



Gwich'yaa Zhee Gwich'in Tribal Government

Gwich'in Solar and Energy Efficiency in the Arctic

Dept of Energy Tribal Energy Review
Golden, CO May 7th 2015

Tony Peter – GZGTG Tribal Council Member, Yukon Flats School District O&M Manager

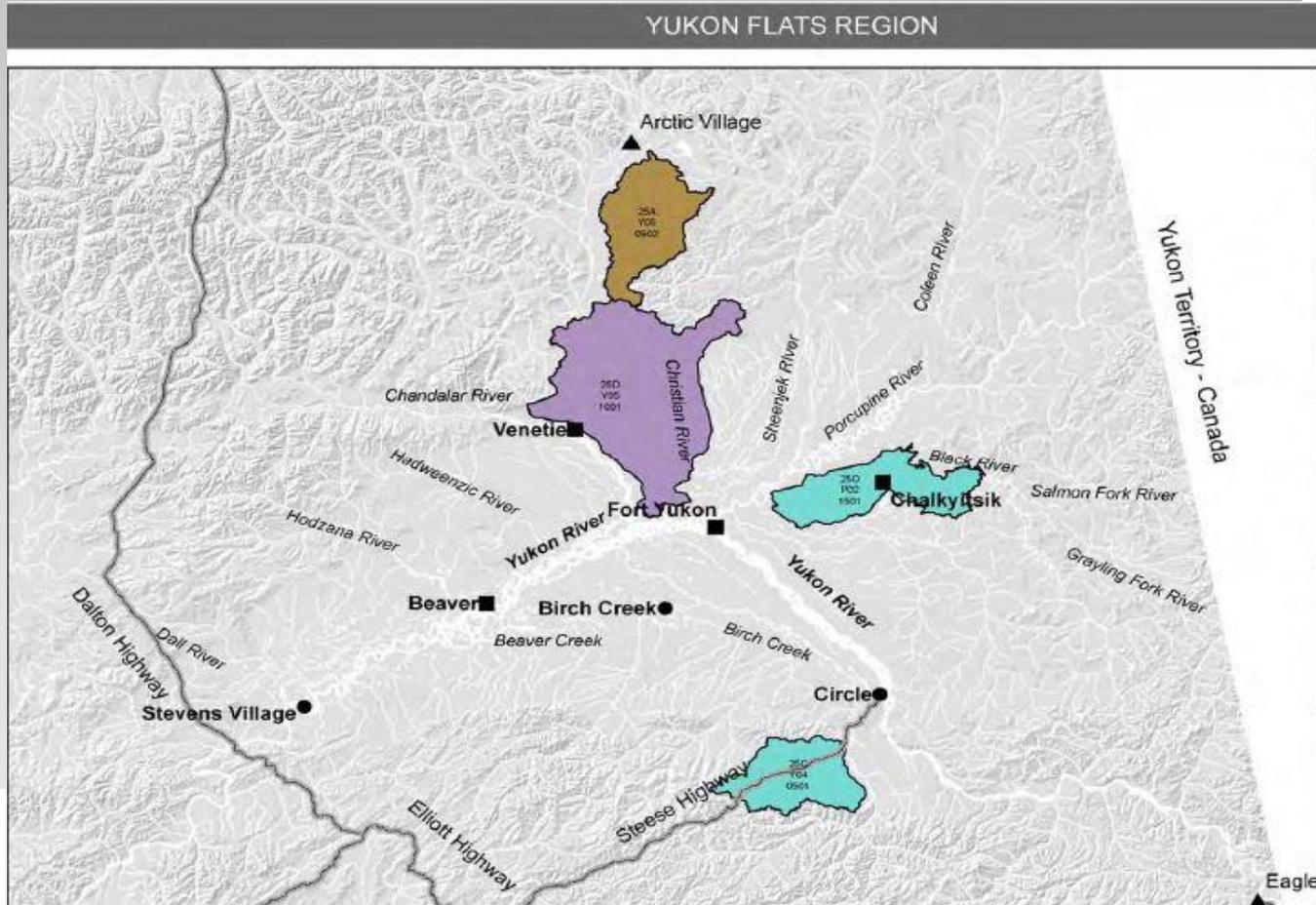
Dave P-M – Tanana Chiefs Conference, Rural Energy Coordinator



