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Part I: STI PRODUCT DESCRIPTION

1. STI PRODUCT IDENTIFIERS (Separate multiples with ; space)
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    2. *DOE Award/Contract Number(s) : DE - FG36-05GO15168 (XXXX-XXXXXXXXX)
    3. Other Identifying Number(s):
2. *RECIPIENT/CONTRACTOR (ORGANIZATION) :

    Aroostook Band of Micmacs
3. *STI PRODUCT TITLE :

    U.S. Department of Energy Micmac Strategic Energy Planning Initiative, DE-FG36-05GO15168, Final Technical and Closeout Report
4. *AUTHOR(S) : (Separate multiples with ; space)

    Corey, Fred, E.
    - Authors E-Mail Addresses: (Separate multiples with ; space)

      fcorey@micmac-nsn.gov
5. *STI PRODUCT TYPE: Technical Report
    - Availability:
6. * PUBLICATION/ISSUE DATE:

    02/02/2007

    clear date
    - ○ Formatted Date: 02/02/2007 (MM/DD/YYYY)
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7. STI PRODUCT OR TECHNICAL REPORTING PERIOD: (mm/dd/yyyy): 10/01/2005 thru 12/31/2006

8. SPONSORING DOE PROGRAM OFFICE

   USDOE Assistant Secretary for Energy Efficiency and Renewable Energy (EE)

9. SUBJECT CATEGORIES: clear categories

   32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

   - Keywords:

10. DESCRIPTION/ABSTRACT:

    In February 2005 the Aroostook Band of Micmacs submitted a grant application to the U.S. Department of Energy's (DOE) Tribal First Steps Program. The purpose of the application was to request funding and technical assistance to identify and document Tribal energy issues, develop a Tribal energy vision, evaluate potential energy opportunities, and to develop an action plan for future Tribal energy activities. The grant application was subsequently funded by DOE, and the Aroostook Band of Micmacs hired an energy consultant to assist with completion of the project. In addition to identification and documentation of Tribal energy issues, and the development of a Tribal energy vision, the potential for wind energy development on Tribal land, and residential energy efficiency issues were thoroughly evaluated.

11. *INTELLECTUAL PROPERTY / DISTRIBUTION LIMITATIONS : (Must select at least one; if uncertain, contact your Contracting Officer (CO))

    1. Unlimited Announcement (The Government assumes no liability for disclosure of such d

    Access Limitations:

    clear access limitations

12. *RECIPIENT / CONTRACTOR POINT OF CONTACT Contact for additional information (contact or organization name to be included in published citations and contact to receive any external questions about the content of the STI product or the research contained therein)

    - *Name and/or Position: Fred E. Corey
    - *E-mail: fcorey@micmac-nsn.go
    - *Phone: (207) 764-7765
    - *Organization: Aroostook Band of Micmacs

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Submit

AROOSTOOK BAND OF MICMACS
7 NORTHERN ROAD
PRESQUE ISLE, MAINE 04769
(207) 764-1972

February 2, 2007

Ms. Lizana K. Pierce
Project Officer
Golden Field Office
1617 Cole Blvd.
Golden CO 80401-3305

Re: DE-FG36-05GO15168
Micmac Strategic Energy Planning Initiative

Dear Ms. Pierce:

The final technical and closeout report for the above referenced project has been completed. Please find enclosed one copy of the report entitled:

"U.S. DEPARTMENT OF ENERGY
MICMAC STRATEGIC ENERGY PLANNING INITIATIVE
DE-FG36-05GO15168
FINAL TECHNICAL AND CLOSEOUT REPORT."

We have enjoyed working with you on this project. If you have any questions or comments concerning this report, please feel free to contact me at (207) 764-7765.

Sincerely,

Fred E. Corey
Environmental Director

cc: Ms. Sarah DeWitt, Acting Tribal Administrator
Ms. Robin Suitter, Chief Financial Officer

enc: report

U.S. DEPARTMENT OF ENERGY

MICMAC STRATEGIC ENERGY PLANNING INITIATIVE
DE-FG36-05GO15168
FINAL TECHNICAL AND CLOSEOUT REPORT

MICMAC STRATEGIC ENERGY PLANNING INITIATIVE
DE-FG36-05GO15168
FINAL TECHNICAL AND CLOSEOUT REPORT

Executive Summary

In February 2005 the Aroostook Band of Micmacs submitted a grant application to the U.S. Department of Energy's (DOE) Tribal First Steps Program. The purpose of the application was to request funding and technical assistance to identify and document Tribal energy issues, develop a Tribal energy vision, evaluate potential energy opportunities, and to develop an action plan for future Tribal energy activities. The grant application was subsequently funded by DOE, and the Aroostook Band of Micmacs hired an energy consultant to assist with completion of the project. In addition to identification and documentation of Tribal energy issues, and the development of a Tribal energy vision, the potential for wind energy development on Tribal land, and residential energy efficiency issues were thoroughly evaluated.

Work Program Summary Plan

The following table represents a comparison of specific project tasks and actual project accomplishments:

Task	Sub-Task	Results
Project Reporting	Attend Meetings in Golden, CO	Attended Tribal Energy Meeting in October, 2006 and Presented on Project Results (see attached presentation).
	Ongoing Project Reporting	Submitted Periodic Project Reports to DOE (01/20/06, 04/26/06, 07/28/06 reports attached).
Form Energy Committee	Form and Assemble Energy Committee	Energy Committee Formed (see attached meeting minutes).
	Develop and Manage a Detailed Workplan	Detailed Workplan Developed (see attached workplan).
Research and Education	Prepare and Finalize Outlines	Outline Prepared and Finalized (see attached outline).
	Baseline Energy Use Analysis	Baseline Energy Use Analysis Completed (see

Task	Sub-Task	Results
		attached KEMA report).
	Energy Options Analysis	Energy Options Analysis Completed (see attached KEMA report).
	Review Session (Energy Committee)	Review Session Conducted (see attached energy committee meeting minutes).
	Presentation to Tribal Council	Presentation to Tribal Council Completed.
	Community Information Meeting	Community Information Meeting Conducted (see attached community meeting information).
	Finalize Reports	Reports Finalized (see attached KEMA report).
Develop Energy Vision	Facilitated Discussion (Energy Committee)	Energy Committee Discussions Facilitated (see attached meeting minutes).
	Development of a Draft Energy Vision	Draft Energy Vision Developed.
	Tribal Community Meeting	Tribal Community Meeting Conducted (see attached meeting minutes).
	Revised Draft Energy Vision	Energy Vision Revised.
	Tribal Council Guidance and Approval	Tribal Council Approved Energy Vision.
	Finalize Energy Vision	Energy Vision Finalized (see attached energy vision).
Develop Action Plan	Development of a Straw Action Plan	Straw Action Plan Developed.
	Facilitated Discussion and Review (Energy Committee)	Energy Committee Discussions Facilitated (see attached meeting minutes).
	Development of a Draft	Draft Action Plan

Task	Sub-Task	Results
	Action Plan	Developed.
	Tribal Council Guidance and Approval	Tribal Council Approved Action Plan.
	Finalize and Present Action Plan	Action Plan Finalized (see attached action plan).

Project Summary

As illustrated in the work program summary table above, all project activities were completed as specified in the grant application workplan. Key project findings included:

1. The Aroostook Band of Micmacs does not currently own property that can be characterized as having a commercial-grade wind resource. It may be possible to erect small wind towers to help offset residential and Tribal office building electrical needs, but the cost-effectiveness of wind tower installation is strongly dependent upon tax incentives and low-cost energy financing. Since the Tribe is continuing to acquire property to expand its land base, a potential wind power strategy for the Tribe could be to seek to acquire property that has a significant wind resource.
2. Existing Tribal housing stock and office buildings are generally well-insulated, with the greatest potential energy efficiency measures associated with replacement of old, inefficient electrical appliances, installation of "smart" thermostats, and replacement of incandescent light bulbs. The Aroostook Band of Micmacs Tribal housing program intends to develop an appliance replacement schedule to enable the Tribal community to realize energy efficiency benefits.
3. New planned Tribal construction should take advantage of energy efficiency innovations and green building design plans. The establishment of green-building codes by the Aroostook Band of Micmacs Tribal government can help to ensure that all future Tribal building construction projects will result in the most energy efficient, environmentally friendly, and environmentally-healthy (for building occupants) buildings possible.
4. The property that the Tribe is acquiring at the former Loring Air Force Base in Limestone, Maine includes massive energy infrastructure, including a fuels tank farm and coal handling system. As a result of the energy infrastructure associated with the property, and that of the local redevelopment authority, this property and project represents the greatest potential for development of a significant Tribal energy project. Future Tribal energy planning projects will be prioritized to focus on this extremely important Tribal asset.

ATTACHMENT LIST

Attachment 1	First Steps Closeout Presentation
Attachment 2	First Quarter 2006 Progress Report Narrative
Attachment 3	Second Quarter 2006 Progress Report Narrative
Attachment 4	Fourth Quarter 2006 Progress Report Narrative
Attachment 5	Energy Committee Meeting Minutes (November 14, 2005)
Attachment 6	Energy Committee Meeting Minutes (December 9, 2005)
Attachment 7	Energy Committee Meeting Minutes (May 18 / June 1, 2006)
Attachment 8	Draft Workplan
Attachment 9	Final Outline
Attachment 10	Baseline Energy Use Analysis
Attachment 11	KEMA Report
Attachment 12	Community Information Meeting Announcement
Attachment 13	Community Information Meeting Summary
Attachment 14	Tribal Energy Visioning Meeting
Attachment 15	Tribal Energy Vision
Attachment 16	Tribal Energy Action Plan

ATTACHMENT 1

FIRST STEPS CLOSEOUT PRESENTATION

Aroostook Band of Micmacs

Strategic Energy Planning Initiative

Presented by:

Fred Corey

Environmental Director

October 2006

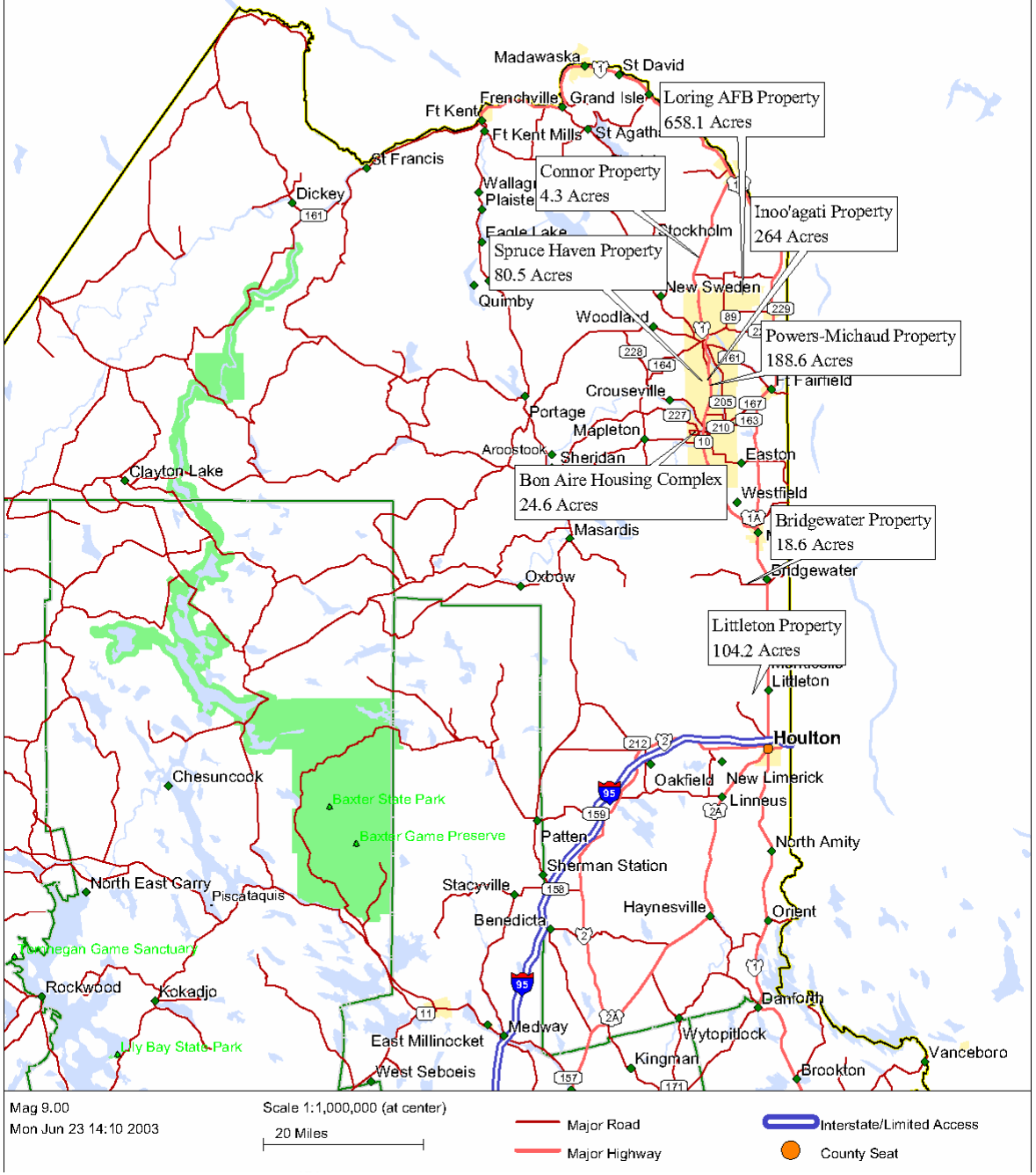
Overview

- **About the Aroostook Band of Micmacs**
- **Project Background and Introduction**
- **Project Goals and Objectives**
- **Summary of Report**
- **Vision Statement**
- **Discussion on Vision and Plan**
- **Next Steps**

Aroostook Band of Micmacs

- **Federally Recognized by Congress in 1991**
- **1,000 Enrolled Members**
- **Largest Maritime Tribe in Eastern Canada (50,000+ Members, 27 Reserves)**
- **Tribal Council form of Government (Elected body consists of Tribal Chief, Vice Chief, and 9 Tribal Council Members)**
- **Current land holdings include approx 800 acres non-BRAC acquired property**

Micmac Tribal Land Holdings (June 2003)



Project Partners

US DOE Tribal Energy Program

Aroostook Band of Micmacs

KEMA *(energy consultants)*

Lori Colombo *(planning consultant)*

Project Background and Introduction

- **US Department of Energy Grant**
  - **"First Steps Toward Developing Renewable Energy and Energy Efficiency on Tribal Lands"**
- **Maine among highest energy costs nationwide (approx 10,000 hdd, electricity approx $0.13 per kwH)**
- **Energy one of ABM highest expenses**
  - **Tribal government spends >$200K annually on energy and energy assistance programs**
- **Opportunities Evaluated:**
  - **Energy Efficiency (residential, commercial)**
  - **Renewable Energy (wind)**

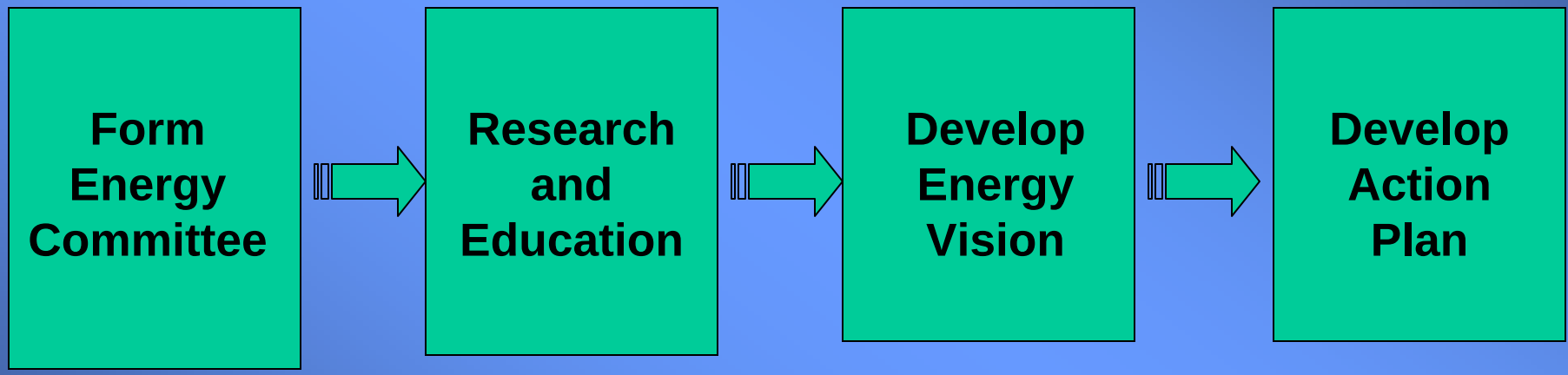
Project Goals and Objectives

- **Reduce Energy Costs**
- **Energy Independence**
  - **Independence from outside suppliers**
  - **Self-Determination**
- **Economic Development**
  - **Attract Businesses / Support Loring AFB Redevelopment**
  - **Job creation**
  - **Generate Tribal Revenue**

Community Benefits

- **Benefits for the Tribe:**
  - **Reduce energy costs to free up funds for other priorities**
  - **Greater self-sufficiency**
  - **Reduced reliance on imported fossil fuels**
- **Benefits for Individuals:**
  - **Lower energy bills**

Project Activities



Preliminary Research Findings

- **Energy efficiency audits find most buildings have only moderate efficiency upgrade opportunities**
- **Based on wind resource assessment, three of seven sites studied most promising for wind turbine siting**
  - **Wind resources are moderate**
  - **Grant financing important to economic feasibility**

Preliminary Findings: Energy Efficiency

- **Most energy efficiency savings in Presque Isle**
  - **largest and oldest buildings.**
  - **Majority of the tribe's energy expenditures**
- **Audits performed at:**
  - **36 Micmac – 2-family**
  - **26 Northern – 2-family**
  - **51 Micmac – single-family**
  - **52 Micmac – single-family**
  - **Housing & Real Estate Building – converted 2-family**
  - **Head Start Building – converted 2-family**


SUNSET

Energy Efficiency Audit Findings

Building	36 MicMac	51 MicMac	52 MicMac	26 Northern	Head Start	Housing/ R.E.
Smart Thermostat	3.3	3.8	3.9	3.7	6.8	6.2
Lighting Retrofit	3.1	3.0	3.0	3.1	2.3	2.4
Refrigerator Replacement	1.5	-	2.8	-	1.6	1.6
HWH Pipe Insulation	4.9	5.9	5.9	4.9	10.4	5.5
R-30 Floor Insulation	-	1.2 (R-19)	1.2 (R-19)	-	4.9	4.7
Sillbox Insulation	7.7	-	-	7.8	-	-
Total Estimated Initial Cost	$879	$1899	$2449	$329	$5041	$4514
Life Cycle SIR	2.6	1.5	1.8	4.4	4.1	4.2

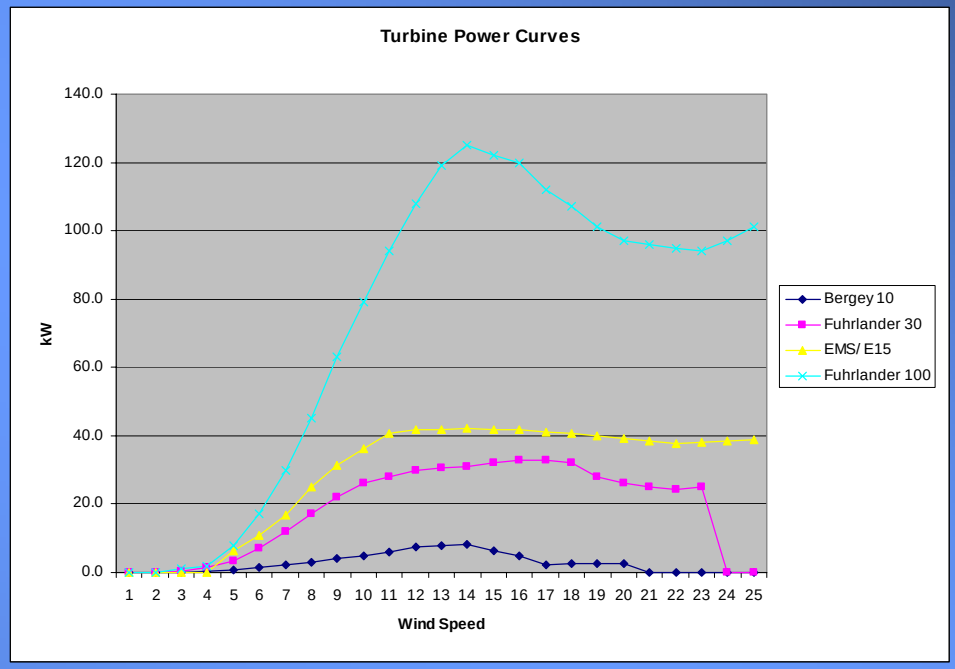
Energy Efficiency Audit Findings

	Residential	Commercial
Average Total Cost of Recommended Measures	$ 1,389	$ 4,784
Average Annual Energy Savings	$ 307	$ 2,265
Approximate Annual Energy Costs	$ 4700	$ 11,750
Percent Annual Savings	6.5 %	19.2%
Simple Payback in Years	4.1	2.1

KEMA recommends setting priorities based upon the individual measures with the highest SIRs.

Wind Resource Assessment

- **Four turbine options were explored:**
  - **Bergey 10 – 10 kW**
  - **Fuhrlander30 - 30 kW**
  - **EMS/E15 – 35 kW**
  - **Fuhrlander 100 – 100 kW**
- **Power curves show projected production at different wind speeds**

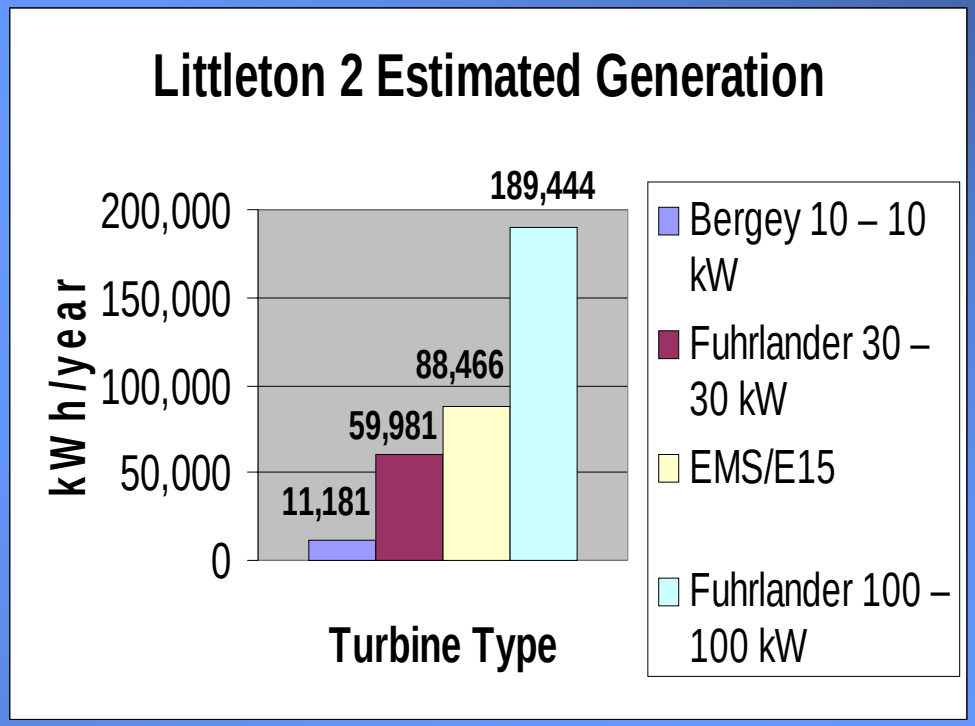


Financial Analysis – Best Case

	Admin Building Fuhrlander 100	Caribou 1 Furhlander 30	Littleton 2 Fuhrlander 30
Net Annual Energy Yield (kWh)	159,059	65,348	69.602
Total Project Cost	$ 327,250	$134,750	$134,750
Average Annual Cash Flow ($000)	$ 7.2	$2.9	$3.9
Cumulative Cash Flow ($000)	$ 143	$58	$78
Net Present Value ($000)	$ 64	$26	$38
Positive Cash Flow Each Year?	Yes (except year 1)	No	Yes

Wind Resource Assessment: "Littleton 2"

- **Littleton 2 located on residential street at top of hill beside homes**
- **Strongest wind resources exist at Littleton 2 – 6.3 m/s average wind speed at 50 meters**
- **Maximum generation at the site is 189,444 kWh per year**
  - **Equivalent of 54% of total electric load for ABM tribally-owned buildings**



Vision Statement

The Aroostook Band of Mi'Gmaq/Micmacs embrace energy efficiency and renewable energy to become increasingly energy independent and to reduce costs. Using proven and new technologies, the tribe harnesses natural resources from the wind, the land and the sun to provide half of its energy needs. New housing is designed and constructed with energy efficient features to reduce tribal members' energy bills. The tribe's renewable energy and energy efficiency programs have reduced energy bills by over 25%.

Next Steps

- **Draft Five Year Strategic Plan that Includes The Following Activities:**
  - **Energy efficiency**
    - Complete Audits on Bon-Aire Housing Units
    - Conduct Appliance Inventories/Replacements
    - Extensive Energy Audit Training for Tribal Maintenance Personnel
    - Weatherization Training for Tribal Maintenance Personnel
    - Upgrades for Bon-Aire Housing Units
    - Incorporate Green Building Techniques into Future Facility Development Plans (develop building codes)

Next Steps (2)

- **Renewable Energy**
  - **Conduct Wind Studies on Bon-Aire & Littleton Sites**
  - **Develop Geothermal Pilot Project for Evaluating Feasibility of Residential Geothermal Projects**
  - **Examine Potential for Wind Energy on Loring Industrial Site**
  - **Re-examine Potential of Wind Energy Payback on Caribou Site After Creating A Master Site Development Plan**

Next Steps (3)

- **Identification of Project Funding Sources**
  - **US DOE First Steps Feasibility Grant**
  - **USDA Renewable Energy Program (Implementation Following Feasibility)**
  - **Clean Renewable Energy Bonds (CREBS)**
  - **Sale of Green Tags**
  - **HUD ICDBG Housing/Community Facilities Grant for Implementation of Energy Efficiency in New & Existing Tribal Facilities**

Next Steps (4)

- **Evaluate reuse options at Loring Air Force Base Property**
- **Incredible opportunity for energy project**
  - **7.5 million gallons of storage tank capacity**
  - **Coal storage yard with hoppers and associated infrastructure**
  - **Pipeline connection to deep-water port on coast, railroad spur**
  - **Large potential source of biomass**

Questions

- **Russell Dennis, Project Director**
  Aroostook Band of Micmacs
  7 Northern Road
  Presque Isle, Maine 04769
  (207)764-1972 Ext. 22
  rdennis@micmac-nsn.gov
  www.micmac-nsn.gov

ATTACHMENT 2

FIST QUARTER 2006 PROGRESS REPORT NARRATIVE

Tribal Renewable Energy - Quarterly Progress Report

Project Title: Micmac Strategic Energy Planning Initiative

Covering Period: January 1, 2006 through March 31, 2006
Date of Report: April 26, 2006

Recipient Organization: Aroostook Band of Micmacs

Award Number: DE-FG36-05GO15168

Partners: Lori Colombo, Kema, Inc. (Ryan Chaytors)

Technical Contact: Ryan Chaytors, Kema, Inc. 67 South Bedford Street, Suite 201E Burlington, MA 01803 (781)418-5717 Phone (781)229-4867 Fax ryan.chaytors@us.kema.com

Business Contact: Russell Dennis 7 Northern Road Presque Isle, ME 04769 (207)764-1972 Phone (207)764-7667 Fax rdennis@micmac-nsn.gov

DOE Project Officer: **Lizana K. Pierce**, lizana.pierce@go.doe.gov

---

1. **Project Objective:** Develop a strategic energy plan in order to reduce energy costs, promote economic development on tribal lands, move towards energy self-sufficiency and promote energy security,

2. **Background:** The Micmac Tribal Council seeks to have a strategic energy plan developed for the reasons highlighted above. The project will help the tribe develop an energy vision that considers a balanced portfolio of energy resources and maximizes energy efficiency improvements. It also serves to promote sustainable economic development and to develop an action plan to address current and future energy needs for the tribe.

