Fluorescent Lighting to LED Lighting Demonstration Project

AFE Presentation February 2016

Presented by: James Kelly CATG EPA/IGAP Coordinator

Funded by EPA and Zender Environmental Group

From Fluorescent to LED Lightning (Light Emitting Diode)

Project Information:

ORGANIZATIONAL SUPPORT LETTER:
See attached letter

TOTAL FUNDING AMOUNT REQUESTED:
$9,980.00

TOTAL PROJECT COST:
$12,655.46

Organization:

Council of Athabascan Tribal Governments
Natural Resource Department:
EPA IGAP Program

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Demo Project Problem Solving

This Project Served to:

- Educate community members about pro's and con's surrounding fluorescent lighting and LED lighting – positive and negative points.
- Raised community awareness of uncontrolled dumping of hazardous waste in community landfills with hazardous waste – out of sight, out of mind.
- In times of high energy cost, using energy efficient products will greatly reduce direct cost you eventually will pay for – the buck always stops with you.
- Fluorescent lamps uses a toxic material to create lighting – mercury, magnesium it from our community will reduce health hazards.
- Taking small steps at first and using an approach that is simple will allow local community to address major environmental issues and witness success over time.

Project Use for Problem Solving

What We Did….

- Installed energy monitoring units to document and records actual energy usage at selected sites for 14 or more days.
- Rewired and changed out Fluorescent Lamps for LEDS lamps.
- Continued to monitor energy use after change-out for 14 or more days.
- Developed charts showing before and after energy use.
- Educated community residents about pro’s and con’s of energy efficient LED lighting products.

What are LEDs and their Advantages?

- Stands for Light Emitting Diode – (basically an electronic component)
- Has long lasting life – some lamps are rated up to 35,000 hours
- More expensive to purchase in the beginning, but you will recover savings over the long term. Prices are starting to come down
- Less heat when in use
- Instant on

What We Know About Fluorescent Lamps

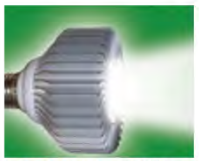
- Toxic material in the glass enclosure
- Glass!
- Uses more electricity then LEDs
- Because it is made up of glass – it is easy to break. Kids love these lamps
- Lamps are disposed of in your community landfill – toxic material

Comparison Chart
LED Lights vs. Incandescent Light Bulbs vs. CFLs

Energy Efficiency & Energy Costs	 **Light Emitting Diodes (LEDs)**	 **Incandescent Light Bulbs**	 **Compact Fluorescents (CFLs)**
Life Span (average)	**50,000 hours**	**1,200 hours**	**8,000 hours**
Watts of electricity used (equivalent to 60 watt bulb). LEDs use less power (watts) per unit of light generated (lumens). LEDs help reduce greenhouse gas emissions from power plants and lower electric bills	**6 - 8 watts**	**60 watts**	**13-15 watts**
Kilo-watts of Electricity used (30 Incandescent Bulbs per year equivalent)	**329 KWh/yr.**	**3285 KWh/yr.**	**767 KWh/yr.**
Annual Operating Cost (30 Incandescent Bulbs per year equivalent)	**$32.85/year**	**$328.59/year**	**$76.65/year**

Environmental Impact	 Light Emitting Diodes (LEDs)	 Incandescent Light Bulbs	 Compact Fluorescents (CFLs)
Contains the TOXIC Mercury	**No**	**No**	**Yes** - Mercury is very toxic to your health and the environment
RoHS Compliant	**Yes**	**Yes**	**No** - contains 1mg-5mg of Mercury and is a major risk to the environment
Carbon Dioxide Emissions (30 bulbs per year) Lower energy consumption decreases: CO2 emissions, sulfur oxide, and high-level nuclear waste.	**451 pounds/year**	**4500 pounds/year**	**1051 pounds/year**

