Village End Use Energy Efficiency Measures Program

AEA Grant # 2195234 Administered by Alaska Building Science Network

Toksook Bay Final Report

Community Summary

11 community buildings and 8 teacher housing units received energy efficiency upgrades as follows:

City Office Building, City Bingo / Community Hall, Head Start, PHS Pump House, Public Safety Building, New IRA Office Building / Bingo Hall, Old IRA Office, Washeteria, Store, Main School Building, School Gym

Retrofits Completed: December 2007

Village-Wide Lighting Retrofit Summary:

- Retrofitted 281 light fixtures with electronic ballasts & T8 lamps
- Installed 152 compact fluorescent light bulbs
- Installed 18 T5 linear fluorescent fixtures
- Pre-retrofit energy use for all lighting: 43.947 Kilowatts
- Post-retrofit energy use for all lighting: 22.447 Kilowatts
- Energy savings projection: 21.500 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 49%
- Estimated Annual Savings:

kWh Rate (as of): $0.58 Fuel Cost (FY 2007 Ave): $1.92

Hours Per Day/ 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
Locally Estimated	$19,611.40	1863.17	$3,577.28
4 Hours/day	$12,373.20	1175.51	$2,256.97
7 Hours/day	**$21,653.10**	2057.14	$3,949.70
10 Hours/day	$30,933.10	2938.76	$5,642.43

- Total project cost for all measures: $ 37,775
- Simple Payback (lighting measures only, using 7 hours/day lighting use run-time): 1.74 years
- Total village wide in-kind contribution: $ 8,694 (extended grant capacity by 23%)

Additional Energy Efficiency Measures:

- 2 local maintenance staff attended ABSN's 2-day Boiler Training Course in Bethel, AK
- 10 programmable thermostats were installed in various city, tribal, corporation and school district owned offices and teacher housing units.
- 4 occupancy sensor light switches installed in City and Tribal offices buildings.

City of Toksook Bay Owned Buildings

Hallways, where high light levels are not necessary always get 25w T8 retrofits.

5 buildings owned by the City of Toksook Bay received energy efficient lighting upgrades as follows:

City Office Building, City Bingo / Community Hall, Head Start, PHS Pump House, Public Safety Building.

- Lighting upgrades completed in December 2007
- Retrofitted 109 light fixtures with electronic ballasts & T8 lamps
- Installed 22 compact fluorescent light bulbs
- Pre-retrofit energy use for all lighting: 11.775 Kilowatts
- Post-retrofit energy use for all lighting: 6.819 Kilowatts
- Energy savings projection: 4.956 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 42%

- Estimated Annual Savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
Locally Estimated	$4,490.22	426.59	$819.05
4 Hours/day	$2,852.18	270.97	$520.26
7 Hours/day	$4,991.31	474.19	$910.45
10 Hours/day	$7,130.45	677.42	$1,300.65

Additional Energy Efficiency Measures:

- 1 programmable thermostat was installed in the City Office Building.
- 2 occupancy sensor light switches were installed in City office bathrooms.

Notes: For programmable thermostats and occupancy sensor wall switches in community buildings we work with local maintenance staff. Our goal is to generally set thermostats to a night time and weekend set-back of 62 - 64 degrees and a daytime temp of 68-70 degrees. Programmable thermostats used and maintained as programmed are known to achieve an overall fuel savings of between 5 and 15% over non-programmed thermostats. Occupancy sensor light switches when properly installed and programmed are known to save 30% - 40% of the energy used by the lighting they control.

City Office Building

Materials Installed	Quantity
1-lamp electronic ballast, (1) 25 watt T8 lamp	8
2-lamp electronic ballast, (2) 25 watt T8 lamps	24
3-lamp electronic ballast, (3) 25 watt T8 lamps	8
CFL-27 W	2

- Pre-retrofit energy use: 3652 watts
- Post-retrofit energy use: 1982 watts
- Energy savings projection: 1670 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
2000 Hours/year (Est.)	$1,922.17	182.61	$350.62
4 Hours/day	$961.09	91.31	$175.31
7 Hours/day	$1,681.90	159.79	$306.79
10 Hours/day	$2,402.71	228.27	$438.27

Notes: Eight 4-lamp fixtures de-lamped to three 25 watt T-8 lamps for additional savings.

City Office – Programmable Thermostats and occupancy sensor light switch

New occupancy sensor light switches were installed in City Office bathrooms.

A city maintenance worker programs a new set-back thermostat.

