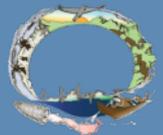


# Sustainable Solar Energy for Hughes Village Council, Hudotl'eekkaakk'e Tribe

A project to increase energy security and tribal resiliency in Hughes Alaska

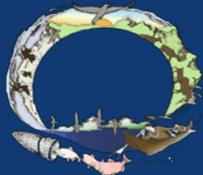
**Dave Messier**  
**TCC Rural Energy Coordinator**



Tanana  
Chiefs  
Conference

# Hughes, Alaska

- Koyukon Athabascan community
- 210 Air miles northwest of Fairbanks
- Fly in Only for Fuel using DC4's built in the 50's and 60's



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# Hughes, Alaska – Community Vision

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“We are a community who value their subsistence way of life, our children and elders, and our healthy lifestyles. We will take direction from our elders through hands-on learning and story-telling. We are preparing our next generation to continue our work. We approach our work with open minds and open hearts and the intention to build a community that is designed by its members to be a place safe from floods and reflective of our values and our lifestyles. We are continuously seeking a higher quality of life “

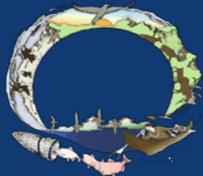


# Community Planning Progress

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Community Planning Initiated in 2002, Successes:

- Construction of new teacher clinic (Completed)
- Construction of outdoor basketball court (Completed)
- VHF Radios for residents (Completed)
- Completion of a new landfill (Completed)
- Biomass Heating Project (Completed)
- Reduce Reliance on Imported Diesel fuel for electric generation (ongoing, Thanks DOE!)

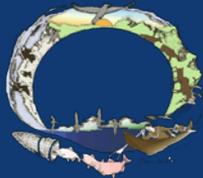
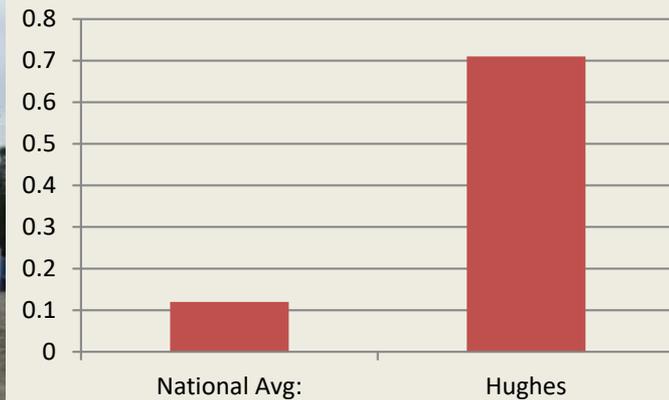


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# Where does YOUR Electricity come from?



\$/kWh Hughes Vs. National Avg

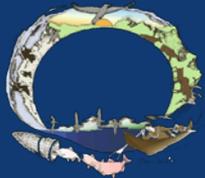
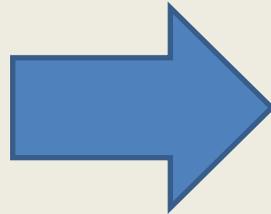


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# The Challenge?

