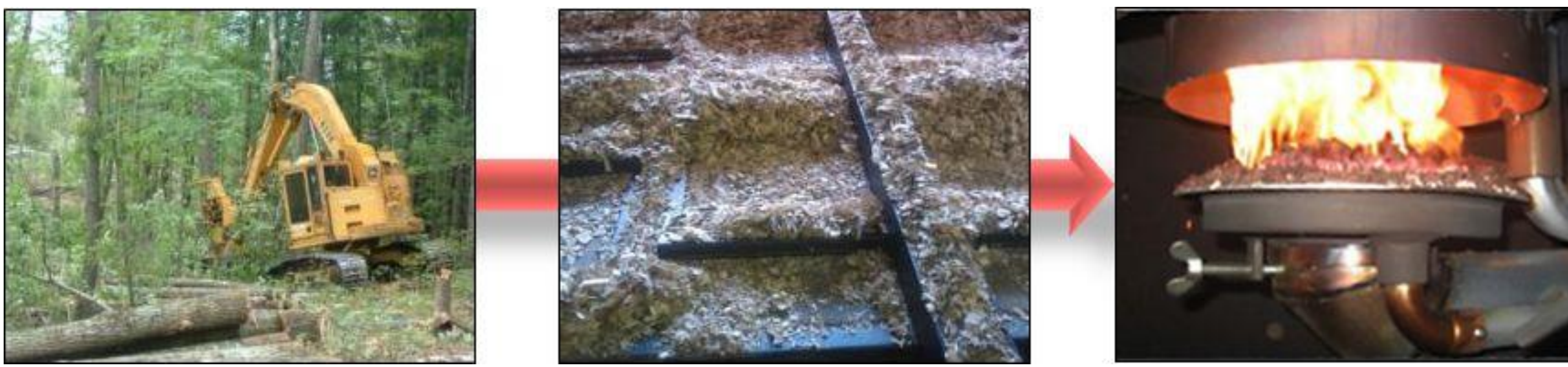
Supporting Community-Driven Sustainable Bioenergy Projects

April 2013



Dovetail Partners / University of Minnesota / USDA Forest Service

Sponsors

- Cook County and Cook County Local Energy Project
- City of Ely Alternative Energy Task Force
- State of Minnesota Environment and Natural Resources Trust Fund / LCCMR
- USDA Wood Education and Resource Center

COOK COUNTY LOCAL ENERGY PROJECT

Ely

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND

FOREST SERVICE U S DEPARTMENT OF AGRICULTURE

Study Teams and Steering Committee

Dovetail Partners, Inc.

Gloria Erickson, Local Coordinator

Gary Atwood, Local Coordinator

Cheryl Miller, Project Manager

Kathryn Fernholz, Executive Director

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Dr. Steven Taff, Applied Economics

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CCLEP Biomass Steering Committee

John Bottger   Tim Kennedy

Mike Garey   Paul Nelson

Patty Johnson   George Wilkes

Ely AETF Steering Committee

Roger Skraba, Mayor

Harold Langowski, City Engineer

Dave Olsen, Retired Engineer

Rebecca Spengler, Business Owner

Mark Akeson, USDA Forest Service

Wood Education and Resource Center / USDA FS

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Dan Wilson, P.E.

George Fetchko, Project Engineer

LHB, Inc.

Chuck Hartley, PE

Community-Driven Sustainable Bioenergy

Support community-led transitions to alternative energy by:

(1) developing high-quality objective information about pertinent topics and options related to bio-energy systems; and

(2) building strong communication structures to gather and disseminate information among project partners, stakeholders, and the larger public






Timeline

Fall 2011	✓ Confirm community participation in study ✓ Hire staff, recruit participants ✓ Develop work plan
Winter / Spring 2012	✓ Identify and assess energy system options ✓ Assess and project local biomass supply ✓ Select preferred options and investigate concerns
Summer 2012	✓ Environmental / lifecycle impact assessment ✓ Public outreach on supply chain issues
Fall 2012	✓ Public outreach on supply chain and financing issues ✓ Community meetings on findings and recommendations
Winter 2012	o Deliver final report

