

# “Wood Pellet Applications”

Rob Davis

Forest Energy Colorado



Can Forests Meet Our Energy Needs?

The Future of Forest Biomass in  
Colorado



Thursday, February 21, 2008  
Colorado State University  
Fort Collins, Colorado



# Pellets

## Refined Fuel

- Clean
- Consistent
  - Size
  - Shape
  - Energy Content
  - Combustion
- Densified



# Why Densify?

- Energy Density
  - Green chips      85,000 Btu / cu ft
  - Pellets            360,000 Btu / cu ft
- One third the delivery trucks
- One fourth the storage space
- Flowable
- Clean, Consistent Combustion
- Higher efficiencies

# Sources for Biomass Pellets

- Forest Residues - Characteristics

- Round wood –White wood
- Whole Tree / Slash
- Green
- Dead



- Ag Residues



# Biomass Pellets For Energy

- Use
  - Thermal Energy (Heat)
  - Feedstock (biofuels)
  - Power Generation
    - Direct
    - Cofiring

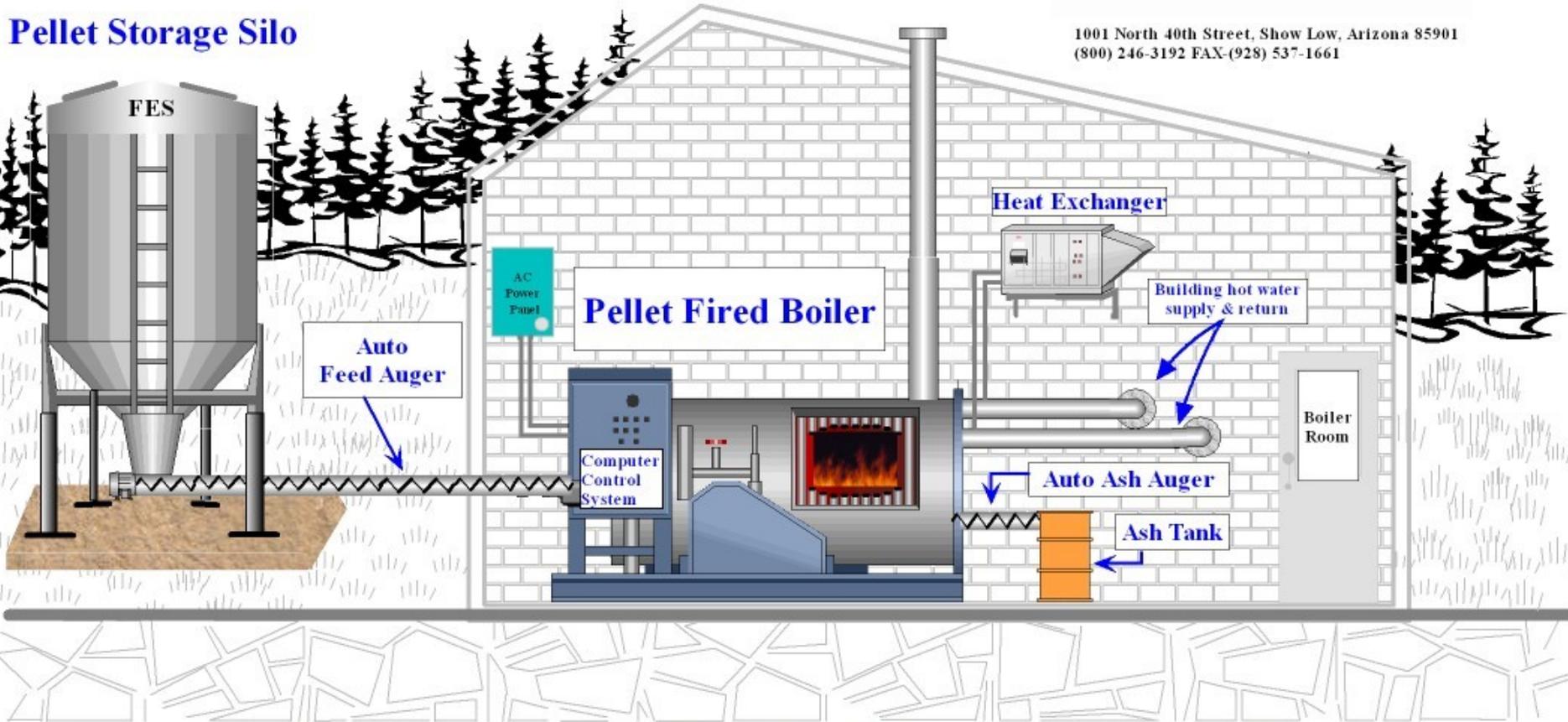


Free standing Pellet  
Stove /

Forced Air  
Furnaces also  
available



## Pellet Storage Silo





RESIDENTIAL



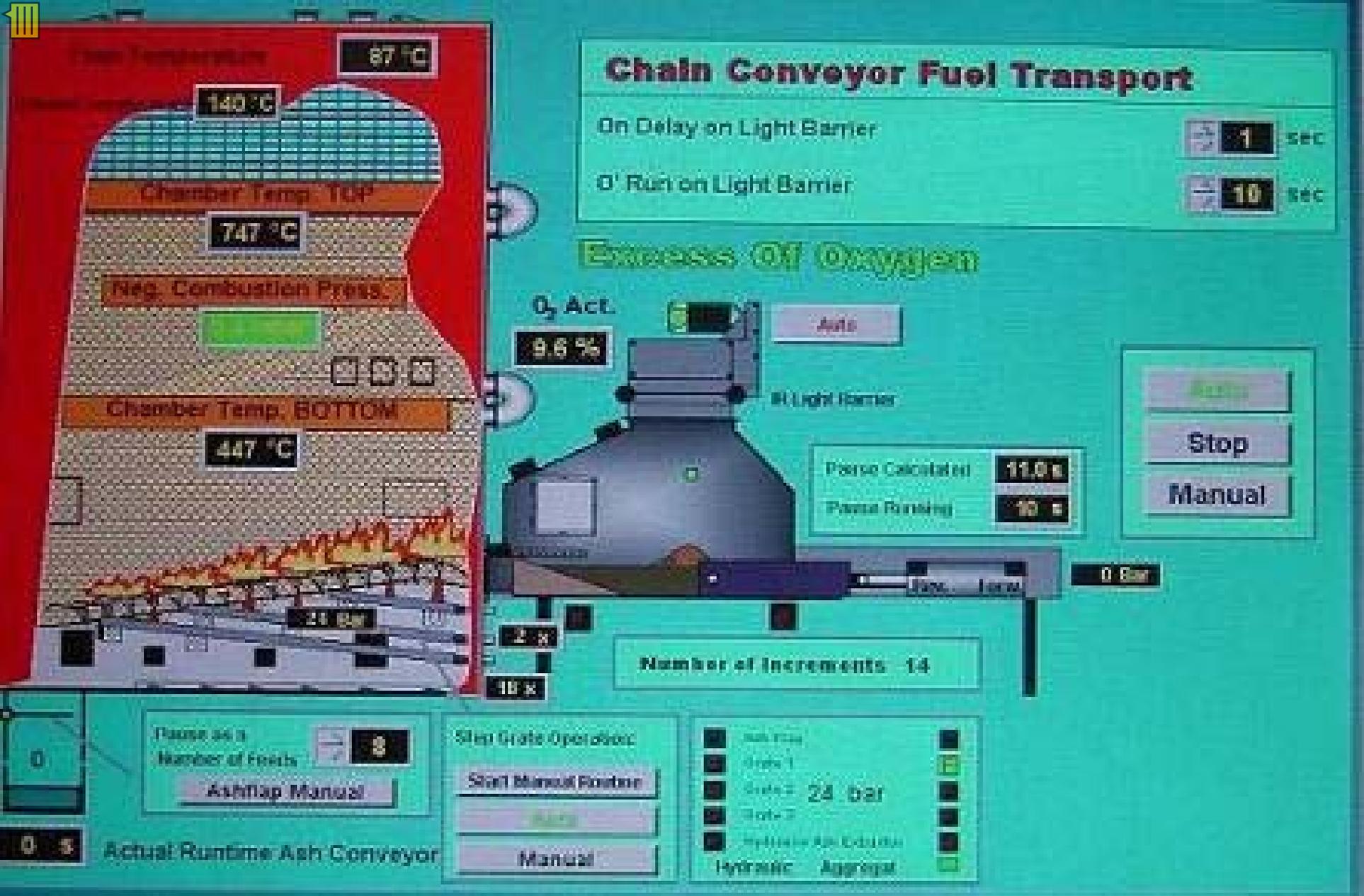
4 16:19



Commercial

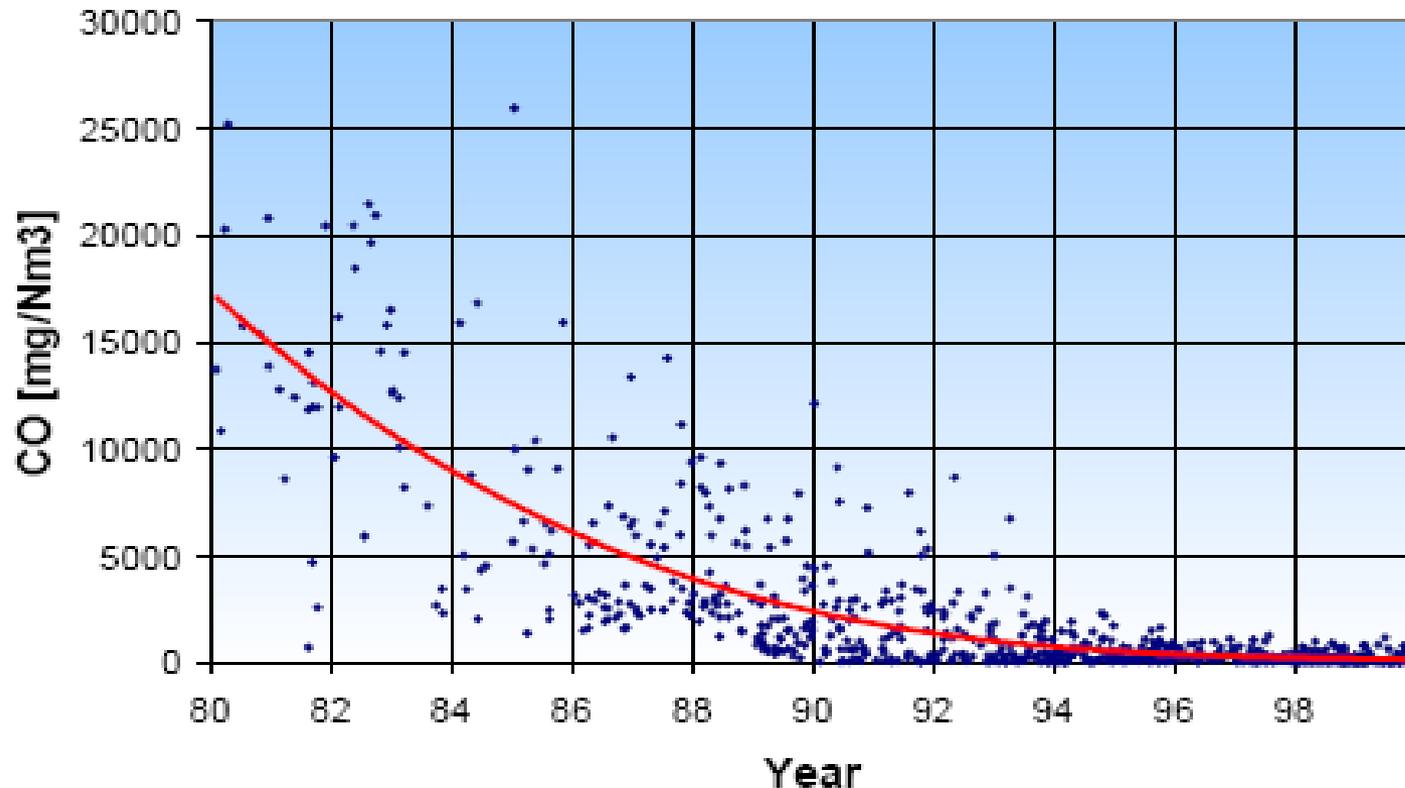


District Heating



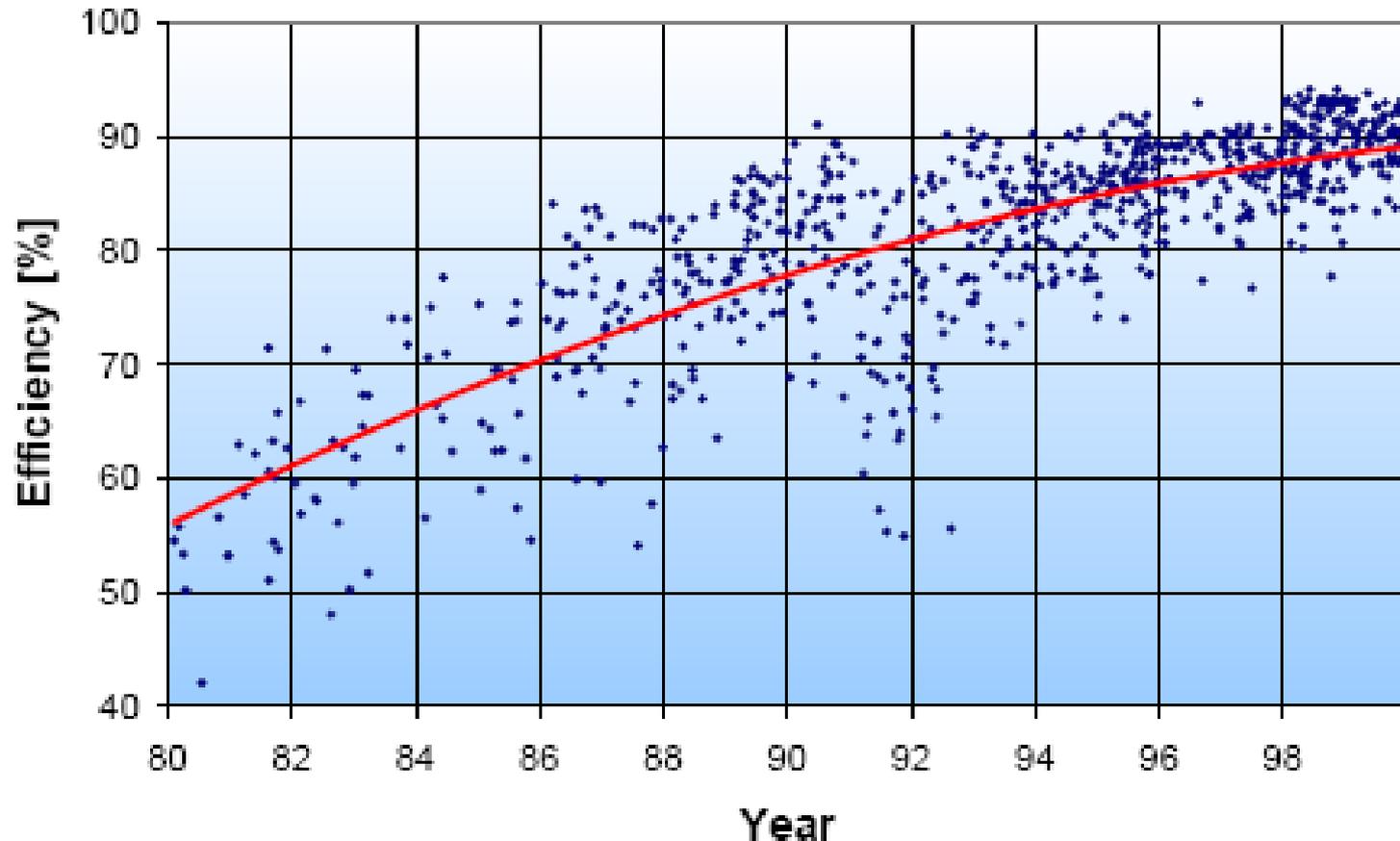
Computer Controlled, Unmanned Systems

# History of CO Emissions Improvements



- Units: PPM =  $\text{mg/Nm}^3 \times 0.8345$
