Gainesville Community Forum Questions and Answers

The following questions were asked by participants, either verbally or in writing, during the Wood to Energy Community Forums in Gainesville, Florida. These questions can provide insight into the concerns that citizens have about using wood for energy. Answers were provided by team members of the Wood to Energy Outreach Program and may be helpful throughout your outreach efforts.

Biomass Energy

1. **How many acres of forest per British thermal unit (Btu)? Is there an average or an analogy to help us understand, since this number depends on different sources, stand densities, etc.?**

   A typical pine plantation under low-intensity management, meaning no fertilization, herbicides, controlled burns, or bedding (a site preparation method for wet or flood-prone soils), grows about 4 green tons/acre/year (1.7 dry tons/acre/year) of merchantable wood, not including the bark, branches, or leaves (based on the slash pine growth and yield model by Pienaar and Rheney 1995). This is equivalent to 25.5 million Btu per year. As the question points out, this value varies with different types of management; the value can be lower with less intensive plantation management or almost twice as high with more intensive management. Assuming that 101,672 million Btu per year equals 1 megawatt (MW) per year, 3,987 acres of typical pine plantations would produce 1 MW per year, which could provide power for 400 to 800 homes annually. To put this land area in perspective, there are 201,061 acres within a 10-mile radius of a given point, so producing 1 MW exclusively from plantation wood within a 10-mile radius would require 2% of the area. Land area increases exponentially as the radius of the woodshed increases.

2. **How do different crops being used for biomass (pine, maidencane, sugarcane, corn, bamboo, hemp, etc.) compare in terms of yields and earnings per acre per year?**

   Different crops can be specifically grown as fuels for energy generation. Important considerations for deciding what crops to utilize include local availability, cost, and potential environmental impacts of production.

   Many things influence yields such as climate, rainfall, planting density, and fertilization. In general, an unmanaged forest will generate 1-2 dry tons/acre/yr and managed forest will generate 3-4 dry tons/acre/yr. Short rotation woody crops are intensively managed and generally generate 5-6 dry tons/acre/yr, which is similar to yields of herbaceous crops in temperate climates. Bamboo can yield 30 dry tons/acre/year in Puerto Rico. Sugarcane can be similarly prolific; however, it only grows in tropical or subtropical climates. Earnings per acre are dependent upon variables such as availability and locations of markets for biomass, biomass quality, who harvests it, and who owns the equipment.

3. **How much energy is generated per ton of wood?**

   A general estimate is approximately 17 million Btu/dry ton of wood. Another general rule of thumb is that 1 ton of dry wood = 1 MW/hour and 2 tons of green wood = 1 MW/hour. These amounts depend on the moisture content and the quality of the wood.

4. **What tree species produce high yields of wood?**

   Tree species such as eucalyptus or poplar are fast growing and produce high yields of wood. There are some potential risks involved with using exotic species, such as eucalyptus, for energy production. See Question 26 for more discussion.

Energy Systems and Technology

5. **Did you assume utilizing the best technology, such as gasification, when making the economic estimates (see the section "Community Economic Profiles")?**

   Conventional technology was assumed in the community economic profiles, not gasification or pyrolosis.

6. **Is cogeneration an option to produce heating?**

   Yes, cogeneration is an option to produce heating and cooling for large buildings. Vermont Fuels for Schools Program is an example of using cogeneration to produce heating. Cogeneration is used more frequently in the northern states.

7. **What is attributing to the increase in demand for electricity?**

   Increases in population, new developments, and buildings, along with more appliances in households attribute to increases in electricity demand.

8. **Why isn't there more use of wood for energy in the paper industry?**

   Many companies in the forest products industry have been energy self-sufficient for years. They serve as good examples to other small facilities interested in generating their own heat and/or power.

9. **Do prefabricated boilers exist in the United States?**

   Yes. A boiler is a vessel or tank where fuel is combusted to produce hot water or steam. This hot water or steam can be used for a variety of applications ranging from space heating and power production to industrial process heat. A prefabricated or packaged boiler is a boiler that comes assembled with the necessary components and is ready for installation on-site. While packaged boilers exist in the United States, they are not utility grade.

