# Converting Sustainable Forest Products into Fuel:

## What it takes to have a successful wood pellet manufacturing business

Presented at

*The Biomass Renewable Energy Opportunities and Strategies Forum*

July 9, 2014


Presented by

Dr. William Strauss

President, FutureMetrics

Director, Maine Energy Systems

Chief Economist, Biomass Thermal Energy Council

# *FutureMetrics LLC*

***Globally Respected Consultants in Wood Pellet Project Development***

8 Airport Road
Bethel, ME  04217, USA

# FutureMetrics Services:

Research, analysis, and strategic guidance for the wood pellet sector.

We combine data driven analysis with a depth of knowledge across the pellet sector to provide full spectrum reporting that enables our clients to make optimal decisions

***Selection of Clients***

RENTECH

graanul invest

INTERFOR

EMO
energising your business

FULGHUM FIBRES

LATIUM
ENTERPRISES INC

BioDean

DEPARTMENT OF CONSERVATION
Maine Forest Service
STATE OF MAINE

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

LAHMEYER INTERNATIONAL

CATE STREET CAPITAL

MESYS
MAINE ENERGY SYSTEMS

MARWOOD
Build Something Beautiful

IOGEN CORPORATION

Holson
Holson Forest

BTEC
Biomass Thermal Energy Council

NCIC


Photo courtesy of Alan Sherrard, Editor in Chief, Bioenergy International

May, 2014

Deal Valued at $50.1 Million

NEW ENGLAND WOOD PELLET

Jaffrey, New Hampshire

**HAS BEEN ACQUIRED BY**

RENTECH

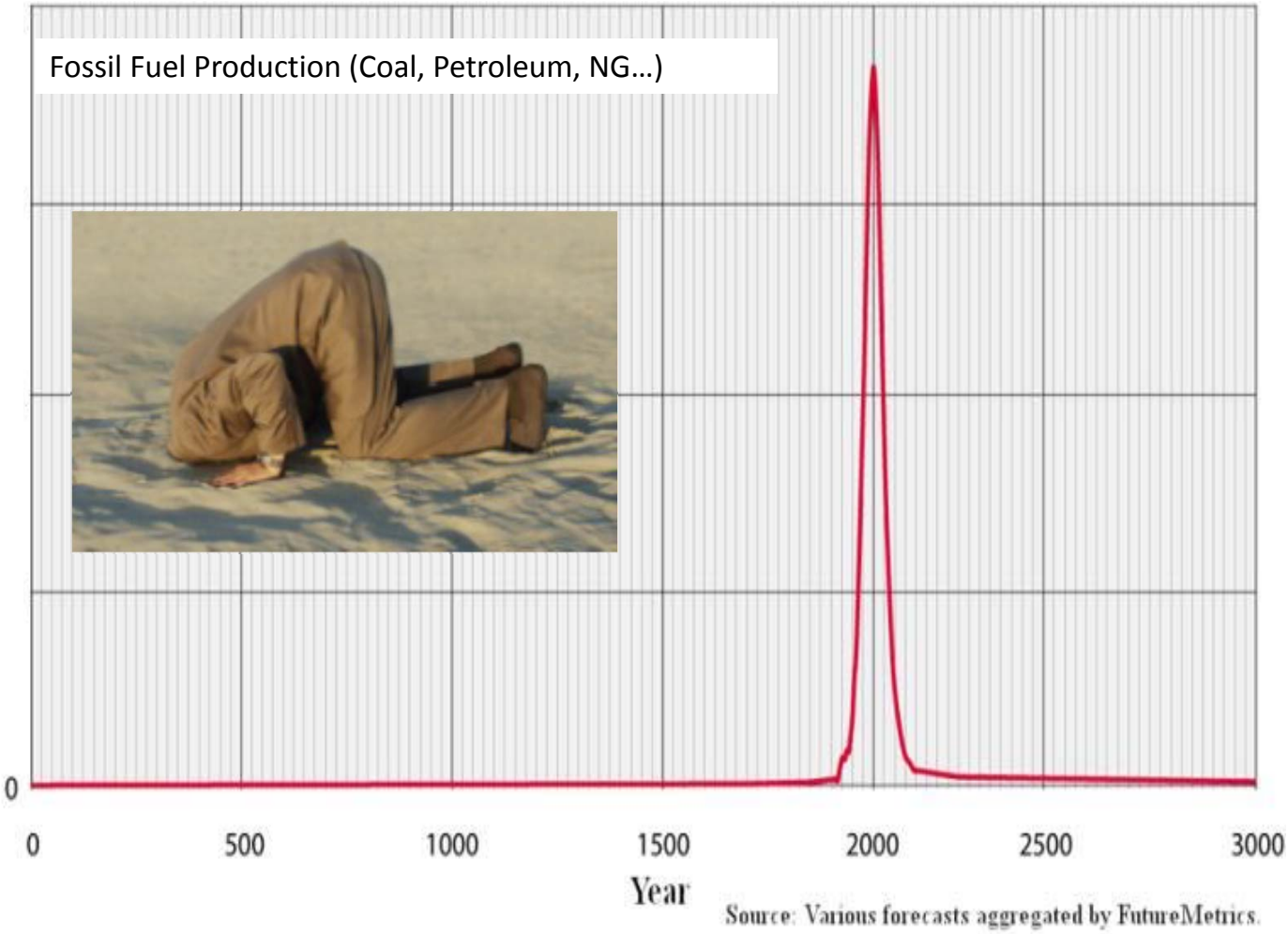
Denver, Colorado

*FutureMetrics* and its consulting partners initiated the acquisition process and provided early stage advice, analysis, and due diligence for Rentech

Dr. William Strauss, President, FutureMetrics

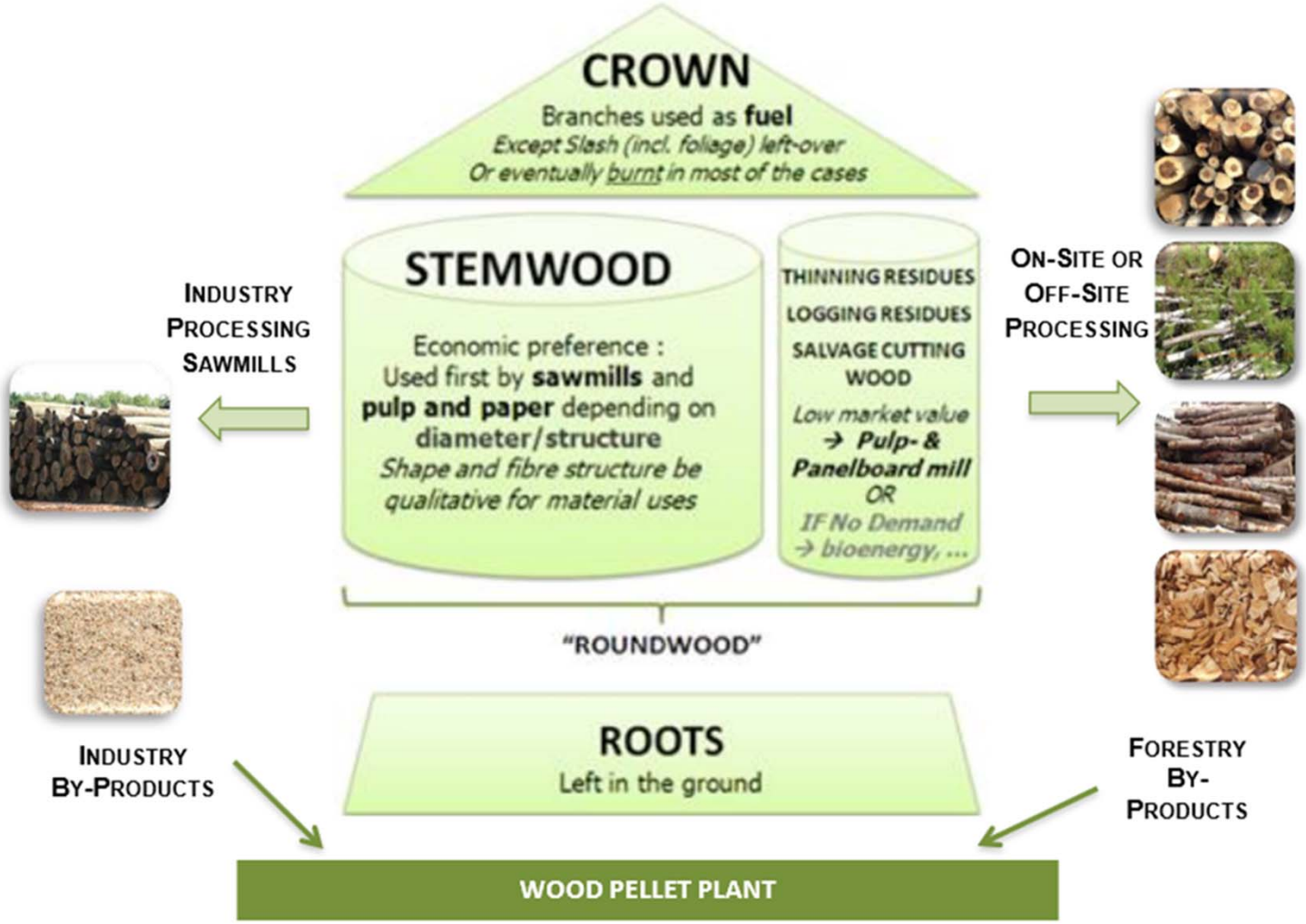
## Recipient of the 2012 International Excellence in Bioenergy Award

