Vermont Residential Heating
VSHI 2012

VSHI - The **V**ermont **S**ustainable **H**eating **I**nitiative

Why we need to be very concerned.
What is the future of wood heating in Vermont?

Current Vermont Resident Primary Heat Source

data from EIA (Energy Information Agency)

- Fuel Oil 59%
- Propane 14%
- Natural gas 12%
- Electricity 5%
- Other 10%
- 16% of Vermont homes have a wood stove (Vermont's # 1 in USA)
- http://forgreenheat.blogspot.com/2012/10/2011-census-shows-wood-heat-continues.html

Global Peak Conventional Oil was in 2005

- There may be 4 trillion barrels of non-conventional recoverable oil
- We have already used .9 trillion barrels
- The remainder will have:
  - EROEI of less than 8:1
  - High price, over $160/b by 2022
  - We need to move away from fossil fuels
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Current fuel cost comparisons

http://nepacrossroads.com/fuel-comparison-calculator.php

Fuel Type	Price	Thermal Efficiency	Cost per Million BTU
Cord Wood	$200/cord	60%	$15.15
Wood Pellets	$200/ton	80%	$15.15
Fuel Oil	$4/gal	70%	$41.20
Propane	$4/gal	80%	$54.74
Co-op Pellets	$120/ton	80%	$9.09

Vermonters Tend to Have More Than One Source...

- “More than 20 percent of New England households that use heating oil also use wood as a source of heat.” Energy Information Administration (EIA), analyst Chip Berry.
- Many Wood Stoves are
  - Old
  - Inefficient
  - Poorly Vented
  - Don’t meet fire code

Biomass Heating Potential

** EROEI is very dependent on transport distance and system efficiency variables.

	EROEI **	Thermal Efficiency	Safety	Scale	System Cost
Wood Chips	~18:1	30%	Commercial Code	Commercial-District	> $ 1.2 million
Wood Pellets	~15:1	85%	No chimney fires No burning ash No creosote	Residential and up	> $ 1,400 Stove and vent
Cord Wood	~50:1	50%	Chimney fires Combustible ash Creosote	Residential and up	> $ 4,000 Stove and vent

- Total available Biomass supply:
- 2,000,000 green ton/yr. (BERC Biomass 2014 study)
- 1,100,000 already allocated
- 900,000 green ton / yr. available =
- 450,000 dry ton / yr. available

Biomass is a limited resource in Vermont

- **Note: margin of error is +/- 25%

Forest Biomass available for Use

- The population of Vermont is 620,000, thus 1.45 green tons per person per year.
  - 900,000 green tons per year / 620,000 people = 1.45 green tons per person per year

- This amounts to .725 green tons of hard wood and .725 green tons of soft wood.

- Assume that green wood is on average 50% moisture. At two tons per cord of hard wood and one ton per cord of soft wood this means on average each Vermonter can increase wood use by about
- *.36 cord* of hard wood and
- *.73 cord* of soft wood.

- Weight/density of cord wood by species
- http://www.engineeringtoolbox.com/weigt-wood-d_821.html
- What would the old timers say about this?

Conclusion

If every Vermont home attempted to heat with cord wood, we would deforest Vermont again, with enormous environmental destruction, and then freeze.

Recommendations:
*Make use of faster growing soft wood resources as fuel in a pellet form.

*Evaluate total heating systems for EROEI and total system efficiency.

*Design “systems” so as to benefit Vermont and local town economies over exporting energy out of state.
*Leave *all* tops and limbs in the forest to replace nutrients

*Large scale biomass use needs to be controlled with a certificate of public good.

*Any proposed use of greater than 30,000 green tons per year, needs to be permitted.

Promote growth of biomass for:

- Increased food production
- Improved soil and water quality
- Local energy production
- Lumber and other forest products
- Recreational and other land uses

Economic impact:

- Biomass electric generation will not reduce Vermont electric rates.
- Biomass for heating can can save $200,000,000 /yr. and put another $200,000,000 into local economy.
- Pellet Production can produce high value fuel, out of marginal soft wood

Scale of operations:

- Transport distance of feedstock is a limiting factor of operations.
- Stewardship of fiber-shed is essential for long term sustainability.
- Relationship to land of local community ownership is essential for sustainability.
- Keep production and use local

Create, under state charter, **six** regional biomass processing facilities.

- Each will process ~ 150,000 green tons of fiber into 75,000 tons of pellets,and anchor a regional biomass industrial park.
- This will allow for biomass to be directed from the fiber shed supply chain to the greatest economic return.
- These end uses in the park may include the production of:
  - Lumber, cord wood, bark, pellets, wood chips, saw dust,
  - methane digestion, soil, bio-char, waste heat, etc.
  - See business model below

Economic Viability

The limiting factor of the EROEI,
and the economic viability of biomass uses
is the transport energy of the feedstock.
By consolidating end uses in regional biomass industrial parks,
it increases the economic viability of all uses.

Recommendations:

- Establish under state charter a Vermont Biomass Energy Corporation, VBEC as a Utility
- Establish guidelines for biomass harvesting, management and use with VNRC and other parties vested in resource conservation
- Establish VBEC as benefit corporation, with co-op membership (see below)
- For profit corporations will over use available natural resources.

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Possible Business Models

- Regional Biomass Parks will sell waste byproducts under contracts to highest bidder in the park.
- Co-op structure will allow for financial benefits to extend to local members.
- Pellet mill will be a consumer co-op
- Related operations in the industrial parks to be run as Benefit Corporation producer co-ops: Lumber, cord wood, bark, pellets, wood chips, saw dust,
- Methane digestion, soil, bio-char, waste heat, etc.
- The state's new biomass diversion from the solid waste stream could be processed in these six regional facilities.

Pellet Co-op model

- Capitalization for initial pellet operation will be ~ $200 per ton of pellet production
- Co-op members will be asked to purchase membership based on ton capacity.
- Example: A Co-op member who invests $1000 would thus control production of 5 tons per year. These 5 tons can be bought at co-op prices for personal use, or sold at market prices through the co-op.
- Pellets will be sold to co-op members at co-op prices.
- The Parent Benefit corporation will be established to have environmental/social benefits. These benefits will be established with the long term sustainability of Vermont's natural resources, including soil, water, air quality, biodiversity and control of invasive species. The benefits will support the Vermont Economy.
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Call for action from Town Energy Committees

*Support VSHI to work with LIHEAP clients

*Bulk purchase of Pellet Stoves, price for stove and vent kit ~ $1,000

*Assess number of possible pellet co-op members in your town
with ton per year

*Support state action
$12,000,000 bond to establish first Biomass Park
Will be repaid by co-op member fees in first year of operation
Once first Biomass Park is operational, money will be used to establish other regional parks.

*Support local ownership by consumer and producer co-op members.

*Support reforestation in stream banks, road sides and residential areas.

*Support that town owned property will have land use management plans for biomass procurement.

*Support a regional exclusion policy now. No transport of biomass feedstock into or out of the six regional districts. Districts are: North West, North East, Central West, Central East, South West, and South East.

*Keep Biomass Local. The local community is best able to safe guard the natural resources, if they live in the fiber-shed, and draw benefits from a healthy ecosystem.

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