City Community & Bingo Hall

Materials Installed	**Quantity**	
2-lamp electronic ballast, (2) 25 watt T8 lamps	18	
CFL-23 W	2	
CFL-27 W	1	
• Pre-retrofit energy use:	1260	watts
• Post-retrofit energy use:	919	watts
• Energy savings projection:	341	watts
• Pre-retrofit to post retrofit energy reduction:	27%	

• Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
2000 Hours/year (Est.)	$392.49	37.29	$71.59
4 Hours/day	$196.25	18.64	$35.80
7 Hours/day	$343.43	32.63	$62.64
10 Hours/day	$490.61	46.61	$89.49

Head Start

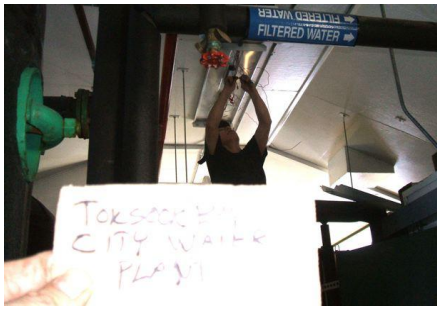
Lighting retrofits save energy while improving light levels in classrooms for a better learning environment.

Materials Installed	**Quantity**	
2-lamp electronic ballast, (2) 25 watt T8 lamps	9	
CFL-14 W	10	
CFL-27 W	3	
• Pre-retrofit energy use:	1433	watts
• Post-retrofit energy use:	644	watts
• Energy savings projection:	789	watts
• Pre-retrofit to post retrofit energy reduction:	55%	

• Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
1200 Hours/year (Est.)	$544.88	51.77	$99.39
4 Hours/day	$454.07	43.14	$82.83
7 Hours/day	$794.62	75.49	$144.94
10 Hours/day	$1,135.17	107.85	$207.06

PHS Pump House



Materials Installed	Quantity
2-lamp electronic ballast, (2) 25 watt T8 lamps	1
4-lamp electronic ballast, (4) 25 watt T8 lamps	13
CFL-23 W	2

- Pre-retrofit energy use: 2064 watts
- Post-retrofit energy use: 1263 watts
- Energy savings projection: 801 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
1000 Hours/year (Est.)	$460.98	43.79	$84.09
4 Hours/day	$460.98	43.79	$84.09
7 Hours/day	$806.71	76.64	$147.15
10 Hours/day	$1,152.44	109.49	$210.21

Public Safety Building

Materials Installed	Quantity
2-lamp electronic ballast, (2) 25 watt T8 lamps	15
3 Ft, 2-lamp electronic ballast, (2) 25w T8 Lamps	1
4-lamp fixture 3-lamp ballast (3) 25 watt T8 lamps	5
8 ft fixture, 2 lamp electronic ballast, (2) 59 watt T8	7
CFL-27 W	2

- Pre-retrofit energy use: 3366 watts
- Post-retrofit energy use: 2011 watts
- Energy savings projection: 1355 watts
- Pre-retrofit to post retrofit energy reduction: 40%
- Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
1500 Hours/year (Est.)	$1,169.70	111.13	$213.36
4 Hours/day	$779.80	74.08	$142.24
7 Hours/day	$1,364.65	129.65	$248.92
10 Hours/day	$1,949.51	185.21	$355.60

Nunakauyak Traditional Council Owned Buildings

3 buildings owned by the Nunakauyak Traditional Council received energy efficient lighting upgrades as follows:

New IRA Office Building / Bingo Hall, Old IRA Office, Washeteria

- Lighting upgrades completed in December 2007
- Retrofitted 67 light fixtures with electronic ballasts & T8 lamps
- Installed 10 compact fluorescent light bulbs
- Pre-retrofit energy use for all lighting: 7.674 Kilowatts
- Post-retrofit energy use for all lighting: 4.243 Kilowatts
- Energy savings projection: 3.431 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	$3,046.12	289.39	$555.63
4 Hours/day	$1,974.54	187.59	$360.17
7 Hours/day	$3,455.45	328.28	$630.30
10 Hours/day	$4,936.35	468.97	$900.43

Additional Energy Efficiency Measures:

- 3 programmable thermostats were installed in the new tribal office and bingo hall building.
- 2 occupancy sensor light switches installed in the new tribal office and bingo hall building.

Notes: For programmable thermostats in community buildings we work with local maintenance staff. Our goal is to set thermostats to a night time and weekend set-back of 62 - 64 degrees and a daytime temp of 68-70 degrees. Programmable thermostats used and maintained as programmed are known to achieve an overall fuel savings of between 5 and 10% over non-programmed thermostats. Occupancy sensor light switches when properly installed and programmed are known to save 30% - 40% of the energy used by the lighting they control.

