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

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

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TCC Rural Energy Coordinator

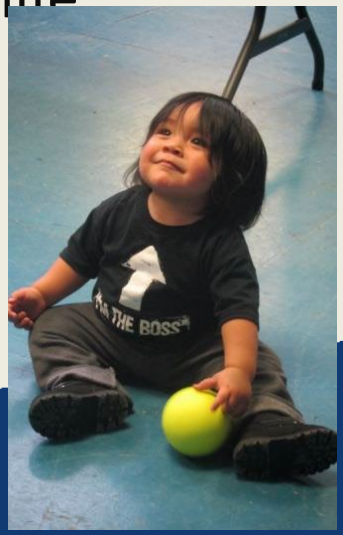
Tanana Chiefs Conference

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

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)

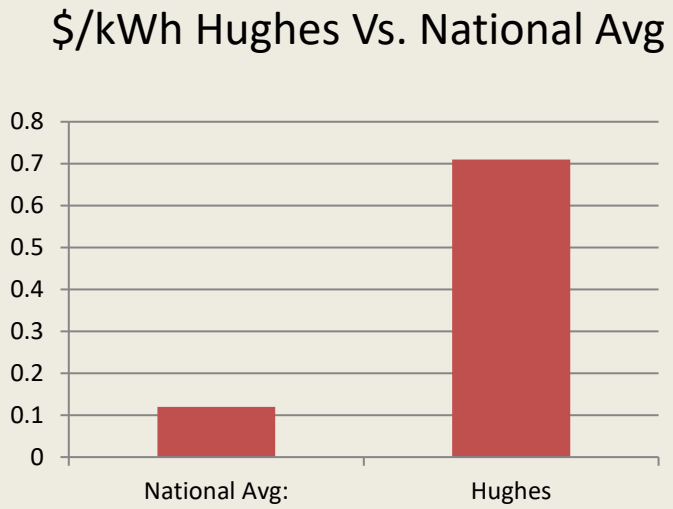
- VHF Radios for residents (Completed)

- 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?



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The Challenge?

How do we get Hughes from

HERE… To …HERE

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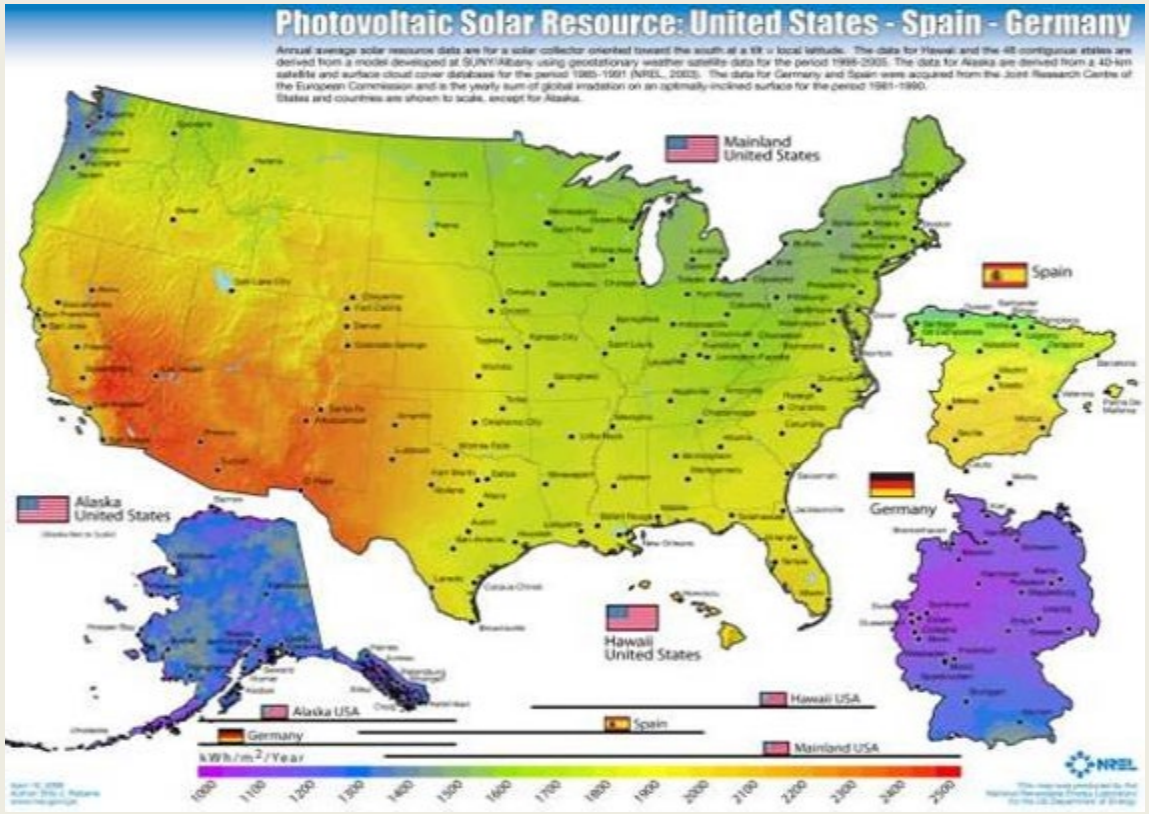
But wait a sec, I thought Alaska didn't have much sun?



