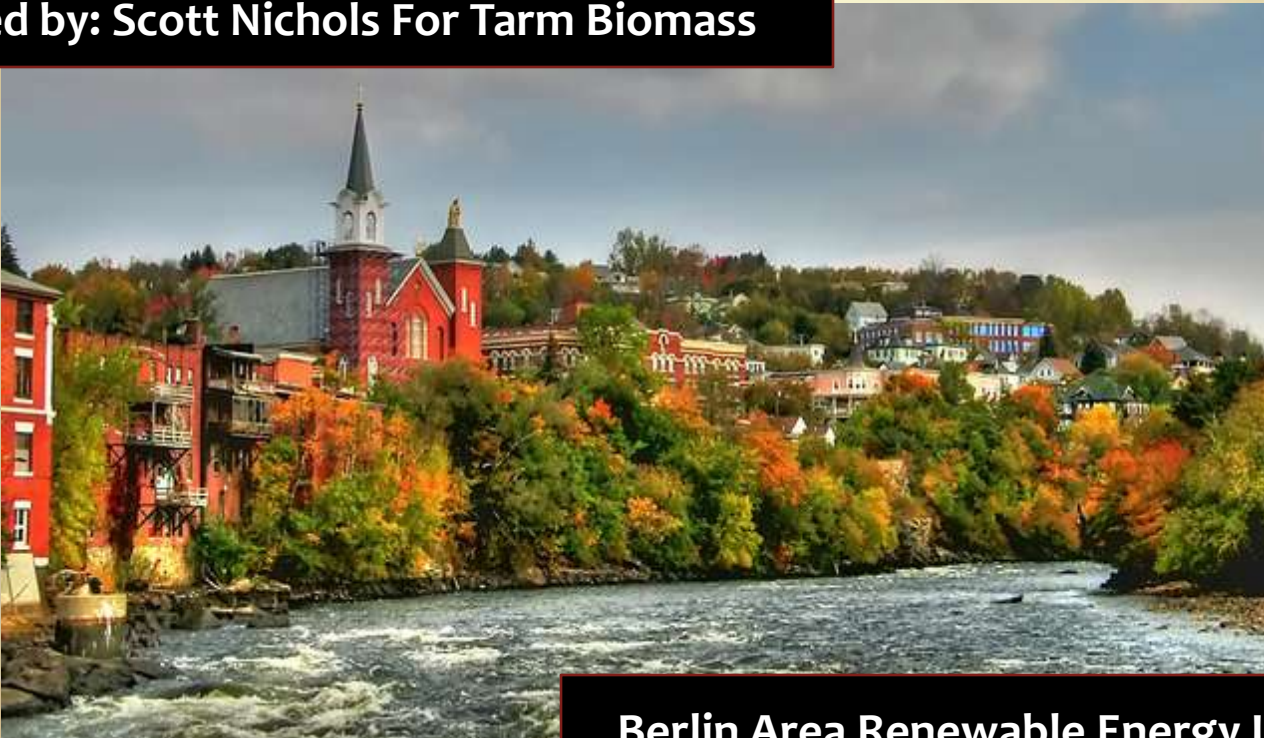


Heating with Renewable Wood Heat
Presented by: Scott Nichols For Tarm Biomass



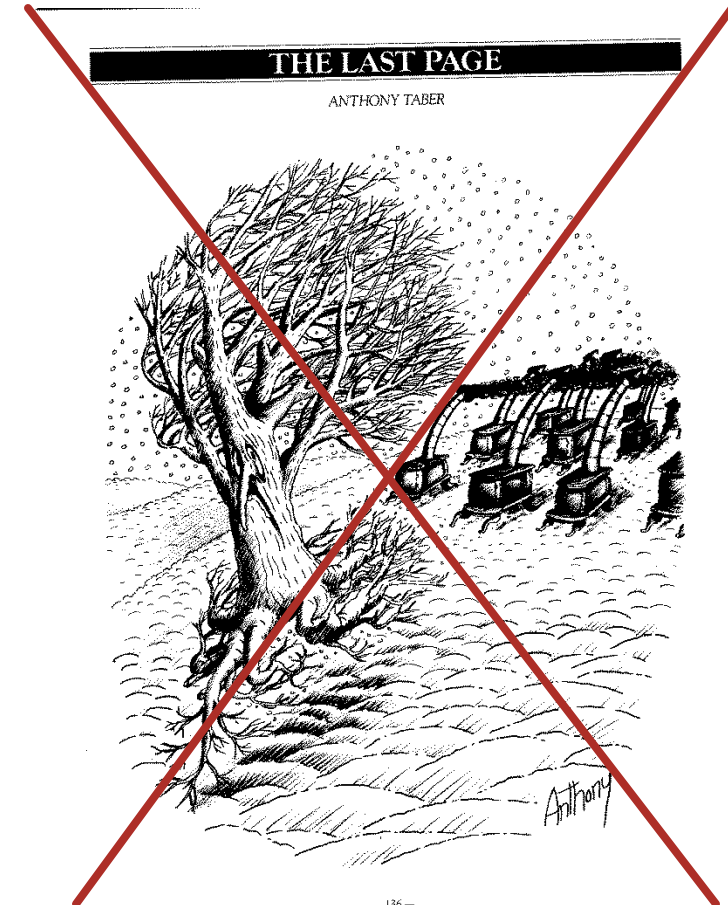
Berlin Area Renewable Energy Initiative
2013 Energy Fair

WHY WOOD FOR HEATING?

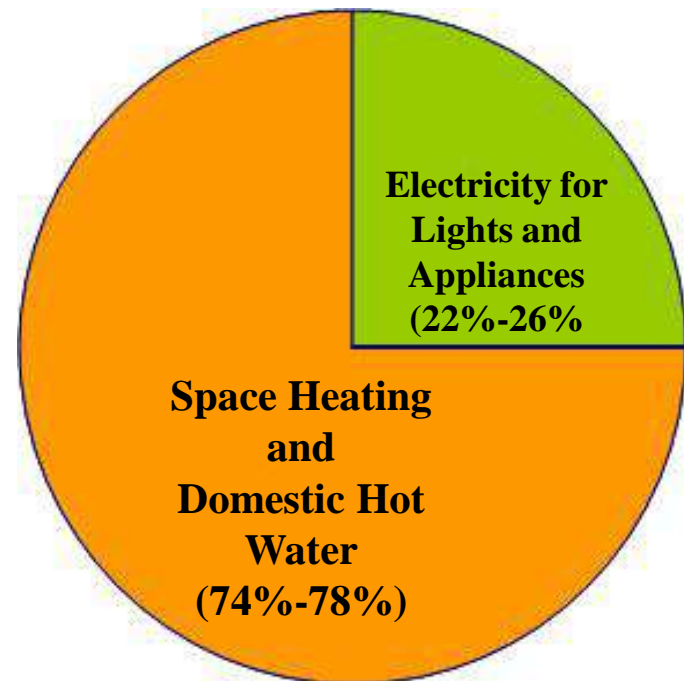
- **78% of residential energy in NH comes from Petroleum Products**
- **Approximately 50% of residential carbon emissions result from home heating**
- **Switching from oil or gas burning heaters to those using wood can reduce new carbon emissions by 75-90% depending upon how much the oil or gas burning equipment is used for back up heat- BERC**
- **Dollar for dollar, biomass is an extremely effective renewable energy source. A \$10,000 boiler and 5 cords of wood will produce the same energy in one heating season that a \$10,000 2.5kW PV array can produce in about 7 years.**