IRA Bingo Hall (Is located in the New IRA Office Building Complex)

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

- Pre-retrofit energy use: 1944 watts
- Post-retrofit energy use: 1184 watts
- Energy savings projection: 760 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
1500 Hours/year (Est.)	$656.07	62.33	$119.67
4 Hours/day	$437.38	41.55	$79.78
7 Hours/day	$765.42	72.72	$139.62
10 Hours/day	$1,093.45	103.88	$199.45

Notes: Three 4-lamp fixtures de-lamped to three 25 watt T-8 lamps for additional savings.

New IRA Office Building

Materials Installed	Quantity
2-lamp electronic ballast, (2) 25 watt T8 lamps	13
4-lamp electronic ballast, (3) 25 watt T8 lamps	2
4-lamp fixture 3-lamp ballast (3) 25 watt T8 lamps	5

- Pre-retrofit energy use: 2004 watts
- Post-retrofit energy use: 1131 watts
- Energy savings projection: 873 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
2000 Hours/year (Est.)	$1,004.82	95.46	$183.29
4 Hours/day	$502.41	47.73	$91.64
7 Hours/day	$879.22	83.53	$160.38
10 Hours/day	$1,256.03	119.33	$229.11

Notes: Five 4-lamp fixtures reduced to 3-lamp fixtures and two 4-lamp fixtures de-lamped to three 25 watt T-8 lamps for additional savings.

Old IRA Office

ABSN Field Manager Harry Morgan inspects a light fixture for PCB ballasts – pre-retrofit.

Materials Installed	**Quantity**
2-lamp electronic ballast, (2) 25 watt T8 lamps	12
4-lamp fixture 3-lamp ballast (3) 25 watt T8 lamps	4
• Pre-retrofit energy use:	1440 watts
• Post-retrofit energy use:	860 watts
• Energy savings projection:	580 watts
• Pre-retrofit to post retrofit energy reduction:	40%
• Estimated annual savings:	

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
1000 Hours/year (Est.)	$333.79	31.71	$60.89
4 Hours/day	$333.79	31.71	$60.89
7 Hours/day	$584.13	55.49	$106.55
10 Hours/day	$834.48	79.28	$152.21

Notes: Four 4-lamp fixtures de-lamped to three 25 watt T-8 lamps for additional savings.

Washeteria

Materials Installed	**Quantity**
2-lamp electronic ballast, (2) 25 watt T8 lamps	4
4-lamp fixture 3-lamp ballast (3) 25 watt T8 lamps	10
CFL-14 W	10
• Pre-retrofit energy use:	2286 watts
• Post-retrofit energy use:	1068 watts
• Energy savings projection:	1218 watts
• 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
1500 Hours/year (Est.)	$1,051.44	99.89	$191.79
4 Hours/day	$700.96	66.59	$127.86
7 Hours/day	$1,226.68	116.54	$223.76
10 Hours/day	$1,752.40	166.48	$319.65

Notes: Ten 4-lamp fixtures de-lamped to three 25 watt T-8 lamps for additional savings.

Nunakauiak Yupik Corporation Owned Buildings



The store and 1 teacher housing unit owned by the Nunakauiak Yupik Corporation received energy efficient lighting upgrades as follows:

Store, LKSD Leased Teacher Housing Teacher Housing building

- Lighting upgrades completed in December 2007
- Retrofitted 47 light fixtures with electronic ballasts & T8 lamps
- Installed 17 compact fluorescent light bulbs
- Pre-retrofit energy use for all lighting: 4.744 Kilowatts
- Post-retrofit energy use for all lighting: 2.591 Kilowatts
- Energy savings projection: 2.153 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	$1,858.58	176.57	$339.02
4 Hours/day	$1,239.05	117.71	$226.01
7 Hours/day	$2,168.34	206.00	$395.52
10 Hours/day	$3,097.63	294.29	$565.03

Additional Energy Efficiency Measures:

- 1 programmable thermostat was installed in the village corporation store office.

Notes: For programmable thermostats in community buildings we work with local maintenance staff. Our goal is to set thermostats to a night time and weekend set-back of 62 - 64 degrees and a daytime temp of 68-70 degrees. Programmable thermostats used and maintained as programmed are known to achieve an overall fuel savings of between 5 and 10% over non-programmed thermostats.

NYC Store

Lighting retrofits save energy and make for brighter retail spaces.

