

Village End Use Energy Efficiency Measures Program
AEA Grant # 2195294 Administered by Alaska Building Science Network

Takotna Final Report



ABSN Project Coordinator Anna Hilbruner participates in maintenance.



Community Summary

15 community buildings and 1 teacher housing unit received energy efficiency upgrades.

Takotna Community Association Office Building and Lodge, Fire Hall, Old Generator Bldg, Community Center, Tire Shop, Woodshop, Takotna Tribal Offices, Library, PHS Washeteria & Water Treatment Plant, Store, Church, Takotna School, Old High School, School Garage/Generator Plant, School Storage Building

Retrofits Completed: February 2009 – June 2009

Village-Wide Lighting Retrofit Summary:

- Retrofitted 226 light fixtures with electronic ballasts & T8 lamps
- Installed 39 compact fluorescent light bulbs
- Pre-retrofit energy use for all lighting: 32.934 Kilowatts
- Post-retrofit energy use for all lighting: 15.414 Kilowatts
- Energy savings projection: 17.520 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 53%
- Estimated Annual Savings:

kWh Rate (FY 2009 AVE): \$1.25 Fuel Cost (FY 2009 Ave): \$6.14

Hours Per Day/ Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
Locally Estimated Use	\$50,960.10	3696.11	\$22,694.10
4 Hours/day	\$21,900.00	1588.40	\$9,752.75
7 Hours/day	\$38,325.00	2779.69	\$17,067.30
10 Hours/day	\$54,750.00	3970.99	\$24,381.80

- Total project cost for all measures:\$36,000
- Simple Payback (lighting measures only, using 7 hours/day lighting use run-time): .94
- Total village wide in-kind contribution: \$5,511

Takotna Community Association Owned Buildings



6 buildings owned by the Takotna Community Association received energy efficient lighting upgrades as follows:

Takotna Community Association Office Building and Lodge, Fire Hall, Old generator bldg, Community Center, Tire Shop, Woodshop

- Lighting upgrades completed in February 2009
- Retrofitted 66 light fixtures with electronic ballasts & T8 lamps
- Installed 5 compact fluorescent light bulbs
- Pre-retrofit energy use for all lighting: 9.412 Kilowatts
- Post-retrofit energy use for all lighting: 5.119 Kilowatts
- Energy savings projection: 4.293 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	\$7,504.15	544.27	\$3,341.83
4 Hours/day	\$5,366.25	389.21	\$2,389.76
7 Hours/day	\$9,390.94	681.12	\$4,182.07
10 Hours/day	\$13,415.6	973.03	\$5,974.39

Takotna Community Association Office Building & Lodge (“The Dorm”)



Materials Installed

- 4-lamp electronic ballast, (3) 25 watt T8 lamps
- 4-lamp electronic ballast, (4) 25 watt T8 lamps
- CFL-20 W
- CFL-27 W
- Pre-retrofit energy use:
- Post-retrofit energy use:
- Energy savings projection:
- Pre-retrofit to post retrofit energy reduction:
- Estimated annual savings:

Quantity

- 22
- 5
- 1
- 1
- 4711 watts
- 2147 watts
- 2564 watts
- 54%

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$3,205.00	232.46	\$1,427.29
7 Hours/day	\$5,608.75	406.80	\$2,497.75
10 Hours/day	\$8,012.50	581.14	\$3,568.21
2080 Hours/year (Est.)	\$6,666.40	483.51	\$2,968.75

Note: Twenty two 4-lamp fixtures de-lamped to operate three lamps each for additional savings.

