

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

**Savoonga Final Report**



**Community Summary**

**5 Community buildings received energy efficiency upgrades May '05 - September '05**  
 City Hall, City Shop, Fire Hall, Clinic, School

**Village-Wide Lighting Retrofit Summary:**

- Retrofitted 341 light fixtures village-wide with electronic ballasts and T8 lamps
- Installed: 30 compact fluorescent light bulbs village-wide
- T5 Light fixtures were installed in School Gym
- Pre-retrofit energy use for all lighting: 49,928 watts
- Post-retrofit energy use for all lighting: 32,220 watts
- Energy savings projection: 17,708 watts (17.71 kW)
- **Pre-retrofit to post retrofit energy reduction: 35 %**
- **Estimated Annual Savings:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	\$7,083	1,432 Gallons	\$2,634
7 Hours	\$12,396	2,505 Gallons	\$4,610
10 Hours	\$17,708	3,579 Gallons	\$6,585

- Total project cost for all measures: \$ 38,235
- Simple mean payback\*: 3.08 Years
- Total village wide in-kind contribution: \$ 18,927

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

**Additional Energy Efficiency Measures: (Budget Expense: \$ 1,023)**

- 16 hour energy efficiency boiler training for 1 local maintenance staff – at Nome regional Boiler training in November, 2005.

## Savoonga City Owned Buildings

Energy efficient lighting upgrades were completed in 4 buildings owned by the City of Savoonga

### City owned Buildings - Lighting Retrofit Summary:

- Lighting upgrades completed in May, 2005
- Retrofitted 133 linear fluorescent fixtures with T8 lamps and electronic ballasts
- Installed: 24 compact fluorescent light bulbs
- Pre-retrofit energy use for all lighting: 20,338 watts
- Post-retrofit energy use for all lighting: 14,088 watts
- Energy savings projection: 6,250 watts (6.25 kW)
- **Pre-retrofit to post retrofit energy reduction: 31 %**
- **Estimated Annual Savings:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	\$2,500	505 Gallons	\$930
7 Hours	\$4,375	884 Gallons	\$1,627
10 Hours	\$6,250	1,263 Gallons	\$2,324

### City Hall



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 Hall	18	61	0	0	0	0	3	0	0

- Pre-retrofit energy use: 11,660 watts
- Post-Retrofit Energy Use: 8,439 watts
- Energy savings projection: 3,221 watts (3.22 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	\$1,288	260 Gallons	\$479
7 Hours	\$2,255	456 Gallons	\$838
10 Hours	\$3,221	651 Gallons	\$1,198

Notes: The City Building was owned and maintained by the City during the '05-'06 grant cycle. Like many rural Alaskan buildings there was inadequate lighting levels during the winter and excessive lighting in the season between spring and autumnal equinoxes. The much improved light levels and energy savings was much appreciated by City of Savoonga staff.

### City Shop



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
<b>City Shop</b>	2	0	0	0	0	0	14	0	3

- Pre-retrofit energy use: 1,304 watts
- Post-Retrofit Energy Use: 377 watts
- Energy savings projection: 927 watts (.93 Kw)
- **Pre-retrofit to post retrofit energy reduction: 71 %**
- **Estimated Annual Savings:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	\$371	75 Gallons	\$138
7 Hours	\$649	131 Gallons	\$241
10 Hours	\$927	187 Gallons	\$345

## Fire Hall



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
<b>Fire Hall</b>	12	13	0	0	0	0	4	0	0

- Pre-retrofit energy use: 3,356 watts
- Post-Retrofit Energy Use: 2,332 watts
- Energy savings projection: 1,024 watts (1.02 Kw)
- **Pre-retrofit to post retrofit energy reduction: 31 %**
- **Estimated Annual Savings:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	\$410	83 Gallons	\$152
7 Hours	\$717	145 Gallons	\$267
10 Hours	\$1,024	207 Gallons	\$381

## Clinic



City Buildings	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
<b>Clinic</b>	5	22	0	0	0	0	0	0	0

- Pre-retrofit energy use: 4,018 watts
- Post-Retrofit Energy Use: 2,940 watts
- Energy savings projection: 1,078 watts (1.08 Kw)
- **Pre-retrofit to post retrofit energy reduction: 27 %**
- **Estimated Annual Savings:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	\$431	87 Gallons	\$160
7 Hours	\$755	153 Gallons	\$281
10 Hours	\$1,078	218 Gallons	\$401

## Savoonga School Owned Buildings

Energy efficient lighting upgrades were completed in all primary lighting areas of the school

### School owned Buildings - Lighting Retrofit Summary:

- Lighting upgrades completed in May, 2005
- Retrofitted 208 linear fluorescent fixtures with T8 lamps and electronic ballasts
- Installed: 6 compact fluorescent light bulbs
- T5 light fixtures installed in the School Gym
- Pre-retrofit energy use for all lighting: 29,590 watts
- Post-retrofit energy use for all lighting: 18,132 watts
- Energy savings projection: 11,458 watts (11.46kW)
- **Pre-retrofit to post retrofit energy reduction: 39 %**
- **Estimated Annual Savings:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	\$4,583	926 Gallons	\$1,704
7 Hours	\$8,021	1,621 Gallons	\$2,983
10 Hours	\$11,458	2,316 Gallons	\$4,261