# Environmental, Social, Ecological, and Economic Sustainability

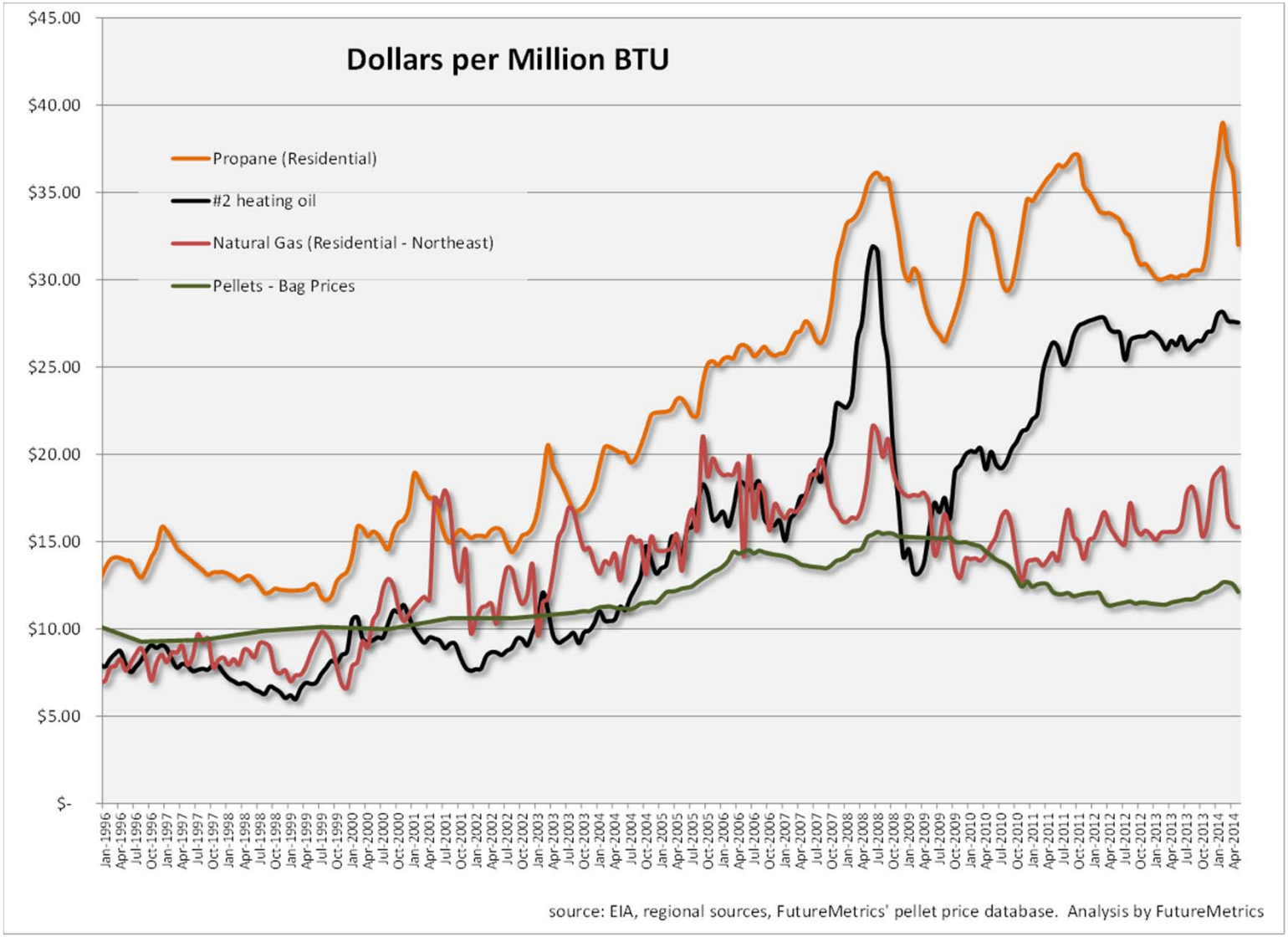


# What are Wood Pellets?

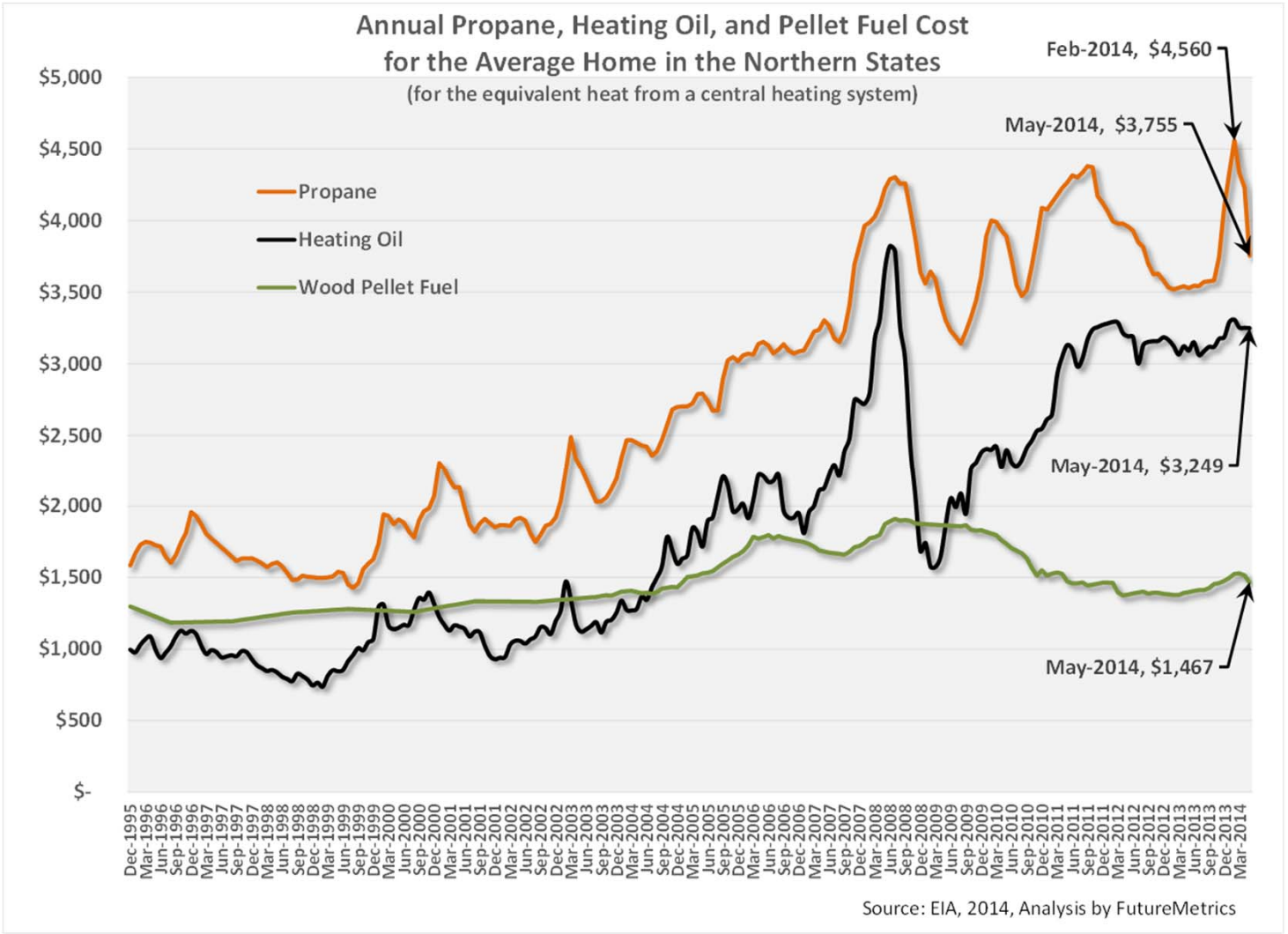
- Wood pellets are compressed dried wood fiber.
- They are about 1.3 times more dense than wood.
- They are an energy source that is renewable and are manufactured using an established and proven production process.
- The pellets have a cylindrical form and are typically 5/16 of an inch in diameter and 1.0 to 1.5 inches long.
- They are an easily managed and free flowing.
- The average wood pellet has about 8500 BTU per pound (17.5 gigajoules per metric tonne).




Courtesy of WPAC, FPInnovation Canada, and Enviva

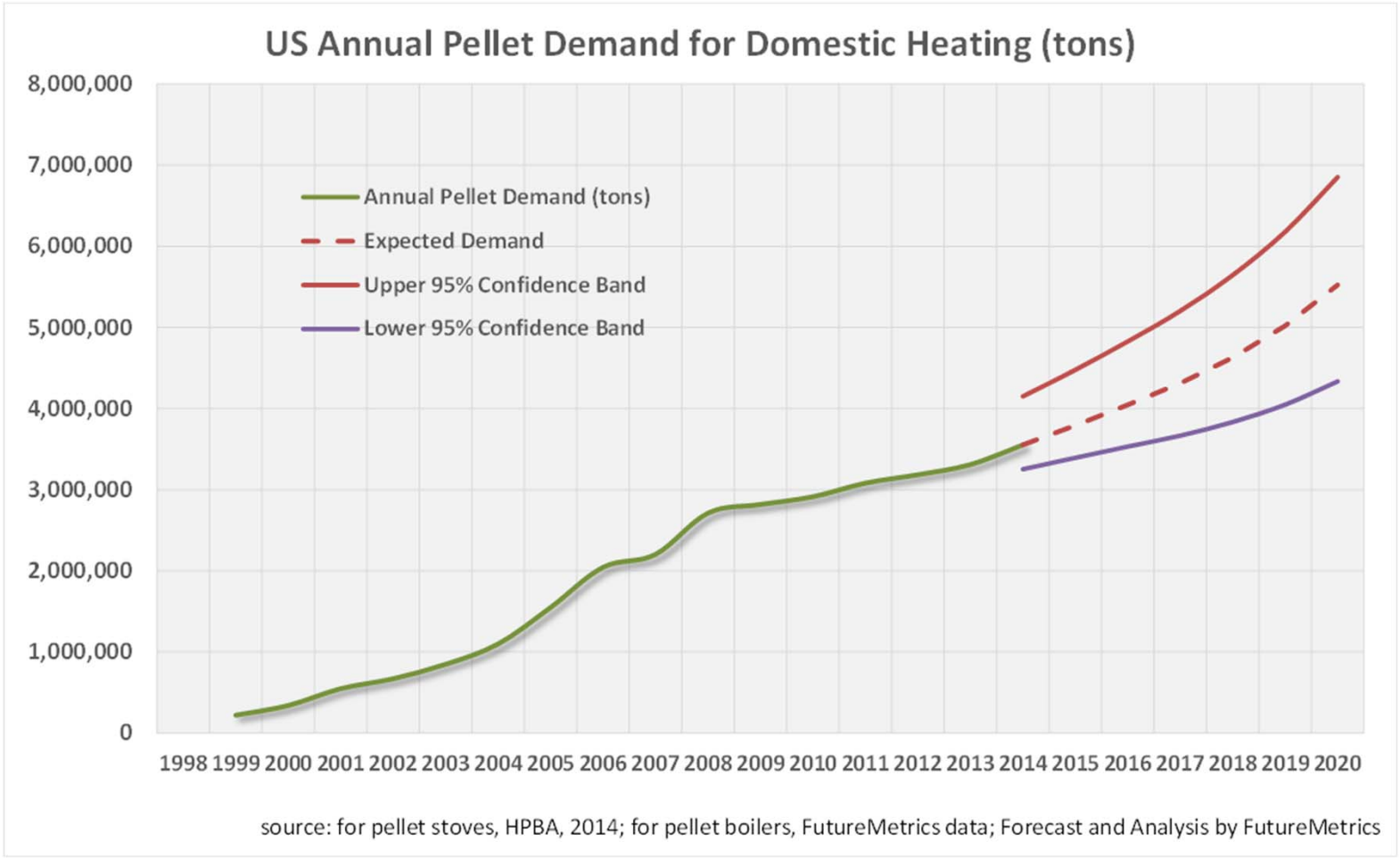



source: EIA, regional sources, FutureMetrics' pellet price database. Analysis by FutureMetrics


Annual Propane, Heating Oil, and Pellet Fuel Cost
for the Average Home in the Northern States
(for the equivalent heat from a central heating system)
Feb-2014, $4,560
May-2014, $3,755
May-2014, $3,249
May-2014, $1,467
Propane
Heating Oil
Wood Pellet Fuel
$5,000
$4,500
$4,000
$3,500
$3,000
$2,500
$2,000
$1,500
$1,000
$500
$-
Source: EIA, 2014, Analysis by FutureMetrics

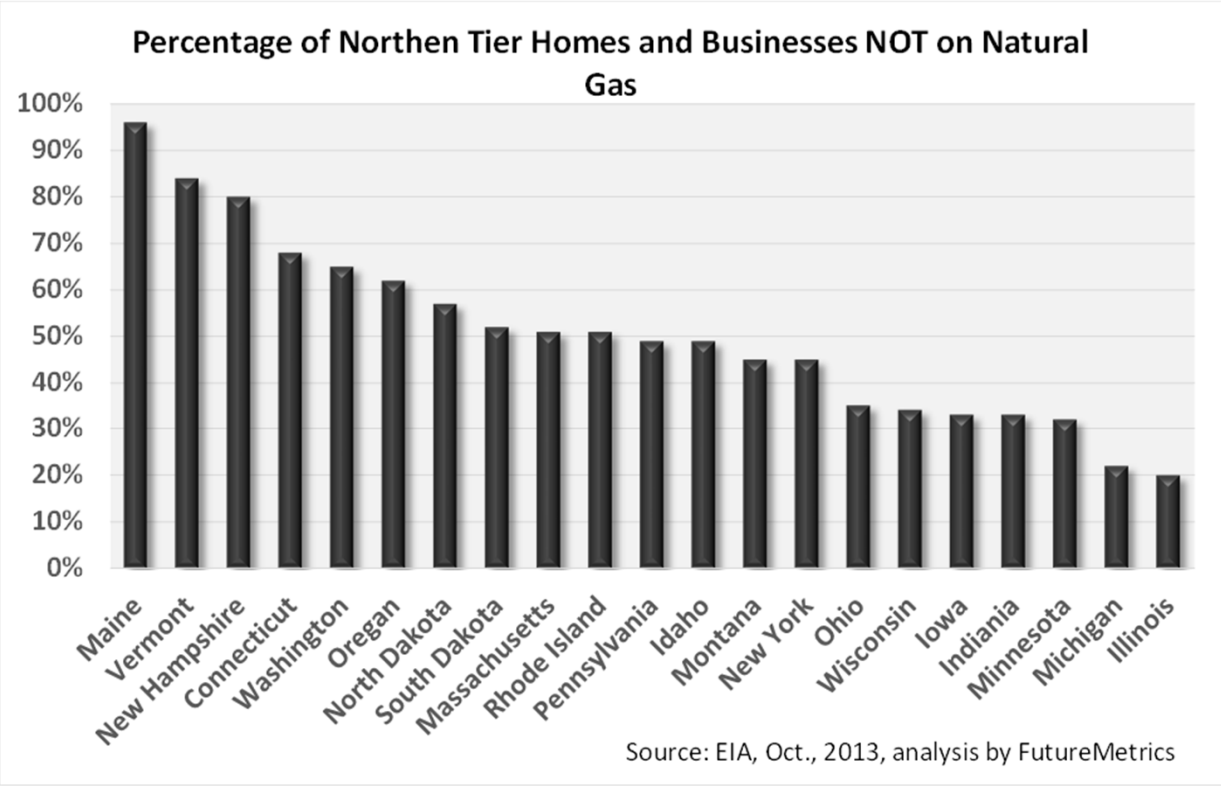
# What is the Market?

