



# Gwich'yaa Zhee Gwich'in Tribal Government

## Gwich'in Solar and Energy Efficiency in the Arctic

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Dept of Energy Tribal Energy Review  
Denver, CO Nov. 16<sup>th</sup> 2016

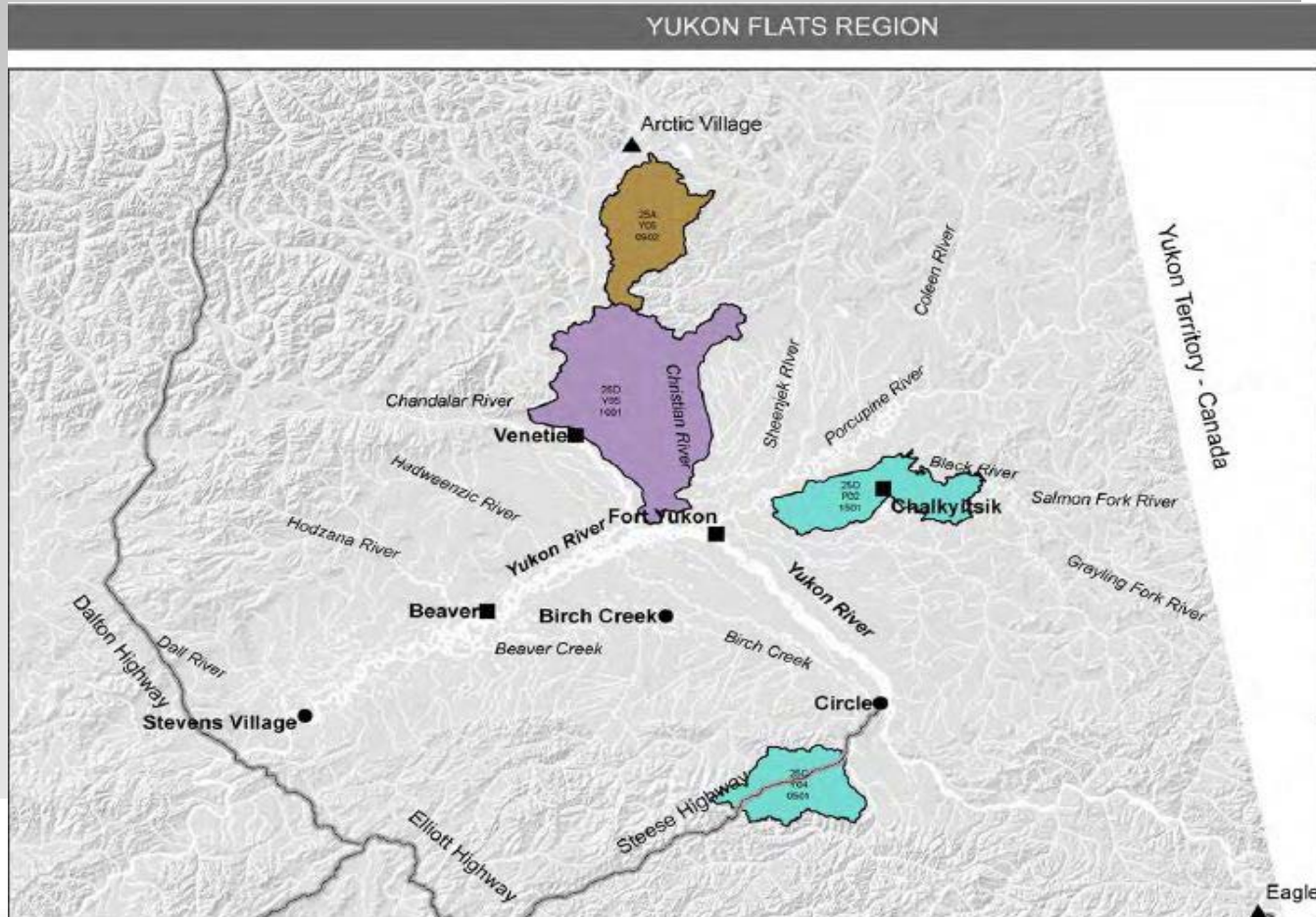
Dave Messier – Tanana Chiefs Conference, Rural Energy Coordinator on behalf of  
Gwich'yaa Zhee Gwich'in Tribal Government



