

Biomass Heat

Green Energy

Green Jobs

Green Savings

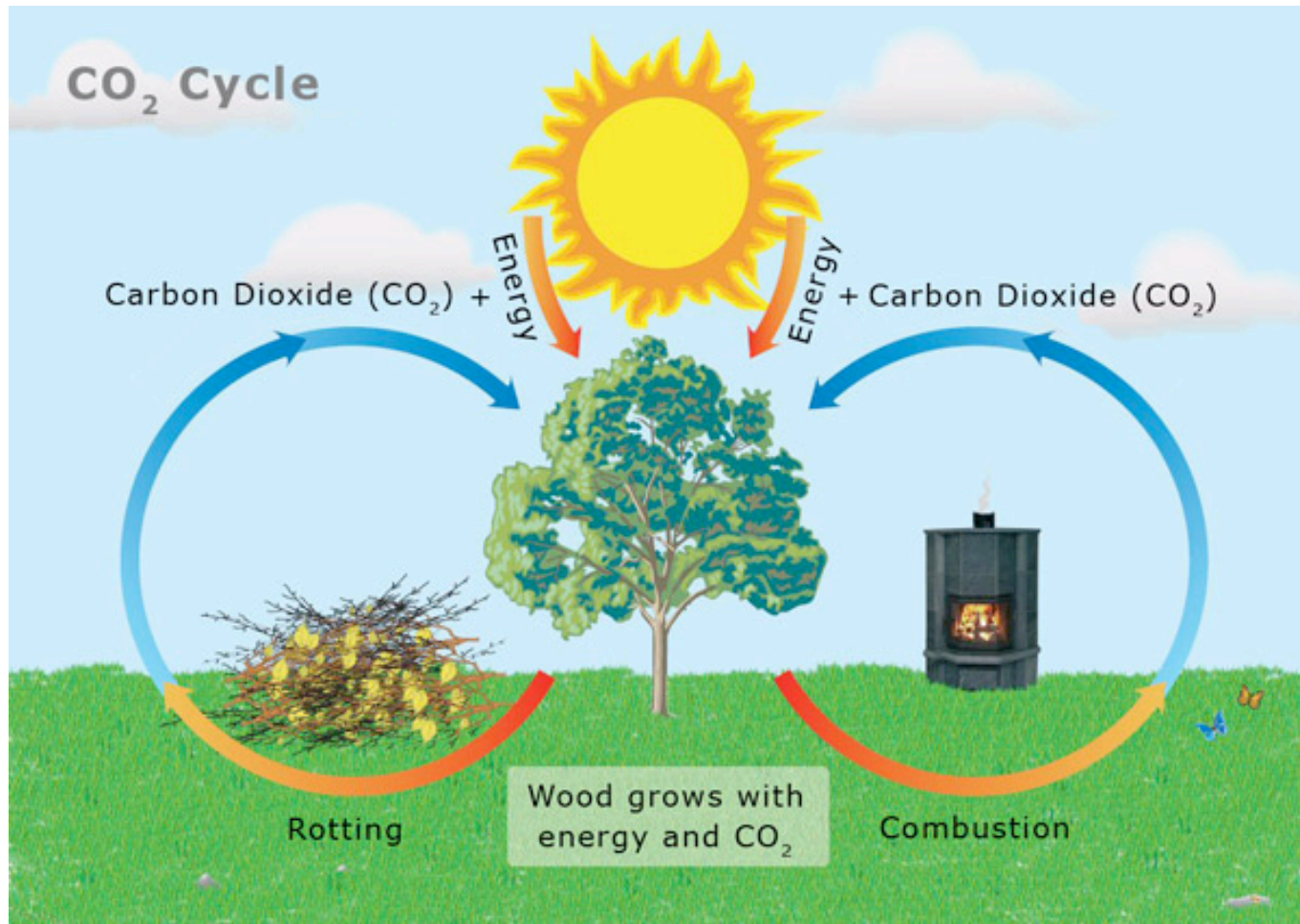


Dave Frank - ***SunWood Biomass***

Innovation in Biomass Heating®



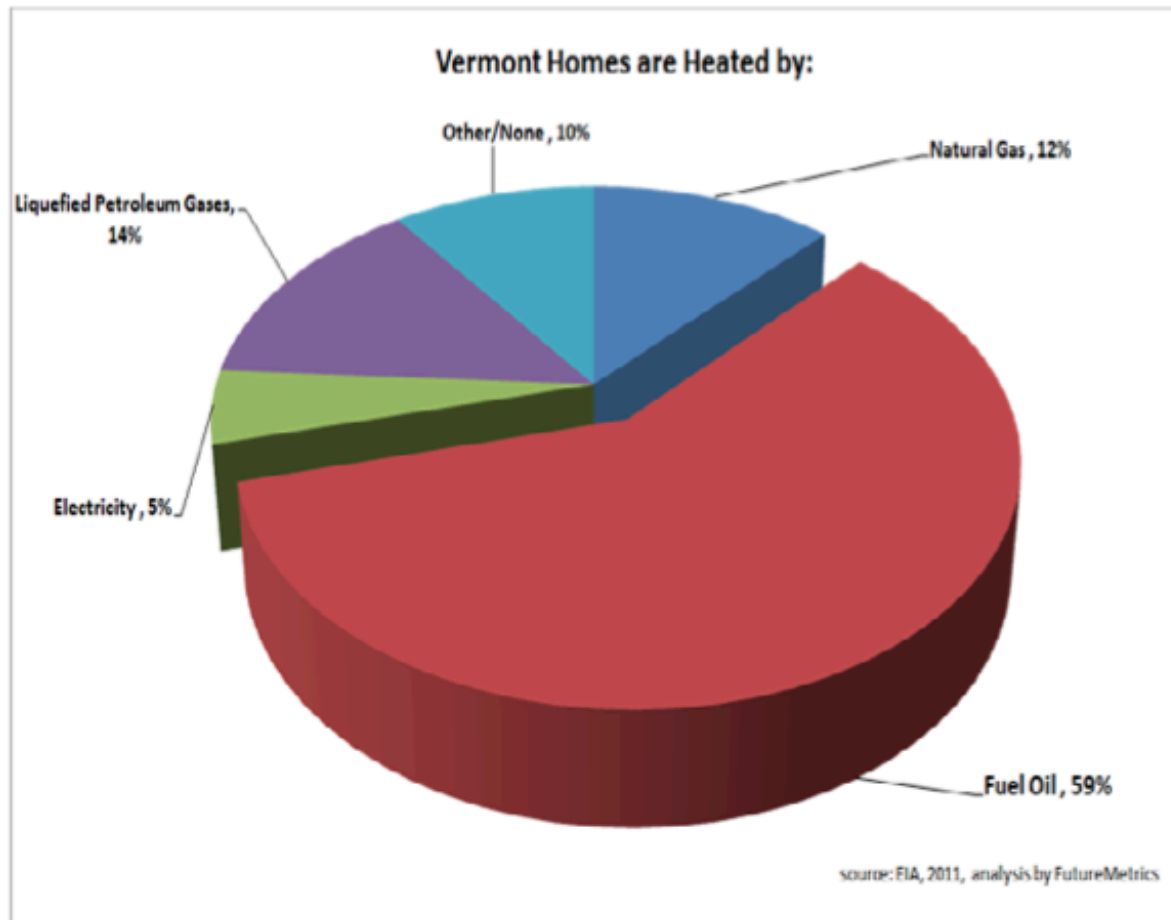
Carbon Neutral *when* Sustainably Harvested & Efficiently Burned...



