Biomass Heating Projects

What Makes a Good Investment?

Eric Kingsley

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A Quick Look at Biomass Thermal Projects

- From the largest pellet using facility in the US to the pellet stove in my house
- All located in New England – an area with significant reliance on oil for home heating
- All based upon public information, and all projects received some level of public support
- Assumes that all fuel prices (pellets and oil) stay flat forever (probably not true, but allows clear comparison)
  - There is a case to be made that pellets escalate at a rate lower than oil; this would make projects much more attractive – not part of this analysis
- Helpful in thinking about how we design capital subsidies for pellet projects >> what is it we want to accomplish?
- These are all good projects. Just different, with different goals.

Biomass Boiler at Jackson Laboratory

Petrokraft / Reciprocal Energy

- $4.4 million project, $1 million grant funding
- Bar Harbor, Maine
- Stand-alone greenfield boiler facility
- 325 psi Babcock & Wilcox water tube boiler
- Two Petrokraft PCES multi fuel burners
- Largest pellet consumer in the U.S.
- Replaces 1.3 + million gallons #2 oil per year
- Dry wood fuel delivered to site as wood pellets
- Completion June 2011
- Simple payback < 2.5 years

Pneumatic Tankers Deliver Fuel to Jackson Lab

Fuel Unloading

Site mounted blower pressurizes tanker driving pellets through a flexible hose and up into the storage silo

B&W “D” Style Boiler

Biomass Boiler at Colby College

Chiptec

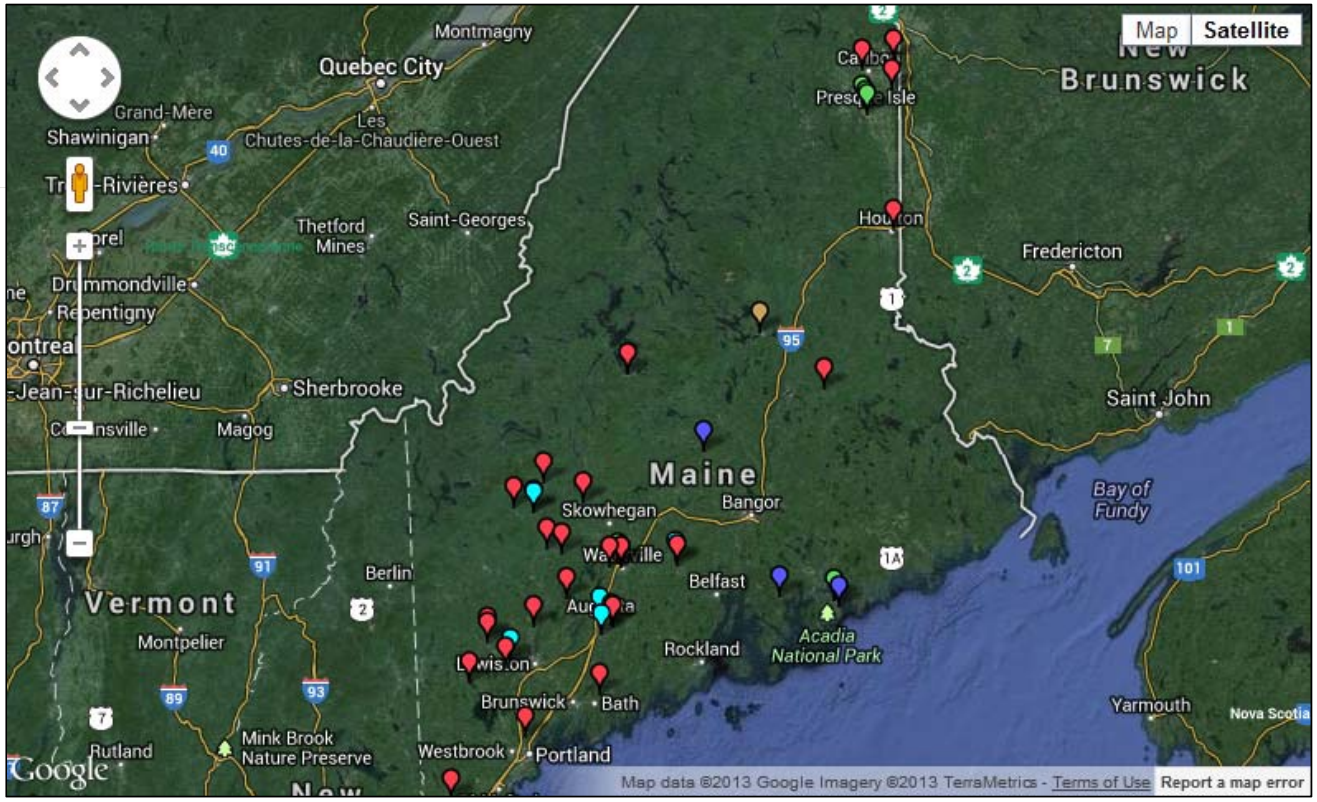
- $11.25 million project, $750,000 grant
- Waterville, Maine
- Stand-alone greenfield boiler facility
- Chiptec Wood Energy System
- Replaces 90% of 1.1 million gallons #2 oil per year
- Wood delivered as chips, live floor trucks
- Completion January 2012
- Saves an estimated $1.5 million in heat costs annually

