

Village End Use Energy Efficiency Measures Program '05 – '06
AEA Grant # 2195225 Administered by Alaska Building Science Network

Koyuk Final Report



Community Summary

5 Community buildings and 7 teacher housing units received energy efficiency upgrades May '05 - October '06

Library, City Office, Washeteria, Post Office, Village Corporation Store, School and 7 Teacher Housing Units

Village-Wide Lighting Retrofit Summary:

- Retrofitted 165 light fixtures village-wide with electronic ballasts and T8 lamps
- Installed: 44 compact fluorescent light bulbs village-wide
- Pre-retrofit energy use for all lighting: 26,182 watts
- Post-retrofit energy use for all lighting: 16,330 watts
- Energy savings projection: 9,852 watts (9.85 kW)
- **Pre-retrofit to post retrofit energy reduction: 38 %**
- **Estimated Annual Savings Range:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	\$3,596	722 Gallons	\$1,350
7 Hours	\$6,293	1,263 Gallons	\$2,362
10 Hours	\$8,990	1,804 Gallons	\$3,374

- Total project cost for all measures: \$38,235
- Simple mean payback*: 6.08 Years
- Total village wide in-kind contribution: \$ 4,023

*(All grant funds, but accounting for lighting savings only)

Additional Energy Efficiency Measures: (Budget Expense: \$ 3,873)

- 2 Monitor heaters were installed in the City Office building. Labor was provided in kind.
- 2 programmable thermostats were provided for installation in the washeteria.

Koyuk City Owned Buildings

Energy efficient lighting upgrades were completed in four buildings owned by the City of Koyuk

City owned Buildings - Lighting Retrofit Summary:

- Lighting upgrades completed in May, 2005
- Retrofitted 93 linear fluorescent fixtures with T8 lamps and electronic ballasts
- Installed: 7 compact fluorescent light bulbs
- Pre-retrofit energy use for all lighting: 14,852 watts
- Post-retrofit energy use for all lighting: 10,550 watts
- Energy savings projection: 4,302 watts (4.30 kW)
- **Pre-retrofit to post retrofit energy reduction: 29 %**
- **Estimated Annual Savings:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	\$1,570	315 Gallons	\$589
7 Hours	\$2,748	552 Gallons	\$1,031
10 Hours	\$3,926	788 Gallons	\$1,473

Library



City Library

Materials Installed	2-Lamp Ballasts 32w lamps	4-Lamp Ballasts 32w lamps	2-Lamp Ballasts 25w lamps	2-Lamp Fixtures 3-lamp ballasts 25w lamps	4-Lamp Fixtures 3-lamp ballasts 25w lamps	4-Lamp Ballasts 25w lamps	13w CFL	20w CFL	25w CFL
Library	0	13	0	0	0	0	0	2	0

- Pre-retrofit energy use: 2,252 watts
- Post-Retrofit Energy Use: 1,600 watts
- Energy savings projection: 652 watts (.65 Kw)
- **Pre-retrofit to post retrofit energy reduction: 29 %**

- **Estimated Annual Savings:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	\$238	48 Gallons	\$89
7 Hours	\$416	84 Gallons	\$156
10 Hours	\$595	119 Gallons	\$223

City Office



Materials Installed	2-Lamp Ballasts 32w lamps	4-Lamp Ballasts 32w lamps	2-Lamp Ballasts 25w lamps	2-Lamp Fixtures 3-lamp ballasts 25w lamps	4-Lamp Fixtures 3-lamp ballasts 25w lamps	4-Lamp Ballasts 25w lamps	13w CFL	20w CFL	25w CFL
City Office	4	45	0	0	0	0	0	3	0

- Pre-retrofit energy use: 7,888 watts
- Post-Retrofit Energy Use: 5,700 watts
- Energy savings projection: 2,188 watts (2.19 Kw)
- **Pre-retrofit to post retrofit energy reduction: 28 %**
- **Estimated Annual Savings:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	\$799	160 Gallons	\$300
7 Hours	\$1,398	281 Gallons	\$525
10 Hours	\$1,997	401 Gallons	\$749

Notes: Some de-lamping of 4 lamp fixtures were done where significant over lighting was observed and agreed upon by the building owners. Incandescent lights were replaced with compact fluorescent lighting wherever possible. Two buildings included in the original audit were not worked on. Teen Center - This building had some serious electrical issues and in need of major repairs that were beyond the scope of this project.