# 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 Energy

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

**Electricity:**

**\$.66/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)

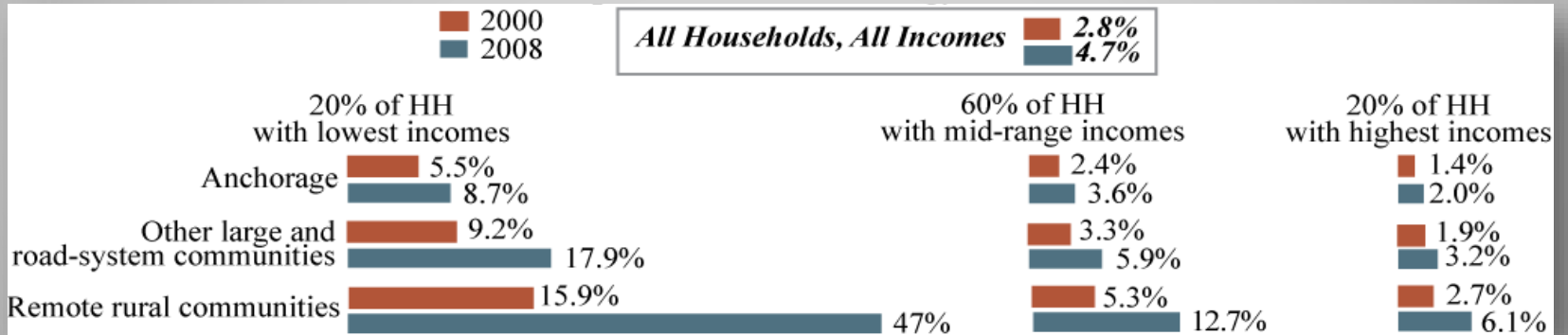
## Electrical Use:

PCE report- In 2015 GZ Corporation, the local utility burned 204,218 gal of diesel for electrical production (\$1.2 million/yr)

Avg Efficiency: 13.31 kwh/gal of diesel  
 Fuel costs account for 73% 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







# 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



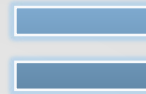
# Project Components

<u>Components</u>	<u>STATUS</u>
1. Install 18kW solar PV array on tribal office	COMPELTED
2. Increase insulation throughout the tribal office attic	COMPLETED
3. Replace inefficient florescent lighting with LED lights	COMPLETED