- New Hampshire is approximately 80% Forested

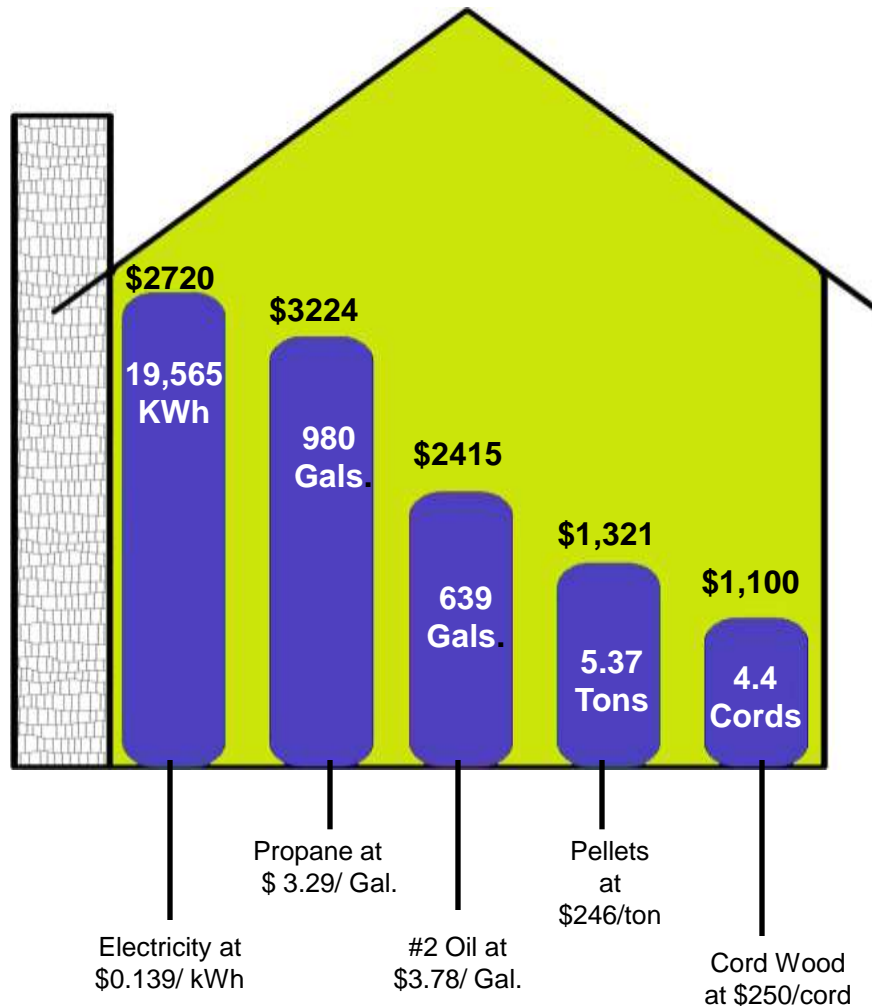
- Heating comprises about 75% of New Hampshire residential energy use



Typical Home Energy Usage in Northern New Hampshire:



Home Heating Costs Typical NH Home @75MMBtu/Yr



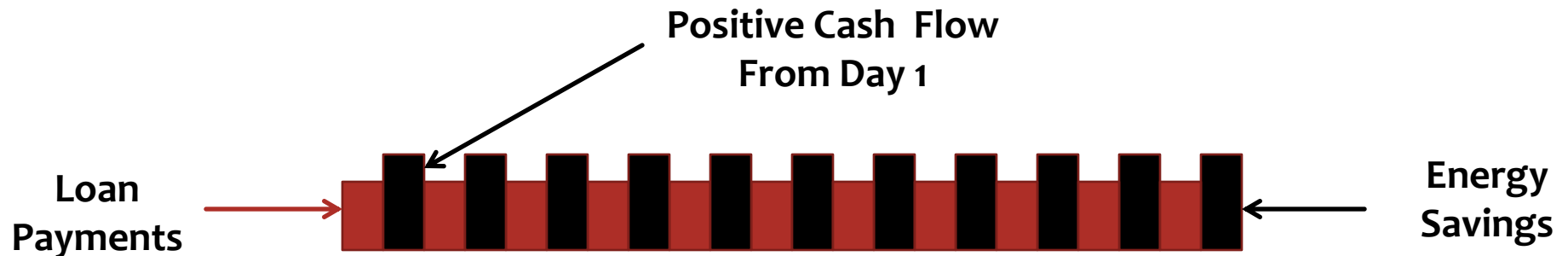
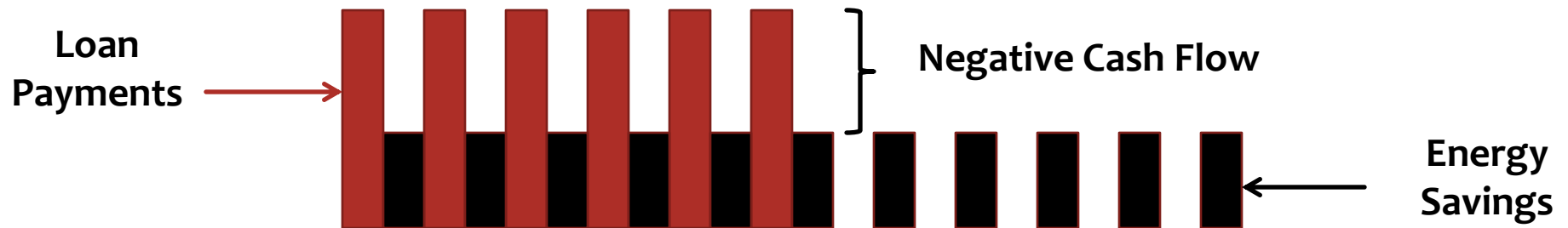
Price Data, NH OEP April 2, 2013