What's the Cost... Environment & Economy

Currently Cord Wood = 1/3 the cost of Oil / Propane
Pellets = 1/2 the cost of Oil / Propane

#2 Distillate Fuel use in Residential, Commercial, and Industrial (not Transportation)	Average Gallons per Year	Money Exported from Regional Economy at \$3.00/gal	Money Exported from Regional Economy at \$4.50/gal	Annual Increased Loss of Money if Heating Oil goes to \$4.50/gal	Permanent Increase in Jobs Lost
Maine	414,493,000	\$969,913,620	\$1,454,870,430	(\$484,956,810)	-31,966
Vermont	130,435,000	\$305,217,900	\$457,826,850	(\$152,608,950)	-11,191
New Hampshire	242,029,000	\$566,347,860	\$849,521,790	(\$283,173,930)	-17,405
Connecticut	672,464,000	\$1,573,565,760	\$2,360,348,640	(\$786,782,880)	-44,896
Rhode Island	148,551,000	\$347,609,340	\$521,414,010	(\$173,804,670)	-12,216
Massachusetts	818,841,000	\$1,916,087,940	\$2,874,131,910	(\$958,043,970)	-59,939
New York	1,818,841,000	\$4,256,087,940	\$6,384,131,910	(\$2,128,043,970)	-126,728
Pennsylvania	840,580,000	\$1,966,957,200	\$2,950,435,800	(\$983,478,600)	-55,075
New Jersey	459,420,000	\$1,075,042,800	\$1,612,564,200	(\$537,521,400)	-29,026
	5,545,654,000	\$12,976,830,360	\$19,465,245,540	(\$6,488,415,180)	-388,443

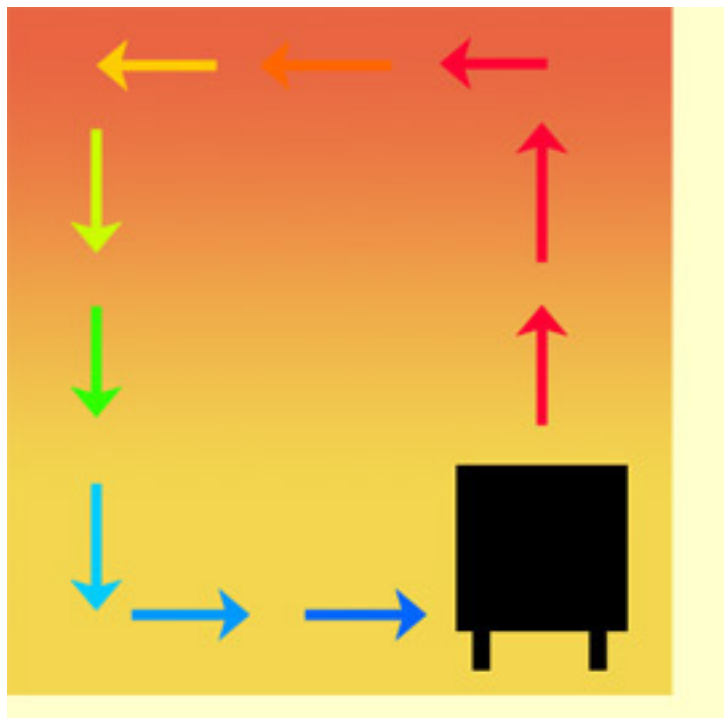


If Vermont were to convert only 17.5% of its homes from heating oil to locally refined wood pellets used in modern fully automatic wood pellet boilers, it would create more than **7,800 jobs**. Some of those jobs would be for the production and supply of pellets and some of those jobs would be created by no longer exporting money.