3. **Patents:** None.

4. **Publications / Presentations:** Russell Dennis, Project Manager, was invited and attended the Sustainable Maine Conference Sponsored by peace Action Maine. It was held at the University of Maine at Farmington on Saturday March 18, 2006.The conference dealt with a wide range of issues including the environment, labor, peace and justice, education, small business, agriculture, and sustainable energy.

   My presentation was included as part of the sustainable energy technologies & climate change breakout session. It was uniquely positioned because the other speakers were with different renewable energy consulting firms talking about projects they were engaged in and services they could offer. The Aroostook Band of Micmacs represented the only community or government of any type engaged in such a study or effort.

5. **Progress in Past Quarter and Current Status:** Our staff and consulting Partners worked very hard this quarter to continue gathering relevant information for our on site audits. After a complete review of information compiled last quarter an audit schedule was devised for tribal facilities and housing sites, along with a wind resources assessment schedule.

   The Loring AFB site was removed from the schedule due to time restraints and FAA height restriction on one end of the tribal property. After a complete review of wind resources, three of seven sights identified by the tribe, showed some limited promise. On the basis of our initial assumptions, four turbines were examined for the potential energy they could provide. The EMS/E15 – 35kW and the Fuhrlander 100 -100 kW would provide the largest share of power on the three sites.

   I went back to reexamine some of the project assumptions for accuracy after somewhat disappointing results given the cost of electricity and the expected returns on the investment. Since the sites reviewed were not going to house any facilities of a commercial or industrial nature, this would result in lower costs per kW hour. I also asked our team to reexamine the wind resource at Loring since it appears to offer some promise.

   The siting of turbines could be achieved in lower lying areas away form runways and still provide power to some of the tribes industrial facilities and proposed greenhouse facilities on the base. The team is currently recalculating our results based on this new information.

6. **Plans for Next Quarter:** Reports based on the changes made this quarter should be complete and in the hands of the energy committee for review by mid May. We will begin work on the energy vision and will present the first draft to the tribal community before the end of the quarter for comment. The report will contain valuable information on the types of financial and programmatic options available to the tribe to finance such projects.

   Grant fund sources will be targeted to post anemometers at the three most promising sites, and at Loring Air Force Base should our analysis prove to provide some evidence of potential success. We will sign up for the loan program at NREL for the anemometers and seek grant funds for installation and monitoring of the equipment. We will begin formulating the action plan based on the information we have and will make adjustments according to the desires of the Micmac Community as we move along.

Task Schedule

Task Number Per Statement of Work	Title or Brief Task Description	Task Completion Date				Progress Notes
		Original Planned	Revised Planned	Actual	Percent Complete	
1	Project Reporting and Meeting Attendance	September 30, 2006			50%	Still need to generate reports based on findings + Progress reports
2	Form Energy Committee Develop & Manage Detailed Work plan	February 1, 2006		March 30, 2006	100%	Community Meeting Schedule and Dates to Draft Energy Vision Still need to be set
3	Research and Education	March 31, 2006	Jun30, 2006		50%	All Data gathered and being processed. Options need to be disseminated in Community Meetings once Reports are Complete
4	Develop an Energy Vision	June 30, 2006	July 31, 2006			Draft Vision should be complete by June 30, 2006 It must be presented to the community for comments prior to finalization
5	Develop an Action Plan	September 30, 2006				
7						
8						
9						
10						

Current Budget Period: 10/01/05-09/30/06

Spending Schedule

Current Quarter: 01/01/06-03/31/06

Budget Category	Approved Budget	Project Expenditures	
		This Quarter	Cumulative to Date
Personnel	8372	1752	4650
Fringe Benefits	2344	526	1395
Travel	8458	818	2907
Equipment	0	0	0
Supplies	0	0	0
Contractual	59420	16825	19795
Construction	0	0	0
Other	0	0	0
Total Direct Charges	83594	19921	28747
Indirect Charges	5750	2043	2875
Total	89344	21964	31622
DOE Share ($, %)		19686, 90	25577, 81
Cost Share ($, %)		2278, 10	6045, 19

Cost Share Contributions Schedule

Funding Source	Approved Cost Share		This Quarter		Cumulative to Date	
	Cash	In-Kind	Cash	In-Kind	Cash	In-Kind
Staff Project Time, Salaries		8372		1752		4650
Staff Project Time, Fringe Benefit		2344		526		1395
Total						
Cumulative Cost Share Contributions					6045	

Comments:
(Specify the nature and method of valuation for all in-kind cost share contributions and any additional information.)

Name of Recipient:

Project Spending and Estimate of Future Spending							
Quarter	**From**	**To**	**Estimated Federal Share of Outlays***	**Actual Federal Share of Outlays**	**Estimated Recipient Share of Outlays***	**Actual Recipient Share of Outlays**	**Cumulative Actual Outlays (Federal + Recipient)**
	Start	9/30/04	Note 1		Note 1		
4Q04	10/1/04	12/31/04	Note 2		Note 2		
1Q05	1/1/05	3/31/05					
2Q05	4/1/05	6/30/05					
3Q05	7/31/05	9/30/05					
4Q05	10/1/05	12/31/05	19646	5891	2679	3767	9658
1Q06	1/1/06	3/31/06	19646	19686	2679	2278	21694
Etc.							
Totals			**39292**	**25577**	**5358**	**6045**	**31622**

* Update quarterly

General Note: DOE Laboratory partner spending should not be included in the above table. If a DOE Laboratory is a partner, report their spending and spend plan information in the table below (use separate tables if multiple DOE Laboratories are involved).
General Note: The information in this table should be consistent with the information provided in section 10 of the quarterly financial status reports (SF269 or SF269A).
Note 1: Leave blank. Only the actual DOE/Cost Share amounts spent through the latest completed quarter are needed.
Note 2: Amount for this quarter and subsequent quarters should be updated as necessary on a quarterly basis. Estimates need to be provided for the entire project. If spending for a given quarter is different than estimated, then the remaining quarter's estimates should be updated to account for the difference. Total DOE and Cost Share amounts should be the same as the Award amount.

ATTACHMENT 3

SECOND QUARTER 2006 PROGRESS REPORT NARRATIVE

Tribal Renewable Energy - Quarterly Progress Report

Project Title: Micmac Strategic Energy Planning Initiative

Covering Period: April 1, 2006 through June 30, 2006
Date of Report: July 28, 2006

Recipient Organization: Aroostook Band of Micmacs

Award Number: DE-FG36-05GO15168

Partners: Lori Ribeiro Colombo, Kema, Inc

Technical Contact: Ryan Chaytors, Kema, Inc. 67 South Bedford Street Suite 201E Burlington, MA 01803 (781)418-5717 Phone (781)229-4867 Fax ryan.chaytors@us.kema.com

Business Contact: Russell Dennis 7 Northern Road Presque Isle, Maine 04769 (207)764-1972 Phone (207)764-7667 Fax rdennis@micmac-nsn.gov

DOE Project Officer: **Lizana K. Pierce**, lizana.pierce@go.doe.gov

---

1. **Project Objective:** Develop a strategic energy plan in order to reduce energy costs, promote economic development on tribal lands, move towards energy self-sufficiency, and promote.

2. **Background:** The Micmac Tribal Council seeks to have a strategic energy plan developed for the reasons highlighted above. The project will help the tribe develop an energy vision that considers a balanced portfolio of energy resources and maximizes energy efficiency improvements. It also serves to promote sustainable economic development and to develop an action plan to address current and future energy needs for the tribe.

3. **Patents:** None

4. **Publications / Presentations:** The only presentations for the quarter were made to the tribal community with meetings held on the Northern and southern ends of the tribe's service area (Aroostook County). Those were held to present and interim report on the findings of the energy audits and preliminary wind studies

5. **Progress in Past Quarter and Current Status:** We have made a good deal of progress in approaching our final goals having put together the preliminary report with our findings in both the supply and demand sides of the energy program we are looking to implement. Lori Ribeiro and project manager Russ Dennis conducted the community meetings to review those findings and present a draft energy vision for

input and approval. Our opportunities on the supply side turned out to be less than we had hoped for due to a modest wind resource. We selected three of seven sites that were identified as possibly having the best potential for wind resource development. These sites also are those where we have the highest current usage of power.

Weatherization measures were included late in the proceedings due to some delays in acquiring cost data from local contractors and the local county action agency that oversees weatherization programs in our service area. Facilities audited were all on our headquarters campus at the Bon Aire site. Housing units at our Caribou, Maine and Littleton, Maine sites were omitted, as were the Health Department and Tribal Administration offices due to the short period of time the structures have been in service. Due to design and planning these were determined to be very energy efficient with little chance of realizing significant savings.

We have been given the data collected for weatherization on current pricing to customize the Weatherization Assistant program that is used nationally to plan expenditures for these programs, along with technical instruction on how to port the local data into the program so that it will be available for future use. Our next steps include incorporation of an action plan along with a final vision and goals into a strategic plan to be incorporated into the final report.

6. **Plans for Next Quarter:** Obtain permits for the placement of towers on the three selected sites, contact NREL and the state energy programs to acquire met towers through their loan programs to collect wind data on each site, conduct site specific energy audit training for selected tribal members to audit the remaining structures in the Bon Aire housing project. The action plan that will be developed will provide time lines for future activities. Our final report with deliverables should be available by September 30, 2006.

Task Schedule

Task Number Per Statement of Work	Title or Brief Task Description	Task Completion Date				Progress Notes
		Original Planned	Revised Planned	Actual	Percent Complete	
1	Project Reporting and Meeting Attendance	September 30, 2006	N/A		80%	One more Community Meeting and two more Special Tribal Council meetings to Strategic Plan
2	Form Energy Committee Develop & Manage Detailed Work Plan	February 1, 2006		March 30, 2006	100%	
3	Research and Education	March 31, 2006	June 30, 2006	June 15, 2006	100%	All information presented with only final reporting needed to complete project
4	Develop and Energy Vision	June 30, 2006	July 31, 2006		75%	Action plan activities and final report needed prior to final approval of strategic plan by Micmac tribal council and community
5	Develop an Action Plan	September 30, 2006			50%	Most of planned activities identified, timelines and resource requirements need to be finalized and incorporated into final report
7						
8						
9						
10						

Current Budget Period: 10/01/05 to 09/30/06

Spending Schedule

Current Quarter: 04/01/06 – 06/30/06

Budget Category	Approved Budget	Project Expenditures	
		This Quarter	Cumulative to Date
Personnel	8372	2913	7563
Fringe Benefits	2344	816	2211
Travel	8458	1017	3924
Equipment	0	0	0
Supplies	0	0	0
Contractual	59420	18221	38016
Construction	0	0	0
Other	5000	1597	1597
Total Direct Charges	83594	24564	53311
Indirect Charges	5750	1438	4313
Total	89344	26002	57624
DOE Share ($, %)		86	83
Cost Share ($, %)		14	17

Cost Share Contributions Schedule

Funding Source	Approved Cost Share		This Quarter		Cumulative to Date	
	Cash	In-Kind	Cash	In-Kind	Cash	In-Kind
Staff Project Time, Salaries		8372		2913		7563
Staff Project Time, Fringe Benefit		2344		816		2211
Total		10716		3728		9774
Cumulative Cost Share Contributions					**9774**	

Comments:
(Specify the nature and method of valuation for all in-kind cost share contributions and any additional information.)

Name of Recipient:

Project Spending and Estimate of Future Spending							
Quarter	**From**	**To**	**Estimated Federal Share of Outlays***	**Actual Federal Share of Outlays**	**Estimated Recipient Share of Outlays***	**Actual Recipient Share of Outlays**	**Cumulative Actual Outlays (Federal + Recipient)**
	Start	9/30/04	Note 1		Note 1		
4Q04	10/1/04	12/31/04	Note 2		Note 2		
2Q06	1/1/05	3/31/05	19646	22274	2679	3728	26002
2Q05	4/1/05	6/30/05					
3Q05	7/31/05	9/30/05					
4Q05	10/1/05	12/31/05	19646	5891	2679	3767	9658
1Q06	1/1/06	3/31/06	19646	19686	2679	2278	21964
Etc.							
Totals			**58938**	**47851**	**8037**	**9774**	**57624**

* Update quarterly

General Note: DOE Laboratory partner spending should not be included in the above table. If a DOE Laboratory is a partner, report their spending and spend plan information in the table below (use separate tables if multiple DOE Laboratories are involved).
General Note: The information in this table should be consistent with the information provided in section 10 of the quarterly financial status reports (SF269 or SF269A).
Note 1: Leave blank. Only the actual DOE/Cost Share amounts spent through the latest completed quarter are needed.
Note 2: Amount for this quarter and subsequent quarters should be updated as necessary on a quarterly basis. Estimates need to be provided for the entire project. If spending for a given quarter is different than estimated, then the remaining quarter's estimates should be updated to account for the difference. Total DOE and Cost Share amounts should be the same as the Award amount.

ATTACHMENT 4

FOURTH QUARTER 2006 PROGRESS REPORT NARRATIVE

Tribal Renewable Energy - Quarterly Progress Report

Project Title:	Micmac Strategic Energy Planning Initiative
Covering Period:	October 1, 2005 through December 31, 2005
Date of Report:	January 20, 2006
Recipient Organization:	Aroostook Band of Micmacs
Award Number:	DE-FG36-05GO15168
Partners:	Lori Colombo, Kema, Inc. (Ryan Chaytors)
Technical Contact:	Ryan Chaytors, Kema, Inc. 67 South Bedford Street, Suite 201E Burlington, MA 01803 (781)418-5717 Phone (781)229-4867 Fax ryan.chaytors@us.kema.com
Business Contact:	Russell Dennis 7 Northern Road Presque Isle, ME 04769 (207)764-1972 Phone (207)764-7667 Fax rdennis@micmac-nsn.gov
DOE Project Officer:	**Lizana K. Pierce**, lizana.pierce@go.doe.gov

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1. **Project Objective:** Develop a strategic energy plan in order to reduce energy costs, promote economic development on tribal lands, move towards energy self-sufficiency and promote energy security,

2. **Background:** The Micmac Tribal Council seeks to have a strategic energy plan developed for the reasons highlighted above. The project will help the tribe develop an energy vision that considers a balanced portfolio of energy resources and maximizes energy efficiency improvements. It also serves to promote sustainable economic development and to develop an action plan to address current and future energy needs for the tribe.

3. **Patents:** None.

4. **Publications / Presentations:** None.

5. **Progress in Past Quarter and Current Status:** We have been able to successfully disseminate information on this program in order to attract participation on a tribal energy committee to spearhead this project. Baseline information has been gathered by many departments within the tribal government to assist in the process of creating a work plan for energy audits and education of tribal community members. The tribe compiled detailed usage and expenditure data (electricity and fuel oil) for several tribally owned buildings and a sample of housing units. The consultants also obtained building layouts and construction plans from the tribe in order to target

buildings for energy efficiency audits. The tribe worked with the consultants to begin to assess opportunities for wind energy. The tribe provided data from an anemometer as well as a tour of potential locations for turbines.

Members of the program staff and project partners attended the Tribal Energy Program Review Meeting in Mid October 2005 for the purpose of networking and presenting their projects to other awardees conducting projects under this funding umbrella. The meeting was very informative providing valuable experiences and program contacts.

6. **Plans for Next Quarter:** We will use the baseline data to develop work plans for our energy audits. We will also develop and analyze more detailed information to assess wind energy opportunities. After these are conducted we will examine our energy options and create a draft vision based on our findings. This information will be presented to tribal council and in our first community forum for feedback and adjustment.

Task Schedule

Task Number Per Statement of Work	Title or Brief Task Description	Task Completion Date				Progress Notes
		Original Planned	Revised Planned	Actual	Percent Complete	
1	Project Reporting and Meeting Attendance	September 30, 2006			10%	Still need to generate reports based on findings + Progress reports
2	Form Energy Committee Develop & Manage Detailed Work plan	February 1, 2006			65%	Will be complete once audit schedule has been finalized
3	Research and Education	March 31, 2006			10%	Awareness of program and interest in participation solidified
4	Develop an Energy Vision	June 30, 2006				
5	Develop an Action Plan	September 30, 2006				
7						
8						
9						
10						

Current Budget Period: 10/01/06-09/30/06

Spending Schedule

Current Quarter: 10/1/05-12/31/05

Budget Category	Approved Budget	Project Expenditures	
		This Quarter	Cumulative to Date
Personnel	8372	2898	2898
Fringe Benefits	2344	869	869
Travel	8458	2089	2089
Equipment	0	0	0
Supplies	0	0	0
Contractual	59420	2970	2970
Construction	0	0	0
Other	0	0	0
Total Direct Charges	83594	8826	8826
Indirect Charges	5750	832	832
Total	89344	9658	0
DOE Share ($, %)		5891, 61	5891, 61
Cost Share ($, %)		3767, 39	3767, 39

Cost Share Contributions Schedule

Funding Source	Approved Cost Share		This Quarter		Cumulative to Date	
	Cash	In-Kind	Cash	In-Kind	Cash	In-Kind
Staff Project Time, Salaries		8372		2898		2898
Staff Project Time, Fringe Benefit		2344		869		869
Total						
Cumulative Cost Share Contributions					3767	

Comments:
Staff time calculated at an average of $16.10 per hour with fringe benefits calculated at 30% of salaries.

Name of Recipient:

Project Spending and Estimate of Future Spending							
Quarter	**From**	**To**	**Estimated Federal Share of Outlays***	**Actual Federal Share of Outlays**	**Estimated Recipient Share of Outlays***	**Actual Recipient Share of Outlays**	**Cumulative Actual Outlays (Federal + Recipient)**
	Start	9/30/04	Note 1		Note 1		
4Q04	10/1/04	12/31/04	Note 2		Note 2		
1Q05	1/1/05	3/31/05					
2Q05	4/1/05	6/30/05					
3Q05	7/31/05	9/30/05					
4Q05	10/1/05	12/31/05	19646	5891	2679	3767	9658
1Q06	1/1/06	3/31/06					
Etc.							
Totals			**19646**	**5891**	**2679**	**3767**	**9658**

* Update quarterly

General Note: DOE Laboratory partner spending should not be included in the above table. If a DOE Laboratory is a partner, report their spending and spend plan information in the table below (use separate tables if multiple DOE Laboratories are involved).
General Note: The information in this table should be consistent with the information provided in section 10 of the quarterly financial status reports (SF269 or SF269A).
Note 1: Leave blank. Only the actual DOE/Cost Share amounts spent through the latest completed quarter are needed.
Note 2: Amount for this quarter and subsequent quarters should be updated as necessary on a quarterly basis. Estimates need to be provided for the entire project. If spending for a given quarter is different than estimated, then the remaining quarter's estimates should be updated to account for the difference. Total DOE and Cost Share amounts should be the same as the Award amount.

ATTACHMENT 5

ENERGY COMMITTEE MEETING MINUTES (NOVEMBER 14, 2005)

Aroostook Band of Micmacs

Memo

To: Fred Corey, Shannon Kirk, Kelly Langley, Robert Muise, Eldon Espling, Gary Race Sarah Dewitt, Richard Dyer

From: Russell Dennis, Energy Committee Project Chair

CC: Lori Colombo

Date: January 30, 2009

Re: Meeting Minutes from November 14, 2005

This is the first meeting of the ABM Energy Committee, formed to carry out the proposed activities within the scope of the First Steps Toward Renewable Energy on Tribal Lands Program funded by the US Department of Energy earlier this year. The energy committee will, with the help of private consultants, study the energy needs of the Micmac community and facilitate the development of a strategic tribal energy plan. Our goal is for the plan to contain widespread community support to develop programs that will make the Micmac community free of dependence upon outside sources to meet their energy needs.

We hope to create jobs and spur economic development while respecting the Earth and protecting the environment for future generations of Micmacs. The project consultants are Lori Colombo, and Kema, Inc. of Massachusetts. Lori's role is primarily acting as a facilitator for community meetings and assisting in the development of reports and other end products for the project. Kema will conduct energy audits on our facilities and train tribal personnel on simple techniques to perform basic energy audits. We discussed the following items that require follow up action

1. Identify the location of tribal facilities and housing units for energy audits

2. Discuss assignment of specific tasks to members of the energy committee to ensure that things keep moving

3. Find out what types of equipment Kema, Inc will be using to conduct the audits, and whether or not it is financially feasible for the tribe to purchase these items. In addition to how in depth the audits will be, we need to find out how much time Kema has allotted to complete on site work, since travel time has to be factored into the equation.

4. Task the consultants with assisting us to identify sources of funding to complete the projects needed to reach our energy goals and to implement the action plan developed to reach them.

5. Gather building plans for facilities and newer housing as needed by Kema to review prior to on site audits

6. Look into acquiring the data from the studies completed on the Mars Hill Wind Project

7. Develop a list of energy efficient builders and contractors

8. Find out what type of consent forms are needed by various energy companies in the area to acquire usage data from tribal members and what their processes are for gaining that consent

9. Data required from the finance office includes expenditures over the last 12 months for fuel oil, electricity, propane, and wood with breakdowns for tribal facilities, social services, and admin account expenditures.

10. Our next meeting will take place on December 5, 2005 in the tribal council chambers of the admin building Copies of the grant proposal will be distributed to members who have not received one at that time.

ATTACHMENT 6

ENERGY COMMITTEE MEETING MINUTES (DECEMBER 9, 2005)

Memorandum

To: ABM Energy Committee Members

CC: Lori Colombo, Ryan Chaytors

From: Russell Dennis

Date:

Re: Meeting Minutes for December 9, 2005

We had a small and enthusiastic crowd for our second meeting which we spent primarily planning out our initial information gathering processes. The following is a basic outline of the information we need to obtain prior to an onsite visit by Ryan Chaytors and his team from Kema. Inc. to conduct energy audits on tribal homes and facilities:

Accounting & Finance

1. Energy expenditures by type over the last five years made by the tribe
2. Energy bills and usage over the last five years, broken down by site or complex
3. Aggregate totals of expenditures by fuel type
4. Breakdown of programs making those expenditures

Tribal Facility Managers

1. Detailed Information on the number and types of buildings owned and operated by the tribe
    a. **Russell Dennis**
    b. **Gary Race**
    c. **Steve Fitzpatrick**
2. A facility manager contact list – **Russell Dennis**
3. Detailed specifications on tribal buildings and housing, including information on builder permit applications, construction permits, and code filings)
    a. Russell Dennis – Admin Building
    b. John Ouellette – I.H.S. Building, Littleton Clinic, Behavioral Health Facility
    c. Steve Fitzpatrick – Bonaire Housing, Littleton and Caribou New Housing Construction Projects, 701
    d. Gary Race – Spruce Haven, Head Start, Elders Building (with Steve Fitzpatrick)
4. Identify facilities for onsite energy audits
    a. Russell Dennis (with members of committee) for Tribal Facilities
    b. Steve Fitzpatrick – Residential Audits

Environmental & Natural Resources

1. Wind data for the Presque Isle site
2. Topographical Maps of all tribal properties

Lori Colombo is planning a visit on December 14 & 15, 2005 to gather as much of this information as we are able to prepare within this short timeframe. Ryan and his team from Kema will review this information and use it as a basis for planning their visit which will hopefully take place in late January 2006 to conduct the audits.

I am also gathering data for inclusion in the quarterly progress report that must be submitted to the US Department of Energy in January. The next meeting of the Tribal Energy Committee will take place on Wednesday January 25, 2006 at 9:00 a.m. in the Tribal Council Chambers.

ATTACHMENT 7

ENERGY COMMITTEE MEETING MINUTES (MAY 18 / JUNE 1, 2006)

ABM Energy Committee

Memo

To: ABM Energy Committee

From: Russell Dennis, Project Manager

CC: Lori Ribeiro, Ryan Chaytors, Chris

Date: January 30, 2009

Re: Consolidated Meeting Minutes for May 18, 2006 and June 1, 2006

May 18, 2006

Attendees for today's meeting included Gary Race, Melanie Philbrook, Lori Ribeiro, Ryan Chaytors and I. We discussed several items and outlined several follow up activities that needed to be accomplished prior to our next meeting.

1. Our first order of business was a preliminary review of the project report in which all of the wind study data was included. We are still waiting for the weatherization measure data as some pricing information is forthcoming from local contractor. This information will be consolidated into the report as soon as it is available.

2. Three sites were selected for the best potential wind resource; Bon Aire, Caribou (Inoo'agati Housing), and Littleton 2 (Hilltop Site). Each of these has average wind speeds of 5 to 6 meters per second. Optimal speeds should be in the 8 to 9 meter per second range.

3. The preliminary data should be matched with data being collected at the Northern Maine Airport and any other sources that can help us get a sense of the long term averages for wind speeds in Presque Isle. The National Weather Service Station in Caribou is another source for this data in Caribou and any other areas locally where they collect this data.

4. The New England Wind Maps have been used as a basis for this data. Our next step is to acquire Met Towers to collect Wind data on all three sites for a period of no less that 12 months.

5. We reviewed our options for the acquisition of various wind turbines for use at each site along with the payback data on each. We are still waiting on data for remanufactured turbines to come in.

6. While we would make sacrifices in the area of warranty support with one of these units, the initial investment is lower. They are the only ones out of the five examined that will provide positive cash flow under all four scenarios.

7. We would essentially need to use all of the energy generated by the system we install since any excess could not be sold back to the grid here in Maine. In the event we do have excess power we can bank it for future use for a period of up to 12 months.

8. Our best financing options at this point appears to be Renewable Energy Credits (also known as Green Tags) and Clean Renewable Energy Bonds. The project was examined as a fully financed project that includes 30% of the project costs offset by Grant revenue. Most programs will require 12 months of wind study data collected from Met Towers before they will find capital costs.

9. Dates for community meetings have been set for Monday June 12, 2006 in Presque Isle and Tuesday June 13, 2006 in Littleton. The scheduled time for each is 6:00 p.m. to 7:30 p.m. These have been published in the tribal newsletter.

10. Activities/actions in preparation for our next meeting:

    a. Inclusion of Weatherization Data in Report – Ryan

    b. Make a List of Renewable Energy Programs in Maine – Russ

    c. Contact NREL and State Energy POCs on Anemometer Loan Programs Available to the Tribe – Russ

    d. Acquire Remaining Info on Remanufactured Turbines for inclusion in the Final Report – Ryan

    e. Contact John Rice, State of Maine Energy Star Program Manager to get details on what is available – Russ

    f. Contact Dave Belyea at AFBCA to see if there is any wind data available for Loring AFB and for info on FAA Restrictions – Russ

June 1, 2006

This morning's meeting was attended by Lori Ribeiro, Ryan Chaytors and I. Chris Chambers, Kema's Energy Efficiency specialist has been out on family business but has all of the weatherization information and turbine pricing to include in the final version of the report.