Why Biomass Central Heating?

- **Save Money.**
- **Reduce greenhouse gas emissions (virtually carbon neutral).**
- **Keep energy dollars local.**
- **Reduce the need for foreign energy.**
- **Comfort.**
- **Convenience.**
- **Conversion of energy from the tree to heat in our homes is one of the most efficient uses of the energy so long as it is burned in an efficient appliance.**



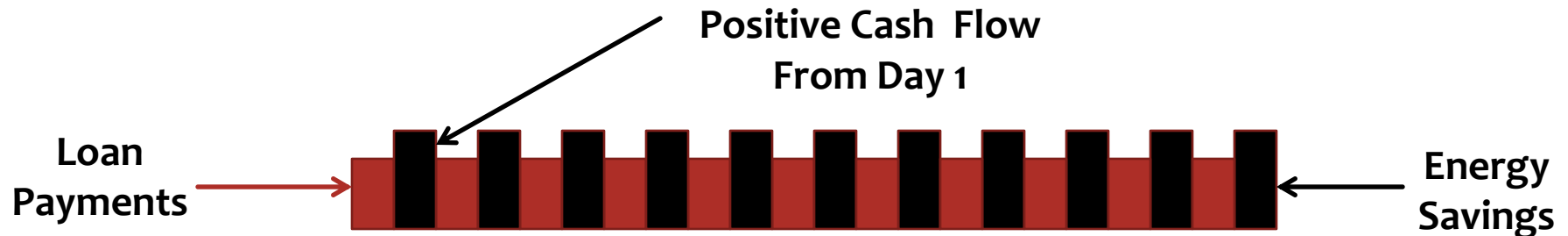
Financing Biomass Heating Installations



The Cost of Not Doing Anything →



Which Installations Yield the Best Financial Results?



➤ This scenario is most likely for sites where more than 1,200 gallons of oil are used each year.

Or

➤ At sites that receive rebates or credits that effectively lower up front cost, sites that receive very low cost financing, or sites that receive very long loan terms.

➤ Commercial installations of pellet boilers benefit from a higher positive cash flow because they offset more oil.

➤ Cordwood boilers can benefit from very low cost fuel, which creates the same financial conditions.

Cord Wood Boiler or Wood Pellet Boiler?

- Do you have your own wood lot that is producing fire wood as a byproduct of woodlot management?
- What are the relative fuel costs now? What will they be?
- How many suppliers do you have in your region?
- How much wood fuel are you going to need? Can you harvest an adequate volume?
- What is your physical fitness level?
- What is your storage space for stacking firewood or storing several tons of wood pellets?
- What is your need for self-sufficiency?

Wood Boilers



Abundant, Renewable, Local



froling

Today's Wood Boiler

- Lambda Control
- Smoke containment
- Insulated jacket
- Exterior HX cleaning
- Firebox Cladding
- Lighting Door
- Induction Fan
- Use with Thermal Storage



Proven History, Simple Danish Design

- No microprocessor
- Individually replaceable controls
- Fully adjustable doors
- Never clean the chimney again
- No smoke in the house
- Cut wood consumption ½ compared to Outdoor boilers
- Fill once every day in the winter with adequate thermal storage
- Easy to clean





NOT THIS!

