Village End Use Energy Efficiency Measures Program

AEA Grant # 2195294 Administered by Alaska Building Science Network

Hughes Final Report

Community Summary

8 community buildings received energy efficiency upgrades as follows:

Tribal/City Office, Washeteria/Water Plant, Clinic/Computer Lab, Safe House, Community Hall, Co-Op Store, Johnny Oldman School, Johnny Oldman School Gymnasium, Hughes Community Church

Retrofits Completed: January 2009 – December 2009

Village-Wide Lighting Retrofit Summary:

- Retrofitted 134 light fixtures with electronic ballasts & T8 lamps
- Retrofitted 15 light fixtures with HO electronic ballasts & HO T8 lamps
- Installed 38 compact fluorescent light bulbs
- Pre-retrofit energy use for all lighting: 20.144 Kilowatts
- Post-retrofit energy use for all lighting: 10.971 Kilowatts
- Energy savings projection: 9.173 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 46%
- Estimated Annual Savings:

kWh Rate (FY 2009 AVE): $0.71 Fuel Cost (FY 2009 Ave): $5.25

Hours Per Day/ 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
Locally Estimated Use	$11,516.57	1207.78	$6,340.86
4 Hours/day	$6,512.83	683.02	$3,585.87
7 Hours/day	**$11,397.45**	1195.29	$6,275.27
10 Hours/day	$16,282.08	1707.56	$8,964.68

- Total project cost for all measures: $20,000
- Simple Payback (lighting measures only, using 7 hours/day lighting use run-time): 1.75
- Total village wide in-kind contribution: $1,703.00

Additional Energy Efficiency Measures: Two programmable thermostats installed in the Clinic/Computer lab bldg. and one in the Washeteria lobby.

City Of Hughes Owned Buildings

Hughes City and Tribal office.

Programmable thermostat installed in computer lab.

3 buildings owned by the City of Hughes received energy efficient lighting upgrades as follows:

Tribal/City Office, Clinic/Computer Lab, Washeteria/Water Plant

- Lighting upgrades completed in: January 2009
- Retrofitted 64 light fixtures with electronic ballasts & T8 lamps
- Installed 16 compact fluorescent light bulbs
- Pre-retrofit energy use for all lighting: 8.565 Kilowatts
- Post-retrofit energy use for all lighting: 4.478 Kilowatts
- Energy savings projection: 4.087 Kilowatts
- 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
Locally Estimated	$5,192.84	544.59	$2,859.10
4 Hours/day	$2,901.77	304.32	$1,597.67
7 Hours/day	$5,078.10	532.56	$2,795.93
10 Hours/day	$7,254.43	760.80	$3,994.18

Tribal/City Office Building



Materials Installed	Quantity
2-lamp electronic ballast, (2) 25 watt T8 lamps	9
4-lamp electronic ballast, (3) 25 watt T8 lamps	9
4-lamp electronic ballast, (4) 25 watt T8 lamps	8
CFL-14 W	3
CFL-20 W	2

- Pre-retrofit energy use: 3699 watts
- Post-retrofit energy use: 1891 watts
- Energy savings projection: 1808 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	$1,283.68	134.62	$706.78
7 Hours/day	$2,246.44	235.59	$1,236.86
10 Hours/day	$3,209.20	336.56	$1,766.94
1920 Hours/year (Est.)	$2,464.67	258.48	$1,357.01

Note: De-lamped nine 4-lamp fixtures to operate three lamps each for additional savings.

Clinic/Computer Lab



Materials Installed	Quantity
2-lamp electronic ballast, (2) 25 watt T8 lamps	8
3-lamp electronic ballast, (3) 25 watt T8 lamps	4
4-lamp electronic ballast, (3) 25 watt T8 lamps	3
CFL-14 W	1
CFL-20 W	2

- Pre-retrofit energy use: 1779 watts
- Post-retrofit energy use: 943 watts
- Energy savings projection: 836 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	$593.56	62.25	$326.81
7 Hours/day	$1,038.73	108.94	$571.91
10 Hours/day	$1,483.90	155.62	$817.01
288 Hours/year (Est.)	$170.95	17.93	$94.12

Note: Reduced four 4-lamp fixtures to 3-lamp fixtures, while de-lamping 3 additional 4-lamp fixtures to operate three lamps each for additional savings. Additional Energy Efficiency Measures: Two programmable thermostats installed in the Clinic/Computer lab.

Washeteria/Water Plant

Materials Installed	**Quantity**
2-lamp electronic ballast, (2) 25 watt T8 lamps	10
3-lamp electronic ballast, (3) 25 watt T8 lamps	5
4-lamp electronic ballast, (4) 25 watt T8 lamps	8
CFL-11 W	6
CFL-14 W	2

- Pre-retrofit energy use: 3087 watts
- Post-retrofit energy use: 1644 watts
- Energy savings projection: 1443 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	$1,024.53	107.45	$564.09
7 Hours/day	$1,792.93	188.03	$987.16
10 Hours/day	$2,561.33	268.62	$1,410.23
2496 Hours/year (Est.)	$2,557.23	268.19	$1,407.97

Note: Reduced five 4-lamp fixtures to 3-lamp fixtures for additional savings.

