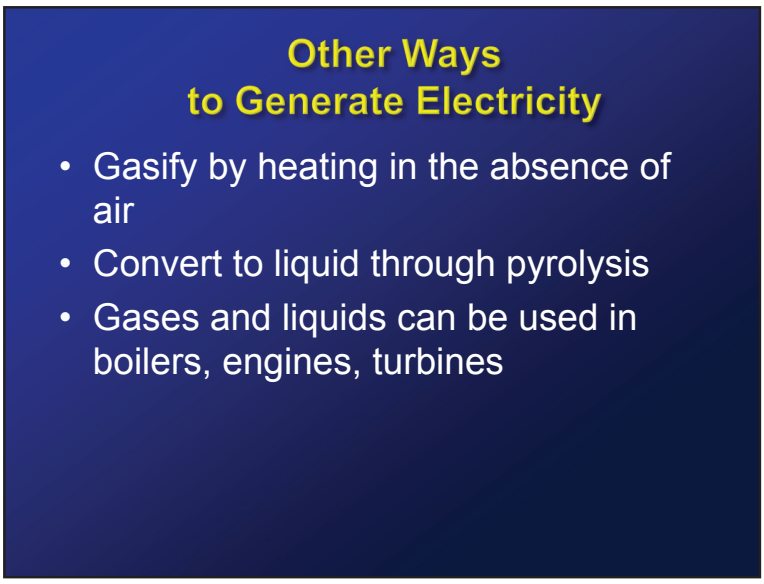
Slide 20



The most important fuel properties are the energy content (Btu/lb), moisture content, the presence of alkali metals, and ash (inorganic) content. Since only the organic portion of the fuel contains usable energy, higher ash content fuels contain less energy. Alkali metals, especially sodium and potassium salts, have lower melting temperatures than the other minerals commonly found in wood ash. Thus the presence of these materials in large quantities can allow the ash to melt and coat the inside of the boiler and boiler tubes.

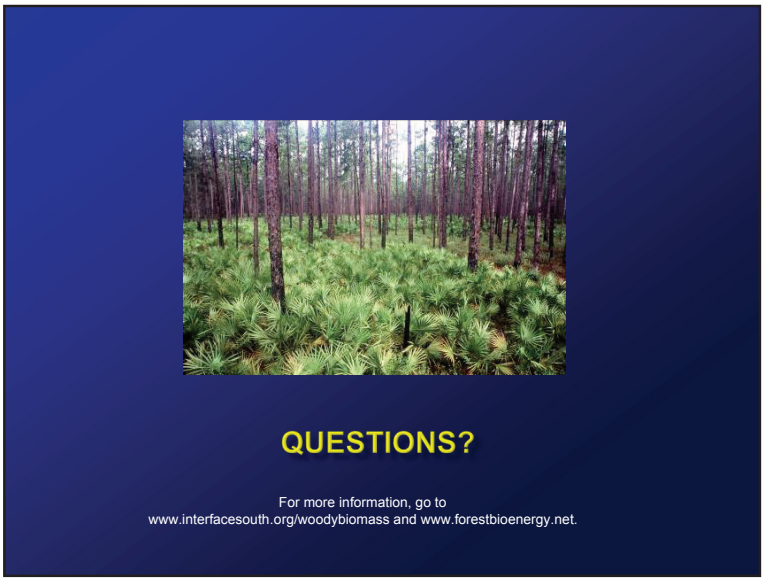
In order for wood to burn, it must be heated up to its ignition temperature. During this heating process, some of the heat is used to drive off any moisture in the wood. Thus larger amounts of moisture require a larger amount of energy for drying the wood and less useful energy is produced.

Slide 21



In addition to burning wood, the wood may first be gasified, and the gas piped to the boiler where it is combusted. Gasification consists of heating the wood under conditions that limit the amount of oxygen present, which causes the wood to decompose into gas, vapor, and charcoal. Gasifiers can be designed to maximize the yield of vapor. This vapor can then be condensed to provide a liquid fuel that can be used to fuel boilers or certain combustion turbines or reciprocating engines to generate power.

Slide 22



AMBASSADORS: *Thank the participants for their attention and interest and offer to answer questions. You might facilitate a discussion as the audience begins to explore local opportunities and concerns about using wood for energy. You might find some of the case studies, fact sheets, and economic profiles useful handouts.*

That concludes the presentation, but I'm happy to answer any questions you might have. Many of you have a great deal of knowledge about your county and forest resources, and I invite you to contribute to the discussion.