Village End Use Energy Efficiency Measures Program ’05 – ’06
AEA Grant # 2195225 Administered by Alaska Building Science Network

Port Heiden Final Report



Community Summary

6 Community buildings and 3 teacher housing units received energy efficiency upgrades May ’05 - December ’06

City Shop, Fire Hall & VPSO Area, Ray’s Place Native Council Building, Clinic, Office Building, School and 3 Teacher Housing Units

Village-Wide Lighting Retrofit Summary:

- Retrofitted 185 fixtures village-wide with electronic ballasts and T8 lamps
- Installed: 33 compact fluorescent light bulbs village-wide
- Major T5 light upgrades were installed in School Gym
- Pre-retrofit energy use for all lighting: 20,396 watts
- Post-retrofit energy use for all lighting: 13,540 watts
- Energy savings projection: 6,856 watts (6.86 kW)
- **Pre-retrofit to post retrofit energy reduction**: 34 %
- **Estimated Annual Savings:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	$2,742	571 Gallons	$1,903
7 Hours	$4,799	1,000 Gallons	$3,330
10 Hours	$6,856	1,429 Gallons	$4,757

- Total project cost for all measures: $ 38,235
- Simple mean payback* 7.97 Years
  *(All grant funds, but accounting for lighting savings only)
- Total village wide in-kind contribution: $ 14,017

Additional Energy Efficiency Measures: (Budget Expense: $ 13,122)

- On-site boiler & controls training for 2 local maintenance staff
- Lake and Peninsula School District, Meshik School:
  Partial materials for school-wide, fuel efficiency boiler system retrofit.
- Energy efficiency cleaning and tuning and outdoor controls for two boilers
- Programmable Thermostats installed in 8 locations

Port Heiden City Owned Buildings

Energy efficient lighting upgrades were completed in two buildings owned by the City of Port Heiden

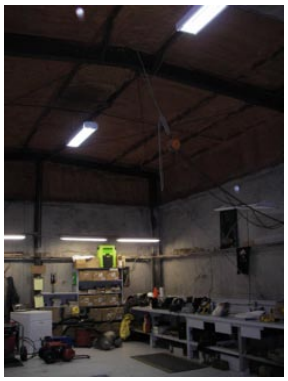
City owned Buildings - Lighting Retrofit Summary:

- Lighting upgrades completed in December 2006
- Retrofitted 29 linear fluorescent fixtures with T8 lamps and electronic ballasts
- Installed: 2 compact fluorescent light bulbs
- Pre-retrofit energy use for all lighting: 3,313 watts
- Post-retrofit energy use for all lighting: 2,350 watts
- Energy savings projection: 963 watts (.96 kW)
- **Pre-retrofit to post retrofit energy reduction**: 29 %
- **Estimated Annual Savings:**

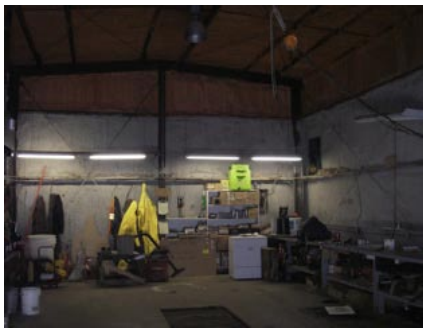
Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	$385	80 Gallons	$267
7 Hours	$674	140 Gallons	$468
10 Hours	$963	201 Gallons	$668

City Shop

Port Heiden City Shop



Two New T5 fixturres



New T8s inside City Shop

Materials Installed	2-Lamp Ballasts 32w lamps	4-Lamp Ballasts 32w lamps	2-Lamp Ballasts 25w lamps	2-Lamp Fixtures 3-lamp ballasts 25w lamps	4-Lamp Fixtures 3-lamp ballasts 25w lamps	4-Lamp Ballasts 25w lamps	2-lamp T5s 114w
City Shop	11	0	0	0	0	0	2

- Pre-retrofit energy use: 1,216 watts
- Post-Retrofit Energy Use: 888 watts
- Energy savings projection: 328 watts (.33 Kw)
- **Pre-retrofit to post retrofit energy reduction**: 27 %

- **Estimated Annual Savings:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	$131	27 Gallons	$91
7 Hours	$230	48 Gallons	$159
10 Hours	$328	68 Gallons	$228

Notes: Existing overhead lighting was two, HID fixtures using 157 watts each. The existing light level was very poor and the existing energy use relatively low. We were able to achieve reasonable savings and much better light levels by replacing the HIDs with 114w T5 fixtures.