Activities/actions in preparation for our next meeting:

1. Draw up Draft Agenda for Community Meetings – Lori
2. Follow up on All Contacts Remaining from May 18, 2006 Discussion
3. Publish Meeting Details on Flyers and Post One Each at Housing, I.H.S., Administration, Littleton, and Spruce Haven – Russ
4. Publish Meeting Announcement on WAGM-TV County Calendar for Free Public Service Announcements – Russ
5. Arrange Meeting Logistics – Russ
6. Send out Final Report for Comment – Ryan
7. Draft a Vision Statement for Review and Comment by All Energy Committee Members for Presentation to the Community – Lori

We will be doing another conference call next Tuesday June 9, 2006 at 1:00 p.m. to review all of the information and to finalize the draft vision statement for presentation to the tribal community. Please review these materials ASAP upon receipt and get any comments, additions or modifications you would like to see. It would also be very helpful if you can let me know about your availability for one or both of the upcoming meetings.

Other Resource Material for Review

Maine State Energy Program http://www.state.me.us/msep/

Maine State Energy Council
http://www.state.me.us/spo/energy/energycouncil/

Small Wind in Maine http://www.awea.org/smallwind/maine_sw.html

Maine Green Power Connection
http://www.mainegreenpower.org/index.shtml

Natural Resources Council of Maine
http://www.maineenvironment.org/project_cleanair.asp

I have attached some other documents in an email with this one. Thanks for your time and I look forward to talking with all of you before Tuesday. Russ

ATTACHMENT 8

DRAFT WORKPLAN

Aroostook Band of Micmacs
First Steps Towards
Energy Efficiency and Renewable Energy on Tribal Lands
Draft Detailed Proposal Outline
January 12, 2005

1) **Project Goals and Objectives.** The Aroostook Band of Micmac (ABM) Tribal Council seeks to develop a strategic energy plan in order to reduce energy costs, promote economic development on Tribal Lands, move towards energy self-sufficiency, and promote energy security. Specific goals and objectives are to:
   a) Reduce Energy Costs
      i) Reduce energy bills for low income tribal members
      ii) Reduce need for energy assistance for tribal members and LIHEAP expenditures
      iii) Reduce tribal government expenditures on energy for tribally-owned buildings
   b) Promote Economic Development
      i) Meet energy needs for tribal lands, primarily the former Loring Air Force Base, where industrial development is planned
      ii) Generate tribal revenues through generation of surplus energy
      iii) Create jobs for tribal members
   c) Foster Energy Self-Sufficiency
      i) Reduce dependence upon outside energy sources to meet tribal needs
   d) Develop Energy Security
      i) Working in partnership with City of Presque Isle on emergency preparedness plan, including power outages

   The ABM Tribal Council believes that development of a strategic energy plan will help it to work towards these goals, and therefore has passed a Tribal Resolution authorizing its Economic Development Director to seek a grant from the US Department of Energy's "First Steps Toward Developing Renewable Energy and Energy Efficiency on Tribal Lands" grant program.

2) **Perceived Value.** A Strategic Energy Plan will provide value through the energy itself, additional economic development benefits, and consistency with tribal values.
   a) Energy Value
      i) High energy costs
      ii) Low energy efficiency penetration
      iii) Good wind and other renewable energy resources
   b) Social and Economic Value
      i) Consistent with Tribal Values
      ii) Independence/ more money for other activities
      iii) Economic development
         (1) Attract businesses/ dovetail with Loring Initiative
         (2) Job creation

3) **Capabilities.** The ABM have the capabilities to manage the First Steps project and will retain consultants to provide needed technical assistance. The **ABM** manages over $5 million in annual Federal, private, and state funding. The tribe has established acceptable bookkeeping and accounting practices in accordance with government auditing standards that are independently evaluated annually by a Certified Public Accountant. The **ABM** has strong administrative capability, and operates a wide range of programs to provide services to its membership.

   a) ABM Management and Staff. William W. Phillips, Tribal Chief will serve as the project director. Day to day project management will be provided by Russell Dennis, Economic Development Director. A team of tribal staff will work on the project.
   b) Consultants
      i) KEMA
      ii) Lori Ribeiro Colombo

4) **Level of Tribal Commitment.** The ABM is very committed to this project. The Tribal Council has enacted a resolution supporting the development of a Strategic Energy Plan and submission of a proposal to US DOE for the First Steps grant. Further, the ABM are devoting staff time to the project as an in-kind commitment of services.
   a) In-kind donation of staff plus fringe is $17,119
      i) Russell Dennis – Director of Economic Development Project Lead
      ii) Gary Race – Director of Realty & Assets
      iii) Fred Corey – Director of Environmental Programs
      iv) Eldon Espling – Injury Prevention, Disaster Preparedness
   b) In-kind Commitment of direct expenses (travel – confirm with RD don't want to charge to grant)

5) Project Scope of Work. The scope of work will involve four phases: Formation of an Energy Committee, Research and Education, Development of Energy Vision, and Development of an Action Plan. The scope of work will be underscored by community involvement with the goal of creating awareness and ownership over the Energy Plan.

   a) Form Energy Committee. The initial task will be to form an Energy Committee composed of various Tribal government officials and community members. Tribal government staff committed to the Energy Committee include the; Director of Economic Development, Director of Realty & Assets, Director of Environmental Programs, and the official for Injury Prevention and Disaster Preparedness. Russell Dennis, Director of Economic Development, will be the project lead and Chair of the Energy Committee. The Energy Committee will guide and work with the consultants on all aspects of this project. Related sub-tasks include:
      i) Form and assemble Energy Committee
      ii) Develop and manage a detailed work plan

   b) Research and Education. This task will educate the Tribal membership and government officials with regard to current energy use habits and potential energy opportunities,

including energy efficiency and renewable energy for both the tribe and for future economic development. Related sub-tasks include:

i) Prepare and Finalize Outlines
ii) Baseline Energy Use Analysis
iii) Energy Options Analysis
iv) Review Session (Energy Committee)
v) Presentation to Tribal Council
vi) Community Information Meeting (include presentation of overall project goals)
vii) Finalize Reports

c) Develop Energy Vision. This task will involve facilitated discussions and preparation of an Energy Vision by the Energy Committee. This process will also involve community input and ultimately Tribal Council Approval. Based on the research, this will include development of a vision statement as well as practical and specific goals and objectives. Related sub-tasks include:
   i) Facilitated Discussion (Energy Committee)
   ii) Development of a Draft Energy Vision
   iii) Tribal Community Meeting
   iv) Revised Draft Energy Vision
   v) Tribal Council Guidance and Approval
   vi) Finalize Energy Vision

d) Develop Action Plan. Based on the Energy Vision, this task will involve the development of a detailed Action Plan for achieving the goals outlined in the Energy Vision. For example, the plan may specify tasks and resources for implementing a residential energy efficiency program, or for further exploring the development of a promising wind site. This will involve the following sub-tasks:
   i) Development of a Straw Action Plan
   ii) Facilitated Discussion and Review (Energy Committee)
   iii) Tribal Council Guidance and Approval
   iv) Finalize and Implement Action Plan

6) **Relevance and justification.** Development of the ABM Strategic Energy Plan project will address mutually-held goals both for the Tribe and the US Department of Energy. It is important to understand the ABM as a Tribe as a context for rating the value of the project.
   a) Need for the Project
      i) Tribal Background and Demographics (from Community Needs Assessment)
      ii) Tribal and Geographic Economic Data Demographics (from Community Needs Assessment)
      iii) Economic Development Plan for Loring Air Force Base and Other Tribally-Owned Land. The ABM own nearly 1,400 acres of tribally-held land including about 660 acres at the former Loring Air Force Base. The ABM anticipates spending nearly $500,000 for feasibility studies, program development, and business plan development related to reuse of the facilities at Loring Air Force Base. The Master Planning process will determine development patterns from which energy needs can be ascertained. There are no tenants yet on the industrial parcels. While some

utilities are available through the local energy authority, we believe that tribal energy resources could be more cost-effective, thereby aiding in the attraction of tenants. Further, the ABM believe that some of the industrial land can be developed to generate excess energy that can generate revenues for the tribe.

b) Value to Achieving US DOE Goals. The US DOE will realize value through providing a First Steps grant to the ABM.
   i) Renewable Energy. The ABM have untapped resources that could generate renewable energy for the tribe. Prime resources under consideration include wind and biomass.
      (1) Preliminary indications from wind resource maps
      (2) Biomass potential – forest, other?
   ii) Energy Efficiency. The ABM have never performed energy efficiency audits. These audits are likely to reveal numerous untapped opportunities to perform energy efficiency measures.
   iii) Tribal Energy Self-Sufficiency. The US DOE shares the ABM goal of energy self-sufficiency. A grant made through the First Steps program will create a plan that the ABM can use as its road map in achieving that goal.

7) **Roles of participants.** The project will be directed by the ABM with the guidance of an Energy Team and the Tribal Council. Day-to-day project management will be overseen by Russell Dennis, Director of Economic Development, who will coordinate participation of a variety of programmatic staff. The Tribal Administration is responsible for financial administration and contract compliance. Consultants retained by ABM will perform an array of project tasks including baseline research, meeting facilitation, writing of the plan, and related tasks. The consultants will be retained under two separate subcontracts that will be administered by the ABM.

   a) Aroostook Band of Micmacs – Overall Responsibilities
      i) Tribal Chief
      ii) Director of Economic Development
      iii) Other Programmatic Staff
      iv) Tribal Administrator
         (1) Administrative Staff
   b) KEMA – Overall Responsibilities
      i) Jon Abe
      ii) Chris Clark
      iii) Ryan Chaytors
   c) Lori Colombo

ATTACHMENT 9

FINAL OUTLINE

STATEMENT OF OBJECTIVES

Aroostook Band of Micmacs

"Micmac Strategic energy Planning Initiative"

The Aroostook Band of Micmacs (ABM) received federal recognition on November 26, 1991. The majority of the ABM lives within Aroostook County, located in Northern Maine. The Micmac Nation is composed of seven districts of 29 bands with a population of approximately 30,000.

Project Goal
The goal of the project is to develop a strategic energy plan in order to reduce energy costs, promote economic development on Tribal Lands, move towards energy self-sufficiency, and promote energy security. We will develop an energy vision that considers a balanced portfolio of energy resources and maximizes energy efficiency improvements; promote sustainable economic development; and develop an action plan to address our current and future energy needs.

Project Method
The scope of work will involve four phases: formation of the Energy Committee, research and education on baseline energy use and energy opportunities, development of an Energy Vision, and development of an Action Plan. The strategic energy plan will include renewable energy development on tribal lands (e.g., wind and/or biomass) and energy efficiency implementation for tribal government buildings and homes. The scope of work will be underscored by community involvement with the goal of creating Tribal awareness and ownership of the Energy Plan.

Project Impact and Benefits
The ABM live in one of the highest energy cost areas of the U.S., which places a significant burden on the ABM people and tribal government. In addition, economic development initiatives are hindered by high local energy costs. Fortunately, the ABM have untapped wind resource, biomass, and energy efficiency potential that can be harnessed to help reverse this trend. First Steps funding will provide us with the resources to begin to address our current and future energy needs, foster economic development, and promote energy independence through our untapped potential.

Project Participants: The ABM is the lead partner. The ABM has retained consulting expertise through partners including KEMA and independent consultant Lori R. Colombo. KEMA and Ms. Colombo will support the project with energy planning, meeting facilitation, and energy policy and market expertise.

Project Plan
The Aroostook Band of Micmac (ABM) Tribal Council seeks to develop a strategic energy plan in order to reduce energy costs, promote economic development on Tribal Lands, move towards energy self-sufficiency, and promote energy security. The project will help us develop an energy vision that considers a balanced portfolio of energy resources and maximizes energy efficiency improvements; promote sustainable economic development; and develop an action plan to address our current and future energy needs.

The ABM seek to develop a strategic energy plan focused on renewable energy and energy efficiency because such a plan will be consistent with tribal values, move us towards energy independence, reduce energy costs, and promote economic development.

> *Within our strategic vision, we, the Aroostook Band of Mi'Gmaq/Micmac, preserve the inherent and aboriginal rights of our people. Strong self-governance, self-determination, and self-sufficiency enable us to realize our potential as a viable economic entity, groom our future leaders, and ensure tribal survival. As a unified nation within a nation, we are partners creating a better environment for native and non-native people. As the caretakers of our paternal ancestral lands, we have a quality of life that fulfills our needs for food, shelter, clothing and spirituality. We are a spiritual and confident people who, recognizing no limitations, maintain our language, heritage and culture through education, technology and healthy living. Our rich land base provides us with many physical needs including hunting, fishing, forestry and timber rights. We have equal access to natural resources within the State of Maine and with the sovereign tribal nations within its borders. Safe, clean and affordable housing is available to every tribal member. We have tribal jurisdiction, tribal courts, police, fire, public works, medical, educational, recreational and social services on all tribal lands.*

Energy Value

Maine has some of the highest energy costs in the U.S. for electricity and fuel. For example, the average retail electricity rate in Maine is more than $.12 per kWh. In 2002, Maine had the third highest cost of electricity in the U.S. Our Tribal Government spends over $200,000 per year on energy and energy assistance programs for tribal members and energy remains one of our highest expenses. Using energy efficiency measures and renewable energy to reduce energy costs will enable us to expend funds on other pressing tribal needs including health care, education, and economic development. Energy costs in general are a burdensome fixed cost for our tribal members. We also are exploring options for economic development projects at the Loring AFB site and on other tribal lands. One idea is development of a large energy intensive commercial greenhouse. The current and future cost of energy will pay a key role in determining the feasibility of these projects. Funding for a strategic energy plan would provide with the initial resources to address our current and future energy needs through our untapped energy efficiency and renewable energy potential. For instance, energy efficient design and distributed generation (e.g. combined heat and power biomass) could be integrated into our plans for a commercial greenhouse and provide significant energy savings as well as a short payback on the additional upfront investment. Furthermore, we have identified several opportunities for:

Energy Efficiency. Our potential to benefit from energy efficiency is two-fold. First, we have done little energy efficiency work on our Tribal government buildings, and state energy efficiency programs have historically underserved our tribal residents' homes. The Cultural Community Education Center, which includes a museum and tribal government offices and Bon-Aire Housing Complex (66 units of housing), located in Presque Isle, Maine, are likely sites. In addition, our economic development plans include consideration of several new energy intensive enterprises on tribal lands. We would like to have a plan in place that not only addresses our current energy use but also promotes energy efficient economic growth.

Renewable Energy. We also have several renewable energy resources that could be tapped to meet current and future energy use needs. First, we own over 600 acres of forest-covered land

as well as the nearby infrastructure of the old Loring AFB coal plant. In addition, there are areas on ABM lands, including Loring AFB, which have significant open space that may be suitable for wind development, and that have good wind resources based on the New England Wind Map (See Attachment 3). For example, Maine has net metering for projects 100 kW and smaller, and only two 100 kW behind the meter wind projects could save ABM over $30,000 each year after financing costs are accounted for.

Project Activities and Schedule
The scope of work involves four phases: Formation of an Energy Committee, Research and Education, Development of Energy Vision, and Development of an Action Plan. The tasks are detailed below:

Form Energy Committee and Project Management. The initial task will be to form an Energy Committee composed of various Tribal government officials and community members. Tribal government staff committed to the Energy Committee include the: Director of Economic Development, Director of Realty & Assets, Director of Environmental Programs, and the official for Injury Prevention and Disaster Preparedness. Russell Dennis, Director of Economic Development, will be the project lead and Chair of the Energy Committee. This group will include representatives that will be able to provide information on all of the relevant issues, including current and future energy use, economic development, and tribal values. The Energy Committee will guide and work with the consultants on all aspects of this project. Related sub-tasks include: 1) Form and assemble Energy Committee, and 2) Develop and manage a detailed work plan

Research and Education. This task will educate the Tribal membership and government officials with regard to current energy use habits and potential energy opportunities, including energy efficiency and renewable energy for both the tribe and for future economic development. This research will address current energy use and costs, energy efficiency opportunities and potential savings on existing facilities, green building opportunities for economic development initiatives (e.g., greenhouse design), and the potential feasibility of wind and biomass development, touching on resource, technical, permitting, and economic considerations. The Energy Committee will work with the consultants to share this information with the ABM. Related sub-tasks include: 1) Prepare and Finalize Outlines, 2) Baseline Energy Use Analysis, 3) Energy Options Analysis, 4) Review Session (Energy Committee), 5) Presentation to Tribal Council, 6) Community Information Meeting (include presentation of overall project goals), and 7) Finalize Reports.

Develop Energy Vision. This task will involve facilitated discussions and preparation of an Energy Vision by the Energy Committee that reflects the findings of the research and tribal values, as well as complements other ABM initiatives. This process will also involve community input and ultimately Tribal Council Approval. Based on the research, this will include development of a vision statement as well as practical and specific goals and objectives (e.g., development of a wind project on ABM lands). Related sub-tasks include: 1) Facilitated Discussion (Energy Committee), 2) Development of a Draft Energy Vision, 3) Tribal Community Meeting, 4) Revised Draft Energy Vision, 5) Tribal Council Guidance and Approval, and 6) Finalize Energy Vision.

Develop Action Plan. Based on the Energy Vision, this task will involve the development of a detailed Action Plan for achieving the goals outlined in the Energy Vision. For example, the plan may specify tasks and resources for implementing a residential energy efficiency program, for development of a green building standard for economic development, or for further exploring

the development of a promising wind site. This will involve the following sub-tasks: 1) Development of a Straw Action Plan, 2) Facilitated Discussion and Review (Energy Committee), 3) Development of a Draft Action Plan, 4) Tribal Council Guidance and Approval, and 5) Finalize and Present Action Plan.

Project Reporting. The ABM will provide all required quarterly and final reports to US DOE and participate in the Tribal Energy Review Program held each fall. The ABM will assign one individual overall project management responsibility to ensure completion of all deliverables.

If funded, we are committed to completing the project within 28 weeks as indicated in the following schedule.

AROOSTOOK BAND OF MICMACS
Project Schedule
Energy Plan

Task	Sub-Task	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18	Week 19	Week 20	Week 21	Week 22	Week 23	Week 24	Week 25	Week 26	Week 27	Week 28
Project Reporting	Attend Meetings in Golden, CO	As needed																											
	Ongoing Project Reporting																												
Form Energy Committee	Form and Assemble Energy Committee																												
	Develop and Manage a Detailed Workplan																												
Research and Education	Prepare and Finalize Outlines																												
	Baseline Energy Use Analysis																												
	Energy Options Analysis																												
	Review Session (Energy Committee)																												
	Presentation to Tribal Council																												
	Community Information Meeting																												
	Finalize Reports																												
Develop Energy Vision	Facilitated Discussion (Energy Committee)																												
	Development of a Draft Energy Vision																												
	Tribal Community Meeting																												
	Revised Draft Energy Vision																												
	Tribal Council Guidance and Approval																												
	Finalize Energy Vision																												
Develop Action Plan	Development of a Straw Action Plan																												
	Facilitated Discussion and Review (Energy Committee)																												
	Development of a Draft Action Plan																												
	Tribal Council Guidance and Approval																												
	Finalize and Present Action Plan																												

8) **Project Activities and Schedule.** The project will be implemented through four steps over the course of one year. The steps and schedule are as follows:

Project Task	Lead	Oct 2005	Nov	Dec	Jan 2006	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Project Management and Reporting													
Form Energy Committee													
Research and Education													
Develop Energy Vision													
Develop Action Plan													

Further, the ABM will comply with DOE requirements for project management and reporting, including quarterly reports, a final report, and participation in the Tribal Energy Review meeting in the Fall.

9) **Request for Technical Assistance**
Hold for request if applicable.

ATTACHMENT 10

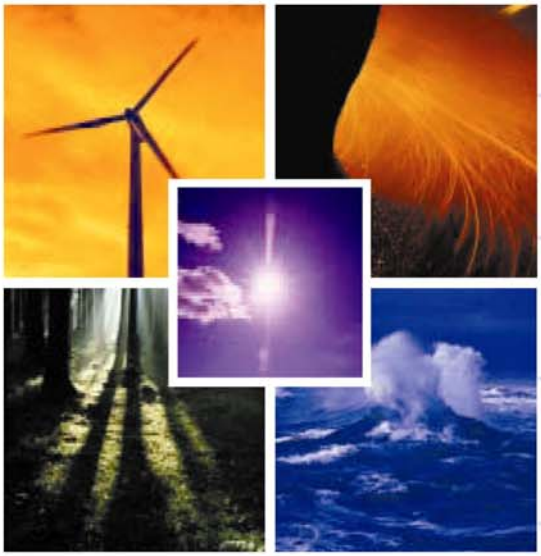
BASELINE ENERGY USE ANALYSIS

Aroostook Band of Micmacs (ABM)
Amount Paid for Fuel for ABM Buildings
2001 Through 2005

ABM Building	Property Address	Fuel Provider	Account #		Total - 2001	Total - 2002	Total - 2003	Total - 2004	Total - 2005	TOTAL
Administration	7 Northern Road, Presque Isle, ME 04769	Daigle Oil Company (DOC)	183880	*Usage:*	3044.6	7738.8	7756.4	4627.1	3766.8	26,933.7
				Amount	$2,453.53	$6,936.58	$9,105.10	$6,191.60	$6,601.04	$31,287.85
Elders	41 Sunset Loop, Presque Isle, ME 04769	DOC	239039	*Usage:*	941.9	967.7	889.7	1122.3	834.8	4,756.4
				Amount	$971.52	$904.88	$1,058.00	$1,527.08	$1,547.88	$6,009.36
Youth	58 Sunset Loop, Presque Isle, ME 04769	DOC	245953	*Usage:*	784.9	1026.5	867.6	821.0	650.8	4,150.8
				Amount	$777.11	$905.16	$1,025.84	$1,087.28	$1,173.94	$4,969.33
Head Start	15 Northern Rd., Presque Isle, ME 04769	DOC	193326	*Usage:*	1053.6	1017.4	1087.9	1211.6	981.5	5,352.0
				Amount	$1,019.75	$918.09	$1,253.18	$1,591.81	$1,771.80	$6,554.63
Head Start	13 Northern Rd. Presque Isle, ME 04769	DOC	1993326	*Usage:*	1250.7	1117.6	1223.7	1498.5	1146.8	6,237.3
				Amount	$1,193.04	$979.93	$1,444.80	$1,978.22	$2,062.77	$7,658.76
Realty and Assets	9 Northern Rd., Presque Isle, ME 04769	DOC	187460	*Usage:*	0.0	631.0	591.5	497.9	444.0	2,164.4
				Amount	$0.00	$539.11	$666.26	$652.12	$822.78	$2,680.27
Housing	11 Northern Rd, Presque Isle, ME 04769.	DOC	192641	*Usage:*	670.2	629.0	841.3	709.5	585.1	3,435.1
				Amount	$676.73	$560.85	$983.88	$942.09	$1,054.29	$4,217.84
IHS Building	8 Northern Rd. Presque Isle, ME 04769	DOC	199548	*Usage:*	1096.8	1333.6	1776.1	1538.4	1024.3	6,769.2
				Amount	$1,152.20	$1,182.40	$2,120.93	$2,050.48	$1,792.31	$8,298.32
Smoke Shop/Emerg. Housing	1 Beacon Street, Presque Isle, ME 04769	DOC	245911	*Usage:*	992.1	1239.8	1448.0	1739.7	1592.7	7,012.3
				Amount	$1,032.74	$1,144.38	$1,704.80	$2,377.89	$2,916.84	$9,176.65
Housing Storage Bldg.	23 Midway Drive, Presque Isle, ME 04769	DOC	245911	*Usage:*	1053.1	1137.8	1688.3	1632.3	1588.3	7,099.8
				Amount	$1,058.00	$1,023.77	$2,031.65	$2,135.69	$2,799.65	$9,048.76
Environmental storage shed/green house	8 Northern Rd. Presque Isle, ME 04769	DOC	28330E 283309	*Usage:*	0.0	0.0	1419.6	407.4	635.3	2,462.3
				Amount	$0.00	$0.00	$1,657.29	$593.89	$1,039.51	$3,290.69
Spruce Haven- lodge	Doyle Rd. Caribou, ME 04736	DOC	191883	*Usage:*	1567.8	1961.3	2105.2	2390.1	1784.7	9,809.1
				Amount	$1,606.60	$1,755.61	$2,413.38	$3,198.81	$3,201.70	$12,176.10
Littleton Office	198 West Ridge Road, Littleton, ME	DOC	187460	*Usage:*	0	1,085.5	1,815.7	1,832.6	1,725.0	6,458.8
				Amount	0	$ 988.55	$ 2,143.14	$ 2,428.66	$ 3,047.06	$8,607.41
Littleton Clinic	Medicine Wheel Road, Littleton, ME 04730	DOC	187460	*Usage:*	0	0	0	0	238.6	238.6
				Amount	0	0	0	0	$430.36	$430.36
Housing: Caribou										
28 Doyle Road	Caribou, ME	DOC	187460	*Usage:*	0	0	0	0	159.4	159.4
				Amount	0	0	0	0	$318.16	$318.16
78 Doyle Road	Caribou, ME	DOC	187460	*Usage:*	0	0	0	0	606.2	606.2
				Amount	0	0	0	0	$1,000.90	$1,000.90
Littleton Housing:										
33 Medicine Wheel Road	Littleton, ME	DOC	187460	*Usage:*	0	0	0	0	611.0	611.0
				Amount	0	0	0	0	$1,137.84	$1,137.84
37 Medicine Wheel Road		DOC	187460	*Usage:*	0	0	0	0	910.7	910.7
				Amount	0	0	0	0	$1,678.33	$1,678.33
Total Fuel Usage for Each Year					12455.7	19886.0	23511.0	20028.4	19286.0	95167.1
Total Fuel Costs for Each Year					$11,941.22	$17,839.31	$27,608.25	$26,755.62	$34,397.16	$118,541.56

ATTACHMENT 11

KEMA REPORT



Renewable Energy and Energy Efficiency Assessment Report

Prepared for:

Aroostook Band of Micmacs
Aroostook County, ME

Prepared by:

KEMA Inc.
Burlington, Massachusetts

June 2, 2006

Table of Contents

Attachments

1. Introduction

1.1 Background

The Aroostook Band of Micmacs (ABM) received federal recognition on November 26, 1991. The majority of the 920 members of the ABM live within Aroostook County, located in Northern Maine. The 530 tribal members residing in this area are dispersed throughout an area of 6,672 square miles. Aroostook County ranks at or near the bottom of every economic income and growth category in Maine. Median Income in Micmac households is $18,059 compared with $34,018 statewide. Unemployment among the Micmac population is about 42%. Developing multi-sector economic development opportunities is a key strategy for several organizations striving to develop and build sustainability into the Northern Maine economy.

Consistent with this goal, the ABM submitted a proposal to the U.S Department of Energy (DOE) under the "First Steps Toward Developing Renewable Energy and Energy Efficiency on Tribal Lands" grant program. In late 2005, the ABM were awarded funding under this program to develop a strategic energy plan in order to reduce energy costs, promote economic development on Tribal Lands, move towards energy self-sufficiency, and promote energy security. Part of the funding for the strategic energy plan was aimed at identifying potential energy efficiency and renewable energy opportunities. This report is the end product of that effort.

1.2 Feasibility Study Purpose

The purpose of this Renewable Energy and Energy Efficiency Assessment is to: 1) evaluate the feasibility of wind turbine projects at several locations throughout ABM's territory and provide ABM with the technical, environmental, and financial information required to determine whether or not to proceed with one or more of the projects; and 2) evaluate the potential for energy efficiency upgrades on existing Tribal government buildings and ABM residential homes.