# EFFICIENCY FIRST -Attic Insulation

**Space Heating Conservation:**  
BEFORE..

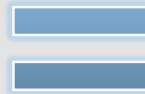






# EFFICIENCY FIRST -Attic Insulation

**Space Heating Conservation:**  
After...





# 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

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

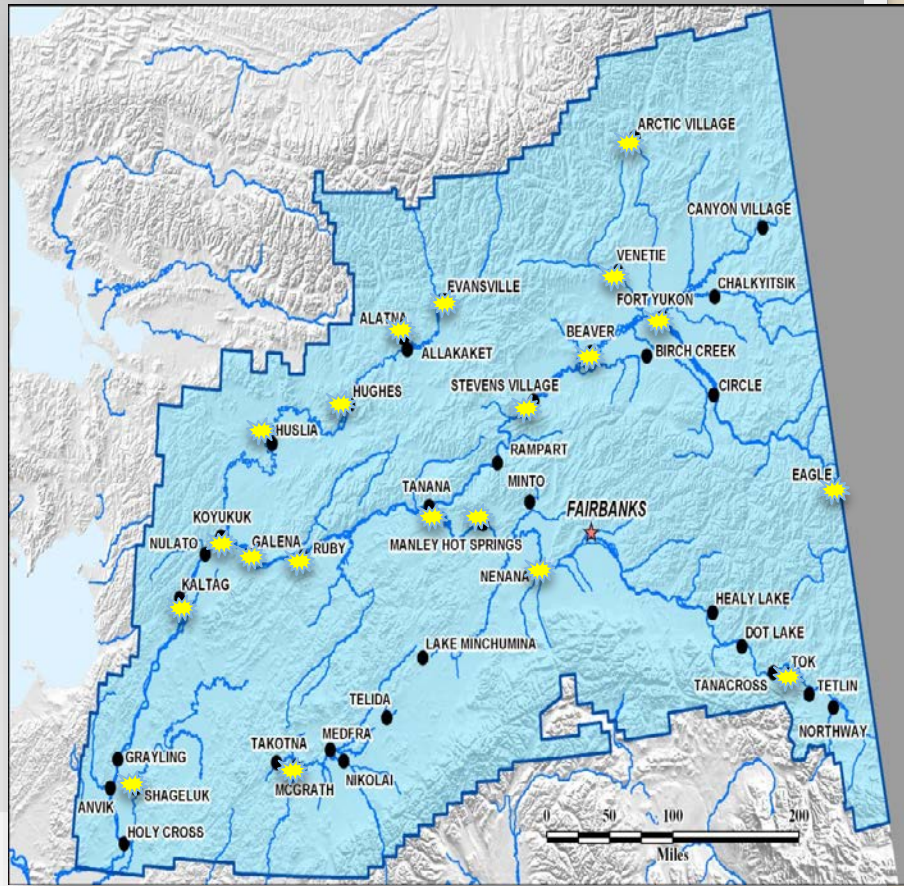
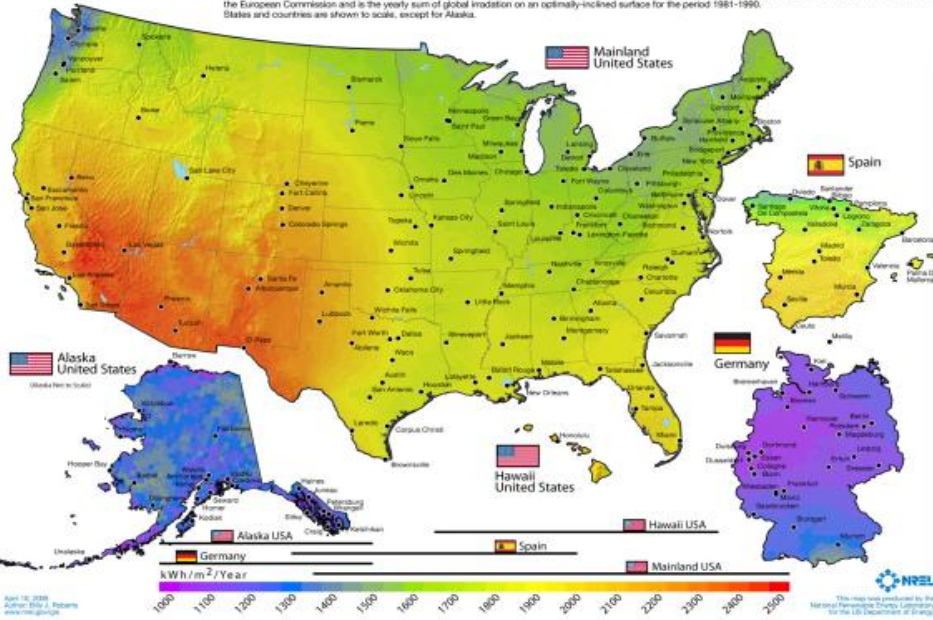




# Solar in Alaska Vs. Germany

## Photovoltaic Solar Resource: United States - Spain - Germany

Annual average solar resource data are for a solar collector oriented toward the south at a 33° local latitude. The data for Hawaii and the 48 contiguous states are derived from a model developed at SUNY/Albany using geostationary weather satellite data for the period 1998-2005. The data for Alaska are derived from a 40-km satellite and surface cloud cover database for the period 1985-1991 (NREL, 2002). The data for Germany and Spain were acquired from the Joint Research Centre of the European Commission and is the yearly sum of global irradiation on an optimally-inclined surface for the period 1981-1990.



April 18, 2008  
Author: Bill J. Roberts  
www.nrel.gov

This map was prepared by the National Renewable Energy Laboratory for the U.S. Department of Energy.