Yukon Flats

Yukon Flats Region:

- Arctic Village
 - \$10/gal
 - \$.8/kWh
- Venetie
- Circle
- Beaver
- Stevens Village
- Chalkyitsik
- Birch Creek





Gwichyaa Zhee Gwich'in Tribal Government (GZGTG)

Gwichyaa Zhee Gwich'in Tribal Government is a sovereign tribal government located in the Yukon Flats region of Alaska.

MISSION: "The Mission of the Gwichyaa Zhee Gwich'in Tribal Government is to exercise governmental authority to promote economic and social development, advocate and secure tribal rights, to secure tribal lands, to enhance educational opportunities and to protect traditional cultural values with a unified voice on behalf of our tribal members."





Gwichyaa Zhee Gwich'in Tribal Government (GZGTG)

Gwichyaa Zhee Gwich'in Tribal Government manages 17 full time employees over 10 different program areas:

- Indian Child Welfare Act Program (ICWA) Dept with 4 tribal judges
- Tribal Transportation Program
- Education & Employment Dept
- Elders Nutrition Program
- Environmental Program
- Tribal Housing Authority
- Natural Resources Dept
- Realty Dept
- Finance Dept
- Admin & Operations Dept

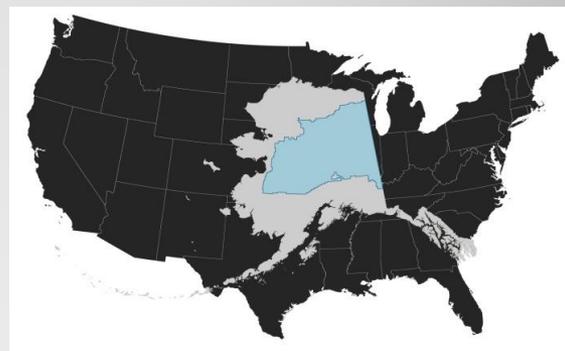




Fort Yukon Alaska



- Yukon Flats National Wildlife Refuge
- Population: 600
- Per Capita Income:
 - Fort Yukon: \$13,360/yr
 - State of AK avg: \$30,992
- North of the Arctic Circle
- GZ Corp owns 103,680 acres
- -78F record low +100F record high (178F deg temp range)





Fort Yukon Energy

**Some of the Highest
Energy Costs in the
Nation**

Electricity:

**\$.64/kWh (500% HIGHER
than the national avg of
\$.11/kWh)**

Heating Fuel:

**\$6.50/gal for diesel
\$300/cord of wood**

Transportation

\$7.50/gal for gas





Energy Challenges (OR Opportunities)

Electrical Use:

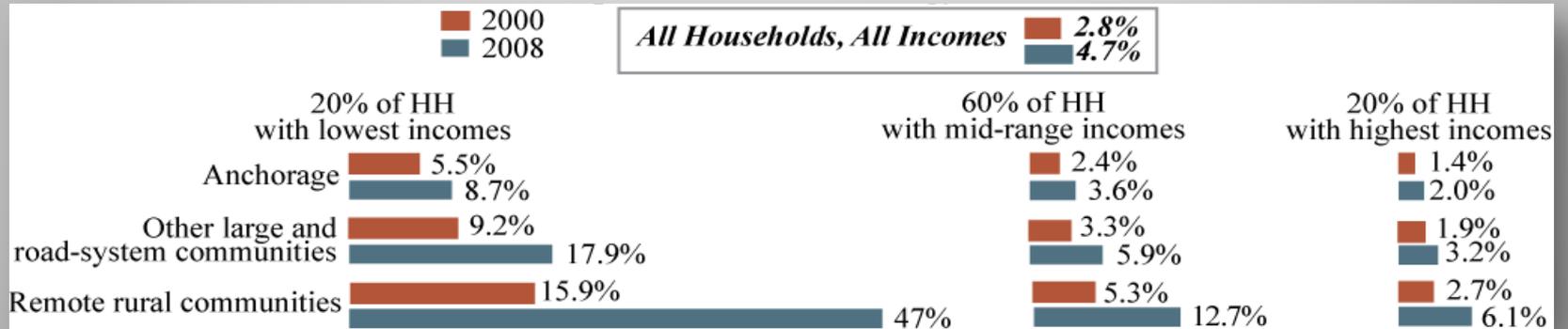
PCE report- In 2014 GZ Corporation, the local utility burned 188,090 gal of diesel for electrical production (\$1.1 million/yr)

