

## Assessing Wood-fired Systems Viability

### Appalachian Wood Energy Innovations Conference Asheville, NC

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## Why Wood Energy?

- First of all – it's a locally-sourced fuel; generates local jobs and supports local communities and their economies
  - Multiplier effect of 1.6
- Sustainable source of power
- Supports healthy forest management programs
- Plentiful supply of fuel
- Its one renewable fuel that is always available
- Relatively stable cost of fuel
- Low or no-net carbon emissions
- Supports a balanced portfolio of fuels
  - Reduces reliance on fossil fuels

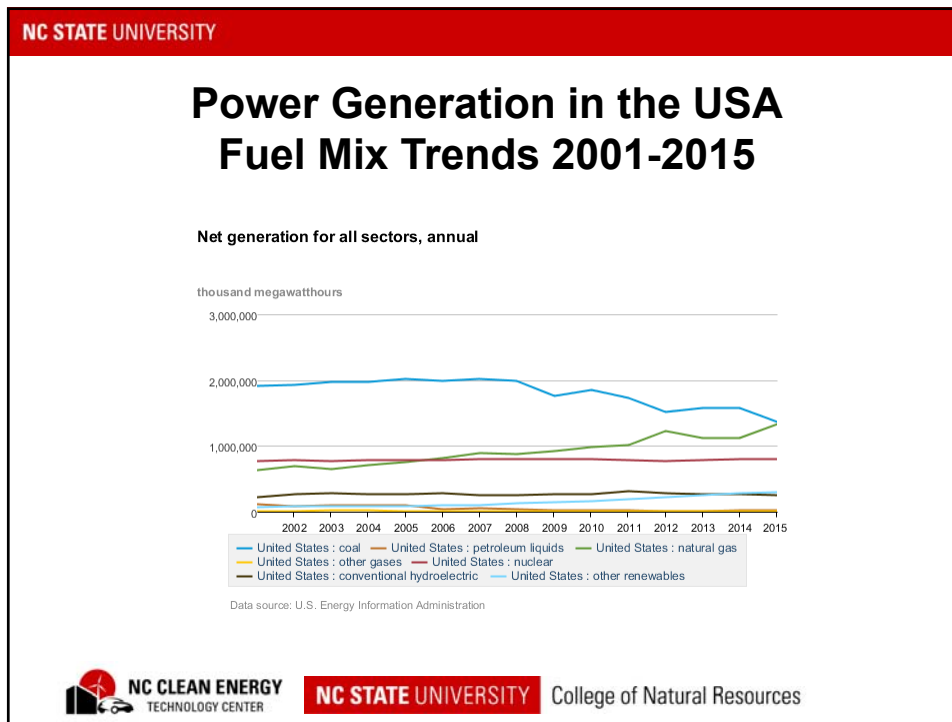


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## A Deeper Look At “Other Renewables”

- Covers a broad segment of renewable generation fuels (solar, wind, biomass)
- An increasingly important fuel category
  - Generation from category increased by a factor of 4.22
  - Generation from all fuels increased by a factor of 1.09
- A closer look at 15-year fuel mix trends depicts additional insight into Other Renewables
  - Generation from solar power increased by factor of 48.8
  - Generation from wind power increased by factor of 28.3
  - Generation from biomass-based power increased by factor of 1.3
- Data illustrates that there is greater potential for biomass-based power to balance renewable portfolios

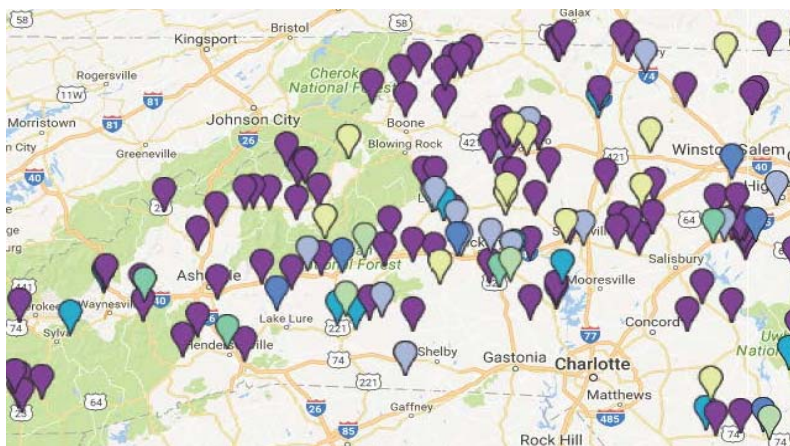
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## Who Are Potential Wood Energy Candidates?