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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"

Hughes Plant Operators and Gensets

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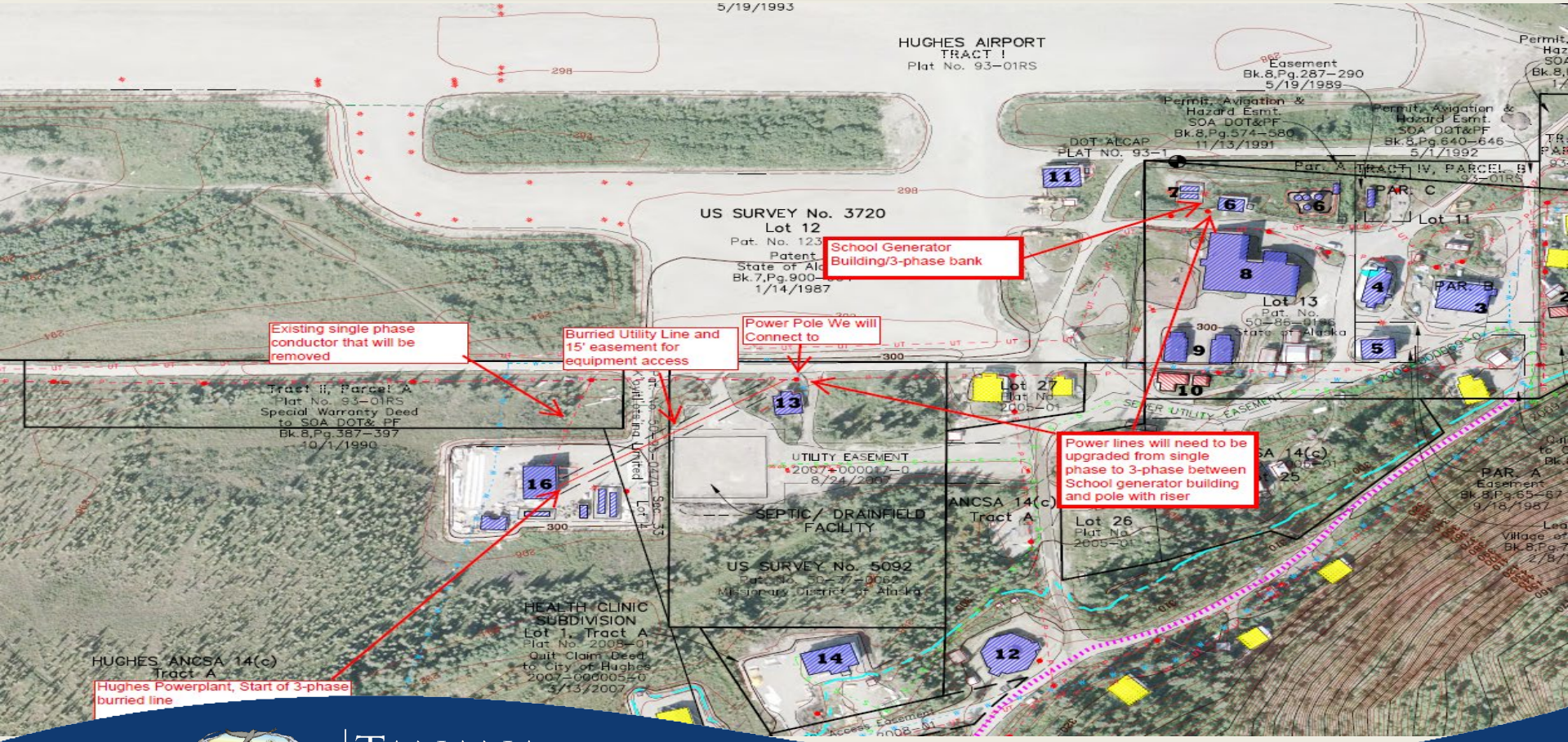
Project Goals