# 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

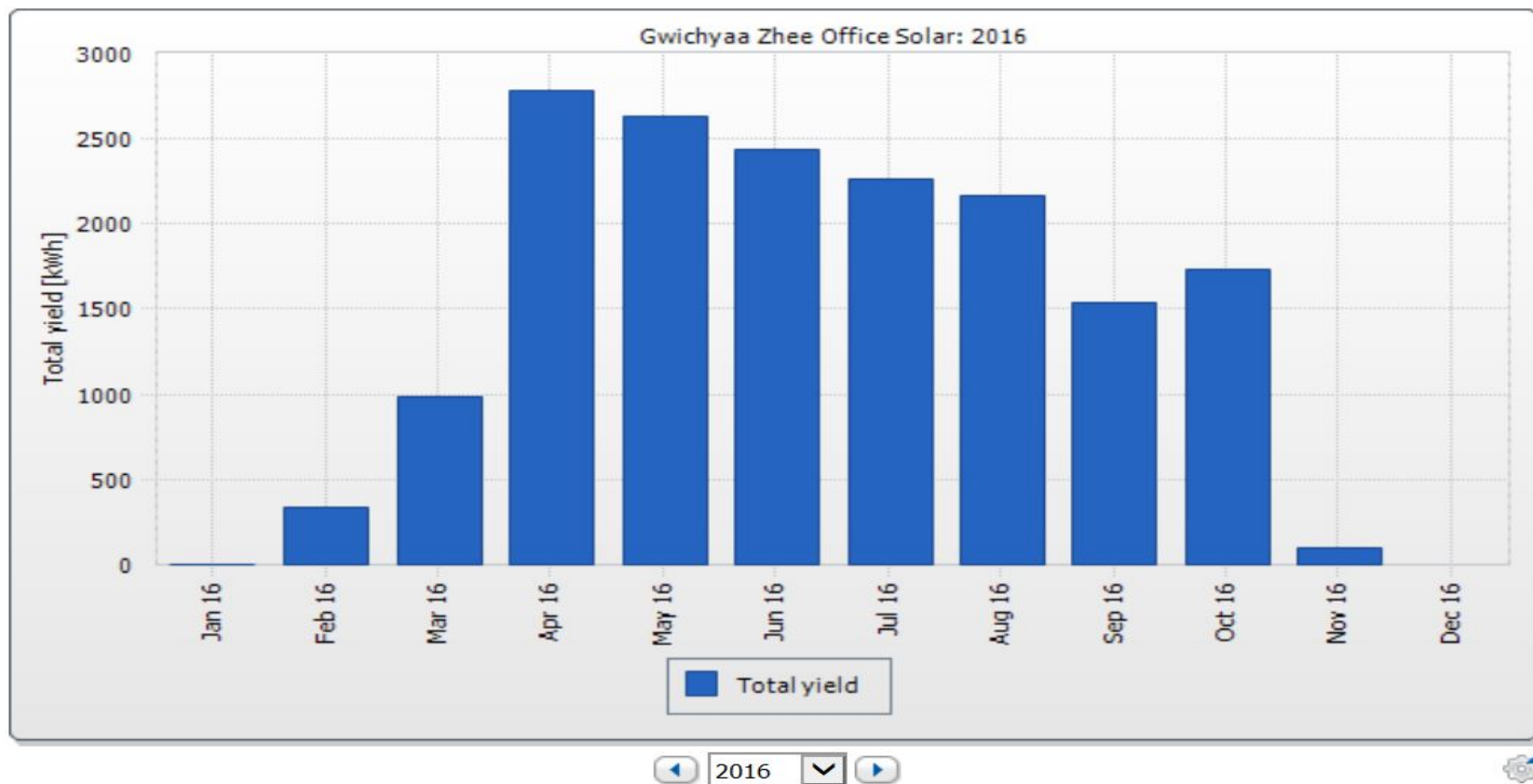
## PV Watts

- Est: 16,890 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

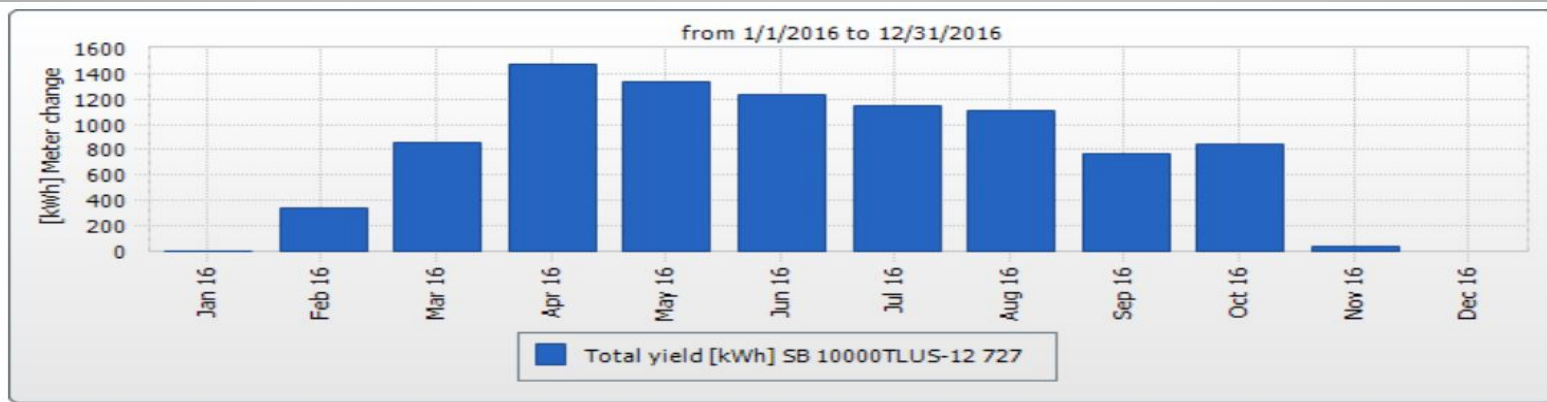


“...If you don't got data, you don't got nothin”