Fire Hall & VPSO Area

City Fire Hall

32-watt T8 retrofits in VPSO area

2-lamp T5 replacement fixtures

Materials Installed	2-Lamp Ballasts 32w lamps	4-Lamp Ballasts 32w lamps	2-Lamp Ballasts 25w lamps	4-Lamp Ballasts 25w lamps	13w CFL	20w CFL	25w CFL	2-lamp T5s 114w
Fire Hall	18	0	0	0	0	2	0	3

- Pre-retrofit energy use: 2,097 watts
- Post-Retrofit Energy Use: 1,462 watts
- Energy savings projection: 635 watts (.64 Kw)
- **Pre-retrofit to post retrofit energy reduction**: 30 %
- **Estimated Annual Savings:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	$192	40 Gallons	$133
7 Hours	$337	70 Gallons	$234
10 Hours	$481	100 Gallons	$334

Notes: The City Fire Hall was in a similar situation as the Shop. Existing overhead lighting was three, HID fixtures using 157 watts each. The existing light level was very poor and the existing energy use relatively low. We were able to achieve reasonable savings and much better light levels by replacing the HIDs with 114w T5 fixtures.

Port Heiden Native Council Owned Buildings

Energy efficient lighting upgrades were completed in two buildings owned by the Native Council of Port Heiden

Native Council owned Buildings - Lighting Retrofit Summary:

- Lighting upgrades completed in May, 2005
- Retrofitted 82 linear fluorescent fixtures with T8 lamps and electronic ballasts
- Installed: 6 compact fluorescent light bulbs
- Pre-retrofit energy use for all lighting: 6,336 watts
- Post-retrofit energy use for all lighting: 4,347 watts
- Energy savings projection: 1,989 watts (1.99 kW)
- **Pre-retrofit to post retrofit energy reduction**: 31 %
- **Estimated Annual Savings:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	$796	166 Gallons	$552
7 Hours	$1,392	290 Gallons	$966
10 Hours	$1,989	414 Gallons	$1,380

Ray's Place – Native Council Building

Ray's Place: Native Council and City Offices – right side of Building

Upstairs rental Apartment

25-watt T8 Retrofits

Materials Installed	2-Lamp Ballasts 32w lamps	2-Lamp Ballasts 25w lamps	2-Lamp Fixtures 3-lamp ballasts 25w lamps	4-Lamp Fixtures 3-lamp ballasts 25w lamps	4-Lamp Ballasts 25w lamps	13w CFL	20w CFL	25w CFL
Ray's Place - Native Council Building	15	24	0	0	0	2	0	0

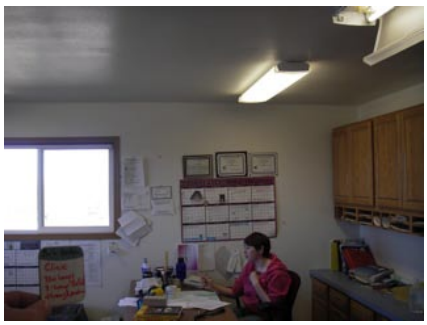
- Pre-retrofit energy use: 2,850 watts
- Post-Retrofit Energy Use: 2,054 watts
- Energy savings projection: 796 watts (.80 Kw)
- **Pre-retrofit to post retrofit energy reduction**: 28 %
- **Estimated Annual Savings:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	$318	66 Gallons	$221
7 Hours	$557	116 Gallons	$387
10 Hours	$796	166 Gallons	$552

Notes: Ray's Place is a large building that houses the Native Council and City Offices in the center and right side of the building pictured. Most of the Native Council and City offices had newer existing magnetic ballasts with low ballast factors and relatively low existing energy use. Two lamp fixtures that normally use 80-somem watts for the magnetic ballast and 2, 40-watt lamps were using 70 watts. The ABSN field manager tailored the retrofit plan to use 32 watt T8s where needed for light levels and 25 watt lamps in corridors and other areas where the light level demand was not as great.