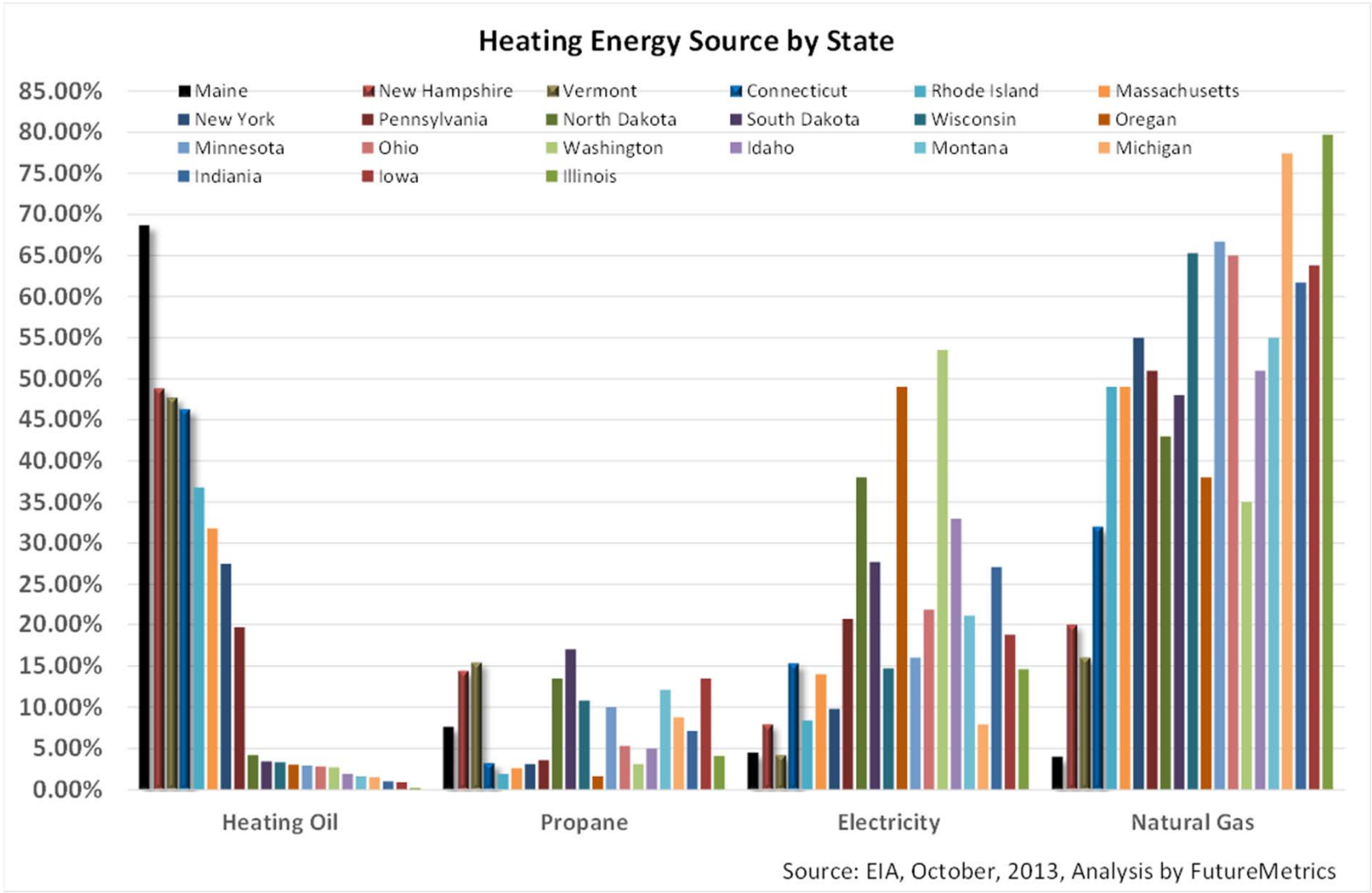
First, the Domestic Heating Market


US Annual Pellet Demand for Domestic Heating (tons)
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Annual Pellet Demand (tons)
Expected Demand
Upper 95% Confidence Band
Lower 95% Confidence Band
1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020
source: for pellet stoves, HPBA, 2014; for pellet boilers, FutureMetrics data; Forecast and Analysis by FutureMetrics

The primary uses of heating pellets in the US are homes with pellet stoves.

However, modern fully automated wood pellet boiler systems that are common in Europe are becoming more common in the US (more on pellet boilers later).

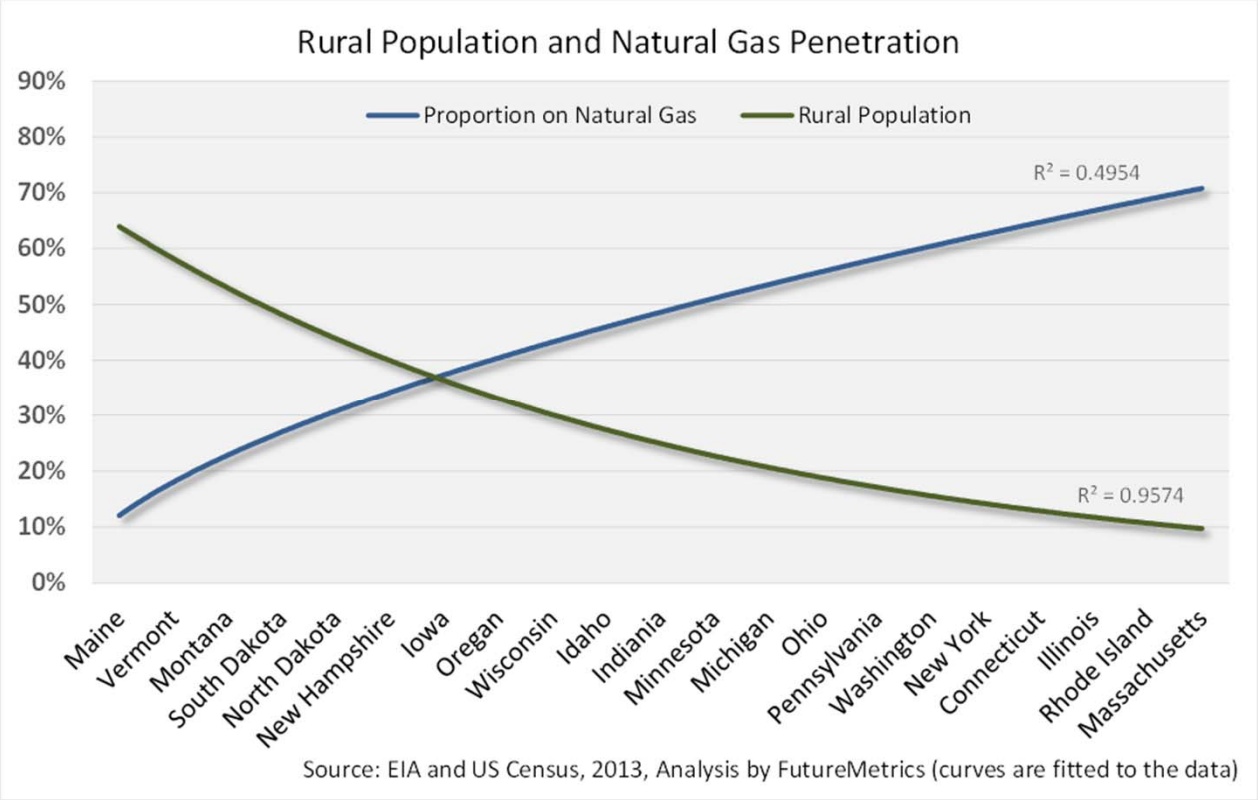


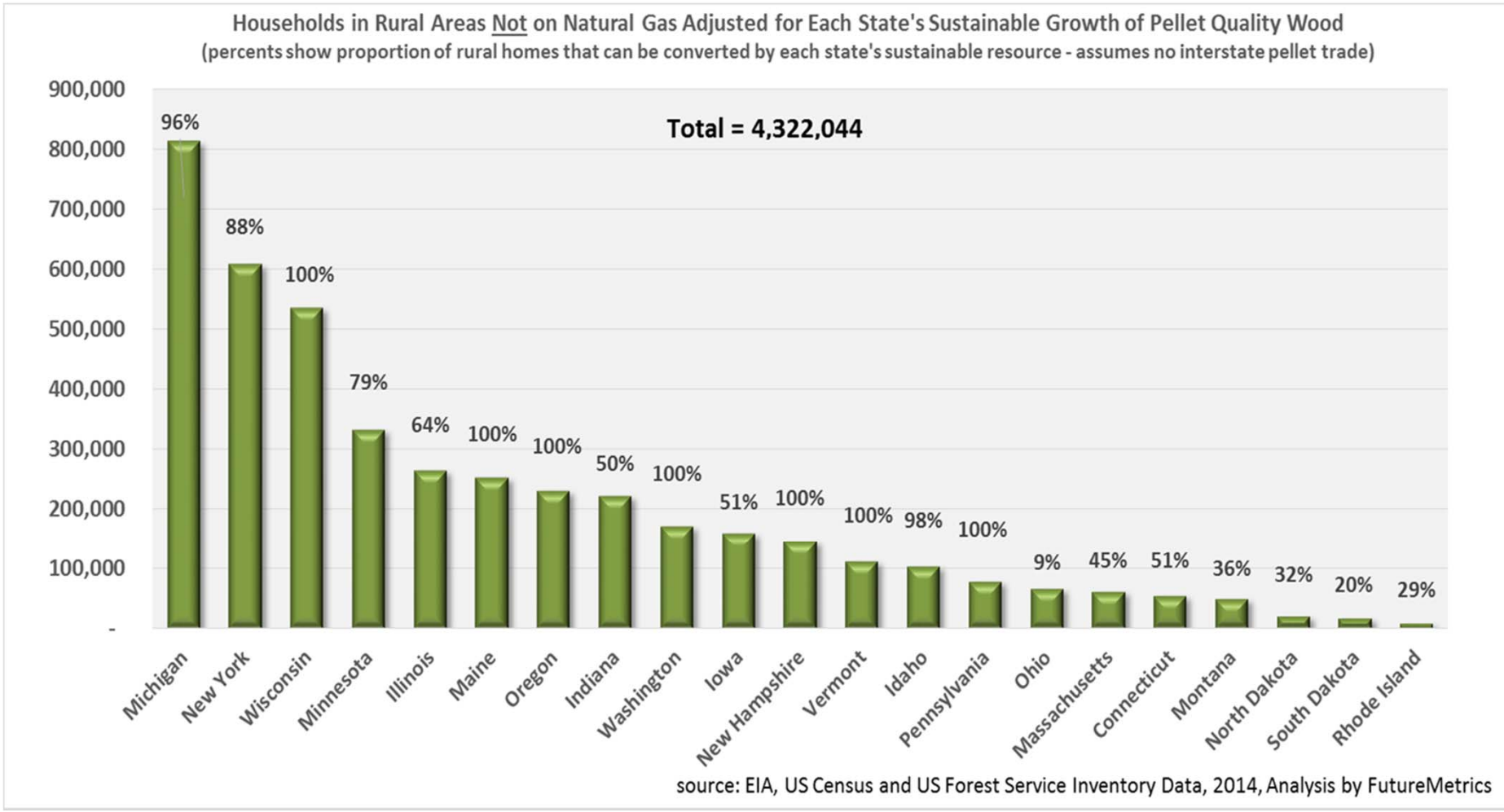

Heating Energy Source by State
85.00%
80.00%
75.00%
70.00%
65.00%
60.00%
55.00%
50.00%
45.00%
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Maine
New Hampshire
Vermont
Connecticut
Rhode Island
Massachusetts
New York
Pennsylvania
North Dakota
South Dakota
Wisconsin
Oregan
Minnesota
Ohio
Washington
Idaho
Montana
Michigan
Indiania
Iowa
Illinois
Heating Oil
Propane
Electricity
Natural Gas
Source: EIA, October, 2013, Analysis by FutureMetrics

How far can natural gas penetrate into the heating market?

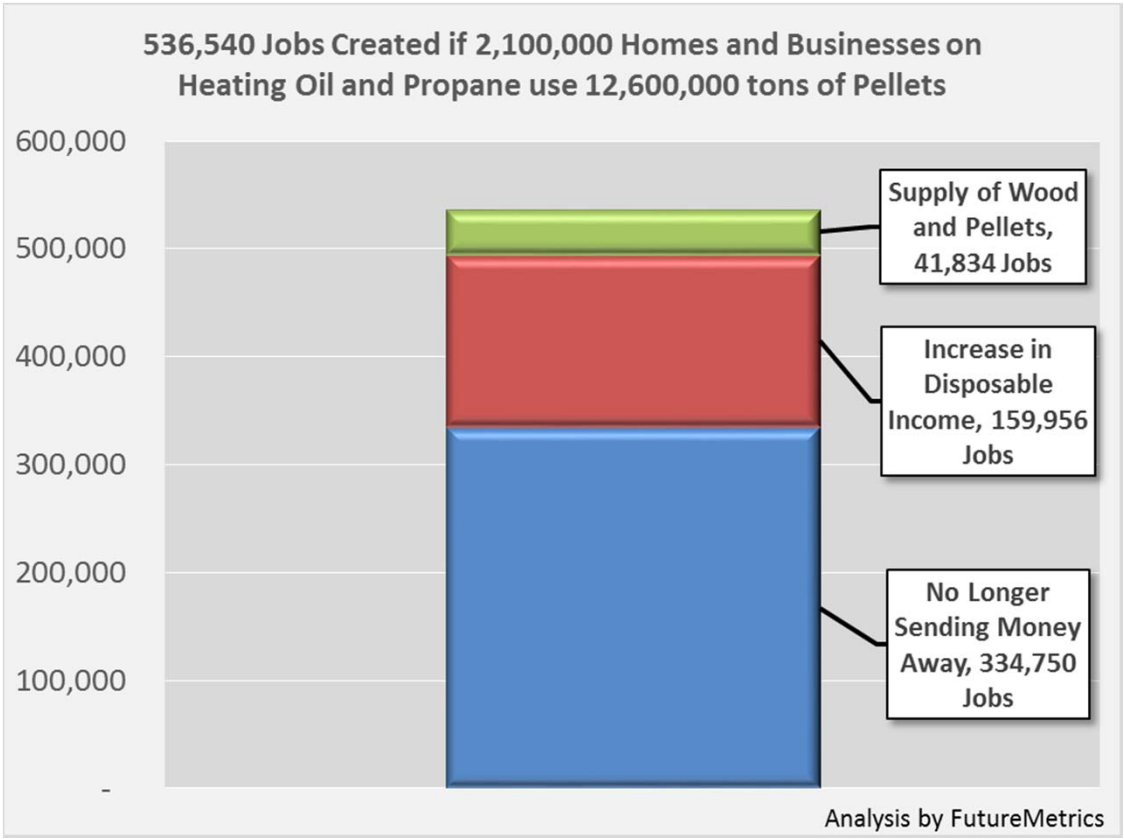
A very optimistic scenario might suggest that by 2020 most urban centers will have natural gas.