Fire Hall



Materials Installed

- 4-lamp electronic ballast, (4) 32 watt T8 lamps
- Pre-retrofit energy use:
- Post-retrofit energy use:
- Energy savings projection:
- Pre-retrofit to post retrofit energy reduction:
- Estimated annual savings:

Quantity

- 8
- 1344 watts
- 960 watts
- 384 watts
- 29%

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$480.00	34.81	\$213.76
7 Hours/day	\$840.00	60.92	\$374.08
10 Hours/day	\$1,200.00	87.04	\$534.40
400 Hours/year (Est.)	\$192.00	13.93	\$85.50

Old Generator Building



Materials Installed

4-lamp electronic ballast, (4) 32 watt T8 lamps

- Pre-retrofit energy use:
- Post-retrofit energy use:
- Energy savings projection:
- Pre-retrofit to post retrofit energy reduction:
- Estimated annual savings:

Quantity

4
672 watts
480 watts
192 watts
29%

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$240.00	17.41	\$106.88
7 Hours/day	\$420.00	30.46	\$187.04
10 Hours/day	\$600.00	43.52	\$267.20
100 Hours/year (Est.)	\$24.00	1.74	\$10.69

Community Center



Materials Installed

2-lamp electronic ballast, (2) 32 watt T8 lamps

CFL-14 W

- Pre-retrofit energy use:
- Post-retrofit energy use:
- Energy savings projection:
- Pre-retrofit to post retrofit energy reduction:
- Estimated annual savings:

Quantity

1
2
284 watts
88 watts
196 watts
69%

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$245.00	17.77	\$109.11
7 Hours/day	\$428.75	31.10	\$190.94
10 Hours/day	\$612.50	44.42	\$272.77
780 Hours/year (Est.)	\$191.10	13.86	\$85.10

Tire Shop



Materials Installed

- 2-lamp electronic ballast, (2) 32 watt T8 lamps
- 8 ft fixture, 2 lamp electronic ballast, (2) 59 watt T8
- Pre-retrofit energy use: 814 watts
- Post-retrofit energy use: 596 watts
- Energy savings projection: 218 watts
- Pre-retrofit to post retrofit energy reduction: 27%
- Estimated annual savings:

Quantity

- 6
- 2
- 814 watts
- 596 watts
- 218 watts
- 27%

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$272.50	19.76	\$121.35
7 Hours/day	\$476.88	34.59	\$212.37
10 Hours/day	\$681.25	49.41	\$303.38
360 Hours/year (Est.)	\$98.10	7.12	\$43.69

Woodshop



Materials Installed

- 2-lamp electronic ballast, (2) 25 watt T8 lamps
- CFL-20 W
- Pre-retrofit energy use: 1587 watts
- Post-retrofit energy use: 848 watts
- Energy savings projection: 739 watts
- Pre-retrofit to post retrofit energy reduction: 47%
- Estimated annual savings:

Quantity

- 18
- 1
- 1587 watts
- 848 watts
- 739 watts
- 47%

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$923.75	67.00	\$411.37
7 Hours/day	\$1,616.56	117.25	\$719.91
10 Hours/day	\$2,309.38	167.50	\$1,028.44
360 Hours/year (Est.)	\$332.55	24.12	\$148.09

Takotna Tribal Council Owned Buildings



ABSN Field Manager Dan Lung helps with a lighting retrofit.

4 buildings owned by the Takotna Tribal Council received energy efficient lighting upgrades as follows:

Tribal Offices, Library, PHS Washeteria & Water Treatment Plant, Store

- Lighting upgrades completed in June 2009
- Retrofitted 65 light fixtures with electronic ballasts & T8 lamps
- Installed 13 compact fluorescent light bulbs
- Pre-retrofit energy use for all lighting: 10.13 Kilowatts
- Post-retrofit energy use for all lighting: 4.628 Kilowatts
- Energy savings projection: 5.502 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 54%
- Estimated Annual Savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
Locally Estimated	\$22,577.4	1637.53	\$10,054.4
4 Hours/day	\$6,877.50	498.82	\$3,062.76
7 Hours/day	\$12,035.6	872.94	\$5,359.84
10 Hours/day	\$17,193.7	1247.05	\$7,656.91