Materials Installed	**Quantity**
2-lamp electronic ballast, (2) 25 watt T8 lamps	44
4-lamp electronic ballast, (3) 25 watt T8 lamps	2
CFL-14 W	3
CFL-27 W	1
• Pre-retrofit energy use:	3750 watts
• Post-retrofit energy use:	2287 watts
• Energy savings projection:	1463 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
1500 Hours/year (Est.)	$1,262.93	119.98	$230.37
4 Hours/day	$841.96	79.99	$153.58
7 Hours/day	$1,473.42	139.98	$268.76
10 Hours/day	$2,104.89	199.97	$383.95

LKSD Leased Teacher Housing

Materials Installed	**Quantity**
2-lamp electronic ballast, (2) 25 watt T8 lamps	1
CFL-14 W	4
CFL-20 W	6
CFL-27 W	3
• Pre-retrofit energy use:	994 watts
• Post-retrofit energy use:	304 watts
• Energy savings projection:	690 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
1500 Hours/year (Est.)	$595.64	56.59	$108.65
4 Hours/day	$397.10	37.73	$72.43
7 Hours/day	$694.92	66.02	$126.76
10 Hours/day	$992.74	94.31	$181.08

Lower Kuskokwim School District Owned Buildings



1 building and 7 teacher housing units owned by the Lower Kuskokwim School District received energy efficient lighting upgrades as follows:

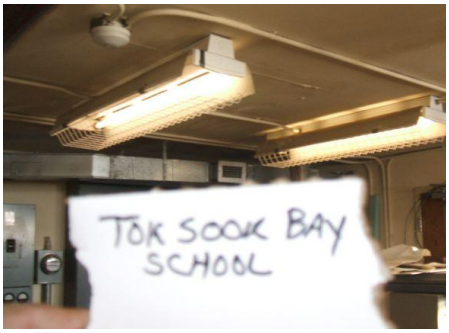
Nelson Island Area School Main School Building, LKSD Housing 0007, LKSD Housing 0008, LKSD Housing 0009, LKSD Housing 0010, LKSD Housing 0011, LKSD Housing 0016, Teacher Housing Leased by NYC

- Lighting upgrades completed in December 2007
- Retrofitted 58 light fixtures with electronic ballasts & T8 lamps
- Installed 103 compact fluorescent light bulbs
- Installed 18 T5 linear fluorescent fixtures
- Pre-retrofit energy use for all lighting: 19.754 Kilowatts
- Post-retrofit energy use for all lighting: 8.794 Kilowatts
- Energy savings projection: 10.96 Kilowatts
- Pre-retrofit to post retrofit energy reduction: 55%

- Estimated Annual Savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
Locally Estimated	$10,216.5	970.61	$1,863.58
4 Hours/day	$6,307.48	599.23	$1,150.53
7 Hours/day	$11,038.0	1048.66	$2,013.43
10 Hours/day	$15,768.7	1498.09	$2,876.33

Main School Building



Lighting retrofits brighten the school for a better learning environment.

Materials Installed	**Quantity**
2-lamp electronic ballast, (2) 25 watt T8 lamps	50
CFL-20 W	4
• Pre-retrofit energy use:	4000 watts
• Post-retrofit energy use:	2430 watts
• Energy savings projection:	1570 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
1800 Hours/year (Est.)	$1,626.36	154.51	$296.66
4 Hours/day	$903.54	85.84	$164.81
7 Hours/day	$1,581.19	150.22	$288.42
10 Hours/day	$2,258.84	214.60	$412.03

LKSD Housing 0007

Materials Installed	Quantity
2-lamp electronic ballast, (2) 25 watt T8 lamps	1
CFL-14 W	9
CFL-20 W	9
CFL-27 W	1

- Pre-retrofit energy use: 1692 watts
- Post-retrofit energy use: 380 watts
- Energy savings projection: 1312 watts
- Pre-retrofit to post retrofit energy reduction: 78%
- Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
1500 Hours/year (Est.)	$1,132.58	107.60	$206.59
4 Hours/day	$755.06	71.73	$137.73
7 Hours/day	$1,321.35	125.53	$241.02
10 Hours/day	$1,887.64	179.33	$344.32

LKSD Housing 0008

Materials Installed	Quantity
4-lamp electronic ballast, (3) 25 watt T8 lamps	1
CFL-20 W	4
CFL-27 W	7

- Pre-retrofit energy use: 1144 watts
- Post-retrofit energy use: 344 watts
- Energy savings projection: 800 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
1500 Hours/year (Est.)	$690.60	65.61	$125.97
4 Hours/day	$460.40	43.74	$83.98
7 Hours/day	$805.70	76.54	$146.97
10 Hours/day	$1,151.00	109.35	$209.95

Notes: One 4-lamp fixture de-lamped to three 25 watt T-8 lamps for additional savings.