Important Facts	 **Light Emitting Diodes (LEDs)**	 **Incandescent Light Bulbs**	 **Compact Fluorescents (CFLs)**
Sensitivity to low temperatures	**None**	**Some**	**Yes - may not work under negative 10 degrees Fahrenheit or over 120 degrees Fahrenheit**
Sensitive to humidity	**No**	**Some**	**Yes**
On/off Cycling Switching a CFL on/off quickly, in a closet for instance, may decrease the lifespan of the bulb.	**No Effect**	**Some**	**Yes - can reduce lifespan drastically**
Turns on instantly	**Yes**	**Yes**	**No - takes time to warm up**
Durability	**Very Durable - LEDs can handle jarring and bumping**	**Not Very Durable - glass or filament can break easily**	**Not Very Durable - glass can break easily**
Heat Emitted	**3.4 btu's/hour**	**85 btu's/hour**	**30 btu's/hour**
Failure Modes	**Not typical**	**Some**	**Yes - may catch on fire, smoke, or omit an odor**

Light Output	 **Light Emitting Diodes (LEDs)**	 **Incandescent Light Bulbs**	 **Compact Fluorescents (CFLs)**
Lumens	**Watts**	**Watts**	**Watts**
450	4-5	40	9-13
800	6-8	60	13-15
1,100	9-13	75	18-25
1,600	16-20	100	23-30
2,600	25-28	150	30-55

Detailed Schedule for each Step of Project in the Table Below

Step/Task/Event (Example)	Who's responsible?	Project Month										
		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Contact Village Council For demonstration project approval	Env. Coordinator		X									
Conduct community site assessment – travel to 3 sites	Env. Coordinator			X								
Select homes & facility for demonstra-tion project in 3 communities	Env. Coordinator/ Tribal Council				X							
Order LED Lamps from vendor	Env. Coordinator				X							
Order Energy Monitoring Equipment	Env. Coordinator				X							
Travel to selected sites for actual installation of LED lamps	Env. Coordinator					X	X	X				
Share project goals with community members thru outreach education	Env. Coordinator			X								
Provide Project Accomplishment to Tribal council and community members	Env. Coordinator									X		
Provide project draft to Grantor	Env. Coordinator										X	X
Provide Final Draft of Project	Env. Coordinator											X
Submit Final Expense Summary to Grantor	Env. Coordinator											X
Close out demonstration project	Env. Coordinator											X

Item	Amount Requested	In-kind (if any)	How cost was calculated	Basis or source of the cost
A. Personnel:				
Environmental Coordinator		1465.20	Based on current hourly wages for 8 hrs/day x 3 days x 3 sites	Council of Athabascan Tribal Governments (CATG)
Temporary Laborer	1,080.00	0	$15.00/hr for 8 hours for 3 days in 3 communities	Normal laborer's pay in Yukon Flats Region
B. Fringe Benefits:		410.26		Rate set by CATG
C. Travel				
Site #1 2 trips	300	300		Travel fares by air
Site #2 2 trips	200	200		Travel fares by air
Site #3 2 trips	300	300		Travel fares by air
D. Equipment				
TED Monitoring Device				
E. Supplies				
LED Lamps	8,100.00		60 lamps at $45 per lamp per site for 3 sites	Quotes from Private Vendor in Fairbanks, Alaska
F. Contractual				
G. Construction				
H. Other - *Break down into other items such as: internet, printing, postage, shipping, rent, phone, etc.*				
I. Total Request	9,980.00	2,675.46		