- Not smoking your neighbor out
- Not putting up 2-3 x as much wood as you need to
- Not making your neighborhood look like an industrial site



- Not having to go out in bad weather in rubber boots
- Not having to put down a board walk to handle mud





THIS!

- 50% or more zero emissions heating!
- Use 1/3 of the wood
- Light the boiler quickly and in your slippers
- No chimney fires
- No over-heating
- No smoke in the house
- No broken backs from handling huge wood



No Visible Smoke

- Use wood for domestic hot water production all year
- Low maintenance
- Low power consumption
- No underground pipe burial

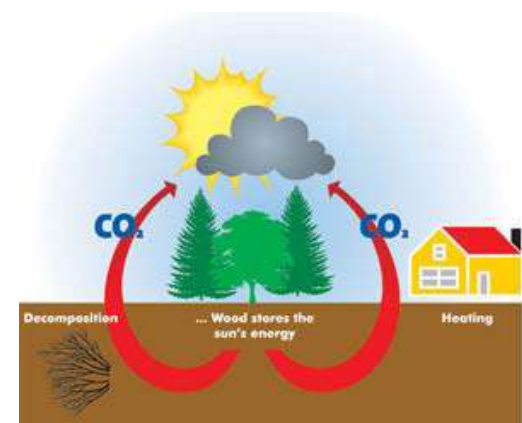




Pellet Boilers

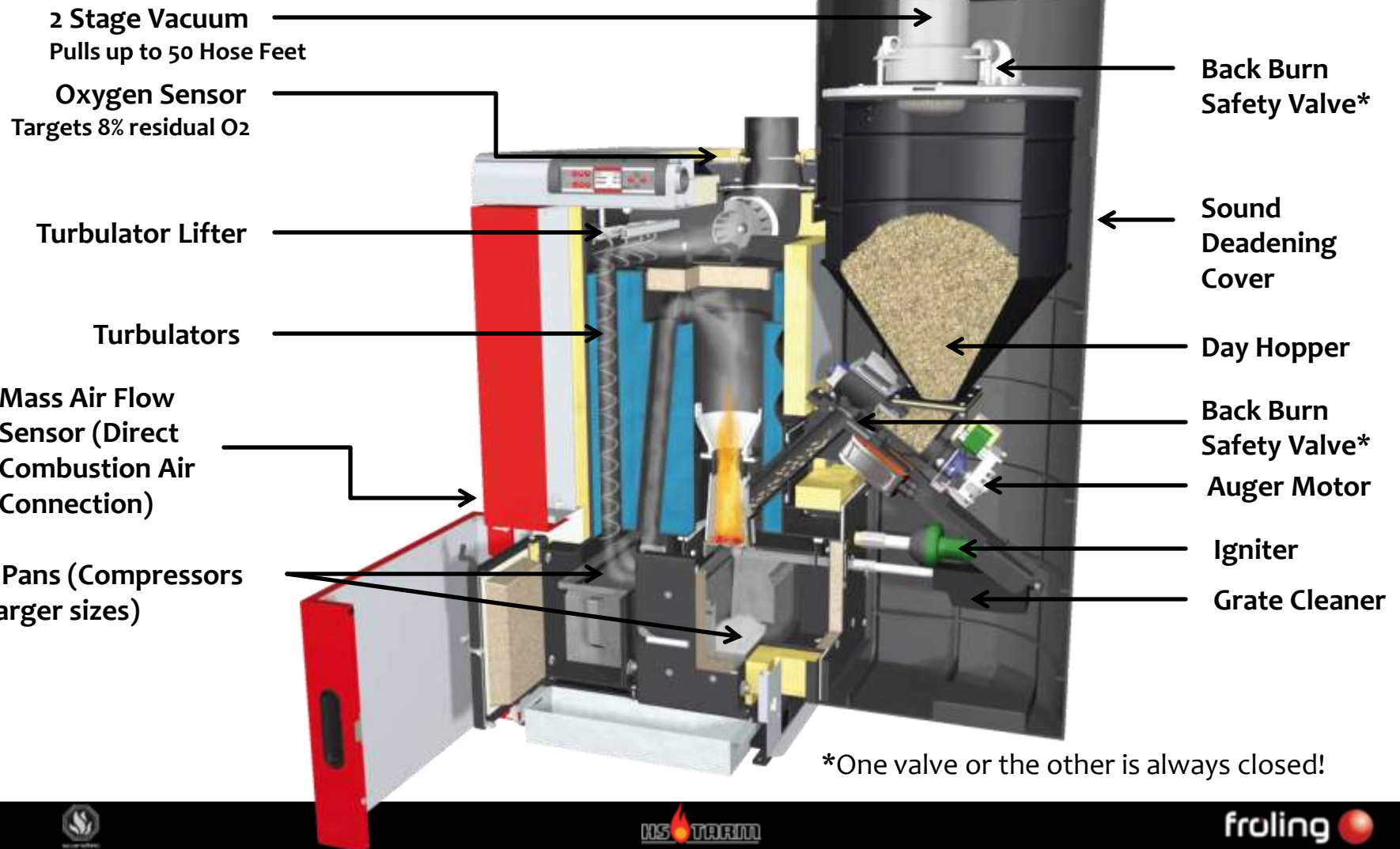


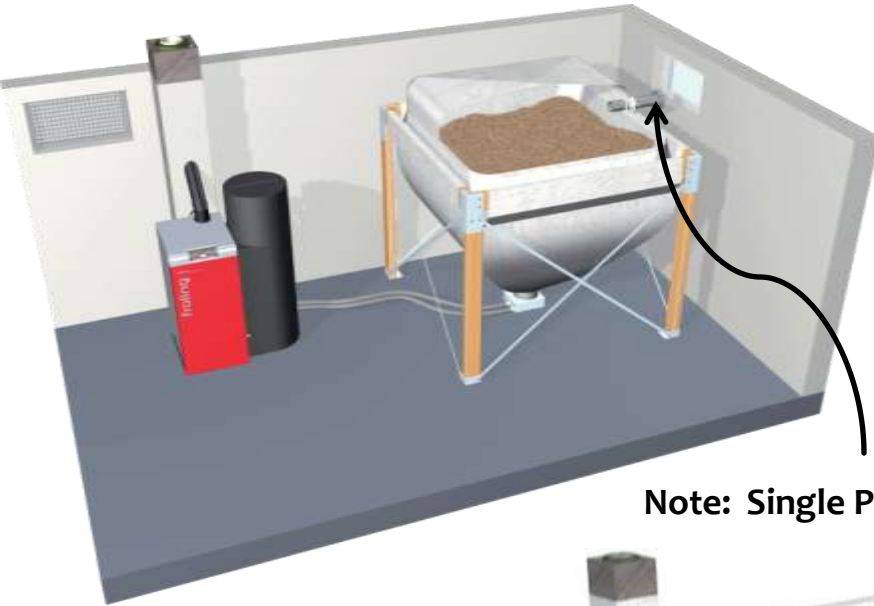
Commercial
Institutional
Residential



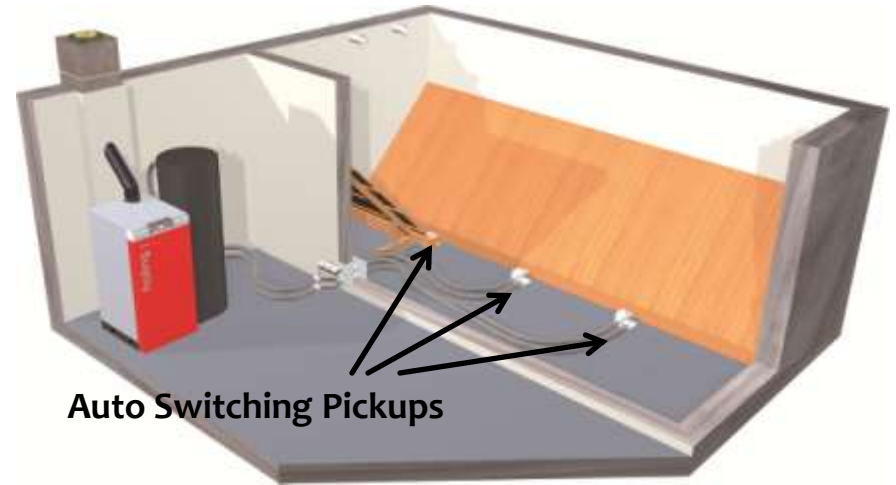
Froling P4 Pellet Boiler Basic Functions