10. **Is there a difference in the scrubbers needed in coal-fired power plants and wood-fired power plants?**

    Yes. Burning wood produces almost no sulfur, so sulfur dioxide scrubbers are not needed. Wood-fired power plants also produce lower levels of mercury and nitrogen.

    Wood will have more particulate matter (ash and soot), which can be removed fairly easily with simple mechanical systems such as cyclones and baghouses.

11. What happens to by-products of burning wood, even if "scrubbed" from stacks? How does mixing coal with wood affect how the ash is handled?

Pure wood ash can be used for landfill cover or can be applied to soil to recycle the nutrients or condition acidic soils by raising their pH. The primary market for pure coal ash is the construction industry. Among other uses, coal ash is used for concrete and cement production, road-base materials, and highway fill. Regulations prevent mixed wood and coal ash from being used for these purposes. If the ash is being sold, there is actually a bigger economic impact on the coal ash than the wood ash from mixing the two. A coal-fired power plant generates a lot of ash and changing it into a product instead of a waste has significant economic impacts for the coal ash generator. Standards have been developed by the American Society for Testing and Materials (ASTM) and other organizations that allow coal ash to be readily marketed, and the presence of anything else in the ash negates these standards.

12. Does "green" woody material require energy inputs for drying or aging on-site to be burned efficiently?

A general rule of thu mb is that 1 ton of dry wood = 1 MW/hour and 2 tons of green wood = 1 MW/hour. Dry wood does burn more efficiently. Fortunately, it does not take a lot of energy to dry wood nor does it take high temperatures. Waste heat from the power plant is commonly used to dry the wood. Chipped wood can also be air-dried rather quickly. The amount of time it takes to dry the wood depends on the method of drying, the temperatures involved, the size of the wood particles, and other factors. Dryers commonly used in the forestry products industry to dry wood chips usually take a few minutes using relatively low temperatures.

13. How does the process work for burning wood? Are there still giant smokestacks?

Wood can be used for fuel at utilities similar to the way that coal is used, to generate electricity. Although there are lots of different ways to convert wood to energy, typically, fuel (wood or coal) is burned to heat water to create steam in boilers, which is passed through steam turbines to generate power. Wood can also be converted into gas or oil, and those syn-fuels can be burned. Wood-fired power plants look similar to coal-fired power plants except that they are much smaller. Neither power plant will have visible smoke emissions unless something is wrong with the emissions-control systems. However, one may see condensing water vapor coming out the stack of either, which people may mistake for smoke. Typically, the stacks on wood-fired power plants are shorter than for coal-fired power plants.

14. Is a bigger facility better? Can we build a bigger facility if technology improves?

A bigger wood-fired plant means you must go farther for wood resources. The size of the plant is determined by the sustainable supply of wood within a reasonable hauling distance. The optimal range for sustainable wood supply is from 30 to 70 MW. If you took all wood going to a pulp mill you would have a 100 MW wood-fired plant. A larger wood-fired plant would have a similar infrastructure.

15. Is it worthwhile for the utility company to manage yet another technological system when a biomass facility will add only a few megawatts to our energy needs?

It's true that a new biomass facility will require a delivery system for wood and somewhat different technology. But here are some reasons that suggest that moving in this direction may be beneficial:

- The technology for burning wood or coal can be the same or very similar.
- Wood-fired power plants from 1 to 50 MW are relatively common.
- It makes sense to build a power plant(s) that will better match the incremental growth of a utility (rather than build huge power plants that provide a lot more power than is needed).
- Using local resources (woody biomass) actually increases the economic growth in their service area.
- Smaller power plants are easier to site than large power plants.
- A carbon credit system is expected to come online in the near future. Utilities that generate energy from biomass will be at a distinct advantage when this happens.

16. What about the efficiency of wood? What is the impact on efficiency of having smaller wood-fired power plants?

Coal has an energy content of 12,800 Btu/pound. Depending on moisture levels, wood has an energy content of 5,000 to 8,600 Btu/pound. Both wood and coal are burned in the boiler at about the same temperature, and therefore have similar thermal efficiencies. Efficiency is also dependent on the type of system that a power plant uses. There is a difference in the efficiency of scale because wood-fired power plants are generally smaller than power plants that use fossil fuels. The volume to surface area ratio is larger for small power plants, which allows more heat to be lost. However, smaller plants can offset this heat loss by including the use of combined heat and power (or cogeneration) in the energy system. In other words, heat that is otherwise lost is recovered and used for heating and cooling in buildings or industry.

