

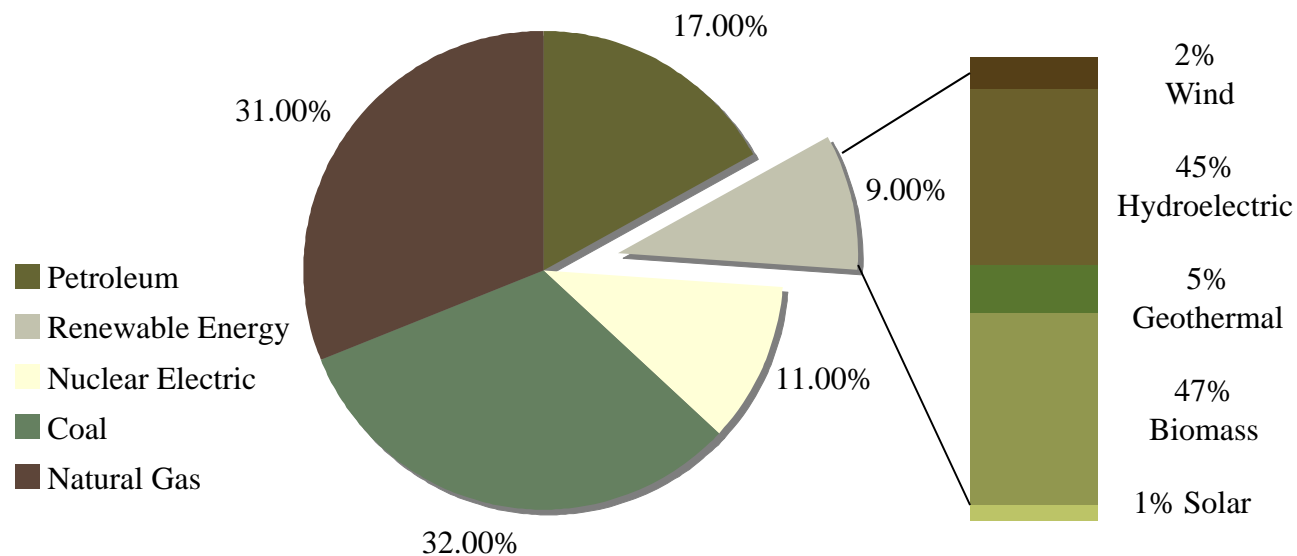
Bioenergy and Wood Fiber in Virginia and Beyond



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Biomass Utilization in the United States

- Domestic energy production
- 9% renewable: 47% biomass: 72% wood-based



Source: Energy Information Administration 2004

Wood Biomass Resources



Existing Sources of Wood Biomass

- Logging residues
- Thinnings and other stand improvement operations
- Underutilized species
- Severely damaged stands
- Urban wood waste
- Hazard Trees
- Manufacturing waste
- SRWC



Wood Biomass Supply

Timber Harvesting Residues

- During a harvesting operation, often 25 to 45% of the tree's biomass is left on site as residues.
- About 65% of total logging residues can easily be recovered for use as bioenergy
- This is about 20-30 tons per acre, on a green basis



Wood Biomass Supply

Small Diameter Stems

- Material from thinnings
- Possible when thinned material cannot be sold to higher value market
- Often more costly biomass and more likely to be limited by site factors



Wood Biomass Supply

Low Value Species

- Need for restoration due to mismanagement and high-grading
- Material generated by restorative silvicultural techniques could be used for bioenergy.



