Village End Use Energy Efficiency Measures Program

AEA Grant # 2195225 Administered by Alaska Building Science Network

White Mountain Final Report



Community Summary

11 community buildings and teacher housing units received energy efficiency upgrades as follows:

City Office/Library Building, Garage/Power Plant, Lift Station, Washeteria / Water Plant, Old Clinic, Power Plant, VPSO, Church, New ITC Office Building, Old IRA Building, Store

Retrofits Completed: March – September 2008

Village-Wide Lighting Retrofit Summary:

- Retrofitted 235 light fixtures with electronic ballasts & T8 lamps
- Installed 17 compact fluorescent light bulbs
- Installed 5 T5 linear fluorescent fixtures in the Power Plant
- Pre-retrofit energy use for all lighting: 27.364 Kilowatts
- Post-retrofit energy use for all lighting: 14.276 Kilowatts
- Energy savings projection: 13.088 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 48%

- Estimated Annual Savings:

kWh Rate (as of Fall 2008): $1.08 Fuel Cost (FY 2007 Ave): $3.05

Hours Per Day/ 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
Locally Estimated	$26,836.50	2091.64	$6,379.49
4 Hours/day	$14,135.00	1101.68	$3,360.13
7 Hours/day	**$24,736.30**	1927.95	$5,880.24
10 Hours/day	$35,337.60	2754.21	$8,400.34

- Total project cost for all measures: $37,775
- Simple Payback (lighting measures only, using 7 hours/day lighting use run-time): 1.53 years
- Total village wide in-kind contribution: $2,268 (extended grant capacity by 6%)

Additional Energy Efficiency Measures:

- Three programmable thermostats installed in City and IRA owned buildings
- Weather stripping installed on exterior doors in City Office building

City of White Mountain Owned Buildings



8 buildings owned by the City of White Mountain received energy efficient lighting upgrades as follows:

City Office/Library Building, Garage/Power Plant, Lift Station, Washeteria / Water Plant, Old Clinic, Power Plant, VPSO Bldg

- Lighting upgrades completed in April 2008 – September 2008
- Retrofitted 118 light fixtures with electronic ballasts & T8 lamps
- Installed 13 compact fluorescent light bulbs
- Installed 5 T5 linear fluorescent fixtures
- Pre-retrofit energy use for all lighting: 17.364 Kilowatts
- Post-retrofit energy use for all lighting: 8.627 Kilowatts
- Energy savings projection: 8.737 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 50%

- Estimated Annual Savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
Locally Estimated	$17,048.8	1328.79	$4,052.80
4 Hours/day	$9,435.96	735.44	$2,243.09
7 Hours/day	$16,512.9	1287.02	$3,925.40
10 Hours/day	$23,589.9	1838.59	$5,607.71

Additional Energy Efficiency Measures:

- Programmable thermostats installed in City Offices and Old Clinic
- Weather stripping installed on exterior doors in City Office building


ABSN Project/Field Manager Geoff Butler describes functions of a programmable thermostat to maintenance workers.

Maintenance workers pack up and label waste fluorescent lamps for backhaul.

City Office/ Library Building



T-8, 25 watt lamps save energy and improve light levels in City office and community library.

Materials Installed	**Quantity**	
1-lamp electronic ballast, (1) 25 watt T8 lamp	7	
2-lamp electronic ballast, (2) 25 watt T8 lamps	2	
4-lamp electronic ballast, (3) 25 watt T8 lamps	41	
CFL-27 W	3	
• Pre-retrofit energy use:	7586	watts
• Post-retrofit energy use:	3418	watts
• Energy savings projection:	4168	watts
• Pre-retrofit to post retrofit energy reduction:	55%	

• Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$4,501.44	350.84	$1,070.07
7 Hours/day	$7,877.52	613.97	$1,872.62
10 Hours/day	$11,253.6	877.10	$2,675.17
2160 Hours/year (Est.)	$9,723.11	757.82	$2,311.35

Notes: Forty one 4-lamp fixtures de-lamped with three 25 watt T-8 lamps for additional savings.