17. Does providing more energy increase development?

In general, the expected increase for energy demand is based on growth projections. The utility company plans for normal growth to meet the needs of the community. Using woody biomass as part of the solution to meet the energy demand may help keep more forestland around by increasing forests' economic value, which could cause less land to be developed.

18. What happens if using woody biomass to generate electricity becomes very common and successful?

A very successful future for woody biomass might mean several facilities in a region each drawing from adjacent woodsheds. There is a limit to how many wood-fired facilities can be built based on the sustainable supply of wood within reasonable haul time. Energy generation cannot surpass sustainable woody biomass yields without depleting woody biomass resources. Once a certain-sized power plant is built, it seems unlikely that it would become "too successful" because it wouldn't be able to exceed its capacity. Any utility in the area attempting to join in the success would have to look at sustainable annual yields from various resources within a given area to figure out 1) if wood can be used as a fuel source and 2) how big the facility should be. A utility would set itself up for an economic failure if it were to build a wood-fired power plant that requires more biomass than is sustainably available.

Competition for wood resources would cause the prices to increase, and operations of the facility would become too expensive. The utility plant would no longer be cost effective, and the utility's investment would be lost.

19. **How far apart, in distance, can you have wood-burning power plants? Is there a limit on total amount produced within a certain region?**

    Yes, there is a limit to how many wood-fueled power plants you can have within a certain region. Facilities must consider the sustainable supply within a reasonable haul time, as well as overlapping demand for wood resources when placing a wood-fired power plant. If a one-hour haul time is reasonable, then power plants would be at least two hours apart.

Comparing Wood and Coal

20. **How do truck/rail emissions compare using wood and coal? What about CO_2 emissions from trucks? Would there be as much truck traffic as Dollar General or Wal-Mart distribution centers? Do we know the average increase in truck/rail traffic compared with coal?**

    It depends on whether the fuel (wood or coal) is transported by rail or truck. In many areas, wood is transported by trucks because roads go to forests and coal is transported by rail because rail lines run from coal-producing parts of the nation. A railroad hopper car can haul up to 120 tons whereas trucks are limited to hauling roughly 26-27 tons each. While trucks cannot haul as many tons and are less efficient than trains on a fuel gallon per ton basis, the trucks will be traveling significantly shorter distances, since the wood is locally grown. Both rail and truck transportation methods currently use diesel engines, which emit carbon dioxide. However, if biofuels are used in place of conventional fuels, emissions could be reduced. A general rule of thumb is 2 truckloads per day per MW, so a 40 MW facility would require about 80 truckloads per day. This can be compared to other industries including the forest products industry. Sawmills generally have about 150 truckloads per day, and pulp mills have about 600 truckloads per day. The increase in the amount of truck traffic would not be as much as a Wal-Mart Distribution Center. According to the Gainesville Council for Economic Outreach, this type of facility adds about 500 trucks per day to existing truck traffic, or 21 trucks per hour, if they arrive 24 hours a day. (http://www.gceo.com/news_details.asp?xid=&id=29&cid=1&rs=10&ds=0&n=13&page_id=1&n=13).

21. **How does wood compare to coal for carbon dioxide (CO_2) emissions and cost per kilowatt hour (kWh)?**

    When comparing CO_2 emissions for wood and coal, we need to consider both CO_2 that is emitted by burning the fuel and CO_2 that is emitted during the harvesting, processing, and transporting of the fuel. Using wood as a fuel produces less CO_2 per kWh than using coal. Please refer to the table below for specific emission and cost quantities.

    When and where wood is readily available on a sustainable basis, energy from wood is economically competitive with energy from coal. A wood-fired power plant, even using relatively old technology, can compete successfully against coal in cost per kWh. This was demonstrated in an open bidding process about 15 years ago when a private developer in Virginia successfully competed against coal plants to construct an 80 MW wood waste fired power plant in south central Virginia. The private developer's bid was $0.05/kWh.