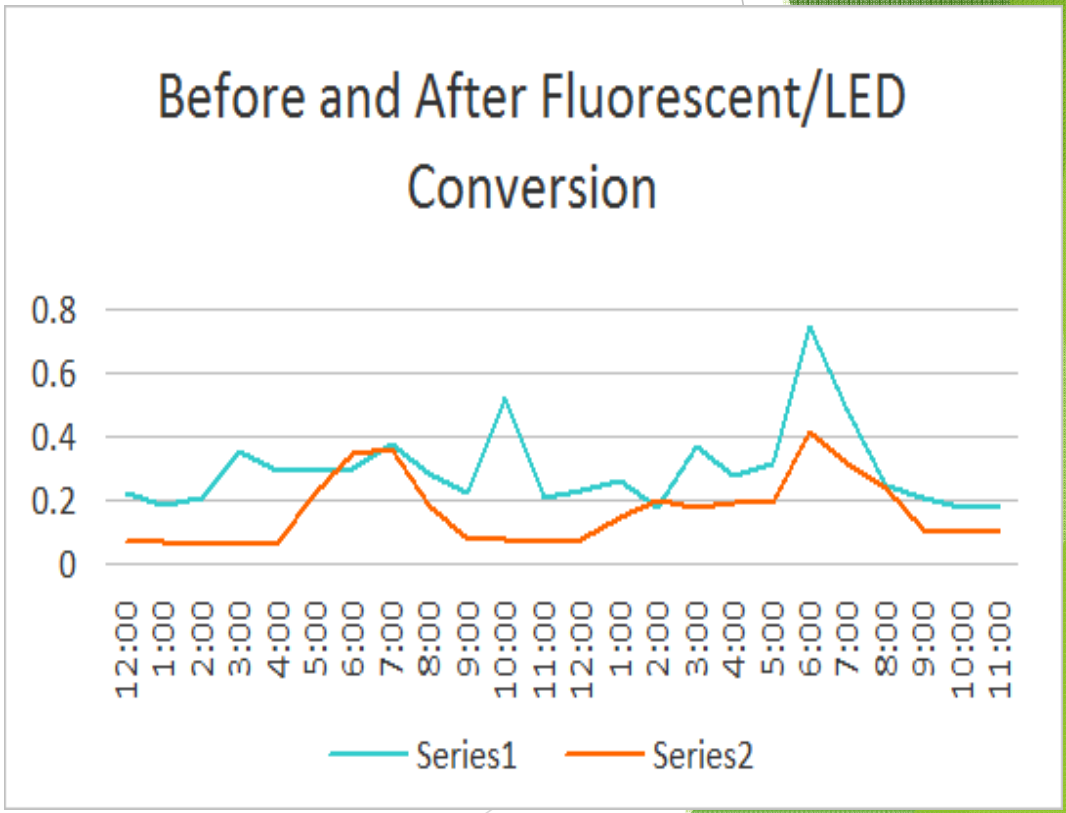
TED Monitoring at selected sites

These units are used to record actual energy use

Rewiring and installation of LED lamps

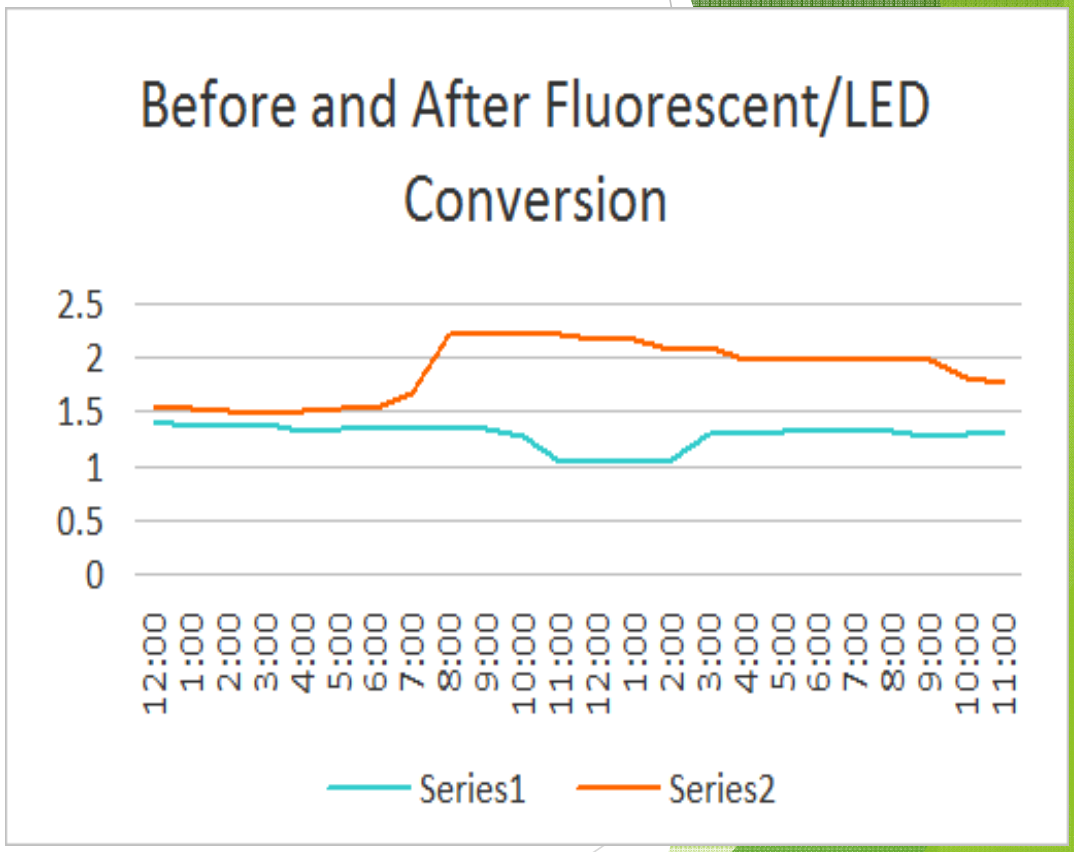
Removing the ballast in the light fixture and wiring the lamp sockets for 120 AC. The LED lamps that I used for the project was purchased from Daylight Energy Services based in Fairbanks, Alaska.

