Village Energy Efficiency Program

AEA VEEP Grant # 7520001 Administered by Alaska Building Science Network

Manokotak Final Report

Grant Amount: $150,000

Community Summary

13 community buildings and teacher housing units and 2 public facilities received energy efficient lighting, heating and mechanical upgrades as follows: City Maintenance Shop, City Office, Public Safety Building, Water Pump House 1, Water Pump House 2, Water Tank Valve House, Water Distribution System, City of Manokotak Street Lights, Manokotak Village Council Office, SWRSD Principal's Quarters, SWRSD Teacher Housing Duplex 1, Teacher Housing Duplex 2, Moravian Community Church, MNL Corporation Office

Lighting Retrofits Completed: May 2012
Mechanical Retrofits Completed: August 2012

Village-Wide Energy Efficient Lighting and Mechanical Retrofit Summary:

• Projected Annual Electrical Savings (kWh):	29,781
• Projected Annual Electrical Cost Savings:	$16,380[1,2]
• Projected Annual Heating Fuel Savings (gallons):	1,919
• Projected Annual Fuel Cost Savings:	$11,226[3]
• Total Projected Annual Energy Cost Savings:	**$27,606**
• Total village wide in-kind contribution:	$8,882
• Total project cost including In-kind contribution:	$158,882
• Simple Payback (including In-kind contributions):	**5.76 years**

[1] kWh Rate [used to calculate electrical cost savings] for Lighting Measures (State of AK - AEA PCE Program Report FY 2011 avg): $0.55

[2] kWh Rate [used to calculate electrical cost savings] for Weatherization & Heating Measures (AkWarm Library): $0.55

[3] #2 Heating Fuel Rate [used to calculate heating fuel savings] (AkWarm Library): $5.85/gal

CITY OF MANOKOTAK OWNED BUILDINGS AND FACILITIES

City Maintenance Shop

Lighting Retrofit Summary:

Materials Installed	Quantity
Fluorescent 2-lamp electronic ballast, (2) 32 watt T8 lamps	15
Fluorescent 4-lamp electronic ballast, (3) 32 watt T8 lamps	1

- Pre-retrofit energy use: 1.896 Kilowatts
- Post-retrofit energy use: 0.999 Kilowatts
- Energy savings projection: 0.897 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 47%
- Estimated Annual Savings: kWh Saved: 1570

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$493.35	72.75	$257.53
7 Hours/day	**$863.36**	127.31	$450.68
10 Hours/day	$1,233.38	181.87	$643.83
1200 Hours/year (Est.)	$592.02	87.30	$309.04

City Office

Lighting Retrofit Summary:

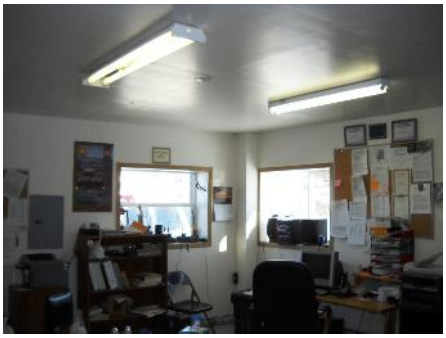
Materials Installed	Quantity
Fluorescent 2-lamp electronic ballast, (2) 25 watt T8 lamps	3
CFL-20 W	1

- Pre-retrofit energy use: 0.291 Kilowatts
- Post-retrofit energy use: 0.158 Kilowatts
- Energy savings projection: 0.133 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 46%
- Estimated Annual Savings: kWh Saved: 233

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$73.15	10.79	$38.18
7 Hours/day	**$128.01**	18.88	$66.82
10 Hours/day	$182.88	26.97	$95.46
1690 Hours/year (Est.)	$123.62	18.23	$64.53

Public Safety Building

Lighting Retrofit Summary:



Materials Installed	Quantity
Fluorescent 2-lamp electronic ballast, (2) 25 watt T8 lamps	6
Fluorescent 2-lamp electronic ballast, (2) 32 watt T8 lamps	6
CFL-20 W	5

- Pre-retrofit energy use: 1.383 Kilowatts
- Post-retrofit energy use: 0.736 Kilowatts
- Energy savings projection: 0.647 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 47%
- Estimated Annual Savings: kWh Saved: 1,132