Avg Efficiency: 14-16 kwh/gal of diesel

Fuel costs account for 80% of the cost/kWh



Estimated Median Share of Income Alaska Households Spend for Home Energy Use (ISER)

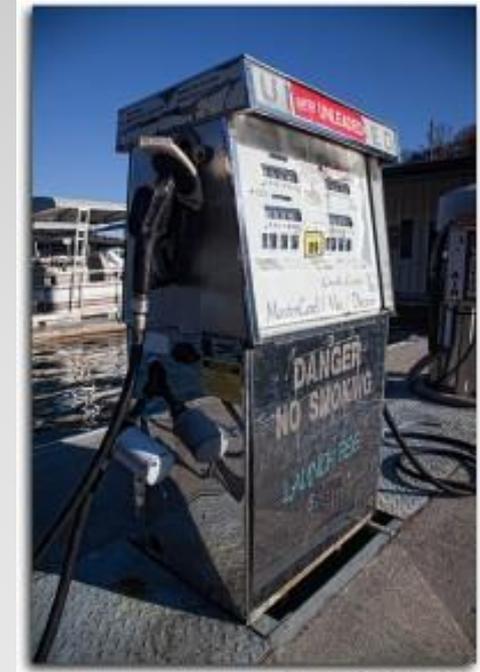




Energy Challenges

Transportation:

- **Effects on Subsistence Activities**
- **Increase cost of travel to/from villages**
- **Increases Cost of Goods in the Village**
 - **\$10/gal for milk average**





Lets Lead by Example in our community

Involving the School in Energy Savings

- **Future LED lighting retrofit?**
- **Educating Students**
- **More \$ for School Programs**





Project goals

- **Reduce the Gwichyaa Zhee Gwich'in Tribal government's dependence on imported diesel fuel to run Tribal Operations and Services**
- **To serve as a model of sustainability for our youth and our surrounding communities, so that they may follow where we have led**
- **To lower operating costs and improve economic sustainability of GZGTG**





TCC Region Energy Model

1. Collect Data & Plan!

2. Efficiency First

3. Renewable Energy
(BIOMASS! SOLAR!)



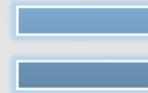
Energy Opportunities

Energy Savings Break-Down	Space Heating (Gal of Diesel)	Electricity (Kwh/Diesel)	Total Gallons of Diesel
Tribal Building Fuel Oil Consumption 2012	2,493gal	30,847kWh/2,387gal	4,880 Gal
Potential Reduction	786gal	19,805kWh / 1,533 gal	2,319 Gal
Potential \$ Saving	\$4,716	\$13,071	\$17,787/yr
Percentage Decrease in GZG Tribal Gov't Fuel Consumption	31.5% Reduction	65.2% Reduction from solar array and Lighting upgrade	48% overall <u>Reduction</u> in Fuel Use



EFFICIENCY FIRST -Attic Insulation

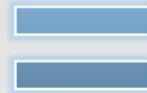
Space Heating Conservation:
BEFORE..





EFFICIENCY FIRST -Attic Insulation

Space Heating Conservation:
After...





EFFICIENCY FIRST -Attic Insulation

Space Heating Conservation:

- Additional Insulation in the Attic, currently R-21 → R-100

TCC RESOLUTION: "Buildings Financed with Public Money Shall Seek To Achieve the Following Efficiency Standards..."