The wind energy feasibility assessment includes the following sections:

- Project Site Description
- Wind Resource
- Wind Turbine Options
- Environmental Issues and Permitting Requirements
- Financial Feasibility
- Project Scenarios

- Conclusions

The energy efficiency opportunity assessment immediately follows the wind energy feasibility section and includes the following sections:

- Methodology
- Energy Efficiency Audit Results
- Recommendations
- Neat Weatherization Tool Report Output (Appendix A)

2. Project Site Descriptions

The ABM own nearly 1,400 acres of tribally held land, including about 660 acres at the former Loring Air Force Base. Due to potential FAA, siting, and development issues surrounding the Loring Air Force Base, this study focuses only on the remaining tribally owned land, with particular attention paid to the area surrounding the ABM administrative building, the area adjacent to the Littleton Housing Complex, and the area behind the Caribou Housing Complex.

The preliminary wind resource assessment identified seven potential sites for wind turbines.

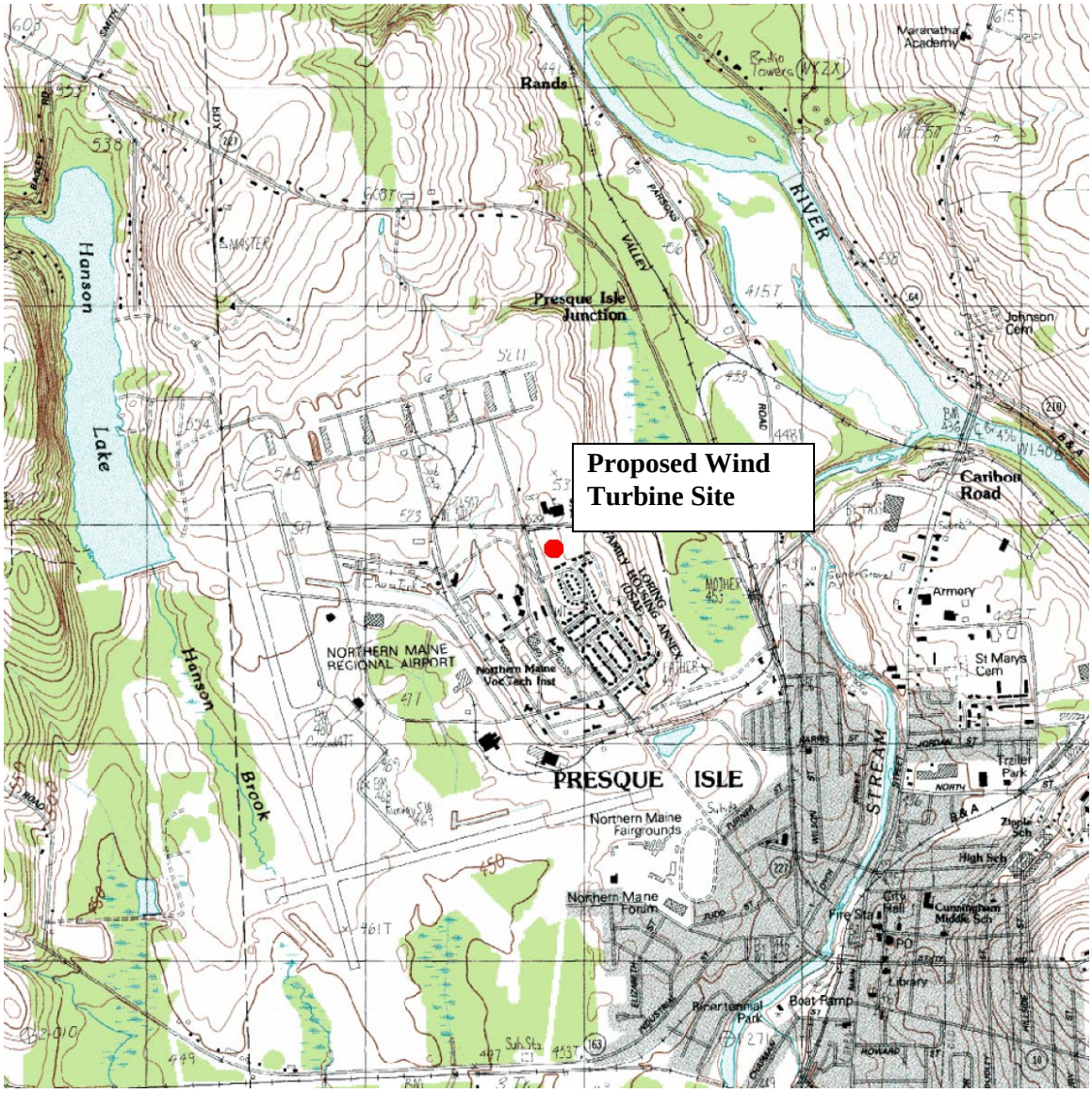
1. Administrative Building – area located directly behind the ABM administration building
2. Playground - area located at the old playground site behind the Bon-Aire Housing Project
3. Littleton 1 – area located at end of Medicine Wheel Road (beyond homes).
4. Littleton 2 – area located at bend in Medicine Wheel Road (top of hill adjacent to homes).
5. Caribou 1 – area located behind homes on Doyle Road (top of ridge).
6. Caribou 2 – area located off Route 1 just before Doyle Road (first parcel on left).
7. Lodge – area located off Doyle Road, to left of Lodge entrance road.

Based primarily on the initial wind resource estimates, and the distinct geographical areas in question (e.g., Presque Isle, Littleton, and Caribou) this study focuses on three of these seven sites: Administrative Building, Caribou 1, and Littleton 2. More details on the wind resource for these sites will be discussed in the next section of this report.

2.1 Administrative Building

The Administrative Building project area consists of a small open area directly behind the Administrative Building and Housing & Reality Building. The immediate terrain is fairly flat with approximately 10-meter trees surrounding it to the North and Northwest (approximately 30 meters away). A topographic view of the project area is shown in Figure 1 below.

Figure 1. Topographic Map of Administrative Building Site



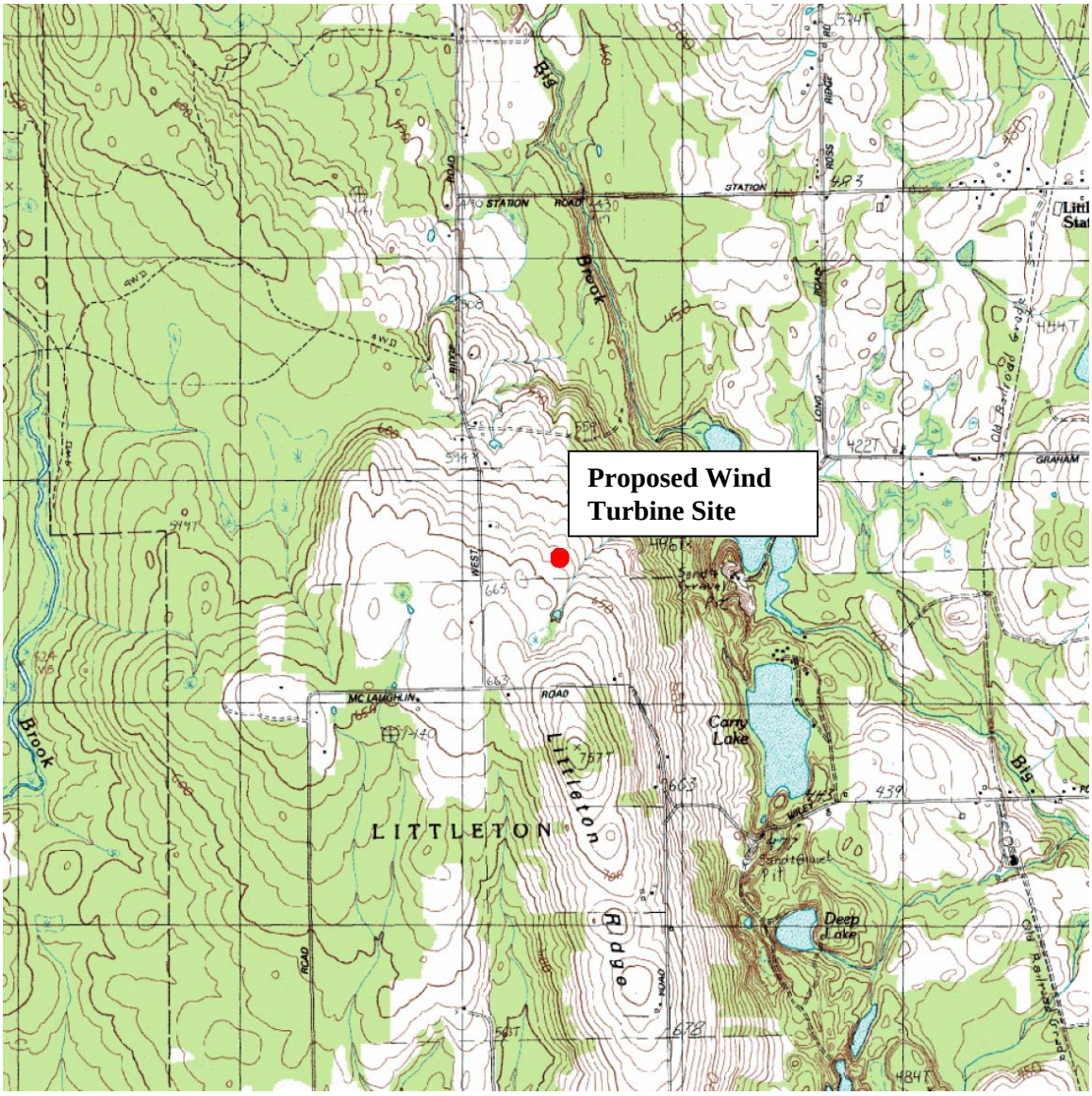
A view of the project area from the Administrative Building parking lot is shown in Figure 2 below.

Figure 2. Administrative Building Project Area

2.2 Littleton Housing Complex

The Littleton Housing Complex project area consists of a small clearing off of Medicine Wheel Road. Wind coordinates for this area were taken approximately 100 feet from the curve in the road at the top of the valley's ridgeline. The site has 10 to 15 meter trees surrounding it to the East and South. A topographic view of the project area is shown in Figure 3 below.

Figure 3. Topographic Map of Littleton Housing Complex Site



A view of the project area from Medicine Wheel Road is shown in Figure 4 below.

Figure 4. Littleton Housing Complex Project Area

2.3 Caribou Housing Complex

The Caribou Housing Complex project area is located behind the houses on Doyle Road directly on top of the ridgeline. The area is very flat to the East and West, and is situated at least a quarter mile from any forested areas (located directly south). Eight single story residential houses are located directly North of the project area (approximately 30 meters away). A topographic view of the project area is shown in Figure 5 below.

Figure 5. Topographic Map of Caribou Housing Complex Site

A view of the project area from Doyle Road is shown in Figure 6 below.

Figure 6. Caribou Housing Complex Project Area

3. Wind Resource

3.1 Analysis of Wind Measurements

3.1.1 Average Wind Speed

The wind resource at each of the ABM sites is characterized by annual wind speeds (in meters per second) at 50 meters above ground level according to the New England Wind Map[1]. Initial analysis of all seven ABM sites indicates that the strongest wind resources exist at Littleton 2 (6.3 m/s), Littleton 1 (6.1 m/s), and Caribou 1 (6.1 m/s). The Lodge area has an average wind speed of 5.8 m/s, while the Administrative Building and Caribou 2 both have average wind speeds of 5.7 m/s. The playground site has the lowest average wind speed of all the sites (5.6 m/s). These are typically considered moderate to sub-moderate wind resources for purposes of power generation.

Figure 7. Average Wind Resource Characteristics

Charcteristics

Location		Admin Building	Playground	Caribou 1	Caribou 2	Littleton 1	Littleton 2	Lodge
Data Source		True Wind	True Wind	True Wind	True Wind	True Wind	True Wind	True Wind
Average Windspeed	m/s	5.7	5.6	6.1	5.7	6.1	6.3	5.8
Height of Avg Windspeed	m	50.0	50.0	50.0	50.0	50.0	50.0	50.0
Weibull Parameter c	m/s	6.4	6.4	7.0	6.5	6.8	7.1	6.6
Weibull Parameter k	--	2.22	2.22	2.15	2.16	2.22	2.22	2.16
Site Altitude	m	152	152	179	177	183	187	182
Terrain Type	--	bling, Moderate Turbulen	bling, Moderate Turbulen	bling, Moderate Turbulen	bling, Moderate Turbulen	bling, Moderate Turbulen	bling, Moderate Turbulen	bling, Moderate Turbulence
Wind Shear Exponent	--	0.143	0.143	0.143	0.143	0.143	0.143	0.143
Turbulence Factor	%	10%	10%	10%	10%	10%	10%	10%
Bin width	m/s	1	1	1	1	1	1	1
Distribution Type		Weibull	Weibull	Weibull	Weibull	Weibull	Weibull	Weibull
Typical Annual Onsite Load	kWh	175,000	150,000	80,000	80,000	73,000	73,000	4,500

As mentioned earlier, based on the initial wind resource estimates and the distinct geographical areas in question, this study focuses on three sites: Administrative Building, Caribou 1, and Littleton 2.

3.1.2 Wind Speed Distribution

A wind speed distribution indicates the percentage of time that the wind blows at a particular speed. This is the basis for wind energy yield calculations. Wind turbine manufacturers give the output of the wind turbine as a function of wind speed. In order to develop energy yield

[1] The New England Wind Map was prepared by TureWind Solutions, LLC and was sponsored by the Connecticut Clean Energy Fund, Northeast Utility Systems, and the Massachusetts Technology Collaborative Renewable Energy Trust. The Map and associated databases provide information important to the evaluation of prospective wind energy sites. The available wind statistics include annual and seasonal average wind speed at four heights above effective ground level, the frequency distribution of wind speed and wind direction, and wind power density. The Wind Map can be accessed at http://truewind.teamcamelot.com/ne/.

calculations for each site, a wind speed distribution was constructed. Wind speed distributions for each of the three sites are depicted below. (Wind speed distributions can be described by a Weibull distribution. The Weibull distribution depends on the average wind speed on the site, and the shape factor. Using a shape factor of 2, the wind speed distribution for the three selected project sites were derived (shown in Figures 8, 9, and 10 below).)

Figure 8. Administrative Building Wind Speed Distribution

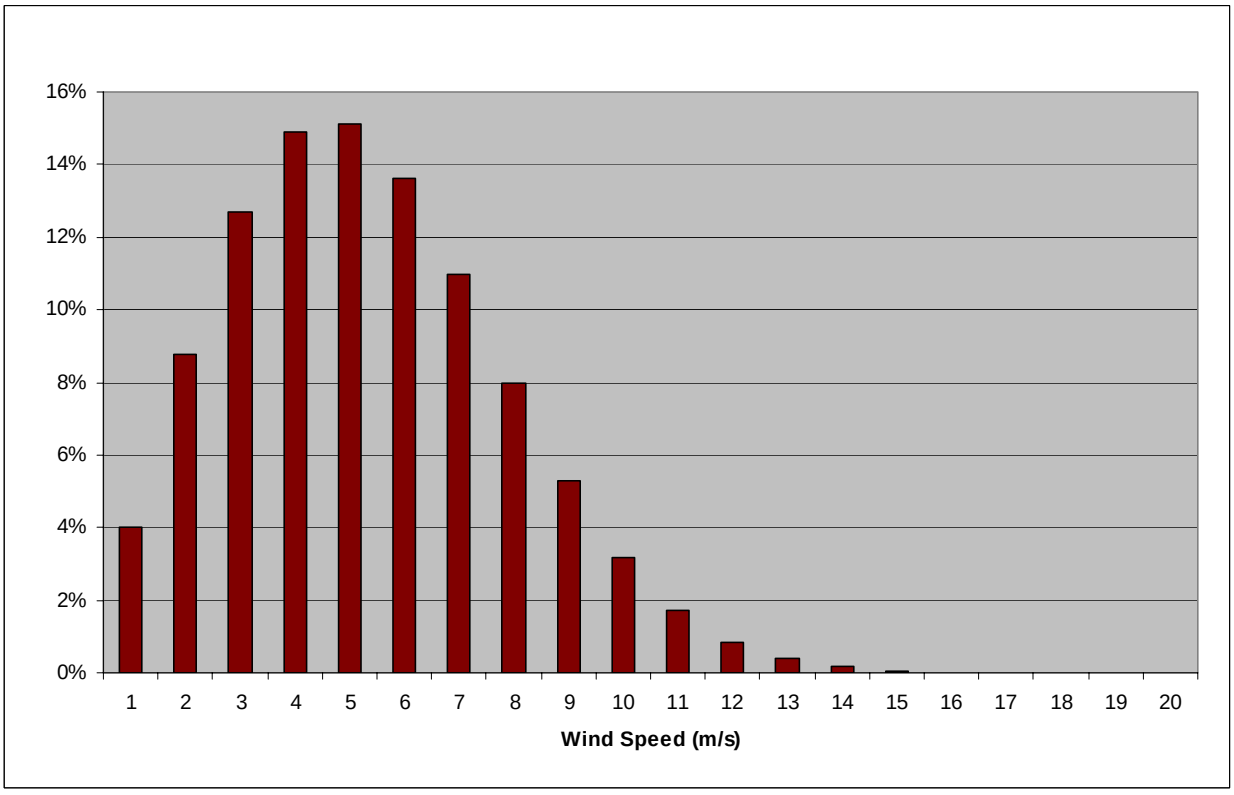


Figure 9. Caribou 1 Wind Speed Distribution

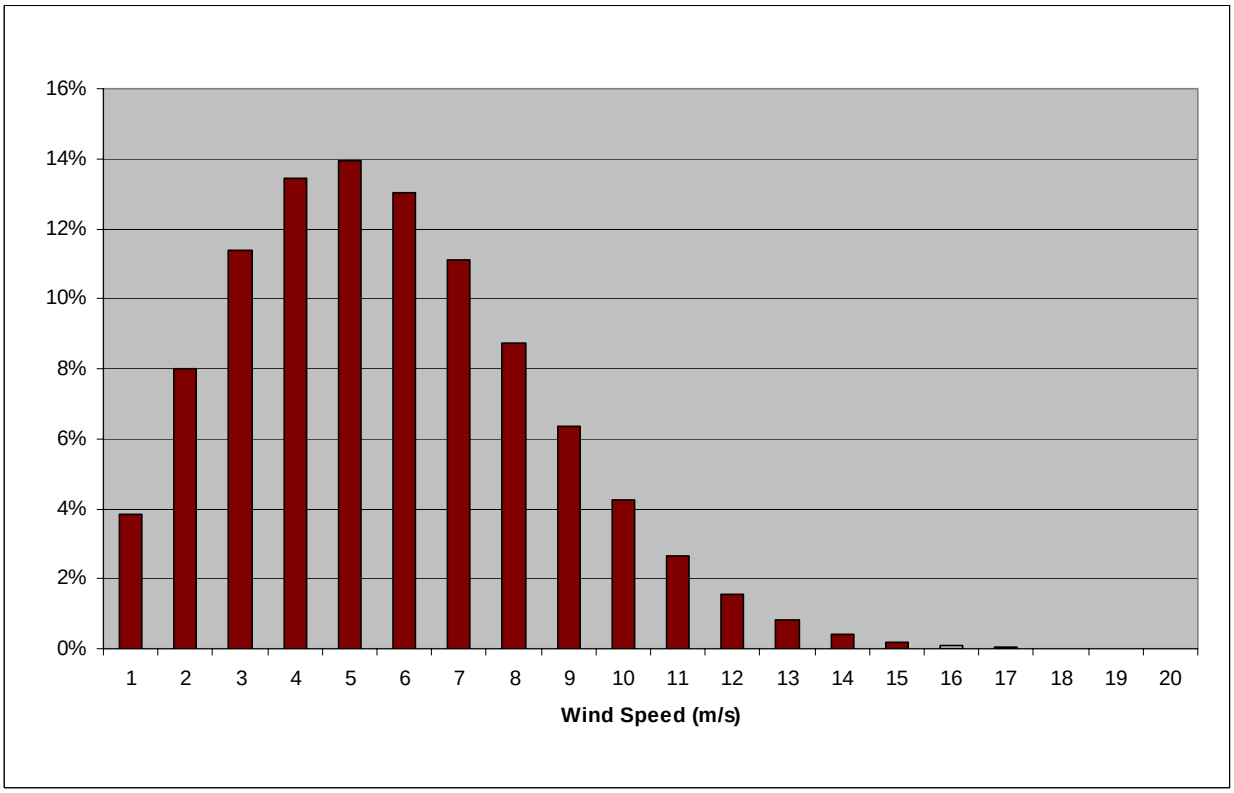
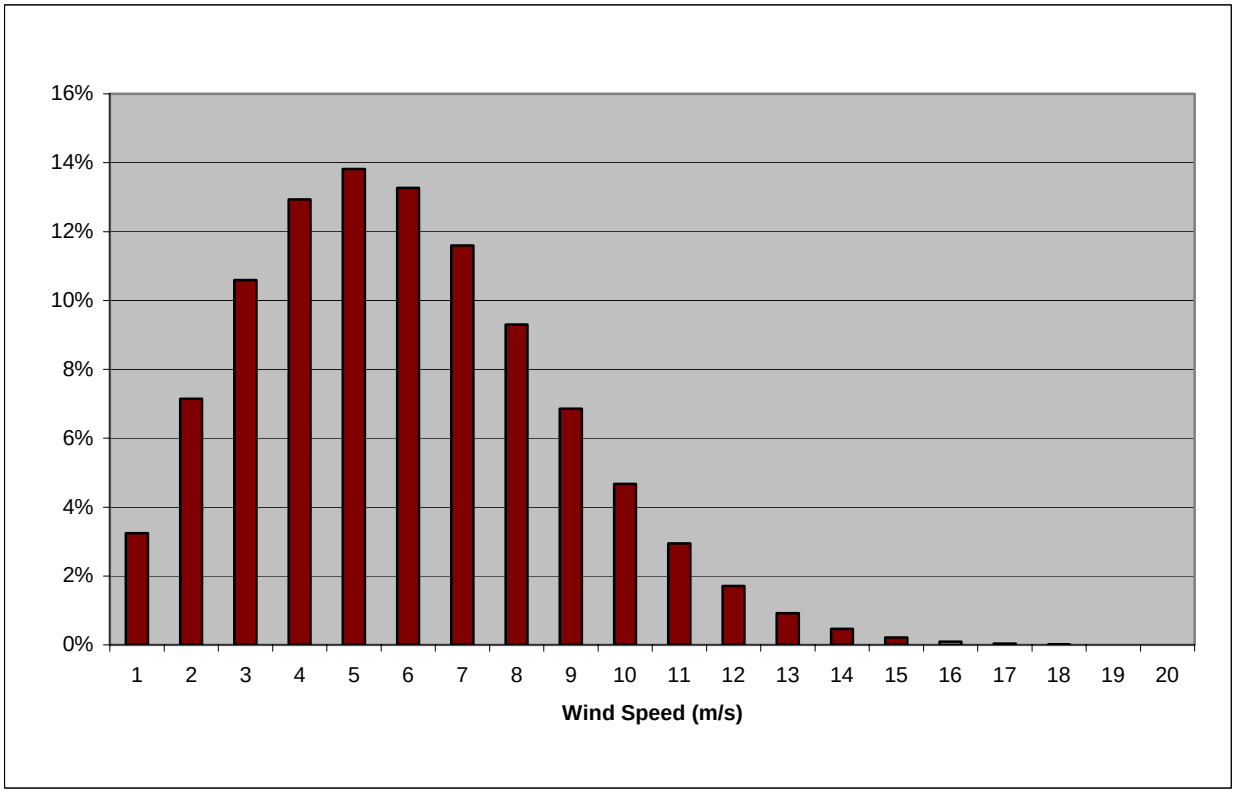


Figure 10. Littleton 2 Wind Speed Distribution



4. Wind Turbine Options

4.1 Potential Wind Turbines

Due to siting concerns (e.g., proximity to residential properties) and the modest wind resources associated with the potential turbine locations, KEMA considered wind turbines of size 100 kW and below. In the U.S., there are a handful of manufacturers producing wind turbines in this size range that meet applicable US standards and could likely be used at any of the proposed project sites. These manufacturers include, but are not limited to Bergey, Fuhrlander, Proven, Energy Maintenance Service (EMS), Northern Power Systems, and Entegrity. Many of these manufacturers provide a full range of turbines ranging from a few kW to over 100 kW.

When sizing a wind turbine to a particular location, several considerations must be made. In general, the most economical turbine applications will be those that maximize turbine size without exceeding onsite electricity demand. As turbine size increases, so too does capital cost and expected energy output. Due to onsite energy use limitations associated with Maine's net metering provision (discussed in more detail below), financially viable projects do not necessarily use the largest turbine available.

Initial analysis for this project evaluated three turbine options for the ABM.

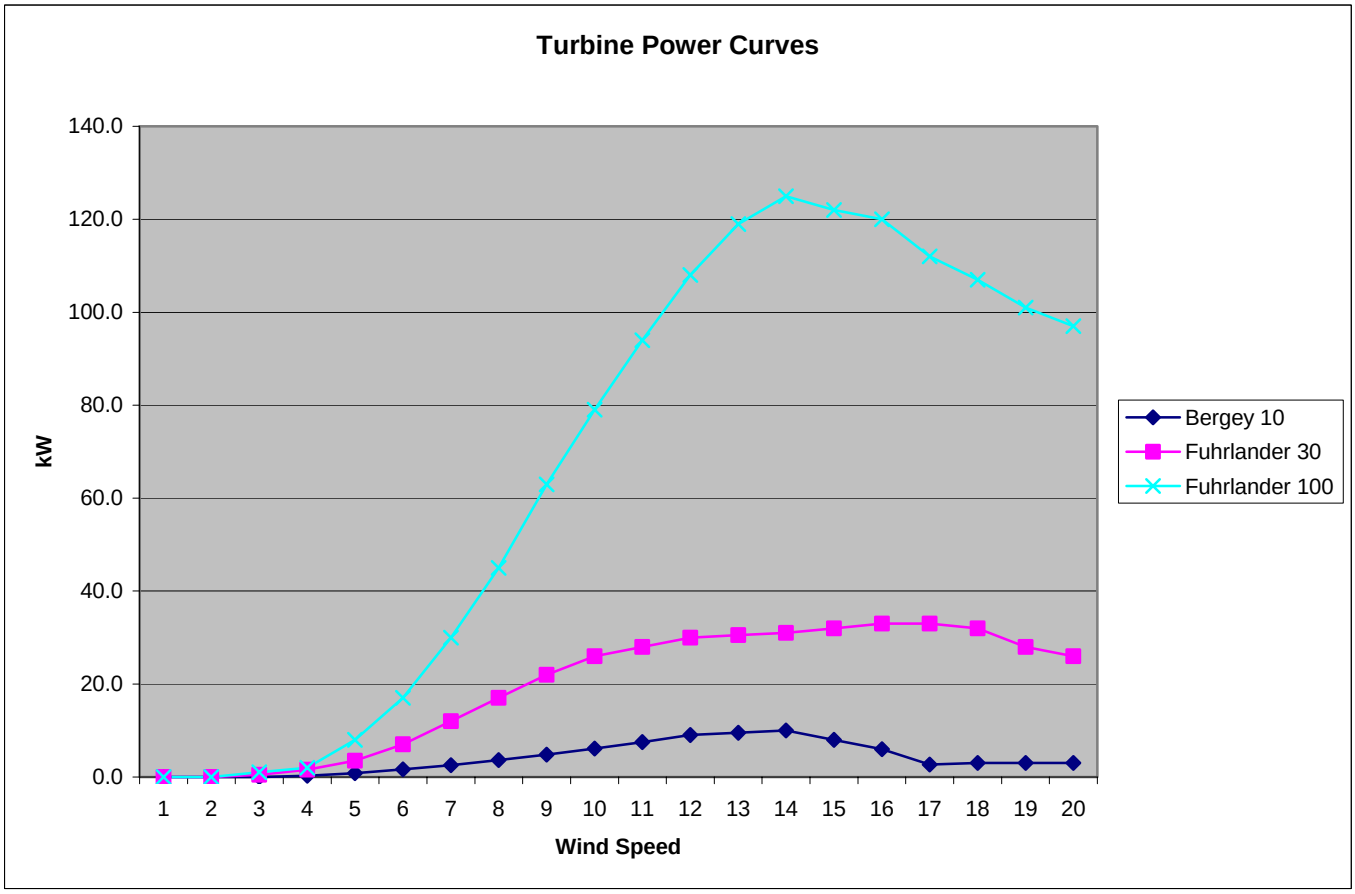
Table 1. Potential Wind Turbines

Wind Turbine	Power (kW)	Rotor Diameter (meters)	Hub Height (meters)
Bergey 10	10	6.7	18 to 37
Fuhrlander 30	30	13	27 to 30
Fuhrander 100	100	21	35 to 40

4.2 Energy Yield

Power Curves for the wind turbines considered in this analysis are depicted in the following figure. The power curve indicates the amount of electricity produced by the wind turbine at any given wind speed.