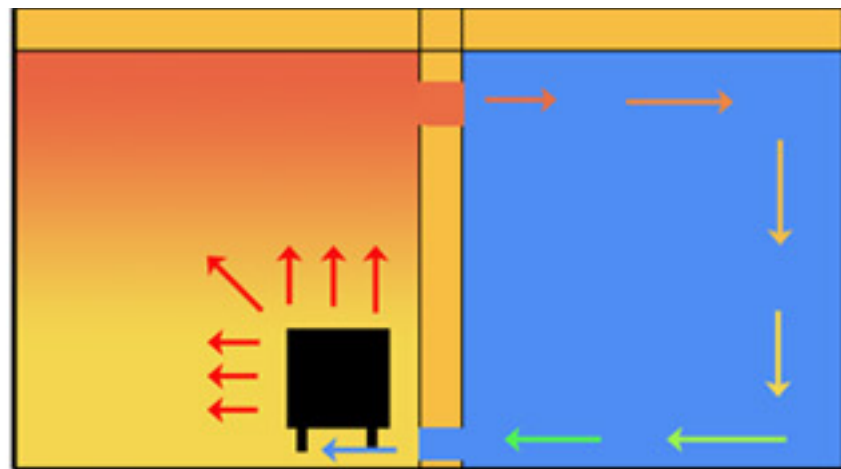
Average Wood or Pellet Stove



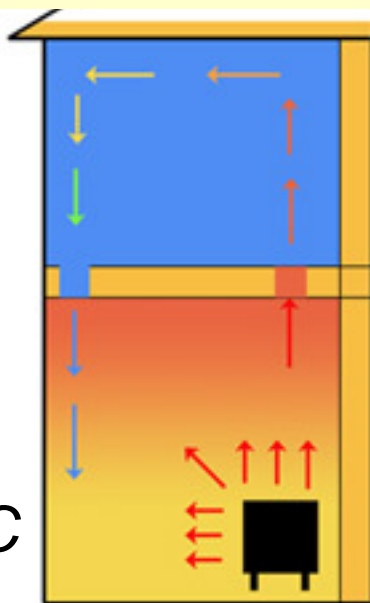
A



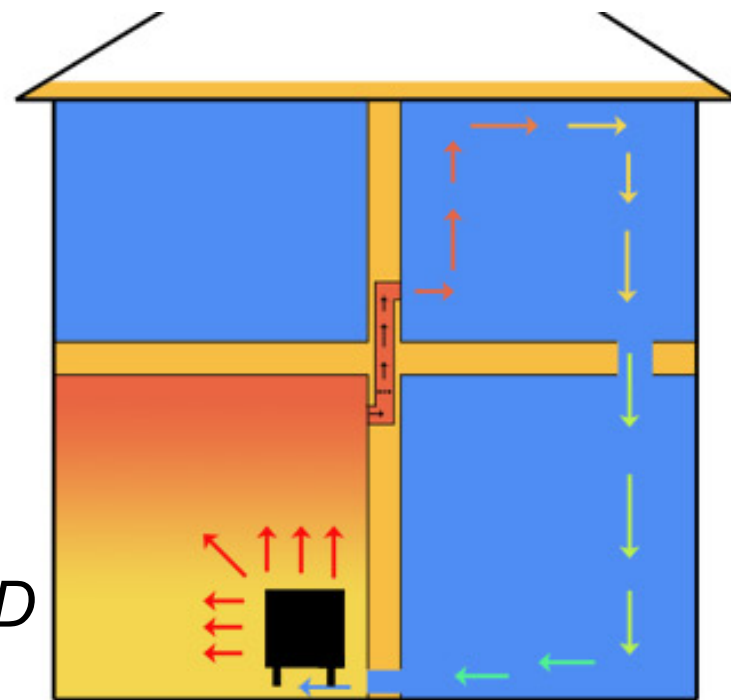
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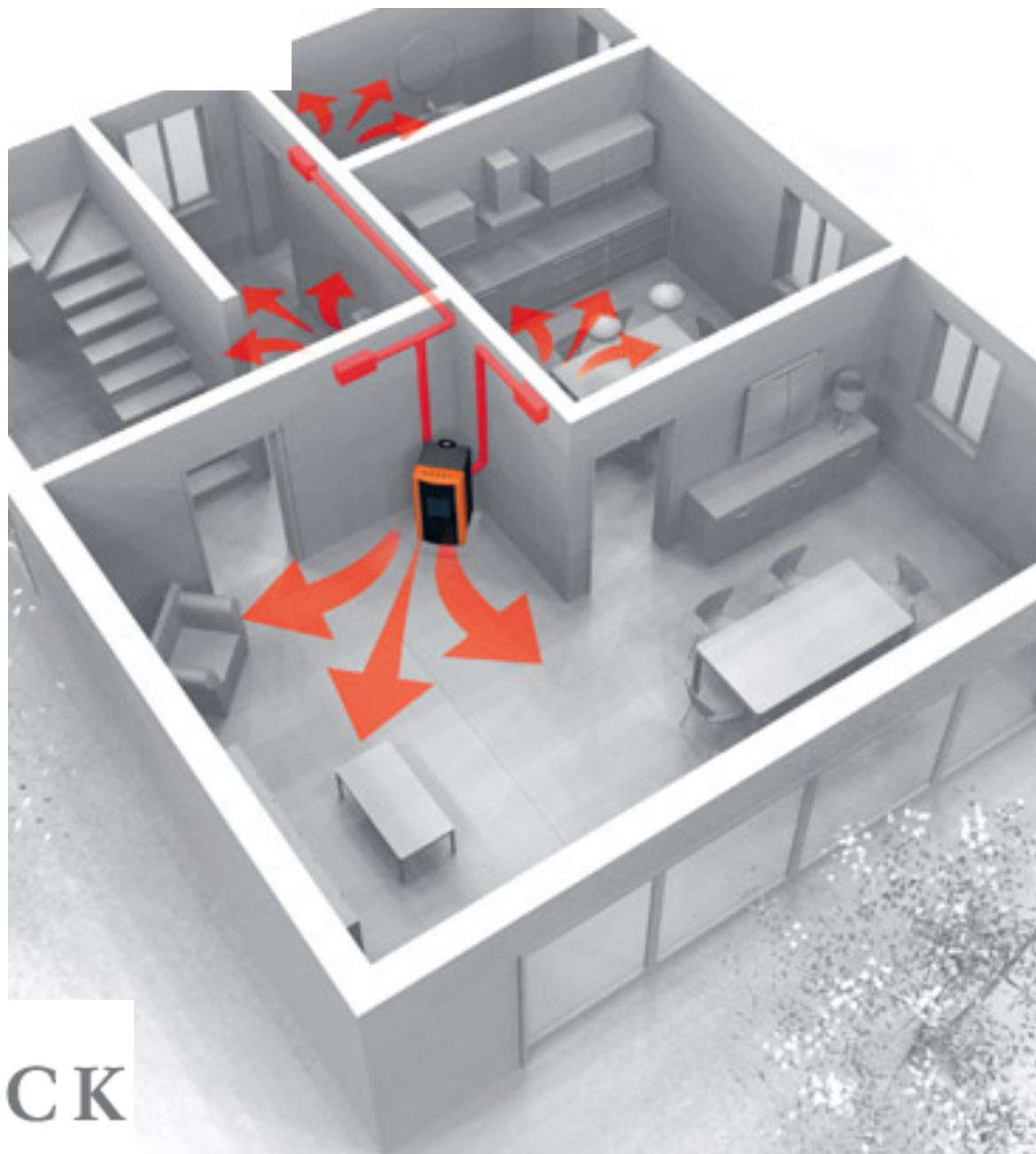
C



D



Innovation.....



ECOT  CK

Bulk Storage Bin for Pellet Stoves



- You Can Make it!
- Holds 1.3+ Tons
(other designs for larger)
- Draw as much as you need
- Bulk Truck Filled....
- NO Plastic Bags!!!

Pellet & Cord Wood Stoves

Pros & Cons

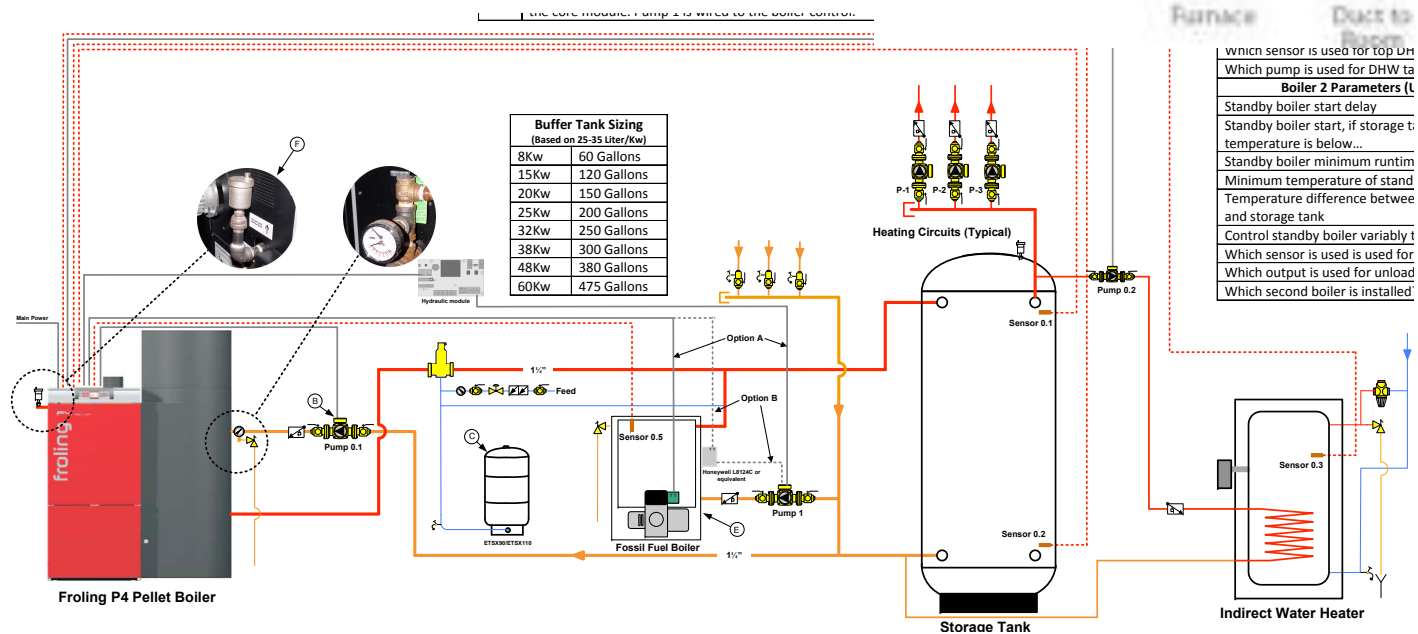
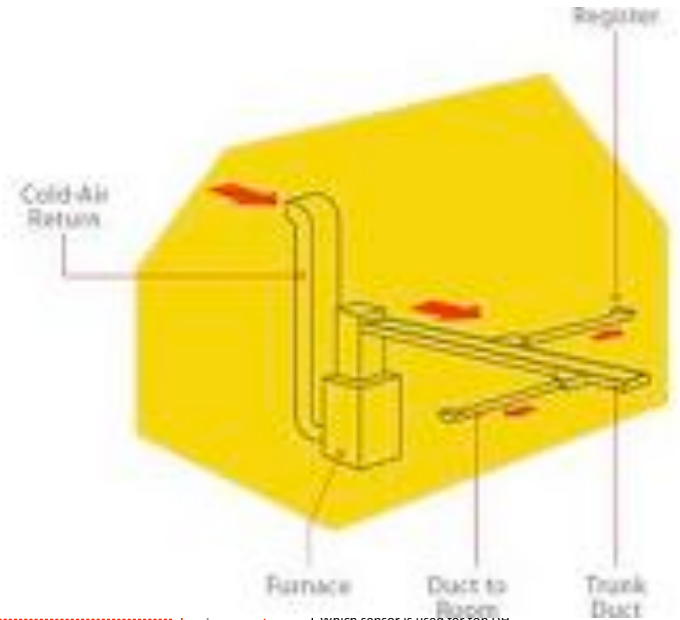
PRO