LKSD Housing 0009

Materials Installed	Quantity
4-lamp fixture 3-lamp ballast (3) 25 watt T8 lamps	1
CFL-14 W	7
CFL-20 W	14
CFL-27 W	1
• Pre-retrofit energy use:	1909 watts
• Post-retrofit energy use:	479 watts
• Energy savings projection:	1430 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
1500 Hours/year (Est.)	$1,234.45	117.28	$225.17
4 Hours/day	$822.97	78.18	$150.11
7 Hours/day	$1,440.19	136.82	$262.70
10 Hours/day	$2,057.41	195.46	$375.29

Notes: One 4-lamp fixture de-lamped to three 25 watt T-8 lamps for additional savings.

LKSD Housing 0010

Materials Installed	Quantity
2-lamp electronic ballast, (2) 25 watt T8 lamps	1
CFL-14 W	4
CFL-20 W	1
CFL-27 W	2
• Pre-retrofit energy use:	639 watts
• Post-retrofit energy use:	177 watts
• Energy savings projection:	462 watts
• Pre-retrofit to post retrofit energy reduction:	72%

• Estimated annual savings:

Hours Per Day / 250 Days Per Year	Electrical Savings	Comparative Avoided Diesel Use (gal)	Comparative Avoided Diesel Costs
1500 Hours/year (Est.)	$398.82	37.89	$72.75
4 Hours/day	$265.88	25.26	$48.50
7 Hours/day	$465.29	44.20	$84.87
10 Hours/day	$664.70	63.15	$121.25

LKSD Housing 0011

Materials Installed	Quantity
2-lamp electronic ballast, (2) 25 watt T8 lamps	1
CFL-14 W	10
CFL-20 W	4
CFL-27 W	1

- Pre-retrofit energy use: 967 watts
- Post-retrofit energy use: 294 watts
- Energy savings projection: 673 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
1500 Hours/year (Est.)	$580.97	55.19	$105.97
4 Hours/day	$387.31	36.80	$70.65
7 Hours/day	$677.80	64.39	$123.63
10 Hours/day	$968.28	91.99	$176.62

LKSD Housing 0016

Materials Installed	Quantity
2-lamp electronic ballast, (2) 25 watt T8 lamps	2
CFL-14 W	13
CFL-20 W	3
CFL-27 W	1

- Pre-retrofit energy use: 1154 watts
- Post-retrofit energy use: 363 watts
- Energy savings projection: 791 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
1500 Hours/year (Est.)	$682.83	64.87	$124.55
4 Hours/day	$455.22	43.25	$83.04
7 Hours/day	$796.64	75.68	$145.31
10 Hours/day	$1,138.05	108.12	$207.59

Teacher Housing NYC - Village Corp owned, leased to school district

Materials Installed	Quantity
2-lamp electronic ballast, (2) 25 watt T8 lamps	1
CFL-14 W	2
CFL-20 W	2
CFL-27 W	4

- Pre-retrofit energy use: 779 watts
- Post-retrofit energy use: 223 watts
- Energy savings projection: 556 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
1500 Hours/year (Est.)	$479.97	45.60	$87.55
4 Hours/day	$319.98	30.40	$58.37
7 Hours/day	$559.96	53.20	$102.14
10 Hours/day	$799.95	76.00	$145.92

School Gym – Pre-retrofit

Existing light levels are poor - 15 – 23 foot candles at desk height.

Existing light fixtures burn approx. 415 watts each including bulbs and ballasts.

Existing light quality has a low color rendering index. Lights take several minutes to come on.

Note: These retrofits will be completed during the summer of 2009. Near the end of March '09, communications with LKSD revealed the school district was committed, had the budget and had a solid electrical contractor who could complete this job - in kind to the grant. Previously this measure was not viable as no labor resources were available on the part of LKSD to complete the upgrade. LKSD has provided a letter to ABSN guaranteeing completion of this measure in summer '09. Savings, light quality and light level improvement will be excellent.

Materials to be Installed	**Quantity**
T5 fixture, electronic ballast, (4) 54 watt T5 HO	18
• Pre-retrofit energy use:	7470 watts
• Post-retrofit energy use:	4104 watts
• Energy savings projection:	3366 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
1750 Hours/year (Est.)	$3,389.98	322.06	$618.36
4 Hours/day	$1,937.13	184.03	$353.35
7 Hours/day	$3,389.98	322.06	$618.36
10 Hours/day	$4,842.83	460.09	$883.37

School Gym – Post-retrofit

ABSN will provide Photos when job is complete	ABSN will provide Photos when job is complete	ABSN will provide Photos when job is complete
Upgraded light levels are much better: average of 52 foot candles at desk height.	New HO T5 light fixtures burn approx. 228 watts each including bulbs and ballasts.	Upgraded light quality has a high color rendering index. Lights turn on instantly.

Following LKSD's letter below are two pages that detail the lighting plan for the new T5 light fixture upgrades.