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$355.85	52.47	$185.76
7 Hours/day	**$622.74**	91.83	$325.07
10 Hours/day	$889.63	131.18	$464.39
1500 Hours/year (Est.)	$533.78	78.71	$278.64

Water Pump House 1

Total Building Savings All Measures:

- Projected Annual Electrical Savings (kWh): 827
- Projected Annual Electrical Cost Savings: $455

- Projected Annual Heating Fuel Savings (gallons): 342
- Projected Annual Fuel Cost Savings: $2,001

- Total Projected Annual Energy Cost Savings: $2,456

Lighting Retrofit Summary:

Materials Installed	Quantity
Fluorescent 3-lamp electronic ballast, (3) 25 watt T8 lamps	6
Fluorescent 4-lamp electronic ballast, (4) 25 watt T8 lamps	2

- Pre-retrofit energy use: 0.756 Kilowatts
- Post-retrofit energy use: 0.624 Kilowatts
- Energy savings projection: 0.132 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 17%
- Estimated Annual Savings: kWh Saved: 231

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$72.60	10.71	$37.90
7 Hours/day	**$127.05**	18.73	$66.32
10 Hours/day	$181.50	26.76	$94.74
500 Hours/year (Est.)	$36.30	5.35	$18.95

Water Pump House 1

Weatherization/Mechanical Retrofit Summary:

- Cleaned and tuned boiler and added new primary controls.
- Replaced two sets of 1.5 hp energy efficient circulatory pumps and motors.

- Annual energy savings projection: 342 gallons / 596 kWh
- Estimated Annual Energy Cost Savings: **$2,001 (fuel) / $328 (electricity)**

Water Pump House 2

Lighting Retrofit Summary:

Materials Installed	**Quantity**
Fluorescent 2-lamp electronic ballast, (2) 25 watt T8 lamps	3
Fluorescent 4-lamp electronic ballast, (4) 25 watt T8 lamps	4

- Pre-retrofit energy use: 0.924 Kilowatts
- Post-retrofit energy use: 0.498 Kilowatts
- Energy savings projection: 0.426 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 46%
- Estimated Annual Savings: kWh Saved: 746

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$234.30	34.55	$122.31
7 Hours/day	**$410.03**	60.46	$214.04
10 Hours/day	$585.75	86.37	$305.77
500 Hours/year (Est.)	$117.15	17.27	$61.15

Water Tank Valve House

Weatherization/Heating/Mechanical Retrofit Summary:

- Installed fuel oil heating system and set existing electric heat to back-up power source.
- Installed space heater with new external fuel storage and alternative back-up power source.

- Annual energy savings projection: 1,567 gallons
- Estimated Annual Heating Fuel Cost Savings: **$9,167**

Water Distribution System

Weatherization/Mechanical Retrofit Summary:

- Mitigated heated water distribution leak.

- Annual energy savings projection: 10 gallons / 415 kWh
- Estimated Annual Energy Cost Savings: **$59 (fuel) / $287 (electricity)**

Street Lights

Lighting Retrofit Summary:



Center Photo: ©State of AK Division of Community and Regional Affairs

- Retrofitted 23 HPS (High-Pressure Sodium) street light fixtures with energy efficient LED (Light-Emitting Diode) street light fixtures – to include 20-year photo sensors.

- Pre-retrofit energy use for all street lighting: 18,939 kWh
- Post-retrofit energy use for all street lighting: 7,052 kWh
- Energy savings projection: 11,887 kWh
- Pre-retrofit to post-retrofit energy reduction: 63%
- Estimated Annual Savings:

Hours Per Day / 365 Days Per Year	Actual Cost per kWh	Electrical Savings
12 Hours	$0.5500	**$6,538**

MANOKOTAK VILLAGE COUNCIL OWNED BUILDINGS

Manokotak Village Council Office

Lighting Retrofit Summary:



Materials Installed	Quantity
Fluorescent 2-lamp electronic ballast, (1) 25 watt T8 lamp	4
Fluorescent 2-lamp electronic ballast, (2) 25 watt T8 lamps	6

