Biomass and Fuel Flexible CHP/District Energy Systems
District Energy System Applications

- Colleges & Universities
- States & Municipalities
- Healthcare
- Federal Government
Middlebury College
Middlebury, VT

• Steam Production: 23,500 per hour @ 240 psig
• 50% reduction in #6 fuel oil annually (1,000,000 gallons plus)
• CO2 reduction: 12,500 plus metric tons per year.
• 40% reduction in carbon footprint
• Annual wood chip consumption: 20,000 tons per year
• Electricity produced: 15-20% of the campuses need (3-5 million kilowatt-hours of electric per year)
• Particulate emissions: 0.017 lbs/MMBTU, average
Colby College
Waterville, ME

- (2) 400 hp high pressure boilers
- Combined steam production: 26,000 lbs per hour @ 300psig
- Consumes 22,000 tons of locally sourced woodchips annually
- Fuel sourced within a 50 mile radius from Sustainable forest operations
- 90% reduction in #6 fuel oil annually (1 million gallons)
- Entire plant LEED Gold Certified
- CO emissions: less than 0.1 lbs/MMBTU, average Particulate emissions: 0.01 lbs/MMBTU, average
University of British Columbia

- Key component to commitment to reduce GHG’s by 100%
- Syngas fuels a 2MW generator, eliminates new electrical transmission line
- Created a Living Laboratory
State of Vermont District Heating

- New biomass fueled facility for serving the current and anticipated State heating requirements as well as the initial phase of the City’s municipal thermal utility.
- Reduce reliance on oil
- Two (2) new 600 BHP wood fueled boiler systems and (1) new #2 oil emergency backup boiler

Images Courtesy of AFS Energy Systems
Enwave Seattle

- Utilized waste wood, avoiding landfill
- Serves approximately 200 buildings downtown
- Reduces CO2 output by 55,000 tons/year
- Cuts carbon footprint by 50-60%
- Supports LEED for customers
Gundersen Lutheran Medical Center, Inc.
La Crosse, WI
Boiler and Wood Metering

800 horsepower biomass boiler making steam at 400psi

Images Courtesy of AFS Energy Systems, Inc.
Gundersen Lutheran Medical Center, Inc.
La Crosse, WI
Steam Turbine Generator

Steam to Facility
400 psi

Electricity to Clinic (400kW)
2,200,000 kW-hrs.

100 psi
• EO 13514: Reduce GHGs by 28% by 2020
• VA Goal: 7.5% of energy from renewable sources by 2020
• 2 MWe and 4.4 MWth for heat & power
• GHG Reduction: 14,000 tonnes/yr
• Produces 10,400,000 kWh- 84% of yearly electricity load
VA Medical Center

Chillicothe, OH

- 600HP wood fired boiler, 450 psig
- Supplies steam to a 350kW steam turbine generator
- Capable of burning a multitude of wood residues
- Fully automatic ash extraction system

Images Courtesy of Wellons FEI Corp
VA Medical Center

Chillicothe, OH

- 8 Rake moving floor storage bin with fuel handling
- Stepped grate combustion system with automatic ash extraction
- Electrostatic Precipitator Emissions Control
- Test results on particulate emissions less than half of what is normally produced by a natural gas burner
• First “Net Zero” Marine Corps Installation
• Uses woody biomass such as tree trimmings, scrap wood, crop residues, and methane gas from landfills for power generation
• 2.1 MW Combined Heat and Power landfill generator
• 8.5 MW steam turbine to generate 44 MWh per year