Comparing Jackson Lab and Colby College

Two Similar Biomass Thermal Projects in Maine

Project	Jackson Labs	Colby College
Biomass Fuel Type	Pellets	Chips (green)
Capital Cost	$4.4 million	$11.25 million
Customer Capital Cost	$3.4 million	$10.5 million
Annual Fuel Savings	$1.74 million	$2.97 million
20-Year Savings	$30.4 million	$23.95 million
30-year Savings	$52.2 million	$47.8 million
Payback Period (years, full cost)	2.5 years	6.4 years
Subsidy / 20 year savings	3%	3%

Maine's Institutional Wood Energy Facilities
Via wood2energy.org database

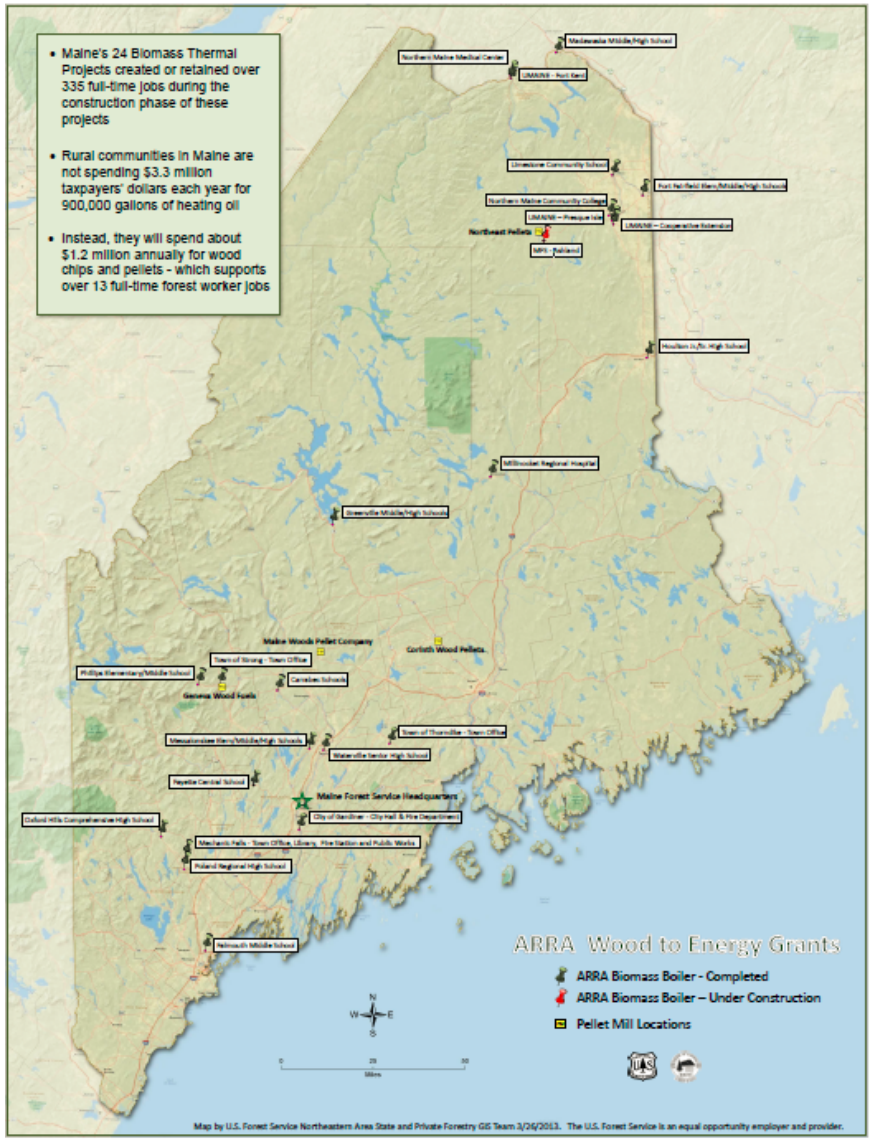


Community facility
Correctional facility
Hospital / Medical center
Military
Public administration / Government facility
Public housing
School
University / College
Other