Figure 11. Wind Turbine Power Curves



Wind speeds are the primary driver of the energy yield of any wind project. In larger, grid-connected wind farms, a net energy yield is determined that considers losses attributable to: wake losses, grid losses, and availability. For the ABM analysis, these losses have been considered to be negligible. If ABM elects to move forward with a wind project, potential loses should be more closely explored after specific turbine design(s) and location(s) have been determined.

Table 2 below shows the estimated energy output at the Administrative Building for the various turbine options. The power output ranges from approximately 12,000 kWh to almost 160,000 kWh.

Table 2. Administrative Building Estimated Energy Output

Turbine Type	Bergey 10	Fuhrlander 30	Fuhrlander 100
Hub Height (m)	30	30	35
Rotor Diameter (m)	6.7	13	21
Rated Power (kW)	10	30	100
Average Wind Speed (m/s)	5.7	5.7	5.7
Net Annual Energy Yield (kWh)	**12,526**	**55,540**	**159,059**

Table 3 below shows the estimated energy output at the Caribou 1 site for the various turbine options. The power output ranges from approximately 15,000 kWh to over 190,000 kWh.

Table 3. Caribou 1 Estimated Energy Output

Turbine Type	Bergey 10	Fuhrlander 30	Fuhrlander 100
Hub Height (m)	30	30	35
Rotor Diameter (m)	6.7	13	21
Rated Power (kW)	10	30	100
Average Wind Speed (m/s)	6.1	6.1	6.1
Net Annual Energy Yield (kWh)	**15,081**	**65,348**	**193,133**

Table 4 below shows the estimated energy output at the Littleton 2 site for the various turbine options. The power output ranges from approximately 16,000 kWh to over 206,000 kWh.

Table 4. Littleton 2 Estimated Energy Output

Turbine Type	Bergey 10	Fuhrlander 30	Fuhrlander 100
Hub Height (m)	30	30	35
Rotor Diameter (m)	6.7	13	21
Rated Power (kW)	10	30	100
Average Wind Speed (m/s)	6.3	6.3	6.3
Net Annual Energy Yield (kWh)	**16,123**	**69,602**	**206,755**

4.2.1 Behind the Meter Generation

For wind turbines of the scale considered here, onsite, or behind the meter, electricity consumption is a key driver of project economics. Maine's net metering provision entitles renewable projects to capture the full retail rate (which includes both electricity generation and delivery charges) for electricity that is generated by the wind turbine and used onsite. However, Maine's net metering rules does not allow any excess generation from the project to be sold back onto the electricity grid.[2] This provision negates a potential revenue stream for the project and makes it extremely important to optimally size the wind turbines at each site. More details on optimally sizing turbines for each site will be discussed in later sections.

[2] As outlined in CMR 65-407-313, excess generation may be banked and rolled over to the customers' bill for the following month. However any unused credits after each 12-month period will be eliminated and will not apply against any future kilowatt-hour usage. The customer will receive no compensation for unused kilowatt-hour credits.

5. Environment Issues and Siting Requirements

Wind turbine projects have several environmental and siting issues that need to be addressed before project construction can commence. This section will briefly describe these issues. If the ABM decides to proceed with one or more of the wind turbine projects evaluated for this report, it is recommended that each of these issues be thoroughly reviewed.

5.1 Wind Resource Assessment

Further wind resource assessment should be completed to determine the best possible location for a wind turbine at each locale. This assessment should take into account not only average wind speed, but also terrain topography. The current analysis does make some basic topographic assumptions, but using more advanced computer modeling tools will allow ABM to choose a specific location that optimizes exposure to the wind from all directions, with emphasis on exposure to the strongest winds. MET tower data, if available, would assist this process.

5.2 Safety

Wind turbines can be a slight risk to the local environment. These risks can be either "direct" risks or "indirect" risks. Direct risks are associated with risks to people that may be impacted by something that falls from the turbine or is thrown from the blades (e.g., ice). Indirect risks are associated with accidents concerning blade or tower impacts on gas tanks, high voltage lines, or other hazardous containers that would cause some negative environmental impact.

The proposed turbine locations do not appear to pose any potential "indirect" risks, but may pose some "direct" risk to local residence and/or ABM employees. Ice throw and prop throw are definitely a concern given the low temperatures experienced in the area and should be explored in more detail during phase two of project development activities.

5.3 FAA

One federal permitting issue that might need to be addressed is the Notice of Proposed Construction or Alteration required by the Federal Aviation Administration (FAA). The FAA requires that a Part 77 review be conducted and that form 7460-1 (Notice of Proposed Construction or Alteration) be submitted for all structures at least 200 feet above ground level, or within a few miles of an airport. Any wind turbine with a tip-height over 200 feet will also require lighting.

In administering Title 14 of the Code of Federal Regulations CFR Part 77, the prime objectives of the FAA are to promote air safety and the efficient use of the navigable airspace. To accomplish this mission, aeronautical studies are conducted based on information by proponents of an FAA Form 7460-1, Notice of Proposed Construction or Alteration. The Notice of Proposed Construction or Alteration must be filed a minimum of 30 days prior to the earlier of: 1) the date the proposed construction is to begin; or 2) the date the application for a construction permit is to be filed. The FAA requires notification for (among other things) proposed construction of more than 200 feet in height above ground level. The total structure height shall include the structure and anything mounted on the structure including lighting, rods, antennas, etc. Subsequent to receipt of the Form 7460-1 package, the FAA will make a feasibility determination.

5.4 Avian Impacts

In most locations, the presence of a single turbine (especially those under 1 MW) is unlikely to cause significant impacts to birds or result in overly contentious permitting issues. For example, the United States Fish and Wildlife Service (USFWS) draft interim guidelines for siting wind farms are recognized to be for wind farms with a minimum of five turbines (1 MW or greater). Therefore, the proposal for a single turbine has the benefit of being a very small-scale project compared to traditional wind farms. However, if ABM decides to proceed with developing a wind turbine at any of the proposed sites, they should contact the USFWS and any other local conservation groups to gage the impact the project could have any local avian populations.

5.5 Noise

Wind turbines produce noise, primarily the result of their spinning blades and their gearbox. Modern wind turbines are designed to operate at as low an RPM as possible. Insulation of the gearbox and generator further helps to reduce wind turbine noise emissions. While noise levels from wind turbines can easily be measured, the public's perception of the noise impacts can be quite subjective. This subjectivity stems largely from the wide variations of individual tolerances for noise, and the inability to precisely predict corresponding reactions of annoyance and/or dissatisfaction. However, with continued advances in wind energy technology, noise produced from modern wind turbines has significantly decreased and is often masked by ambient or background noise of the wind itself. For reference, the Fuhrlander 100 turbine can be heard at

42 decibels at a point 300 feet away and ten feet from the ground. Forty decibels is the equivalent of noise heard from inside an urban environment.[3]

5.6 Flicker and Shadowing

Shadowing and flickering that may be caused by wind turbines can cause irritation for people living in nearby dwellings. Shadow casting refers to the shadow that is caused when the turbine blades pass in front of the sun. This shadow changes, when the wind turbine rotates. These changes (when a blade is in front of the sun) are named shadow flicker and can be annoying when living nearby. While impacts of shadow flicker should be evaluated further during the next phase of project development, they are not expected to be a significant concern for projects of this size.

[3] 30 decibels – whisper, 50 decibels – quiet auto at low speeds, 60 decibels – ordinary conversation at 3 feet.

6. Financial Feasibility

This section provides preliminary financial results for a single wind turbine project located at each of the following locations: the ABM Administrative Building, Caribou Housing Complex, and Littleton Housing Complex. Three different turbine options (Bergey 10, Fuhrlander 30, and Fuhrlander 100) are considered for each of the three sites. Upfront capital expenditures and recurring O&M costs are outlined in Section 6.1. Project revenue streams are discussed in Section 6.2. Federal tax and incentive programs that have the potential to impact project financial performance are described in Section 6.3.

6.1 Project Costs

6.1.1 Capital Costs

Wind turbine capital cost is a key driver of project financial performance. As a consequence of increased energy and steel costs, as well as market pressures created by short-term extension of the Production Tax Credit (PTC)[4], the cost of wind turbines has increased over the past couple years.

The estimated installed capital costs outlined below include all development, equipment purchase and delivery, construction, and installation costs required to prepare each wind project for operation. Estimates are based on industry experience, research, and conversations with turbine sales representatives.

[4] The PTC is a per kilowatt-hour tax credit for electricity generated by qualified energy resources. Enacted as part of the Energy Policy Act of 1992, the credit expired at the end of 2001, and was subsequently extended in March 2002 as part of the Job Creation and Worker Assistance Act of 2002 (H.R. 3090). The tax credit then expired at the end of 2003 and was not renewed until October 4, 2004, as part of H.R. 1308, the Working Families Tax Relief Act of 2004, which extended the credit through December 31, 2005. The Energy Policy Act of 2005 (H.R. 6) modified the credit and extended it once again through December 31, 2007. Only taxable entities can take advantage of the PTC.

Table 5. Wind Turbine Capital Costs

Cost				
Installed Cost		**Bergey 10**	**Fuhrlander 30**	**Fuhrlander 100**
Shipping and Permitting	$/turbine	$ 4,000		
Complete nacelle	$/turbine	$ 43,150	$ 125,000	$ 325,000
Standard tower	$/turbine			
Foundation	$/turbine	$ 2,000		
Installation	$/turbine	$ 3,000	$ 50,000	$ 100,000
BOP and interconnection	$/turbine	$ 1,600		
Total Cost	$/turbine	$ 53,750	$ 175,000	$ 425,000
Cost per kW	$/kW	$ 5,375	$ 5,833	$ 4,250
Operating Costs				
Insurance	$/Turbine	$ -	$ -	$ -
O&M (include fund for parts)	$/Turbine	$ 1,344	$ 4,375	$ 10,625

6.1.2 O&M Costs

The majority of annual operating costs are incurred for turbine maintenance, including system monitoring, unscheduled but predicable routine maintenance of turbines, preventative maintenance, and major overhauls and subsystem replacement of turbines. Based on research and experience, annual O&M costs are anticipated to be 2.5% of total capital costs. This figure is consistent with published estimates provided by separate wind energy trade organizations as well as conversations with a Fuhrlander representative for the Northeast United States.

6.2 Revenues

The proposed wind projects will derive revenues from both the avoided cost of purchasing electricity from the local utility and the sale of renewable energy credits (RECs). Each of these revenue streams is described below.

6.2.1 Electricity Revenues

Electricity revenues are based on the estimated electricity production by the proposed wind project. Electricity production from the proposed turbine will offset any electricity that would otherwise be purchased from the Maine Public Service Company (MPS) or Eastern Maine Electric (EME). For purposes of this analysis, an average electricity value of 13 cents/ kWh was utilized. As mentioned earlier, because of the nature of net metering rules in Maine, any excess generation from the wind projects would not be able to be sold into Maine's electricity markets. Therefore, only the electricity used on site has any financial value for project proponents.

6.2.2 Renewable Energy Credits

In addition to electricity, the proposed wind turbine project will also produce renewable energy certificates (RECs). A single REC is generated with every MWh of electricity produced by the wind turbine. RECs are most easily thought of as representing the environmental attributes of the wind power generated by the project. RECs have a value that is distinct from the accompanying MWh of electricity generated by the project.

In Maine, the state Renewable Portfolio Standard (RPS) requires each of the state's retail electricity suppliers to derive a minimum amount of their electricity supply from renewable energy. Retailers are allowed to trade RECs in the regions REC market, via NEPOOL's Generation Information System[5], to comply with this requirement. RECs produced by renewable energy projects in Maine are therefore tradable commodities.

For purposes of the financial analysis, it is necessary to assign values to RECs produced over the life of the proposed wind projects. Maine's portfolio requirement is the highest in the country, but the required percentage is in fact lower than the existing percentage of renewable energy used. While this may seem to limit the value of RECs in Maine, with the ability to sell RECs into other New England markets (most importantly Massachusetts where REC values are over $50/MWh) Maine RECs still represent a significant revenue stream for renewable energy projects.

Based on this assessment, the base case financial model values RECs at $53/MWh, the approximate penalty for noncompliance under the Massachusetts RPS, and assumes a 10% annual decrease in REC values beginning in year five of the project.

6.3 Federal Programs

At the federal level, there are two primary policies that have the potential to benefit the proposed wind turbine projects: the Renewable Energy Production Incentive (REPI) and the Clean Renewable Energy Bonds (CREBs) Program. Both programs are described in detail below.

6.3.1 Renewable Energy Production Incentive

The Renewable Energy Production Incentive (REPI) provides an important financial incentive for qualifying renewable energy projects. Assuming sufficient federal appropriations, an ABM wind turbine project would be eligible for this incentive.

[5] http://www.nepoolgis.com/

The REPI provides financial incentive payments for electricity produced and sold by new qualifying renewable energy generation facilities. Qualifying facilities are eligible for annual incentive payments of 1.5 cents per kilowatt-hour (1993 dollars and indexed for inflation) for the first ten-year period of their operation, subject to the availability of annual appropriations in each Federal fiscal year of operation.

REPI was originally authorized under section 1212 of the Energy Policy Act of 1992 and had expired for new projects as of 9/30/03. However, Section 202 of the Energy Policy Act of 2005 (H.R. 6) reauthorized appropriations for fiscal years 2006 through 2026 and expanded the list of eligible technologies and facilities owners. See 42 USCS § 13317 for the new REPI statute.

Eligible electric production facilities include not-for-profit electrical cooperatives, public utilities, state governments, Commonwealths, territories, possessions of the U.S., the District of Columbia, Indian tribal governments, or a political subdivision thereof, or Native Corporations that sell the project's electricity to someone else.

Qualifying facilities must use solar, wind, geothermal (with certain restrictions as contained in the rulemaking), or biomass (except for municipal solid waste combustion), landfill gas, livestock methane, and ocean (including tidal, wave, current, and thermal) generation technologies. Fuel cells using hydrogen derived from eligible biomass facilities are also considered an eligible technology.

If there are insufficient appropriations to make full payments for electric production from all qualified facilities for a fiscal year, 60% of appropriated funds are to be assigned to facilities that use solar, wind, ocean (including tidal, wave, current, and thermal), geothermal, or closed-loop biomass technologies; and 40% of appropriated funds for the fiscal year to other projects.

6.3.2 Clean Renewable Energy Bonds

Clean Renewable Energy Bonds (CREBs) are a financing mechanism enacted via the Energy Policy Act of 2005 to assist governmental agencies and electric cooperatives with the development of clean energy projects. As described by the IRS, the bond issuer will receive interest free financing for a qualifying renewable energy project, while the bondholder will receive a tax credit in lieu of interest payments. Congress has authorized $800 million of CREBs to be issued after December 31, 2005 and before January 1, 2008, with not more than $500 million reserved for government projects. Applications are due April 26th of each year.

Facilities eligible for CREBs are those described in Section 45(d) of the IRS code of 1986, without regard to placed-in-service dates. Wind Energy projects are included in this list. The following entities may issue CREBs: state and local governments; US territories and possessions; mutual or cooperative electric companies; CoBank and ACB; Indian tribal governments; National Rural Utilities Cooperative Finance Corporation; and not-for-profit electric utilities that have received a loan or loan guarantee under the Rural Electrification Act.

Projects seeking to apply for CREBs will undertake the following steps:

- Identify the qualified borrower expected to own the project.
- If part of a pooled financing, demonstrate that the issuer will enter into a written loan commitment with each qualified borrower prior to the issue date of the bond issue.
- Provide a detailed description of the project to be financed, with expected placed in service date.
- Provide independent certification by a licensed engineer of qualifying project, certifying that it is technically viable.
- Provide a detailed description of planned financing.

Applicants must have a binding commitment with a third party to spend at least 10% of the proceeds within six months of the date of issuance; 95% of the proceeds should be spent within 5 years of issuance.

The bond term and tax credit rate for CREBs will be determined as follows.

- **Term –** During each calendar month, the Secretary of the Treasury will determine the maximum term for CREBs issued for the following month. This information will be available on the State and Local Government Securities website (http://www.publicdebt.treas.gov). The maximum term will be no more than the period where 50% of the par value of the bond, invested at an interest rate published by the Bureau of Public Debt. The interest rate is 110% of the long-term adjusted APR, compounded semi-annually. Under current interest rates, this term is estimated to be about 15 years. As interest rates increase, the maximum term for CREBs will decrease. For example, if the BPD determines the discount rate to be 4%, a bond with a $5MM par value has a maturity date equal to the point where $2.5MM, invested at 4% semi-

annually, will equal $5MM in approximately 17.5 years. Principal must be repaid evenly over the term of the issue.

- **Tax Credit Rate –** The Treasury department will determine the credits available from each principal payment so that it is similar to the yield on similar AA-rated corporate bonds of a similar maturity. These rates will be published on the State and Local Government Securities website. The tax credit granted is not tax-free: a credit of $100 to a bondholder in the 35% bracket will result in a $65 tax benefit to the bondholder.

7. Project Scenarios

Based on this initial evaluation and the factors described throughout this report, the most financially viable turbine for the Administrative Building site is the Furhlander 100 turbine. For illustrative purposes this section also includes an analysis of the Fuhrlander 30 at the Administrative Building project site. The most financially viable turbine for both the Caribou 1 and Littleton 2 sites is the Fuhrlander 30 turbine.

The following section describes the base case assumptions used for the financial analysis and the specific financial results for each of these three turbine/site options.

7.1 Assumptions

The base case assumptions used in the pro forma financial analysis for all three potential turbine locations are outlined in the following table.

Table 6. Base case assumptions for financial analysis

Assumptions	Value	Comments
Technology Assumptions		
Project Size	1 Turbine	Single turbine per site
Project Capacity		
Administrative Building	30 kW or 100 kW	Depending on turbine selected
Caribou 1	30 kW	Fuhrlander 30
Littleton 2	30 kW	Fuhrlander 30
Annual Generation		Estimates based on New England Wind Map wind resource and supplier power curves
Admin Bldg - Fuhrlander 30	55,540 kWh	
Admin Bldg - Fuhrlander 100	159,059 kWh	
Caribou 1 – Fuhrlander 30	65,348 kWh	
Littleton 2 – Fuhrlander 30	69,602 kWh	
Percent of Production Net Metered	100%	All generation is to be used on site to maximize financial benefits
Cost and Revenue Assumptions		
Turbine Capital Costs		Industry costs based on reported U.S average in 2005 and supplier provided pricing information.
Bergey 10	$5,375/kW	
Fuhrlander 30	$5,833/kW	
Fuhrlander 100	$4,250/kW	
Annual O&M Costs	2.5%	Percent of total capital costs (actual dollar amount depends on selected turbine)
Energy Value	13 cents/kWh	Estimated average
REC Value	5.3 cents/kWh	Estimated average
REPI	1.8 cents/kWh	Valued for first ten years of project life
Financing Assumptions		
Debt Ratio	100%	Assumed 100% financing
Debt Term	20 years	Based on ABM input
Debt Interest Rate	5.0%	Based on ABM input
Project Life	20 years	Standard for wind turbine projects
O&M Escalation	2.0%	Standard industry inflation projection
Energy Escalation	2.5%	Standard industry inflation projection
Depreciation	n/a	Not applicable to Tribal entity
Contingency	10%	Standard contingency factor, based on ABM input
Discount Rate	5%	Same as debt interest rate
Other		
Grants	None	Not included in base case scenario
Clean Renewable Energy Bond	None	Not included in base case scenario

7.2 Financial Results

For each of the selected project sites, four different scenarios have been evaluated (A through D). Scenario A is the base case and uses all the standard assumptions outlined above. Scenario B incorporates potential grant opportunities equaling 30% of capital costs. Scenario C utilizes the zero percent clean energy bond through the CREBS program. Scenario D uses both grant and zero percent bond options.

7.2.1 Administrative Building/ Fuhrlander 30

Table 7 below provides pro forma financial results for the Administrative Building and Fuhrlander 30 turbine project option.

Table 7. Financial Analysis Results for Scenarios A through D.

	Scenario A	Scenario B	Scenario C	Scenario D
Net Annual Energy Yield (kWh)	55,540	55,540	55,540	55,540
Total Project Cost	$ 192,500	$ 134,750	$ 192,500	$ 134,750
Average Annual Cash Flow ($000)	$ (8.0)	$ (3.4)	$ (2.2)	$ 0.7
Cumulative Cash Flow ($000)	$ (161)	$ (38)	$ (44)	$ 13
Net Present Value ($000)	$ (101)	$ (43)	$ (42)	$ (2)
Positive Cash Flow Each Year?	No	No	No	No

Results of the financial analysis show that under all conditions, the project is expected to have a negative net present value (NPV) regardless of grant and bond scenarios. In addition the project is unable to achieve positive annual cash flow throughout its life for any of the four scenarios.

7.2.2 Administrative Building/ Fuhrlander 100

Table 8 below provides pro forma financial results for the Administrative Building and Fuhrlander 100 turbine project option.

Table 8. Financial Analysis Results for Scenarios A through D.

	Scenario A	Scenario B	Scenario C	Scenario D
Net Annual Energy Yield (kWh)	159,059	159,059	159,059	159,059
Total Project Cost	$ 467,500	$ 327,250	$ 467,500	$ 327,250
Average Annual Cash Flow ($000)	$ (14.0)	$ (2.7)	$ 0.2	$ 7.2
Cumulative Cash Flow ($000)	$ (280)	$ (55)	$ 3.0	$ 143
Net Present Value ($000)	$ (177)	$ (37)	$ (33)	$ 64
Positive Cash Flow Each Year?	No	No	No	Yes (except year 1)

Results of the financial analysis for the Administrative Building with the Fuhrlander 100 turbine show a negative estimated NPV for all scenarios except Scenario D. When a 30% of capital cost grant and zero interest bond are included in the financial model, the project is estimated to have a positive NPV of $64,000. Except for a slightly negative value in year 1, Scenario D is also expected to maintain positive annual cash flow throughout the life of the project.

Figures 12 and 13 below show cumulative and annual cash flows for Scenario A and D, illustrating the difference between baseline and optimal financing conditions.

Figure 12. Base Case Cash Flows for Scenario A

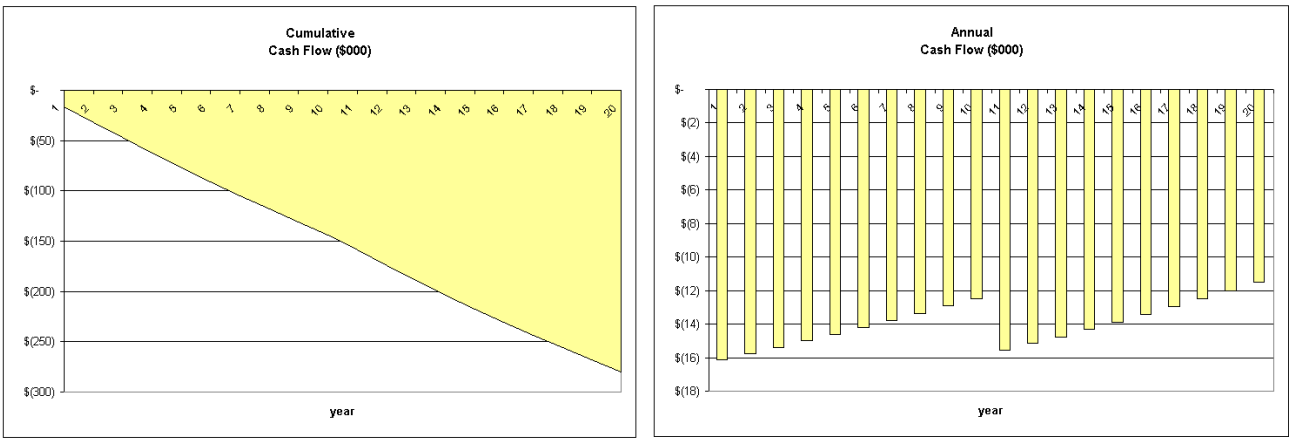
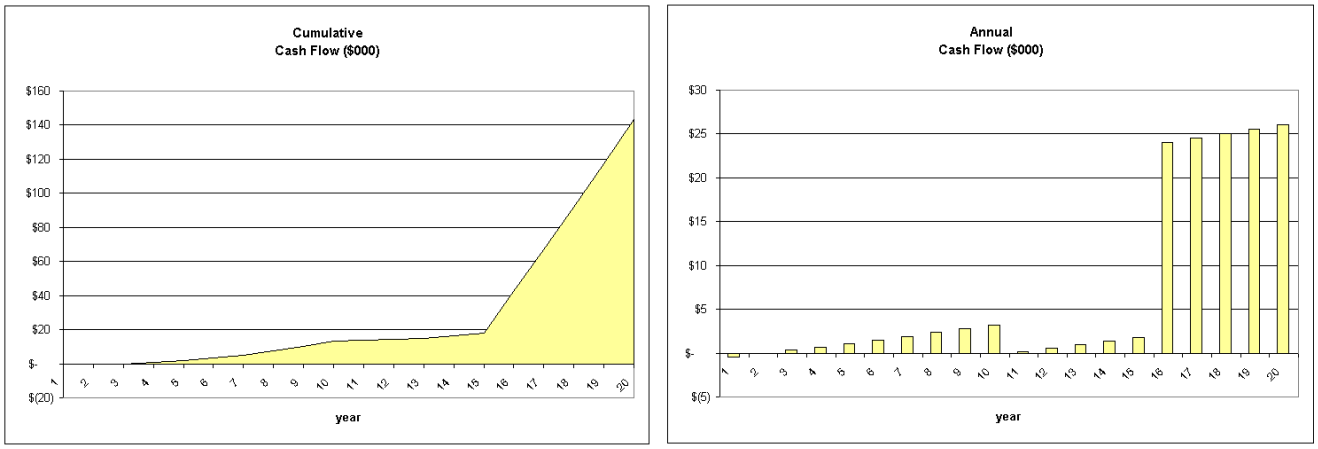


Figure 13. Base Case Cash Flows for Scenario D



Under Scenario D, the projected annual cash flow decreases in year 11 and then significantly increases in year 16. This result is attributable to the expiration of the 1.8 cent/kWh REPI, and the assumed 15-year term of the CREBS debt obligation respectively. The project generates significant annual cash flow after debt is paid off.