- Pellet: easy to Install
- Cord: Low purchase \$
& Low Fuel Cost
- Pellet: Thermostat Controlled
- Pellet: stoves look just like a wood stove
- Pellet: Low maintenance.
- Pellet: direct vent “through wall”...no chimney! (\$\$\$)
- Pellet: more efficient
- & lower emissions

CON

- Maintenance
- avg. heat only 30-60% of your entire home
- Both: hauling 6,000 -to- 9,000lbs annually of 40lb “plastic bags” or Cord Wood...
- Pellet: Most are noisy
- Both: fly ash in living space (use Vacuum)

Boiler & Hot Air Systems



Which sensor is used for top up
Which pump is used for DHW to
Boiler 2 Parameters (L
Standby boiler start delay
Standby boiler start, if storage t
temperature is below...
Standby boiler minimum runtim
Minimum temperature of stand
Temperature difference between
and storage tank
Control standby boiler variably t
Which sensor is used for
Which output is used for unload
Which second boiler is installed

Outdoor Wood Boilers



Planning for Equipment

Cost vs. Value of all Equipment

- Durability.....Quality of components and debt of technology
- Warranty
- Efficiency
- Maintenance: frequency & difficulty of regular maintenance
- Servicability & parts availability
- Ease of Use of daily
- **User Experience talk to owner operators visit installs**

High Efficiency Gasification Log Boiler

(85-to- 90% efficiency)





Garn brand

Cord Wood Boiler w/ Heat Storage



Available in 3 Sizes

Garn1500: 350,000btu w/ 1,420 gallons of heat storage

Garn 2000: 425,000btu w/ 1,825 gallons of heat storage

Garn 3200: 950,000btu w/ 3,200 gallons of heat storage

The Garn Gasification Wood Boiler with built in thermal storage...

- * Two-Stage Combustion ensures low emissions so there is virtually no smoke, creosote, or ash.
- * Meets and exceeds Vermont Clean air emissions including the upcoming Phase II Regulations.
- * The Garn burn cord or slab wood, pallet and other scrap wood up to 32", & wood briquettes.
- * Integrated Thermal Storage allows heat to be drawn off as needed between burns.
- * Water-Based Delivery ensures efficient transfer of the stored heat to the building & DHW.
- * 30 Years of Proven Technology and Product Commitment insures Long Life, Low Maintenance
- * Need More...visit <http://garn.com/> or call a the distributor SunWood Systems (802)583.9300

GARN® is a registered trademark of DECTRA CORPORATION

Heating With Pellets


EU vs. US Pellet Standards

- EU Strict Standardization w/ random sampling (additional Standards new as of Interpellet '09)
- US Improvement w/ new PFI Standards...*coming soon*
- **EU** = Heavy Regs & Oversight **US** = No Oversight



Current Pellet Fuel Standard

member of



Pellet Fuels Institute
www.pelletheat.org
MANUFACTURER'S
GUARANTEED ANALYSIS

Grade:	
Material:	
Ash:	
Fines:	
Sodium:	

ALSO Look For...

- BTU per/lb (8000+ Ideal)
- Moisture by % weight

---- Premium (Super Premium IDEAL)

---- Hard or Soft Wood

---- Below 1% (<.5% IDEAL)

---- <.5% by weight (1 ton of pellets = 10lb)

---- < 300 parts per million (corrosion issue)