Project Structure and Approach

- Phase I
  - Local steering committee and study team identify options
  - Assess financial viability and availability of fuel supply
  - Select best options for further investigation
- Phase II
  - Life cycle assessment review (focus on emissions)
  - Environmental impacts (MN Forest GEIS)
  - Biomass supply logistics (forest to customer)
  - Public education and input
  - Support next steps

Phase II Dovetail/UMN reports

- *Pre-Feasibility Financial and Wood Supply Analysis for Biomass District Heating in Ely and Cook County, MN: University of Minnesota Report to Dovetail Partners, Inc*
- *Life Cycle Impacts of Heating with Wood in Scenarios Ranging from Home and Institutional Heating to Community Scale District Heating Systems*
- *Local Environmental Considerations Associated with Potential Biomass Energy Projects in Cook County and Ely*
- *Supply Chain Logistics and Concerns*
- *Fact sheets summarize findings for public*

http://www.dovetailinc.org/content/lccmr-supporting-community-driven-sustainable-bioenergy-projects

Major Findings

I. Financial and Wood Supply Analysis

- Recent technological innovations greatly improve bio-energy performance (efficiency, practicality)
- Optimal sizing for district heat is crucial (central core + heat density per linear foot of piping)
- Sustainable biomass supply in 60-mile radii zone
  - Estimated demand: 390 DT to 2,559 DT *(per installation)*
  - Estimated biomass supply for Ely and GM:

Resource	Ely	Grand Marais
50% timber residues	44,679 DT hogfuel	12,576 DT hogfuel
10% roundwood	34,309 DT clean chips	9,960 DT clean chips
Fuel treatment removal	Data not available	6,194 DT

- Additional engineering & business planning needed

II. Life Cycle Impacts

- Lower density of wood = higher emissions per unit of heat
- Direct emissions depend on feedstocks, boiler technology, and pollution controls
  - Clean, dry biomass feedstocks (pellets lower than chips)
  - Optimally sized, high-efficiency technology and automatic feeding
  - State of art emissions control
- Air emission estimates of the largest district heating options are below 10% of EPA/Clean Air Act thresholds, 2-14% of Minnesota Option D emission limits.
  - Air quality regulations for PM and other compounds could tighten.
- Indirect emissions (transportation & processing) can add 30 - 50% to non-local fuels (means pellets have higher emissions per unit of energy)
- Detailed information in fact sheets and reports