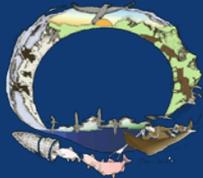
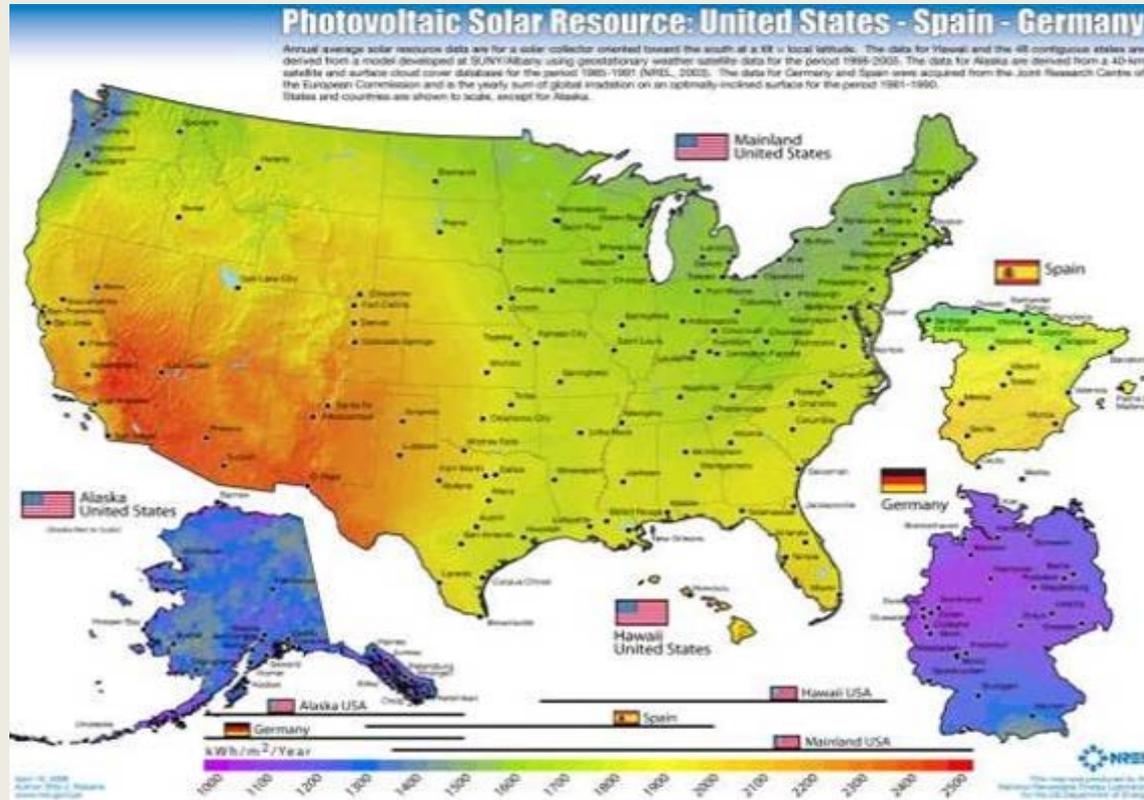
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How do we get Hughes from  
HERE... To ...HERE



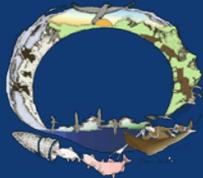
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# But wait a sec, I thought Alaska didn't have much sun?



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Did we mention the DC 4's...

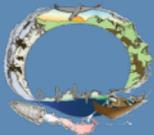


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# Renewable Portfolio Standard

## Renewable/Efficiency Portfolio Standard:

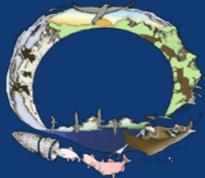
**“NOW THEREFORE BE IT RESOLVED** that the city of Hughes, Alaska and the Hughes Tribal Council recognize the importance of communities working together to improve their energy situation...[and] that these entities choose to establish a goal of 50% diesel displacement in our community by the year 2025....meaning that 50% of the electricity generated and sold by the local utility will be from renewable energy sources”



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*“Stronger Together  
for the Next 100 Years”*