- Almost any site is a good candidate
  - Especially those with a sustained thermal energy demand
- Facilities that create sawdust or waste-wood as a byproduct of production
- Operations that currently utilize fuels that are either supply-limited or are costly
  - Some portions of western NC have natural gas supply constraints, and are required to supplement with or totally rely on propane to meet steam and hot water needs
- Facilities that are Boiler MACT-applicable and recognize that Biomass could reduce compliance requirements
- Facilities that are expanding or replacing an existing boiler



## Identifying Candidate Sites



## Assessing Viability of Wood Energy at Your Facility

- Viability is a function of technology and cost
- To evaluate both of these factors, a Project Screening is conducted
- The screening incorporates existing steam/hot water demand, existing technology, current consumption and cost of fuel, electricity and other site-specific factors
  - This is referred to as the base case
- The base case is evaluated against two scenarios
  - A new boiler firing biomass (wood energy)
  - A new biomass-fired Combined Heat and Power system
- If your existing boiler fires solid fuel, then the screening will exclude costs for new boiler



## Assessing Viability of Wood Energy at Your Facility

- The Project Screening utilizes site energy demand to determine appropriate size of new boiler (if applicable)
- It then calculates the capital, operations and maintenance and fuel costs of the biomass boiler and the biomass CHP scenarios
- Other cost factors include renewable energy credits, biomass production tax credits and other incentives as applicable
- All of the above factors are then distilled down to the Simple Payback



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### Biomass Boiler / Biomass CHP Screening

**Facility Information**

Facility Name	E Corp.
Location (City, State)	Canton NC
Application	Lumber Mill
Date	15-Aug-16

**Loads**

Existing Heating Fuel	Propane
Annual Hours of Operation	6,800
Average Power Demand, kW	3,000
Annual Electricity Consumption, kWh	20,400,000
Average Steam Demand, MMBtu/hr	20.00
Annual Steam Demand, MMBtu	136,000

**Energy Costs**

	Base Case - Fossil Fuel	Biomass Boiler Case	Biomass CHP Case
Existing Thermal Fuel Costs, \$/MMBtu	\$6.50	\$3.75	\$3.75
Biomass Boiler/CHP Fuel Costs, \$MM/ktu			
Average Electricity Costs, \$/kWh	\$0.08		
Percent Average per kWh Electric Cost Avoided			
Standby Rate, \$/kW			\$4.00

**Existing System**

Existing Boiler Efficiency, %	75.0%
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**CHP System**

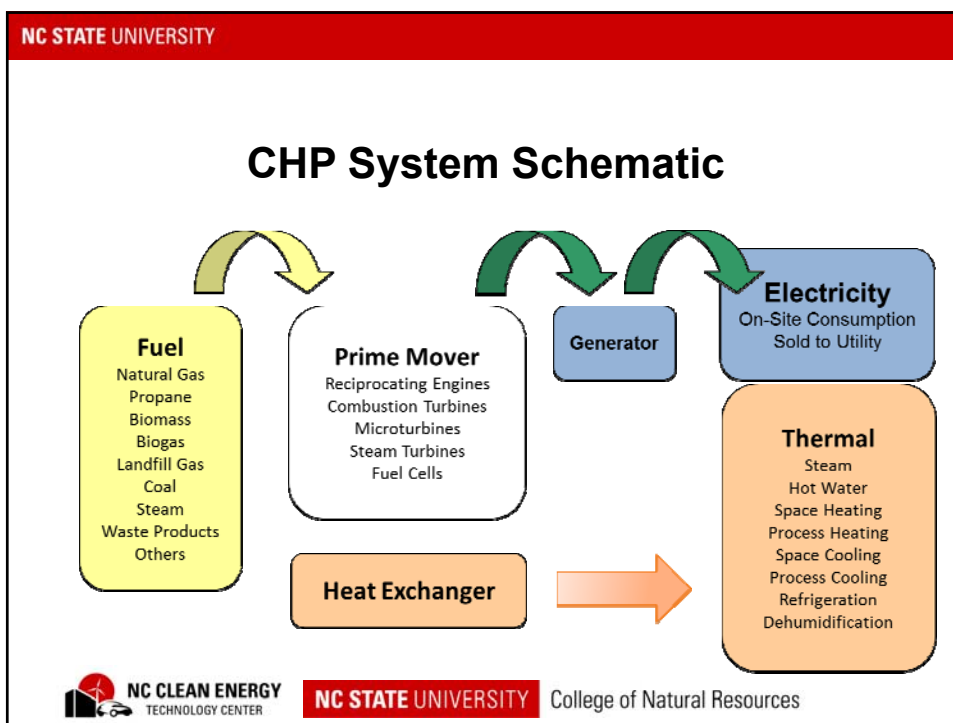
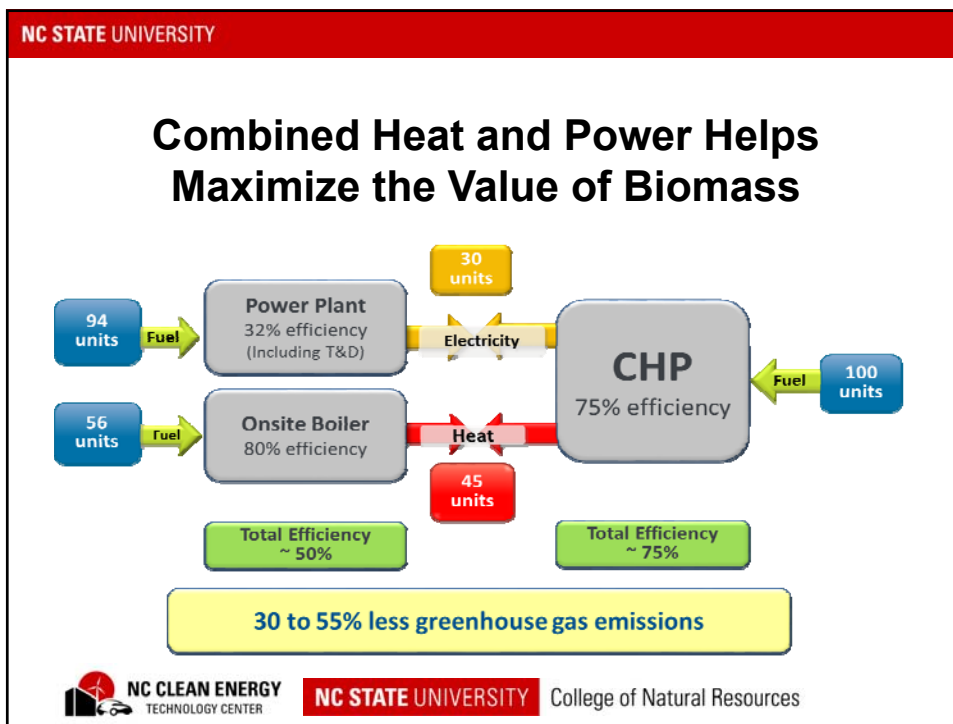
	Biomass Boiler Case	Biomass CHP Case
New Boiler = 1, Steam Turbine Only = 0	1	1
Net CHP Power, kW	500	500
CHP Electric Efficiency, % (HHV)	8.5%	8.5%
CHP Thermal Output, Btu/kWh	39,674	39,674
CHP Thermal Output, MMBtu/hr	20.00	20.00
CHP Power to Heat Ratio	0.088	0.088
CHP Availability, %	95%	95%
Incremental O&M Costs, \$/MMBtu	\$0.209	
Total Installed Costs, \$/MMBtu	\$124,000	
Incremental O&M Costs, \$/kWh		\$ 0.010
Total Installed Costs, \$/kW		\$6,000
New CHP Boiler Efficiency, % (if "New Boiler" = 1)	75.0%	75.0%