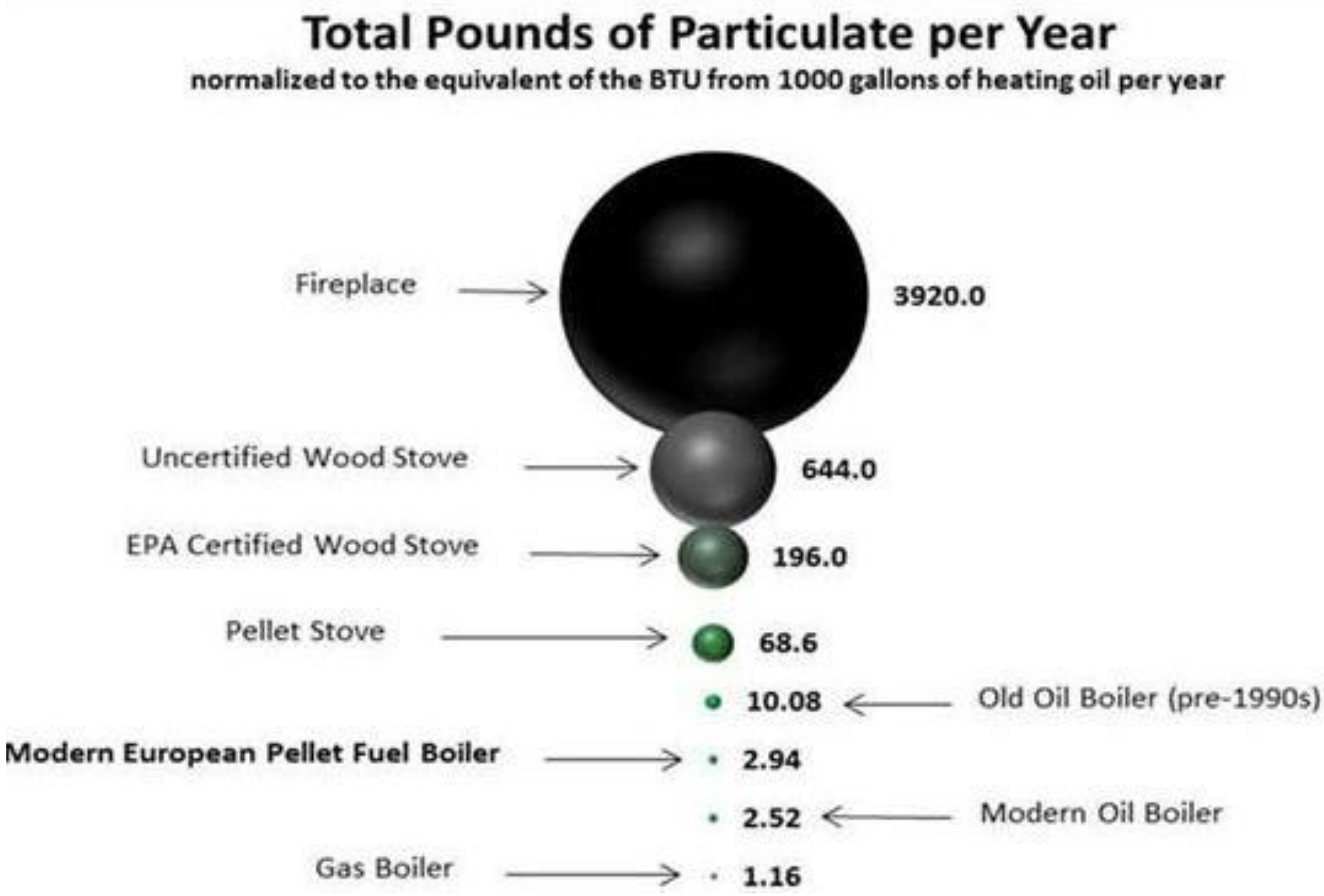
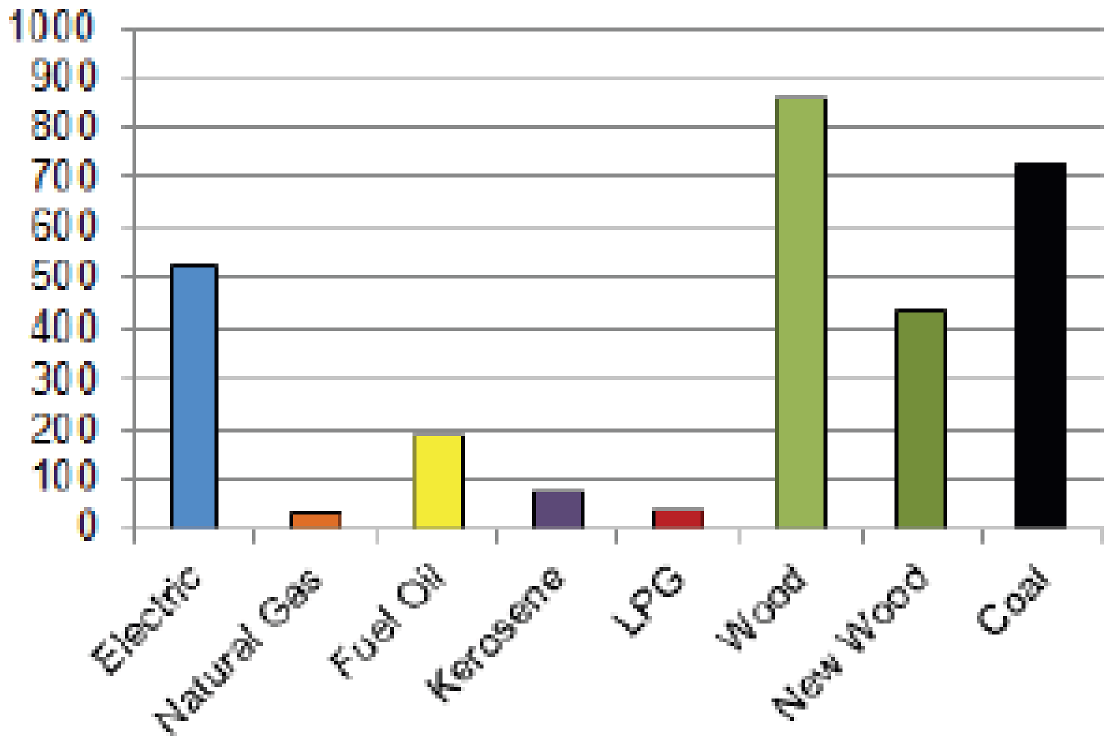