# Hughes Plant Operators and Gensets

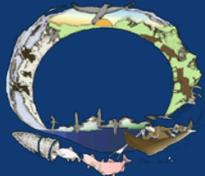


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# Project Goals

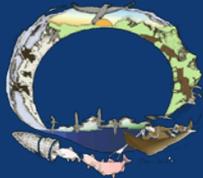
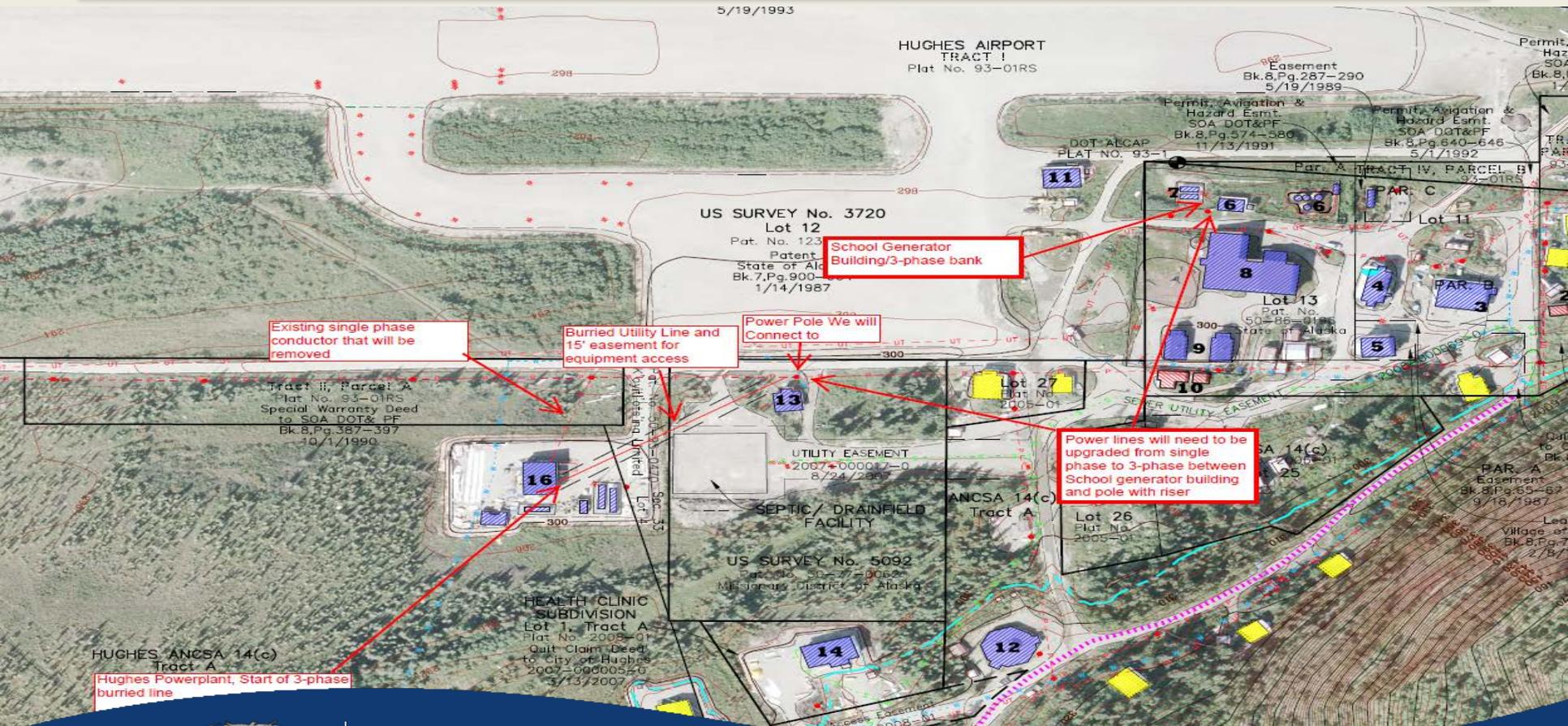
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1. Increase Tribal Energy Security and Resiliency
2. Development of a replicable PV-Diesel hybrid electrical system that can be deployed in other villages
3. Implement a financial model that allows tribal ownership, reduces energy costs and does not negatively effect the PCE contribution to electric rates



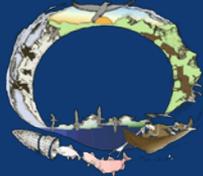
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# Community Wide 3-phase Upgrade



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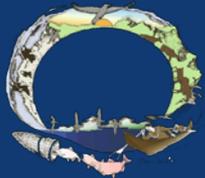
# Community Wide LED Lighting Upgrade



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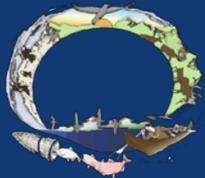
# Site of Solar PV Array

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# Site of Solar PV Array last year