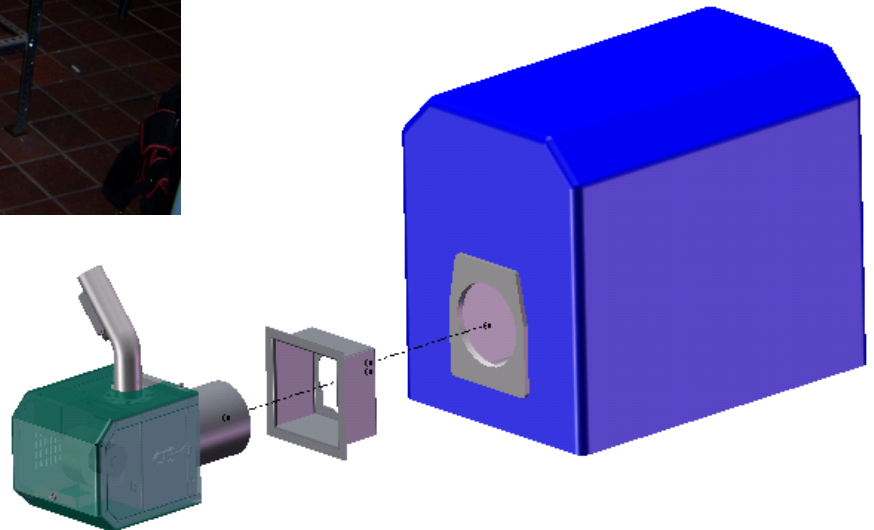
Pellergy Pellet Boiler Adaptation



<http://www.pellergy.com>

Andy Boutin

MADE IN VERMONT



Fröling P4 Pellet Boiler

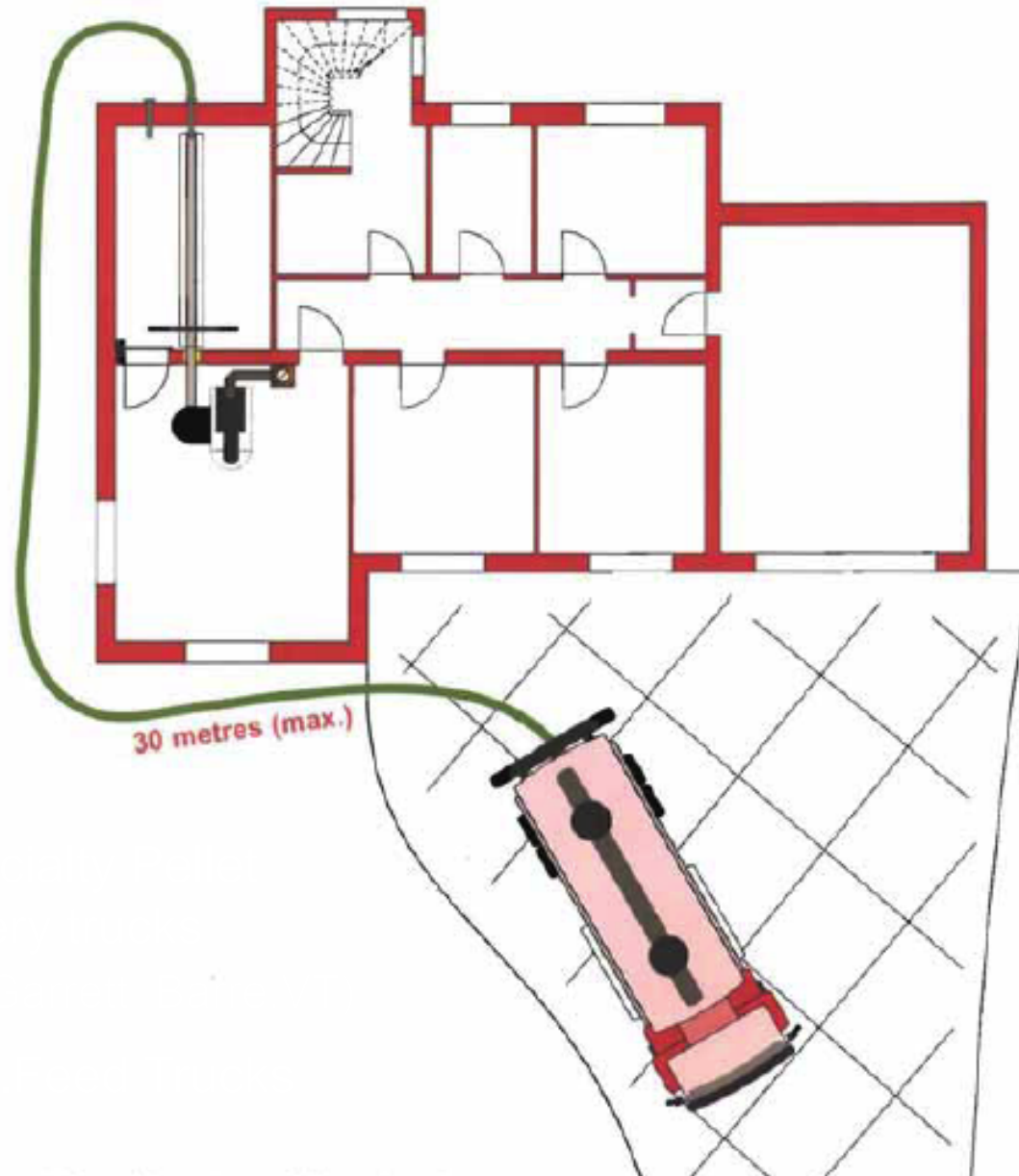
92+% efficient



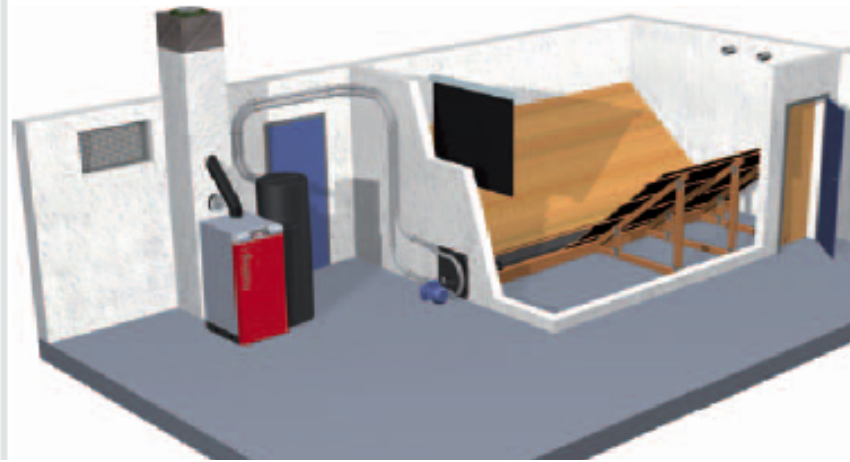
Pellet Silo via Bulk Delivery Systems



Interior Bulk Pellet Delivery Systems



Screw suction system



The Froling screw delivery system is the ideal solution for rectangular rooms with front-end removal. The deep and horizontal position of the delivery screw means the space in the room is used optimally and complete emptying of the store is guaranteed. Combined with a suction system from Froling it also enables flexible boiler setup.

Pellet Storage Systems

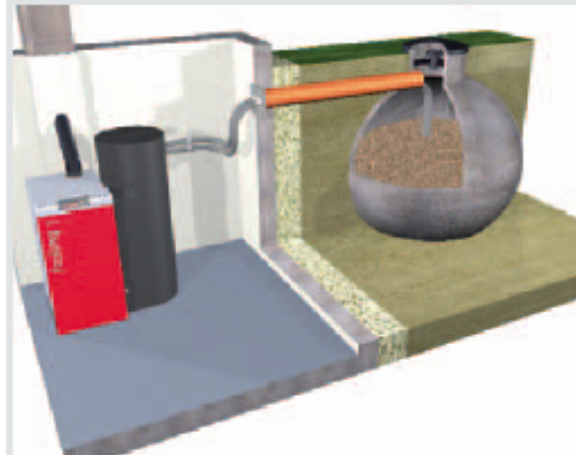
Bag silo system



The bag silo system is a flexible, simple way of storing pellets.

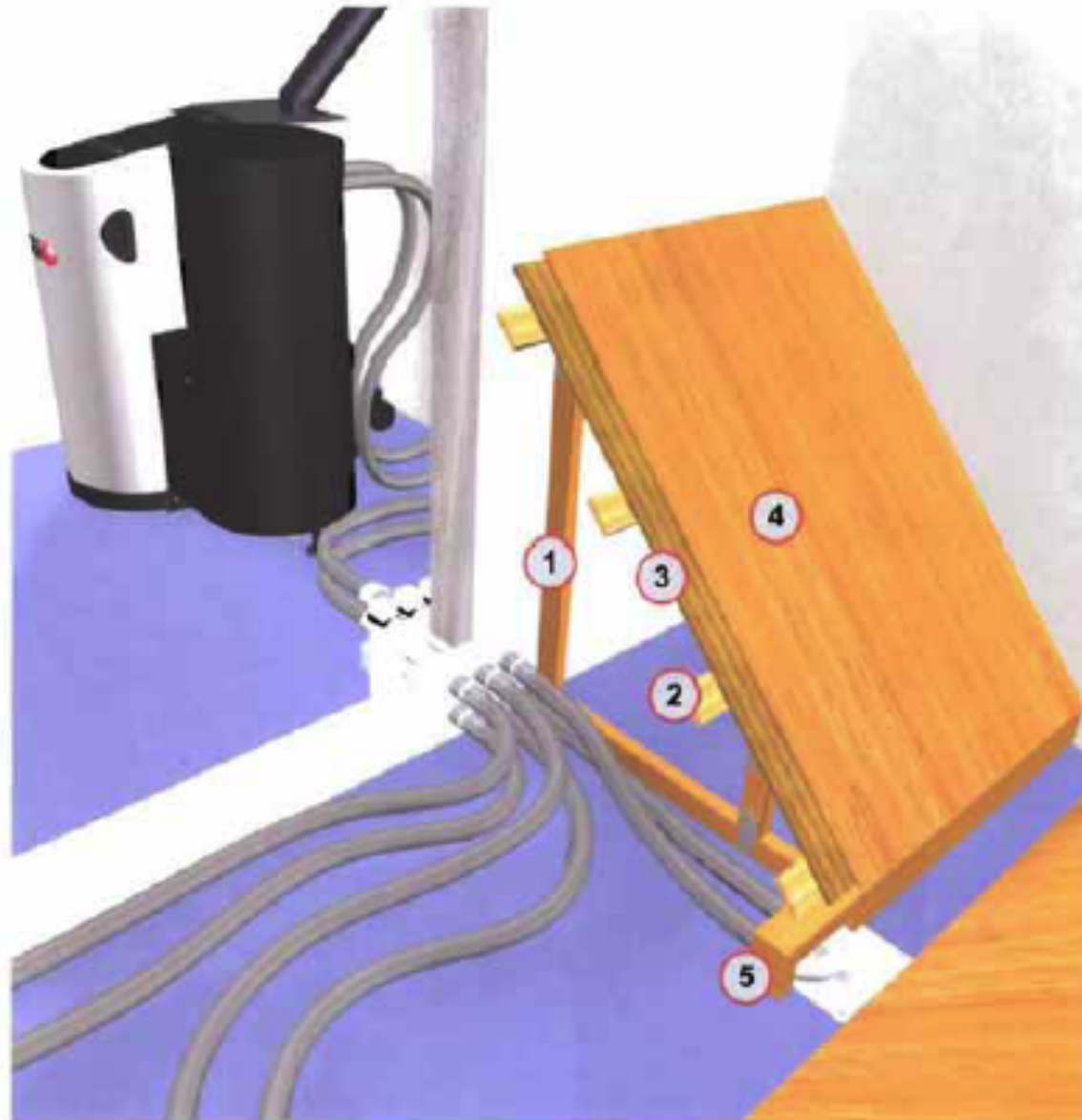
There are other advantages to using a bag silo. It is easy to assemble and store. It is dustproof and flood proof. You can fit rainproof and sun proof covers and install the silo outside.