City Garage - The garage is unheated and used only for storing heavy equipment. There was no electricity supplied to the building during the time this project was underway.

City Washeteria



Materials Installed	2-Lamp Ballasts 32w lamps	4-Lamp Ballasts 32w lamps	2-Lamp Ballasts 25w lamps	2-Lamp Fixtures 3-lamp ballasts 25w lamps	4-Lamp Fixtures 3-lamp ballasts 25w lamps	4-Lamp Ballasts 25w lamps	13w CFL	20w CFL
Washeteria	0	20	0	0	0	0	0	2

- Pre-retrofit energy use: 3,400 watts
- Post-Retrofit Energy Use: 2,440 watts
- Energy savings projection: 960 watts (.96 Kw)
- **Pre-retrofit to post retrofit energy reduction: 28 %**
- **Estimated Annual Savings:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	\$350	70 Gallons	\$132
7 Hours	\$613	123 Gallons	\$230
10 Hours	\$876	176 Gallons	\$329

Post Office

Materials Installed	2-Lamp Ballasts 32w lamps	4-Lamp Ballasts 32w lamps	2-Lamp Ballasts 25w lamps	2-Lamp Fixtures 3-lamp ballasts 25w lamps	4-Lamp Fixtures 3-lamp ballasts 25w lamps	4-Lamp Ballasts 25w lamps	13w CFL	20w CFL	3-Lamp Ballasts (3) 32w lamps
Post Office	6	0	0	0	0	0	0	0	5

- Pre-retrofit energy use: 1,312 watts
- Post-Retrofit Energy Use: 810 watts
- Energy savings projection: 502 watts (.50 Kw)
- **Pre-retrofit to post retrofit energy reduction: 38 %**
- **Estimated Annual Savings:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	\$183	37 Gallons	\$69
7 Hours	\$321	64 Gallons	\$120
10 Hours	\$458	92 Gallons	\$172

Koyuk Village Corporation Owned Buildings



Village Corp Offices and Store

Energy efficient lighting upgrades were completed in one building owned by the Koyuk village Corporation

Village Corporation Offices, Store and Rental - Lighting Retrofit Summary:

- Lighting upgrades completed in May, 2005
- Retrofitted 16 linear fluorescent fixtures with T8 lamps and electronic ballasts
- Installed: 3 compact fluorescent light bulbs

Materials Installed	2-Lamp Ballasts 32w lamps	4-Lamp Ballasts 32w lamps	2-Lamp Ballasts 25w lamps	2-Lamp Fixtures 3-lamp ballasts 25w lamps	4-Lamp Fixtures 3-lamp ballasts 25w lamps	4-Lamp Ballasts 25w lamps	13w CFL	20w CFL	25w CFL
Village Corporation Store	4	12	0	0	0	0	0	3	0

- Pre-retrofit energy use for all lighting: 2,476 watts
- Post-retrofit energy use for all lighting: 1,740 watts
- Energy savings projection: 736 watts (.74 kW)
- **Pre-retrofit to post retrofit energy reduction: 30 %**
- **Estimated Annual Savings:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	\$269	54 Gallons	\$101
7 Hours	\$470	94 Gallons	\$176
10 Hours	\$672	135 Gallons	\$252

Bering Straits School District Owned Buildings

Energy efficient lighting upgrades were completed in 7 teacher housing units owned by the Bering Straits School District

School owned Buildings - Lighting Retrofit Summary:

- Lighting upgrades completed in October, 2006
- Retrofitted 56 linear fluorescent fixtures with T8 lamps and electronic ballasts
- Installed: 34 compact fluorescent light bulbs
- Pre-retrofit energy use for all lighting: 8,854 watts
- Post-retrofit energy use for all lighting: 4,040 watts
- Energy savings projection: 4,814 watts (4.81 kW)
- **Pre-retrofit to post retrofit energy reduction: 54 %**
- **Estimated Annual Savings:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	\$1,570	315 Gallons	\$589
7 Hours	\$3,075	617 Gallons	\$1,154
10 Hours	\$4,393	882 Gallons	\$1,649

School Boiler Module Building

Materials Installed	2-Lamp Ballasts 32w lamps	4-Lamp Ballasts 32w lamps	2-Lamp Ballasts 25w lamps	2-Lamp Fixtures 3-lamp ballasts 25w lamps	4-Lamp Fixtures 3-lamp ballasts 25w lamps	4-Lamp Ballasts (4) 25w lamps	13w CFL	20w CFL	25w CFL
School Building	10	0	7	0	0	0	0	0	0

- Pre-retrofit energy use: 1,394 watts
- Post-Retrofit Energy Use: 929 watts
- Energy savings projection: 465 watts (.47 Kw)
- **Pre-retrofit to post retrofit energy reduction: 33 %**
- **Estimated Annual Savings:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	\$170	34 Gallons	\$64
7 Hours	\$297	60 Gallons	\$111
10 Hours	\$424	85 Gallons	\$159

Teacher Housing Units



Materials Installed	2-Lamp Ballasts 32w lamps	4-Lamp Ballasts 32w lamps	2-Lamp Ballasts 25w lamps	2-Lamp Fixtures 3-lamp ballasts 25w lamps	4-Lamp Fixtures 3-lamp ballasts 25w lamps	4-Lamp Ballasts (4) 25w lamps	13w CFL	20w CFL	25w CFL
Teacher Housing	0	0	13	0	24	2	28	0	6

- Pre-retrofit energy use: 7,460 watts
- Post-Retrofit Energy Use: 3,111 watts
- Energy savings projection: 4,349 watts (4.35 Kw)
- **Pre-retrofit to post retrofit energy reduction: 58 %**
- **Estimated Annual Savings:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	\$1,587	319 Gallons	\$596
7 Hours	\$2,778	558 Gallons	\$1,043
10 Hours	\$3,968	797 Gallons	\$1,489

Notes: For teacher housing units with relatively low ceiling heights, 25 watt lamps were used to provide both excellent light and energy savings.

Heating Measures for City of Koyuk Office Building:

In addition to the lighting upgrades, two Monitor heaters were installed in the City Office Building. The building originally had two large forced-air oil fired furnaces, with one heating the office portion of the building and the other heating the community space. The furnace used to heat the offices was replaced with several Monitor heaters several years ago. The other furnace was still operating, but in need of major repairs. Significant duct leakage into the furnace room made the room unbearably hot. Ducts were run in the cold attic and in a number of places exposed and un-insulated. Duct leakage into the attic space was also occurring. Delivered air temperatures to the far register was 20 degrees cooler than the air directly out of the furnace, indicating significant losses occurring in the attic. Fuel savings is estimated to be a minimum of 400 gallons per year resulting in an annual savings of \$1600 per year. Eliminating the large furnace blower should result in several hundred kWh/year savings as well. Simple payback is estimated at 3-4 years.



New Monitor Heater



Leaky Ductwork in Attic

Village Energy Summit:

During the final site inspection the Field Inspector arranged a community wide energy summit. To encourage participation, a flyer was mailed to each homeowner offering \$1000 worth of energy saving products for each attendee. Contributions from AVEC utility and the Norton Sound Economic Development Corp, as well as funds from the AEA contract allowed us to distribute one Costco pack of 8 cfls, one storm window kit, and one box of weather stripping to each attendee. The training itself was covered by ABSN as an in-kind donation and addition to the VEUEEM project. The meeting was well attended with over 40 homeowners attending which equated to about 50% of the homeowners in the village. Lighting and other low cost energy saving measures were discussed. Each cfl at \$.25.kWh and 10,000 hour life would save \$250 EACH. The \$12 pack of eight cfls would save \$2000 in electric costs at the subsidized PCE rate. If only half of the cfl's were installed and operated for just 3 hours per day, the payback would be still be less than 3 months. Approximately 320 cfl's were handed out.