Clinic

Ray's Place: Native Council and City Offices – right side of Building



Clinic Office

Exam Room

Materials Installed	2-Lamp Ballasts 32w lamps	4-Lamp Ballasts 32w lamps	2-Lamp Ballasts 25w lamps	2-Lamp Fixtures 3-lamp ballasts 25w lamps	4-Lamp Fixtures 3-lamp ballasts 25w lamps	13w CFL	20w CFL	25w CFL
Clinic	12	0	16	0	0	1	0	1

- Pre-retrofit energy use: 2,316 watts
- Post-Retrofit Energy Use: 1,510 watts
- Energy savings projection: 806 watts (.81 Kw)
- **Pre-retrofit to post retrofit energy reduction**: 35 %

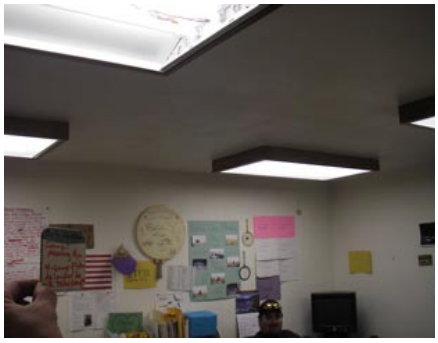
- **Estimated Annual Savings:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	$322	67 Gallons	$224
7 Hours	$564	118 Gallons	$391
10 Hours	$806	168 Gallons	$559

Notes: The Clinic had magnetic ballasts with more standard ballast factors – affording better savings from T8 retrofits. 25-watt lamps were used in corridors and the lobby area.

City Offices

Ray's Place: City Offices & Native Council – right side of Building



City office meeting area

Materials Installed	2-Lamp Ballasts 32w lamps	4-Lamp Ballasts 32w lamps	2-Lamp Ballasts 25w lamps	2-Lamp Fixtures 3-lamp ballasts 25w lamps	4-Lamp Fixtures 3-lamp ballasts 25w lamps	4-Lamp Ballasts 25w lamps	13w CFL	20w CFL	25w CFL
NC Owned Offices	4	0	11	0	0	0	2	0	0

- Pre-retrofit energy use: 1,170 watts
- Post-Retrofit Energy Use: 783 watts
- Energy savings projection: 387 watts (.39 Kw)
- **Pre-retrofit to post retrofit energy reduction**: 33 %
- **Estimated Annual Savings:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	$155	32 Gallons	$107
7 Hours	$271	56 Gallons	$188
10 Hours	$387	81 Gallons	$269

Lake and Peninsula School District Owned Buildings

Energy efficient lighting upgrades were completed in four buildings owned by the Lake and Peninsula School District

School owned Buildings - Lighting Retrofit Summary:

- Lighting upgrades completed in August 2006
- Retrofitted 74 linear fluorescent fixtures with T8 lamps and electronic ballasts
- Installed: 25 compact fluorescent light bulbs
- Pre-retrofit energy use for all lighting: 10,747 watts
- Post-retrofit energy use for all lighting: 6,843 watts
- Energy savings projection: 3,904 watts (3.90 kW)
- **Pre-retrofit to post retrofit energy reduction**: 36 %
- **Estimated Annual Savings:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	$1,562	325 Gallons	$1,084
7 Hours	$2,733	569 Gallons	$1,896
10 Hours	$3,904	813 Gallons	$2,709

School Buildings

Lake and Pen SD Meshik School and teacher housing

School Shop

School Boiler Module

Materials Installed	2-Lamp Ballasts 32w lamps	4-Lamp Ballasts 32w lamps	2-Lamp Ballasts 25w lamps	2-Lamp Fixtures 3-lamp ballasts 25w lamps	4-Lamp Fixtures 3-lamp ballasts 25w lamps	4-Lamp Ballasts 25w lamps	13w CFL	20w CFL	25w CFL	Other Lights
School Buildings	27	0	29	0	0	0	0	0	5	0

- Pre-retrofit energy use: 4,967 watts
- Post-Retrofit Energy Use: 3,108 watts
- Energy savings projection: 1,859 watts (1.86 Kw)

- **Pre-retrofit to post retrofit energy reduction**: 37 %
- **Estimated Annual Savings:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	$744	155 Gallons	$516
7 Hours	$1,301	271 Gallons	$903
10 Hours	$1,859	387 Gallons	$1,290

Notes: Primary lighting in the Meshik School had already been upgraded tro T8s prior to the VEUEEM grants. A few outbuildings and areas in the school were still using T12s which were retrofitted by local school maintenance staff under this grant. Teacher housing had a fair share of incandescent lighting that was upgraded with CFLs – affording excellent savings.