7.2.3 Caribou 1/ Fuhrlander 30

Table 9 below provides pro forma financial results for the Caribou 1 and Fuhrlander 30 turbine project option.

Table 9. Financial Analysis Results for Scenarios A through D.

	Scenario A	Scenario B	Scenario C	Scenario D
Net Annual Energy Yield (kWh)	65,348	65,348	65,348	65,348
Total Project Cost	$ 192,500	$ 134,750	$ 192,500	$ 134,750
Average Annual Cash Flow ($000)	$ (5.8)	$ (1.2)	$ 0.0	$ 2.9
Cumulative Cash Flow ($000)	$ (116)	$ (23)	$ 1.0	$ 58
Net Present Value ($000)	$ (73)	$ (16)	$ (14)	$ 26
Positive Cash Flow Each Year?	No	No	No	No

Results of the financial analysis above show that only under the most optimistic financing scenario (Scenario D) could the project expect to achieve a positive NPV.

Figures 14 and 15 below show cumulative and annual cash flows for Scenario A and D, illustrating the difference between baseline and optimal financing conditions.

Figure 14. Base Case Cash Flows for Scenario A

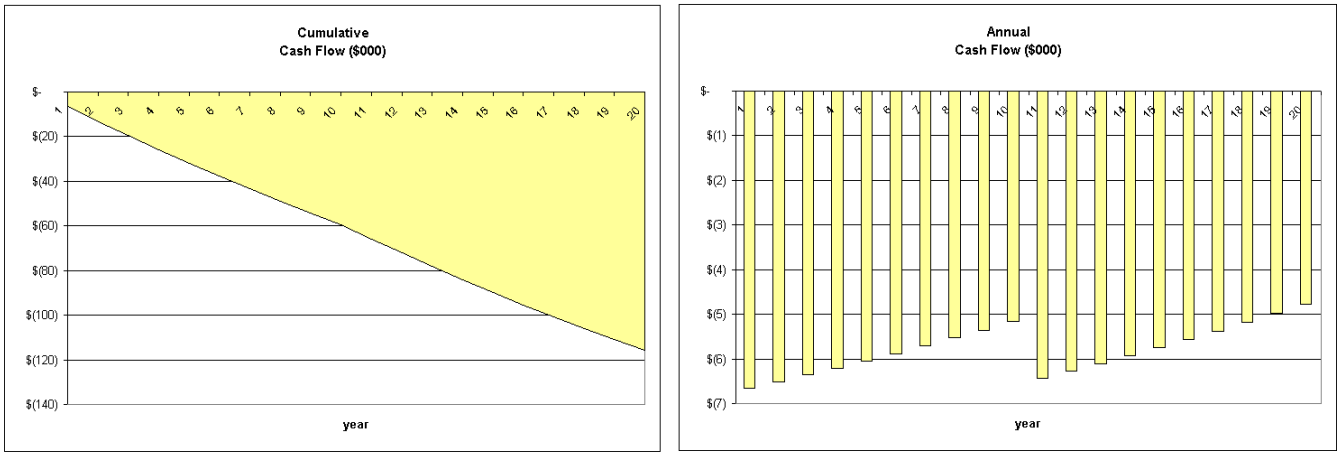
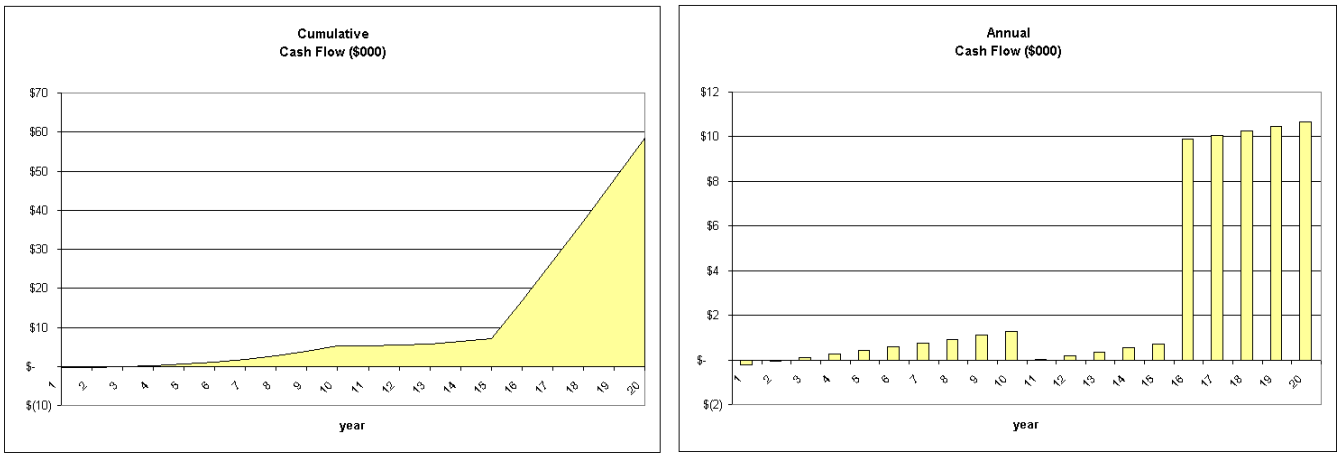


Figure 15. Base Case Cash Flows for Scenario D



7.2.4 Littleton 2/ Fuhrlander 30

Table 10 below provides pro forma financial results for the Littleton 2 and Fuhrlander 30 turbine project option.

Table 10. Financial Analysis Results for Scenarios A through D.

	Scenario A	Scenario B	Scenario C	Scenario D
Net Annual Energy Yield (kWh)	69,602	69,602	69,602	69,602
Total Project Cost	$ 192,500	$ 134,750	$ 192,500	$ 134,750
Average Annual Cash Flow ($000)	$ (4.8)	$ (0.2)	$ 1.0	$ 3.9
Cumulative Cash Flow ($000)	$ (96)	$ (4)	$ 20	$ 78
Net Present Value ($000)	$ (62)	$ (4)	$ (2)	$ 38
Positive Cash Flow Each Year?	No	No	No	Yes

Results of the financial analysis above show that only under the most optimistic financing scenario (Scenario D) could the project expect to achieve a positive NPV.

Figures 16 and 17 below show cumulative and annual cash flows for Scenario A and D, illustrating the difference between baseline and optimal financing conditions.

Figure 16. Base Case Cash Flows for Scenario A

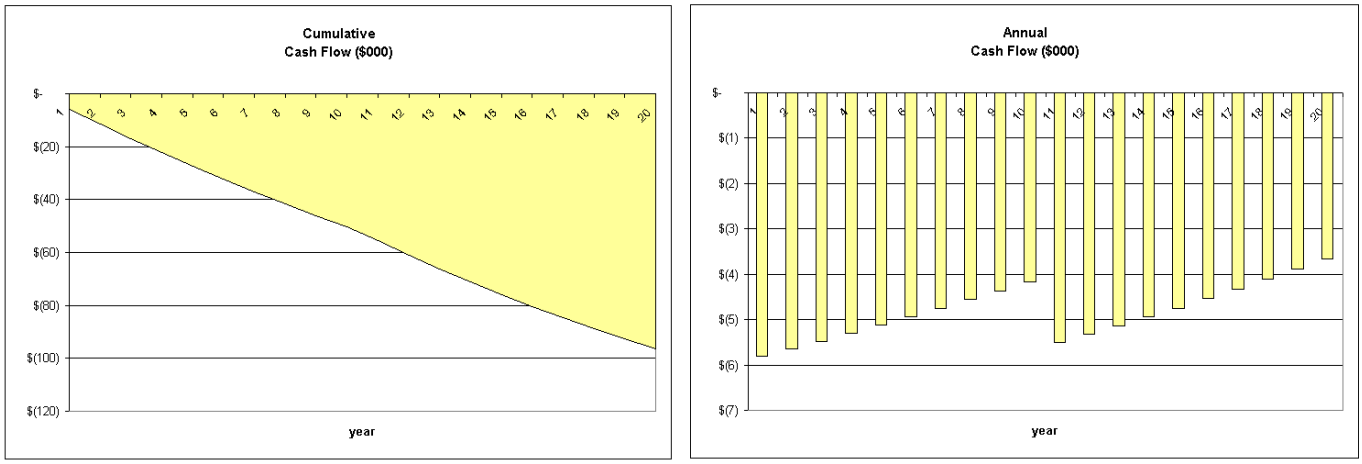
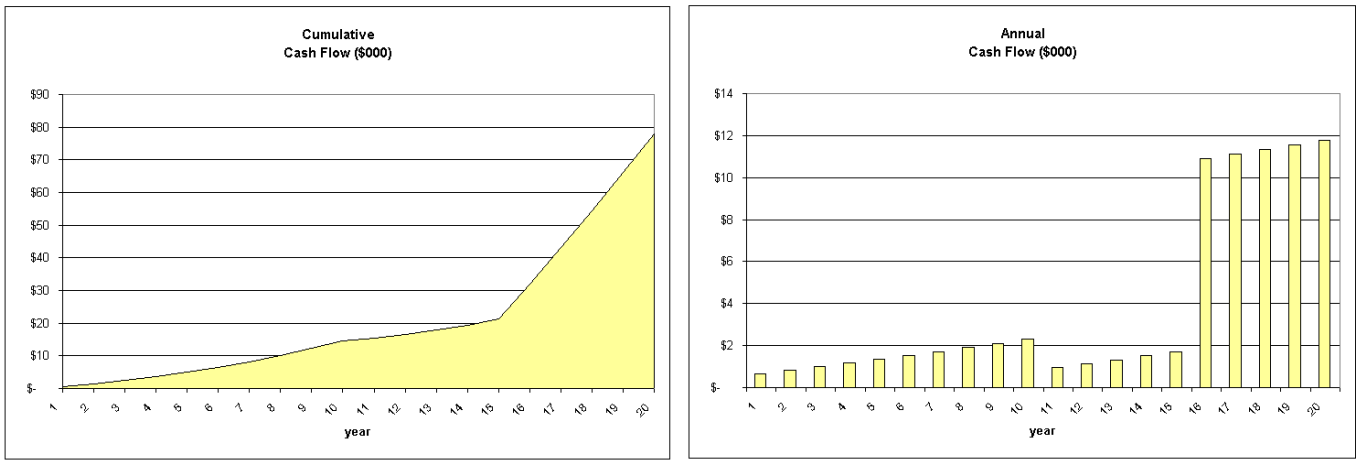


Figure 17. Base Case Cash Flows for Scenario D



7.2.5 Remanufactured Turbine Option

Another option ABM may wish to consider is purchasing a remanufactured turbine (the PNM Construction turbine located on property adjacent to ABM property was purchased as a remanufactured turbine). Prices for these turbines are often much lower than new turbines and tend to be readily available. However, remanufactured turbines typically come with only a one-year warranty, and less data is available on potential O&M costs associated with these turbines.

The following analysis is intended to show the potential economic benefits of purchasing a remanufactured turbine. In this scenario, we evaluate an EMS/E15 re-manufactured turbine at the Administrative Building site.

Table 11. EMS/E15 Turbine Specifications and Energy Output

Turbine Type	EMS/E15
Hub Height (m)	33
Rotor Diameter (m)	15
Rated Power (kW)	35
Total Project Costs	$160,600
Average Wind Speed (m/s)	5.7
Net Annual Energy Yield (kWh)	80,853

Table 12 below provides pro forma financial results for the Administrative Building and EMS/E15 turbine project option.

Table 12. Financial Analysis Results for Scenarios A through D.

	Scenario A	Scenario B	Scenario C	Scenario D
Net Annual Energy Yield (kWh)	80,853	80,853	80,853	80,853
Total Project Cost	$ 160,600	$ 112,420	$ 160,600	$ 112,420
Average Annual Cash Flow ($000)	$ 1.2	$ 5.1	$ 6.1	$ 8.5
Cumulative Cash Flow ($000)	$ 24	$ 101	$ 121	$ 169
Net Present Value ($000)	$ 13	$ 61	$ 62	$ 95
Positive Cash Flow Each Year?	No	Yes	Yes	Yes

Results of the financial analysis above show that the project is expected to have a positive NPV under all scenarios. The positive NPV for this turbine option primarily stems from the lower estimated capital costs.

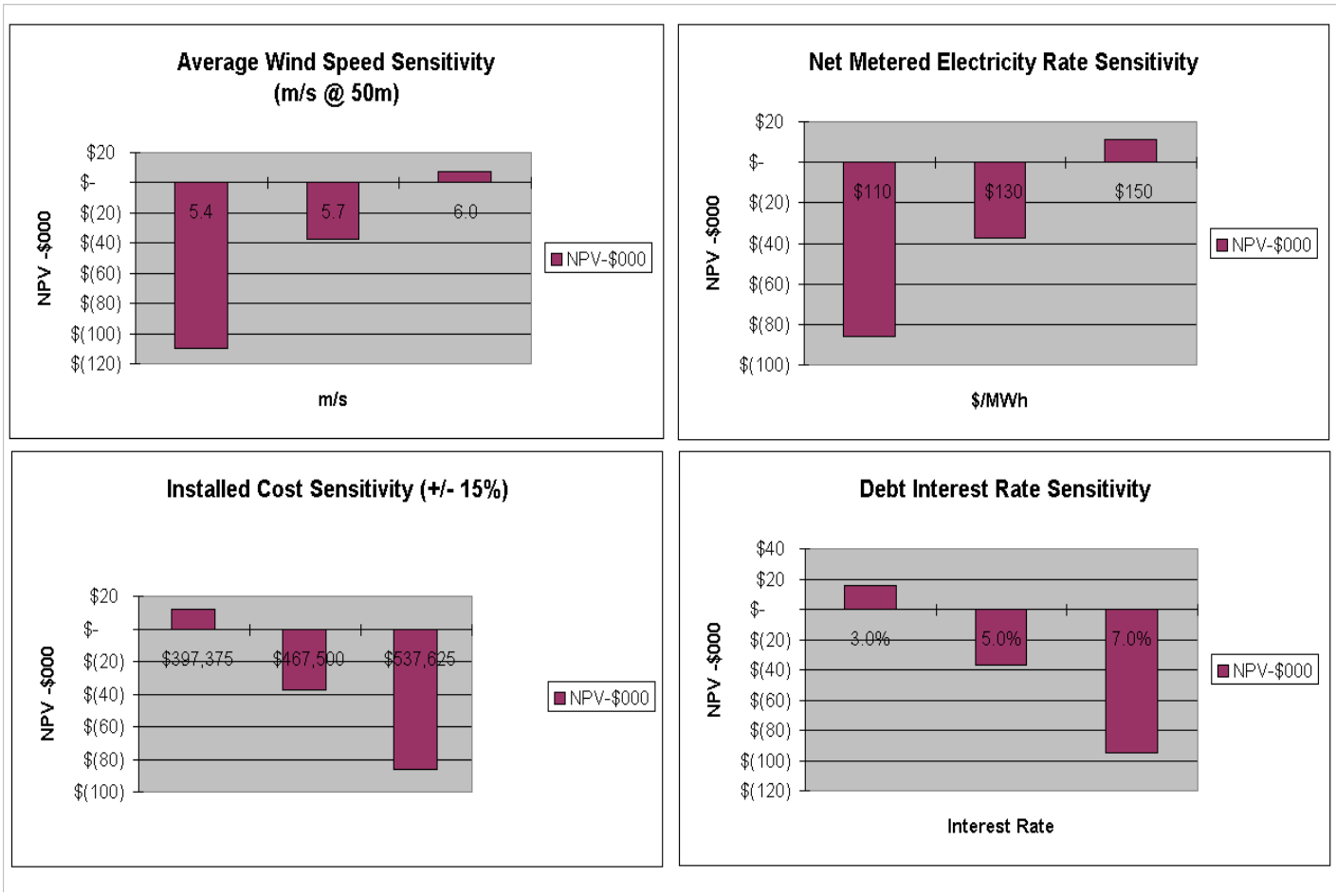
7.3 Sensitivity Analysis

Sensitivity analysis of key project variables is used to illustrate the independent impact of each of these variables on project NPV. Sensitivity analysis was performed for the Administrative Building/ Fuhrlander 100 project option (four variables were altered under Scenario B):

- **Average Wind Speed** – effect of a 6% change in average wind speed
- **Project Energy Revenues** – effect of a 2 cent change in average cents/kWh sold
- **Capital Cost** – effect of a 15% change in project capital cost
- **Interest Rate** – effect of a 2% change in debt interest rate

The results of the sensitivity analysis are shown in Figure 18 below.

Figure 18. Sensitivity Analysis for Administrative Building/ Fuhrlander 100 Scenario B



As indicated in the figure above, project performance is substantially impacted by changes in the average wind speed. Similar impacts are observed for changes in energy revenues, capital costs, and debt interest rates.

8. Conclusions

Based on the information collected during the writing of this report, and primarily due to the modest wind resource at each of the sites, the wind projects analyzed here do not appear to be economically viable at this time. However, there are a number of threshold activities, including identifying possible financing and funding opportunities during the next phase of development that could significantly improve the economic performance of the proposed wind projects. These activities include:

- **Financing and Funding Sources** – Zero interest Clean Renewable Energy Bonds (CREBS), and direct grant funding from the U.S Department of Agriculture, U.S Department of Energy or other agencies are two potential forms of renewable project assistance applicable to the proposed wind projects. These as well as other funding sources should be explored and evaluated in more detail as a precondition for further project development.

- **MET Tower** – Wind measurement data for this analysis was based on the New England Wind Map. In order to improve the accuracy of the wind resource estimates it is recommended that ABM look into installing a Meteorological (MET) tower at one or more of the project locations. However, given the relatively small proposed project size and marginal economics associated with these projects, we recommend installation of a MET tower only if the ABM can get the tower donated, or have the costs fully covered by another funding source.

- **Local Ordinances** – Prior to installing a MET tower, it will be important to further evaluate local ordinances for noise, height and setback limitations. It may be necessary to go before a local zoning board to get a permit and/or exemption for a MET tower and potential wind project. This should be performed in conjunction with initial community outreach.

- **Remanufactured Turbine Option** – It is also recommended that project proponents look at the possibility of using a remanufactured turbine at any of the project sites. Assuming lower capital costs for remanufactured turbines, consideration of this option will have a substantial positive impact on project finances. However, unpredictable and potentially higher O&M costs may offset this value and should also be taken into account.

- **Initial Community Outreach** – Given the proximity of the proposed project areas to many residential homes, it will be important to educate the local community and adjacent residences on the benefits and potential safety issues surrounding wind turbine development in their area.

9. Energy Efficiency Opportunity Assessment

9.1 Methodology

KEMA performed energy audits at six separate ABM tribal buildings in Presque Isle. The buildings selected were deemed to constitute a representative sample of the tribal-owned building stock at Presque Isle. These buildings were also selected on the basis of their age and energy consumption patterns. The audits performed included four residences and two converted commercial buildings as indicated below:

Residential

- 36 MicMac – two-family dwelling
- 26 Northern – two-family dwelling
- 51 MicMac – single-family dwelling
- 52 MicMac - single-family dwelling

Commercial

- Housing & Real Estate Building – converted two-family dwelling
- Head Start Building – converted two-family dwelling

The buildings consisted of one of two basic designs. Building designs and associated square footage calculations are depicted below.

Figure 19. Two-family dwelling

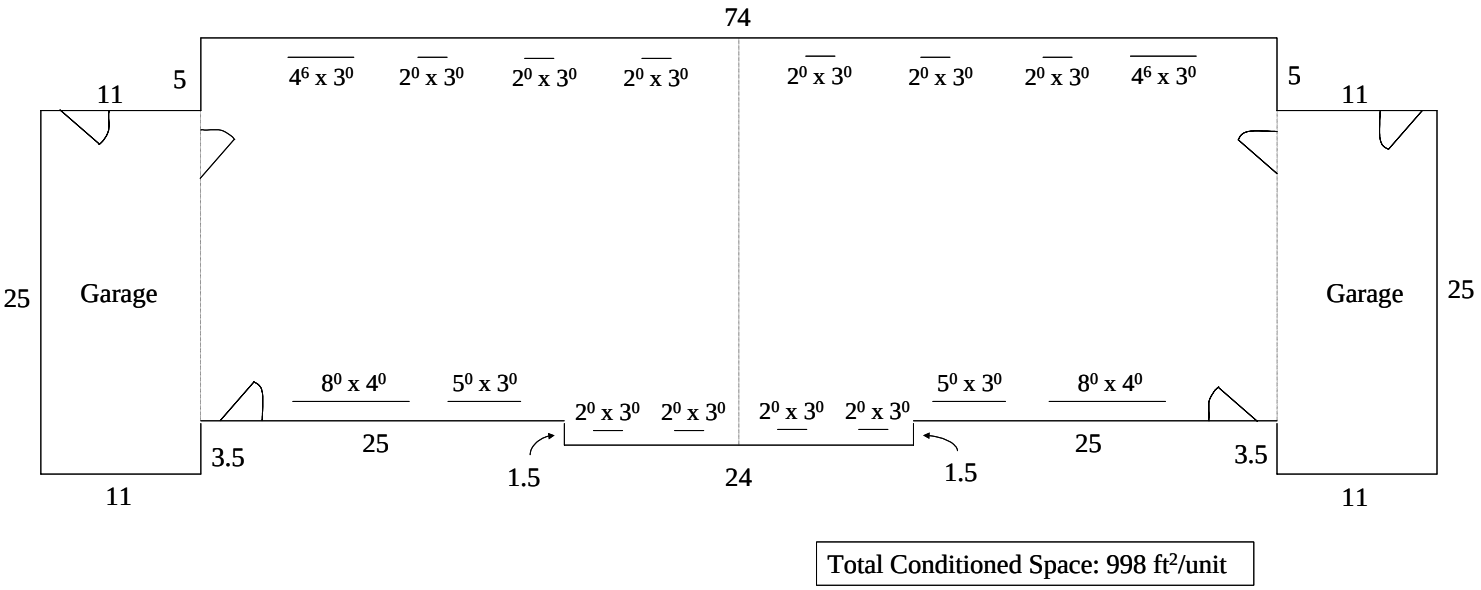
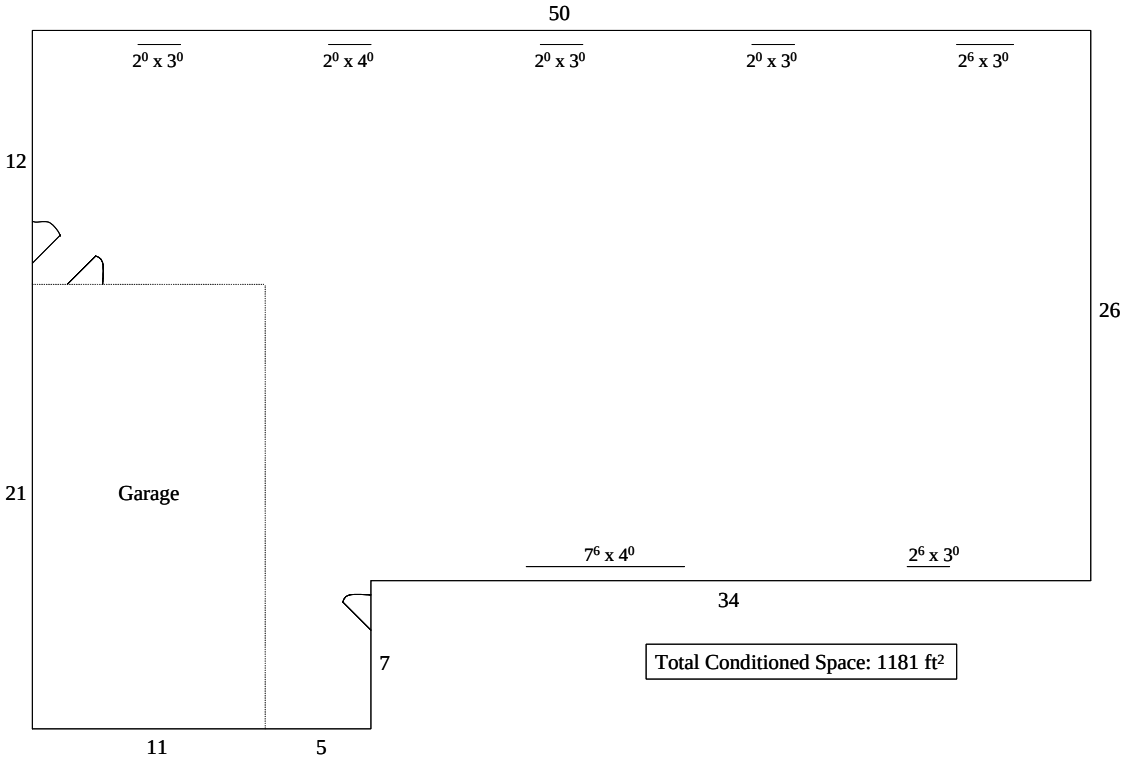


Figure 20. Single Family Dwelling



For each dwelling, KEMA inspected insulation levels, windows and doors, heating and hot water systems, lighting, and refrigerators. Overall, the six buildings proved to be quite similar in most aspects, with sufficient levels of exterior envelope insulation and no obvious major upgrade opportunities. However, there were some differences identified between the buildings, and KEMA has performed cost-effectiveness analysis to quantify any potential opportunities for energy savings.

KEMA utilized the National Energy Audit Tool (NEAT) to evaluate potential energy savings opportunities for each dwelling. NEAT is a PC-based energy auditing tool developed by the U.S. Department of Energy for use by Weatherization Assistance Programs throughout the U.S. It applies engineering and economic calculations to evaluate energy conservation measures for single-family and small multi-family buildings. The tool calculates estimated energy savings associated with different energy efficiency measures, and based on the benefit-cost ratios of each measure, develops a priority ranking of conservation measures for each dwelling. In order to customize the tool for Presque Isle, model inputs were modified to reflect local climate, fuel cost, and measure cost data.

9.2 Energy Efficiency Audit Results

The NEAT analysis tool confirmed our initial observation from the site visits. Overall, the building shells were found to be well-insulated and opportunities for cost-effective upgrades limited. The same was found to be true of windows and doors, which were in satisfactory condition. In addition, the heating systems in the dwellings we evaluated were found to be in good condition, and did not offer immediate opportunity for upgrade. Note that KEMA did not perform efficiency or diagnostic testing of heating systems.

Although the dwellings were shown to be in satisfactory condition from a weatherization perspective, the NEAT analysis did highlight several other opportunities for energy and cost savings. In particular, smart thermostats and lighting retrofits were recommended for all dwellings. In some cases, refrigerator replacement was recommended. With regard to insulation, pipe insulation on hot water pipes is highlighted as a cost-effective measure, as is floor and sill box insulation in some of the dwellings.

The table below summarizes recommended efficiency measures for each of the dwellings evaluated. Savings to investment ratio (SIR) is provided for each recommended measure. SIR is a measure of cost-effectiveness and is calculated for each recommended energy conservation measure, computed over the measure's lifetime. Additional details about each measure, such as

estimated cost and annual energy savings, are provided in the NEAT output report for each dwelling. These reports are included as **Appendix A** to this document.

Table 13. SIR of energy savings opportunities identified by energy audits.