But that will leave a lot of homes and business on heating oil or propane.




Households in Rural Areas Not on Natural Gas Adjusted for Each State's Sustainable Growth of Pellet Quality Wood
(percents show proportion of rural homes that can be converted by each state's sustainable resource - assumes no interstate pellet trade)
Total = 4,322,044
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
-
96%
88%
100%
79%
64%
100%
100%
50%
100%
51%
100%
100%
98%
100%
9%
45%
51%
36%
32%
20%
29%
Michigan
New York
Wisconsin
Minnesota
Illinois
Maine
Oregon
Indiana
Washington
Iowa
New Hampshire
Vermont
Idaho
Pennsylvania
Ohio
Massachusetts
Connecticut
Montana
North Dakota
South Dakota
Rhode Island
source: EIA, US Census and US Forest Service Inventory Data, 2014, Analysis by FutureMetrics

# Wood pellet production for domestic heating use can replace heating oil and propane and create jobs



Most know about pellet stoves.  What about pellet boilers?

MAINE ENERGY SYSTEMS

## Central Heat *and* Hot Water

### The central heating systems of tomorrow are here today.

The MESys AutoPellet boiler is the world's finest fully-automatic wood pellet central heating system. The AutoPellet is a standalone system and is designed to meet the heat and domestic hot water demands of households, businesses, institutions and municipal buildings.


## Automatic Auger or Vacuum Fuel Feed

From the pellet mill to the burner, you never see or touch the fuel.

## Automatic Heat Exchanger Cleaning

Heat exchanger tubes are automatically cleaned daily, only requiring annual cleaning. There is no need to shut or cool down the MESys AutoPellet for routine cleaning.

## Bottom Fed Burner

Our bottom fed burner design eliminates emptying ash from the burn chamber for a restart, this results in no by-product build up. After a period of low-demand, only the application of air is commonly necessary to restart.

## AutoPellet Features:

- Automated Three-Way Ash Removal
- ASME Certified (where necessary)
- OMNI Listed to UL Standards
- Up to 87.7% Efficient
- Two-Stage Combustion
- Stainless Steel Combustion Chamber
- Digital LCD Controller Interface
- 30-Year Warranty
- Bottom Fed Burner
- Programmable Logic Controller for Modulated Heat Output
- External Detachable Ash Container
- Automatic Electric Ignition
- Burner Mountable on Left or Right
- Automatic Heat Exchanger Cleaning
- Burnback Fire Prevention Through Air Tight Spring Actuated Valve
- Auto Auger or Vacuum Fuel Feed
- Combustion Sensor (Monitors Efficiency)
- Pressure Sensor and Flue Gas Fan Safely Control Draft

# AutoPellet = automatic ash removal.

The MESys AutoPellet boiler is designed to make your life easier. Pellet ash is automatically removed from the boiler and compressed into the integrated ashbox. The ashbox can hold ash from 2 tons of burned pellets before emptying. There is no need to shut the system down for ash removal or wear heat-protective mitts.

*Detach ashbox & lift*

*Empty into storage container*

*Return to boiler*

With a simple twist of the lever, the ashbox is detached from the boiler. The ashbox is then placed on top of the storage container, emptied, and returned back to the boiler.

This is a quick, clean and easy task and the ash is great for your lawn or garden.

# EnergyBox

## **Complete** self-contained heating.

The MESys Energy Box is a complete self-contained heating system suitable for almost any application. Each Energy Box contains wood pellet storage, MESys AutoPellet boiler(s), flue and fuel supply system.

An ideal solution for municipalities, school districts and commercial applications where indoor space is limited, the Energy Box is also applicable for temporary buildings as the entire unit can easily be relocated to another site with minimal work. The Energy Box is delivered, ready for installation, by truck and is connected to the heating system in a matter of hours.

| Type I | Type II | Type III-IV |
|---|---|---|
|  |  |  |
| 191 MBtu / hr | 245-382 MBtu / hr | 492-765 MBtu / hr |
| 20.3 x 8 x 8.7 feet | 33.8 x 8 x 8.7 feet | 40.4 x 8 x 8.7 feet |
| 1 MESys AutoPellet Boiler | 2 MESys AutoPellet Boilers | 3 or 4 MESys AutoPellet Boilers |
| 9.5 Ton Pellet Storage | 15 ton pellet storage | 14 ton pellet storage |

*MESys Energy Boxes can also be customized to fit your heating needs.*

## **500+** trained and certified installation contractors.

Our wood pellet boiler specialists have matched hundreds of happy customers to the appropriate MESys installation contractor. We have trained over 500 plumbing and heating professionals to install, configure, and maintain MESys boilers.

Contact us to find the contractor that's right for you.

Contractor coverage areas:

- Alaska
- Canada (Northwest Territory)
- Connecticut
- Maine
- Massachusetts
- New Hampshire
- New York
- Pennsylvania
- Rhode Island
- Vermont


Bulk wood pellet **delivery**.
You don't handle your oil or propane and with our fully-automated system, you'll never touch your pellets either. Delivered directly to your home or business, bagless, by a delivery truck the same way as oil or propane.
A typical home requires just 3 deliveries annually.
Cut your heating costs!
AutoPellet
MESYS
MAINE ENERGY SYSTEMS
(207) 824-NRGY (6749)
MaineEnergySystems.com


Cut your heating costs!
MESYS
AutoPellet

Fuel storage for **any** application.

### From 1/2 Ton to 50 Tons, We Can Store It All

With many sizes and configurations available, our wood pellet storage options are designed to fit your space and needs. These options ensure safe, automatic, reliable movement of the wood pellets from bulk storage to the burner. Our FleXILO storage bags are well suited for indoor spaces where space is limited.

### Vacuum Fuel Feed

For installations that require pellet storage to be in a seprate location from the boiler, vacuum delivery may be used. Maximim distance between storage and boiler in this case is 66 feet.


## TAKING A VACATION
## WITH YOUR FUEL SAVINGS

*Switch to the world's finest fully-automated wood pellet boiler. The boiler that saves more than it costs.*

- **Automatic Operation**
  Just Turn Your Existing Thermostat
- **No Fuel Handling**
  Delivered in Bulk / Automatically Fed
- **Automatic Ash Removal**
  No Ash to Touch
- **Clean Burning**
  Exceeds all EPA Emission Standards
- **Reliable**
  40,000+ Units in Service Worldwide
- **Affordable Fuel**
  Lock-in at $1.99 / Gallon Oil Equivalent

MESYS
MAINE ENERGY SYSTEMS
877-917-2319
MESysHeat.com

**Contact Us**
Stop being held hostage by your heating system.


## DON'T BURN **YOUR** MONEY.

*If you think your cost of heating is high, switch to the world's finest fully-automated wood pellet boiler, it saves more than it costs.*

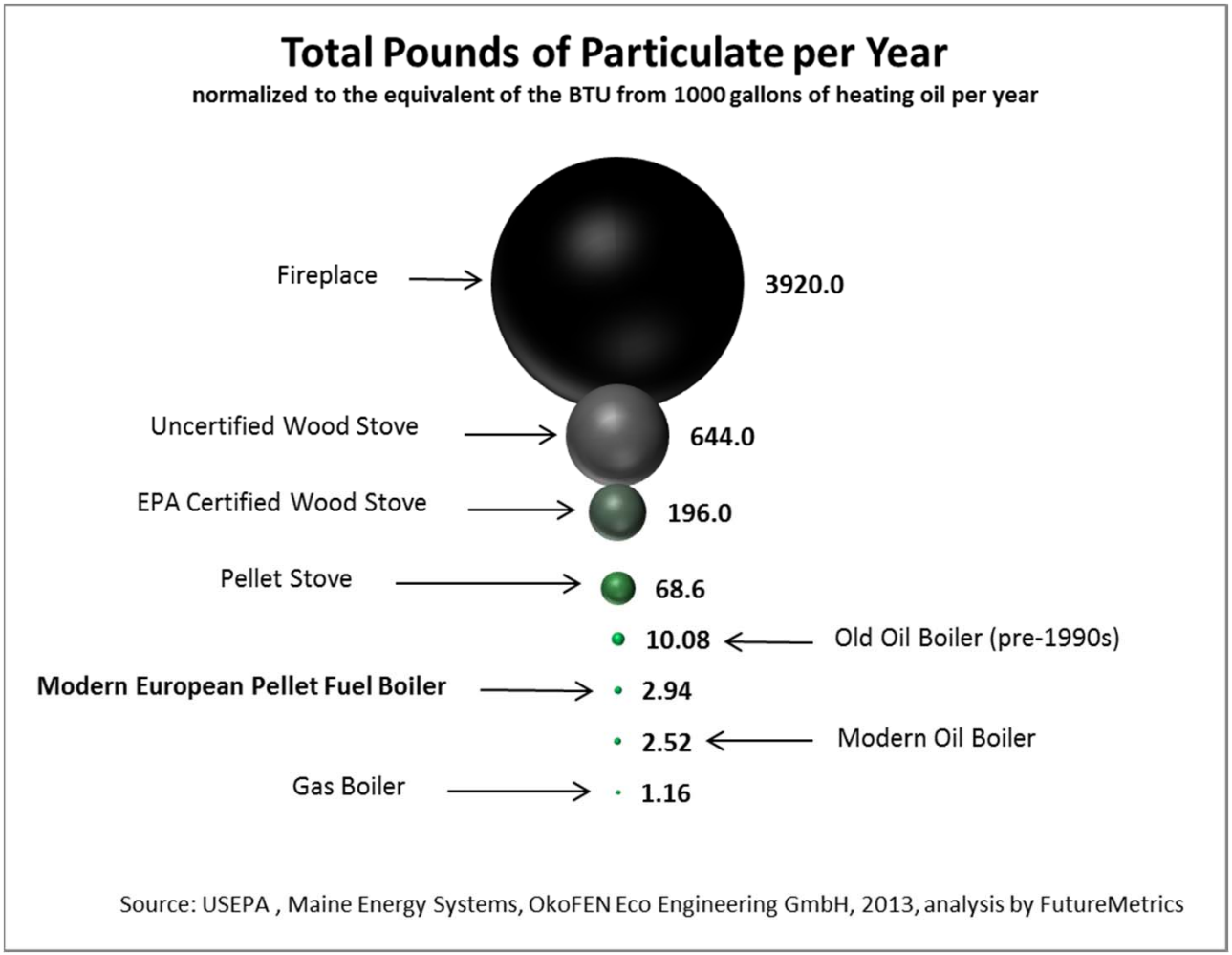
- **Automatic Operation**
  Just Turn Your Existing Thermostat
- **No Fuel Handling**
  Delivered in Bulk / Automatically Fed
- **Automatic Ash Removal**
  No Ash to Touch
- **Clean Burning**
  Exceeds all EPA Emission Standards
- **Reliable**
  40,000+ Units in Service Worldwide
- **Affordable Fuel**
  Lock-in at $1.99 / Gallon Oil Equivalent

MESYS
MAINE ENERGY SYSTEMS
877-917-2319
MESysHeat.com

**Contact Us**
How's $1.99 / gallon for the next **2 years** sound?


BEAT OIL!
& Stay Warm
$1.99
ENERGY
GUARANTEED TWO YEARS*
AutoPellet Boilers
• Automatic Operation
• Automatic Ash Removal
• Automatic Fuel Delivery
• No Fuel Handling
• Highly Efficient
• 40,000+ Units in Service
• Clean Burning
FINANCING AVAILABLE
• FHA guaranteed loans from Admirals Bank.**
• Pellet fuel and boiler payment may be less than just your oil bill.
MESYS
MAINE ENERGY SYSTEMS
(207) 824-NRGY (6749) • MaineEnergySystems.com
* Maine Energy Systems guarantees the delivery of bagless bulk wood pellets at the price of $239 / ton, the BTU equivalent of $1.99 / gallon heating oil, within 150 miles of Bethel, Maine through June 2014.
** Financing available disclaimer here. ** Financing available disclaimer here. ** Financing available disclaimer here. ** Financing available disclaimer here. ** Financing available disclaimer here.

## Modern Wood Pellet Boilers are CLEAN and completely automatic



**To put this into perspective, let's compare using a half of a ton of wood in a fireplace and the equivalent energy from wood pellets in a modern pellet boiler.**

375 pounds

**Particulate emissions (SMOKE!)**

0.28 pound

# What is the Industrial Pellet Market?

## 27 million metric tonnes per year by 2020*

## 74,000 tonnes per day!

(more than a shipload per day)

## Europe alone = 20 million TPY

Source: Hawkins-Wright, October, 2013

# What is the Market?

Current Industrial pellet production in North America (the primary supplier to the UK and EU now) is about 5 million tonnes per year.