Teacher Housing

Teacher housing on left

T8s in laundry arera

School Buildings	2-Lamp Ballasts 32w lamps	4-Lamp Ballasts 32w lamps	2-Lamp Ballasts 25w lamps	2-Lamp Fixtures 3-lamp ballasts 25w lamps	4-Lamp Fixtures 3-lamp ballasts 25w lamps	4-Lamp Ballasts 25w lamps	13w CFL	20w CFL	25w CFL	Other Lights
Teacher Housing	0	0	18	0	0	0	13	4	3	0

- Pre-retrofit energy use: 2,640 watts
- Post-Retrofit Energy Use: 1,170 watts
- Energy savings projection: 1,470 watts (1.47 Kw)
- **Pre-retrofit to post retrofit energy reduction**: 56 %
- **Estimated Annual Savings:**

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	$588	123 Gallons	$408
7 Hours	$1,029	214 Gallons	$714
10 Hours	$1,470	306 Gallons	$1,020

High Output T5 Lighting Upgrades for the School Gym

Port Heiden Meshik School gym with new T5 fixtures

Hours Per Day / 250 Days Per Year	Electrical Savings	Avoided Diesel Use	Avoided Diesel Costs
4 Hours	$230	48 Gallons	$160
7 Hours	$403	84 Gallons	$279
10 Hours	$575	120 Gallons	$399

The school gym had a relatively low energy use with the existing 150 watt HPS light fixtures. Although the pre-post energy reduction shows only 19%, the savings will be greater as the increased light levels of the new T5s allows a partial number of fixtures to be used for most of the run-time.

"The savings are going to be more than the savings based on each light fixture. The lights are brighter so we are turning on less fixtures at Port Heiden." – Vince Webster, Facilities Manager, Lake and Pen. School District

Vince has gone on to purchase more T5s from his district budget and replaced several other Lake and Pen school gyms with energy efficient lighting.

Port Heiden School Gym, Pre & Post T5 Lighting Retrofit, ABSN Energy Efficiency Projects '05-'06

Completed fall '06

Room Space	Length (feet)	Width (feet)	Ceiling Hieght (feet)	# of Existing Fixtures	Existing Fixture Watts	Total Existing Watts	Existing Foot-candles	Projected New Foot-Candles	# of New Fixtures	lamps / fixture	New Fixture Watts	Total New Watts
Gym	70	48	20	20	157	3,140	40	40	15	2	114	1710
NOTE: FOR NEW LIGHTING, Usual use pattern of new lighting: 5, 2-lamp and 2, 3-lamp fixtures only (912 watts verses 2,545 watts), so the savings is probably more like 40% compared with pre-retrofit energy use.									5	3	171	835
						2-lamp fixtures all except row nearest peak, which has 5, 3-lamp fixtures. This will save 455 watts over existing lighting to achieve a 19% savings.						2545
						Lake & Peninsula School District anticipates greater savings than the 19%. They report brighter lighting with the T5s which allows some T5s to remain off much of the time.						

-18.94904459

Savings & Payback Calculation for Gym:

Assume 1800 hrs / year for 250 days/year of use

Full cost of electricity: $0.40 /kWh

Watts of existing lighting: 3,140

New wattage for T5 fixtures: 2,545

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

Existing Cost: $2,261

Retrofitted Cost: $1,832

Annual Savings: $ $428

Est material & shipping cost of Gym retrofit: $4,230.66

Simple Payback: Materials cost / annual savings = **9.875490196** years (for retrofit to pay for itself in materials)

This would be if they used all lights during all run times, which is not the case.

Energy Efficiency Heating System Retrofit – Lake & Peninsula School District Meshik School

New Boilers supplied by Lake & Pen SD

New piping loops to separate boiler heating loops

Cic pumps provided by ABSN / AEA

This heating Retrofit was completed in the summer of '06 through in-kind labor provided by the Lake & Pen. SD. VEUEEM grant funds supplied 2 new Grundfoss circ pumps, several circuit setter flow-reducer valves, new pipe for isolating heating loops and control components. – These materials enabled 6 older circ pumps to be taken off-line saving substantial electrical energy. As this was also part of a larger boiler and control replacement plan, this measure will result in substantial fuel savings as well.