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



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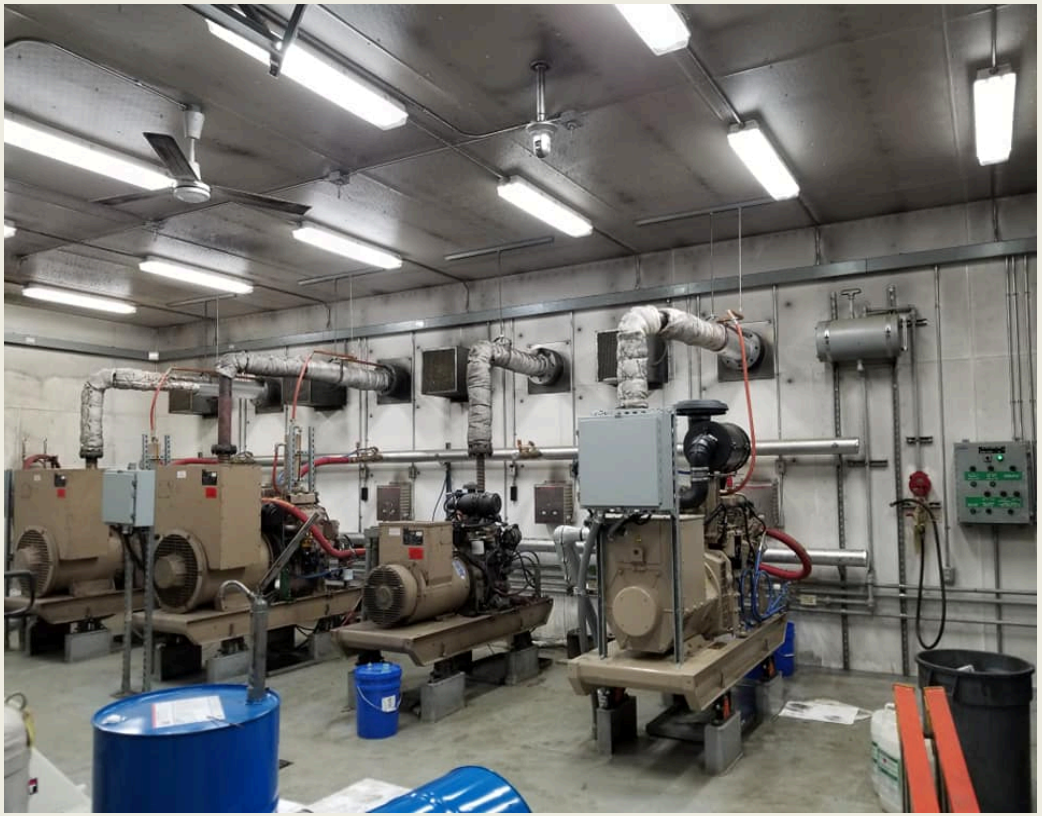
Community Wide LED Lighting Upgrade