### Main School Building



School Buildings	2-Lamp Ballasts 32w lamps	4-Lamp Ballasts 32w lamps	4-Lamp Ballasts 3, 32w 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
<b>Fixture TOTALS</b>	163	4	41	0	0	0	6	0	0

- Pre-retrofit energy use: 19,630 watts
- Post-Retrofit Energy Use: 14,028 watts
- Energy savings projection: 5,602 watts (5.60 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	\$2,241	453 Gallons	\$833
7 Hours	\$3,921	793 Gallons	\$1,458
10 Hours	\$5,602	1,132 Gallons	\$2,083

Notes: The Savoonga school was the only school throughout the NW-SW region villages in this grant that still was using 40 watt T12 lamps and magnetic ballasts. Bering Straits School District maintenance staff retrofitted all substantial lighting throughout the school. Local maintenance staff from Savoonga along with a BSSD electrician worked together to accomplish the retrofits.

### High Output T5 Lighting Upgrades for the Savoonga Gym



Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	\$2,342	473 Gallons	\$871
7 Hours	\$4,099	828 Gallons	\$1,524
10 Hours	\$5,856	1,184 Gallons	\$2,178

Notes: Our lighting plan of mixing 2-lamp and 4-lamp T5 fixtures throughout the gym resulted in a 58% reduction in energy use while providing 50 foot-candles of light on average.

**Savoonga School - T5 Lighting Upgrade Details - ABSN Energy Efficiency Projects '05-'06**

These retrofits were completed in Aug & Sept, 2005.

Savoonga Gym	Length (feet)	Width (feet)	Ceiling Hieght (feet)	# of Existing Fixtures	Existing Fixture Wattage	Total Existing Wattage	Existing Foot-candles	New Foot-Candles	# of New Fixtures	lamps / fixture	New Fixture Wattage	New Wattage	
	86	58	27	24	415	9,960		50	12	4	228	2736	
New T5 wattage = 57 watts / lamp, which includes ballast wattage										12	2	114	1368
											<b>Total New Wattage</b>	<b>4104</b>	
<b>Total New wattage for gym (58% savings)</b>													

**Savings & Payback Calculation for Gym:**

58.79518072

Assume 1800 hrs / year for 250 days/year of use

Full cost of electricity \$0.40 /kWh

Watts of existing lighting: 9,960

New wattage for T5 fixtures: 4,104

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

Existing Cost: \$7,171

Retrofitted Cost: \$2,955

**Annual Savings:**  
\$ 4,216

Material & shipping cost of Gym retrofit: \$6,417.42

**Simple Payback:** Materials cost / annual savings = **1.522042919** years (for retrofit to pay for itself in materials)

## Nome Boiler Training

In November, 2005 ABSN partnered with Kawerak Housing Authority based in Nome to provide ABSN's 16 hour boiler training course to 15 rural maintenance staff. AEA VEUEEM grant funds were used to cover air fair and lodging in Nome for the following maintenance staff from this grant's villages: Savoonga: Cedric Toolie; Selawik: Daniel, Harry Foxglove; Buckland: Jonny Hadley.



Using a flu analyzer to test boiler efficiency



Charlie Deer covering Boiler Controls



Checking CO2 content of flu gases with Bacharak test kit

During this 16-hour course ABSN's boiler specialist Charlie Deer instructed the 4 village maintenance staff in the fundamentals of boiler and fuel energy efficiency. This benefit to the grant came through an in-kind contribution of \$2,100 provided by ABSN. Training topics covered: fuel, proper heating system sizing, testing boiler efficiency with a flu gas analyzer kit, cleaning and tuning boilers for energy efficiency, control options and proper control function, burner and nozzle components and function, outdoor temperature boiler controls, programmable thermostats, etc.

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

Village entities worked with: City and 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)		4	\$15.00	\$60.00	# 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, etc.
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
City of Savoonga Maint. Staff - Raynard Toolie	6/1/05	28	\$15.00	\$420.00	
School Maint. Staff time to assist Field Manager on verifying building assessments - 1st site visit		4	\$15.00	\$60.00	
<b>Village office administrative percentage of total project cost less ABSN Admin %.</b> 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.
City Lodging - FM				\$240.00	4 nights stay @ \$60/night
School-wide T8 retrofits				\$2,568.00	value of in-kind labor for school-wide retrofit 208 fixtures, 143 hrs, \$18/hr
Savoonga School T5 Labor	Aug & Sept			\$13,533.00	(as per Ric Reid email 11-17-05, BSSD maint foreman)
ATS Shipping - Recycle lamps & regular ballasts from Savoonga School	10/31/06			\$82.50	Total Reclaim Inc., 4 buckets @ 330 lbs, .13/lb, & 5 boxes of lamps - (many broken), 1280' @ .14/lineal foot
Nome Boiler Training, Savoonga IRA Council	11/30/06			\$43.44	Payroll - employer contribution
	TOTAL			\$18,926.94	