**There is a capacity gap, of 22 million tonnes per year that has to be filled in the next 6 years.**

**And**

**Korea's emission trading scheme starts January 2015…**

**Japan…?**

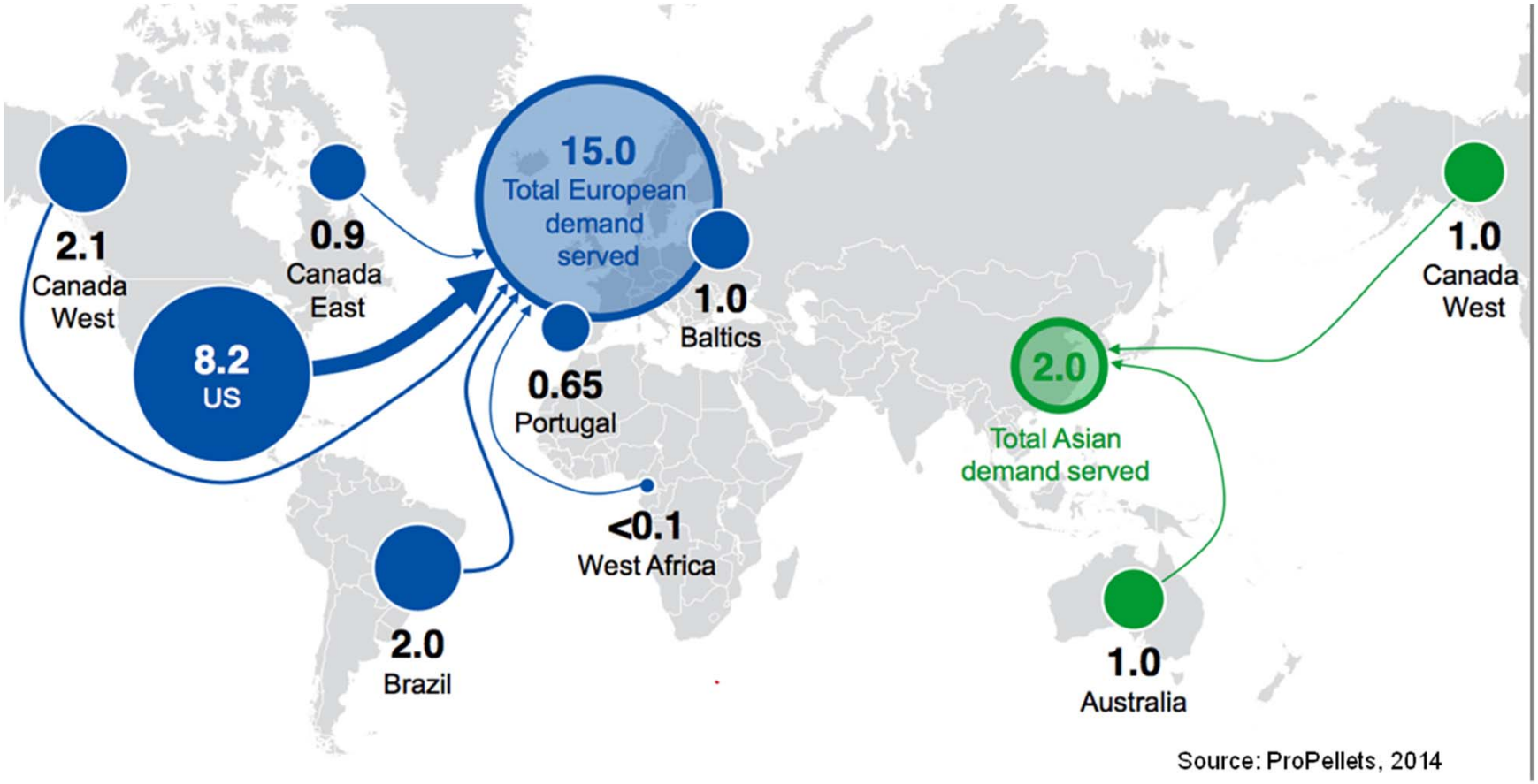
Source: Hawkins-Wright, October, 2013

One example: Drax

7.5 million tons per year by 2015-16.

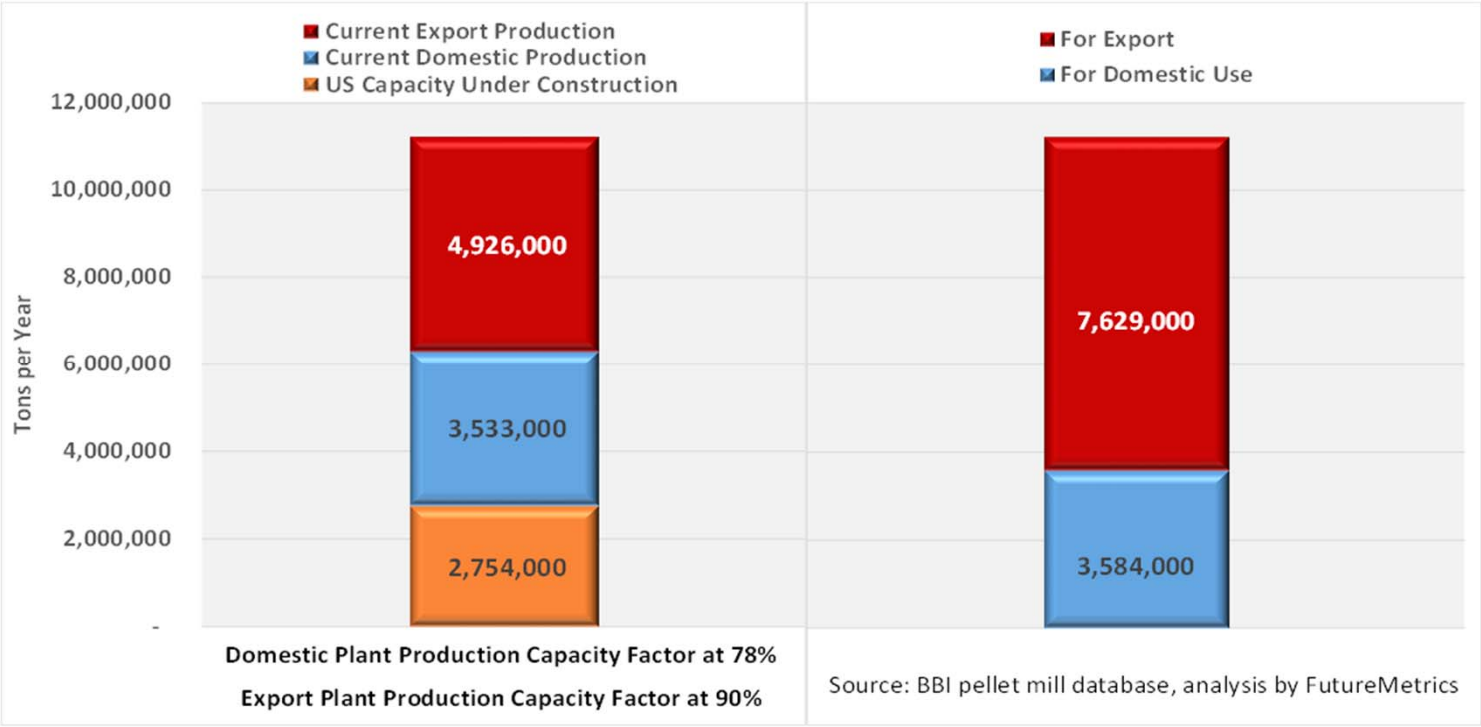
Unit #2 running on 100% pellets at full capacity – 650 MW

# Forecast Industrial Pellet Flows by 2016



# What about the North American Industrial Pellet Market?

Plenty of production capacity with rich sustainable fiber baskets able to provide renewing feedstock for much higher levels of production.

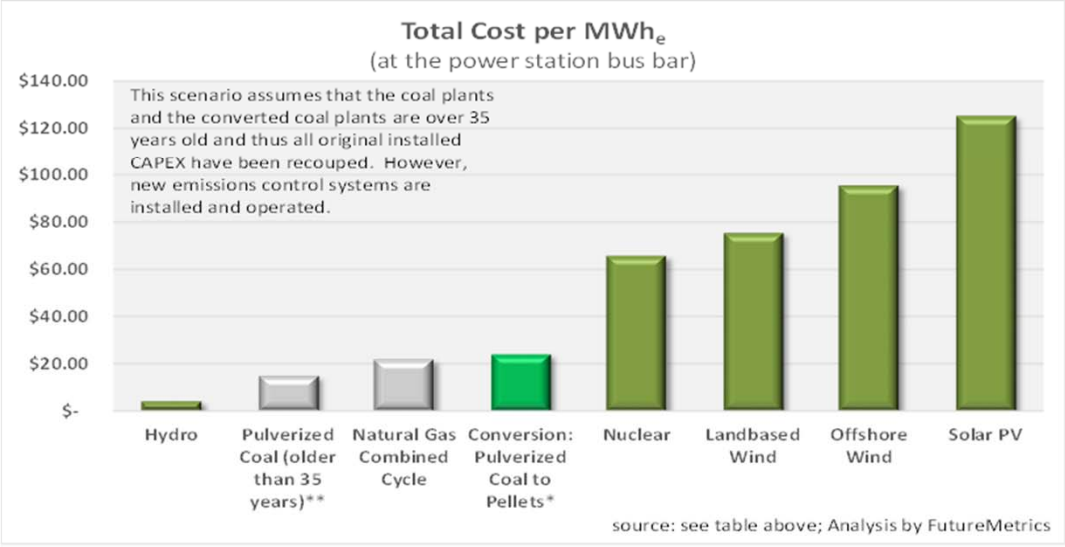


| Green shading for low carbon solutions | | | Costs amortized over | 35 years | | Utility Natural Gas at $5.50 per MMBTU | Coal at $2.60 per MMBTU | | Pellets at $175.00 per ton | or $9.72 per MMBTU |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | at | 6.00% | | | | | |
| | Construction, Conversion, or New Pollution Control Cost per kW | Size (MW) | Capacity Factor | Install Cost | Annual Capital Cost Amortization | Annual Output ($MWh_e$) | Fixed Capital Cost per $MWh_e$ | Fixed and Variable O&M per $MWh_e$ | Fuel Cost per $MWh_e$ | **Total Cost per $MWh_e$ (at the power station bus bar)** |
| **Hydro** | $ - | 1000 | 90.0% | $ - | $ - | 7,884,000 | $ - | $ 4.10 | $ - | **$ 4.10** |
| **Pulverized Coal (older than 35 years)**** | $ 380 | 610 | 85.0% | $ 231,800,000 | $ 15,988,141 | 4,542,060 | $ 3.52 | $ 5.60 | $ 5.77 | **$ 14.89** |
| **Natural Gas Combined Cycle** | $ 1,230 | 580 | 90.0% | $ 713,400,000 | $ 49,205,951 | 4,572,720 | $ 10.76 | $ 1.70 | $ 9.38 | **$ 21.84** |
| **Conversion: Pulverized Coal to Pellets*** | $ 210 | 600 | 85.0% | $ 126,000,000 | $ 8,690,706 | 4,467,600 | $ 1.95 | $ 5.50 | $ 16.59 | **$ 24.03** |
| **Nuclear** | $ 6,100 | 1125 | 90.0% | $ 6,862,500,000 | $ 473,333,107 | 8,869,500 | $ 53.37 | $ 11.80 | $ 0.60 | **$ 65.76** |
| **Landbased Wind** | $ 1,980 | 50 | 25.0% | $ 99,000,000 | $ 6,828,412 | 109,500 | $ 62.36 | $ 13.00 | $ - | **$ 75.36** |
| **Offshore Wind** | $ 3,230 | 50 | 35.0% | $ 161,500,000 | $ 11,139,278 | 153,300 | $ 72.66 | $ 22.80 | $ - | **$ 95.46** |
| **Solar PV** | $ 4,340 | 100 | 30.0% | $ 434,000,000 | $ 29,934,655 | 262,800 | $ 113.91 | $ 11.40 | $ - | **$ 125.31** |

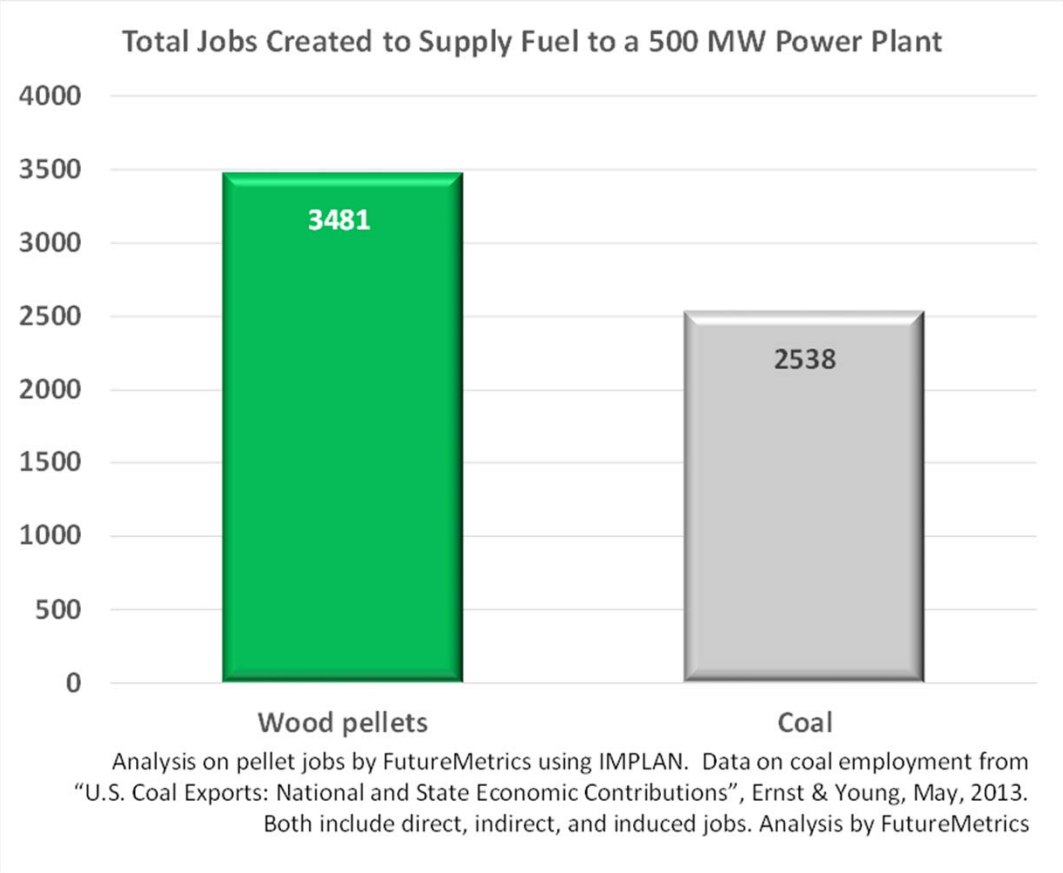
*Assumes CAPEX is only for the conversion since the plants are over 35 years old and all installed CAPEX costs have been recouped.