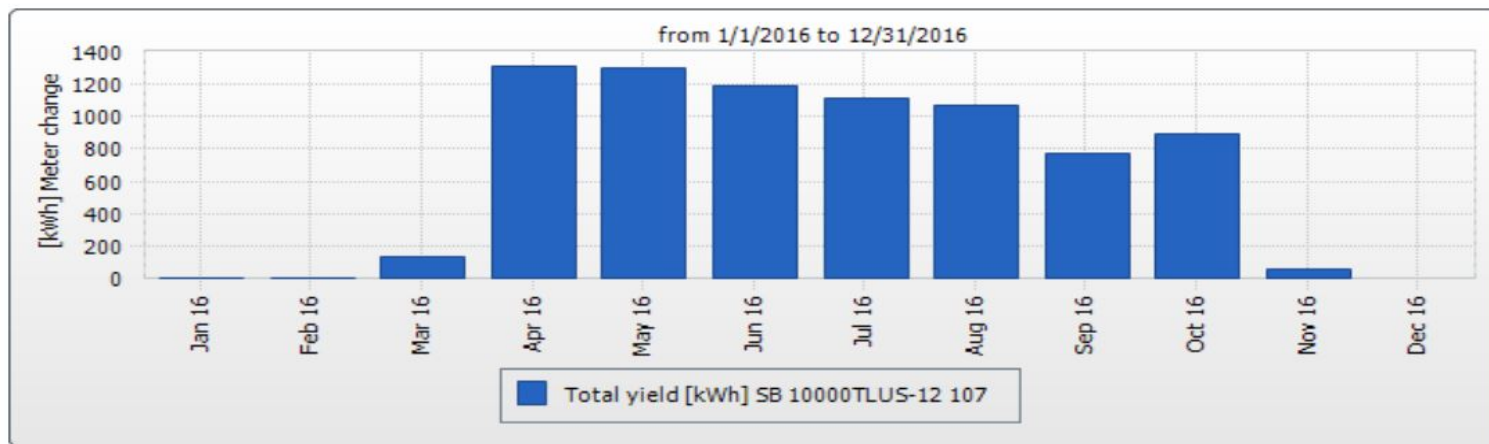




# Why the difference between inverters? (~1000kWh per year)



1/1/2016 - 12/31/2016

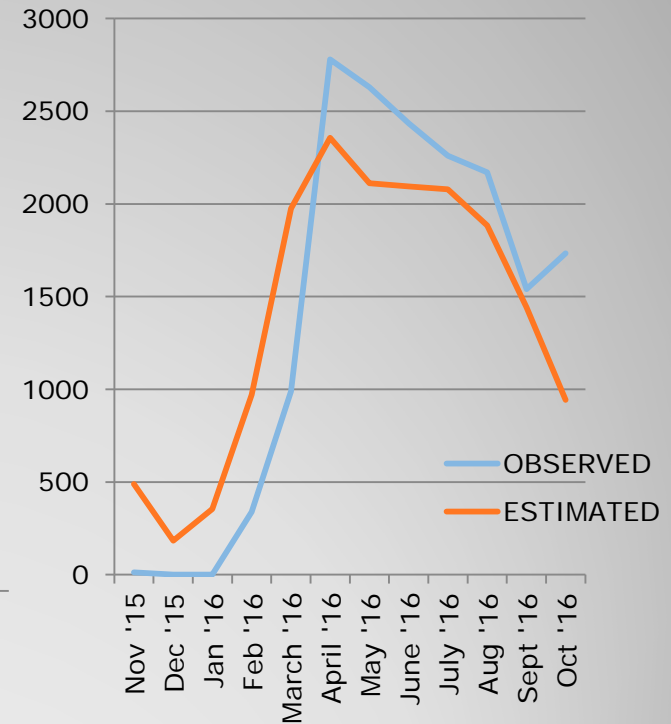
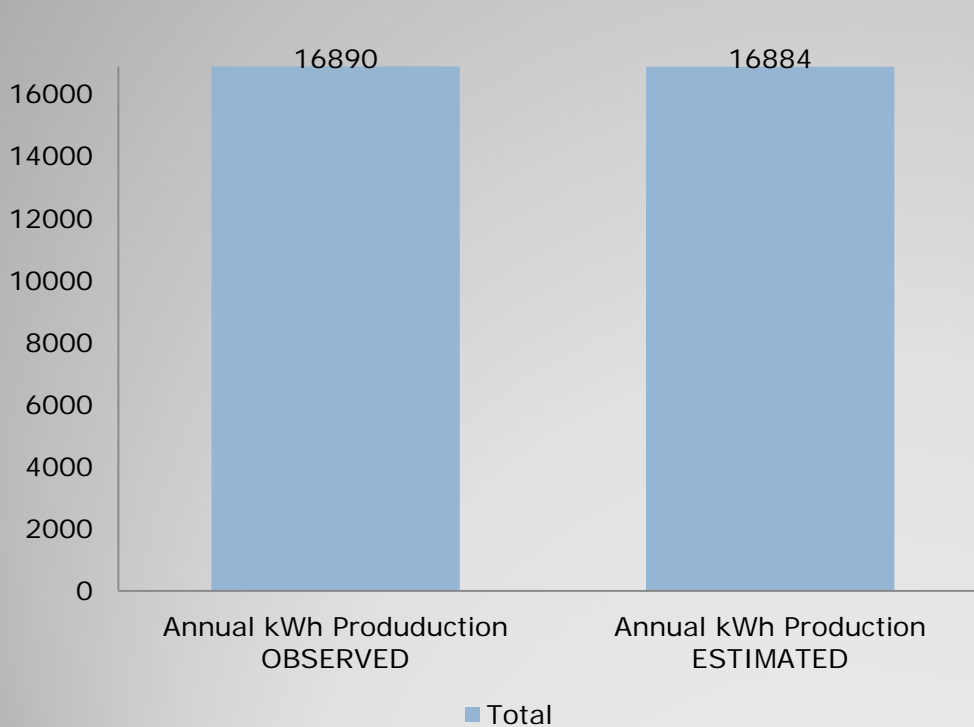


1/1/2016 - 12/31/2016





# 18 kW Solar PV Array On Tribal Office



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



# 18 kW Solar PV Array On Tribal Office

## RESULTS:

### Tribal Office Energy Use

#### BEFORE

Average Electrical Cost '13- '14: \$19,927

Heating Fuel Used '13: 2,098 gal

#### AFTER

Electrical Cost '16 (Nov/Dec Estimated): \$6,416

Heating Fuel Used '16 (Estimated): 1,200 gal

**ELECTRIC COST**

**68%**



**Fuel Use 35%**





# Outreach to Students

## Education and Outreach



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





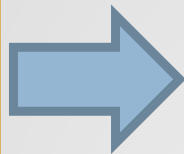
# Main Take-Aways

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

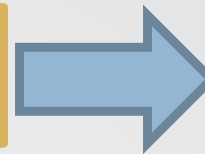
-A. Einstein-

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, but hey, this stuff works well!**

1. Collect  
Data and  
Plan



2. Efficiency  
First



3. Renewable/  
Local Energy



# Contact Information

**Mahsi Cho! (Thank you!) Dept of Energy!**

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Tanana Chiefs Conference  
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907-452-8251**