Takotna Tribal Offices/Clinic/Community Hall



Materials Installed

- 2-lamp electronic ballast, (2) 25 watt T8 lamps
- 3-lamp electronic ballast, (3) 25 watt T8 lamps
- 4-lamp electronic ballast, (3) 25 watt T8 lamps
- CFL-20 W
- CFL-23 W

Quantity

- Pre-retrofit energy use: 2614 watts
- Post-retrofit energy use: 1119 watts
- Energy savings projection: 1495 watts
- Pre-retrofit to post retrofit energy reduction: 57%
- Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$1,868.75	135.54	\$832.21
7 Hours/day	\$3,270.31	237.19	\$1,456.37
10 Hours/day	\$4,671.88	338.85	\$2,080.53
2080 Hours/year (Est.)	\$3,887.00	281.92	\$1,731.00

Note: Two 4-lamp fixtures reduced to 3-lamp fixtures while de-lamping ten 4-lamp fixtures to operate three lamps each for additional savings.

Library



Materials Installed

- 2-lamp electronic ballast, (2) 25 watt T8 lamps
- Pre-retrofit energy use:
- Post-retrofit energy use:
- Energy savings projection:
- Pre-retrofit to post retrofit energy reduction:
- Estimated annual savings:

Quantity

- 11
- 792 watts
- 506 watts
- 286 watts
- 36%

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$357.50	25.93	\$159.21
7 Hours/day	\$625.63	45.38	\$278.61
10 Hours/day	\$893.75	64.82	\$398.01
1040 Hours/year (Est.)	\$371.80	26.97	\$165.57

PHS Washeteria & Water Treatment Plant



Materials Installed

- 2-lamp electronic ballast, (2) 25 watt T8 lamps
- 3-lamp electronic ballast, (3) 25 watt T8 lamps
- 4-lamp electronic ballast, (3) 25 watt T8 lamps
- 4-lamp electronic ballast, (4) 25 watt T8 lamps
- CFL-14 W
- CFL-23 W
- CFL-27 W

Quantity

	7
	8
	3
	16
	2
	2
	2
• Pre-retrofit energy use:	6120 watts
• Post-retrofit energy use:	2707 watts
• Energy savings projection:	3413 watts
• Pre-retrofit to post retrofit energy reduction:	56%
• Estimated annual savings:	

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$4,266.25	309.43	\$1,899.89
7 Hours/day	\$7,465.94	541.50	\$3,324.81
10 Hours/day	\$10,665.60	773.57	\$4,749.73
4200 Hours/year (Est.)	\$17,918.20	1299.60	\$7,979.55

Note: Reduced five 4-lamp fixtures to 2-lamp fixtures and eight 4-lamp fixtures to 3-lamp fixtures while de-lamping three 4-lamp fixtures to operate three lamps each for additional savings.

Store



Materials Installed

- 2-lamp electronic ballast, (2) 25 watt T8 lamps
- CFL-20 W
- Pre-retrofit energy use:
- Post-retrofit energy use:
- Energy savings projection:
- Pre-retrofit to post retrofit energy reduction:
- Estimated annual savings:

Quantity

	6
	1
• Pre-retrofit energy use:	604 watts
• Post-retrofit energy use:	296 watts
• Energy savings projection:	308 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	\$385.00	27.92	\$171.45
7 Hours/day	\$673.75	48.87	\$300.04
10 Hours/day	\$962.50	69.81	\$428.63
1040 Hours/year (Est.)	\$400.40	29.04	\$178.31

Iditarod Area School District Owned Buildings



4 buildings and 1 teacher housing unit owned by the School received energy efficient lighting upgrades as follows
Takotna Community School:

Takotna School, Old High School, School Garage/Generator Plant, School Storage Building, Teacher Housing

- Lighting upgrades completed in
- Retrofitted 84 light fixtures with electronic ballasts & T8 lamps
- Installed 21 compact fluorescent light bulbs
- Pre-retrofit energy use for all lighting: 11.88 Kilowatts
- Post-retrofit energy use for all lighting: 4.958 Kilowatts
- Energy savings projection: 6.922 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 58%
- Estimated Annual Savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
Locally Estimated	\$20,693.8	1500.91	\$9,215.59
4 Hours/day	\$8,652.50	627.56	\$3,853.23
7 Hours/day	\$15,141.8	1098.23	\$6,743.15
10 Hours/day	\$21,631.2	1568.90	\$9,633.06