Lower Kuskokwim School District

Plant Facilities/Capital Projects Department
P.O. Box 305 • Bethel, Alaska 99559
907 543-4893 FAX 907 543-4908

Date: March 26,2009

To: Geoff Butler
Project Manager,
Rural Community Building Energy Efficiency
Alaska Building Science Network

From: Gary C. Hanson
Plant Facilities Manager
Lower Kuskokwim School District

Subject: Request for a time extension in Toksook Bay to complete T5 retrofit

Mr. Butler,

We are seeking a short extension of time to perform the retrofit of the lighting in the Toksook Bay gymnasium. If the extension is granted we will ensure that the work is completed prior to the beginning of school in August. We have added another electrician and have some additional options available to ensure the work is completed on time.

Thank you for your consideration in this matter, and all the support you have provided over the years.

Sincerely,

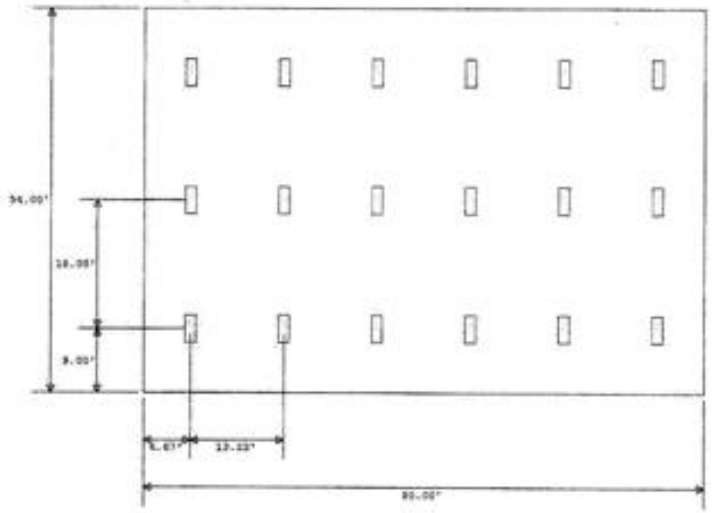
Gary C. Hanson
907-543-4888
gary_hanson@lksd.org

18 FIXTURES
4 LAMP T5

Results (Layout 1)

Average Illuminance Obtained:	52.04 fc(avg)	# of Rows:	3
Unit Power Density (UPD):	0.90 W/sq. ft.	Row Spacing:	18.00
Spacing Criteria:	Acceptable	# of Cols:	6
		Col. Spacing:	13.33

18 luminaires provide 52.04 fc (avg). 0.90 W/sq. ft. meets target UPD of 1.2 W/sq. ft.



Room Characteristics

Dimensions:	X: 80.00 ft.	Reflectances:	Ceiling:	0.8	Work Plane Height: 3.00 ft.
	Y: 54.00 ft.		Walls:	0.5	Target UPD: 0.90 W/sq. ft.
	Z: 22.00 ft.		Floor:	0.2	Target Illuminance: 18.00 fc(avg)

Luminaire Characteristics

Luminaire Description:	JK-BMF-454-T5-HO		
Suspension Length:	0.00 ft.	CU:	0.78
Light Loss Factor:	0.80		
Lamp Description:			
Lamps/Luminaire:	4	Lamp Lumens:	5000 lms
Lamp Life:	0		
Ballast:			
Ballast Factor:	1		

Room 1-1
Calculation Grid: Whole Room Horizontal Grid
Horizontal Illuminance

Layout 1

Grid Name: Whole Room Horizontal Grid
Grid Type: Horizontal Illuminance
Grid Units: Footcandles
Grid Origin: (0.00, 0.00)
Grid Orient:
Grid Elev.: 3.00
Grid Surface: n/a
Grid Hinge: 0
Grid Azimuth: 0

Statistical Area Summary

Stat. Area	Ave	Max	Min	Ave/Min	Max/Min	Std. Dev.
Whole Room Horizontal Grid	54.7	68.9	32.1	1.7	2.1	8.7