22 Projects in Maine Supported with ARRA $

- Criteria for the project selection included:
  - the number of jobs created and preserved;
  - unemployment rates;
  - the size and scope of the project;
  - community support; and
  - amount of community funding
- Save the recipients between 1/2 to 2/3 on their annual heating bills
- Total project cost $23.9 million
- Total subsidy $10.5 million
- Funding from USDA Forest Service, administered by Maine Forest Service

- Maine's 24 Biomass Thermal Projects created or retained over 335 full-time jobs during the construction phase of these projects
- Rural communities in Maine are not spending $3.3 million taxpayers' dollars each year for 900,000 gallons of heating oil
- Instead, they will spend about $1.2 million annually for wood chips and pellets - which supports over 13 full-time forest worker jobs



Millinocket Regional Hospital

Maine

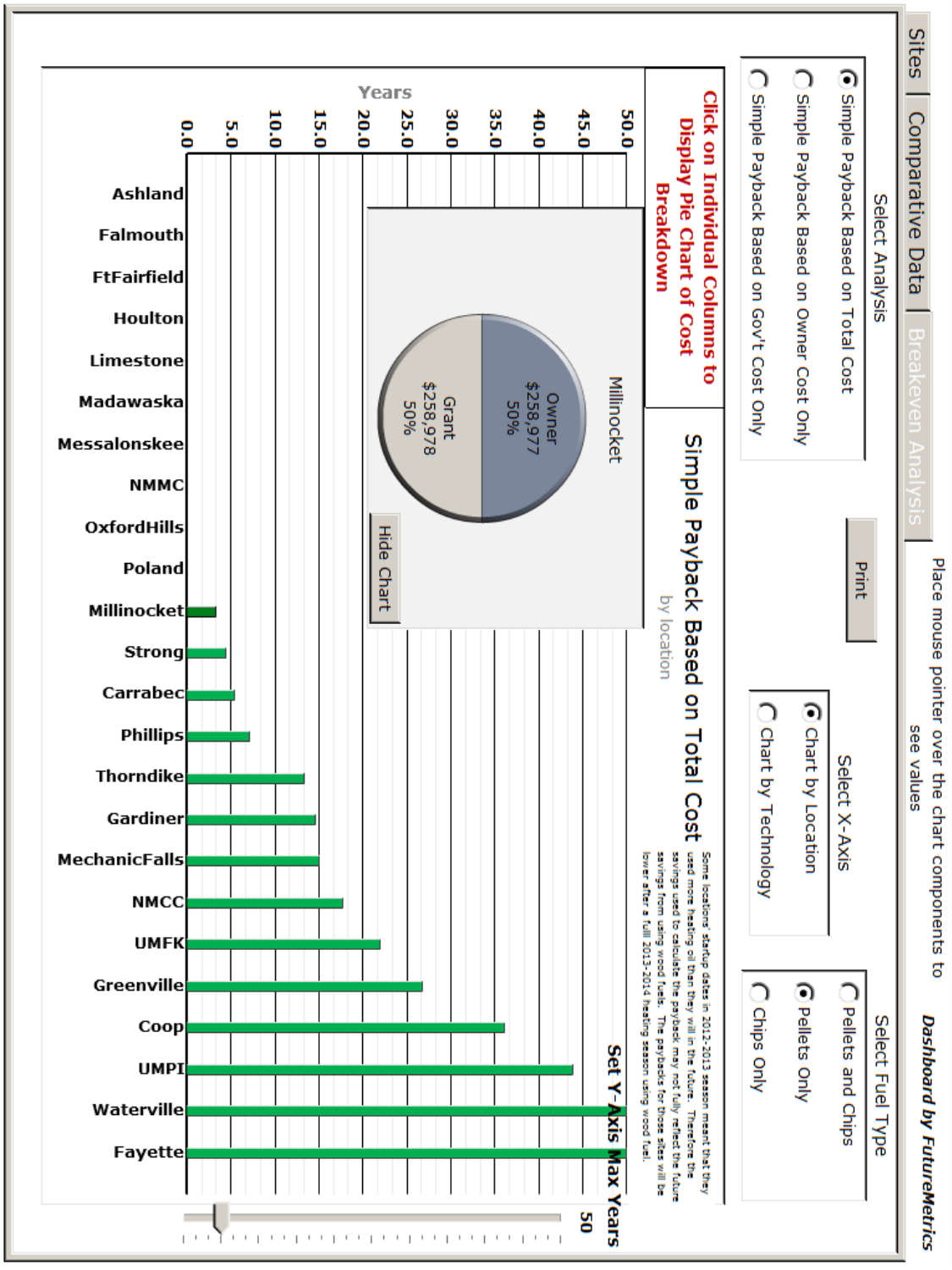
- 25 beds
- Average daily census 12
- 70,000 square feet

