Village End Use Energy Efficiency Measures Program

AEA Grant # 2195294 Administered by Alaska Building Science Network

Stevens Village Final Report

Community Summary

8 community buildings received energy efficiency upgrades in:

Washeteria & Water Plant, Community Hall, Clinic & IRA Offices, Storage (Old VPSO), School, School Gym, Generator Shed, Sewer Lift Station

Retrofits Completed: April 2009

Village-Wide Lighting Retrofit Summary:

- Retrofitted 213 light fixtures with electronic ballasts & T8 lamps
- Installed 40 compact fluorescent light bulbs
- Installed 8 T5 linear fluorescent fixtures in the School Gym
- Pre-retrofit energy use for all lighting: 27.527 Kilowatts
- Post-retrofit energy use for all lighting: 15.037 Kilowatts
- Energy savings projection: 12.490 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 45%

- Estimated Annual Savings:

kWh Rate (FY 2009 AVE): $1.07 Fuel Cost (FY 2009 Ave): $5.16

Hours Per Day/ 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
Locally Estimated Use	$21,070.62	1803.31	$9,305.09
4 Hours/day	$13,364.30	1143.77	$5,901.87
7 Hours/day	**$23,387.53**	2001.60	$10,328.2
10 Hours/day	$33,410.75	2859.43	$14,754.6

- Total project cost for all measures: $34,500
- Simple Payback (lighting measures only, using 7 hours/day lighting use run-time): 1.48
- Total village wide in-kind contribution: $10,609.78

Stevens Village IRA Council Owned Buildings



Transporting lighting supplies to next building.

4 buildings owned by the Stevens Village IRA Council received energy efficient lighting upgrades as follows:

Washeteria & Water Plant, Community Hall, Clinic & IRA Offices, Storage (Old VPSO)

- Lighting upgrades completed in March 2009
- Retrofitted 92 light fixtures with electronic ballasts & T8 lamps
- Installed 16 compact fluorescent light bulbs
- Pre-retrofit energy use for all lighting: 12.594 Kilowatts
- Post-retrofit energy use for all lighting: 6.863 Kilowatts
- Energy savings projection: 5.731 Kilowatts
- 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
Locally Estimated	$9,661.54	826.87	$4,266.67
4 Hours/day	$6,132.17	524.82	$2,708.05
7 Hours/day	$10,731.3	918.43	$4,739.10
10 Hours/day	$15,330.4	1312.04	$6,770.14

Washeteria & Water Plant

Materials Installed	Quantity
2-lamp electronic ballast, (2) 25 watt T8 lamps	7
4-lamp electronic ballast, (3) 25 watt T8 lamps	11
4-lamp fixture (2) 2-lamp ballasts (4) 25 watt T8	19
CFL-20 W	11
CFL-23 W	2

- Pre-retrofit energy use: 6165 watts
- Post-retrofit energy use: 3161 watts
- Energy savings projection: 3004 watts
- Pre-retrofit to post retrofit energy reduction: 49%
- Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$3,214.28	275.09	$1,419.47
7 Hours/day	$5,624.99	481.41	$2,484.08
10 Hours/day	$8,035.70	687.73	$3,548.68
1248 Hours/year (Est.)	$4,011.42	343.31	$1,771.50

Note: Three fixtures reduced from 4-lamp to 2-lamp fixture, while eleven 4-lamp fixtures de-lamped to operate 3-lamps each for additional savings.

Community Hall

Materials Installed	Quantity
4-lamp electronic ballast, (4) 25 watt T8 lamps	14

- Pre-retrofit energy use: 2016 watts
- Post-retrofit energy use: 1260 watts
- Energy savings projection: 756 watts
- Pre-retrofit to post retrofit energy reduction: 38%
- Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$808.92	69.23	$357.23
7 Hours/day	$1,415.61	121.15	$625.15
10 Hours/day	$2,022.30	173.08	$893.08
2080 Hours/year (Est.)	$1,682.55	144.00	$743.04

Clinic & IRA Offices

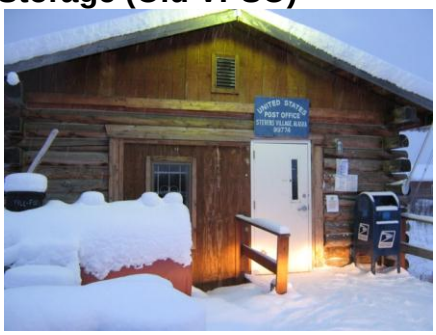
Materials Installed	Quantity
2-lamp electronic ballast, (2) 25 watt T8 lamps	14
3-lamp electronic ballast, (2) 25 watt T8 lamps	7
4-lamp electronic ballast, (3) 25 watt T8 lamps	9
4-lamp electronic ballast, (4) 25 watt T8 lamps	5
CFL-11 W	3

- Pre-retrofit energy use: 3981 watts
- Post-retrofit energy use: 2166 watts
- Energy savings projection: 1815 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	$1,942.05	166.21	$857.64
7 Hours/day	$3,398.59	290.87	$1,500.87
10 Hours/day	$4,855.13	415.52	$2,144.09
2000 Hours/year (Est.)	$3,884.10	332.42	$1,715.27

Note: Nine 4-lamp fixtures were de-lamped operating three lamps each for additional savings.