Vince Webster, Facilities Manager, Lake and Pen. School District has stated they expect a 25% or more reduction in their overall fuel use for all school facilities. Vince gave a ball park average of fuel use of ~10,000 gallons of fuel per year for the Meshik school. 20%, or 2000 gallons x $3.33/ gallon translates to an average annual fuel savings of $6,660.

Heating Energy Efficiency, Site visit and Measures for Native Council

Outdoor Temperature Controls for Ray's Place, Native Council Building

Ray's Place: Charlie Deer and Andrew Lind install outdoor temp boiler controls

Andrew Lind Installs Outdoor boiler control sensors

New outdoor temp Boiler control

Notes: Charlie Deer traveled to Port Heiden and worked with two local maintenance staff for two days of hands-on energy efficiency heating work. Both boilers in Ray's Place were cleaned and tuned for maximum energy efficiency. Charlie Deer provided training and worked with Andrew Lind to retrofit both boilers with outdoor temp boiler controls. These controls can save 5 – 15% of overall fuel use.

Programmable Thermostats for Ray's Place, Native Council Building

Andrew Lind programs Thermostats

Demonstrating use of programmable thermostats to office staff

Notes: Eight programmable thermostats were installed in Ray's place including the clinic to reduce overall fuel use.

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

Village entities worked with: Tribe, City, School District.

In-Kind Item	Dates	Hours Contri-buted	Hourly Wage	Value / Amount	Notes
Staff time for project contact, introduction, and reviewof intro materials (Number of entities x 1 hour each)		4	$15.00	$60.00	# of entities we worked with in the village is indicated in the Hrs contributed column. $15 / hr is our generic estimated average wage for local village staff: Tribal Administrators, City Clerks,
Communications to coordinate upgrades & follow-up with Native Council	April, '05 - Dec. '06	8	$15.00	$120.00	Estimate 8 hrs x 15/hr
Communications to coordinate upgrades & follow-up with City Mayor and staff	April, '05 - Dec. '06	4	$15.00	$60.00	Estimate 4 hrs x 15/hr
Staff time for Attending teleconference village-wide		7.5	$15.00	$112.50	Hrs contributed column indicates length of telecon multiplied by # of village telecon participants
City labor for T5 installation @ Shop & fire hall - final site visit		9	$14.00	$126.00	Mark Kosbruk
Village office administrative percentage of total project cost less ABSN Admin %. Total project cost = $38,235/village - (our admin percentage , (around 9%) Approx: $3,440) = $34,795 x 5% = $1,740 (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.	Jan '05 - Jan '07			$1,740.00	Each time we call, email, or fax a village entity, someone has to receive the communication, review and/or foward the information, follow-up on requests, etc. Wether 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 ammount.
Lodging for Native Council - site visits including Charlie Deer's stay	22 & 23-May '06	10	70	$700.00	$70/day for 3 site visits, or 10 nights,
Transportation and fuel costs - 1st site-visit	4 - 6 May '05	10.5	40	$420.00	in-kind, rent City truck for 10.5 days, $40/day
School & teacher housing lighting upgrades		30	$18.00	$540.00	Estimate 30 hrs x $18/hr local labor
School T5 Gym lighting upgrades				$4,000.00	Estimate electrician at $50/hr x 35 hrs , and an electrician assist at $30/hr x 35 hours plus air fare & per diem $1,200 for 2 trips from King Salmon to Port Heiden.
Lake & Pen materials contribution	6/6/06			$957.25	(5) 3-lamp T5 fixtures
Lake & Pen SD shipping contribution	10/12/06			$387.51	(5) 3-lamp T5 fixtures. See NAC Statement in 3-31-07 Fin Report
Lake & Pen - Ship from King Salmon to Pt Heiden	7/27/05			$406.40	.45 /lb x 850 lbs + 6.25%
Shipping - lamp and ballast recycling backhaul		535	0.38	$203.30	Arctic Circle Air gave half back haul rate .20 verses .58. So in-kind: 535 lbs x .38/lb
NAC free back-haul Shipping - T5 Shipping from King Salm to Pt Heiden	8/23/06			$184.56	.45 /lb x 386 lbs + 6.25%
Lake & Pen SD labor for heating system retrofit		80	50	$4,000.00	Estimate 80 hrs x $50/hr + air fare of $1,200 for 2 trips from King Salmon to Port Heiden.
	TOTAL			$14,017.52	