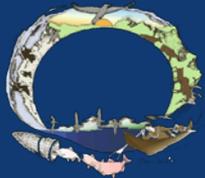


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# Solar PV Array



Oct 30<sup>th</sup> 2018 Hughes, AK North of the Arctic Circle

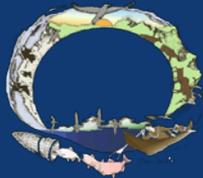


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# Summer 2019 Wiring PV Panels



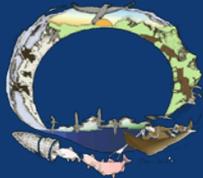
***Hughes PV Array Panels-Inverter \$2.10/watt***



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# Logistics...



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# Project Logistics

Material Cost of Racking and Solar PV Panels: \$102,000

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Cost of Shipping: \$15k SEA → Nenana + \$15k Nenana → Hughes

Racking From Ohio →

Trucked to SEA →

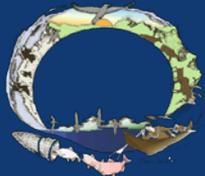
Barged to ANC →

Trucked to NEN →

→ Barged 450 miles down the Yukon Tanana and Yukon River and 400 miles up the Koyukuk River

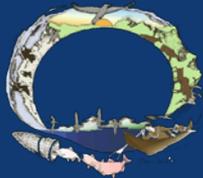
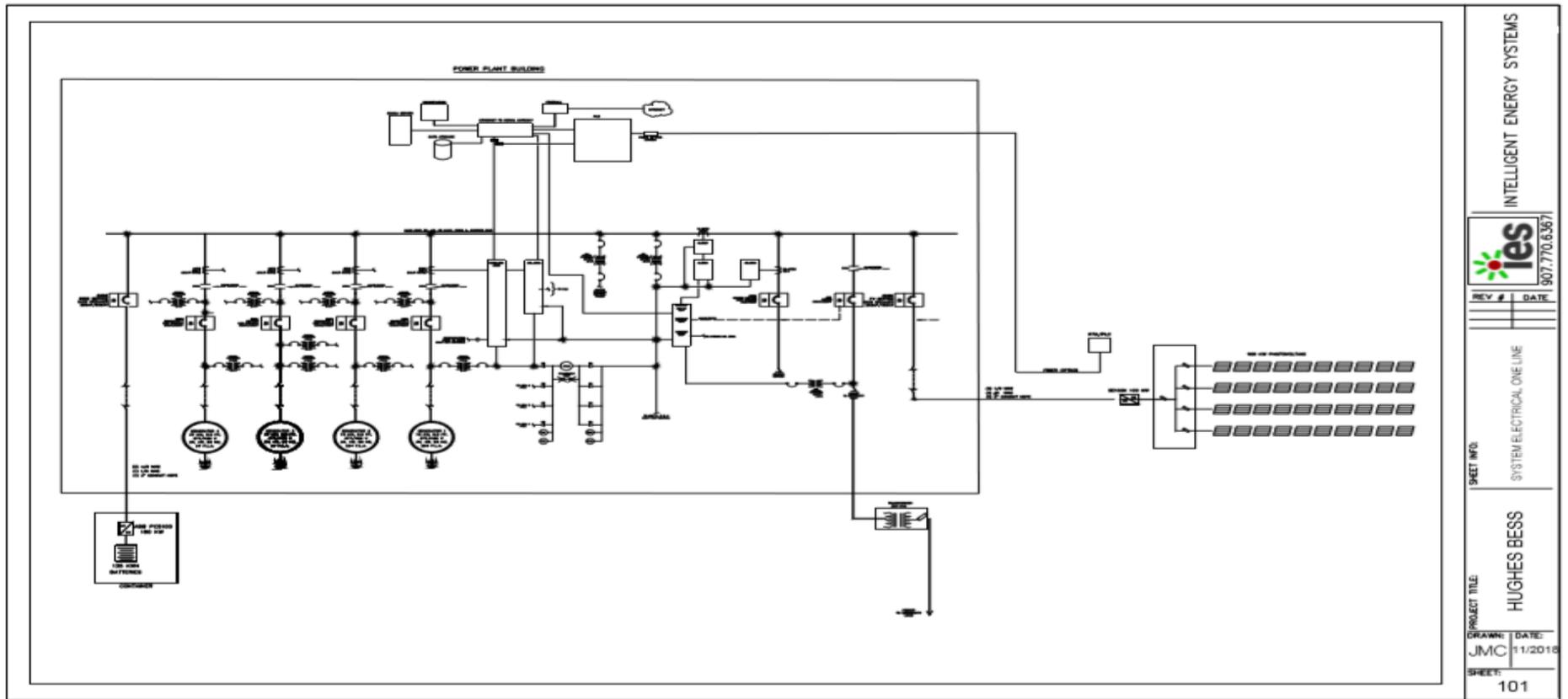
Installed Cost w/shipping: \$2.10/watt