Storage (Old VPSO)



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

- Pre-retrofit energy use: 432 watts
- Post-retrofit energy use: 276 watts
- Energy savings projection: 156 watts
- Pre-retrofit to post retrofit energy reduction: 36%
- Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$166.92	14.29	$73.71
7 Hours/day	$292.11	25.00	$129.00
10 Hours/day	$417.30	35.71	$184.29
500 Hours/year (Est.)	$83.46	7.14	$36.86

Yukon Flats School District Owned Buildings

4 buildings owned by the Yukon Flats School District received energy efficient lighting upgrades as follows:

Stevens Village School, School Gym, Generator Shed, Sewer Lift Station

- Lighting upgrades completed in March 2009
- Retrofitted 121 light fixtures with electronic ballasts & t8 lamps
- Installed 24 compact fluorescent light bulbs
- Installed 8 T5 linear fluorescent fixtures
- Pre-retrofit energy use for all lighting: 14.933 Kilowatts
- Post-retrofit energy use for all lighting: 8.174 Kilowatts
- Energy savings projection: 6.759 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 45%
- Estimated Annual Savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
Locally Estimated	$11,409.0	976.44	$5,038.42
4 Hours/day	$7,232.13	618.96	$3,193.81
7 Hours/day	$12,656.2	1083.17	$5,589.17
10 Hours/day	$18,080.3	1547.39	$7,984.53

School

Stevens Village School

Lighting retrofits save energy while improving light quality in classrooms, hallways & gym.

Lighting motion sensor switch installed in school laundry room.

Materials Installed	**Quantity**
2-lamp electronic ballast, (2) 25 watt T8 lamps	114
3-lamp electronic ballast, (3) 25 watt T8 lamps	1
4-lamp electronic ballast, (4) 25 watt T8 lamps	3
8-Lamp Fixture, (2) 4-Lamp electronic ballast, (6)	1
CFL-20 W	12
CFL-27 W	1
motion detector switch	1

- Pre-retrofit energy use: 10169 watts
- Post-retrofit energy use: 6005 watts
- Energy savings projection: 4164 watts
- Pre-retrofit to post retrofit energy reduction: 41%
- Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$4,455.48	381.32	$1,967.60
7 Hours/day	$7,797.09	667.31	$3,443.31
10 Hours/day	$11,138.7	953.30	$4,919.01
1800 Hours/year (Est.)	$8,019.86	686.37	$3,541.69

Note: One 4-lamp fixture reduced to a 2-lamp fixture and a second 4-lamp fixture reduced to a 3-lamp fixture. for additional savings.

Generator Shed

Materials Installed **Quantity**

CFL-23 W 11

- Pre-retrofit energy use: 1300 watts
- Post-retrofit energy use: 253 watts
- Energy savings projection: 1047 watts
- Pre-retrofit to post retrofit energy reduction: 81%
- Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$1,120.29	95.88	$494.74
7 Hours/day	$1,960.51	167.79	$865.79
10 Hours/day	$2,800.73	239.70	$1,236.84
500 Hours/year (Est.)	$560.15	47.94	$247.37

Sewer Lift Station

Materials Installed **Quantity**

2-lamp electronic ballast, (2) 25 watt T8 lamps 2

- Pre-retrofit energy use: 144 watts
- Post-retrofit energy use: 92 watts
- Energy savings projection: 52 watts
- Pre-retrofit to post retrofit energy reduction: 36%
- Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$55.64	4.76	$24.57
7 Hours/day	$97.37	8.33	$43.00
10 Hours/day	$139.10	11.90	$61.43
500 Hours/year (Est.)	$27.82	2.38	$12.29

School Gym

T-5 fluorescent lights installed in school gym.

Materials Installed	**Quantity**
T5 fixture, electronic ballast, (4) 54 watt T5 HO	8

- Pre-retrofit energy use: 3320 watts
- Post-retrofit energy use: 1824 watts
- Energy savings projection: 1496 watts
- Pre-retrofit to post retrofit energy reduction: 45%
- Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$1,600.72	137.00	$706.90
7 Hours/day	$2,801.26	239.74	$1,237.08
10 Hours/day	$4,001.80	342.49	$1,767.25
1750 Hours/year (Est.)	$2,801.26	239.74	$1,237.08

Note: Eight (415 watt) Multi-Vapor fixtures were replaced with eight 114 watt T5 fluorescent fixtures.