Additional Energy Efficiency Measures: One programmable thermostat installed in the Washeteria lobby.

IRA/TC Owned Buildings

ABSN Project Coordinator Anna Hilbruner gives training on how to recycle old lamps and ballasts.

Maintenance workers practice changing out ballasts.

3 buildings owned by the IRA/TC received energy efficient lighting upgrades as follows:

Community Hall, Safe House, Co-Op Store

- Lighting upgrades completed in: January 2009
- Retrofitted 10 light fixtures with electronic ballasts & T8 lamps
- Installed 21 compact fluorescent light bulbs
- Pre-retrofit energy use for all lighting: 3.347 Kilowatts
- Post-retrofit energy use for all lighting: 1.232 Kilowatts
- Energy savings projection: 2.115 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 63%
- Estimated Annual Savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
Locally Estimated	$2,490.58	261.20	$1,371.28
4 Hours/day	$1,501.65	157.48	$826.79
7 Hours/day	$2,627.89	275.60	$1,446.88
10 Hours/day	$3,754.13	393.71	$2,066.97

Community Hall

Materials Installed	Quantity
4-lamp electronic ballast, (4) 25 watt T8 lamps	8
CFL-20 W	1

- Pre-retrofit energy use: 1419 watts
- Post-retrofit energy use: 740 watts
- Energy savings projection: 679 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	$482.09	50.56	$265.43
7 Hours/day	$843.66	88.48	$464.51
10 Hours/day	$1,205.23	126.40	$663.58
880 Hours/year (Est.)	$424.24	44.49	$233.58

Safe House

Materials Installed	Quantity
CFL-20 W	11

- Pre-retrofit energy use: 1100 watts
- Post-retrofit energy use: 220 watts
- Energy savings projection: 880 watts
- Pre-retrofit to post retrofit energy reduction: 80%
- Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$624.80	65.52	$344.01
7 Hours/day	$1,093.40	114.67	$602.01
10 Hours/day	$1,562.00	163.81	$860.01
2640 Hours/year (Est.)	$1,649.47	172.99	$908.18

Co-Op Store

Materials Installed	**Quantity**
2-lamp electronic ballast, (2) 25 watt T8 lamps	2
CFL-20 W	9

- Pre-retrofit energy use: 828 watts
- Post-retrofit energy use: 272 watts
- Energy savings projection: 556 watts
- Pre-retrofit to post retrofit energy reduction: 67%
- Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$394.76	41.40	$217.35
7 Hours/day	$690.83	72.45	$380.36
10 Hours/day	$986.90	103.50	$543.37
1056 Hours/year (Est.)	$416.87	43.72	$229.52

Yukon-Koyukuk School District Owned Buildings

All classrooms and hallway lighting updated with energy efficient electronic ballast and T-8 lamps while improving light levels in those spaces.

1 building owned by Yukon-Koyukuk School District received energy efficient lighting upgrades as follows:

Johnny Oldman School & Gym

- Lighting upgrades completed in December 2009
- Retrofitted 56 light fixtures with electronic ballasts & T8 lamps
- Retrofitted 15 light fixtures with HO electronic ballasts & T8 lamps
- Installed 1 compact fluorescent light bulb
- Pre-retrofit energy use for all lighting: 7.896 Kilowatts
- Post-retrofit energy use for all lighting: 5.077 Kilowatts
- Energy savings projection: 2.819 Kilowatts
- 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
Locally Estimated	$3,821.93	400.82	$2,104.30
4 Hours/day	$2,001.49	209.90	$1,101.99
7 Hours/day	$3,502.61	367.33	$1,928.49
10 Hours/day	$5,003.73	524.76	$2,754.98

Note: Eight 2-lamp fixtures taken offline in the boys and girls restrooms due to over-lighting in those spaces for additional savings.

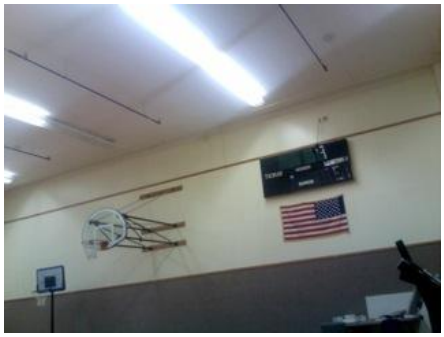
Johnny Oldman School

Materials Installed	Quantity
2-lamp electronic ballast, (2) 25 watt T8 lamps	23
3-lamp electronic ballast, (2) 25 watt T8 lamps	33
CFL-23 W	1

- Pre-retrofit energy use: 4596 watts
- Post-retrofit energy use: 2797 watts
- Energy savings projection: 1799 watts
- Pre-retrofit to post retrofit energy reduction: 39%
- Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$1,277.29	133.95	$703.26
7 Hours/day	$2,235.26	234.42	$1,230.70
10 Hours/day	$3,193.23	334.88	$1,758.14
2000 Hours/year (Est.)	$2,554.58	267.91	$1,406.52

Johnny Oldman School Gym



Gym lights updated with energy efficient electronic ballast and T-8 lamps save energy while improving light quality.