** New CAPEX is for emissions controls for SO2, Nox, and mercury. Higher O&M cost are for operating the flue gas contol systems. Values from a number of plant case studies.

Source of Data: "Levelized Cost and Levelized Avoided Cost of New Generation Resources in the AEO", 2014, EIA, April 2014; "Cost and Performance Data for Power Generation Technologies", Prepared for NREL by Black & Veatch, February, 2012; Analysis by FutureMetrics



Pellet fuel is 2.88 times more expensive than coal for a reason.
The supply chain requires more labor.




Analysis on pellet jobs by FutureMetrics using IMPLAN. Data on coal employment from "U.S. Coal Exports: National and State Economic Contributions", Ernst & Young, May, 2013. Both include direct, indirect, and induced jobs. Analysis by FutureMetrics

# Case Study:

# What is the Opportunity for the XXX Site
# And
# The Aroostook Band of the Micmacs?

Two Key Questions:

Is there wood supply at volumes and prices that will support a pellet mill?

Is there a market for the pellets?

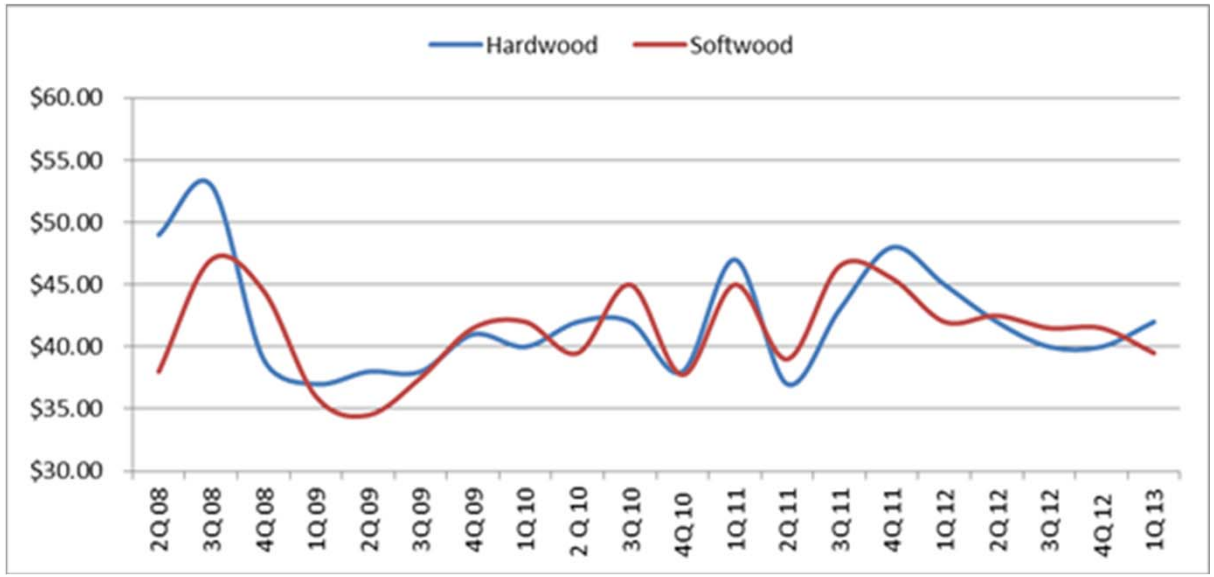
# A wood study was done for FutureMetrics


60 minute drive time and 25 mile radius

| Distance in Miles | | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Delivered Cost per Green Ton | | $23.22 | $24.49 | $25.77 | $27.04 | $28.32 | $29.60 | $30.87 | $32.15 | $33.42 | $34.70 | $35.97 | $37.25 | $38.53 | $39.80 | $41.08 | $42.35 | $43.63 | $44.90 |

Within this region roughly 230,000 green tons are available annually. Of this, roughly 125,000 green tons are in non-sawlog material, and would be economically appropriate for use in wood pellet manufacturing.

| Net Growth | Softwood | Hardwood | Total |
|---|---|---|---|
| all | 124,998 | 106,581 | 231,579 |
| sawtimber | 86,564 | 21,230 | 107,793 |
| non-sawtimber | 38,434 | 85,352 | 123,786 |



There would appear to be sufficient wood for a modestly sized plant.

There are two potential markets for pellets manufactured at the XXX site:

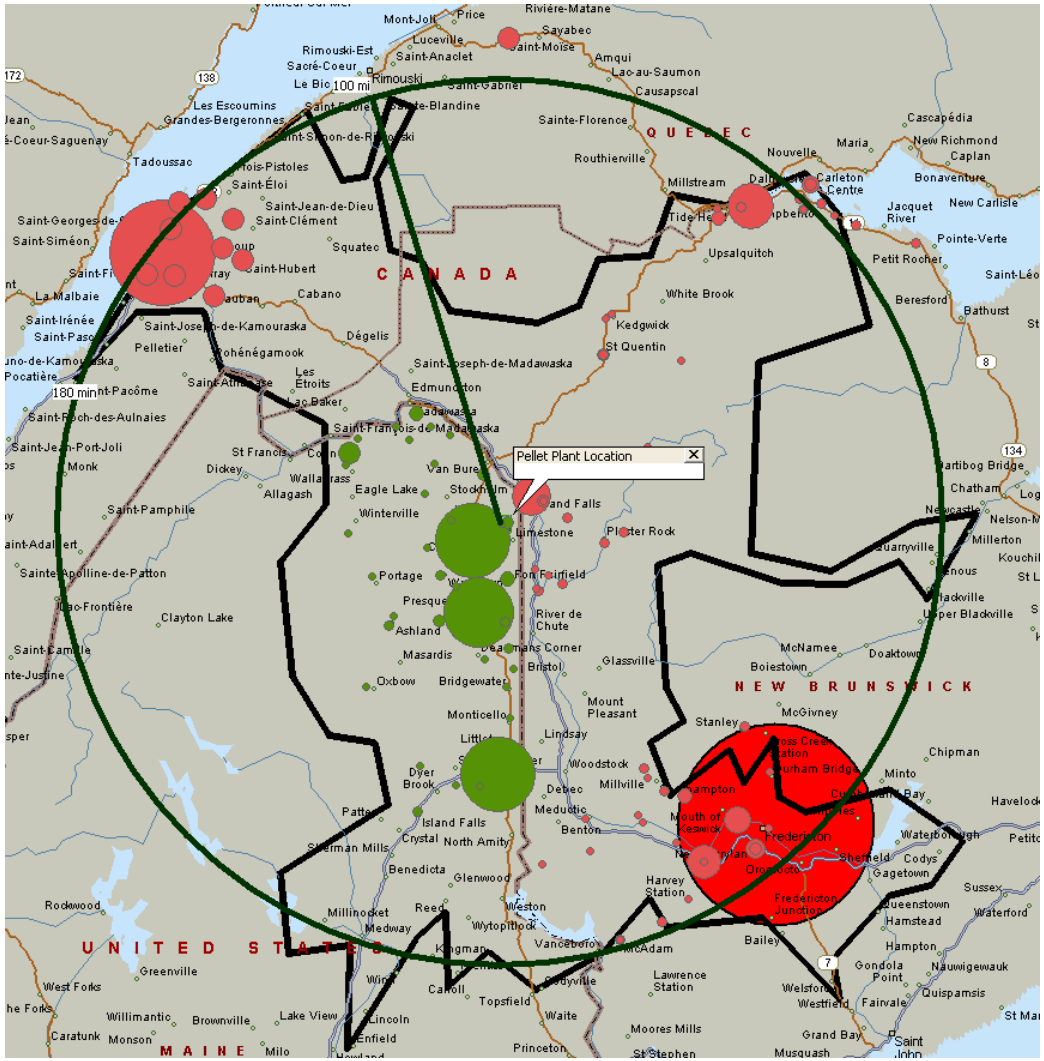
- The Micmac's own set of buildings and
- The retail market in the region.

# Micmac Buildings

| One Year Fuel Usage (June, 2010 - May 2012) | Heating Oil Gallons | Cost | $/gal | Pellet Equivelant Tons | Cost at $145 per ton |
|---|---|---|---|---|---|
| Micmac Service Unit | 1,156 | $3,716 | $3.216 | 9.38 | $1,360 |
| Admin - 7 Northern Rd. | 5,365 | $17,255 | $3.216 | 43.55 | $6,315 |
| Little Feathers Head Start | 2,061 | $6,435 | $3.123 | 16.73 | $2,426 |
| Spruce Haven | 3,418 | $11,096 | $3.247 | 27.74 | $4,023 |
| Farm | 650 | $2,090 | $3.216 | 5.28 | $765 |
| Employees | 21,543 | $67,710 | $3.143 | 174.88 | $25,357 |
| Housing Vacancies | 11,361 | $35,255 | $3.103 | 92.22 | $13,372 |
| | | | | | |
| LIHEAP/CITGO Housing Fuel | 83,977 | $236,254 | $2.813 | 681.70 | $98,846 |
| | | | | | |
| **TOTALS** | **129,531** | **$379,812** | | **1051.48** | **$152,465** |

Heating cost savings of about $230,000 per year.

The Houlton / Presque Isle / Caribou area has very strong growth both in the pellet stove and pellet boiler market.




Three hour drive and 100 mile radius

The potential for some 40,000 to 60,000 households in the region to convert from heating oil to pellet fuel, each of which would use about 8 to 10 tons per year, suggests that the plant at XXX will be able to sell its production in 2015.

If the Band converts its buildings, and the schools near the facility are customers, the project will already have about ¼ of its annual production accounted for.