Takotna School



Materials Installed

CFL-11 W	1
2-lamp electronic ballast, (2) 25 watt T8 lamps	38
3-lamp electronic ballast, (2) 25 watt T8 lamps	12
4-lamp electronic ballast, (4) 25 watt T8 lamps	6
• Pre-retrofit energy use:	6376 watts
• Post-retrofit energy use:	2923 watts
• Energy savings projection:	3453 watts
• Pre-retrofit to post retrofit energy reduction:	54%
• Estimated annual savings:	

Quantity

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$4,316.25	313.06	\$1,922.16
7 Hours/day	\$7,553.44	547.85	\$3,363.78
10 Hours/day	\$10,790.60	782.64	\$4,805.40
3000 Hours/year (Est.)	\$12,948.70	939.17	\$5,766.48

Note: Reduced two 4-lamp fixtures to 2-lamp fixtures and eighteen 3-lamp fixtures to 2-lamp fixtures while de-lamping twelve 3-lamp fixtures to operate two-lamps each for additional savings.

Old High School



Materials Installed

2-lamp electronic ballast, (2) 25 watt T8 lamps	6
4-lamp electronic ballast, (3) 25 watt T8 lamps	13
• Pre-retrofit energy use:	2688 watts
• Post-retrofit energy use:	1251 watts
• Energy savings projection:	1437 watts
• Pre-retrofit to post retrofit energy reduction:	53%
• Estimated annual savings:	

Quantity

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$1,796.25	130.28	\$799.93
7 Hours/day	\$3,143.44	227.99	\$1,399.87
10 Hours/day	\$4,490.63	325.70	\$1,999.81
3000 Hours/year (Est.)	\$5,388.75	390.84	\$2,399.78

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

School Garage/Generator Plant



Materials Installed

CFL-20 W

- Pre-retrofit energy use:
- Post-retrofit energy use:
- Energy savings projection:
- Pre-retrofit to post retrofit energy reduction:
- Estimated annual savings:

Quantity

- 4
- 400 watts
- 80 watts
- 320 watts
- 80%

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$400.00	29.01	\$178.13
7 Hours/day	\$700.00	50.77	\$311.73
10 Hours/day	\$1,000.00	72.53	\$445.33
50 Hours/year (Est.)	\$20.00	1.45	\$8.91

School Storage Building



Materials Installed

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

- Pre-retrofit energy use:
- Post-retrofit energy use:
- Energy savings projection:
- Pre-retrofit to post retrofit energy reduction:
- Estimated annual savings:

Quantity

- 3
- 504 watts
- 138 watts
- 366 watts
- 73%

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$457.50	33.18	\$203.74
7 Hours/day	\$800.63	58.07	\$356.54
10 Hours/day	\$1,143.75	82.96	\$509.35
50 Hours/year (Est.)	\$22.88	1.66	\$10.19

Note: Three 4-lamp fixtures reduced to 2-lamp fixtures for additional savings.

Teacher Housing



Materials Installed

Quantity

- CFL-14 W 5
- CFL-20 W 11
- 2-lamp electronic ballast, (2) 25 watt T8 lamps 6
- Pre-retrofit energy use: 1912 watts
- Post-retrofit energy use: 566 watts
- Energy savings projection: 1346 watts
- Pre-retrofit to post retrofit energy reduction: 70%
- Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$1,682.50	122.03	\$749.27
7 Hours/day	\$2,944.38	213.55	\$1,311.22
10 Hours/day	\$4,206.25	305.08	\$1,873.17
1375 Hours/year (Est.)	\$2,313.44	167.79	\$1,030.25

Takotna Community Church



1 building owned by the Community Church received energy efficient lighting upgrades as follows:

Church

<u>Materials Installed</u>	<u>Quantity</u>
2-lamp electronic ballast, (2) 25 watt T8 lamps	4
4-lamp electronic ballast, (3) 25 watt T8 lamps	7

- Lighting upgrades completed in
- Retrofitted 11 light fixtures with electronic ballasts & T8 lamps
- Pre-retrofit energy use for all lighting: 1.512 Kilowatts
- Post-retrofit energy use for all lighting: 0.709 Kilowatts
- Energy savings projection: 0.803 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 53%
- Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$1,003.75	72.80	\$447.00
7 Hours/day	\$1,756.56	127.40	\$782.25
10 Hours/day	\$2,509.38	182.00	\$1,117.50
184 Hours/year (Est.)	\$184.69	13.40	\$82.25

Note: Seven 4-lamp fixtures de-lamped from to operate three lamps each for additional savings.

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

In-Kind Item	Dates	Hours Contributed	Hourly Wage	Value / Amount	Notes
Staff time for project contact, introduction & review of intro materials		4	\$ 20.00	\$ 80.00	4 entities (# of entities x 1 hour each)
Staff time for Attending telecon (Village)		1	\$ 20.00	\$ 20.00	\$15/hr is an average wage designated for village staff
Staff time for Attending telecon (CA)		2	\$ 20.00	\$ 40.00	"
Staff time for Attending telecon(School)		2	\$ 20.00	\$ 40.00	"
Maint. Staff time to accompany Field Manager on building assessments	8/25/2008	3	\$ 15.00	\$ 45.00	Nell Huffman - 1st site visit
Conservative village office administrative percentage of total project cost less ABSN Admin %. Total project cost = \$36,000/village - (our admin percentage , (around 12%) Approx: \$4,320) = \$31,680 x 5% = \$1,718 (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.	Feb, '07 through			\$1,718.00	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 FMs - 1st site visit	8/25-9-29/08	3	\$ 90.00	\$ 270.00	3 nights stay at Council Office room.
Transportation and fuel costs - 1st visit	8/26-27/2008	2	\$100.00	\$ 200.00	4-wheeler rental
Lodging for ABSN FMs - 2nd site visit	2/9-2/12/09	8	\$ 90.00	\$ 720.00	4 nights stay at Council Office room for Dan & Anna
labor for school lighting retrofits	2/9-2/12/09	45	15	\$ 675.00	IASD agreed to cover labor for Larry Flynn (maintenance worker) time on school lighting retro-fits.
Employer expense for Workman's Comp and payroll fringe	2/9-2/12/09			\$ 108.06	see TCA invoice 10304 in Fin report 4-15-09, payroll fringe and workman's comp for two workers:
Lunches for Dan and Anna	2/9-2/12/09	8	\$8	\$ 64.00	4 lunches during site visit for Dan and Anna (8 total)
Larry Flynn's time on school upgrades	2/9-2/12/09	45	\$15	\$ 675.00	
Takotna Tribal Council Fred's Wages		27	\$1.67	\$ 45.09	Fred Capsul \$1.67 Wage higher than \$15
Takotna Tribal Council Fred's Fringe		1	\$60.76	\$ 60.76	Fred Capsul Payroll Taxes & Workers Comp
Takotna Tribal Council Sylvia's Fringe		1	\$61.76	\$ 61.76	Sylvia Rodriguez Payroll Taxes & Workers Comp
Takotna Tribal Council Office Support		4	\$18.00	\$ 72.00	
PCB ballast backhaul w/Tanana Air	7/17/2009			\$ 46.48	83 lbs from Takotna to McGrath. - Kathy
Bulb Eater - Recycling of Materials				\$ 569.38	277 (Quantity) Unit Price 1.14, 1 transport fee \$85 Ballasts Quantity 843 Unit Price .2
	TOTAL			\$5,510.53	

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 Takotna to deliver 15% more energy savings measures beyond the original grant funding.