Materials Installed	Quantity
8 FT, 2 lamp HO electronic ballast, T8 (152w fixtures)	15

- Pre-retrofit energy use: 3300 watts
- Post-retrofit energy use: 2280 watts
- Energy savings projection: 1020 watts
- Pre-retrofit to post retrofit energy reduction: 31%
- Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	$724.20	75.95	$398.73
7 Hours/day	$1,267.35	132.91	$697.78
10 Hours/day	$1,810.50	189.87	$996.84
1750 Hours/year (Est.)	$1,267.35	132.91	$697.78

Note: Fifteen original T-12 HO fixtures operating at approx. 220 watts each, were retrofitted with energy efficient electronic ballast and T-8 HO lamps operating at 152 watts each.

Hughes - Alaska Building Science Network - T5 Lighting Upgrade Details, Yukon - Koyukuk SD,
These retrofits were completed in (December, 2009).

Hughes 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**
Hughes	59	39	20	HPS 150 watt		160	**0**	37-43	40-47		T-5 2 lamps	114	**0**
Color shade of walls	white			HPS 250 watt		260	**0**				T-5 3 lamps	171	**0**
Color shade of floor	dark			Multi-Vapor 400 watt		415	**0**				T-5 4 lamps	228	**0**
				8FT HO	15	220	**3,300**			15	**T-8-HO**	152	**2280**
					Total Existing Watts		3,300				Total New Watts		2280

Percent Savings Pre to Post Retrofit:	**30.91%**	neg 1 (New watts / Old watts x 100 - 100) / 100
1750		New watts / old watts

Savings & Payback Calculation for Gym:

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

Full cost of electricity: $ 0.71 /kWh

Watts of existing lighting: 3,300

New wattage for T5 fixtures: 2,280

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

Existing Cost: $ 4,100

Retrofitted Cost: $ 2,833

Annual Savings: $ $ 1,267

T5 Materials costs $ 964.65

T5 shipping costs $ 86.80

Material & shipping cost of Gym retrofit: $1,051.45

Simple Payback: Materials cost / annual savings = **0.83** years (for retrofit to pay for itself in materials)

Hughes Community Church Owned Buildings

The Hughes Community Church received energy efficient lighting upgrades as follows:

Church

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

- Lighting upgrades completed in: January 2009
- Retrofitted 4 light fixtures with electronic ballasts & T8 lamps
- Pre-retrofit energy use for all lighting: 0.336 Kilowatts
- Post-retrofit energy use for all lighting: 0.184 Kilowatts
- Energy savings projection: 0.152 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
4 Hours/day	$107.92	11.32	$59.42
7 Hours/day	$188.86	19.81	$103.98
10 Hours/day	$269.80	28.29	$148.55
104 Hours/year (Est.)	$11.22	1.18	$6.18

Hughes 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		4	$ 20.00	$ 80.00	(# of entities x 1 hour each)
Staff time for Attending telecon Village Council		1	$ 20.00	$ 20.00	Janet Bifelt
Staff time for Attending teleconference (City)		1	$ 20.00	$ 20.00	Wilmer Beetus
Staff time for Attending teleconference (School)		1	$ 20.00	$ 20.00	John Christian
Maint. Staff time to accompany Field Manager on building assessments - 1st site visit				$ 120.00	Wilbur Koyukuk 8 hours over 2 days $15hr
Conservative village office administrative percentage of total project cost less ABSN Admin %. Total project cost = $20,000/village - (our admin percentage , (around 12%) Approx: $2,400) = $17,600 x 5.5% = $968 (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			$ 968.00	Each time we call, email, or fax a village entity, someone has to receive the communication, review and/or foward 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	7/22-24/08			$75	Dan 3 nights stay at school ($25/night)
Transportation and fuel costs - 1st site-visit	7/22-23/08	2	$ 25.00	$ 50.00	4-wheeler rental 1.5 days (Wilbur Koyukuk).
Lodging for ABSN Field Managers - 2nd site visit	1/12-16/09	7	$50	$ 350.00	Lodging for Dan 4 nights & Anna 3 Nights
	TOTAL			$1,703.00	

The capacity of ABSN's scope of work was 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 Hughes to deliver 9% more energy savings measures beyond the original grant funding.