Wood Biomass Supply

Sanitation and Salvage

- Material from sanitation or salvage cuts
- Possible when sanitation or salvage material cannot be sold to higher value market



Wood Biomass Supply

Urban Wood Waste / Hazard Trees

- Cheap
- Quality Issues
- Infrastructure



Wood Biomass Supply

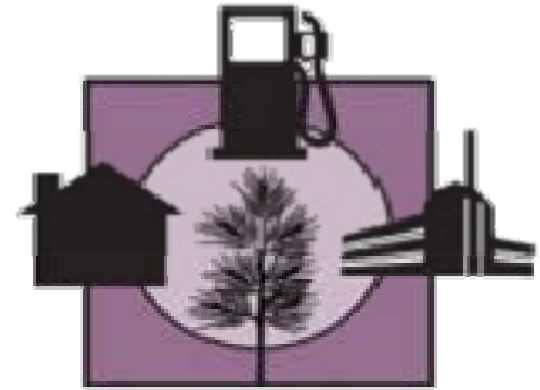
Manufacturing Waste

- Typically Inexpensive
- Clean / Dirty
- Multiple uses



Wood Biomass Supply

Today's Focus



Short-Rotation Woody Crops

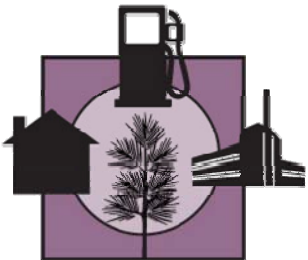
- Willow and hybrid poplars extensively researched
- Loblolly and sweetgum researched in South
- Short-rotation willow ranges from 3-7 oven-dry tons per acre per year
- Higher with irrigation and fertilization



Wood Biomass Supply

Material and Systems

- Conventional Wood Boilers
- Combined Heat and Power
- Co-fire
- Fuel



Woody Biomass Energy Systems

Factors Affecting Availability

- Biological
- Physical
- Social/Political



Woody Biomass Energy Systems



Virginia's Situation

Virginia's Energy Goals

- Increase energy independence
 - 40% reduction in rate of energy growth
 - 20% increase in in-state energy production
- Energy education
- Climate change
 - 2000 GHG emission levels by 2025
- R & D / economic development
 - Alternate fuels, nuclear technologies, coastal energy, carbon capture & storage

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Virginia's Biomass Capacity

- 760 MW in total
 - More than 500 MW from forest residues
 - 180 MW from urban wood residues
- Utilization opportunity
- Use underway, but room for improvement