Calculation Grid

	2.00	6.00	10.00	14.00	18.00	22.00	26.00	30.00	34.00	38.00	42.00	46.00	50.00	54.00	58.00	62.00	66.00	70.00	74.00	78.00
52.65	32.3	34.7	40.5	44.9	44.6	46.3	49.1	47.8	47.7	49.2	49.2	47.7	47.8	49.1	46.4	44.6	44.9	40.5	34.8	32.5
49.95	35.9	37.9	44.4	49.7	48.8	50.2	54.0	52.3	51.2	53.9	53.9	51.2	52.3	54.0	50.2	48.8	49.7	44.5	38.1	36.2
47.25	38.7	40.8	48.1	53.5	52.5	54.0	58.0	56.4	54.7	57.9	57.9	54.7	56.4	58.0	54.0	52.6	53.5	48.2	41.0	39.0
44.55	40.9	43.1	50.8	56.3	55.4	56.9	61.1	59.5	57.7	61.2	61.2	57.7	59.6	61.1	56.9	55.5	56.4	50.9	43.3	41.4
41.85	42.4	44.3	52.1	58.0	57.0	58.6	62.9	61.2	59.3	62.9	62.9	59.5	61.2	62.9	58.6	57.1	58.0	52.2	44.5	42.8
39.15	42.6	45.0	52.8	58.9	58.0	59.7	64.0	62.2	60.8	64.0	64.0	60.8	62.2	64.1	59.7	58.1	59.0	52.9	45.2	43.0
36.45	43.3	45.7	53.5	59.5	58.9	60.5	64.7	63.0	61.7	64.6	64.6	61.7	63.0	64.7	60.5	58.9	59.5	53.5	45.9	43.7
33.75	44.3	46.5	54.5	60.9	60.0	61.7	66.2	64.3	62.9	66.1	66.1	62.9	64.3	66.2	61.7	60.1	60.9	54.6	46.7	44.7
31.05	45.3	47.5	55.9	62.5	61.3	63.0	68.0	65.9	64.1	67.9	67.9	64.1	65.9	68.0	63.0	61.4	62.6	56.0	47.7	45.8
28.35	46.3	48.1	57.0	63.4	62.1	63.8	68.8	66.9	64.7	68.9	68.9	64.7	66.9	68.8	63.8	62.2	63.5	57.0	48.3	46.7
25.65	46.3	48.1	57.0	63.4	62.1	63.8	68.8	66.9	64.7	68.9	68.8	64.7	66.9	68.8	63.8	62.2	63.5	57.0	48.3	46.7
22.95	45.3	47.4	55.9	62.5	61.3	63.0	67.9	65.9	64.0	67.9	67.8	64.0	65.9	68.0	63.0	61.4	62.6	56.0	47.6	45.7
20.25	44.3	46.5	54.5	60.8	60.0	61.6	66.2	64.3	62.8	66.1	66.1	62.8	64.3	66.2	61.6	60.0	60.9	54.6	46.7	44.7
17.55	43.3	45.7	53.4	59.4	58.8	60.5	64.6	62.9	61.7	64.6	64.6	61.7	63.0	64.7	60.5	58.9	59.5	53.5	45.9	43.7
14.85	42.5	44.9	52.7	58.8	58.0	59.6	64.0	62.1	60.7	63.9	63.9	60.7	62.2	64.0	59.6	58.0	58.9	52.8	45.1	42.9
12.15	42.3	44.2	52.0	57.9	56.9	58.5	62.8	61.1	59.4	62.8	62.8	59.4	61.1	62.8	58.5	57.0	57.9	52.1	44.4	42.7
9.45	40.9	43.0	50.7	56.2	55.3	56.8	60.9	59.4	57.5	61.0	61.0	57.5	59.4	60.9	56.8	55.3	56.3	50.8	43.2	41.3
6.75	38.6	40.7	47.9	53.3	52.3	53.8	57.8	56.2	54.5	57.7	57.7	54.5	56.2	57.8	53.8	52.4	53.3	48.0	40.9	38.9
4.05	35.8	37.7	44.1	49.4	48.5	49.9	53.7	52.0	50.9	53.6	53.6	50.9	52.0	53.7	49.9	48.5	49.4	44.2	37.8	36.1
1.35	32.1	34.3	40.9	44.4	44.1	45.9	48.6	47.4	47.3	48.7	48.7	47.3	47.4	48.6	45.9	44.2	44.5	40.1	34.4	32.3

Toksook Bay - Alaska Building Science Network - T5 Lighting Upgrade Details

These retrofits will be completed during the summer of 2009. Near the end of March '09, communications with LKSD revealed the school district was committed, had the budget and had a solid electrical contractor who could complete this job - in kind to the grant. Previously this measure was not viable as no labor resources were available on the part of LKSD to complete the upgrade. LKSD has provided a letter to ABSN guaranteeing completion of this measure in summer '09. Savings, light quality and light level improvement will be excellent.