Drop Feed Burner

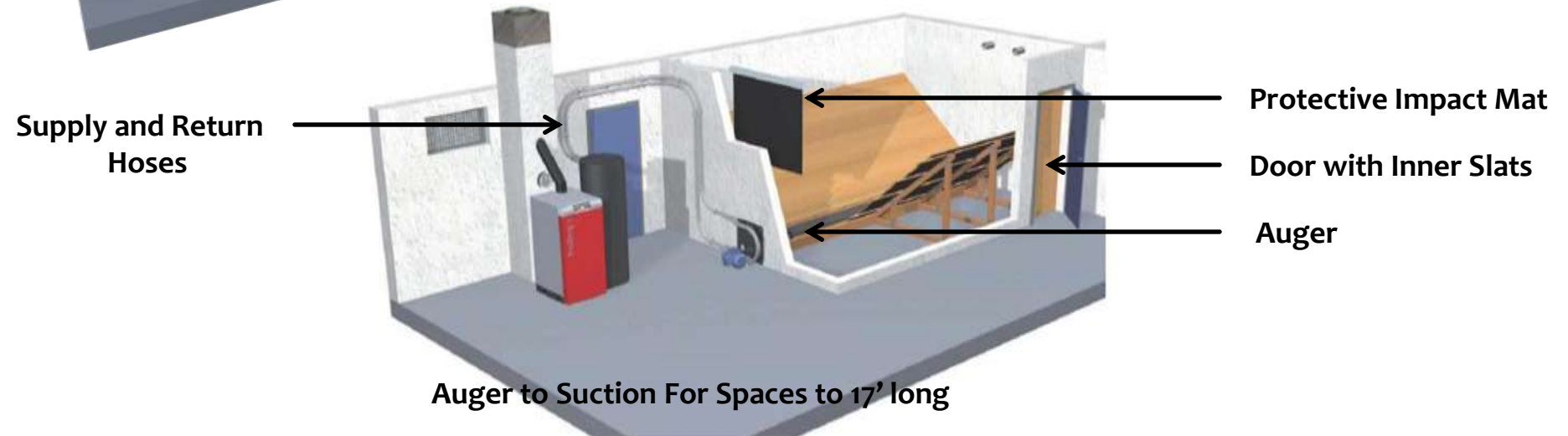




Note: Single Pipe



Auto Switching Pickups



Protective Impact Mat

Door with Inner Slats

Auger

Auger to Suction For Spaces to 17' long

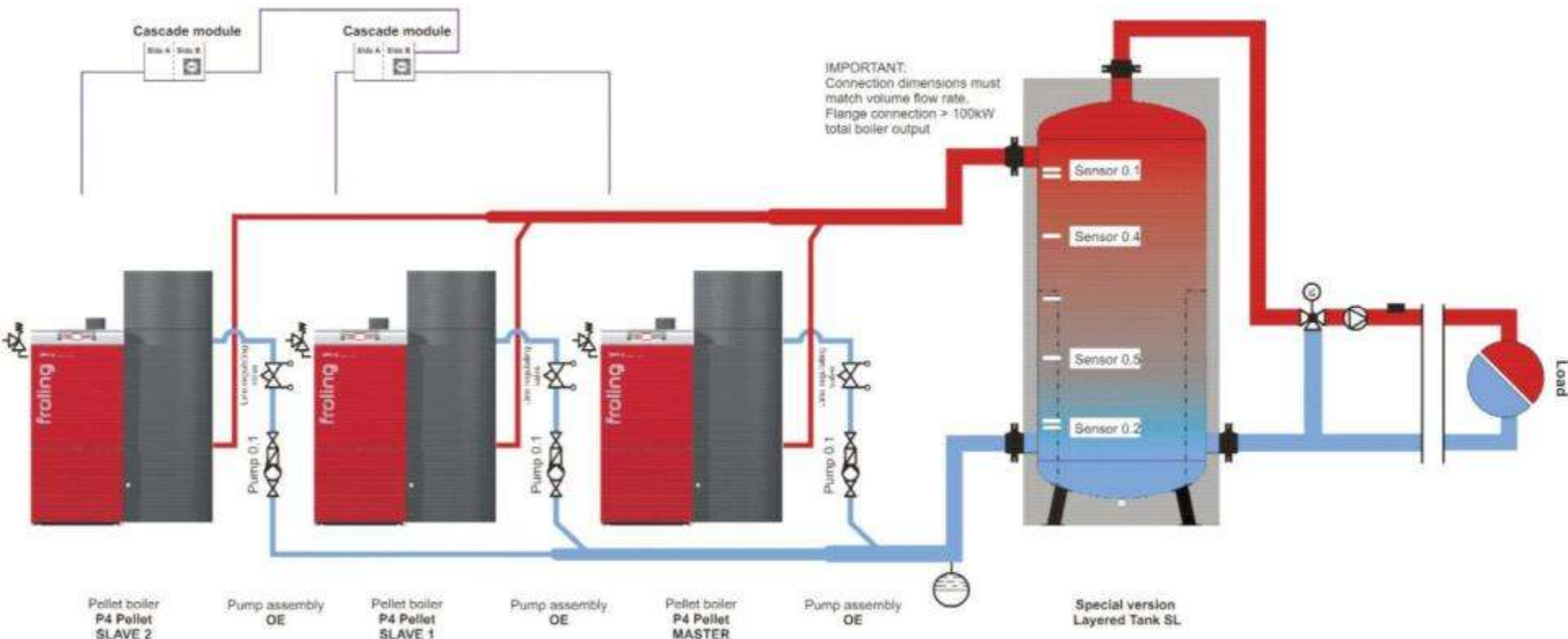
Commercial Boilers

**Heavy Duty Froling TX Boiler
burns wood pellets or dry
wood chips.**

- 500,000 Btu output
- 7'x10' footprint
- Fully approved and rated for all North American installations
- Cascaded up to 2 MM Btu
- All of the automation that the smaller boilers have



Cascade Plumbing and Thermal Storage



Some Advantages of Cascading

- Reduce installation cost
- Increase utilization
- Add redundancy
- Match seasonal and diurnal variation

A 10:1 turndown ratio.

A single 600,000 Btu boiler may reduce its output by 70%.

A cascaded installation of three 200,000 Btu boilers may reduce total output by 90%



Thermal Storage/Buffer

- Improves response to calls for heat
- Isolates the boiler from the system hydraulically
- Reduces emissions
- Reduces equipment wear
- Still allows for boiler modulation
- Can double as domestic hot water maker
- Extends operating season of boilers, increasing utilization, and reducing payback period
- Reduces fouling of heat exchanger surfaces. Fouling builds more rapidly with on/off cycles.

60% reduction in on/off cycling with thermal storage.



Without Thermal Storage, **1700** on/off cycles per year

Recommend between 15 and 30 gallons per 10,000 Btu of boiler output for automatic stoking boilers and 40-80 gallons per 10,000 Btu for Cord wood boilers.



With Thermal Storage, **700** on/off cycles per year

Ideal conditions for efficient wood, wood pellet, and wood chip heating:

- High oil and propane prices
- Access to cord wood or wood pellet fuel in bulk
- Heavy heating or domestic hot water load
- Desire to reduce human produced global climate change
- Desire to keep fuel dollars in the state and country
- Desire to enhance forest land value by providing markets for low value timber
- Desire to take control of a heating budget
- Desire to be less prone to fuel price shocks
- Installation in buildings for which weatherization is very difficult

Thank you

Questions?