CIK #1 Residential Energy Monitoring Data - Hourly				
Time	KWH	Before	KWH	After
12:00 AM		0.226		0.072
1:00 AM		0.184		0.066
2:00 AM		0.208		0.06
3:00 AM		0.357		0.064
4:00 AM		0.295		0.067
5:00 AM		0.294		0.222
6:00 AM		0.297		0.344
7:00 AM		0.376		0.359
8:00 AM		0.282		0.187
9:00 AM		0.22		0.079
10:00 AM		0.522		0.079
11:00 AM		0.208		0.07
12:00 PM		0.229		0.076
1:00 PM		0.264		0.149
2:00 PM		0.174		0.203
3:00 PM		0.366		0.18
4:00 PM		0.277		0.192
5:00 PM		0.313		0.196
6:00 PM		0.748		0.417
7:00 PM		0.488		0.319
8:00 PM		0.248		0.241
9:00 PM		0.205		0.108
10:00 PM		0.174		0.103
11:00 PM		0.18		0.103
		1/11/2015		1/14/2015
		Series 1		Series 2

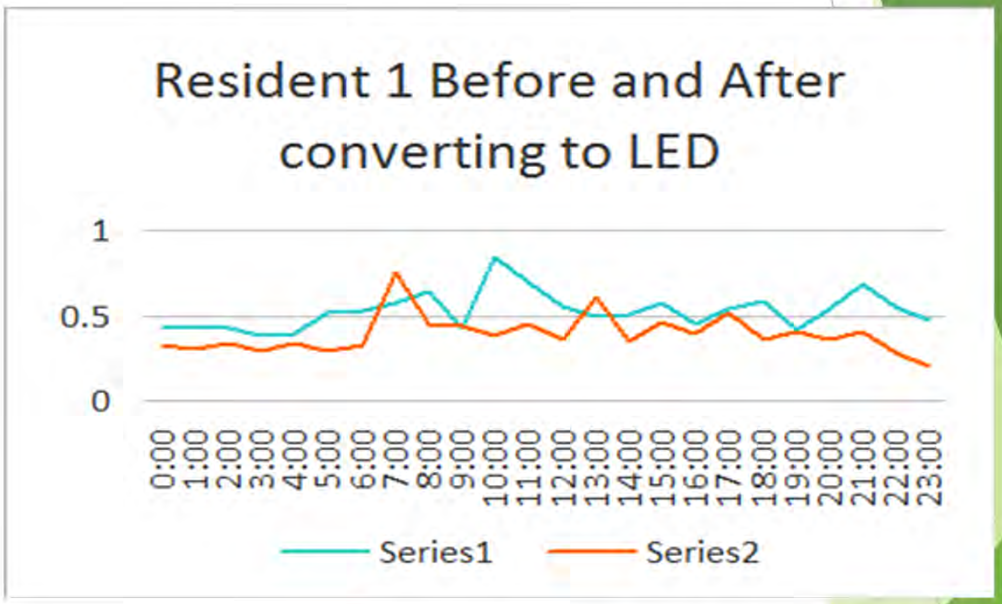


CIK Tribal Office's Energy Monitoring Data -Hourly

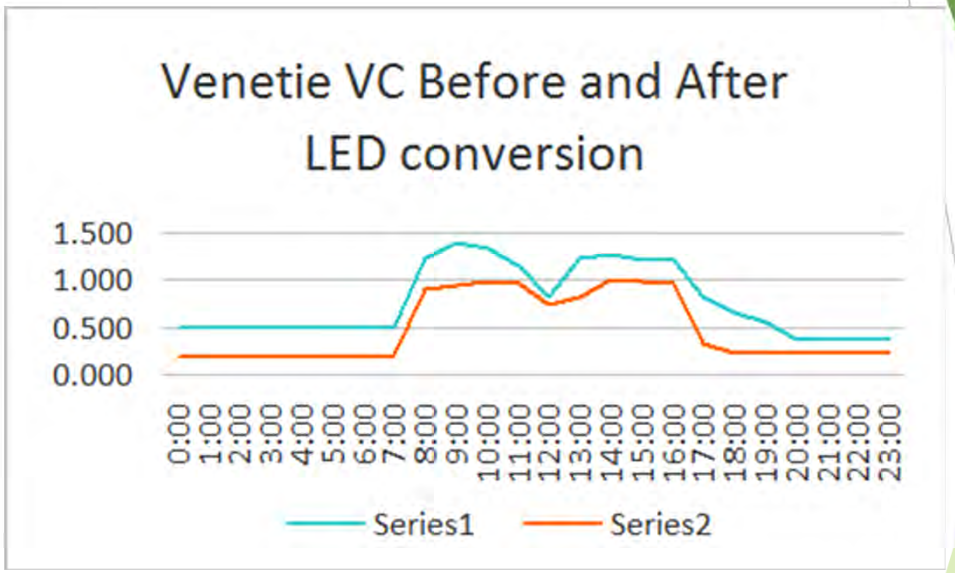
Time	KWH Before	KWH After
12:00 AM	1.41	1.546
1:00 AM	1.368	1.528
2:00 AM	1.366	1.513
3:00 AM	1.384	1.494
4:00 AM	1.328	1.517
5:00 AM	1.338	1.535