Present Use in Virginia

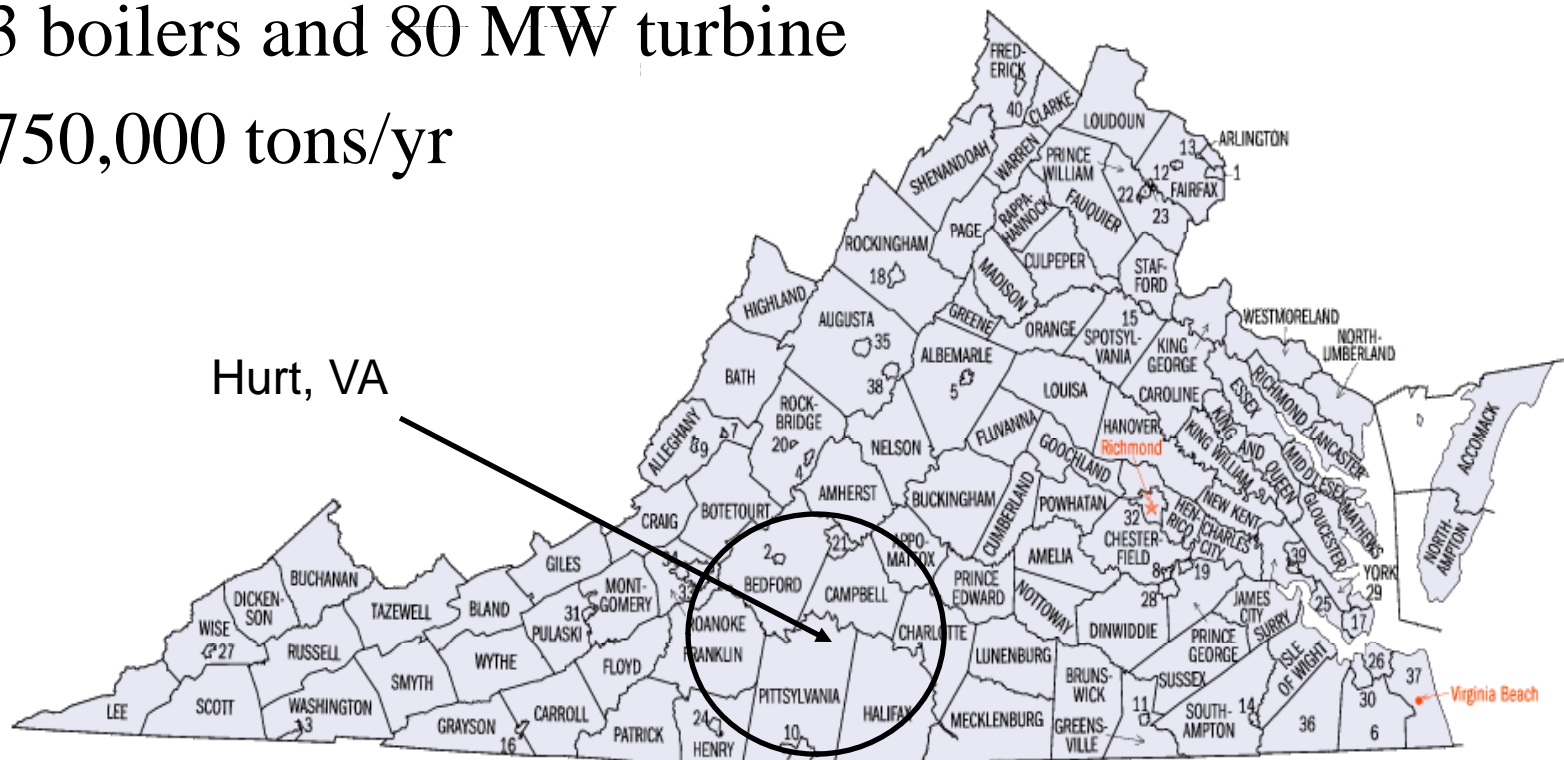
- Electricity
 - sole use fuel chips
- Industry
 - residue for boiler fuel
- Wood pellets
 - manufacturing waste and in-woods stock

Future Use in Virginia

- Small-scale heating and power
 - Fuels for schools and other municipal facilities
- Bio-fuels

Electricity (sole use)

- Dominion Power
 - Largest facility East of the Mississippi River
 - 3 boilers and 80 MW turbine
 - 750,000 tons/yr



Electricity (sole use)