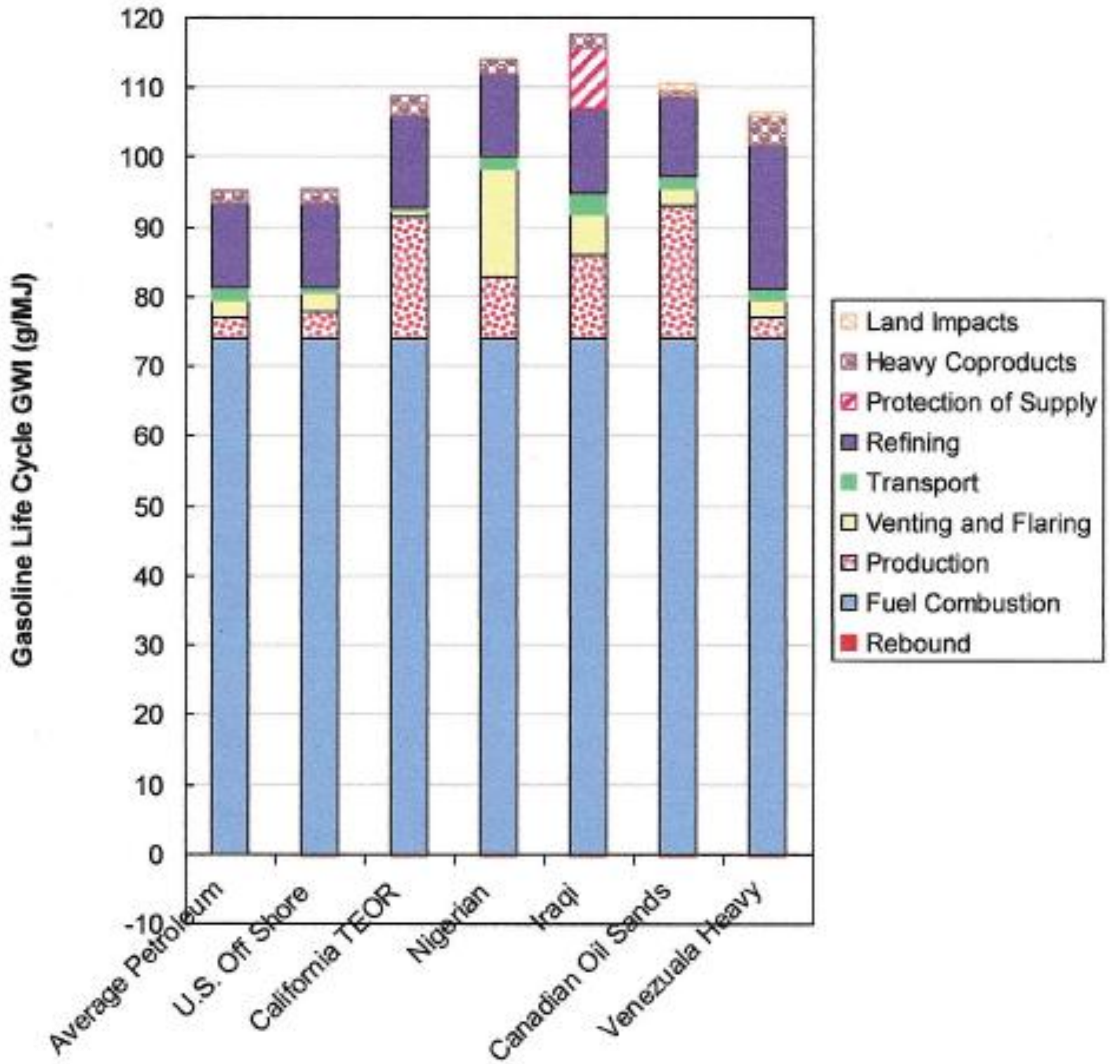