Underground feeder tank system



If you have no storage space indoors then the underground tank is a good alternative. The underground tank is buried outdoors and feeds pellets to the boiler via a suction pipe. The suction pipes should be laid inside a hollow pipe from the underground tank to the building.

Suction Trough Systems



advanced Textile Pellet Bag Interior Storage Systems



Pellet Home Storage Flexibility



East Montpelier Fire Department

New Super Insulated Fire Department



Pellet Storage In Pellet Hose Tower



East Montpelier & Calais Fire Department
200,000btu/hr Fröling P4 Pellet Boiler with custom pellet storage

Efficiency & Renewables



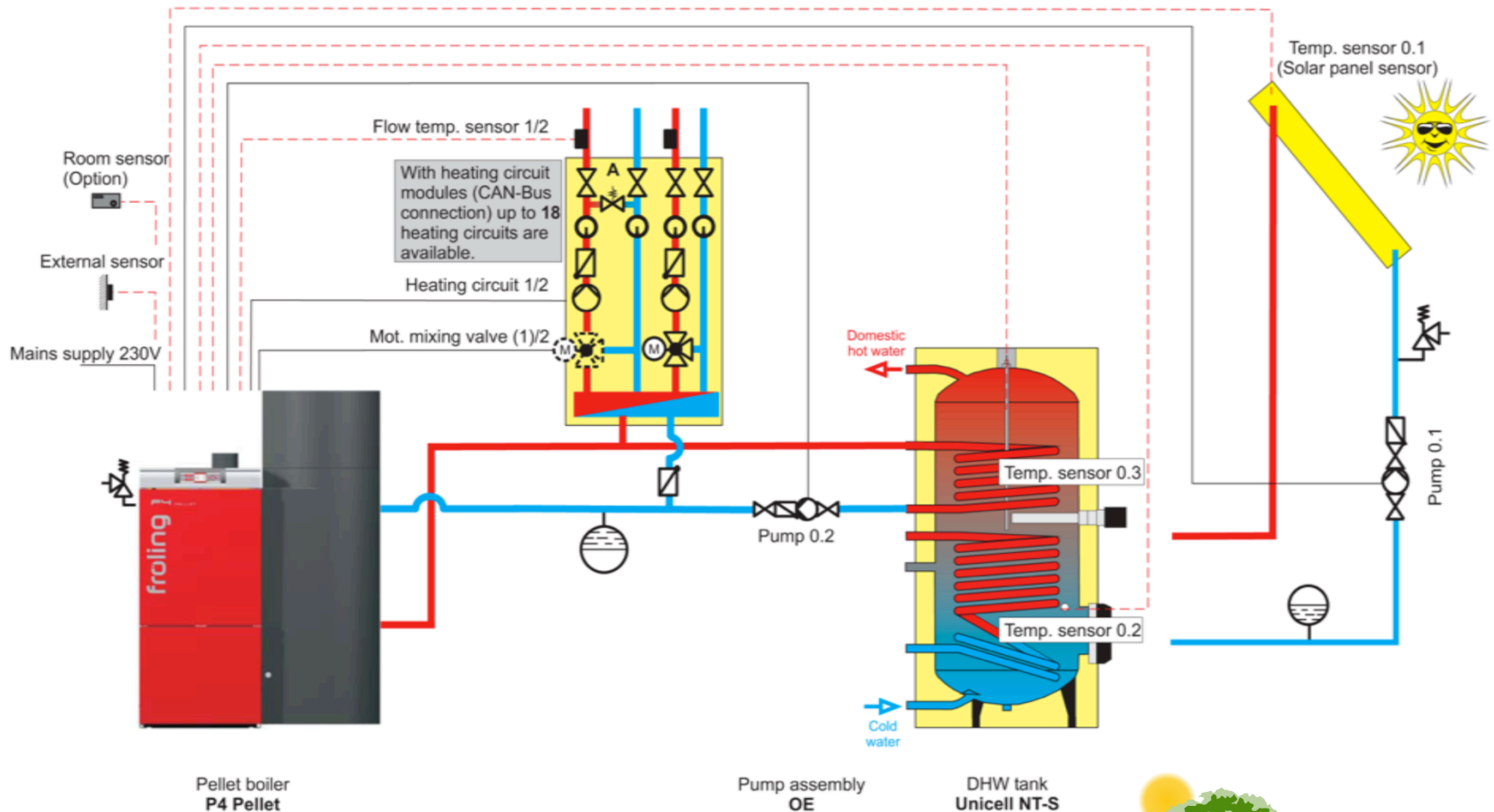
Planning Renewables around Efficiency Improvements

Integrating Solar w/ Pellet Heat

Suggested layout proposal!

The minimum flow through rate of the P4 Pellet boiler shall be respected!
(e.g. With over pressure valve shown as **A** in schematic)
Heating circuits and over pressure valve have to be balanced.

System 0.P002



Note: Please set parameter in menu SOLAR, item SERVICE, SOLAR SYSTEM to "1",
WHICH SENSOR IS USED FOR THE SOLAR COLLECTOR to "0.1",
WHICH SENSOR IS USED FOR BOTTOM DHW TANK to "0.2"
WHICH PUMP IS USED FOR THE SOLAR COLLECTOR to "0.1".
Controller P3200

