

Village End Use Energy Efficiency Measures Program
AEA Grant # 2195234 Administered by Alaska Building Science Network

Kipnuk Final Report



Community Summary

17 community buildings and 6 teacher-housing units received energy efficiency upgrades as follows:

Kanganak Building, Brown Shop, Bunkhouse, Food Warehouse, Light Plant, VPSO (Old Clinic), Water Plant, Kugkaktlik Limited Offices, Grocery Store, Hardware Store, Storage Building, School Smurf Houses 1 & 2, Teacher Housing & Site Admin, Teacher Housing East, Teacher Housing Middle, Teacher Housing West, 8th Grade Classroom, Old Building Shop, School Light Plant, Moravian Church, Mission House, Sunday School

Retrofits Completed: Primary lighting retrofits completed in January, 2009

Village-Wide Lighting Retrofit Summary:

- Retrofitted 295 light fixtures with electronic ballasts & T8 lamps
- Installed 121 compact fluorescent light bulbs
- Pre-retrofit energy use for all lighting: 43.99 Kilowatts
- Post-retrofit energy use for all lighting: 18.41 Kilowatts
- Energy savings projection: 25.58 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 58%

• Estimated Annual Savings:

kWh Rate (FY 2009 AVE): \$0.65

Fuel Cost (FY 2009 Ave): \$4.74

	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
Hours Per Day/ 250			
Days Per Year			
Locally Estimated Use	\$29,200	3941	\$18,683
4 Hours/day	\$16,697	2253	\$10,683
7 Hours/day	\$29,220	3944	\$18,696
10 Hours/day	\$41,743	5634	\$26,708

- Total project cost for all measures: \$46,000
- Simple Payback (lighting measures only, using 7 hours/day lighting use run-time): 1.57 years
- Total village wide in-kind contribution: \$ 5,908 (expanded grant capacity by 13%)

Kipnuk Village Council Owned Buildings



7 buildings owned by the Kipnuk Village Council received energy efficient lighting upgrades as follows:

Kanganak Building, Brown Shop, Bunkhouse, Food Warehouse, Light Plant, VPSO (Old Clinic), Water Plant

- Lighting upgrades completed in: January 2009
- Retrofitted 213 light fixtures with electronic ballasts & T8 lamps
- Installed 13 compact fluorescent light bulbs
- Pre-retrofit energy use for all lighting: 28.391 Kilowatts
- Post-retrofit energy use for all lighting: 13.142 Kilowatts
- Energy savings projection: 15.249 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	\$18,498.20	2497.01	\$11,835.80
4 Hours/day	\$9,953.02	1343.52	\$6,368.30
7 Hours/day	\$17,417.70	2351.17	\$11,144.50
10 Hours/day	\$24,882.50	3358.81	\$15,920.70

Kanganak Building



Materials Installed

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

Quantity

- Pre-retrofit energy use: 20553 watts
- Post-retrofit energy use: 8866 watts
- Energy savings projection: 11687 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	\$7,628.10	1029.69	\$4,880.74
7 Hours/day	\$13,349.10	1801.96	\$8,541.29
10 Hours/day	\$19,070.20	2574.23	\$12,201.80
2000 Hours/year (Est.)	\$15,256.20	2059.38	\$9,761.48

Note: Reduced 86 4-lamp fixtures to 3-lamp fixtures and 19 4-lamp fixtures to 2-lamp fixtures.

Brown Shop



Materials Installed

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

Quantity

- Pre-retrofit energy use: 744 watts
- Post-retrofit energy use: 414 watts
- Energy savings projection: 330 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	\$215.39	29.07	\$137.81
7 Hours/day	\$376.93	50.88	\$241.18
10 Hours/day	\$538.48	72.69	\$344.54
1200 Hours/year (Est.)	\$258.47	34.89	\$165.38

Bunkhouse



Materials Installed

2-lamp electronic ballast, (2) 25 watt T8 lamps	Quantity	13
3-lamp electronic ballast, (2) 25 watt T8 lamps		1
3-lamp electronic ballast, (3) 25 watt T8 lamps		2
• Pre-retrofit energy use:		1932 watts
• Post-retrofit energy use:		798 watts
• Energy savings projection:		1134 watts
• Pre-retrofit to post retrofit energy reduction:		59%
• Estimated annual savings:		

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$740.16	99.91	\$473.58
7 Hours/day	\$1,295.28	174.85	\$828.77
10 Hours/day	\$1,850.40	249.78	\$1,183.96
1375 Hours/year (Est.)	\$1,017.72	137.38	\$651.18

Note: Reduced two, 4-lamp fixtures to 3-lamp fixtures, and reduced five, 4-lamp fixtures to 2-lamp fixtures.