- Roof: R-100
- Walls: R-70
- Floor/Slab: R-50

• Potential Savings:
786 Gal/yr
=\$5,100

Insulation Calculation WorkSheet

See information at NREL website: <http://energy.gov/energysaver/articles/estimating-payback-period-additional-insulation>

DIRECTIONS: CHANGE CELLS IN RED, SEE CHANGES IN YELLOW

	Years to Payback	=	Cost of Insulation \$/SqFt	X	Original Insulation (r-value)	X	Final Insulation (R-value)	X	Efficiency of heat source	/	\$/BTU	X	Change in Insulation	X	Heating Degree Days x24
Formula	Payback	=	C(i)	X	R(1)	X	R(2)	X	E	/	C(e)	X	[R(2)-R(1)]	X	HDDx24
DOE Example	5.62	=	0.18		19		30		0.88	/	9E-06		11		168000
Nenana	0.53	=	0.3		19		38		0.85	/	3E-05		38	X	338184
Fort Yukon	2.97	=	\$2.00	X	21	X	81	X	0.9	/	4E-05	X	60	X	384000
	YEARLY SAVINGS PER 1000 SQ FT						\$673.88								
	50 YEAR SAVINGS PER 1000 SQ FEET:						\$33,693.96								
	MATERIAL COST PER 1000 SQ FT:						\$2,000.00								
	EST YEARLY FUEL SAVINGS PER 1000 SQ FT:						112								
	EST YEARLY FUEL SAVINGS FOR 7000 SQ FT:						786								

Cost of Fuel \$/gal:	\$6.00
Heating Degree Days	16000
Original R-Value	21
New R-Value	81
\$/sq Ft Insulation	\$2.00

Heating Degree days available Via: <http://www.huduser.org/portal/resources/UtilityModel/hdd.html>



LED Lighting Retrofit

LED lighting Retrofit:

Convert Existing t8 lighting fixtures to 17 watt LED





LED Lighting Retrofit

LED lighting Retrofit:

- Convert Existing t8 lighting fixtures to 17 watt LED
- Total Yearly Electrical Savings: \$3,088

Client Name Gwichyaa Zhee Gwich'in Tribal Government
 Address: 3rd and Alder St Fort Yukon, AK 99740
 Attn: Walter Peter Jr. GZGTG Housing Director

Lighting Payback

Average Utility Rate (\$/kWh)	0.66	Material Cost Per fixture:	\$69
kW Demand Charge:	0	Labor cost/hr:	\$0
Billing Category:	GS-2	Bulbs/hr:	1
Typical Hrs/week lights are on	50	Average LED life expectancy (hrs):	50,000
# of bulbs being replaced:	120		
Wattage of current bulb	32		
Wattage of LED bulb	17		

NOTE CHANGING ANY OF THE PARAMETERS ABOVE THIS LINE WILL EFFECT THE ENTIRE SPREADSHEET

LED light Savings

Current Lighting

kw	\$/kWh	\$/bulb/hr	# bulbs	Hrs/yr	kWh Use	Total Cost/yr
0.032	0.66	0.02112	120	2,600	9984	6589.44

LED replacement Lighting

kw	\$/kWh	\$/bulb/hr	# bulbs	Hrs/yr	kWh Use	Total Cost/yr
0.017	0.66	0.01122	120	2,600	5304	3500.64