Table 1. *Comparison of Wood and Coal for CO_2 Emissions and Cost per kWh*

	CO_2 emissions from fuel	CO_2 emissions from fuel harvest, process, and transport	Cost[a]
	(lbs CO_2 per kWh)		($ per kWh)
Coal	2.095[1]	0.233[c]	0.0539[e]
Woody biomass	0[b]	0.136[d]	0.0565[f]

[a] Cost can vary widely depending on generation technology, scale of generation, and other factors.
[b] Net emissions assuming the biomass used is produced sustainably.
[c] Based on a net energy ratio of 9/1.[2]
[d] Based on 61.8 kg CO_2 per MWh reported by [3] for energy from logging residues. Emissions might be lower in the case of urban wood waste, which would be harvested, processed, and transported regardless of end disposal, or higher for dedicated feedstock supply systems, which require planting and maintenance.
[e] Based on [4], Exhibit 8-43, IGCC scenario.
[f] Based on [4], Exhibit 8-43, Biomass/Maximum DSM scenario.

Sources:

1. DOE and EPA, Carbon Dioxide Emissions from the Generation of Electric Power in the United States. 2000: Washington, DC.
2. Bender, M. Energy in Agriculture and Society: Insights from the Sunshine Farm. 2001 [cited Nov. 2005]; available from: http://www.landinstitute.org/vnews/display.v/ART/2001/03/28/3accb0712.
3. Yoshioka, T., K. Aruga, T. Nitami, H. Kobayashi, and H. Sakai, Energy and carbon dioxide (CO_2) balance of logging residues as alternative energy resources: system analysis based on the method of a life cycle inventory (LCI) analysis. Journal of Forest Research, 2005. 10(2): p. 125-134.
4. City of Gainesville Electricity Supply Needs. 2006, ICF Consulting.

Environmental Impacts

22. How is burning wood carbon-neutral?

Burning wood is carbon-neutral because it does not increase the amount of carbon dioxide, a regularly occurring molecule but also a greenhouse gas, cycling through the atmosphere. Carbon is continually cycling through all living plants and animals. Tree growth and wood decomposition represent a short-term carbon cycle, where growing trees convert carbon dioxide to woody biomass and decomposing trees release carbon dioxide back into the atmosphere. Whether trees naturally decompose or burn, carbon dioxide is emitted back into the atmosphere, replacing what was just taken out. As long as trees are replanted at least as fast as wood is burned, the carbon cycle remains in balance; there is no net increase of carbon in the atmosphere.

Conversely, fossil fuels are carbon deposits that have been buried beneath the soil for millions of years and are no longer part of the balanced carbon cycle. When fossil fuels are burned, carbon dioxide is added to the atmosphere; most of it cannot be absorbed into the carbon cycle. Unlike wood, there is no corresponding process by which this carbon emitted from fossil fuels is removed from the atmosphere. Planting trees will help, but we need to plant more trees every year, and we do not have enough land surface for all the trees we would need to plant. So the amount of carbon dioxide increases, which plays a significant role in global climate change. Because fossil fuels are currently used for harvesting, transporting, and processing woody biomass, there is a small net increase in atmospheric carbon. As mentioned in Question 20, this amount could be reduced if biofuels were used.

23. Do managed plantations result in monocultures that reduce biodiversity of animal life?

When forests are managed intensively, a smaller variety of tree species exist and overall diversity is reduced. There are certain animals (such as deer and turkey) that prefer such habitats for specific needs. Many of the methods used in intensive management (fertilizer, controlled burning, thinning) can actually promote grasses and herbaceous plants that have a positive impact on diversity. If surrounding forests vary in their management intensity, diversity can be maintained on a landscape scale. So there is not a simple, uniform answer.

24. What usually happens to "waste" foliage?

In the case of urban wood waste, foliage is collected and typically ground up with other waste wood. The foliage can be used as mulch or converted to compost. In the case of harvesting commercial timber, it depends on the harvesting operation. In "cut to length" (trees are cut to the required length above the stump) operations, foliage is typically left on-site, is distributed throughout the forest, or may build up in piles if trees are passed through a delimber (a machine used to remove limbs) before being removed. Foliage is usually harvested in whole-tree harvesting operations, though this practice is less common and is usually avoided to help maintain soil nutrients on-site.