- Source: "Heating Large Buildings with Wood Fuels" SWS Group, [www.bioheat.info](http://www.bioheat.info)

# History of Efficiency Improvement



Efficiency of Biomass Boilers (wood chip & pellet fired)

As of 2005, average pellet boiler efficiency ranges from 85% to 94%.

# Direct Electric Generation



- Conventional Delivery Mechanism
- Demand for electricity
- 24% Efficient
- Feasible Wood Payment - \$23 / green ton
- Considerable Subsidy Required

# Combined Heat and Power

- Higher efficiency - Waste heat use
- Electricity to grid – heat to local energy

# Cofiring Wood & Coal

- Pellets pulverize similar to coal
- Pellets flow and are easily fed.
- Capital Cost is low due to less storage and handling & existing power infrastructure
- Cofiring in larger coal plants improves efficiency
- Doesn't create new generation
- Cofiring wood and coal may be the best short term solution to large short term wood volumes
- Title V Air Permit must be reopened for even 10%.

# SELECTING THE BEST SOLUTION

## Primary Considerations

- Limited Resource
- Biomass Characteristics
- Appropriate Size
  - Short Term
  - Long Term – Sustainable
- Benefits
- Prudent Use

# Benefits

- Forest Management /  
Fire Hazard Mitigation
- Renewable Energy
  - Fossil Fuel Displacement
  - Carbon
- Economic

# Forest Management / Fire Hazard Reduction

- Short Term Volumes –
  - Beetle Kill
  - Fires
  - Restoration
- Long Term Sustainable Volumes
  - Restoration
  - Ongoing Forest management needs
- Paying the bill
  - \$35 – 40 / green ton

# Renewable Energy

- Fossil Fuel Reduction
- Carbon Reduction
- Sustainable Energy

# Economic

- Paying the forest bill
- Jobs
  - Short Term
  - Sustainable / Long Term
    - Harvesting
    - Processing
    - Delivery
- Reduce Economic Leakage
  - Dollars stay in Community / State
    - 5000 households, ave. heating bill \$2,500 / year = \$12.5million

# Prudent Use

- The most benefit per ton of wood
  - Fossil Fuel displaced / ton
  - Useable Energy generated per ton
  - Jobs / ton
  - \$ remaining in Community