- Pre-retrofit energy use for all lighting: 0.596 Kilowatts
- Post-retrofit energy use for all lighting: 0.380 Kilowatts
- Energy savings projection: 0.216 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 36%
- Estimated Annual Savings: kWh Saved: 378

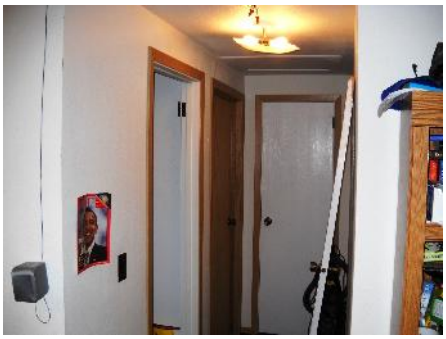
Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$118.80	17.52	$62.01
7 Hours/day	**$207.90**	30.66	$108.53
10 Hours/day	$297.00	43.80	$155.04
2000 Hours/year (Est.)	$237.60	35.04	$124.03

SOUTHWEST REGION SCHOOL DISTRICT OWNED BUILDINGS

Principal's Quarters

Lighting Retrofit Summary:





Materials Installed	Quantity
CFL-11 W	5
CFL-14 W	5
CFL-20 W	13
CFL-9 W	5

- Pre-retrofit energy use: 1.680 Kilowatts
- Post-retrofit energy use: 0.430 Kilowatts
- Energy savings projection: 1.250 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 74%
- Estimated Annual Savings: kWh Saved: 2,188

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$687.50	101.38	$358.88
7 Hours/day	**$1,203.13**	177.41	$628.04
10 Hours/day	$1,718.75	253.45	$897.20
1375 Hours/year (Est.)	$945.31	139.40	$493.46

Teacher Housing Duplex 1

Lighting Retrofit Summary:

Materials Installed	Quantity
CFL-11 W	4
CFL-14 W	10
CFL-20 W	19
CFL-9 W	6

- Pre-retrofit energy use: 2.220 Kilowatts
- Post-retrofit energy use: 0.618 Kilowatts
- Energy savings projection: 1.602 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 72%
- Estimated Annual Savings: kWh Saved: 2,835

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$881.10	129.93	$459.94
7 Hours/day	**$1,541.93**	227.37	$804.90
10 Hours/day	$2,202.75	324.82	$1,149.85
1350 Hours/year (Est.)	$1,189.49	175.40	$620.92

Teacher Housing Duplex 2

Lighting Retrofit Summary:

Materials Installed	Quantity
CFL-11 W	4
CFL-14 W	10
CFL-20 W	19
CFL-9 W	6

- Pre-retrofit energy use: 2.220 Kilowatts
- Post-retrofit energy use: 0.618 Kilowatts
- Energy savings projection: 1.602 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 72%
- Estimated Annual Savings: kWh Saved: 2,804

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$881.10	129.93	$459.94
7 Hours/day	**$1,541.93**	227.37	$804.90
10 Hours/day	$2,202.75	324.82	$1,149.85
1350 Hours/year (Est.)	$1,189.49	175.40	$620.92

MORAVIAN CHURCH OWNED BUILDINGS*

Moravian Community Church

Lighting Retrofit Summary:



Materials Installed	Quantity
Fluorescent 2-lamp electronic ballast, (2) 25 watt T8 lamps	15
Fluorescent 3-lamp electronic ballast, (3) 25 watt T8 lamps	1
Fluorescent 4-lamp electronic ballast, (4) 25 watt T8 lamps	3
CFL-20 W	1

- Pre-retrofit energy use for all lighting: 2.343 Kilowatts
- Post-retrofit energy use for all lighting: 1.054 Kilowatts
- Energy savings projection: 1.289 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 55%
- Estimated Annual Savings: kWh Saved: 2,556

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$708.95	104.54	$370.08
7 Hours/day	**$1,240.66**	182.95	$647.64
10 Hours/day	$1,772.38	261.35	$925.19
700 urs/year (Est.)	$496.27	73.18	$259.05

***Note:** The community of **Manokotak** opted to purchase materials and provide labor In-kind to complete energy efficiency retrofits for the **Moravian Community Church**. To further maximize the value of the VEEP & EECBG, Alaska Building Science Network provided energy audits of various community buildings not included under VEEP/EECBG funding upon local request, while providing technical support and training as needed to complete upgrades.