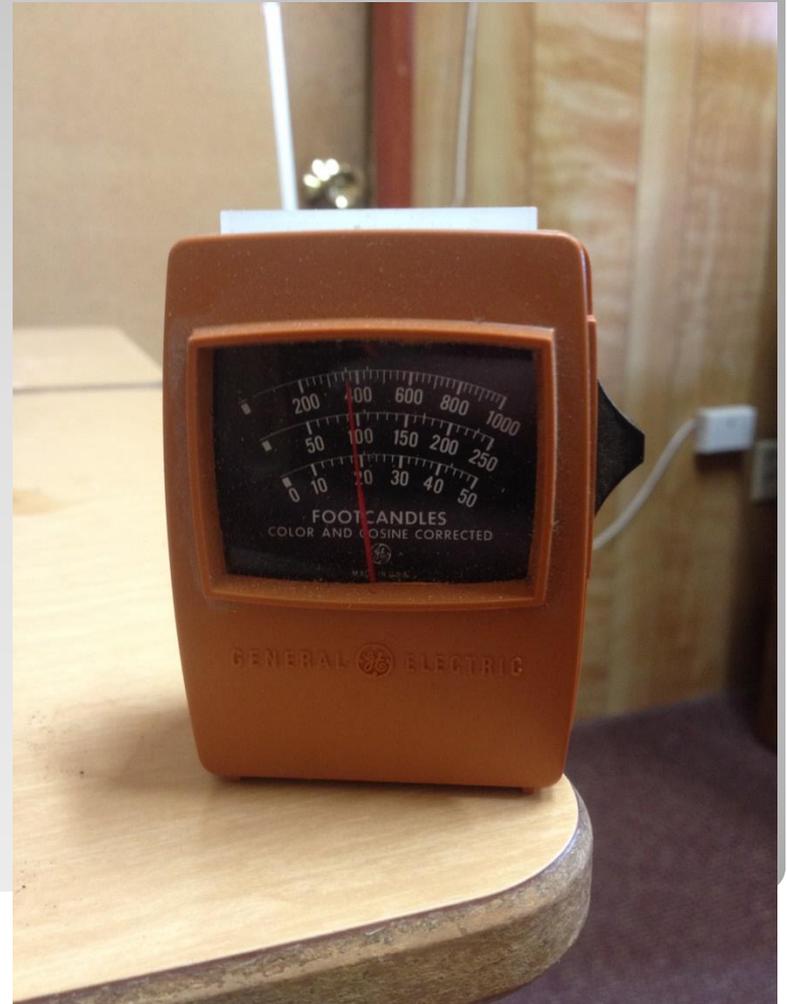
Total Yearly Electrical Savings:	\$3,088.80
Payback on bulbs (yrs):	2.67
Lifetime Savings:	\$51,144.00
Yearly kWh Savings:	4680



LED Lighting Retrofit

LED lighting Retrofit:

- Foot Candle Improvement at work height
- Easy to install!





Everyone Still With Me?





18 kW Solar PV Array On Tribal Office

Collect Data and Plan – 6 mo/yr with no Electric Bill?

Tribal Office Energy Use

Fort Yukon kWh use						
Admin	2013		Admin	2014	Admin	2015
kWh	Cost		kWh	Cost	kWh	Cost
3219	2,099.79		2379	1527.4	1703	1138.71
3357	2,181.68		2564	1631.42	2500	1595.88
2199	1494.56		3495	2155.46	2103	1372.58
3079	2016.72		3683	2260.61	2152	1400.14
2058	1410.9		1812	1202.95		
2622	1745.55		1970	1295.53		
2635	1753.29		2778	1752.23		
2241	1519.5		2284	1474.38		
1940	1339.1		2039	1336.59		
2137	1457.8		2391	1534.57		
2256	1528.39		2513	1603.19		
2476	1581.38		2744	1733.12		
30219	20,128.66		30652	19507.45		

PV Watts Est. Production

Month	Solar Radiation (kWh / m ² / day)	AC Energy (kWh)	Energy Value (\$)
January	0.67	355	227
February	2.09	971	621
March	4.01	1,998	1,279
April	5.11	2,434	1,558
May	4.7	2,340	1,498
June	4.93	2,351	1,504
July	4.8	2,250	1,440
August	4.27	1,938	1,240
September	3.28	1,463	936
October	1.95	944	604
November	0.99	490	313
December	0.35	184	118
Annual	3.1	17,718	\$11,338



18 kW Solar PV Array On Tribal Office

PV Watts

- Est: 17,718 kWh/yr of electrical production
- \$3.5 - \$4/watt installed → ~\$2.5/watt equipment, \$1-1.5/watt labor + shipping
- Estimated yearly electrical offset: \$11,338