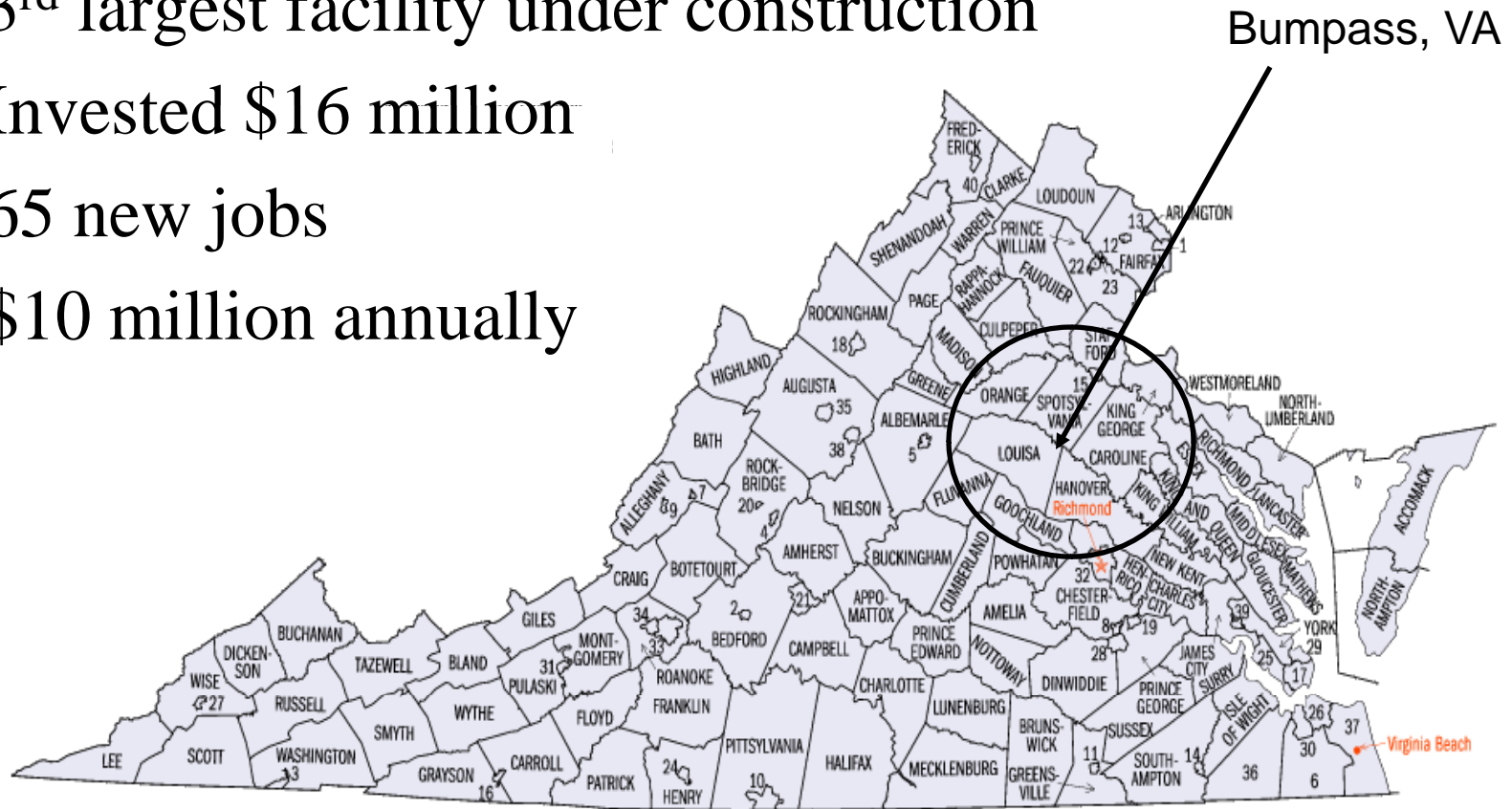
- Most feedstock collected during clearings
 - Contractors and land managers offer landowners a “clean cut” option
- Generally no payment made to landowner
 - Revenue covers operation
- Increased prices may open up opportunities for revenue sharing
 - Higher prices needed to pay for feedstock removal when thinning

Electricity (co-fire)

- Dominion Power co-fire facility in Wise, VA
 - Construction underway on Virginia City Hybrid Energy Center (2012)
 - 585 MW, co-fire as much as 20% with wood
 - Advanced circulating fluidized bed boiler
 - \$3.5 to 4 million in annual revenue
 - 1,000 construction, 250 mining, 75-100 permanent jobs