ABSN T5 Fluorescent Lighting plans are designed to increase light levels throughout the space (when all fixtures are switched on) - in comparison with previous existing light output. Existing switching controls are retained - allowing users to choose the appropriate number of light fixtures/rows of light fixtures needed for various use patterns. In many cases building staff will choose not to use all fixtures available, thereby achieving further electrical savings than what is shown above. ABSN T5 lighting plans employ 54-watt, high output T5 lamps with a color-rendering index (CRI) of 85, which improves light quality. Existing light fixtures in rural high ceiling areas typically have a CRI ranging from 30 to 70. The T5 retrofits boost CRI which greatly improves light quality, resulting in objects appearing much closer to their true color as seen under sunlight. This increased light quality can result in less light needed to illuminate a given space. As an added advantage, building owners also appreciate the “instant-on” function of T5 lighting compared with long wait periods for older HID fixtures to come on. With the waiting period eliminated, building owners have indicated they are more likely to keep lighting off until needed.

Stevens Village - Alaska Building Science Network - T5 Lighting Upgrade Details

These retrofits were completed in April, 2009.

Stevens Village Gym	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**
	50	36.5	25	HPS 150 watt		160	**0**	8 to13			T-5 2 lamps	114	**0**
Color shade of walls	light		wall height (feet)	HPS 250 watt		260	**0**				T-5 3 lamps	171	**0**
Color shade of floor	light		20	Multi-Vapor 400 watt	8	415	**3,320**			8	T-5 4 lamps	228	**1824**
					Total Existing Watts		3,320				Total New Watts		1824

Percent Savings Pre to Post Retrofit:	**45.06%**

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: $1.07 /kWh

Watts of existing lighting: 3,320

New wattage for T5 fixtures: 1,824

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

Existing Cost: $6,217

Retrofitted Cost: $3,415

Annual Savings: $ $2,801

T5 Materials costs $ 1,639.12

T5 shipping costs $ 138.53

Material & shipping cost of Gym retrofit: $ 1,777.65

Simple Payback: Materials cost / annual savings = **.63** years (for retrofit to pay for itself in materials)

Stevens Village, 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, intro & review intro materials		2.0	$20.00	$ 40.00	Number of entities x 1 hour each
Staff time for Attending teleconference (TC/IRA)		2.0	$20.00	$ 40.00	list # of staff $15/hr is an average wage designated for village entity staff
Staff time for Attending teleconference (School)		1.0	$20.00	$ 20.00	"
Maint. Staff time to accompany Field Manager on building assessments - 1st site visit	12/2, 12/3, 12/4/08	8.0	$15.00	$ 120.00	YFSD maintenance worker William Tritt assisted with assessments of school and IRA Council buildings.
Conservative village office administrative percentage of total project cost less ABSN Admin %. Total project cost = $34,500/village - (our admin percentage , (around 12%) Approx: $4,200) = $30,300 x 5.5% = $1,666 (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			$1,666.00	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. Village expenses for phone charges, copying and fax costs, office supplies, etc. are part of this amount.
Lodging for ABSN Field Managers - 1st site visit	12/2-12/4/08	3.0		$100	FM stay at school-4days @ $25/day
Transportation and fuel costs - 1st assessment site-visit	12/2-4/08	3.0		$200	YFSD William Tritt -4 days @ $50/day.
Lodging for ABSN Field Managers - 2nd site visit	3/9-3/13/2009	4.0		$100	FM stay at school-4days @ $25/day
Transportation and fuel costs during 2nd Site-visit				$200	YFSD William Tritt -school truck 4 days @ $50/day.
Mr. Pritchard School T5 Work				$1,200.00	YFSD providing electrician
Mr. Pritchard T5 Air Ticket				$ 226.00	YFSD providing electrician
Troy Simon T5 Work				$ 551.39	
Andrew Brattrud T5 Work				$ 952.00	
Workman's Comp				$2,929.39	Employer expense
Troy Simon's Hours working on school classroom and hallway retrofits		49.0	$15	$ 735.00	YFSD is providing maintenance labor In-kind-contact
William Tritt's hours working on school classroom and hallway retrofits		51.5	$15	$ 772.50	YFSD is providing maintenance labor In-kind-contact
Andrew Brattrud hours working on school classroom and hallway retrofits		50.5	$15	$ 757.50	YFSD is providing maintenance labor In-kind-contact
	TOTAL			$10,609.78	

The capacity of ABSN's scope of work was greatly increased by the response of local communities to work in partnership with ABSN and provide in-kind services of project coordination, paid labor for lighting retrofits, transportation and lodging for ABSN field staff, and other valuable contributions. This allowed ABSN and the community of Steven's Village to deliver 31% more energy savings measures beyond the original grant funding.