Food Warehouse Building

Materials Installed

2-lamp electronic ballast, (2) 25 watt T8 lamps	Quantity	10
CFL-27 W		8
• Pre-retrofit energy use:		1640 watts
• Post-retrofit energy use:		676 watts
• Energy savings projection:		964 watts
• Pre-retrofit to post retrofit energy reduction:		59%

- Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$629.20	84.93	\$402.59
7 Hours/day	\$1,101.10	148.63	\$704.53
10 Hours/day	\$1,573.01	212.33	\$1,006.47
1000 Hours/year (Est.)	\$629.20	84.93	\$402.59

Light Plant



Materials Installed

Quantity

- 2-lamp electronic ballast, (2) 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:

18
1512 watts
1080 watts
432 watts
29%

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$281.97	38.06	\$180.41
7 Hours/day	\$493.44	66.61	\$315.72
10 Hours/day	\$704.92	95.15	\$451.03
2000 Hours/year (Est.)	\$563.93	76.12	\$360.82

VPSO (Old Clinic)



Materials Installed

Quantity

- 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:

6
2
582 watts
316 watts
266 watts
46%

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$173.62	23.44	\$111.09
7 Hours/day	\$303.83	41.01	\$194.40
10 Hours/day	\$434.05	58.59	\$277.72
1500 Hours/year (Est.)	\$260.43	35.15	\$166.63

Water Plant



Materials Installed

Quantity

2-lamp electronic ballast, (2) 25 watt T8 lamps	2
2-lamp electronic ballast, (2) 32 watt T8 lamps	15
• Pre-retrofit energy use:	1428 watts
• Post-retrofit energy use:	992 watts
• Energy savings projection:	436 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	\$284.58	38.41	\$182.08
7 Hours/day	\$498.01	67.22	\$318.64
10 Hours/day	\$711.44	96.04	\$455.21
1800 Hours/year (Est.)	\$512.24	69.15	\$327.75

Kugkaktlik Limited Owned Buildings



4 buildings owned by the Kugkaktlik Limited received energy efficient lighting upgrades as follows:

Kugkaktlik Limited Offices, Grocery Store, Hardware Store, Storage Building

- Lighting upgrades completed in January, 2009
- Retrofitted 37 light fixtures with electronic ballasts & T8 lamps
- Installed 1 compact fluorescent light bulbs
- Pre-retrofit energy use for all lighting: 3.208 Kilowatts
- Post-retrofit energy use for all lighting: 1.289 Kilowatts
- Energy savings projection: 1.919 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 60%

- Estimated Annual Savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
Locally Estimated	\$3,156.37	426.07	\$2,019.56
4 Hours/day	\$1,252.53	169.07	\$801.41
7 Hours/day	\$2,191.93	295.88	\$1,402.48
10 Hours/day	\$3,131.33	422.69	\$2,003.54

Kugaktlik Limited Offices

Materials Installed

Quantity

2-lamp electronic ballast, (1) 25 watt T8 lamp	10
• Pre-retrofit energy use:	840 watts
• Post-retrofit energy use:	260 watts
• Energy savings projection:	580 watts
• Pre-retrofit to post retrofit energy reduction:	69%

• Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$378.57	51.10	\$242.22
7 Hours/day	\$662.49	89.43	\$423.89
10 Hours/day	\$946.42	127.75	\$605.55
1920 Hours/year (Est.)	\$726.85	98.11	\$465.06

Note: Reduced ten 2-lamp fixtures to 1-lamp fixtures.

Grocery Store



Materials Installed

Quantity

2-lamp electronic ballast, (2) 25 watt T8 lamps	13
• Pre-retrofit energy use:	1092 watts
• Post-retrofit energy use:	598 watts
• Energy savings projection:	494 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	\$322.43	43.52	\$206.30
7 Hours/day	\$564.26	76.17	\$361.03
10 Hours/day	\$806.08	108.81	\$515.76
3480 Hours/year (Est.)	\$1,122.07	151.46	\$717.94

Hardware Store



Materials Installed

Quantity

- 2-lamp electronic ballast, (1) 25 watt T8 lamp 12
- Pre-retrofit energy use: 1008 watts
- Post-retrofit energy use: 312 watts
- Energy savings projection: 696 watts
- Pre-retrofit to post retrofit energy reduction: 69%
- Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$454.28	61.32	\$290.66
7 Hours/day	\$794.99	107.31	\$508.66
10 Hours/day	\$1,135.70	153.30	\$726.66
2664 Hours/year (Est.)	\$1,210.20	163.36	\$774.33