A “Dashboard” for All Projects

Developed by FutureMetrics LLC

Information on projects, capital cost, payback, etc.

http://mfs.nmcc.edu



mfs.nmcc.edu

Sites | Comparative Data | Breakeven Analysis

Place mouse pointer over the chart components to see values

Dashboard by FutureMetrics

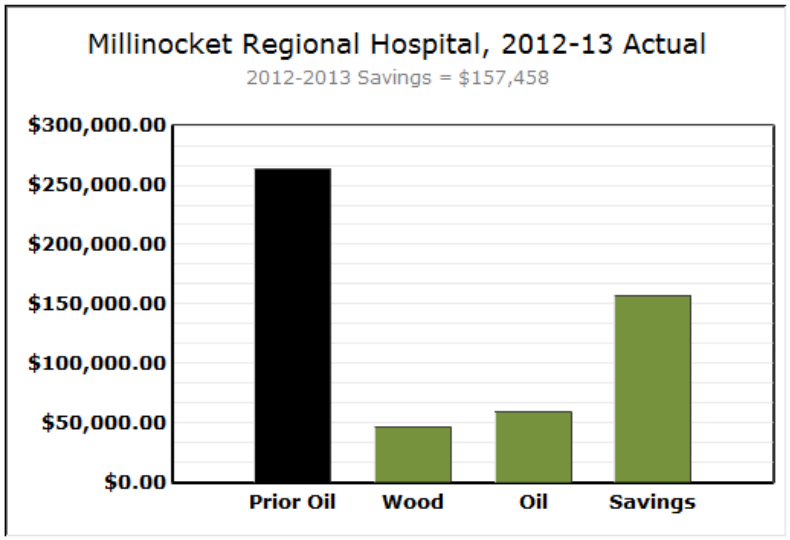
Choose Site

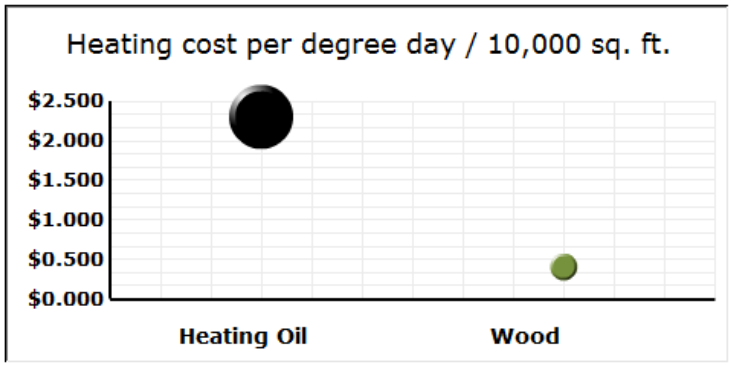
Millinocket Regional Hospital

Maine Biomass Heating Projects Data Dashboard

Summary Data
Millinocket Regional Hospital
Public School building
200 Somerset Street
Millinocket, ME, 04662
Building Size = 70,000 Square Feet
New Boiler: Schmid Model UTSP 700
Boiler Capacity = 2.20 MMBTU/hr
Fuel Type is Pellets
Grant Amount = $258,978
Owner Amount = $258,977
Total Cost = $517,955
Capital Cost per MMBTU = $235,434
Completion Date: January 24, 2013

2012-2013 Actual	
2012-2013 Wood Cost	$46,538.88
2012-2013 Heating Oil Cost	$59,588.06
2012-2013 Savings	$157,458.33
Projected in Grant	
Prior Oil Cost	$263,585.27
Estimated Wood Cost	$56,961.65
Estimated Oil Cost	$0.00
Estimated Savings	$206,623.62
Savings Variance from Grant (+ is good)	($49,165.29)





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Total Cost per 1000 Sq. Ft. (includes amortized capital cost over 20	$521.44

Millinocket Regional Hospital

Key Metrics

Project	
Biomass Fuel Type	Pellets
Capital Cost	$517,955
Customer Capital Cost	$258,977
Annual Fuel Savings	$144,733
20-Year Savings	$2.9 million
30-year Savings	$4.3 million
Payback Period (years, full cost)	3.6 years
Payback Period (w/ subsidy)	1.8 years
Subsidy / 20 year savings	11%

