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

Hours Per Day/ 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
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

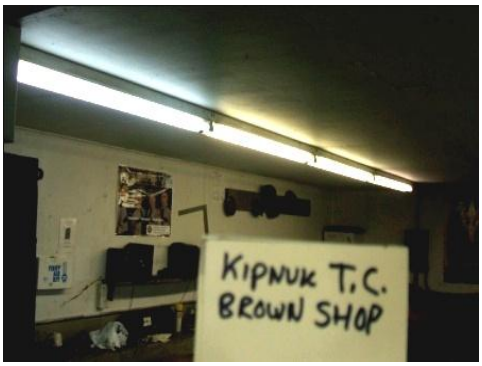
Materials Installed	**Quantity**
2-lamp electronic ballast, (2) 25 watt T8 lamps	35
3-lamp electronic ballast, (2) 25 watt T8 lamps	16
3-lamp electronic ballast, (3) 25 watt T8 lamps	86
CFL-20 W	3

- 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	**Quantity**
2-lamp electronic ballast, (2) 25 watt T8 lamps	9

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

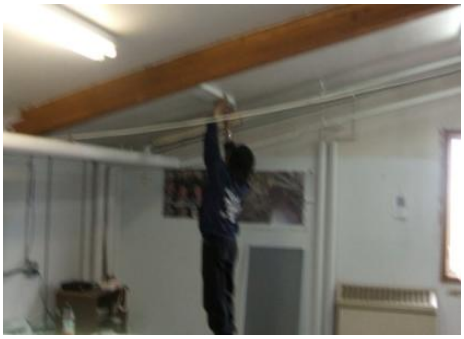
Materials Installed **Quantity**

2-lamp electronic ballast, (2) 32 watt T8 lamps	18
• Pre-retrofit energy use:	1512 watts
• Post-retrofit energy use:	1080 watts
• Energy savings projection:	432 watts
• Pre-retrofit to post retrofit energy reduction:	29%

• Estimated annual savings:

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	6
CFL-20 W	2
• Pre-retrofit energy use:	582 watts
• Post-retrofit energy use:	316 watts
• Energy savings projection:	266 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	$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

Kugkaktlik 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

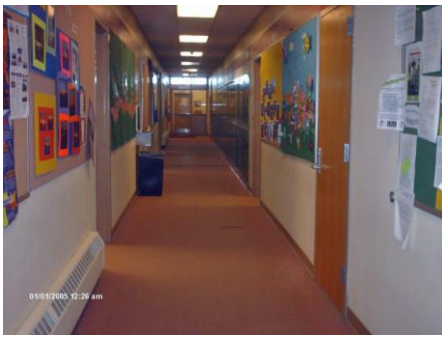
Materials Installed **Quantity**

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	Quantity
2-lamp electronic ballast, (2) 25 watt T8 lamps	3
CFL-20 W	1
• 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:

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	Quantity
CFL-27 W	3
• 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:

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
- Retrofitted13 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