Toksook Bay 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**
	80	54	22 av	HPS 150 watt		160	**0**	2 - 23 fc, poor light level	52		T-5 2 lamps	114	**0**
Color shade of walls				HPS 250 watt		260	**0**				T-5 3 lamps	171	**0**
Color shade of floor				Multi-Vapor 400 watt	18	415	**7,470**			18	T-5 4 lamps	228	**4104**
				Other School Gym (B)			**0**				Other fixtures (A)		**0**
					Total Existing Watts		7,470				Total New Watts		4104

Percent Savings Pre to Post Retrofit:	**45.06%**
1750	New watts / old watts

Savings & Payback Calculation for Gym:

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

Full cost of electricity: $ 0.58 /kWh

Watts of existing lighting: 7,470

New wattage for T5 fixtures: 4,104

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

Existing Cost: $7,523

Retrofitted Cost: $ 4,133

Annual Savings: $ 3,390

T5 Materials costs $3,630.52

T5 shipping costs $300.00

Material & shipping cost of Gym retrofit: $3,930.52

Simple Payback: Materials cost / annual savings = **1.16** years (for retrofit to pay for itself in materials)

Toksook, 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 (Number of entities x 1 hour each)		4	$15.00	$60.00	list number of entities
Staff time for Attending teleconference (TC/IRA)	2/27/2007	2	$15.00	$30.00	list # of staff and wages if possible ($15/hr is an average wage designated for village entity staff).
Staff time for Attending teleconference (City)	2/27/2007	2	$15.00	$30.00	"
Staff time for Attending teleconference (Village Corp)	2/27/2007	1	$15.00	$15.00	"
Staff time for Attending teleconference (School)	2/27/2007	2	$15.00	$30.00	"
Conservative village office administrative percentage of total project cost less ABSN Admin %. Total project cost = $37,775/village - (our admin percentage , (around 12%) Approx: $4,533) = $33,242 x 5.5% = $1,828 (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			$1,828.00	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 Field Managers - 3rd site visit	2-6 to 2-7-08			$50.00	one nights stay at school for Harry Morgan
Transportation and fuel costs during 3rd Site-visit	2-6 to 2-7-08	4	$18.00	$72.00	Frank Pitka picked up Harry and helped transport PCB druum and materials to Fallen Hall, etc. Also - Programmable T-stat installations
Nunakauyak Traditional Council, in-kind labor for lighting upgrades (West fin report 1-10-08)	12/20/2008	27	$17.00	$ 459.00	
LKSD In-kind labor for teacher housing lighting upgrades and installation of 5 programmable T-stats.		56	$20.00	$1,120.00	Frank Pitka did work - assume $20/hr including fringe. Tally sheet estimates 47 hrs - say 50 hrs for lighting and 6 for T-stats, to retrofit 58 linear fluorescent fixtures and install 103 cfl bulbs.
LKSD cert. electrician and maint labor for T5 retrofits. Replacing 18, 400w merc vapor fixtures - large job usually the in-kind is estimated at $4,500				$5,000.00	Comparable estimate for larger job - In-kind labor, provided by school district - includes airfare & per diem and lodging.
	TOTAL			$8,694.00	

Bethel Boiler Trainings at Yuut Elitnaurviat Learning Center, October 7-8 & 15-16, 2008

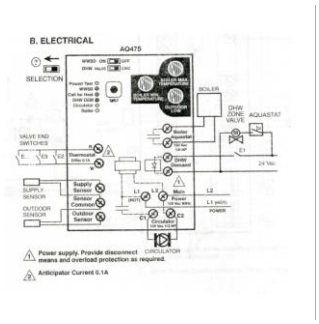
ABSN Master Boiler Technician Charlie Deer presents at Bethel area boiler training -Yuut Elitnaurviat, the Learning Center Shop in Bethel, October, 2008.

Training on oil burner combustion efficiency and maintenance.

Nunakquyak Traditional Council maintenance staff Ralph John traveled to Bethel October 7 and 8, 2008 to participate in this training. ABSN partnered with Association of Village Council Presidents Housing Authority and YKHC's Yuut Elitnaurviat Learning Center to provide ABSN's 16-hour boiler training course to 4 rural maintenance staff from '07-'08 villages covered under this VEUEEM grant. Additionally 11 AVCP Housing maintenance staff from Bethel and surrounding western villages attended this training. Charlie Deer's training hours were covered by matching funds from ABSN. AEA VEUEEM grant funds were used to cover training coordination, air fare, meals and lodging in Bethel for VEUEEM grant village maintenance staff.

Components of a Bacharach Flu Gas Analyzing Kit used in boiler efficiency training and left with capable maint staff for use in their villages.

Smoke-test kit for analyzing flu gases for boiler efficiency



Schematic of outdoor temperature sensing boiler control

During this 16-hour course ABSN's boiler specialist Charlie Deer instructed maintenance staff in the fundamentals of boiler and fuel energy efficiency. Training topics covered: fuel, proper heating system sizing, testing boiler efficiency with a flu gas analyzer kit, cleaning and tuning boilers for energy efficiency, control options and proper control function, burner and nozzle components and function, outdoor temperature boiler controls, programmable thermostats, etc.