Berlin Model Neighborhood Project

(Residential Incentives)

http://www.northernforest.org/model_neighborhood_project.html

Investment Overview:

- OkoFEN Residential Boilers Installed (January 2012 – June 2013): 37
- Total Capital Cost: $790,000
- NFC Subsidies: $301,000
- NH PUC Subsidies: $202,550
- Homeowner Investments: $286,600
- Average Installed Cost - $21,351

Current Annual Impact:

- 31,709 gallons of oil/year replaced with clean-burning, locally generated wood pellet fuel
- $53,560 in savings for Berlin homeowners
- $228,718 in new economic activity for the North Country (from fuel switching, not including capital investments)
- 402.8 tons net carbon dioxide emission reduction

Projected Long-Term Impact:

- 40 Residential Boilers
- 7,187 Tons of Pellets Purchased
- $3 Million Wealth Retained
- $5.4 Million Total Local Impact
- 9,566 Net Tons of C02 Avoided

Northern Forest Center
Thriving Communities & Healthy Forests

Typical Results – Oil vs. Wood Pellets

	Oil	Wood Pellets	Benefits of using wood
Average fuel use per home	829 Gallons of Oil	7 Tons of Wood Pellets	☑ Reduce oil use
Cost to homeowner	$2984 829 Gallons at $3.60/gallon	$1645 7 Tons at $235/ton	☑ Lower cost
Savings	No Savings for Homeowner	$1339 Homeowner Savings	☑ Save money
Direct value to local economy	$656 22% spent on oil stays local + $0 saved	$2850 100% spent on pellets stays local + 90% of savings $1339 stays local	☑ Keep $$$ circulating locally
Total economic impact (each dollar circulates an average 1.8 times locally)	$1181 Direct Value x 1.8	$5130 Direct Value x 1.8	☑ Boost economy
Net carbon dioxide avoided	0 Tons Carbon dioxide avoided	9.32 Tons Carbon dioxide avoided	☑ Reduce pollution

Northern Forest Center
Thriving Communities & Healthy Forests

Berlin, NH Model Neighborhood Program

Key Metrics

Project	
Biomass Fuel Type	Pellets
Capital Cost	$790,000
Customer Capital Cost	$286,540
Annual Fuel Savings	$60,956
20-Year Savings	$429,112
30-year Savings	$1,038,668
Payback Period (years, full cost)	13 years
Payback Period (w/ subsidy)	4.7 years
Subsidy / 20 year savings	117%

Kingsley Family Stove

Portland, Maine

- Technology: Quadrafire - Castine
- Total project cost - $3,400
- Federal tax credit - $1,000
- Supplemental heat – primary heat from natural gas (unlike most homes in Maine)
  - For comparison purposes, we'll substitute #2 oil
  - Displaces about 245 gallons of oil
- Wood delivered to my garage on pallets
- Storage in basement
  - 2 tons per year
  - Bag quality is CRITICAL for this buyer
- Simple payback 8.7 years (6.2 years with subsidy)
- In winter (6 months), the most popular spot in the house

Kingsley Family Stove

Key Metrics

Project	
Biomass Fuel Type	Pellets
Capital Cost	$3,400
Customer Capital Cost	$2,400
Annual Fuel Savings	$390
20-Year Savings	$4,403
30-year Savings	$8,305
Payback Period (years, full cost)	8.7 years
Payback Period (w/ subsidy)	6.2 years
Subsidy / 20 year savings	12%

Comparing Biomass Heating Projects

Key Metrics

Project	Jackson Labs	Colby College	MRH	Berlin, NH	Kingsley
Biomass Fuel Type	Pellets	Chips (green)	Pellets	Pellets	Pellets
Capital Cost	$4.4 million	$11.25 million	$517,955	$790,000	$3,400
Customer Capital Cost	$3.4 million	$10.5 million	$258,977	$286,540	$2,400
Annual Fuel Savings	$1.74 million	$2.97 million	$144,733	$60,956	$390
20-Year Savings	$30.4 million	$23.95 million	$2.9 million	$429,112	$4,403
30-year Savings	$52.2 million	$47.8 million	$4.3 million	$1,038,668	$8,305
Payback Period (years, full cost)	2.5 years	6.4 years	3.6 years	13 years	8.7 years
Payback Period (w/ subsidy)	2.0 years	6.0 years	1.8 years	4.7 years	6.2 years
Subsidy / 20 year savings	3%	3%	11%	117%	12%
$ Subsidy / Ton (20 years)	$4.17	-	$19.47	$85.00	$25.00

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