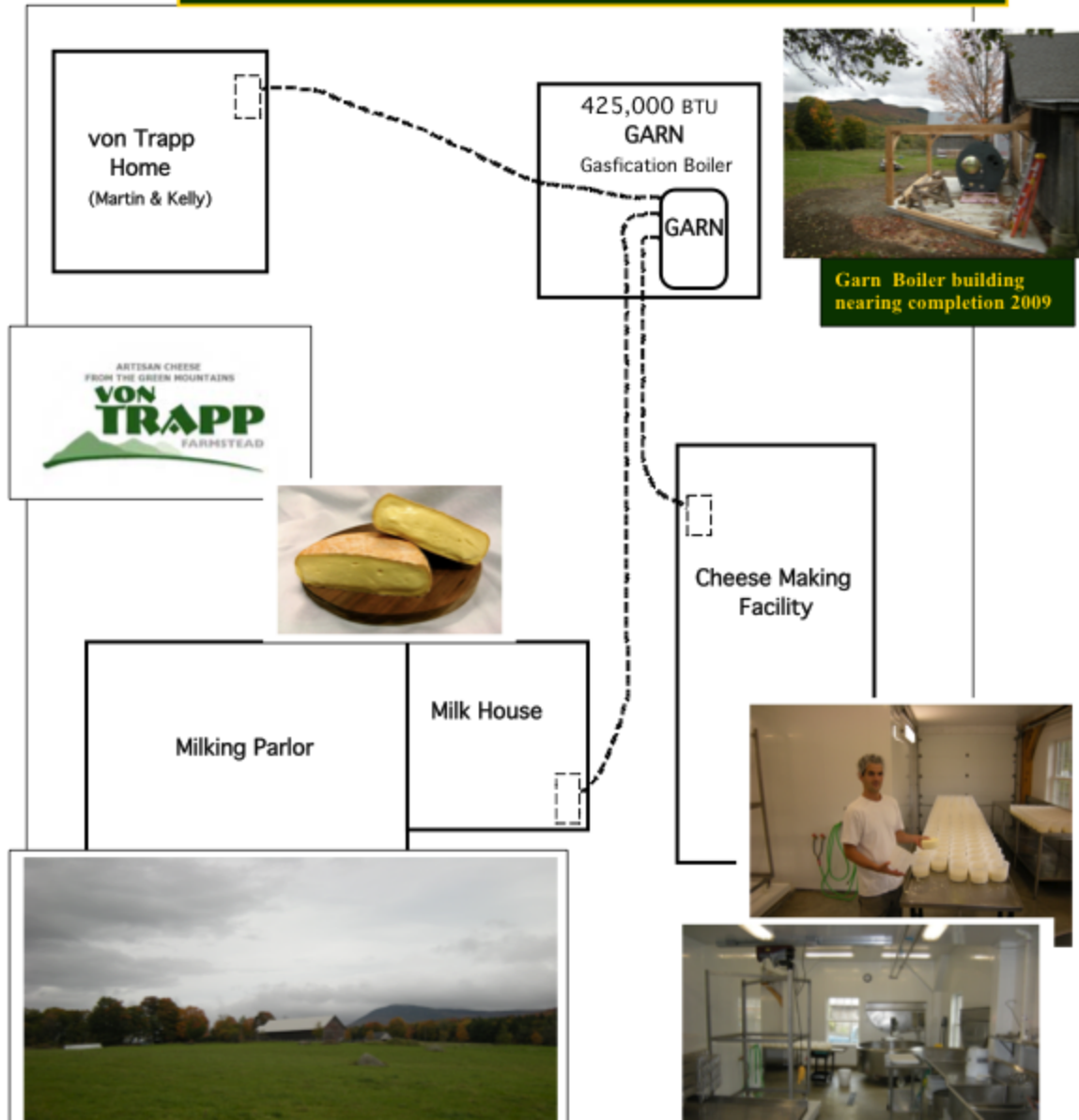
froling



SunWood Systems

Von TRAPP Farmstead

Small Scale District Heating.....*makes cheese*



Pellet / Chip Boiler as a Small Scale District Heating Network

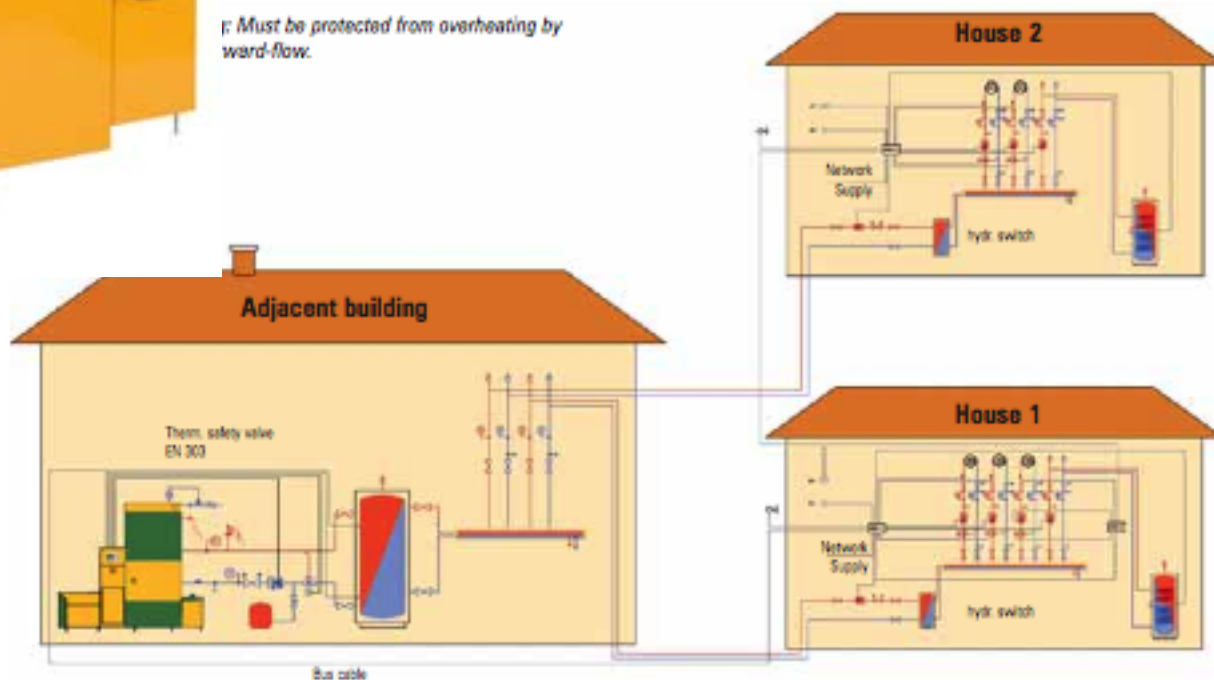
Needs...

Legislative action for incentives

*Shared Cost
Makes this more
Affordable*



*Must be protected from overheating by
ward-flow.*



Institutional Containerized Pellet System

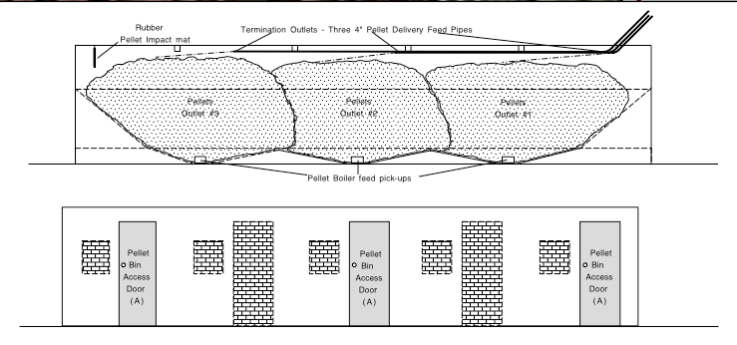
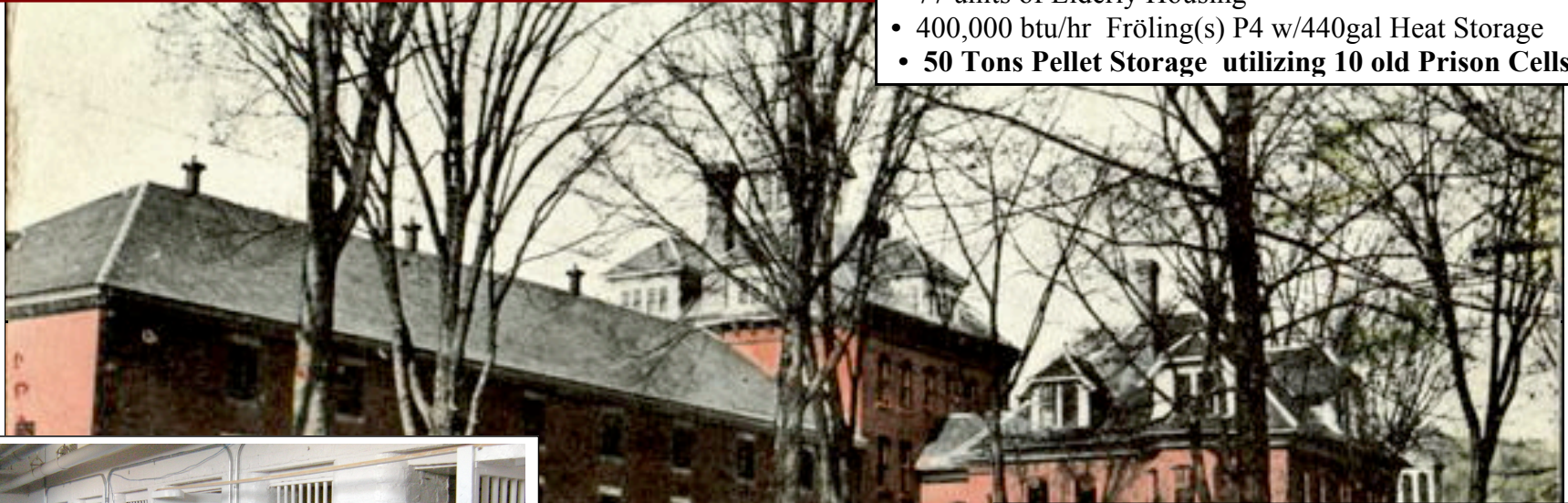