6:00 AM	1.337	1.525
7:00 AM	1.341	1.672
8:00 AM	1.354	2.224
9:00 AM	1.353	2.224
10:00 AM	1.28	2.224
11:00 AM	1.047	2.224
12:00 PM	1.041	2.179
1:00 PM	1.042	2.181
2:00 PM	1.062	2.085
3:00 PM	1.296	2.102
4:00 PM	1.308	1.977
5:00 PM	1.312	1.977
6:00 PM	1.351	1.977
7:00 PM	1.318	1.977
8:00 PM	1.325	1.977
9:00 PM	1.283	1.977
10:00 PM	1.294	1.821
11:00 PM	1.319	1.758
	1/11/2015	1/14/2015
	Series 1	Series 2



	Venetie Residential Household 1	
Time	KWH Before	KWH After
0:00	0.431	0.321
1:00	0.424	0.305
2:00	0.423	0.334
3:00	0.379	0.293
4:00	0.389	0.332
5:00	0.521	0.292
6:00	0.523	0.331
7:00	0.578	0.754
8:00	0.64	0.453
9:00	0.426	0.434
10:00	0.84	0.384
11:00	0.7	0.45
12:00	0.548	0.361
13:00	0.492	0.611
14:00	0.507	0.347
15:00	0.578	0.463
16:00	0.444	0.389
17:00	0.543	0.517
18:00	0.582	0.358
19:00	0.416	0.4
20:00	0.537	0.361
21:00	0.68	0.406
22:00	0.551	0.281
23:00	0.468	0.202
	Series 1	Series 2
	1/16/2015	1/19/2015