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Site of Solar PV Array 2017

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Site of Solar PV Array 2018

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Solar PV Array 2018

Oct 30th 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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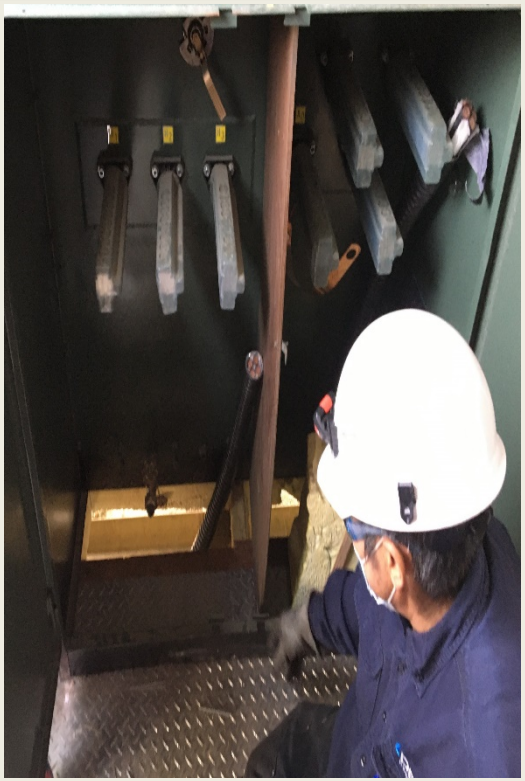
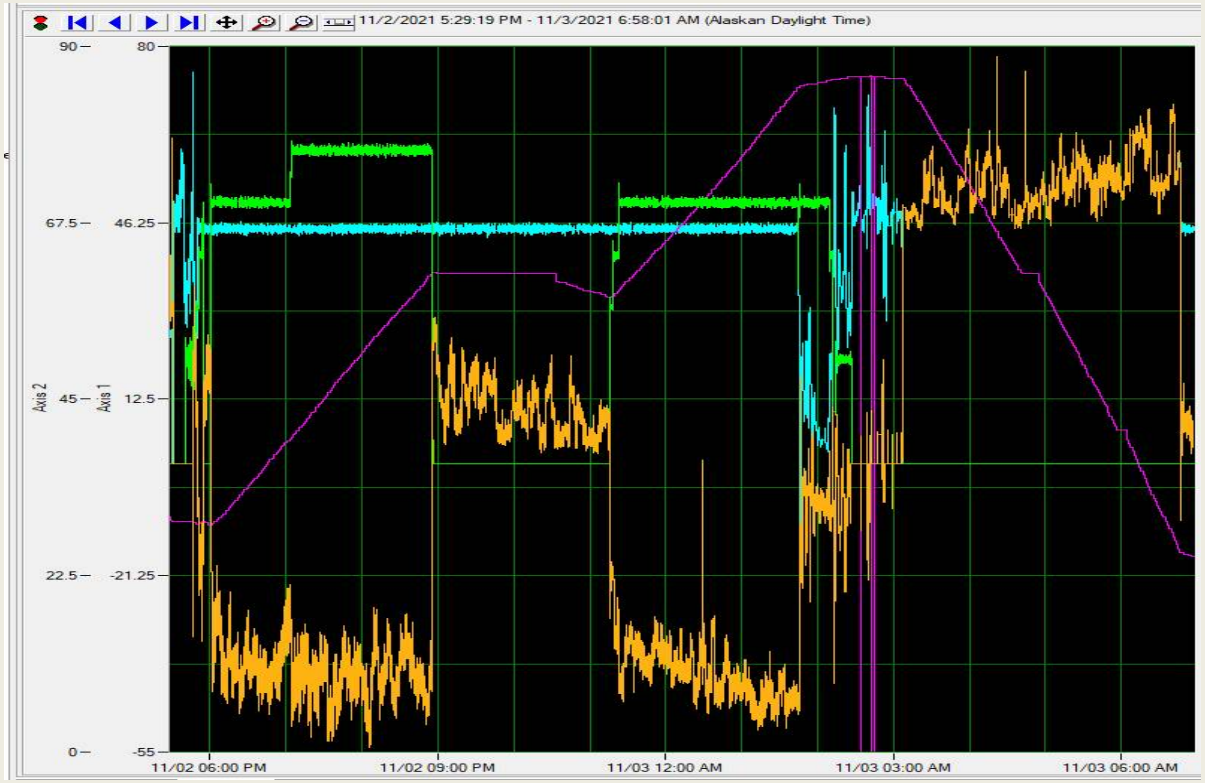
Summer 2020 Battery Shelter



Hughes 250kw/335kWh ABB Emesh unit inside Quonset Hut

2021 – HUGHES VILLAGE RAN “DIESELS OFF” and nobody lost power!!



Caption: this is a bunch of gyrating lines

Caption: self portrait, Dave Messier 11/3/21 approx 10am (Alaskan Daylight Time)

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Logistics…

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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