The total capital cost for the project is estimated to be $2,113,000. This includes all process equipment, buildings, engineering, construction, working capital needs.

| | # | Shifts | Rate | Hours | $/year | % Soft | $/year | $/position |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| Plant Manager | 1 | 1 | | | $ 75,000 | 30% | $ 97,500 | $ 97,500 |
| Raw material handler | 1 | 4 | $ 17.00 | 2,200 | $ 37,400 | 30% | $ 48,620 | $ 194,480 |
| Plant operator | 1 | 4 | $ 17.00 | 2,200 | $ 37,400 | 30% | $ 48,620 | $ 194,480 |
| Utility Operator | 1 | 2 | $ 17.00 | 2,200 | $ 37,400 | 30% | $ 48,620 | $ 97,240 |
| Mechanical / Electrician | 1 | 2 | $ 17.00 | 2,200 | $ 37,400 | 30% | $ 48,620 | $ 97,240 |
| | | | | | | | | |
| **Total Labor cost** | | **13** | | | | | | **$ 680,940** |

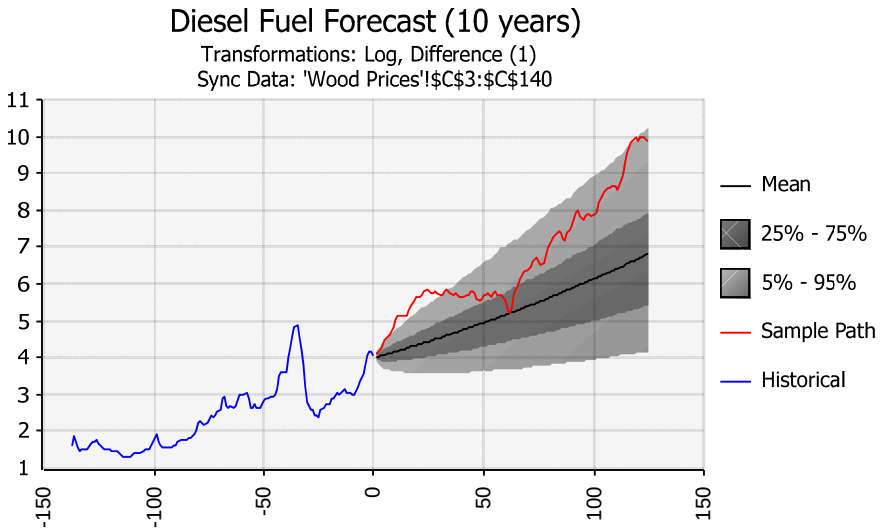
| extra borrowing for early cash flow needs ====> | $ 200,000 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Scenario 1 - Projected Cash Flows -- Return on Investment (ROI) -- Net Present Value Calculation (NPV)** | | | | | | | | | | | |
| Capacity | | 65% | 93% | 93% | 93% | 93% | 93% | 93% | 93% | 93% | 93% |
| Tons | | 6,833 | 9,776 | 9,776 | 9,776 | 9,776 | 9,776 | 9,776 | 9,776 | 9,776 | 9,776 |
| Pellet Price Delivered | | $174 | $184 | $194 | $204 | $216 | $228 | $240 | $253 | $267 | $282 |
| Debt Percentage | 75% | | | | | | | | | | |
| Equity Percentage | 25% | | | | | | | | | | |
| Year | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **Year 6** | **Year 7** | **Year 8** | **Year 9** | **Year 10** |
| Capital Costs (less "other startup" and contingency costs) | $2,021,328 | | | | | | | | | | |
| Change in Working Capital | $36,575 | | | | | | | | | | |
| **Revenue** | $0 | $1,219,155 | $1,886,275 | $2,039,770 | $2,205,756 | $2,385,250 | $2,579,350 | $2,789,244 | $3,016,219 | $3,261,664 | $3,527,082 |
| Subtract Cost of Goods (includes labor) | $0 | 1,021,217 | 1,503,691 | 1,547,659 | 1,593,827 | 1,641,903 | 1,692,275 | 1,744,523 | 1,798,944 | 1,855,977 | 1,915,398 |
| **Gross Operating Cash Flow** | | **197,938** | **382,583** | **492,111** | **611,929** | **743,346** | **887,074** | **1,044,721** | **1,217,275** | **1,405,686** | **1,611,684** |
| Subtract General Selling and Admin (includes Plt.Mgr.) | $75,000 | 75,000 | 75,000 | 75,000 | 75,000 | 75,000 | 75,000 | 75,000 | 75,000 | 75,000 | 75,000 |
| Potential Heating Cost Savings Scenario | | - | - | - | - | - | - | - | - | - | - |
| Subtract Annual Debt Service (includes interest) | $70,000 | 219,917 | 219,917 | 219,917 | 219,917 | 219,917 | 219,917 | 219,917 | 219,917 | 219,917 | 219,917 |
| Annual Taxes | - | - | - | - | - | - | - | - | - | - | - |
| Salvage Estimates | | | | | | | | | | | |
| **Net Operating Cash Flows** | **($2,002,903)** | **($96,979)** | **$87,666** | **$197,194** | **$317,013** | **$448,430** | **$592,158** | **$749,804** | **$922,358** | **$1,110,770** | **1,316,767** |
| Cash at the start of the period | $2,111,628 | **$108,725** | **$11,746** | **$99,413** | **$296,607** | **$613,620** | **$1,062,049** | **$1,654,207** | **$2,404,011** | **$3,326,369** | **$4,437,139** |
| Cash inflow (outflow) during the period | ($2,002,903) | **($96,979)** | **87,666** | **197,194** | **317,013** | **448,430** | **592,158** | **749,804** | **922,358** | **1,110,770** | **1,316,767** |
| | ($527,907) | | | | | | | | | | |
| Cash at the end of the period | **$108,725** | **$11,746** | **$99,413** | **$296,607** | **$613,620** | **$1,062,049** | **$1,654,207** | **$2,404,011** | **$3,326,369** | **$4,437,139** | **$5,753,906** |
| EBITDA | | (25,630) | 153,073 | 256,420 | 369,811 | 494,543 | 631,319 | 781,735 | 946,769 | 1,127,361 | 1,325,226 |
| **ROI for total CAPEX (10 Yrs.)** | **14.10%** | **NPV (@ 8%, 10 Yrs.)** | | **$1,043,047.17** | | | | **Equity Cash Out ==>** | | | **$5,225,999** |

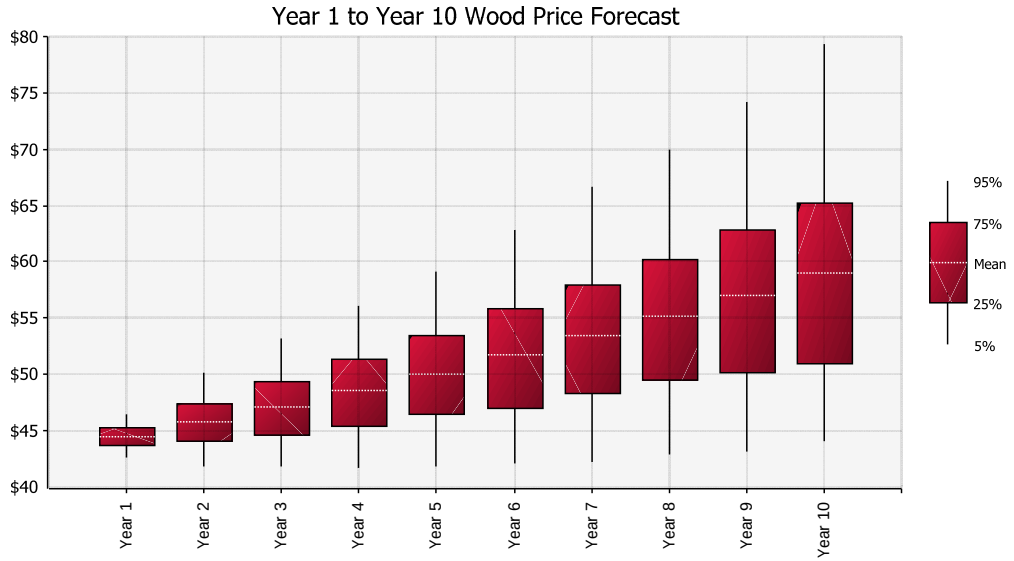
| extra borrowing for early cash flow needs ====> | $ 200,000 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Scenario 2 - Projected Cash Flows -- Return on Investment (ROI) -- Net Present Value Calculation (NPV) WITH COST SAVINGS FROM FUEL SWITCHING** | | | | | | | | | | | |
| Capacity | | 65% | 93% | 93% | 93% | 93% | 93% | 93% | 93% | 93% | 93% |
| Tons | | 6,833 | 9,776 | 9,776 | 9,776 | 9,776 | 9,776 | 9,776 | 9,776 | 9,776 | 9,776 |
| Pellet Price Delivered | | $174 | $184 | $194 | $204 | $216 | $228 | $240 | $253 | $267 | $282 |
| Debt Percentage | 75% | | | | | | | | | | |
| Equity Percentage | 25% | | | | | | | | | | |
| Year | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **Year 6** | **Year 7** | **Year 8** | **Year 9** | **Year 10** |
| Capital Costs (less "other startup" and contingency costs) | $2,021,328 | | | | | | | | | | |
| Change in Working Capital | $36,575 | | | | | | | | | | |
| **Revenue** | $0 | $1,219,155 | $1,886,275 | $2,039,770 | $2,205,756 | $2,385,250 | $2,579,350 | $2,789,244 | $3,016,219 | $3,261,664 | $3,527,082 |
| Subtract Cost of Goods (includes labor) | $0 | 1,021,217 | 1,503,691 | 1,547,659 | 1,593,827 | 1,641,903 | 1,692,275 | 1,744,523 | 1,798,944 | 1,855,977 | 1,915,398 |
| **Gross Operating Cash Flow** | | **197,938** | **382,583** | **492,111** | **611,929** | **743,346** | **887,074** | **1,044,721** | **1,217,275** | **1,405,686** | **1,611,684** |
| Subtract General Selling and Admin (includes Plt.Mgr.) | $75,000 | 75,000 | 75,000 | 75,000 | 75,000 | 75,000 | 75,000 | 75,000 | 75,000 | 75,000 | 75,000 |
| Potential Heating Cost Savings Scenario | | (56,837) | (119,143) | (187,285) | (261,651) | (274,120) | (287,145) | (300,747) | (314,953) | (329,788) | (345,279) |
| Subtract Annual Debt Service (includes interest) | $70,000 | 219,917 | 219,917 | 219,917 | 219,917 | 219,917 | 219,917 | 219,917 | 219,917 | 219,917 | 219,917 |
| Annual Taxes | - | - | - | - | - | - | - | - | - | - | - |
| Salvage Estimates | | | | | | | | | | | |
| **Net Operating Cash Flows** | **($2,002,903)** | **($40,142)** | **$206,809** | **$384,479** | **$578,663** | **$722,550** | **$879,302** | **$1,050,552** | **$1,237,311** | **$1,440,558** | **1,662,046** |
| Cash at the start of the period | $2,111,628 | **$108,725** | **$68,583** | **$275,392** | **$659,871** | **$1,238,534** | **$1,961,084** | **$2,840,386** | **$3,890,938** | **$5,128,249** | **$6,568,807** |
| Cash inflow (outflow) during the period | ($2,002,903) | **($40,142)** | **206,809** | **384,479** | **578,663** | **722,550** | **879,302** | **1,050,552** | **1,237,311** | **1,440,558** | **1,662,046** |
| | ($527,907) | | | | | | | | | | |
| Cash at the end of the period | **$108,725** | **$68,583** | **$275,392** | **$659,871** | **$1,238,534** | **$1,961,084** | **$2,840,386** | **$3,890,938** | **$5,128,249** | **$6,568,807** | **$8,230,852** |
| EBITDA | | 31,207 | 272,215 | 443,705 | 631,461 | 768,663 | 918,463 | 1,082,483 | 1,261,723 | 1,457,149 | 1,670,504 |
| **ROI for total CAPEX (10 Yrs.)** | **21.84%** | **NPV (@ 8%, 10 Yrs.)** | | **$2,576,873.64** | | | | **Equity Cash Out ==>** | | | **$7,702,945** |

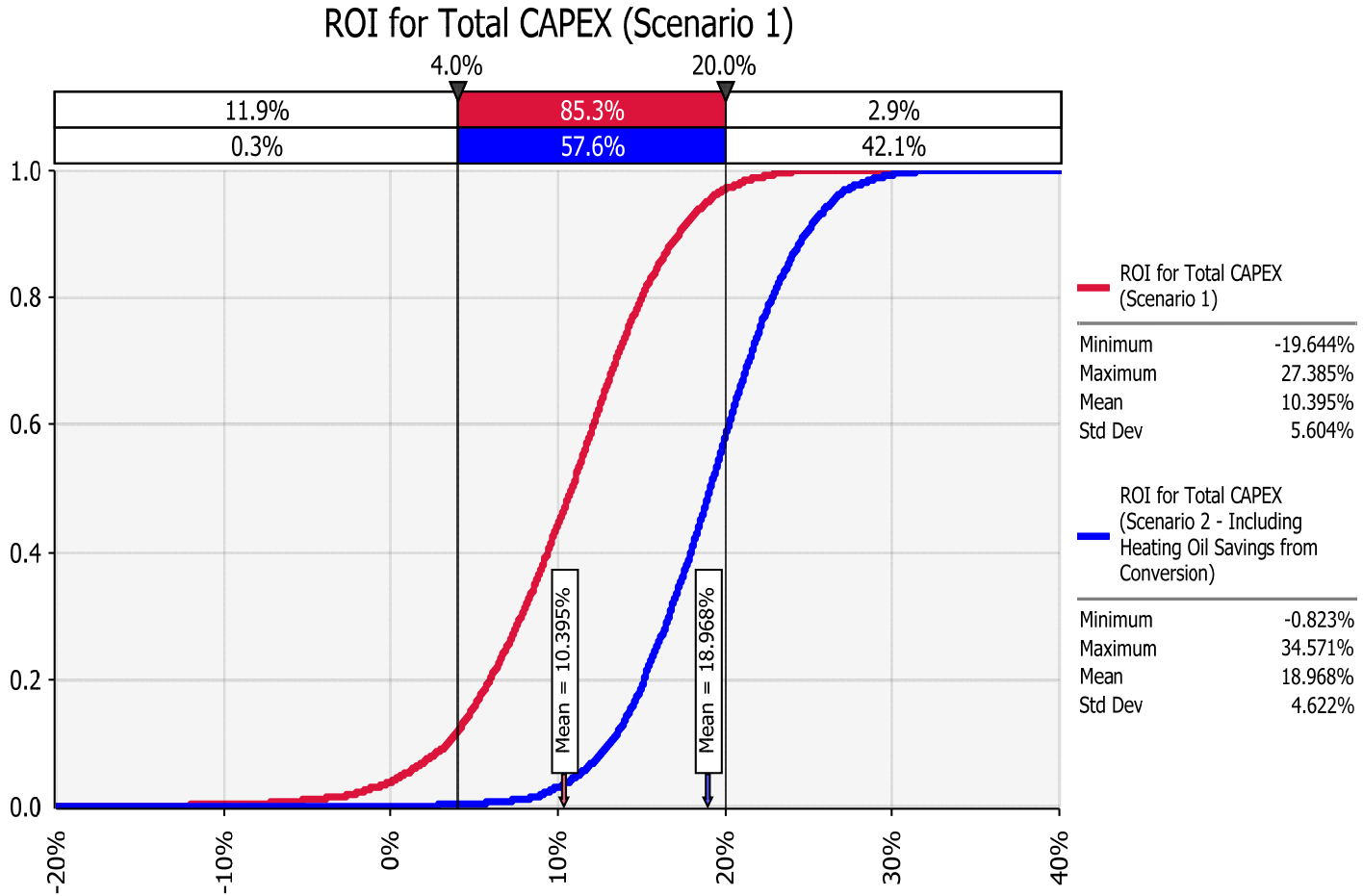
Conversion of Buildings over first four years