25. Many organisms live on decaying wood, so if decaying wood is removed, then the native ecology may be disrupted. What would be the long-term consequences to wildlife and consequences to atmosphere (CO_2 levels, O_2 levels, air pollution)?

The native ecology of decomposers will be disrupted to some degree although how much is not well known, and there would still be woody stems of shrubs, branches from the next rotation of trees, and foliage from herbaceous and shrub plants contributing carbon for decay on the forest floor. Stumps and roots represent as much biomass as the trunk and branches, and as long as roots remain in the ground, there could be sufficient biomass for decomposers. Also, decaying wood is generally not desirable for fuel, so dead trees, also called snags, are typically left in the forest. In terms of atmospheric levels of carbon dioxide and oxygen (CO_2 and O_2), there should be little change because both will be exchanged in the atmosphere whether by burning or decomposition. Both processes are essentially the breakdown of photosynthetic products, just at very different rates. In addition, the burning of wood in power plants lessens the release of methane, a greenhouse gas, which occurs during decomposition.

26. Given the fact that burning fast-growing herbaceous exotics is around twice as profitable as burning tree parts (from forestry operations and general tree fall operations, especially after hurricanes), what is going to stop private landowners from planting these many exotics after they clearcut and burn their slash pines first?

Legislation is state dependent. For example in Florida, current state legislation prohibits landowners from cultivating non-native plants, or exotic plants, on more than 2 contiguous acres without a special permit (http://www.leg.state.fl.us/Statutes/index.cfm ?App_mode=Display_Statute&Search_String=&URL=Ch0581/SEC083.HTM&Title=-%3E2006-%3ECh0581-%3ESection%20083#0581.083). Certain plant species, like melaleuca, are prohibited from cultivation because they are classified as invasive plants (http://www.fleppc.org/list/05List.htm). If citizens believe that controlling what landowners plant is an important concern, they could encourage the facility to restrict purchases of wood to native trees. However, restricting what the facility purchases may have implications for the use of hurricane and yard debris.

27. How often would fertilization be necessary?

Tree plantations requiring additional fertilizer typically receive only two or three applications in 20 years. In comparison, fertilizer applications for agricultural crops are typically applied several times during a growing season.

28. Can landowners put the ash back on the land, and does the ash change the soil pH?

Pure wood ash can be applied to soils to recycle nutrients or condition acidic soils by raising their pH. Ash is applied to the soil in Norway and Finland, but their trees and soils are different from the South's trees and soils. Research on applying ash to soils in the South would be necessary.

29. How will you ensure that harvesting wood for energy is sustainable? Is there a possibility of deforestation?

Certification could help ensure forest sustainability. A number of programs are available to help landowners develop management plans, conduct sustainable management practices, and require landowners to meet various standards for long term sustainability before they are certified as sustainable. The Forest Stewardship Council and the Sustainable Forestry Initiative both offer accreditation programs. More information is available at http://www.fsc.org/en/about/accreditation and http://www.sfiprogram.org/certification.cfm. Also, see the response to Question 18.

30. If we contract with someone other than the utility to get wood resources, how can ensure our values are addressed (deforestation, wildlife, etc.)? How can we be sure that habitat isn't being harmed to supply the wood?

The utility can have regulations for wood suppliers that help maintain citizen values. For example, the utility can require all purchased wood to come from certified forests.

31. What are the air emissions of burning wood?

In comparison to other fuels (coal, natural gas, and oil), wood has low nitrogen oxides (NO_x), carbon monoxide (CO, a product of incomplete combustion), sulfur dioxide (SO_2), and mercury (Hg) emissions. Effective methods of particulate control have been developed to remove most of the particles from the exhaust air of wood combustion facilities. In addition, unlike fossil fuels, wood is a carbon-neutral source of energy, meaning it does not increase the amount of carbon dioxide, a greenhouse gas, cycling through the atmosphere.