Garage/Power Plant



Former lighting in the garage: 300w incandescent bulbs supplied an average of 4 – 5 foot candles

April, 2009, City of White Mountain, City Clerk Amy Titus commented on the light quality at the City Power Plant Garage and on the overall City electric bill***: "It's way better than the old lighting and our electricity bill is almost cut in half, so we are really happy about that. Our kWh rate went up since you were out here, but we are using only about half the electricity that we did. It's a very big improvement."***

Materials Installed	**Quantity**
2-lamp electronic ballast, (2) 25 watt T8 lamps	21
4-lamp electronic ballast, (3) 25 watt T8 lamps	2

- Pre-retrofit energy use: 1800 watts
- Post-retrofit energy use: 1137 watts
- Energy savings projection: 663 watts
- Pre-retrofit to post retrofit energy reduction: 37%
- Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$716.04	55.81	$170.21
7 Hours/day	$1,253.07	97.66	$297.88
10 Hours/day	$1,790.10	139.52	$425.54
2000 Hours/year (Est.)	$1,432.08	111.62	$340.43

Notes: Two 4-lamp fixtures de-lamped with three 25 watt T-8 lamps for additional savings.

Garage/Power Plant – T5 Lighting Retrofit



New T5 fixtures now provide more adequate lighting at a 43% savings

Materials Installed	**Quantity**
T5 3-lamp fixtures, electronic ballasts, (3) 54-watt T5 HO lamps:	5

- Pre-retrofit energy use: 1500 watts
- Post-retrofit energy use: 855 watts
- Energy savings projection: 645 watts
- Pre-retrofit to post retrofit energy reduction: 43%

- Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$696.60	54.29	$165.59
7 Hours/day	$1,219.05	95.01	$289.79
10 Hours/day	$1,741.50	135.73	$413.98

Notes: Five 300 watt incandescent fixtures replaced with five energy efficient 171 watt T-5 fixtures.

Washeteria / Water Plant

Maintenance workers reduce 4-lamp fixtures to 3-lamp in an over-lit space for additional savings.

Materials Installed	**Quantity**
2-lamp electronic ballast, (2) 25 watt T8 lamps	2
2-lamp electronic ballast, (2) 32 watt T8 lamps	4
4-lamp electronic ballast, (3) 25 watt T8 lamps	11

- Pre-retrofit energy use: 2352 watts
- Post-retrofit energy use: 1159 watts
- Energy savings projection: 1193 watts
- Pre-retrofit to post retrofit energy reduction: 51%
- Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$1,288.44	100.42	$306.28
7 Hours/day	$2,254.77	175.74	$536.00
10 Hours/day	$3,221.10	251.05	$765.71
2160 Hours/year (Est.)	$2,783.03	216.91	$661.57

Notes: Eleven 4-lamp fixtures de-lamped with three 25 watt T-8 lamps for additional savings.

Lift Station

Materials Installed	**Quantity**
CFL-40 W	3

- Pre-retrofit energy use: 450 watts
- Post-retrofit energy use: 120 watts
- Energy savings projection: 330 watts
- Pre-retrofit to post retrofit energy reduction: 73%
- Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$356.40	27.78	$84.72
7 Hours/day	$623.70	48.61	$148.26
10 Hours/day	$891.00	69.44	$211.81

1620 Hours/year (Est.)	$577.37	45.00	$137.25

Old Clinic

Geoff Butler goes over lighting plan with local maintenance worker.

Materials Installed	**Quantity**
2-lamp electronic ballast, (2) 25 watt T8 lamps	4
4-lamp fixture 3-lamp ballast (3) 25 watt T8 lamps	11
CFL-14 W	2
• Pre-retrofit energy use:	1992 watts
• Post-retrofit energy use:	1030 watts
• Energy savings projection:	962 watts
• Pre-retrofit to post retrofit energy reduction:	48%

• Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$1,038.96	80.98	$246.98
7 Hours/day	$1,818.18	141.71	$432.21
10 Hours/day	$2,597.40	202.44	$617.45
1620 Hours/year (Est.)	$1,683.12	131.18	$400.10

Notes: Eleven4-lamp fixtures reduced to 3-lamp fixtures for additional savings.

14 watt compact fluorescent light bulb replaces a 60 watt incandescent bulb.

Programmable thermostat installed in the Old Clinic.