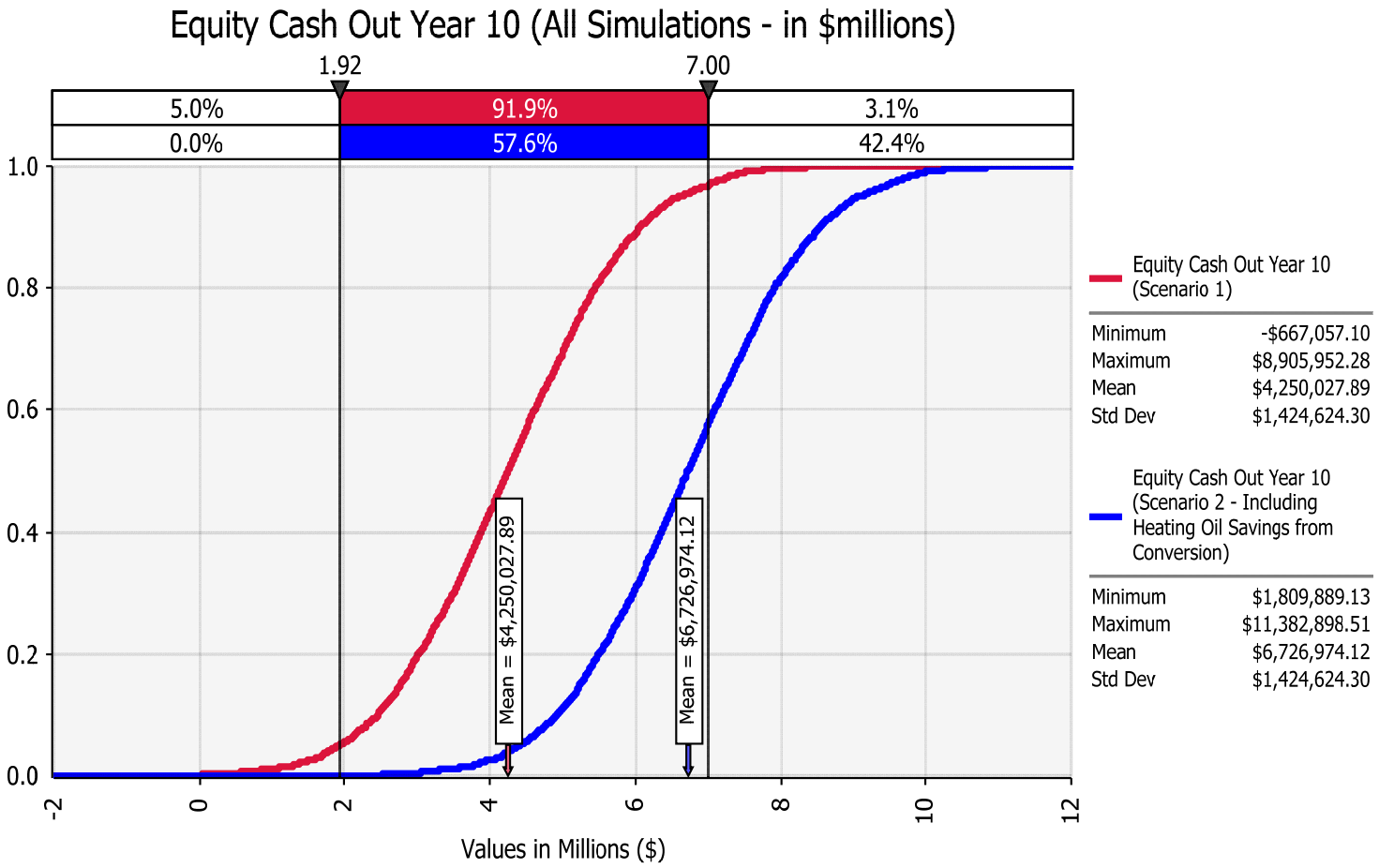
# Free Cash Flows versus wood costs and gate pellet prices (second year of operation)

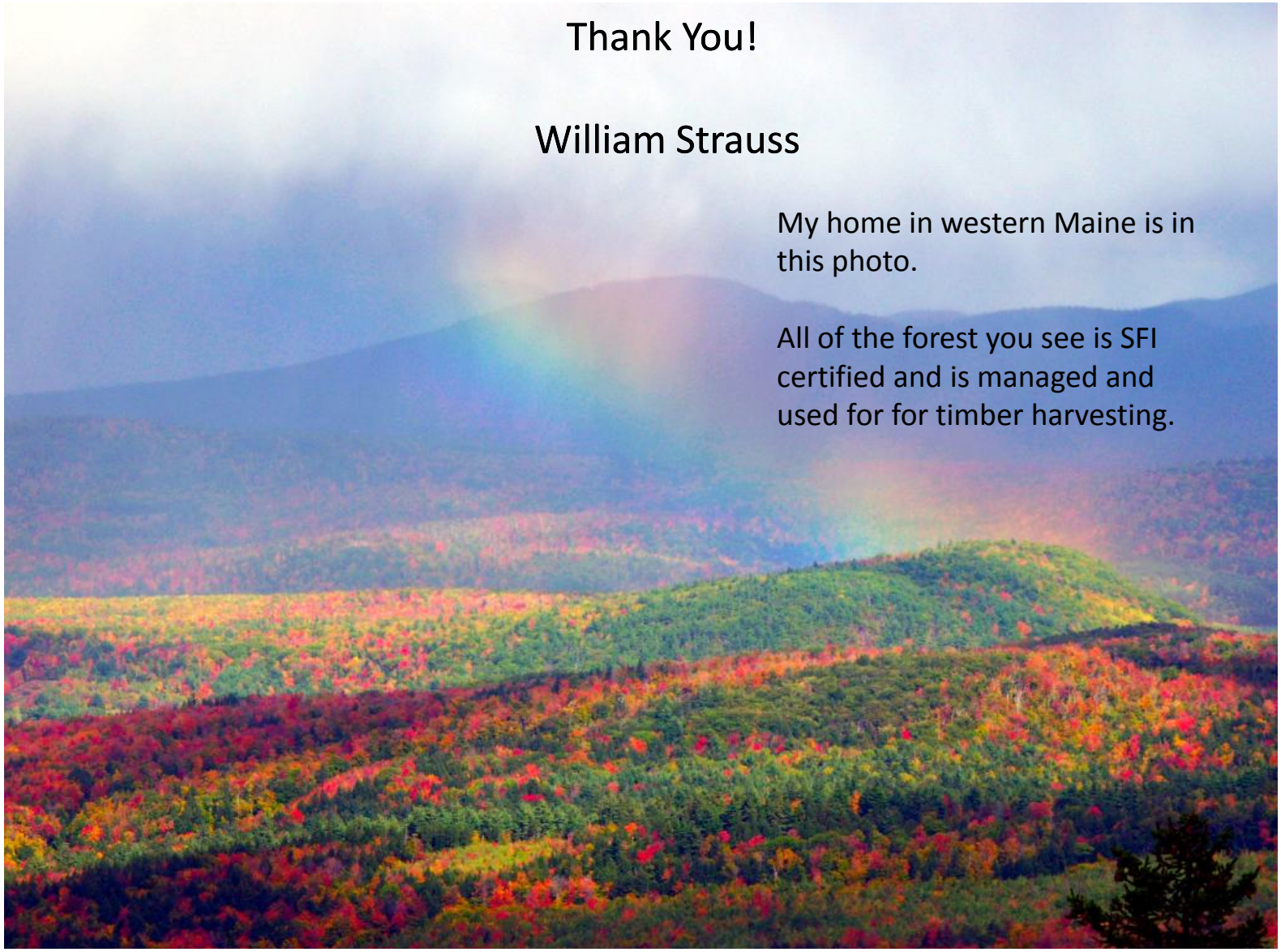
| | $155 | $160 | $165 | $170 | $175 | $180 | $185 | $190 | $195 |
|---|---|---|---|---|---|---|---|---|---|
| $35 | $112,940 | $164,296 | $215,651 | $267,007 | $318,362 | $369,717 | $421,073 | $472,428 | $523,783 |
| $36 | $95,343 | $146,699 | $198,054 | $249,409 | $300,765 | $352,120 | $403,476 | $454,831 | $506,186 |
| $37 | $77,746 | $129,102 | $180,457 | $231,812 | $283,168 | $334,523 | $385,879 | $437,234 | $488,589 |
| $38 | $60,149 | $111,504 | $162,860 | $214,215 | $265,571 | $316,926 | $368,281 | $419,637 | $470,992 |
| $39 | $42,552 | $93,907 | $145,263 | $196,618 | $247,974 | $299,329 | $350,684 | $402,040 | $453,395 |
| $40 | $24,955 | $76,310 | $127,666 | $179,021 | $230,376 | $281,732 | $333,087 | $384,443 | $435,798 |
| $41 | $7,358 | $58,713 | $110,069 | $161,424 | $212,779 | $264,135 | $315,490 | $366,846 | $418,201 |
| $42 | ($10,239) | $41,116 | $92,472 | $143,827 | $195,182 | $246,538 | $297,893 | $349,248 | $400,604 |
| $43 | ($27,836) | $23,519 | $74,874 | $126,230 | $177,585 | $228,941 | $280,296 | $331,651 | $383,007 |
| $44 | ($45,433) | $5,922 | $57,277 | $108,633 | $159,988 | $211,344 | $262,699 | $314,054 | $365,410 |
| $45 | ($63,031) | ($11,675) | $39,680 | $91,036 | $142,391 | $193,746 | $245,102 | $296,457 | $347,813 |
| $46 | ($80,628) | ($29,272) | $22,083 | $73,439 | $124,794 | $176,149 | $227,505 | $278,860 | $330,216 |
| $47 | ($98,225) | ($46,869) | $4,486 | $55,841 | $107,197 | $158,552 | $209,908 | $261,263 | $312,618 |
| $48 | ($115,822) | ($64,466) | ($13,111) | $38,244 | $89,600 | $140,955 | $192,311 | $243,666 | $295,021 |
| $49 | ($133,419) | ($82,063) | ($30,708) | $20,647 | $72,003 | $123,358 | $174,713 | $226,069 | $277,424 |
| $50 | ($151,016) | ($99,661) | ($48,305) | $3,050 | $54,406 | $105,761 | $157,116 | $208,472 | $259,827 |


Diesel Fuel Forecast (10 years)
Transformations: Log, Difference (1)
Sync Data: 'Wood Prices'!$C$3:$C$140
11
10
9
8
7
6
5
4
3
2
1
-150
-100
-50
0
50
100
150
Mean
25% - 75%
5% - 95%
Sample Path
Historical


Year 1 to Year 10 Wood Price Forecast
$80
$75
$70
$65
$60
$55
$50
$45
$40
Year 1
Year 2
Year 3
Year 4
Year 5
Year 6
Year 7
Year 8
Year 9
Year 10
95%
75%
Mean
25%
5%


ROI for Total CAPEX (Scenario 1)
4.0%
20.0%
11.9%
85.3%
2.9%
0.3%
57.6%
42.1%
1.0
0.8
0.6
0.4
0.2
0.0
Mean = 10.395%
Mean = 18.968%
-20%
-10%
0%
10%
20%
30%
40%
ROI for Total CAPEX (Scenario 1)
Minimum -19.644%
Maximum 27.385%
Mean 10.395%
Std Dev 5.604%
ROI for Total CAPEX (Scenario 2 - Including Heating Oil Savings from Conversion)
Minimum -0.823%
Maximum 34.571%
Mean 18.968%
Std Dev 4.622%


Equity Cash Out Year 10 (All Simulations - in $millions)
1.92
7.00
5.0%
91.9%
3.1%
0.0%
57.6%
42.4%
1.0
0.8
0.6
0.4
0.2
0.0
Mean = $4,250,027.89
Mean = $6,726,974.12
-2
0
2
4
6
8
10
12
Values in Millions ($)
Equity Cash Out Year 10 (Scenario 1)
Minimum -$667,057.10
Maximum $8,905,952.28
Mean $4,250,027.89
Std Dev $1,424,624.30
Equity Cash Out Year 10 (Scenario 2 - Including Heating Oil Savings from Conversion)
Minimum $1,809,889.13
Maximum $11,382,898.51
Mean $6,726,974.12
Std Dev $1,424,624.30


Thank You!
William Strauss
My home in western Maine is in this photo.
All of the forest you see is SFI certified and is managed and used for for timber harvesting.