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	Base Case - Fossil Fuel	Biomass Boiler Case	Biomass CHP Case
<b>Annual Energy Consumption</b>			
Purchased Electricity, kWh	20,400,000	20,400,000	17,143,494
Generated Electricity, kWh	0	0	3,256,506
Boiler Steam, MMBtu	136,000	136,000	0
CHP Boiler Steam, MMBtu	0	0	136,000
Boiler Fuel, MMBtu	181,333	181,333	0
CHP Boiler Fuel, MMBtu	0	0	196,451
Total Fuel, MMBtu	181,333	181,333	196,451
<b>Annual Operating Costs</b>			
Purchased Electricity, \$	\$1,734,000	\$1,734,000	\$1,457,197
Standby Charges (Option 2), \$	\$0	\$0	\$24,197
On-site Thermal Fuel, \$	\$1,178,667	\$680,000	\$0
CHP Fuel, \$	\$0	\$0	\$736,600
Incremental O&M, \$	\$0	\$27,200	\$32,565
Total Operating Costs, \$	\$2,912,667	\$2,441,200	\$2,250,649
<b>Simple Payback</b>			
Annual Operating Savings		\$471,467	\$662,018
Renewable Energy Credits (NC REPS)		-	43,116
RECS Sale @\$2.00 per MWh Equivalent			\$86,232
Biomass Production Tax Credit @ 0.012/kWh			\$517
NET Annual Savings			\$748,767
Total Installed Costs		\$2,480,000	\$3,024,619
<b>Simple Payback, Years</b>		<b>5.3</b>	<b>4.0</b>
<b>Operating Costs to Generate</b>			
Fuel Costs, \$/kWh			\$0.226
Thermal Credit, \$/kWh			(\$0.209)
Incremental O&M, \$/kWh			\$0.010
<b>Total Operating Costs to Generate, \$/kWh</b>			<b>\$0.027</b>

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## Next Steps

- Contact us for a no-cost project screening
  - Determine if biomass/wood energy is viable for your facility
- Following completion of the screening, we will review the inputs, outputs and sensitivities of the screening to provide the information you need to make an informed decision, based on unbiased analyses
- Provide information regarding technical assistance and other services available through USDA and USDOE programs



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# Thank You!

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