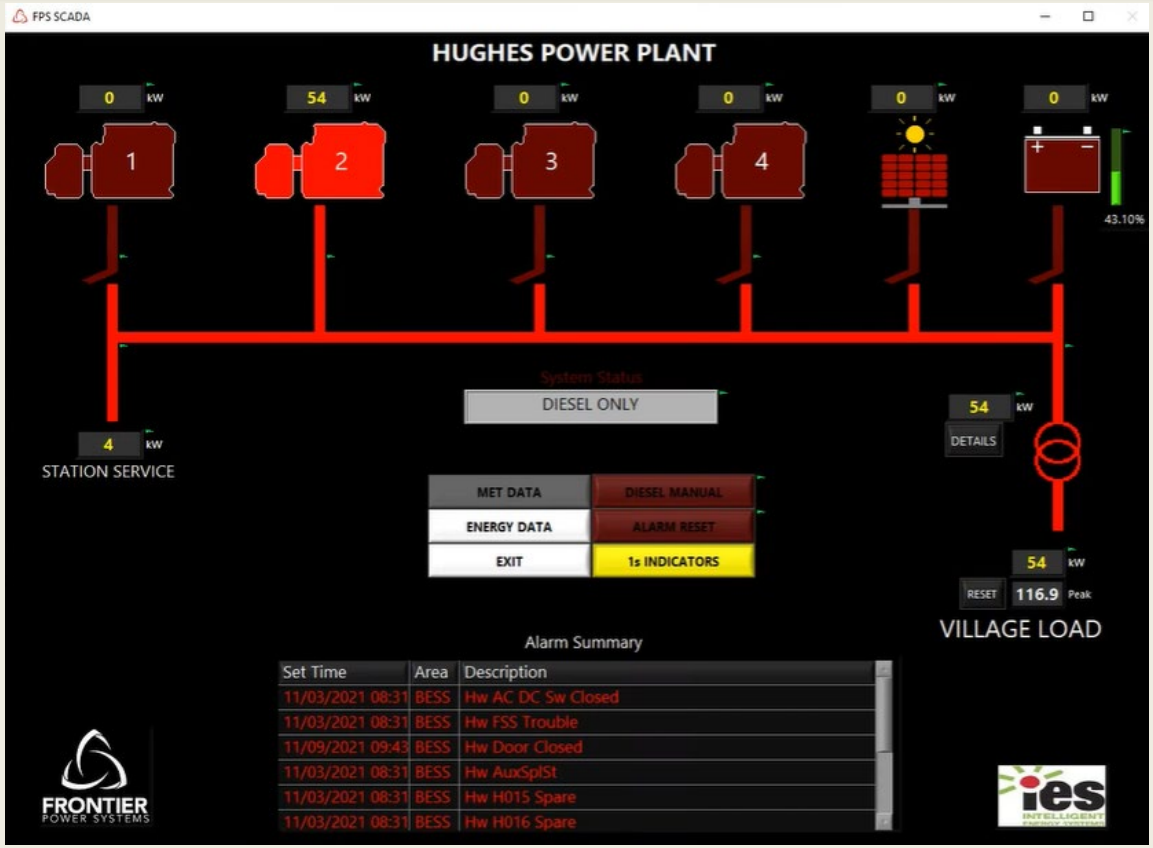


ABB E-Mesh 250/335

MICROGRID AND ENERGY STORAGE SOLUTIONS

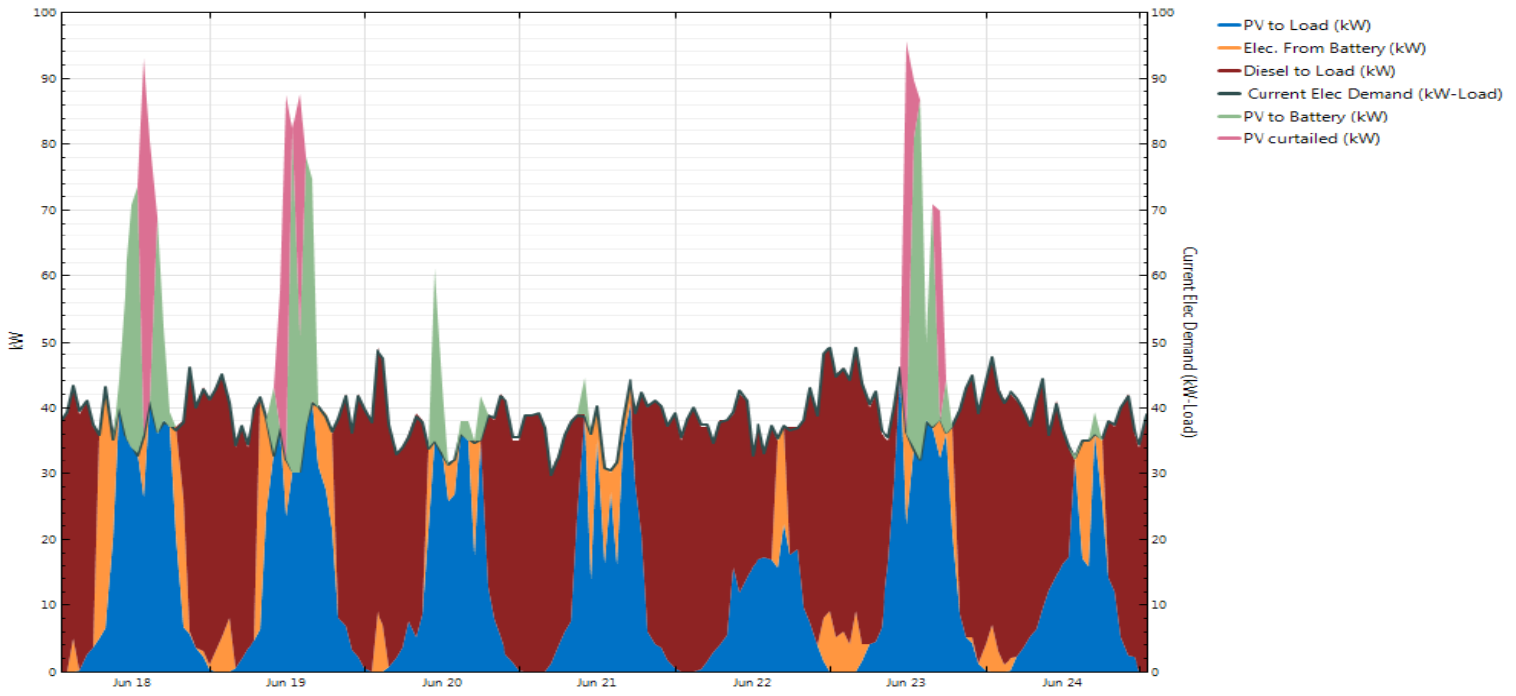
e-mesh™ PowerStore™ Integrated 250/500

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.

NREL Modeling in Hughes

Dispatch – Nominal battery cost



Delays = Budget

Original Budget	All In Cost with DOE cost-share reduction
$623k DOE	$913k DOE
$127k Hughes/TCC	$314k Hughes/TCC
$751k Total Project	$1.2M 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) : $.79/kWh ($.55 Fuel $.24 non Fuel)

