Sustainable Solar Energy for Hughes Village Council, Hudotl’eeekkaak’e Tribe

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

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TCC Rural Energy Coordinator
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
Hughes, Alaska – Community Vision

“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 hears 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

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!)
Where does YOUR Electricity come from?

$/kWh Hughes Vs. National Avg
The Challenge?

How do we get Hughes from HERE... To ...HERE
But wait a sec, I thought Alaska didn’t have much sun?
Did we mention the DC 4’s...
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”
Hughes Plant Operators and Gensets
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
Community Wide 3-phase Upgrade
Community Wide LED Lighting Upgrade
Site of Solar PV Array
Site of Solar PV Array last year
Solar PV Array

Oct 30th 2018 Hughes, AK North of the Arctic Circle
Summer 2019 Wiring PV Panels

Hughes PV Array Panels-Inverter $2.10/watt
Logistics...
Project Logistics

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

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
Micro Grid Control Package
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.
Example from Northway
NREL Modeling in Hughes

Dispatch – Nominal battery cost

- PV to Load (kW)
- Electric From Battery (kW)
- Diesel to Load (kW)
- Current Electric Demand (kW-Load)
- PV to Battery (kW)
- PV curtailed (kW)

Dates: Jun 18 to Jun 24
Delays = Budget

Original Budget

- $623k DOE
- $127k Hughes/TCC
- $751k Total Project

All In Cost Estimates

- $623k DOE
- $500k Hughes/TCC
- $1.12M Total Project
Why is DOE Funding so Important?

Hughes Village Light and Power FY18
Customers: 63
Annual kWh Sales: 443,942
Expense/kWh (Fuel, parts, Staff): $.79/kWh ($0.55 Fuel $0.24 non Fuel)

10 year loan at 4% interest for this project:
Payments: $11,370/mo × 12 = $136,332 - $66k Fuel Savings = $70,332
$70,332/443,942kwh = $.16/kWh
New $/kWh = $.95/kWh = 20% cost increase
Project Challenges

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

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

Questions?

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