Storage Building



Materials Installed

Quantity

- 2-lamp electronic ballast, (2) 25 watt T8 lamps 2
- CFL-27 W 1
- Pre-retrofit energy use: 268 watts
- Post-retrofit energy use: 119 watts
- Energy savings projection: 149 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	\$97.25	13.13	\$62.23
7 Hours/day	\$170.19	22.97	\$108.89
10 Hours/day	\$243.13	32.82	\$155.56
1000 Hours/year (Est.)	\$97.25	13.13	\$62.23

Lower Kuskokwim School District Owned Buildings



Above Photos taken by the Kipnuk School Photography Club

3 buildings and 6 teacher housing units owned by Lower Kuskokwim School District received energy efficient lighting upgrades as follows:

Chief Paul Memorial School School Smurf Houses 1 & 2, Teacher Housing & Site Admin, Teacher Housing East, Teacher Housing Middle, Teacher Housing West, 8th Grade Classroom, Old Building Shop, School Light Plant,

- Lighting upgrades completed in: January 2009
- Retrofitted 32 light fixtures with electronic ballasts & T8 lamps
- Installed 89 compact fluorescent light bulbs
- Pre-retrofit energy use for all lighting: 9.854 Kilowatts
- Post-retrofit energy use for all lighting: 2.958 Kilowatts
- Energy savings projection: 6.896 Kilowatts
- 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
Locally Estimated	\$6,590.85	889.68	\$4,217.07
4 Hours/day	\$4,501.02	607.58	\$2,879.92
7 Hours/day	\$7,876.78	1063.26	\$5,039.85
10 Hours/day	\$11,252.50	1518.94	\$7,199.79

School Smurf Houses 1 & 2



Materials Installed

Quantity

2-lamp electronic ballast, (1) 32 watt T8 lamp	4
2-lamp electronic ballast, (2) 25 watt T8 lamps	5
CFL-11 W	5
CFL-14 W	1
CFL-20 W	3
CFL-23 W	5
CFL-27 W	1
2-lamp electronic ballast, (1) 32 watt T8 lamp	4
2-lamp electronic ballast, (2) 25 watt T8 lamps	5
• Pre-retrofit energy use:	1719 watts
• Post-retrofit energy use:	633 watts
• Energy savings projection:	1086 watts
• 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
4 Hours/day	\$708.83	95.68	\$453.54
7 Hours/day	\$1,240.46	167.44	\$793.69
10 Hours/day	\$1,772.08	239.21	\$1,133.84
1375 Hours/year (Est.)	\$974.64	131.56	\$623.61

Teacher Housing Site Admin Building

Materials Installed

Quantity

2-lamp electronic ballast, (2) 25 watt T8 lamps	2
CFL-11 W	5
CFL-14 W	26
• Pre-retrofit energy use:	2893 watts
• Post-retrofit energy use:	511 watts
• Energy savings projection:	2382 watts
• Pre-retrofit to post retrofit energy reduction:	82%
• Estimated annual savings:	

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$1,554.73	209.87	\$994.77
7 Hours/day	\$2,720.78	367.27	\$1,740.85
10 Hours/day	\$3,886.83	524.67	\$2,486.93
2000 Hours/year (Est.)	\$3,109.46	419.74	\$1,989.55

Teacher Housing East



Materials Installed

Quantity

2-lamp electronic ballast, (1) 32 watt T8 lamp	3
CFL-14 W	6
CFL-20 W	7
CFL-23 W	1
• Pre-retrofit energy use:	1198 watts
• Post-retrofit energy use:	346 watts
• Energy savings projection:	852 watts
• Pre-retrofit to post retrofit energy reduction:	71%

• Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$556.10	75.07	\$355.81
7 Hours/day	\$973.18	131.37	\$622.67
10 Hours/day	\$1,390.25	187.67	\$889.53
1375 Hours/year (Est.)	\$764.64	103.22	\$489.24

Teacher Housing Middle

Materials Installed

Quantity

2-lamp electronic ballast, (1) 32 watt T8 lamp	1
CFL-14 W	8
CFL-20 W	1
CFL-23 W	3
CFL-27 W	1
• Pre-retrofit energy use:	1041 watts
• Post-retrofit energy use:	261 watts
• Energy savings projection:	780 watts
• Pre-retrofit to post retrofit energy reduction:	75%

• Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$509.11	68.72	\$325.74
7 Hours/day	\$890.94	120.26	\$570.05
10 Hours/day	\$1,272.77	171.81	\$814.36
1375 Hours/year (Est.)	\$700.02	94.49	\$447.90