MANOKOTAK NATIVES LIMITED CORPORATION OWNED BUILDINGS*

MNL Corporation Office

Lighting Retrofit Summary:



Materials Installed	Quantity
Fluorescent 2-lamp electronic ballast, (2) 25 watt T8 lamps	12
CFL-20 W	3

- Pre-retrofit energy use: 2.166 Kilowatts
- Post-retrofit energy use: 0.612 Kilowatts
- Energy savings projection: 1.554 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 72%
- Estimated Annual Savings: kWh Saved: 2,720

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$854.70	126.03	$446.16
7 Hours/day	**$1,495.73**	220.56	$780.78
10 Hours/day	$2,136.75	315.09	$1,115.40
2000 Hours/year (Est.)	$1,709.40	252.07	$892.32

***Note: Manokotak Natives Limited** opted to purchase materials and provide labor In-kind to complete energy efficiency retrofits for the **MNL Corporation Office**. To further maximize the value of the VEEP & EECBG, Alaska Building Science Network provided energy audits of various community buildings not included under VEEP/EECBG funding upon local request, while providing technical support and training as needed to complete upgrades.

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

In-Kind Item	Dates	Hours Contri-buted	Hourly Wage	Value / Amount	Notes
Staff time for project contact, introduction & review of intro materials		5	$20.00	$100.00	Number of entities x 1 hour each
Staff time during site visit	3/15/11	2	$25.00	$50.00	Nancy George - City Administrator
Staff time during site visit	3/15/11	2	$30.00	$60.00	Moses Toyukuk - Grant Writer/Tribal Member
Staff time during site visit	3/15/11	2	$20.00	$40.00	Peter Nanalook - Water & Sewer operator
Conservative village office administrative and other project support - percentage of total project cost less ABSN Admin %. Total project cost = $150000 - (our admin percentage, (around 14%) Approx: $21,000) = $129,000 x 4% = $5,160 (this 4% 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 for cumulative, otherwise unaccounted time expense for village - based project support.	August '10 through August '12			$5,160.00	Each time we call, email, or fax a village entity, someone receives the communication, reviews and/or forwards the information, follows-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, ship lamps and ballasts out of the village for recycling, request a labor reimbursement agreement, or invoice etc, send additional photos of completed work, etc. Village expenses for phone charges, copying and fax costs, office supplies, etc. are part of this amount.
Transportation and fuel costs	March '11	2	$75.00	$150.00	City 4-wheeler - 2 days
Transportation and fuel costs - Lx Upgrades	4/29/12 - 5/4/12		$80.00	$547.00	City truck, plus fuel - 6 days for Lx Upgrades
Training Facility - Lx Upgrades	4/30/12			$50.00	City Office - 1 day for Lx Training
School Labor, etc . .	4/29/12 - 5/4/12	20	$20.00	$400.00	Lx Upgrades
School Labor - payroll expenses	4/29/12 - 5/4/12			$120.00	Lx Upgrades
Materials for Church Upgrade - Manokotak Village Council	4/29/12 - 5/4/12			$407.32	Lx Upgrades (Alaska Lighting & Supply)
Materials for Corp Upgrade - Manokotak Natives Limited	4/29/12 - 5/4/12			$295.69	Lx Upgrades (Alaska Lighting & Supply)
Materials for Lx Upgrade - Manokotak Village Council	4/29/12 - 5/4/12			$260.00	Lx Upgrades (Brown's Electrical)
Materials for Corp Upgrade - Manokotak Natives Limited	4/29/12 - 5/4/12			$257.40	Lx Upgrades (Brown's Electrical)
PCB Abatement - Manokotak Village Council	May '12			$706.81	Lx Upgrades (Emerald Alaska)
PCB Abatement, Shipping - Manokotak Village Council	May '12			$173.80	Lx Upgrades (NAC & PenAir)
Street Light Shipping - Manokotak Natives Limited	May '12			$104.00	Street Lx Upgrades (PenAir)
	TOTAL			**$8,882.02**	