Economic Impacts

32. What is the pay rate of local jobs added by a wood-fired plant?

The pay rate is state dependent. In Florida, for the occupational groups that would be impacted by a 40 MW wood-fired power plant, the average annual earnings range from $16,470 (farmworkers and laborers, crop, nursery, and greenhouse occupations) to $99,710 (engineering managers). The average annual earnings of all the impacted occupational groups is $39,083.

33. What if the harvested wood is exported to another region to use for energy, instead of using the wood locally for energy?

If the wood is processed in one area and then exported to another area for use, the economic impacts provided in the community economic profiles would significantly change. The economic impacts calculated assumed the addition of a 20 or 40 MW facility in an area, with the wood sources being collected and processed within a reasonable haul time. However, exportation of woody biomass is certainly a possibility. In our global marketplace, products are readily shipped around the world to the highest bidder (or from the lowest seller). As other countries continue to adjust to carbon tax systems, which are becoming more common due to the Kyoto Protocol, they may be willing to pay a premium for wood. This potential demand needs to be considered when communities think about meeting energy needs with woody biomass. In most cases, contracts can be designed to ensure that enough wood is available to meet the needs of the local power plant. In addition, when looking toward sustainability, we should aim to use local resources to meet local needs. The pelletization and shipping of wood works in some regions because of the large amount of wood resources, which makes wood relatively low cost, and the proximity of the wood and pellet mills to ports.

34. Does the large number of jobs in a biomass plant mean higher operating costs?

The greater employment impacts associated with biomass plants do not necessarily mean higher operating costs. Rather, they represent a substitution of imported fossil fuels with local wood resources and local labor. According to the Department of Energy (DOE), the non-fuel operating costs for biomass plants are very similar to coal-fired or natural gas-fired plants. This certainly holds within the range of biomass plant sizes that we have considered (20 to 40 MW) in our community economic profiles; however, for larger plants, it might be expected that higher costs for transportation of wood fuels could lead to greater overall operating costs.

35. How much would a landowner make per year in revenue by selling wood?

A landowner can expect $3000 to $4000 per acre if the tree stand is about 25 years old.

36. How will you convince landowners not to sell to developers, when it is not economically feasible?

Many forest landowners would like to continue living on and/or maintaining forested lands, but they may need economic incentives to do so.

37. Assuming forest owners are getting $7 per ton of pulp wood, what would be the economic benefit of forest production?

The economic benefit would not be any higher than pulpwood. However, using wood for energy would create another market for wood, and wood suppliers have been struggling recently to find buyers.

38. What is the difference in cost of construction of a coal-fired plant and a wood-fired plant?

The construction costs for a wood-fired plant are comparable to those of a coal-fired plant.

39. **What would be the approximate cost (in time, money, and equipment) and possibility of building a woody biomass facility and then if it doesn't work out, to switch the facility to burning coal (partially or completely)? In other words, once you commit to a 50 MW plant, are you committed forever, or is it an easy transfer to something else?**

    A plant can be designed to burn either wood or coal or a mixture. If the plant is not designed initially to burn both, it still may be able to depending on the design or may be able to do so with minor modifications. There are different emission controls and methods of material handling for using coal or wood for fuel sources. The cost depends on the type of equipment, the design, and a number of factors. Many existing coal plants are being adapted to also burn wood, so this is not an impossible idea. It could be easier, however, to determine if you might need to burn coal in the future and to design the original wood facility to accommodate other fuels.

40. **As competition for wood increases or when there are no more trees, then won't the price of wood become more expensive?**

    Yes, competition for wood resources would cause wood prices to increase.

Woody Biomass Sources and Supply

41. **Can all types of trees and debris be used?**

    The facility's infrastructure dictates what types of fuels can be used. Facilities must be careful when using construction debris. Debris may be processed or treated wood, which would require extra pollution control measures such as scrubbers. Leaves contain chlorides which are corrosive and can damage boilers, so the facility would rather use just woody biomass, not foliage.

42. **What are the sources of woody biomass?**

    Urban waste wood, forestry residues, wood grown purposefully for energy, and wood from forest health thinning activities (for restoration, wildfire mitigation, or insect mitigation).