VPSO

Materials Installed	Quantity
2-lamp electronic ballast, (2) 25 watt T8 lamps	4
• Pre-retrofit energy use:	336 watts
• Post-retrofit energy use:	188 watts
• Energy savings projection:	148 watts
• Pre-retrofit to post retrofit energy reduction:	44%

• Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$159.84	12.46	$38.00
7 Hours/day	$279.72	21.80	$66.49
10 Hours/day	$399.60	31.14	$94.99
1500 Hours/year (Est.)	$239.76	18.69	$56.99

Church

Materials Installed	Quantity
2-lamp electronic ballast, (2) 25 watt T8 lamps	3
4-lamp fixture 3-lamp ballast (3) 25 watt T8 lamps	6
CFL-27 W	5
• Pre-retrofit energy use:	1348 watts
• Post-retrofit energy use:	720 watts
• Energy savings projection:	628 watts
• Pre-retrofit to post retrofit energy reduction:	47%

• Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$678.24	52.86	$161.23
7 Hours/day	$1,186.92	92.51	$282.15
10 Hours/day	$1,695.60	132.15	$403.07
900 Hours/year (Est.)	$610.42	47.58	$145.11

Notes: Six 4-lamp fixtures de-lamped with three 25 watt T-8 lamps for additional savings.

Native Village of White Mountain Owned Buildings

3 buildings owned by the Native Village of White Mountain received energy efficient lighting upgrades as follows:

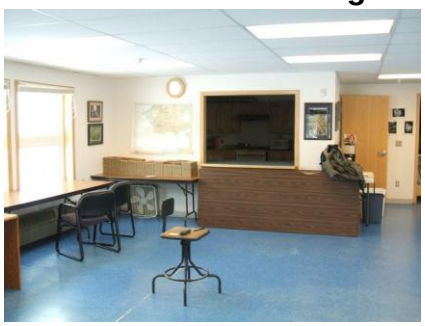
New ITC Office Building, Old IRA Building, Store

- Lighting upgrades completed in March 2008
- Retrofitted 117 light fixtures with electronic ballasts & T8 lamps
- Installed 4 compact fluorescent light bulbs
- Pre-retrofit energy use for all lighting: 10 Kilowatts
- Post-retrofit energy use for all lighting: 5.649 Kilowatts
- Energy savings projection: 4.351 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 44%

- Estimated Annual Savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
Locally Estimated	$9,787.65	762.85	$2,326.69
4 Hours/day	$4,699.08	366.25	$1,117.05
7 Hours/day	$8,223.39	640.93	$1,954.84
10 Hours/day	$11,747.7	915.61	$2,792.62

New ITC Office Building



Light meter checks light levels to ensure adequate lighting.

Fixtures re-lamped with 25 watt T-8 lamps.

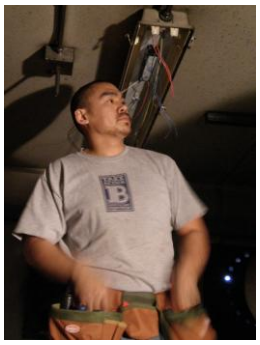
Materials Installed	**Quantity**
2-Lamp Fixture (w/existing electronic ballast) re-lamped with (2)25 watt T8 Lamps	59
3-Lamp Fixture (w/existing electronic ballast) re-lamped with (3)25 watt T8 Lamps	3
CFL-27 W	1

- Pre-retrofit energy use: 5580 watts
- Post-retrofit energy use: 3022 watts
- Energy savings projection: 2558 watts
- Pre-retrofit to post retrofit energy reduction: 46%
- Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$2,762.64	215.32	$656.73
7 Hours/day	$4,834.62	376.81	$1,149.27
10 Hours/day	$6,906.60	538.30	$1,641.81
2160 Hours/year (Est.)	$5,967.30	465.09	$1,418.53

Notes: 24, 3-lamp 32 watt T-8 fixtures in the conference room and hallways reduced to 2-lamp fixtures and re-lamped with 25 watt T-8 lamps for additional savings.