Installed Cost w/out shipping \$1.84/watt



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# Micro Grid Control Package



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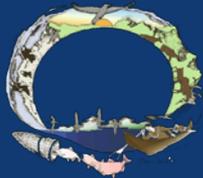
# ABB E-Mesh 250/335

MICROGRID AND ENERGY STORAGE SOLUTIONS

## **e-mesh™ PowerStore™ Integrated 250/500** Energy storage with a compact footprint

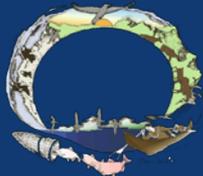
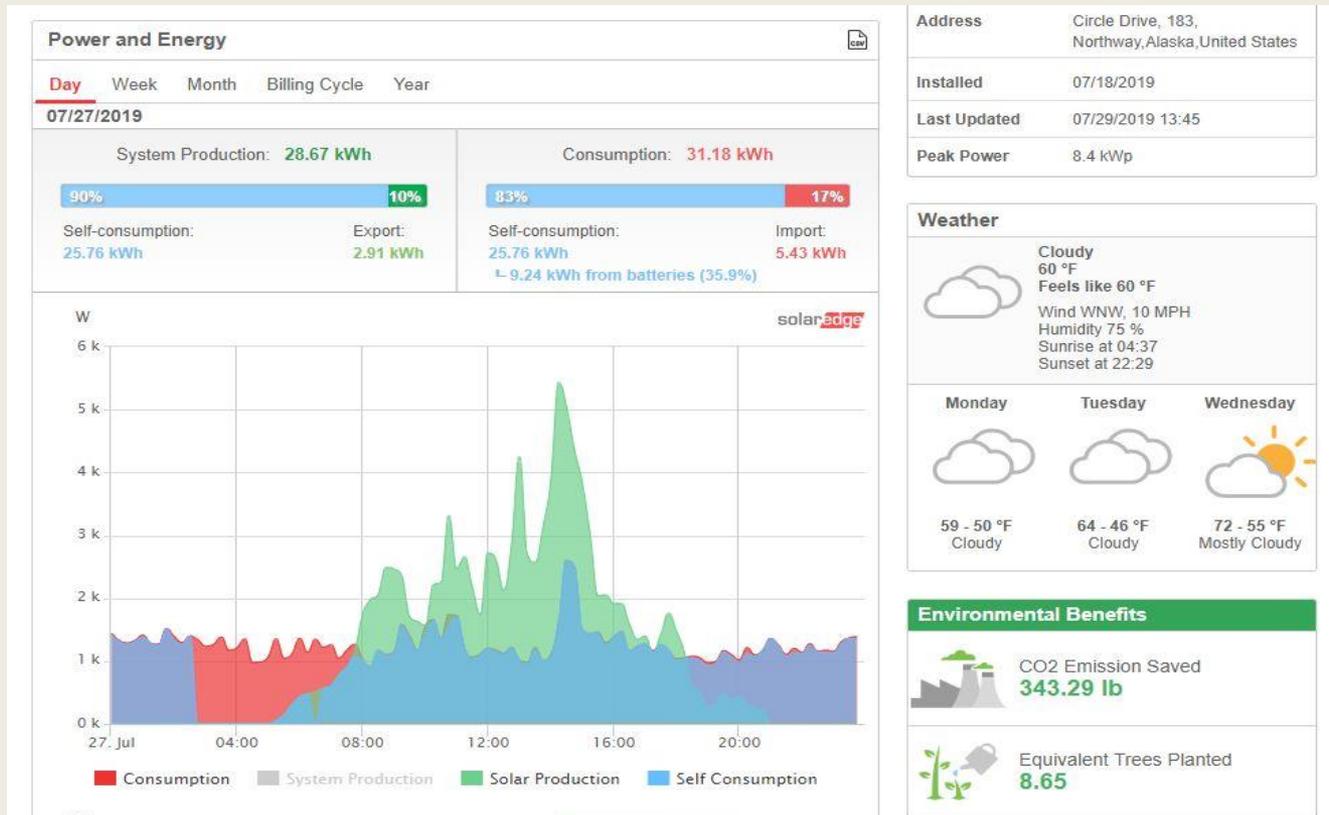