Venetie VC Hourly Energy Monitoring Data		
Time	KWH Before	KWH After
0:00	0.489	0.194
1:00	0.488	0.19
2:00	0.487	0.191
3:00	0.488	0.191
4:00	0.488	0.19
5:00	0.488	0.19
6:00	0.488	0.191
7:00	0.488	0.199
8:00	1.223	0.913
9:00	1.390	0.953
10:00	1.335	0.996
11:00	1.157	0.975
12:00	0.822	0.749
13:00	1.240	0.828
14:00	1.278	1.005
15:00	1.214	0.995
16:00	1.210	0.965
17:00	0.812	0.326
18:00	0.651	0.222
19:00	0.552	0.222
20:00	0.368	0.223
21:00	0.369	0.222
22:00	0.374	0.222
23:00	0.368	0.223
	Series 1	Series 2
	1/16/2015	1/19/2015

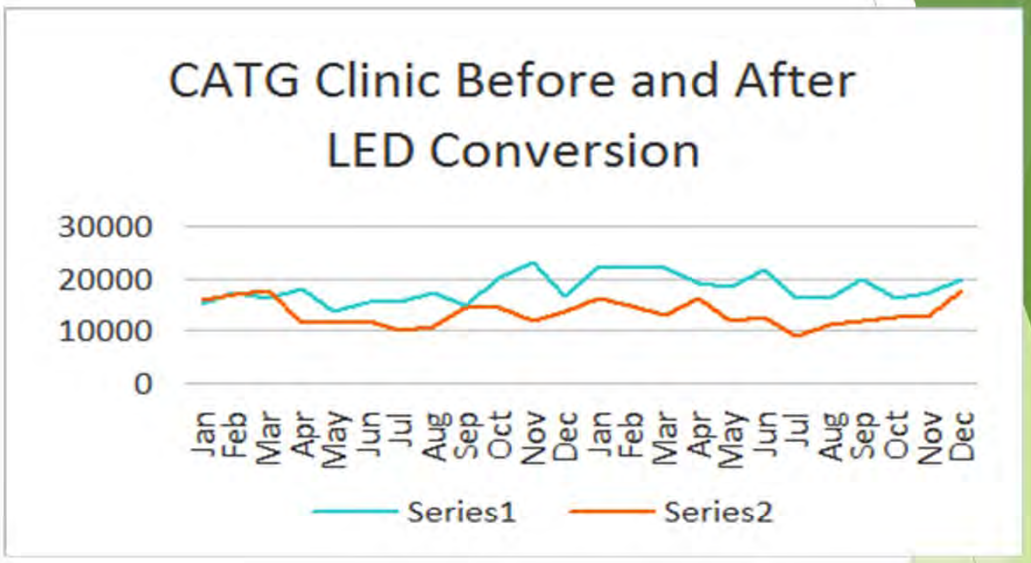


CATG Clinic Energy Use

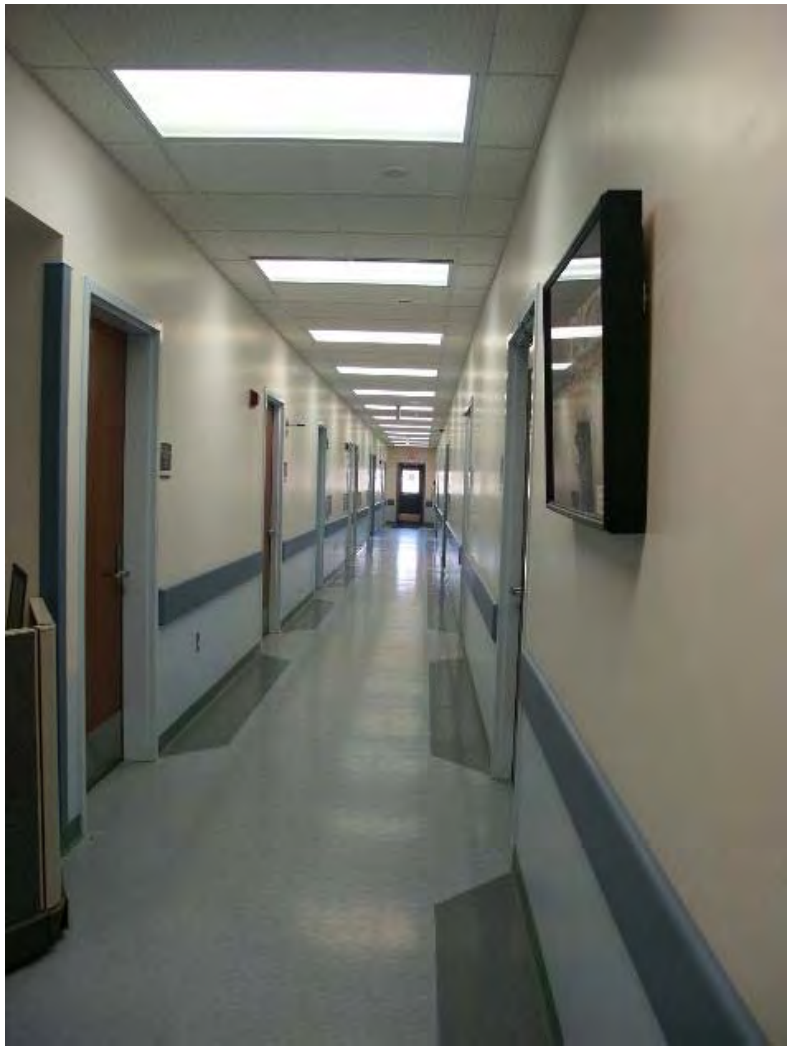
Month	KWH Before	KWH After
Jan	15110	15900
Feb	17334	16972
Mar	16108	17706
Apr	17955	11493
May	13780	11560
Jun	15480	11947
Jul	15608	10001
Aug	17287	10676
Sep	14874	14434
Oct	20368	14590
Nov	22984	11871
Dec	16513	13581
Jan	22392	16116
Feb	22109	14686
Mar	21936	13037
Apr	19215	16274
May	18325	11758
Jun	21519	12566
Jul	16210	8962
Aug	16248	11091
Sep	20027	11891
Oct	16131	12654
Nov	17333	13048
Dec	19738	17772

Series 1 Jan/11-Dec/12

Series 2 Jan/13-Dec/14



CATG Finance Department confirmed after reviewing past electrical bills that converting fluorescent lamps to LED lamps saved CATG Clinic close to $60,000/yr



A view of the hallway in the CATG Clinic in Fort Yukon, AK

CATG Clinic in Fort Yukon that serves 5 villages in the Yukon Flats Region

Challenges Faced During the Course of Demo Project Implementation

- A lot of times, things will not work as planned. You will have to make adjustments.
- Don’t assume that all wiring in a home was done by certified and qualified electrician. We had a situation where a local individual with very little experience wired a light fixture and I found out the hard way that the light fixture chassis was hot!
- Don’t plan a huge project if you don’t understand the financial commitment.

Recommendations for Similar Community Projects

- Hire an individual who is certified and qualified to do electrical wiring.
- Use proper electrical tools to ensure safe work environment and practice safe work ethics.
- Do a thorough assessment of light fixtures you will be rewiring. There are different types of light fixtures out there.
- Inventory material for project to ensure sufficient supplies and materials.
- Be prepared for unexpected events that can cause delays, don’t let this discourage you.

Acknowledgements

The Council of Athabascan Tribal Governments Natural Resources Department would like to acknowledge David Palunis-Messier with TCC Energy Dept., Zender Environmental Group, EPA, and Jacqueline Shirley for their financial support and technical assistance, developing a partnership that made this demonstration project possible.

Questions?

Cool Beans!