Total Pounds of Particulate per Year
normalized to the equivalent of the BTU from 1000 gallons of heating oil per year
Fireplace
3920.0
Uncertified Wood Stove
644.0
EPA Certified Wood Stove
196.0
Pellet Stove
68.6
10.08
Old Oil Boiler (pre-1990s)
Modern European Pellet Fuel Boiler
2.94
2.52
Modern Oil Boiler
Gas Boiler
1.16

Figure 16
Fine Particle Emissions per Quad of Heat Delivered



Source: Houck (1999).

Figure 6
Summary of GHG Emissions for Different Crude Oil Production Scenarios



Source: Unnasch (2009).

Table 2. Estimates of direct, on-site air emissions[1] of biomass energy options (short tons/year) based on reported emissions per MMBtu. *(Note: one short ton is equal to 2000 lbs.)*

Pollutant		SO_2	NO_X	PM_{10}	CO	CH_4	VOC	PAH	Fossil CO_2
Regulatory thresholds									
Standard permit (PTE)[2]		50	100	25	100	---	100	---	100,000
Option D permit[3]		50	50	50	50	---	50	---	100,000
Configurations									
Five hundred supplemental single-family stoves, each 35 MMBtu.[4]	Cordwood	0.36	1.81	13.59	127.29	14.95	62.93	0.69	---
	Pellets	0.36	1.81	2.49	22.66	0.14	3.97	0.00	---
Option 1: Vermillion Community College. Annual heat load 7,227 MMBtu.	Chips[5]	0.19	1.20	0.86	2.97	0.17	0.30	0.34	---
	Pellets	0.19	0.81	0.47	1.63	0.07	0.10	0.04	---
Option 2: District heat for E-B Community Hospital, Sibley Manor, ISD 696. Annual heat load 16,235 MMBtu.	Chips	0.43	2.71	1.93	6.67	0.38	0.67	0.75	---
	Pellets	0.43	1.82	1.06	3.67	0.16	0.22	0.10	---
Option 3A: District heat for E-BCH, SM, ISD 696 (above) plus approximately 15 businesses along Sheridan Street. Annual heat load 21,553 MMBtu	Chips	0.57	3.60	2.57	8.86	0.51	0.89	1.00	---
	Pellets	0.57	2.41	1.41	4.87	0.22	0.30	0.13	---

III. Environmental impacts

- Increased bio-energy could alter forestry practices positively and negatively in procurement zone
  - If bi-product of timber harvest, would reduce residuals at harvest site
  - If roundwood, increase timber harvest?
- Public concern expressed about impacts to water, air, habitat, aesthetic resources
- GEIS found no significant negative impacts at timber harvest rates that would adequately supply local bio-energy needs
- Application of MN Biomass Harvest Guidelines needed to avoid negative impacts to soils, forest structure, habitat values
- Training, consistent application, and monitoring needed to improve use of guidelines & better understand impacts