e-mesh™ PowerStore™ Integrated 250/500, is ABB's latest battery energy storage solution that helps ensure power reliability and availability, grid stability, and the integration of renewable energy enabled by advanced automation technology.



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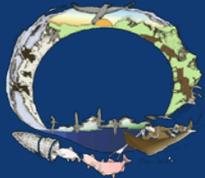
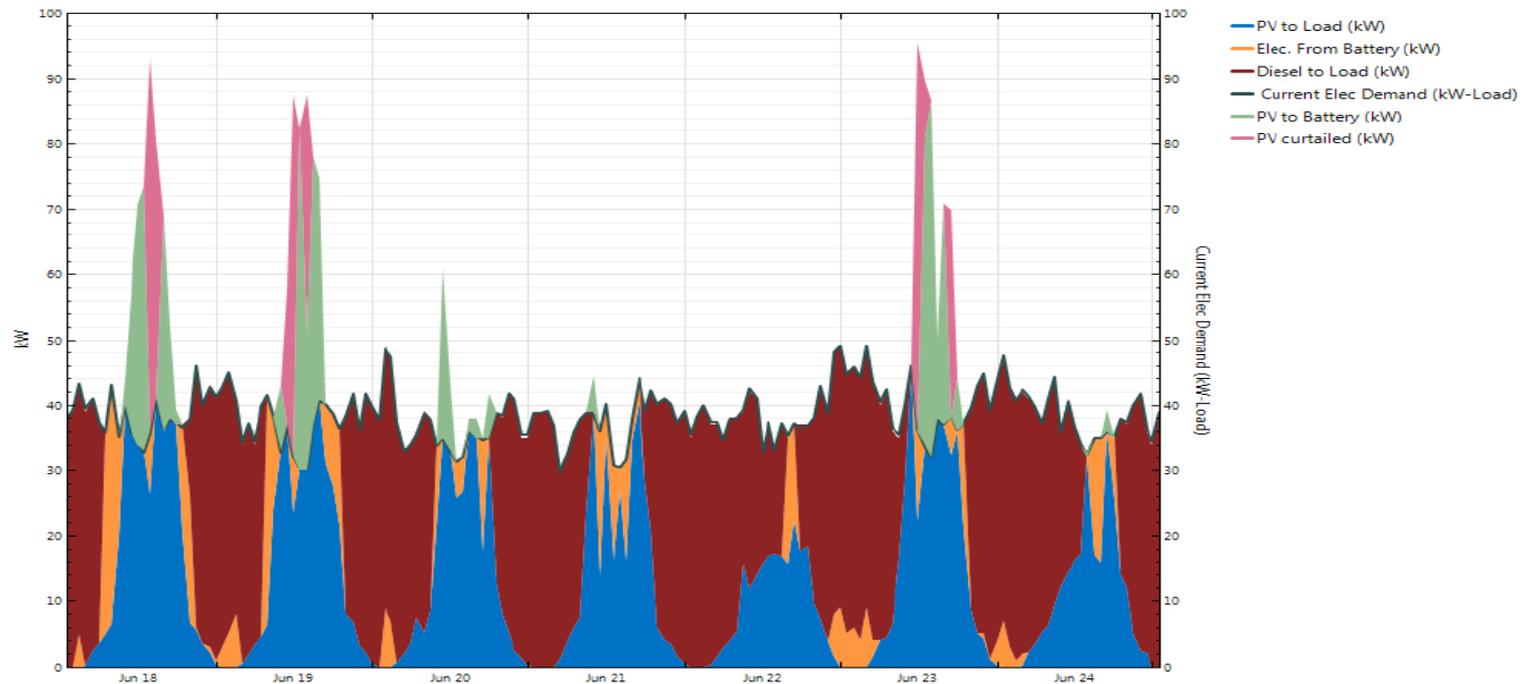
# Example from Northway