Building	36 MicMac	51 MicMac	52 MicMac	26 Northern	Head Start	Housing/R.E.
Smart Thermostat	3.3	3.8	3.9	3.7	6.8	6.2
Lighting Retrofit	3.1	3.0	3.0	3.1	2.3	2.4
Refrigerator Replacement	1.5	-	2.8	-	1.6	1.6
HWH Pipe Insulation	4.9	5.9	5.9	4.9	10.4	5.5
R-30 Floor Insulation	-	1.2 (R-19)	1.2 (R-19)	-	4.9	4.7
Sillbox Insulation	7.7	-	-	7.8	-	-
Total Estimated Initial Cost	$879	$1899	$2449	$329	$5041	$4514
Life Cycle SIR	2.6	1.5	1.8	4.4	4.1	4.2

Additional information about each of the measures identified above is provided below:

- **Smart Thermostat** – Also called a setback thermostat, this is a thermostat with a built-in clock that can be programmed to automatically increase or decrease the temperature in the conditioned space at different times of the day or week. Smart thermostat technology allows the occupants to set up a program that automatically lowers the temperature of the house during unoccupied periods or when occupants are sleeping.

- **Lighting Retrofit** – Refers to replacing standard incandescent lightbulbs with compact fluorescent lightbulbs (CFLs). CFLs screw into standard sockets, and give off light that looks just like that of common incandescent bulbs. Although the initial cost of a CFL is higher than that of an incandescent bulb, CFLs are four times more efficient and last up to 10 times longer than incandescents.

- **Refrigerator Replacement** – On average, refrigerators are responsible for nine percent of a home's total energy consumption. In recent years, significant energy efficiency improvements have been made in refrigerator construction. In general, units manufactured

prior to 1990 will use substantially more electricity than newer units. The make, model, and vintage of refrigerators we encountered during our audits varied from dwelling to dwelling.

- **Hot Water Heater Pipe Insulation** – In general, it makes sense to insulate any hot water pipes in unheated spaces, as these will be a source of heat loss. NEAT evaluates savings from insulating the first five feet of both the cold and hot water pipes enter and exiting hot a water heater. Due to the low cost of the measure, it is often cost-effective.

- **Floor Insulation** – Refers to the addition of fiberglass batt insulation to the floor between the living space and basement area. NEAT considers the cost-effectiveness of adding R-11, R-19, or R-30 floor insulation. In general, either floor insulation or foundation wall insulation is recommended for a given subspace. Two of the buildings we looked at, the Head Start and Housing and Real Estate Buildings, had neither type of insulation, although both had sillbox insulation (see below). R-30 floor insulation is recommended as the most cost-effective option for both buildings. In two of the residential buildings we examined, R-11 floor insulation was found. In these cases, upgrading to R-30 (by adding R-19) is recommended as cost-effective.

- **Sillbox Insulation** – The sillbox area on many houses is uninsulated. This is the area between the floor joists above the foundation wall. NEAT recommends installation of R-19 fiberglass insulation to areas of the band joist that are uninsulated and exposed to the outdoors.

9.3 Recommendations

Given a limited budget for energy efficiency upgrades, the SIR for each measure recommended by the NEAT analysis serves as a basis for prioritizing energy efficiency upgrades. A high SIR is representative of a greater opportunity for savings relative to a low SIR. Based on the results, we offer the following initial recommendations:

- The lifecycle SIR for each of the six buildings suggests that the greatest overall savings opportunities exist at the Head Start and Housing & Real Estate Buildings. An approach focused on cost-effectiveness would likely involve concentrating initial efforts on opportunities at these two buildings.

- A second observation is the general consistency in SIR for each measure opportunity across the various buildings. KEMA recommends using measure SIR as the basis for targeting specific measures across ABM buildings. For instance, this approach would suggest that you

first focus on sillbox insulation in buildings where it is needed, followed by HWH pipe insulation, smart thermostats, then lighting retrofits. Such an approach would require doing an inventory of all dwellings to determine those most likely to benefit from upgrades.

- The efficacy and longevity of certain energy efficiency measures, such as installation of smart thermostats and lighting retrofits, require that building occupants fully understand the benefits surrounding their use. As part of this objective, occupants need to be instructed on their use. For example, if a smart thermostat is to be installed in a particular dwelling, it is imperative that the occupants in that dwelling be taught to operate and program the thermostat when it is installed. We therefore recommend that these measures, if undertaken, be accompanied by occupant education.

- Replacement of old refrigerators with newer models offers a significant potential savings opportunity. ABM may wish to do an inventory of the refrigerator stock in ABM dwellings. Given some basic information about an existing refrigerator (i.e., energy rating or make and model number), a simple calculation can be performed to assess the cost-effectiveness of refrigerator replacement. The following web site has a simple calculator for this purpose: http://www.homeenergy.org/consumerinfo/refrigeration2/rsearch.htm.

Appendix A:

NEAT Weatherization Tool Output Reports

NEAT Recommended Measures

Agency	KEMA, Inc.	**State**	US	**Run On**	6/1/2006 3:10:34 P
RunID	1149189034	**Version**	8.2.7.6 8/29/05	**AuditID**	1823179077

Audit Name	36 MICMAC (101-1882)	**Audit Date**	6/1/2006 3
Client ID	1	**Auditor**	admin
Weather File	CARIBUME.WX	**Setup Library Name**	KEMA Library
Comment	Left Side of Duplex		

Annual Energy and Cost Savings

Index	Recommended Measure	Components	Heating (MMBtu)	Heating ($)	Cooling (kWh)	Cooling ($)	BaseLoad (kWh)	BaseLoad ($)	Total (MMBtu)
1	Sillbox Ins.	1	2.9	53	0	0	0	0	2.9
2	DWH Pipe Insulation		0.0	0	0	0	305	15	1.0
3	Smart Thermostat		2.4	44	0	0	0	0	2.4
4	Lighting Retrofits	1,2	0.0	0	0	0	480	62	1.6
5	Refrigerator Rplcmnt		0.0	0	0	0	662	86	2.3

Energy Saving Measure Economics

Index	Recommended Measure	Components	Measure Savings ($/yr)	Measure Cost ($)	Measure SIR	Cumulative Cost ($)	Cumulative SIR
1	Sillbox Ins.	1	53	72	7.7	72	7.7
2	DWH Pipe Insulation		15	23	4.9	95	7.0
3	Smart Thermostat		44	116	3.3	212	5.0
4	Lighting Retrofits	1,2	62	118	3.1	329	4.3
5	Refrigerator Rplcmnt		86	550	1.5	879	2.6

Materials

Index	Material	Type	Quantity	Units
1	Sill Insulation	Faced Batt - R-19	68	SqFt
2	Smart Thermostat		1	Each
3	Compact Fl.	13 Watt	8	Each
4	DHW Pipe Insulation		1	Each
5	New Refrigerator		1	Each

Pre/Post Retrofit Energy and Loads

	Pre Retrofit		Post Retrofit	
	Heating	Cooling	Heating	Cooling
Annual load (MBtu/yr)	30.0	0.0	26.5	0.0
Annual Energy (MBtu/yr)	45.1	0.0	39.8	0.0
Heat loss/gain (kBtu/hr)	36.5	6.3	29.3	6.3
Output required (kBtu/hr)(ton)	36.9	0.5	29.5	0.5

Approximate Manual J Component Contributions to Peak HEATING Load

Component Type	Component Name	Area or Volume (Inf)	Pre Retrofit Load (Btu/h)	Post Retrofit Load (BTU/h)
Wall	WAL1-E	5	38.6	38.6
Wall	WAL1-N	274	2113.8	2113.8
Wall	WAL1-S	250	1933.4	1933.4
Wall	WAL1-W	190	1466.6	1466.6
Window	1	18	752.4	752.4
Window	2	14	564.3	564.3
Window	3	32	1551.6	1551.6
Window	4	15	727.3	727.3
Window	5	12	581.9	581.9
Door	1	17	511.6	511.6
Door	2	17	511.6	511.6
Attic	1	998	2109.1	2109.1
Foundation	1	998	10760.1	10760.1
Infiltration	Inf	7984	12880.9	5630.4
Total heat loss	Tot	0	36503.2	29252.7
Duct loss	Duct	0	365.0	292.5
Output required	Output	0	36868.2	29545.2

Approximate Manual J Component Contributions to Peak COOLING Load

Component Type	Component Name	Area or Volume (Inf)	Pre Retrofit Load (Btu/h)	Post Retrofit Load (BTU/h)
Wall	WAL1-E	5	0.4	0.4
Wall	WAL1-N	274	230.6	230.6
Wall	WAL1-S	250	210.9	210.9
Wall	WAL1-W	190	16.7	16.7
Window	1	18	313.2	313.2
Window	2	14	234.9	234.9
Window	3	32	1036.8	1036.8
Window	4	15	486.0	486.0
Window	5	12	388.8	388.8
Door	1	17	55.8	55.8
Door	2	17	55.8	55.8
Attic	1	998	717.3	717.3
Foundation	1	998	0.0	0.0
Infiltration	Inf	7984	349.8	349.8
People	People	4	1000.0	1000.0

Component Type	Component Name	Area or Volume (Inf)	Pre Retrofit Load (Btu/h)	Post Retrofit Load (BTU/h)
Appliances	Appl	1	1200.0	1200.0
Total Sensible	TotS	0	6297.0	6297.0
Ducts	Ducts	0	0.0	0.0
Total (with ducts)	TotW	0	6297.0	6297.0
Size (tons)	Size	0	0.5	0.5
Latent Load (inf)	LatentI	0	234.3	234.3
Latent Load (occ)	LatentO	0	920.0	920.0
Latent Load (tot)	LatentT	0	1154.3	1154.3
Total Load	Total	0	7451.3	7451.3
Size (tons)	Size	0	0.6	0.6

Special Notes

NOTE: Heat loss and Output required are only guides to sizing equipment.
NOTE: See NEAT User's Manual for further sizing details.
NOTE: Read cautions in NEAT User's Manual related to sizing results.
NOTE: (+) in the Materials list indicates there are more related User Defined Materials.

Comments

Type	Code	Comment
Wall	WAL1-E	Interior Wall of Duplex; Not considered in calculations
Wall	WAL1-W	Mostly Garage Wall
Attic	1	R19 fiberglass batt + 6" loose cellulose
Water Heater		HWH operates off of boiler - AMTROL
Lighting	1	Use estimates from Tacoma, WA Baseline Residential Lighting Energy Use Study 5/96

NEAT Recommended Measures

Agency	KEMA, Inc.	**State**	US	**Run On**	6/1/2006 3:08:41 P
RunID	1149188921	**Version**	8.2.7.6 8/29/05	**AuditID**	-1974164510

Audit Name	26 Northern (101-1885)	**Audit Date**	6/1/2006 3
Client ID	1	**Auditor**	admin
Weather File	CARIBUME.WX	**Setup Library Name**	KEMA Library
Comment	Left Side of Duplex		

Annual Energy and Cost Savings

Index	Recommended Measure	Components	Heating (MMBtu)	Heating ($)	Cooling (kWh)	Cooling ($)	BaseLoad (kWh)	BaseLoad ($)	Total (MMBtu)
1	Sillbox Ins.	1	2.9	53	0	0	0	0	2.9
2	DWH Pipe Insulation		0.0	0	0	0	305	15	1.0
3	Smart Thermostat		2.6	49	0	0	0	0	2.6
4	Lighting Retrofits	1,2	0.0	0	0	0	480	62	1.6

Energy Saving Measure Economics

Index	Recommended Measure	Components	Measure Savings ($/yr)	Measure Cost ($)	Measure SIR	Cumulative Cost ($)	Cumulative SIR
1	Sillbox Ins.	1	53	72	7.8	72	7.8
2	DWH Pipe Insulation		15	23	4.9	95	7.1
3	Smart Thermostat		49	116	3.7	212	5.2
4	Lighting Retrofits	1,2	62	118	3.1	329	4.4

Materials

Index	Material	Type	Quantity	Units
1	Sill Insulation	Faced Batt - R-19	68	SqFt
2	Smart Thermostat		1	Each
3	Compact Fl.	13 Watt	8	Each
4	DHW Pipe Insulation		1	Each

Pre/Post Retrofit Energy and Loads

	Pre Retrofit		Post Retrofit	
	Heating	Cooling	Heating	Cooling
Annual load (MBtu/yr)	34.4	0.0	30.7	0.0

	Pre Retrofit		Post Retrofit	
	Heating	Cooling	Heating	Cooling
Annual Energy (MBtu/yr)	51.7	0.0	46.1	0.0
Heat loss/gain (kBtu/hr)	36.5	5.9	29.3	5.9
Output required (kBtu/hr)(ton)	36.9	0.5	29.5	0.5

Approximate Manual J Component Contributions to Peak HEATING Load

Component Type	Component Name	Area or Volume (Inf)	Pre Retrofit Load (Btu/h)	Post Retrofit Load (BTU/h)
Wall	WAL1-E	207	1597.8	1597.8
Wall	WAL1-N	233	1802.1	1802.1
Wall	WAL1-S	274	2113.8	2113.8
Wall	WAL1-W	5	38.6	38.6
Window	1	18	752.4	752.4
Window	2	14	564.3	564.3
Window	3	32	1551.6	1551.6
Window	4	15	727.3	727.3
Window	5	12	581.9	581.9
Door	1	17	511.6	511.6
Door	2	17	511.6	511.6
Attic	1	998	2109.1	2109.1
Foundation	1	998	10760.1	10760.1
Infiltration	Inf	7984	12880.9	5630.4
Total heat loss	Tot	0	36503.2	29252.7
Duct loss	Duct	0	365.0	292.5
Output required	Output	0	36868.2	29545.2

Approximate Manual J Component Contributions to Peak COOLING Load

Component Type	Component Name	Area or Volume (Inf)	Pre Retrofit Load (Btu/h)	Post Retrofit Load (BTU/h)
Wall	WAL1-E	207	18.2	18.2
Wall	WAL1-N	233	196.6	196.6
Wall	WAL1-S	274	230.6	230.6
Wall	WAL1-W	5	0.4	0.4
Window	1	18	583.2	583.2
Window	2	14	437.4	437.4
Window	3	32	556.8	556.8
Window	4	15	261.0	261.0
Window	5	12	208.8	208.8
Door	1	17	55.8	55.8
Door	2	17	55.8	55.8
Attic	1	998	717.3	717.3
Foundation	1	998	0.0	0.0
Infiltration	Inf	7984	349.8	349.8
People	People	4	1000.0	1000.0

Component Type	Component Name	Area or Volume (Inf)	Pre Retrofit Load (Btu/h)	Post Retrofit Load (BTU/h)
Appliances	Appl	1	1200.0	1200.0
Total Sensible	TotS	0	5871.7	5871.7
Ducts	Ducts	0	0.0	0.0
Total (with ducts)	TotW	0	5871.7	5871.7
Size (tons)	Size	0	0.5	0.5
Latent Load (inf)	LatentI	0	234.3	234.3
Latent Load (occ)	LatentO	0	920.0	920.0
Latent Load (tot)	LatentT	0	1154.3	1154.3
Total Load	Total	0	7026.0	7026.0
Size (tons)	Size	0	0.6	0.6

Special Notes

NOTE: Heat loss and Output required are only guides to sizing equipment.
NOTE: See NEAT User's Manual for further sizing details.
NOTE: Read cautions in NEAT User's Manual related to sizing results.
NOTE: (+) in the Materials list indicates there are more related User Defined Materials.

Comments

Type	Code	Comment
Wall	WAL1-E	Mostly Garage Wall
Wall	WAL1-W	Interior Wall of Duplex; not included in calculations
Attic	1	R19 fiberglass batt + 6" loose cellulose
Water Heater		HWH operates off of boiler - AMTROL
Lighting	1	Use estimates from Tacoma, WA Baseline Residential Lighting Energy Use Study 5/96

NEAT Recommended Measures

Agency	KEMA, Inc.	**State**	US	**Run On**	6/1/2006 11:55:22
				RunID	1149177322
				Version	8.2.7.6 8/29/05
				AuditID	14324788

Audit Name	51 MICMAC (101-1884)	**Audit Date**	6/1/2006 1
Client ID	1	**Auditor**	admin
Weather File	CARIBUME.WX	**Setup Library Name**	KEMA Library
Comment	Single Family Stand Alone		

Annual Energy and Cost Savings

Index	Recommended Measure	Components	Heating (MMBtu)	Heating ($)	Cooling (kWh)	Cooling ($)	BaseLoad (kWh)	BaseLoad ($)	Total (MMBtu)
1	DWH Pipe Insulation		0.0	0	0	0	373	18	1.3
2	Smart Thermostat		2.8	51	0	0	0	0	2.8
3	Lighting Retrofits	3,6,7	0.0	0	0	0	515	67	1.8
4	Floor Ins. R-19	1	9.6	177	0	0	0	0	9.6

Energy Saving Measure Economics

Index	Recommended Measure	Components	Measure Savings ($/yr)	Measure Cost ($)	Measure SIR	Cumulative Cost ($)	Cumulative SIR
1	DWH Pipe Insulation		18	23	5.9	23	5.9
2	Smart Thermostat		51	116	3.8	140	4.2
3	Lighting Retrofits	3,6,7	67	147	3.0	287	3.6
4	Floor Ins. R-19	1	177	1612	1.2	1899	1.5

Materials

Index	Material	Type	Quantity	Units
1	Floor Insulation	Faced Batt - R-19	1181	SqFt
2	Smart Thermostat		1	Each
3	Compact Fl.	13 Watt	10	Each
4	DHW Pipe Insulation		1	Each

Pre/Post Retrofit Energy and Loads

	Pre Retrofit		Post Retrofit	
	Heating	Cooling	Heating	Cooling
Annual load (MBtu/yr)	41.9	0.0	32.3	0.0

	Pre Retrofit		Post Retrofit	
	Heating	Cooling	Heating	Cooling
Annual Energy (MBtu/yr)	53.9	0.0	41.5	0.0
Heat loss/gain (kBtu/hr)	36.2	9.3	24.4	9.3
Output required (kBtu/hr)(ton)	36.6	0.8	24.6	0.8

Approximate Manual J Component Contributions to Peak HEATING Load

Component Type	Component Name	Area or Volume (Inf)	Pre Retrofit Load (Btu/h)	Post Retrofit Load (BTU/h)
Wall	WAL-E	353	2726.9	2726.9
Wall	WAL-N	247	1906.6	1906.6
Wall	WAL-S	247	1906.6	1906.6
Wall	WAL-W	377	2909.9	2909.9
Window	1	18	872.8	872.8
Window	2	8	363.7	363.7
Window	3	8	387.9	387.9
Window	4	8	363.7	363.7
Window	5	30	1454.6	1454.6
Door	1	17	511.6	511.6
Door	2	17	511.6	511.6
Door	3	17	511.6	511.6
Attic	1	1181	2495.9	2495.9
Foundation	1	1181	4030.7	1848.5
Infiltration	Inf	9448	15242.8	5630.4
Total heat loss	Tot	0	36196.8	24402.2
Duct loss	Duct	0	362.0	244.0
Output required	Output	0	36558.8	24646.2

Approximate Manual J Component Contributions to Peak COOLING Load

Component Type	Component Name	Area or Volume (Inf)	Pre Retrofit Load (Btu/h)	Post Retrofit Load (BTU/h)
Wall	WAL-E	353	297.5	297.5
Wall	WAL-N	247	208.0	208.0
Wall	WAL-S	247	208.0	208.0
Wall	WAL-W	377	317.4	317.4
Window	1	18	1195.2	1195.2
Window	2	8	498.0	498.0
Window	3	8	531.2	531.2
Window	4	8	498.0	498.0
Window	5	30	1992.0	1992.0
Door	1	17	55.8	55.8
Door	2	17	55.8	55.8
Door	3	17	55.8	55.8
Attic	1	1181	848.8	848.8
Foundation	1	1181	0.0	0.0

Component Type	Component Name	Area or Volume (Inf)	Pre Retrofit Load (Btu/h)	Post Retrofit Load (BTU/h)
Infiltration	Inf	9448	365.9	365.9
People	People	4	1000.0	1000.0
Appliances	Appl	1	1200.0	1200.0
Total Sensible	TotS	0	9327.5	9327.5
Ducts	Ducts	0	0.0	0.0
Total (with ducts)	TotW	0	9327.5	9327.5
Size (tons)	Size	0	0.8	0.8
Latent Load (inf)	LatentI	0	245.0	245.0
Latent Load (occ)	LatentO	0	920.0	920.0
Latent Load (tot)	LatentT	0	1165.0	1165.0
Total Load	Total	0	10492.5	10492.5
Size (tons)	Size	0	0.9	0.9

Special Notes

NOTE: Heat loss and Output required are only guides to sizing equipment.
NOTE: See NEAT User's Manual for further sizing details.
NOTE: Read cautions in NEAT User's Manual related to sizing results.
NOTE: (+) in the Materials list indicates there are more related User Defined Materials.

Comments

Type	Code	Comment
Attic	1	Attic entries sealed - no access (info estimated based on like home) 2.5" Rockwool Batt & 6" Loose Cellulose
Foundation	1	Ceiling insulated but foundation is not
Heating System	1	Pipes not insulated in basement
Water Heater		HWH operates off of Boiler

NEAT Recommended Measures

Agency	KEMA, Inc.	**State**	US	**Run On**	6/1/2006 11:56:51
RunID	1149177411	**Version**	8.2.7.6 8/29/05	**AuditID**	1147875811

Audit Name	52 MICMAC (101-1883)	**Audit Date**	6/1/2006 1
Client ID	1	**Auditor**	admin
Weather File	CARIBUME.WX	**Setup Library Name**	KEMA Library
Comment	Single Family Stand Alone		

Annual Energy and Cost Savings

Index	Recommended Measure	Components	Heating (MMBtu)	Heating ($)	Cooling (kWh)	Cooling ($)	BaseLoad (kWh)	BaseLoad ($)	Total (MMBtu)
1	DWH Pipe Insulation		0.0	0	0	0	373	18	1.3
2	Smart Thermostat		2.8	51	0	0	0	0	2.8
3	Lighting Retrofits	3,6,7	0.0	0	0	0	515	67	1.8
4	Refrigerator Rplcmnt		0.0	0	0	0	1236	161	4.2
5	Floor Ins. R-19	1	9.5	177	0	0	0	0	9.5

Energy Saving Measure Economics

Index	Recommended Measure	Components	Measure Savings ($/yr)	Measure Cost ($)	Measure SIR	Cumulative Cost ($)	Cumulative SIR
1	DWH Pipe Insulation		18	23	5.9	23	5.9
2	Smart Thermostat		51	116	3.9	140	4.2
3	Lighting Retrofits	3,6,7	67	147	3.0	287	3.6
4	Refrigerator Rplcmnt		161	550	2.8	837	3.1
5	Floor Ins. R-19	1	177	1612	1.2	2449	1.8

Materials

Index	Material	Type	Quantity	Units
1	Floor Insulation	Faced Batt - R-19	1181	SqFt
2	Smart Thermostat		1	Each
3	Compact Fl.	13 Watt	10	Each
4	DHW Pipe Insulation		1	Each
5	New Refrigerator		1	Each

Pre/Post Retrofit Energy and Loads

	Pre Retrofit		Post Retrofit	
	Heating	Cooling	Heating	Cooling
Annual load (MBtu/yr)	41.3	0.0	31.7	0.0
Annual Energy (MBtu/yr)	53.1	0.0	40.7	0.0
Heat loss/gain (kBtu/hr)	36.7	9.7	24.9	9.7
Output required (kBtu/hr)(ton)	37.1	0.8	25.2	0.8

Approximate Manual J Component Contributions to Peak HEATING Load

Component Type	Component Name	Area or Volume (Inf)	Pre Retrofit Load (Btu/h)	Post Retrofit Load (BTU/h)
Wall	WAL-E	377	2909.9	2909.9
Wall	WAL-N	247	1906.6	1906.6
Wall	WAL-S	239	1844.4	1844.4
Wall	WAL-W	353	2726.9	2726.9
Window	1	18	872.8	872.8
Window	2	8	363.7	363.7
Window	3	8	387.9	387.9
Window	4	8	363.7	363.7
Window	5	30	1454.6	1454.6
Window	6	12	581.9	581.9
Door	1	17	511.6	511.6
Door	2	17	511.6	511.6
Door	3	17	511.6	511.6
Attic	1	1181	2495.9	2495.9
Foundation	1	1181	4030.7	1848.5
Infiltration	Inf	9448	15242.8	5630.4
Total heat loss	Tot	0	36716.5	24921.9
Duct loss	Duct	0	367.2	249.2
Output required	Output	0	37083.6	25171.1

Approximate Manual J Component Contributions to Peak COOLING Load

Component Type	Component Name	Area or Volume (Inf)	Pre Retrofit Load (Btu/h)	Post Retrofit Load (BTU/h)
Wall	WAL-E	377	317.4	317.4
Wall	WAL-N	247	208.0	208.0
Wall	WAL-S	239	201.2	201.2
Wall	WAL-W	353	297.5	297.5
Window	1	18	1195.2	1195.2
Window	2	8	498.0	498.0
Window	3	8	531.2	531.2
Window	4	8	498.0	498.0
Window	5	30	1992.0	1992.0
Window	6	12	388.8	388.8
Door	1	17	55.8	55.8
Door	2	17	55.8	55.8
Door	3	17	55.8	55.8

Component Type	Component Name	Area or Volume (Inf)	Pre Retrofit Load (Btu/h)	Post Retrofit Load (BTU/h)
Attic	1	1181	848.8	848.8
Foundation	1	1181	0.0	0.0
Infiltration	Inf	9448	365.9	365.9
People	People	4	1000.0	1000.0
Appliances	Appl	1	1200.0	1200.0
Total Sensible	TotS	0	9709.5	9709.5
Ducts	Ducts	0	0.0	0.0
Total (with ducts)	TotW	0	9709.5	9709.5
Size (tons)	Size	0	0.8	0.8
Latent Load (inf)	LatentI	0	245.0	245.0
Latent Load (occ)	LatentO	0	920.0	920.0
Latent Load (tot)	LatentT	0	1165.0	1165.0
Total Load	Total	0	10874.5	10874.5
Size (tons)	Size	0	0.9	0.9

Special Notes

NOTE: Heat loss and Output required are only guides to sizing equipment.

NOTE: See NEAT User's Manual for further sizing details.

NOTE: Read cautions in NEAT User's Manual related to sizing results.

NOTE: (+) in the Materials list indicates there are more related User Defined Materials.