Old IRA Building



Materials Installed	**Quantity**
2-lamp electronic ballast, (2) 25 watt T8 lamps	30
CFL-14 W	3

- Pre-retrofit energy use: 2320 watts
- Post-retrofit energy use: 1452 watts
- Energy savings projection: 868 watts
- Pre-retrofit to post retrofit energy reduction: 37%
- Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$937.44	73.06	$222.85
7 Hours/day	$1,640.52	127.86	$389.98
10 Hours/day	$2,343.60	182.66	$557.11
1620 Hours/year (Est.)	$1,518.65	118.36	$361.01

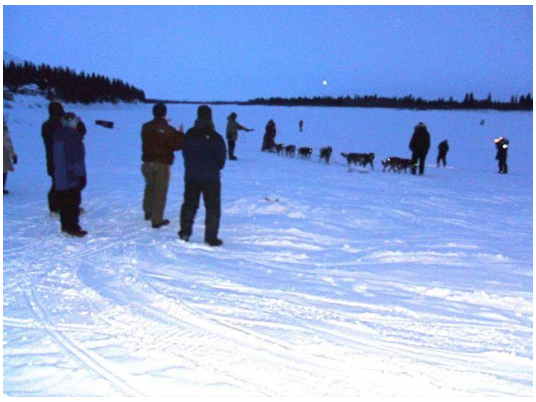
Store

Materials Installed **Quantity**

2-lamp electronic ballast, (2) 25 watt T8 lamps	25	
• Pre-retrofit energy use:	2100	watts
• Post-retrofit energy use:	1175	watts
• Energy savings projection:	925	watts
• Pre-retrofit to post retrofit energy reduction:	44%	

• Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$999.00	77.86	$237.48
7 Hours/day	$1,748.25	136.26	$415.59
10 Hours/day	$2,497.50	194.65	$593.70
2304 Hours/year (Est.)	$2,301.70	179.39	$547.15



Lance Mackey arrives first in White Mountain. during the 2008 Iditarod Trail Sled Dog Race

White Mountain - Alaska Building Science Network - T5 Lighting Upgrade Details

These retrofits were completed in September 2008

Power Plant	Length (feet)	Width (feet)	Ceiling Height (feet)	Type of Existing Fixture	# of Existing Fixtures	Existing Fixture Wattage	**Total Existing Wattage**	Existing Foot-candles	New Foot-Candles	# of New Fixtures	New fixtures	New Fixture Wattage	**Total New Wattage**
				HPS 150 watt		160	**0**				T-5 2 lamps	114	**0**
Color shade of walls				Incd 300	5	300	**1,500**			5	T-5 3 lamps	171	**855**
Color shade of floor				Multi-Vapor 400 watt		415	**0**				T-5 4 lamps	228	**0**
					Total Existing Watts		1,500				Total New Watts		855

Percent Savings Pre to Post Retrofit:	**43%**

Savings & Payback Calculation for Gym:

1750 New watts / old watts

neg 1 (New watts / Old watts x 100 - 100) / 100

Assume 1750 hrs / year for 250 days/year of use

Full cost of electricity: $1.0800 /kWh

Watts of existing lighting: 1,500

New wattage for T5 fixtures: 855

Calculation: (Watts) x (hrs/year) / (1000w/kw) x (cost of electricity) = (cost / year)

Existing Cost: $ 2,835

Retrofitted Cost: $1,616

Annual Savings: $1,219

Est material & shipping cost of Gym retrofit: $900.00

Labor cost: 1600

Simple Payback: Materials cost / annual savings = **0.74** years (for retrofit to pay for itself in materials)

White Mountain, 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, and review of intro materials (Number of entities x 1 hour each)		3	$15.00	$45.00	list number of entities
Staff time for Attending teleconference (TC/IRA)		2	$15.00	$30.00	list # of staff and wages if possible ($15/hr is an average wage designated for village entity staff).
Staff time for Attending teleconference (City)		2	$15.00	$30.00	"
Staff time for Attending teleconference (School)		1	$15.00	$15.00	"
Conservative village office administrative percentage of total project cost less ABSN Admin %. Total project cost = $37,775/village - (our admin percentage , (around 12%) Approx: $4,533) = $33,242 x 5.5% = $1,828 (this 5.5% 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 village- based project support.	Feb, '07 through			$1,828.00	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 - 1st assessment site visit	8/28 & 8/29			$170	$85 / Night for city lodging
Transportation and fuel costs - 1st assessment site-visit	8/28 & 8/29			$150	$75 / Day 4-wheel rental rate
City of White Mountain, T5 lighting upgrades for Power Plant Garage	8/29/08			$282.50	One half travel costs for electrician - Paul Lincoln
	TOTAL			$2,550.50	