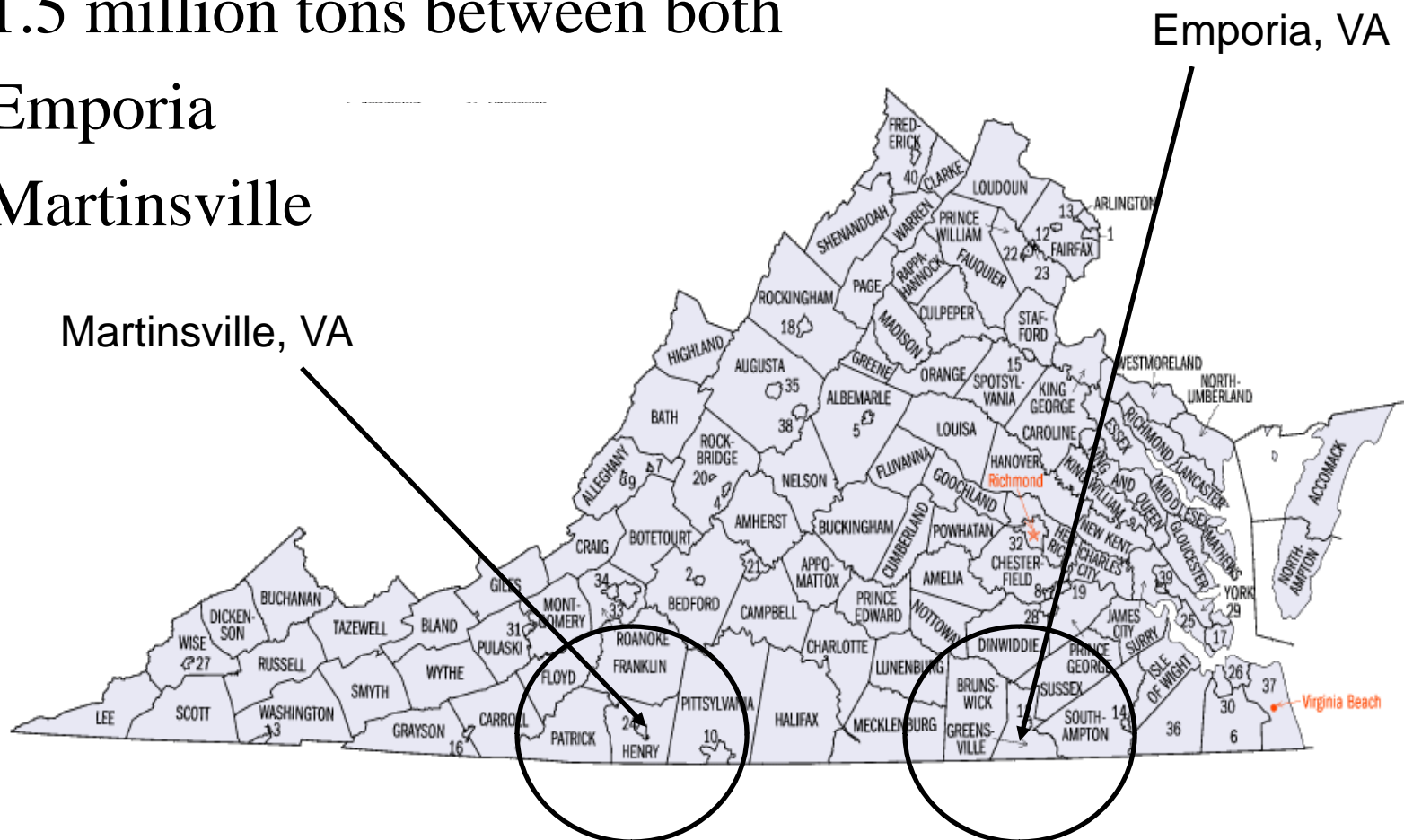
Wood Pellets

- Argonaut Bio-fuels
 - 3rd largest facility under construction
 - Invested \$16 million
 - 65 new jobs
 - \$10 million annually



Wood Pellets

- Two more facilities – abandoned warehouses
 - 1.5 million tons between both
 - Emporia
 - Martinsville