Comments

Type	Code	Comment
Attic	1	Attic entries sealed - no access (info estimated based on like home) 2.5" Rockwool Batt & 6" Loose Cellulose
Foundation	1	Ceiling insulated but foundation is not
Heating System	1	Pipes not insulated in basement
Water Heater		HWH operates off of Boiler

NEAT Recommended Measures

Agency	KEMA, Inc.	**State**	US	**Run On**	6/1/2006 11:58:29
				RunID	1149177509
				Version	8.2.7.6 8/29/05
				AuditID	1311117161

Audit Name	Head Start (101-1887)	**Audit Date**	6/1/2006 1
Client ID	1	**Auditor**	admin
Weather File	CARIBUME.WX	**Setup Library Name**	KEMA Library
Comment	Includes left and right side of Duplex and garage space		

Annual Energy and Cost Savings

Index	Recommended Measure	Components	Heating (MMBtu)	Heating ($)	Cooling (kWh)	Cooling ($)	BaseLoad (kWh)	BaseLoad ($)	Total (MMBtu)
1	DWH Pipe Insulation		0.0	0	0	0	213	28	0.7
2	Smart Thermostat		4.9	91	0	0	0	0	4.9
3	Floor Ins. R-30	1	84.9	1571	0	0	0	0	84.9
4	Lighting Retrofits	1,2,3,5	0.0	0	0	0	5567	724	19.0
5	Refrigerator Rplcmnt		0.0	0	0	0	708	92	2.4

Energy Saving Measure Economics

Index	Recommended Measure	Components	Measure Savings ($/yr)	Measure Cost ($)	Measure SIR	Cumulative Cost ($)	Cumulative SIR
1	DWH Pipe Insulation		28	23	10.4	23	10.4
2	Smart Thermostat		91	116	6.8	140	7.4
3	Floor Ins. R-30	1	1571	3403	4.9	3543	5.0
4	Lighting Retrofits	1,2,3,5	724	955	2.3	4497	4.4
5	Refrigerator Rplcmnt		92	550	1.6	5047	4.1

Materials

Index	Material	Type	Quantity	Units
1	Floor Insulation	Faced Batt - R-30	1996	SqFt
2	Smart Thermostat		1	Each
3	Compact Fl.	7 Watt	68	Each
4	Compact Fl.	13 Watt	4	Each
5	DHW Pipe Insulation		1	Each
6	New Refrigerator		1	Each

Pre/Post Retrofit Energy and Loads

	Pre Retrofit		Post Retrofit	
	Heating	Cooling	Heating	Cooling
Annual load (MBtu/yr)	119.3	0.0	56.7	0.0
Annual Energy (MBtu/yr)	171.3	0.0	81.4	0.0
Heat loss/gain (kBtu/hr)	76.1	10.5	40.3	10.5
Output required (kBtu/hr)(ton)	76.8	0.9	40.7	0.9

Approximate Manual J Component Contributions to Peak HEATING Load

Component Type	Component Name	Area or Volume (Inf)	Pre Retrofit Load (Btu/h)	Post Retrofit Load (BTU/h)
Wall	HWAL1-E	303	2338.8	2338.8
Wall	HWAL1-N	690	5323.6	5323.6
Wall	HWAL1-S	644	4974.6	4974.6
Wall	HWAL1-W	303	2338.8	2338.8
Window	1	36	1745.6	1745.6
Window	2	27	1309.2	1309.2
Window	3	64	3103.2	3103.2
Window	4	30	1454.6	1454.6
Door	1	17	511.6	511.6
Door	2	51	1534.9	1534.9
Door	3	17	511.6	511.6
Door	4	34	1023.3	1023.3
Attic	1	2546	5380.6	5380.6
Foundation	1	1996	21520.2	3124.2
Infiltration	Inf	20368	23002.3	5630.4
Total heat loss	Tot	0	76073.0	40305.0
Duct loss	Duct	0	760.7	403.1
Output required	Output	0	76833.7	40708.1

Approximate Manual J Component Contributions to Peak COOLING Load

Component Type	Component Name	Area or Volume (Inf)	Pre Retrofit Load (Btu/h)	Post Retrofit Load (BTU/h)
Wall	HWAL1-E	303	255.1	255.1
Wall	HWAL1-N	690	580.8	580.8
Wall	HWAL1-S	644	542.7	542.7
Wall	HWAL1-W	303	26.6	26.6
Window	1	36	626.4	626.4
Window	2	27	469.8	469.8
Window	3	64	2073.6	2073.6
Window	4	30	972.0	972.0
Door	1	17	55.8	55.8
Door	2	51	167.4	167.4
Door	3	17	55.8	55.8
Door	4	34	111.6	111.6
Attic	1	2546	1829.9	1829.9
Foundation	1	1996	0.0	0.0

Component Type	Component Name	Area or Volume (Inf)	Pre Retrofit Load (Btu/h)	Post Retrofit Load (BTU/h)
Infiltration	Inf	20368	486.0	486.0
People	People	4	1000.0	1000.0
Appliances	Appl	1	1200.0	1200.0
Total Sensible	TotS	0	10453.5	10453.5
Ducts	Ducts	0	0.0	0.0
Total (with ducts)	TotW	0	10453.5	10453.5
Size (tons)	Size	0	0.9	0.9
Latent Load (inf)	LatentI	0	325.5	325.5
Latent Load (occ)	LatentO	0	920.0	920.0
Latent Load (tot)	LatentT	0	1245.5	1245.5
Total Load	Total	0	11699.0	11699.0
Size (tons)	Size	0	1.0	1.0

Special Notes

NOTE: Heat loss and Output required are only guides to sizing equipment.
NOTE: See NEAT User's Manual for further sizing details.
NOTE: Read cautions in NEAT User's Manual related to sizing results.
NOTE: (+) in the Materials list indicates there are more related User Defined Materials.

Comments

Type	Code	Comment
Attic	1	R19 fiberglass batt + 6" loose cellulose - based on other attics
Foundation	1	Sill insulation present No wall or ceiling insulation in basement
Heating System	2	Pipes not insulated
Water Heater		2 identical HWH/expansion tanks off boiler and small supplimental HWH...see above
Lighting	1	Use estimates from Tacoma, WA Baseline Residential Lighting Energy Use Study 5/96
Lighting	3	48 T-12s

NEAT Recommended Measures

Agency	KEMA, Inc.	**State**	US	**Run On**	6/1/2006 3:05:19 P
RunID	1149188719	**Version**	8.2.7.6 8/29/05	**AuditID**	1148395846

Audit Name	Housing/Real Estate (101-1886	**Audit Date**	6/1/2006 3
Client ID	1	**Auditor**	admin
Weather File	CARIBUME.WX	**Setup Library Name**	KEMA Library
Comment	Includes left and right side of Duplex		

Annual Energy and Cost Savings

Index	Recommended Measure	Components	Heating (MMBtu)	Heating ($)	Cooling (kWh)	Cooling ($)	BaseLoad (kWh)	BaseLoad ($)	Total (MMBtu)
1	Smart Thermostat		4.5	82	0	0	0	0	4.5
2	DWH Pipe Insulation		0.0	0	0	0	342	16	1.2
3	Floor Ins. R-30	1	82.1	1519	0	0	0	0	82.1
4	Lighting Retrofits	1,2,4,5	0.0	0	0	0	2413	314	8.2
5	Refrigerator Rplcmnt		0.0	0	0	0	708	92	2.4

Energy Saving Measure Economics

Index	Recommended Measure	Components	Measure Savings ($/yr)	Measure Cost ($)	Measure SIR	Cumulative Cost ($)	Cumulative SIR
1	Smart Thermostat		82	116	6.2	116	6.2
2	DWH Pipe Insulation		16	23	5.5	140	6.1
3	Floor Ins. R-30	1	1519	3403	4.7	3543	4.8
4	Lighting Retrofits	1,2,4,5	314	428	2.4	3970	4.5
5	Refrigerator Rplcmnt		92	550	1.6	4520	4.2

Materials

Index	Material	Type	Quantity	Units
1	Floor Insulation	Faced Batt - R-30	1996	SqFt
2	Smart Thermostat		1	Each
3	Compact Fl.	7 Watt	28	Each
4	Compact Fl.	13 Watt	4	Each
5	DHW Pipe Insulation		1	Each
6	New Refrigerator		1	Each

Pre/Post Retrofit Energy and Loads

	Pre Retrofit		Post Retrofit	
	Heating	Cooling	Heating	Cooling
Annual load (MBtu/yr)	111.2	0.0	49.1	0.0
Annual Energy (MBtu/yr)	155.1	0.0	68.5	0.0
Heat loss/gain (kBtu/hr)	71.6	9.8	38.3	9.8
Output required (kBtu/hr)(ton)	72.4	0.8	38.6	0.8

Approximate Manual J Component Contributions to Peak HEATING Load

Component Type	Component Name	Area or Volume (Inf)	Pre Retrofit Load (Btu/h)	Post Retrofit Load (BTU/h)
Wall	HWAL1-E	303	2338.8	2338.8
Wall	HWAL1-N	724	5586.1	5586.1
Wall	HWAL1-S	657	5074.7	5074.7
Wall	HWAL1-W	303	2338.8	2338.8
Window	1	36	1745.6	1745.6
Window	2	27	1309.2	1309.2
Window	3	64	3103.2	3103.2
Window	4	36	1745.6	1745.6
Door	1	17	511.6	511.6
Door	2	34	1023.3	1023.3
Door	3	17	511.6	511.6
Attic	1	1996	4218.3	4218.3
Foundation	1	1996	21520.2	3124.2
Infiltration	Inf	15968	20609.4	5630.4
Total heat loss	Tot	0	71636.3	38261.3
Duct loss	Duct	0	716.4	382.6
Output required	Output	0	72352.7	38643.9

Approximate Manual J Component Contributions to Peak COOLING Load

Component Type	Component Name	Area or Volume (Inf)	Pre Retrofit Load (Btu/h)	Post Retrofit Load (BTU/h)
Wall	HWAL1-E	303	26.6	26.6
Wall	HWAL1-N	724	609.4	609.4
Wall	HWAL1-S	657	553.6	553.6
Wall	HWAL1-W	303	26.6	26.6
Window	1	36	626.4	626.4
Window	2	27	469.8	469.8
Window	3	64	2073.6	2073.6
Window	4	36	1166.4	1166.4
Door	1	17	55.8	55.8
Door	2	34	111.6	111.6
Door	3	17	55.8	55.8
Attic	1	1996	1434.6	1434.6
Foundation	1	1996	0.0	0.0
Infiltration	Inf	15968	437.6	437.6
People	People	4	1000.0	1000.0

Component Type	Component Name	Area or Volume (Inf)	Pre Retrofit Load (Btu/h)	Post Retrofit Load (BTU/h)
Appliances	Appl	1	1200.0	1200.0
Total Sensible	TotS	0	9847.8	9847.8
Ducts	Ducts	0	0.0	0.0
Total (with ducts)	TotW	0	9847.8	9847.8
Size (tons)	Size	0	0.8	0.8
Latent Load (inf)	LatentI	0	293.0	293.0
Latent Load (occ)	LatentO	0	920.0	920.0
Latent Load (tot)	LatentT	0	1213.0	1213.0
Total Load	Total	0	11060.8	11060.8
Size (tons)	Size	0	0.9	0.9

Special Notes

NOTE: Heat loss and Output required are only guides to sizing equipment.
NOTE: See NEAT User's Manual for further sizing details.
NOTE: Read cautions in NEAT User's Manual related to sizing results.
NOTE: (+) in the Materials list indicates there are more related User Defined Materials.

Comments

Type	Code	Comment
Wall	HWAL1-E	Mostly Garage Wall
Wall	HWAL1-W	Interior Wall of Duplex
Attic	1	R19 fiberglass batt + 6" loose cellulose
Foundation	1	Sill insulation present No wall or ceiling insulation
Heating System	2	Pipes not insulated
Lighting	1	Use estimates from Tacoma, WA Baseline Residential Lighting Energy Use Study 5/96
Lighting	3	Basement - 12 T12s

ATTACHMENT 12

COMMUNITY INFORMATION MEETING ANNOUNCEMENT

Aroostook Band of Micmacs
Strategic Energy Planning
Community Information Meeting Agenda

Meeting Purpose:

- To present findings of research on tribal energy use, energy efficiency opportunities, and renewable energy options.
- To obtain community input on research and findings.
- To obtain community input on draft vision statement.

Desired Outcomes:

- Educate the community on tribal and household energy usage, energy efficiency and renewable energy opportunities.
- Input on the vision statement to ensure it reflects community interests, goals and values.

Agenda:

Introductions	All
Project Goals and Objectives	Russell Dennis, Economic Development Director
1.	
Summary of Report	Chris Clark or Ryan Chaytors, KEMA
Q&A	All
Draft Vision Statement	Lori Ribeiro, Independent Consultant
Discussion	All
Meeting Wrap Up/Next Steps	Lori Ribeiro, Independent Consultant Russell Dennis

1. Develop Action Plan
2. Permits for Tower Placement
3. Contact NREL, State Energy Program, Cost Estimates for Studies
4. Feasibility Studies (Wind for Three Sites)
5. Training for Energy Auditors (Bon Aire Site Specific)
6. Energy Audits (Bon Aire)

7. Appliance Inventory
8. Begin Weatherization Measures
9. Identify Funding Sources
    a. USDOE Follow on Feasibility Study under First Steps Program
    b. USDA Renewable Energy Program (Implementation)
    c. Green Tags
    d. CREBS
10. Extensive Energy Audit Training for Interested Tribal Members
11. Weatherization Training
12. Acquire Equipment and Software to Conduct Audits
13. Training for Green Building Techniques
14. Establish Weatherization Business

Close

Russell Dennis, Economic Development Director

For Further Information Contact:
Russell Dennis, Economic Development Director (207) 764-1972, rdennis@micmac-nsn.gov

ATTACHMENT 13

COMMUNITY INFORMATION MEETING SUMMARY

Report Summary
Aroostook Band of Micmacs
Strategic Energy Planning
June 2006

Introduction
In 2005, the U.S. Department of Energy awarded the Aroostook Band of Micmacs a "First Steps" grant to develop a strategic energy plan. The tribe formed an Energy Committee that has been working with consultants to perform research on energy efficiency and renewable energy opportunities. The information they gather will be used to develop a strategic energy vision and plan for the tribe. This report summarizes key findings of the research to date.

Project Goals and Objectives
The Aroostook Band of Micmac (ABM) Tribal Council will develop a strategic energy plan to:
- Reduce energy costs;
- Promote economic development on Tribal Lands;
- Move towards energy self-sufficiency; and,
- Promote energy security.

In the process, we will:
- Develop an energy vision that considers a balanced portfolio of energy resources and maximizes energy efficiency improvements;
- Promote sustainable economic development; and
- Develop an action plan to address our current and future energy needs.

Community Benefits
The strategic energy plan is important due to the benefits it will provide our community. Benefits to the tribe as a whole include:

- Lower energy bills will reduce operating costs to free up funds for other priorities.
- Producing our own energy is consistent with the tribe's desire for greater self-sufficiency.
- Producing our own energy reduces our reliance on imported fuel sources.

Individual tribal members can benefit primarily from lower energy bills.

Preliminary Findings
The research focused on current and historic tribal energy use, energy efficiency opportunities for tribal buildings and residences, and feasibility of installing wind turbines on tribal land.

Preliminary research found that the majority of opportunities for energy efficiency savings would be found in Presque Isle, location of the largest number, largest sized and oldest tribally-owned buildings. The majority of the tribe's energy expenditures are in Presque Isle.

KEMA, an international energy consulting firm, performed energy efficiency audits. They concluded that the largest buildings – Tribal Headquarters and Health Services buildings – had been built within the past few years, and with efficient features, so they did not require audits. The buildings KEMA audited included:

Residential	**Commercial**
36 Micmac – two-family dwelling 26 Northern – two-family dwelling 51 Micmac – single-family dwelling 52 Micmac – single-family dwelling	Housing & Real Estate Building – converted two-family dwelling Head Start Building – converted two-family dwelling

For each dwelling, KEMA inspected insulation levels, windows and doors, heating and hot water systems, lighting, and refrigerators. Overall, the six buildings proved to be quite similar in most aspects, with sufficient levels of exterior envelope insulation and no obvious major upgrade opportunities. However, there were some differences identified between the buildings, and KEMA has performed cost-effectiveness analysis to quantify any potential opportunities for energy savings.

KEMA used the National Energy Audit Tool (NEAT) to evaluate potential energy savings opportunities for each dwelling. NEAT is an energy auditing tool developed by the U.S. Department of Energy for use by Weatherization Assistance Programs throughout the U.S. In order to customize the tool for Presque Isle, model inputs were modified to reflect local climate, fuel cost, and measure cost data.

Table 1 below summarizes recommended efficiency measures for each of the dwellings evaluated. Savings to investment ratio (SIR) is provided for each recommended measure. SIR is a measure of cost-effectiveness and is calculated for each recommended energy conservation measure, computed over the measure's lifetime.

Table 1. SIR of energy savings opportunities identified by energy audits.

Building	**36 MicMac**	**51 MicMac**	**52 MicMac**	**26 Northern**	**Head Start**	**Housing/R.E.**
Smart Thermostat	3.3	3.8	3.9	3.7	6.8	6.2
Lighting Retrofit	3.1	3.0	3.0	3.1	2.3	2.4
Refrigerator Replacement	1.5	-	2.8	-	1.6	1.6
HWH Pipe Insulation	4.9	5.9	5.9	4.9	10.4	5.5
R-30 Floor Insulation	-	1.2 (R-19)	1.2 (R-19)	-	4.9	4.7
Sillbox Insulation	7.7	-	-	7.8	-	-
Total Estimated Initial Cost	$879	$1899	$2449	$329	$5041	$4514
Life Cycle SIR	2.6	1.5	1.8	4.4	4.1	4.2

Table 2 below shows the average cost and energy savings estimated for each type of building evaluated if all measures were implemented. KEMA recommends setting priorities based upon the individual measures with the highest SIRs.

Table 2. Average cost and energy savings of opportunities identified by energy audits for residential and commercial applications.

	Residential	Commercial
Average Total Cost of Recommended Measures	$ 1,389	$ 4,784
Average Annual Energy Savings	$ 307	$ 2,265
Approximate Annual Energy Costs	$ 4700	$ 11,750
Percent Annual Savings	6.5 %	19.2%
Simple Payback in Years	4.1	2.1

KEMA also performed a wind study. The preliminary wind resource assessment identified seven potential sites for wind turbines. Based primarily on the initial wind resource estimates, and the distinct geographical areas in question (e.g., Presque Isle, Littleton, and Caribou) this study focuses on three of these seven sites: Administrative Building, Caribou 1 (area located behind homes on Doyle Road, top of ridge), and Littleton 2 (area located at bend in Medicine Wheel Road, top of hill adjacent to homes). The initial analysis explored three turbine sizes considered appropriate for those locations.

Table 3. Potential Wind Turbines

Wind Turbine	Power (kW)	Rotor Diameter (meters)	Hub Height (meters)
Bergey 10	10	6.7	18 to 37
Fuhrlander 30	30	13	27 to 30
Fuhrander 100	100	21	35 to 40

Wind speeds are the primary driver of the energy yield of any wind project. The best case scenarios for the best wind turbine at each location is highlighted below:

Table 4. Financial Analysis Results. Best Case Scenarios at Each Location

	Admin Building Fuhrlander 100	Caribou 1 Furhlander 30	Littleton 2 Fuhrlander 30
Net Annual Energy Yield (kWh)	159,059	65,348	69.602
Total Project Cost	$ 327,250	$ 134,750	$134,750
Average Annual Cash Flow ($000)	$ 7.2	$2.9	$3.9
Cumulative Cash Flow ($000)	$ 143	$58	$78
Net Present Value ($000)	$ 64	$26	$38
Positive Cash Flow Each Year?	Yes (except year 1)	No	Yes

The best case scenarios rely upon significant grant funding and obtaining special, zero interest "Community Renewable Energy Bonds". These funds typically require that the tribe first obtain a year of wind speed measurements from "MET Towers" placed at the sites.

Next Steps

The Energy Committee will use conclusions and recommendations from the preliminary research to plan next actions. The next actions include the following steps:

1. Finalize energy vision
2. Draft energy plan that includes:
    a. Energy efficiency measures
    b. Wind energy plan
3. Seek funds to implement plan

For Further Information Contact:
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ATTACHMENT 14

TRIBAL ENERGY VISIONING MEETING

Meeting Announcement
Aroostook Band of Micmacs Strategic Energy Planning
June 12 and June 13

Introduction

Please join the Aroostook Band of Micmacs Energy Committee on
June 12 from 6:00 –7:30 at Tribal Council Chambers, 7 Northern Road in Presque Isle
or
June 13 from 6:00–7:30 at the Littleton Office, 198 West Ridge Road.
The Committee and its consultants will present initial findings of their studies regarding energy efficiency and renewable energy. This information will be used to develop a strategic energy vision for the tribe. The Committee is seeking public input to create this vision that will guide development of an energy plan.

The consultants working with us include KEMA, an international energy consulting firm, and Lori Ribeiro, an independent consultant specializing in energy and environmental consulting.

Project Goals and Objectives

The Aroostook Band of Micmac (ABM) Tribal Council will develop a strategic energy plan in order to:

- Reduce energy costs;
- Promote economic development on Tribal Lands;
- Move towards energy self-sufficiency; and,
- Promote energy security.

In the process, we will:

- Develop an energy vision that considers a balanced portfolio of energy resources and maximizes energy efficiency improvements;
- Promote sustainable economic development; and
- Develop an action plan to address our current and future energy needs.

Community Benefits

The strategic energy plan is important due to the benefits it will provide our community. Benefits to the tribe as a whole include:

- Lower energy bills will reduce operating costs and free up funds for other priorities.
- Producing our own energy is consistent with the tribe's desire for greater self-sufficiency.
- Producing our own energy reduces our reliance on imported fuel sources.

Individual tribal members can benefit primarily from lower energy bills.

Preliminary Findings

A report will be distributed at the meeting

Next Steps

1. Finalize energy vision
2. Draft energy plan that includes:
    a. Energy efficiency
    b. Wind energy
3. Seek funds to implement plan

ATTACHMENT 15

TRIBAL ENERGY VISION

Vision Statement

The Aroostook Band of Mi'Gmaq/Micmacs embrace energy efficiency and renewable energy to become increasingly energy independent and to reduce costs. Using proven and new technologies, the tribe harnesses natural resources from the wind, the land and the sun to provide half of its energy needs. New housing is designed and constructed with energy efficient features to reduce tribal members' energy bills. The tribe's renewable energy and energy efficiency programs have reduced energy bills by over 25%.

ATTACHMENT 16

TRIBAL ENERGY ACTION PLAN

AROOSTOOK BAND OF MICMACS

Tribal Energy Action Plan

December 2006

The following Tribal energy action plan represents the culmination of completion of a U.S. Department of Energy (DOE) funded Tribal energy project, energy discussions in the Tribal community, and ongoing Tribal energy discussions amongst Tribal planners and Tribal program managers.

As a result of project activities associated with the DOE First Steps grant, it was determined that a commercial-scale wind resource does not exist on Tribal land. Although the contractor that was hired to evaluate Tribal wind resources determined that a variety of funding mechanisms should be evaluated to attempt to identify a way to make a Tribal wind project cost-effective, the limited potential for energy and capital-cost recovery means that this option is a low-priority for addressing the energy needs of the Aroostook Band of Micmacs.

Despite the fact that preliminary Tribal energy efforts focused almost exclusively on wind power opportunities, the First Steps project demonstrated that the development of a diverse Tribal energy portfolio coupled with wide-ranging conservation measures offers the greatest potential for achieving Tribal energy self-sufficiency and capacity.

In the course of researching alternative energy opportunities, it was determined that geo-thermal (ground source heat pumps), air-to-air heat pumps, solar projects, and a variety of biofuel (wood pellets, biologs, biodiesel, etc) options are potentially viable energy opportunities for both residential and community Tribal buildings.

For the purposes of enhancing Tribal energy knowledge, and to improve the ability of the Aroostook Band of Micmacs to implement Tribal energy activities, major energy activities have been categorized as follows (some of the recommendations developed for future action have already commenced):

Tribal Facilities

Develop an energy and materials management plan for Tribal facilities to promote energy conservation and efficient use of office supplies, building and fleet maintenance energy and materials, and other consumable supplies:

1. Develop an inventory of current energy use and materials use;
2. Review the inventory to identify “low hanging fruit” measures that could be implemented to reduce Tribal energy and materials use;
3. Review the inventory to identify more difficult or more expensive measures that will result in incremental decreases in energy and materials usage;
4. Based on the inventories that are conducted, establish strategic targets for short-term, mid-term, and long-range activities that will result in energy and materials conservation by the Aroostook Band of Micmacs;

5. Develop a grant proposal for submission to EPA's pollution prevention (P2) program for implementation of a Tribal P2 program that utilizes EPA Tribal P2 guidance;
6. Due to the inherent importance of buy-in and acceptance by Tribal staff, Tribal leaders, and the Tribal community, regularly provide updates on progress that is being accomplished toward reaching Tribal energy and materials usage and conservation goals.

Loring Air Force Base

As a result of the Department of Defense' Base Realignment and Closure Act (BRAC) legislation, the Aroostook Band of Micmacs is in the process of acquiring approximately 676 acres of property at the former Loring Air Force Base in Limestone, Maine. This land parcel includes significant industrial energy assets, including five 1-million gallon above ground storage tanks (used by the Air Force for storage of jet fuel and other petroleum products), a coal storage yard and coal distribution system (used by the Air Force for fueling the central heat plant), a fuel pipeline connector (the pipeline travels from the property to a fuel depot at a marine port on the coast of Maine), a railroad spur, and several large industrial buildings. In addition to the Tribal land parcel, the balance of the 12,000 acre former base is currently being re-developed as an industrial park by the local redevelopment authority. These redevelopment efforts support and strengthen Tribal energy and industrial reuse activities because the redevelopment authority is committed to promoting the reuse of industrial infrastructure, and is actively seeking to establish major energy projects at the former base.

1. Develop and submit a proposal to hire an energy consultant to inventory industrial infrastructure at Loring Air Force Base and based on local market conditions, determine several options for energy projects (the BIA energy and minerals management planning program is a likely potential funding source, and a potential energy consultant has also been identified);
2. Present the highest and best potential use energy projects to the Aroostook Band of Micmacs Tribal Council for their review, input, and approval;
3. Based on the energy project preferences of the Aroostook Band of Micmacs Tribal Council, seek potential energy project partners and financing to implement the projects;
4. Concurrent with activities 1-3 listed above, begin exploration of potential energy project partnerships with the local development authority and other independent economic developers.

Tribal Residential Housing

1. Based on the residential energy efficiency study commissioned by KEMA, begin replacement of inefficient appliances in Tribal homes, including refrigerators and water heaters. Potential funding sources for this work includes U.S. Department of Housing and Urban Development (HUD) housing modernization grants and HUD Indian Community Development Block Grant (ICDBG) program funding;

2. Develop an energy efficiency/alternative energy model home demonstration project with the Maine Indoor Air Quality Council, the U.S. Department of Housing and Urban Development, and the Maine State Housing Authority;
3. Utilizing lessons learned from the model home project, develop a Tribal building standard for energy efficient, environmentally safe (free of radon, mold, etc.) housing. The new model will become the new standard or expectation in the Tribal community for all new Tribal housing projects;
4. Orient all newly constructed Tribal homes to take advantage of solar energy (solar aspect), regardless of whether or not solar energy is currently being utilized. As solar energy efficiency gains increase due to rapidly evolving solar technology, the homes will be oriented to take advantage of this resource;
5. Investigate and evaluate alternative residential construction techniques, including foam block and straw bale construction. A limited number of these projects have been completed in the Aroostook County area and could provide a useful information resource for similar projects being contemplated by the Aroostook Band of Micmacs;
6. Hire an energy consultant to compare the local cost effectiveness of various alternative energy and energy conservation measures.

Other Energy Activities

The Aroostook Band of Micmacs is continuing to increase its land base and land holdings to provide land for residential, commercial, natural resource utilization, recreational, and economic development opportunities. Given that existing Tribal land holdings are not characterized as having a commercial grade wind resource, begin identifying and evaluating potential land acquisition parcels that could be utilized to support Tribal wind energy projects. To support this effort, wind tower criteria should be developed for the evaluation of specific land parcels including parameters such as the quality of the wind resource, distance to electric transmission lines, potential wildlife or other environmental impacts, potential socioeconomic impacts, and potential regulatory or permitting issues. Utilizing these criteria, the Aroostook Band of Micmacs can seek to identify and procure land parcels that have the greatest potential for development of a commercial scale wind power project.