18 kW Solar PV Array On Tribal Office





18 kW Solar PV Array On Tribal Office

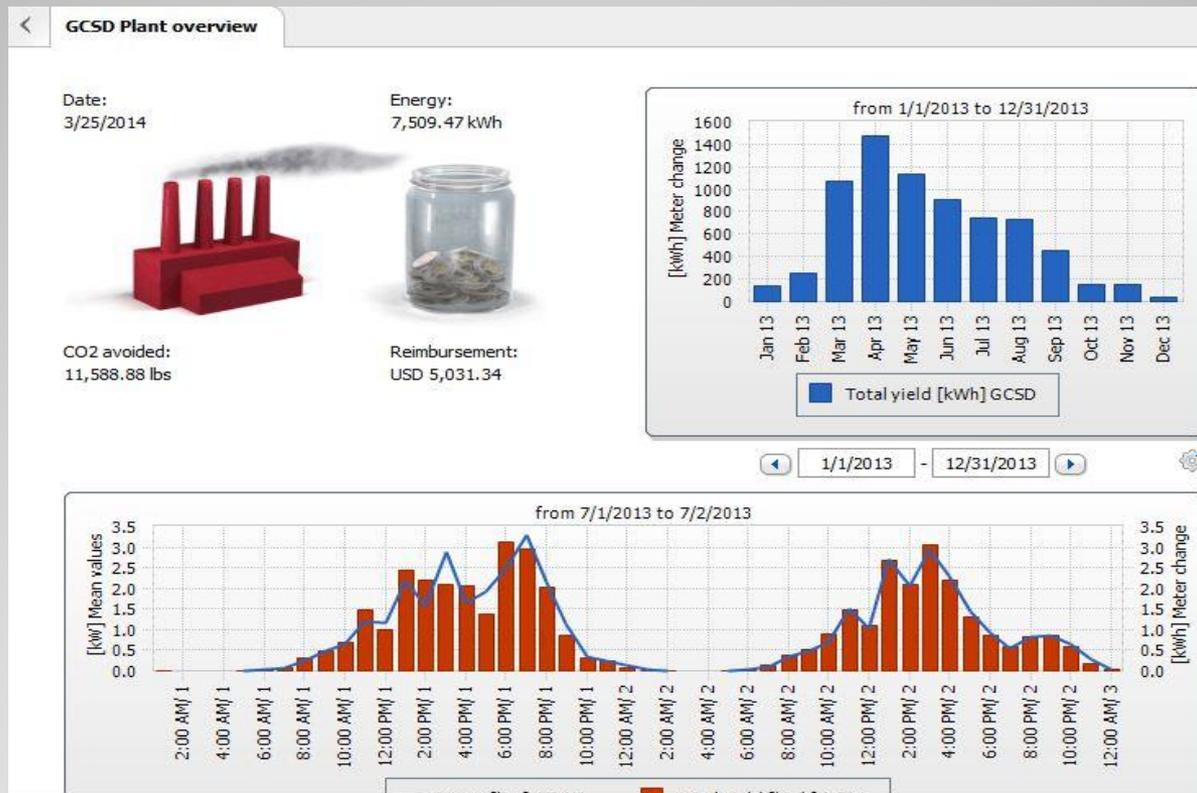
100% Local Labor (Plus Dave)





18 kW Solar PV Array On Tribal Office

Education and Outreach



“...If you don’t got data, you don’t got nothin”



18 kW Solar PV Array On Tribal Office

Education and Outreach



The Energy Avengers... and Future Energy Avengers...



3.4 kW Solar PV with

Gwichyaa Zhee Gwich'in Tribal Government Passive Solar Greenhouse

Fort Yukon Greenhouse Phase 1

Original Site



Foundation Work



Shell is UP





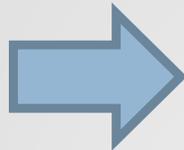
Main Take-Aways

“We cannot solve our problems with the same thinking that we used when we created them”

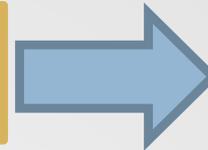
-A. Einstein-

1. **Local/Cheaper Energy → Sustainable Communities**
2. **Energy is Expensive, Cheaper to Conserve than to Produce**
 - LED lighting
 - Insulation is SEXY
 - Always share the information with youth and project partners
3. **Renewables are only a part of the solution**

1. Collect
Data and
Plan



2. Efficiency
First



3.
Renewable/Local
Energy



Contact Information

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