Koyuk, In-Kind Contribution Tracking Record - ABSN Energy Efficiency Projects:

Village entities worked with: City, Village Corp, School District.

In-Kind Item	Dates	Hours Contributed	Hourly Wage	Value / Amount	Notes
Staff time for project contact, introduction, and review of intro materials (Number of entities x 1 hour each)		3	\$15.00	\$45.00	# of entities we worked with in the village is indicated in the Hrs contributed column. \$15 / hr is our generic estimated average wage for local village staff: Tribal Administrators, City Clerks,
Staff time for Attending teleconference village-wide		12	\$15.00	\$180.00	Hrs contributed column indicates length of telecon multiplied by # of village telecon participants
Tribal Maint. Staff time to assist Field Manager on building assessments - 1st site visit		6	\$12.00	\$72.00	list hrs of in-kind staff assisting FM on building assessments.
School Maint. Staff time to assist Field Manager on building assessments - teacher housing		4	\$12.00	\$48.00	
Maint. Staff time to attend ABSN training		6	\$12.00	\$72.00	Hrs contributed column indicates length of training multiplied by # of in-kind training participants
Village office administrative percentage of total project cost less ABSN Admin %. Total project cost = \$38,235/village - (our admin percentage, (around 9%) Approx: \$3,440) = \$34,795 x 5% = \$1,740 (this 5% village admin cost estimate is spread across all entities we work with for the course of the grant for completing all energy efficiency measures. These are primarily for cumulative, otherwise unaccounted time expense for project support.	Jan '05 - Jan '07			\$1,740.00	Each time we call, email, or fax a village entity, someone has to receive the communication, review and/or forward the information, follow-up on requests, etc. Whether it is to set-up a teleconference, verify maintenance staff participation in lighting or boiler trainings, set-up in-kind lodging and transportation, lighting trainings, track a shipment, verify completion of lighting in a given building, ship lamps and ballasts out of the village, request a labor reimbursement agreement, or invoice etc, etc. Village expenses for phone charges, copying and fax costs, office supplies, etc are part of this amount.
Lodging for ABSN Field Managers				\$300.00	5 nights @ 60/night
Village Labor for installation of 2 monitor heaters	Feb - Mar '06	24	15	\$360.00	planning, set-u, retrofit installation
Koyuk IRA In-kind labor for lighting upgrades to their Office bldg	6/20/05	5	\$15.00	\$75.00	7 fixtures and 3 CFLs
Koyuk Village Corp	6/20/06	11	\$15.00	\$165.00	16 fixtures - 12 are 4-lamp, and 3 CFLs
School & teacher housing lighting upgrades					45 hours in-kind labor
ATS - Disposal / recycle shipment T12s & ballasts - back-haul		353	\$0.25	\$88.25	Price per pound for ATS backhaul. Airway bill: NAC 345-0210-1061
NAC - Disposal / recycle shipment T12s & ballasts - back-haul		353	\$0.27	\$95.31	Price per pound for NAC shipment. Airway bill: NAC 345-0210-1061, (\$ charges donated by NAC).
ABSN Contribution to fund Elim Energy Fair	Dec '06			\$450.00	ABSN field manager time for presentation. (6 hrs @ \$75/hr) (AEA covered air fare and travel expense)
Village Energy Fair - partnership grant project	Dec '06			\$333.33	Norton Sound Economic Development Corp: In-Kind Grant for Village Energy Fair Kits, Credited to AEA Grant materials in 12-31-06 financial report
	TOTAL			\$4,023.89	