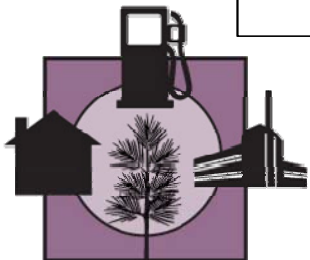
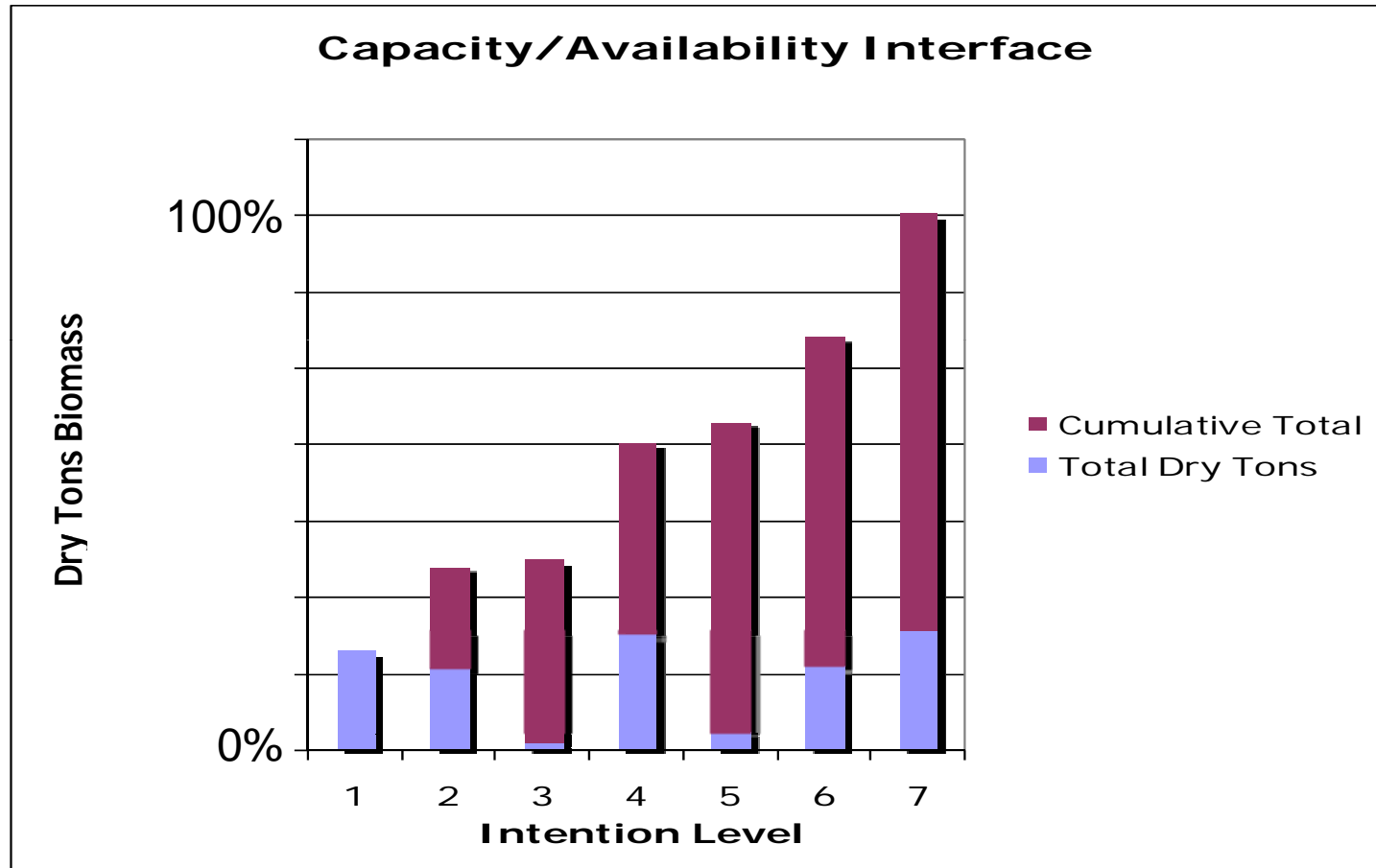
Others

- Fuels for schools
 - Grayson County and others
- Northern Virginia – Municipal Waste
- Bio-fuels / Ethanol Goals
 - VA Energy Plan - 200 million gal/year ethanol
 - Proposed plants
 - Chesapeake, Hopewell, Chase City

Questions



Factors Affecting Availability



22.7 15.9 3.8 21.9 1.5 15.7 18.6
 42.4 35.8

Woody Biomass Energy Systems