Table 8. Summary of Minnesota's Biomass Harvesting Guidelines

DO'S	DON'TS
During Biomass Harvesting:	***Avoid Biomass Harvesting:***
• Plan roads, landings and stockpiles to occupy a minimized amount of the site • Ensure that landings are in a condition to regenerate native vegetation after use, including tree regeneration • Avoid site re-entry to collect biomass after harvesting *(this reduces potential for soil compaction and damage to regeneration)* • Install erosion control devices where appropriate to reduce sedimentation of stream, lakes and wetlands • Retain and scatter at least one third of the fine woody debris on the site • Encourage native seed mixes and avoid introduction of invasive species • Retain slash piles that show evidence of use by wildlife • Leave all snags, retain stumps and limit disturbance of pre-existing coarse woody	• Within 25 feet of a dry wash bank, except for tops and limbs of trees • On nutrient-poor organic soils deeper than 24 inches *(These sites typically have sparse (25-75%) cover that is predominantly (>90%) black spruce and stunted (<30 feet high).)* • On aspen or hardwood cover types on shallow soils (8 inches or less) over bedrock • On erosion-prone sites (e.g. steep slopes of 35% or more) • In areas that impact sensitive native plant communities and where rare species are present • In riparian areas or leave tree retention clumps • In a manner that removes the forest floor, litter layer or root systems; these resources

IV. Logistics / Supply Chain

- Public forest managers expressed interest in new tools (and markets) to support forestry activities
- Presence of active logging labor force is critical factor in local bio-energy expansion
- Continued dialogue is needed on viable business plans for harvest, handling, processing biofuels

IV. Logistics / Supply Chain, ii

- Numerous businesses have (1) near-term plans to replace furnaces and (2) interest in biomass DE
- Viability of downtown extensions depend on how many businesses decide to participate

Fact sheets summarize findings for public outreach


Fact Sheet
Biomass Energy

Emissions and biomass energy in Northeast Minnesota

Fact Sheet
Biomass Energy

Forestry and biomass energy in Northeast Minnesota

Table 1. Biomass Feedstocks

Fact Sheet
Biomass Energy

Environmental Impacts of Biomass Harvesting and Wood Energy Production in Northeastern Minnesota

Northern Superior Upland Section

Next Steps

- Reports available on community and Dovetail websites
- Lessons learned, based on feedback from community meetings and partners, distributed statewide

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Questions / comments ?

Resource slides

Table 1. Modeled biomass systems and equipment specifications for Ely.

Configuration	Heat demand (non-peak) (MMBtu/yr)	Building connections	Fuel type	Annual biomass demand dry tons (wet tons)
Option 1: Vermilion Community College	7,680	0	Chips/Hog	527 (878)
Option 2: E-BCH, Sibley, ISD 696	16,235	3	Chips/Hog	1,754 (2,924)
Option 3A: Option 2 extension	21,381	18	Chips/Hog	2,559 (4,165)

[1]Assumes 55-60% of heat load with peaking backup for coldest days. [2]District heating portion of a CHP system; a stand-alone district heating system was not analyzed in the LHB report.

Table 2. Financial performance of proposed options for Ely.

	Option 1:	**Option 2:**	**Option 3A:**
Capital costs including hookup ($)	$1,934,318	$3,783,002	$5,459,348
Annual electricity sales ($)	$0	$0	$0
NPV project cost ($)	$2,601,514	$4,856,236	TBD
NPV savings (including PPA) ($)	$2,666,281	$5,996,704	TBD
Net Present Value ($)	$64,767	$1,140,469	$4,560,259
Simple payback period (years)	12	0	13.5
Biomass cost of heat ($/mmBtu)	$32	$26	$30
Current fossil fuel price ($/mmBtu)	$30	$29	$29
Maximum annual outlay ($)	$10,861	$0	TBD

[1]Including Power Purchase Agreement (PPA) for electricity sold.

[2]Cost of fossil fuel only; does not include the full cost of heating.