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# NREL Modeling in Hughes

## Dispatch – Nominal battery cost



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# Delays = Budget

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Original Budget

All In Cost Estimates

\$623k DOE

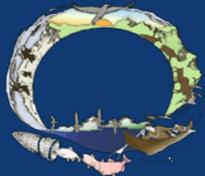
\$623k DOE

\$127k Hughes/TCC

\$500k Hughes/TCC

\$751k Total Project

\$1.12M Total Project



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# Why is DOE Funding so Important?

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## Hughes Village Light and Power FY18

Customers: 63

Annual kWh Sales: 443,942

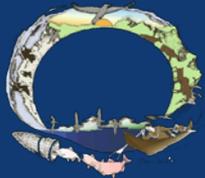
Expense/kWh (Fuel, parts, Staff) : \$.79/kWh (\$.55 Fuel \$.24 non Fuel)

10 year loan at 4% interest for this project:

Payments: \$11,370/mo x12 = \$136,332 - \$66k Fuel Savings = \$70,332

$\$70,332 / 443,942 \text{ kWh} = \$.16/\text{kWh}$

***New \$/kWh = \$.95/kWh = 20% cost increase***

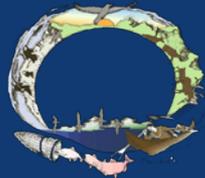
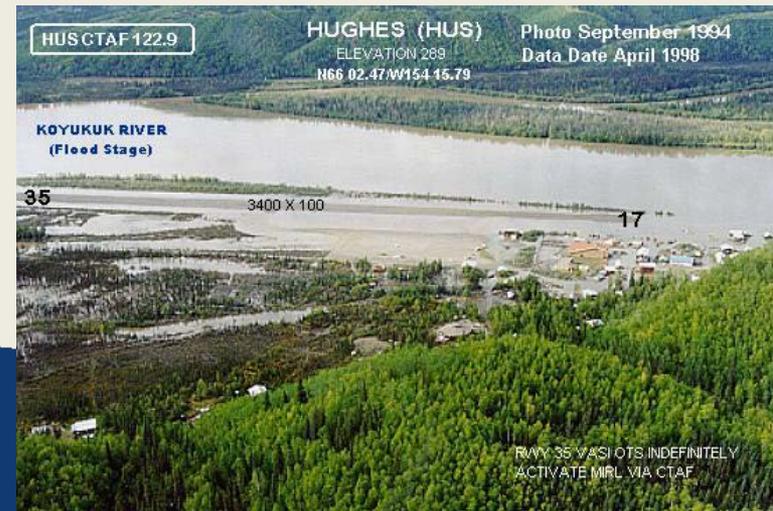


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# Project Challenges

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1. Cost effective design and battery bank in a changing Battery Market
- ~~2. Single Phase limitation in the community of Hughes~~
- ~~3. Getting panels and battery bank out of the flood plain~~
4. Implementation of Effective Micro-grid Control System
5. Budget



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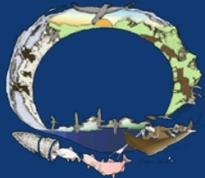
Ana Basee' (Thank you!) Dept. of  
Energy for your support!

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“Self Sufficiency is the greatest of All Wealth”  
- Epicurus

Questions?

Dave Messier  
Tanana Chiefs Conference  
Rural Energy Coordinator  
Dave.pm@tananachiefs.org



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