43. **Will there be only wood or multiple sources (tires, trash, etc.) of fuel used?**

    It depends on the facility's system. The Wood to Energy Outreach Program includes only wood resources, not refuse. A significant amount of fuel could come from urban waste wood. Some facilities are designed to accommodate a variety of fuels. See case studies *Innovative Fuel Sources Generate Success* and *Powering the Grid with Waste* for more information.

44. **Can we use storm debris?**

    If the system has the infrastructure to handle wood from storm debris, then this wood is considered an opportunity fuel; however, it does not represent a reliable or constant supply.

45. **What is the difference between mulch and pulpwood?**

    Mulch is shredded bark, branches, and tree trunks. It is a by-product of processing wood and can come from many sources. Pulpwood is the tree trunk that is grown and cut for pulp markets.

46. How long would local wood resources last to supply a facility?

The quantities discussed in the community economic profiles are annual projections. These numbers will not change as long as land use does not change; hence there is a sustainable amount of wood resources.

47. Can wood be renewed fast enough to meet our energy needs?

Investors are going to make sure there's a reliable wood supply and will not develop a wood-fired plant if there are not enough resources to sustain the supply. No one-time harvest is sustainable. Planners must also consider overlapping demand for wood resources when siting a wood-fired power plant.

Other Concerns

48. What problems do you see in terms of public perceptions?

There are a variety of concerns and solutions, but sustaining local forests and air quality are two of the most significant concerns. This is why community participation and input is important. Citizen priorities can be addressed by including their input in the local energy plan. The development of a wood-fired plant in Burlington, Vermont, is an example of benefits to citizen involvement (see case study, *Power to the People*).

49. Shouldn't we start with conservation education, little changes = bigger impacts?

Most utilities do have conservation programs, which recognize that an important part of changing energy consumption is reducing the overall amount of energy each person needs through conservation and increased efficiency. Conservation should always be part of the energy picture but, in many places of the South, will not be sufficient. As human populations grow, we will also need to find new solutions for increased energy needs. Communities should consider a variety of energy options and decide how they can best plan for a sustainable future. Using wood to generate energy may be part of this discussion in some communities.

50. What about managerial issues with biomass, such as coal is easy and familiar, and requires a business-as-usual perspective?

While the organizational aspects of a utility and community may be a large barrier to developing new energy plans, existing wood-fired power plants have overcome these barriers and been successfully developed.

51. What are some trade-offs we should consider when deciding whether a wood for energy facility is right for our community?

While trade-offs are location-specific, communities can consider the types of fuel they are currently using and their associated costs and benefits and compare these with the costs and benefits of using wood as an energy source.

52. What happens when we run out of trees because of development?

The wood supply estimates expressed in the community economic profiles are based on existing land use. Changing land use from forested areas to developments will affect the sustainable supply of wood resources. However, using woody biomass as part of the solution to meet the energy demand may cause less land to be developed by increasing forests' economic value. Also, see the response to Question 18.

53. What are the reasons not to use wood for energy?

Communities should discuss a number of factors when considering whether using wood for energy is the right choice. While many factors may be location-specific, some factors to consider include the cost and supply of wood resources within a reasonable hauling distance, environmental sustainability, local economic impacts, transportation and processing of wood resources, and competing demand for wood resources.

54. Is your group promoting the use of wood for energy production?

The honest answer to this question is, "It depends." The University of Florida, School of Forest Resources and Conservation, in partnership with the USDA Forest Service, Centers for Urban and Interface Forestry and Southern States Energy Board, has developed an outreach program to help communities in the southeastern United States consider the possibility of using woody biomass for energy production. By virtue of choosing to take on this project, we are suggesting there are some advantages to using wood for energy that the public should be aware of. We believe public education is important to meaningful public participation in these decisions. Without specific decisions about forest management, harvesting, transportation, and technology being in place, wood can merely be considered as an option, not promoted as a solution. These types of decisions are the responsibility of community members and leaders. We recognize that wood is not an appropriate choice for every community or situation. The Wood to Energy Outreach Program does not advocate any specific outcome, other than stimulating community discussion about the many connected issues associated with using wood for energy. Funding for the project comes through the USDA Forest Service, from the U.S. Departments of Energy and Agriculture.