# Biomass Electricity

**One bdTon  
Biomass**



**4.95 MWHR  
(168 Therms)**

Electrical  
Generation

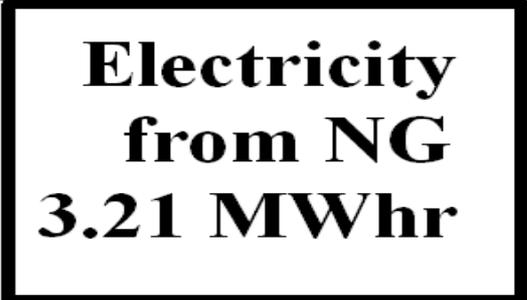
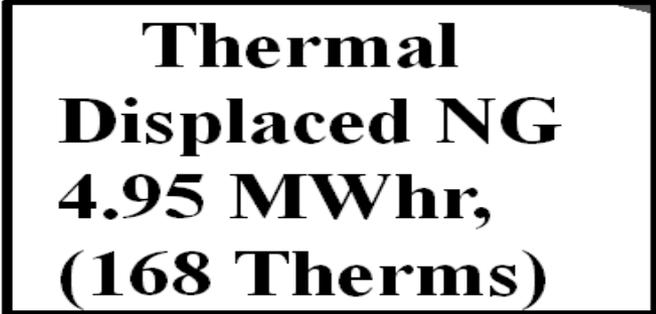
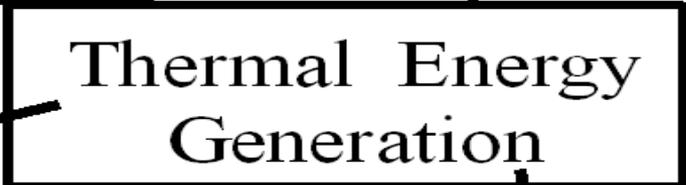
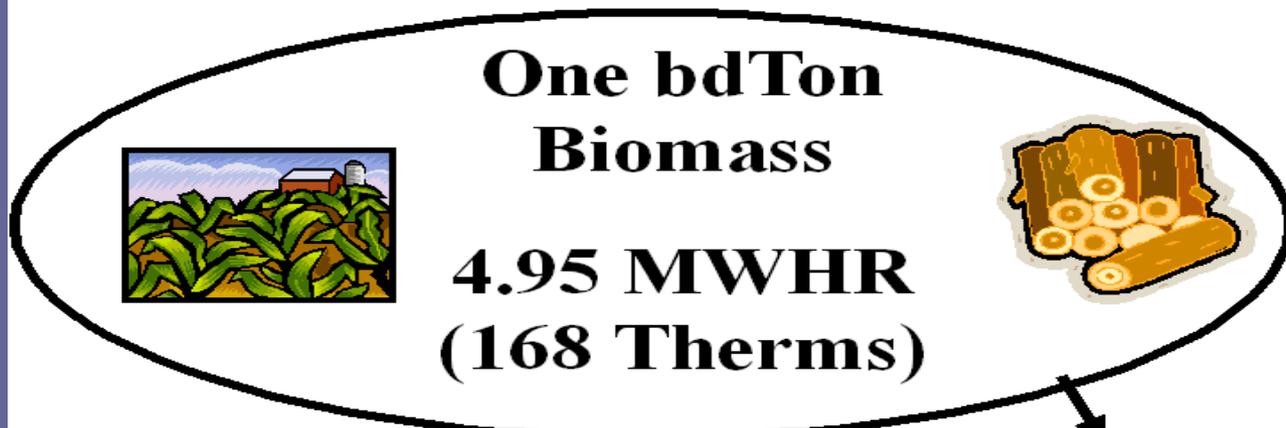
**1 MWhr**



**Electricity**

**Displaced NG  
1.65 MWhr  
(56.3 Therms)**

# Biomass Heating





## **Biomass**

**One bone dry Ton**

**4.95 MWHR  
(168 Therms)**

	<b>Electricity Produced MWhr</b>	<b>Fossil Fuel Displaced MWhr (Therms)</b>
<b>Generate Electricity (only)</b>	<b>1.0</b>	<b>1.65 (56.3 )</b>
<b>Thermal Energy</b>	<b>-0-</b>	<b>4.95 (168 )</b>
<b>Use NG to produce elec</b>	<b>3.21</b>	

# Solution Assistance

- Acknowledgement by our leaders of all biomass benefits.
- Even the playing field – Subsidies
  - Thermal - -0- incentives
  - Power -
    - REC
    - PTC
    - Accelerated Depreciation
  - Biofuels / ethanol - incentives

Rob Davis  
President

Forest Energy Corp  
1001 N 40<sup>th</sup> Street  
Show Low, AZ 85901  
928-537-1647

Forest Energy **Colorado**  
PO Box 5861 .  
Dillon, CO 80435 .  
970-468-1668 .

Forest Energy Systems  
[www.forestenergysystems.com](http://www.forestenergysystems.com)  
970-562-4242