Developing Biomass Power

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American Renewables, LLC

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About American Renewables, LLC

• Focused on developing, owning and operating utility-scale biomass energy facilities
  – Headquartered in Boston, MA

• Partnership between BayCorp Holdings, Energy Management and Tyr Energy
  – Principals have a long and successful history of developing and operating energy facilities

• Currently developing three projects in Southeast US
  – Nacogdoches Power
  – Gainesville Renewable Energy Center
  – Hamilton County Renewable Energy Center
Development Approach

• Utilize standard design and bulk purchasing to reduce engineering and construction costs
• Exploit economies of scale to reduce capital costs
• Leverage fuel procurement and O&M expertise to produce better operating results
• Standard design: 100 MW net biomass-fired facility
  – Primary fuels include logging residue, wood processing residue, urban wood waste and pre-commercial thinnings
  – Fluidized bed boiler
Current Focus on 100MW Size

• Compared costs for 50 MW and 100 MW projects
  – Delivered power cost from 100 MW project is 30% less expensive than from 50 MW project

• Capital cost for 50 MW project is much higher per kW
  – Equipment cost is only slightly less
  – Engineering and design cost is nearly identical
  – Civil and site construction costs are nearly identical
  – Access road, water supply and discharge and transmission costs are nearly identical

• Operating cost for 50 MW project is much higher per kWh
  – Staff size is nearly identical
Our Technology

- Fluidized bed boiler with back-end emissions controls
- Continuous emission monitoring
- Efficient combustion
- No burning wood smell
- Clean ash which can be beneficially reused
- Negligible sulfur emissions
- Conventional steam turbine generator
- Steam condenser
Our Projects

**Hamilton County Renewable Energy Center (Jasper, FL)**
- 30 year PPA with GRU

**Gainesville Renewable Energy Center (Gainesville, FL)**
- 30 year PPA with Austin Energy
- Completely permitted

**Nacogdoches Power (Sacul, TX)**
- 20 year PPA with Austin Energy
- Completely permitted
Project Highlights

• Each generates 100 MW (net) of electric output to grid
  – Can power 65,000 homes
  – Renewable power: RECs, other green attributes

• Consume ~1 million green tons of biomass fuel per year
  – Primary fuels include logging residue, wood processing residue, urban wood waste and pre-commercial thinnings
    – Not C&D waste or energy crops
  – Fuel brought in by truck: ~150 truckloads per day
  – Typical fuel procurement area is about 75 miles radius

• Significant local economic impact
American Renewables Reference Plant

100 MW wood-fueled reference plant
Wood and Wood Residues

- In-Forest Residue
  - Tree tops and limbs ("slash")
  - Pre-merchantable timber ("thinnings")

- Storm Debris
  - Wood debris from hurricanes, wind storms, ice storms

- Wood Processing Residue
  - Sawmill residues (sawdust, ends)
  - Pallet waste

- Urban Wood Waste
  - Right of way trimmings
  - Land clearing material

- [Whole Tree]
  - Chips
  - Roundwood

- [Energy Crops]
  - Switchgrass, poplar, etc.
Typical Project Procurement Area

- Typical procurement area is a 75-mile radius around the site
- Area from which most of the forest-based feedstock is expected to be produced
- Allows for about a maximum 100-mile haul distance which is the practical limit for hauling logging residues and chips
Fuel Sustainability Standards

• Growth of industry will require demonstration of sustainability
  – Convergence of energy, forestry, environmental and policy sectors
    • Education, tolerance and compromise are required

• GRU Example:
  – Thoughtful, multi-step approach to accepting biomass power:
    • Review of general fuel availability
    • Analysis of sustainable harvesting
      – High-level goals
      – Specific standards
Environmental Benefits

• Can contribute significantly to a utility’s renewable energy portfolio
• Carbon neutral/negative
  – Reduces methane caused by decomposition of wood waste
• Contributes to healthy forestry practices
• Helps alleviate other environmental issues:
  – Disposal of wood waste incurs costs and utilizes landfill space
  – Open burning of wood waste can cause significant air quality impacts
  – Biomass facilities can transform wood debris into a valuable product
Economic Benefits of an AR Project

• Significant construction expenditures
  – Over $400 million capital costs, much of which remains in the local area
  – Increases municipal tax base

• Significant job creation
  – During construction: ~350 construction jobs at peak
  – Direct permanent jobs: ~40 permanent operational jobs
  – Indirect permanent: Additional 400-500 jobs in secondary markets

• Biomass fuel dollars stay in the local and state economy
  – Long-term contracts will enable local loggers/chippers to make capital investments
  – The project will provide stable demand for wood