.5MM/BTU -to- 3MM/BTU

Elderly Housing - Windsor Village

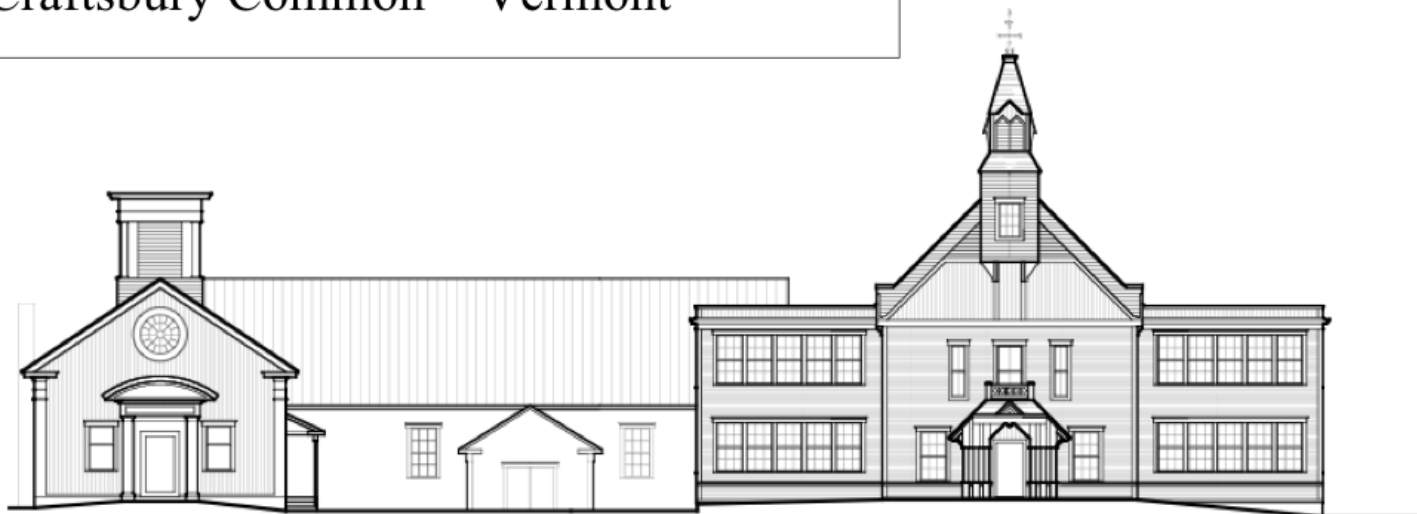
Historical Preservation for Housing Utilizing Biomass

- 77 units of Elderly Housing
- 400,000 btu/hr Fröling(s) P4 w/440gal Heat Storage
- 50 Tons Pellet Storage utilizing 10 old Prison Cells



Craftsbury Academy

Craftsbury Common ~ Vermont



ACT's Combination Wood Chip Pellet & Boiler

- Offset of **25,000+ gallons** annually of Heating oil
- Heating **26,000sq.ft** School & Gym
- **Annual savings to exceed \$18,000.**
- Craftsbury Academy and it's community are committed to being carbon neutral...
- Deep Energy retrofit underway as well.



850,000 Btu ACT Boiler
Advanced Climate Technologies
Wood Chip / Pellet Boiler

BAST & ROOD ARCHITECTS
187 WINDROW LANE
PO BOX 220
HINESBURG, VT 05461

TEL : 802 - 482 - 5200
FAX : 802 - 482 - 3953
EMAIL : bastrood@mavt.net

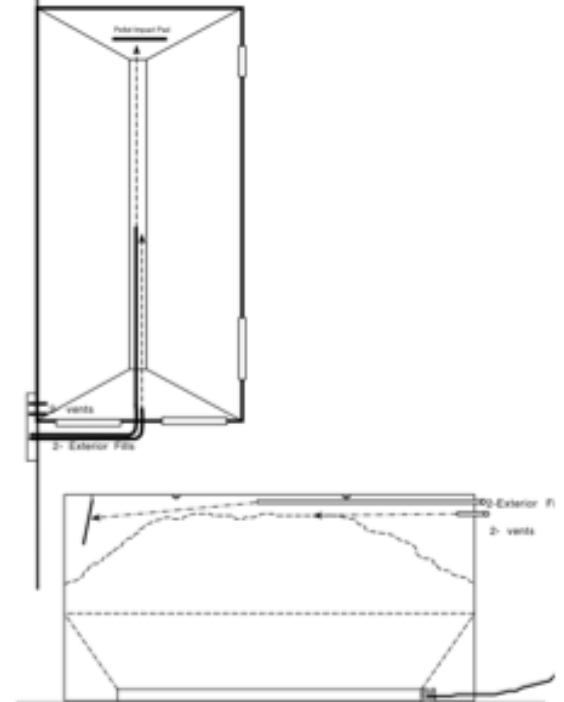
VERMONT TECHINICAL COLLEGE

Biomass Educational Installation & Historical Preservation



Installation In Progress

Basement Pellet Storage & VTC's Applied Biomass Educational Curriculum



- 164,000btu/hr Fröling Pellet Boiler System
- Interior Trough Auger System Designed by SunWood Biomass
- Switch Grass Pellet Combustion Testing will be conducted
- VTC's Red School House in Randolph Center Vermont

<p>Wood Pellets Cost per ton in dollars \$ 265 Appliance Efficiency 86 % Cost per million BTU=\$18.79</p>	
<p>Fuel Oil #2 Cost per gallon in dollars \$ 2.85 Appliance Efficiency 82 % Cost per million BTU=\$25.19</p>	<p>Electricity Cost per kWh in cents 16 ¢ Appliance Efficiency 100 % Cost per million BTU=\$46.89</p>
<p>Natural Gas Cost per therm in dollars \$ 2.10 Appliance Efficiency 82 % Cost per million BTU=\$24.99</p>	<p>LP Gas / Propane Cost per gallon in dollars \$ 2.20 Appliance Efficiency 82 % Cost per million BTU=\$29.38</p>
<p>Hardwood (air dried) Cost per cord in dollars \$ 190 Appliance Efficiency 60 % Cost per million BTU=\$15.83</p>	<p>Coal Cost per ton in dollars \$ 250 Appliance Efficiency 75 % Cost per million BTU=\$10.89</p>

Fuel Cost Comparison Calculator

Available PFI Website pelletheat.org

Regional & National Organizations

- **BERC Biomass Energy Resource Center**
Montpelier, VT *operates internationally* biomasscenter.org
- **VNRC Vermont Natural Resources Council** (two publications)
The Energy Planning and Implementation Guide *Communities Tackling Vermont's Energy Challenges*
- **VPIRG Vermont Public Interest Group**
Clean Heat: Comfortable Homes, Affordable Future
- 25 x 25.Org **National Wood-to-Energy Roadmap**
- NEbioheat.org **“A Bold Vision for 2025”**
- Biomass heating in Upper Austria: **Green Energy - Green Jobs**
- **Biomass Thermal Energy Council - BTEC**
National BiomassThermal.org

- Vermont Wood Pellet Co. = vermontwoodpellet.com
- Pellet Fuels Institute = **pelletheat.org**
- DOE US Dept of Energy = energy.gov
- Hearth.com = Forums...be careful of “experts”
- Biomass Energy Resource Ctr. (BERC) = biomasscenter.org
- Vermont Sustainable Heating Initiative ~ **VSHI**
“transition low income households to pellet heating”
sustainableheatingvt.org

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SunWoodBiomass.com