Teacher Housing West



Materials Installed

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

- Pre-retrofit energy use: 327 watts
- Post-retrofit energy use: 158 watts
- Energy savings projection: 169 watts
- Pre-retrofit to post retrofit energy reduction: 52%
- Estimated annual savings:

Quantity

3

1

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$110.31	14.89	\$70.58
7 Hours/day	\$193.04	26.06	\$123.51
10 Hours/day	\$275.77	37.22	\$176.44
1375 Hours/year (Est.)	\$151.67	20.47	\$97.04

8th Grade Classroom



Above Photos taken by the Kipnuk School Photography Club

Materials Installed

CFL-27 W

- Pre-retrofit energy use: 300 watts
- Post-retrofit energy use: 81 watts
- Energy savings projection: 219 watts
- Pre-retrofit to post retrofit energy reduction: 73%
- Estimated annual savings:

Quantity

3

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$142.94	19.30	\$91.46
7 Hours/day	\$250.15	33.77	\$160.05
10 Hours/day	\$357.35	48.24	\$228.65
1800 Hours/year (Est.)	\$257.29	34.73	\$164.63

Old Building Shop



Above Photos taken by the Kipnuk School Photography Club

Materials Installed

Quantity

- 2-lamp electronic ballast, (2) 25 watt T8 lamps 14
- Pre-retrofit energy use: 1176 watts
- Post-retrofit energy use: 644 watts
- Energy savings projection: 532 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	\$347.24	46.87	\$222.17
7 Hours/day	\$607.66	82.03	\$388.81
10 Hours/day	\$868.09	117.18	\$555.44
1000 Hours/year (Est.)	\$347.24	46.87	\$222.17

School Light Plant

Materials Installed

Quantity

- CFL-27 W 12
- Pre-retrofit energy use: 1200 watts
- Post-retrofit energy use: 324 watts
- Energy savings projection: 876 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	\$571.77	77.18	\$365.84
7 Hours/day	\$1,000.59	135.07	\$640.21
10 Hours/day	\$1,429.41	192.95	\$914.59
500 Hours/year (Est.)	\$285.88	38.59	\$182.92

Moravian Church Owned Buildings



3 buildings owned by the Moravian Church received energy efficient lighting upgrades as follows:

Moravian Church, Mission House, Sunday School

- Lighting upgrades completed in January, 2009
- Retrofitted 13 light fixtures with electronic ballasts & t8 lamps
- Installed 18 compact fluorescent light bulbs
- Pre-retrofit energy use for all lighting: 2.542 Kilowatts
- Post-retrofit energy use for all lighting: 1.024 Kilowatts
- Energy savings projection: 1.518 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 60%
- Estimated Annual Savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
Locally Estimated	\$955.14	128.93	\$611.14
4 Hours/day	\$990.80	133.74	\$633.95
7 Hours/day	\$1,733.90	234.05	\$1,109.41
10 Hours/day	\$2,477.00	334.36	\$1,584.87

Moravian Church



Materials Installed

Quantity

2-lamp electronic ballast, (2) 25 watt T8 lamps	10
CFL-20 W	3
CFL-23 W	1
• Pre-retrofit energy use:	1240 watts
• Post-retrofit energy use:	543 watts
• Energy savings projection:	697 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	\$454.93	61.41	\$291.08
7 Hours/day	\$796.13	107.47	\$509.39
10 Hours/day	\$1,137.33	153.52	\$727.70
800 Hours/year (Est.)	\$363.95	49.13	\$232.87

Mission House



Materials Installed

Quantity

2-lamp electronic ballast, (2) 25 watt T8 lamps	2
CFL-20 W	3
CFL-27 W	4
• Pre-retrofit energy use:	693 watts
• Post-retrofit energy use:	260 watts
• Energy savings projection:	433 watts
• Pre-retrofit to post retrofit energy reduction:	62%
• Estimated annual savings:	

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$282.62	38.15	\$180.83
7 Hours/day	\$494.58	66.76	\$316.45
10 Hours/day	\$706.55	95.37	\$452.07
1375 Hours/year (Est.)	\$388.60	52.46	\$248.64

Sunday School Building



Materials Installed

Quantity

- 2-lamp electronic ballast, (2) 25 watt T8 lamps 1
- CFL-20 W 2
- CFL-27 W 5
- Pre-retrofit energy use: 609 watts
- Post-retrofit energy use: 221 watts
- Energy savings projection: 388 watts
- Pre-retrofit to post retrofit energy reduction: 64%

- Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
4 Hours/day	\$253.25	34.19	\$162.04
7 Hours/day	\$443.18	59.82	\$283.56
10 Hours/day	\$633.12	85.46	\$405.09
800 Hours/year (Est.)	\$202.60	27.35	\$129.63