10 year loan at 4% interest for this project:

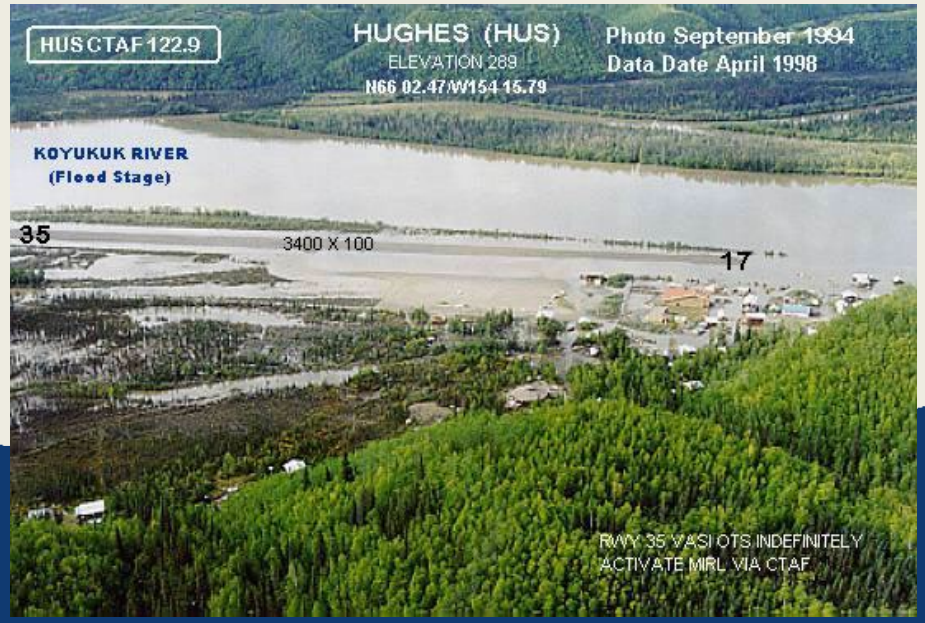
Payments: $11,370/mo x12 = $136,332 - $66k Fuel Savings = $70,332

$70,332/443,942kwh = $.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~~
6. ABB: E-mesh Vendor
7. Taking advantage of PCE



“I got 99 problems…” and a BESS is one -JZ

Lessons Learned:

1. Power plant MUST BE IN GOOD WORKING ORDER: engines, switchgear etc
2. Factory Acceptance Test (FAT) MUST BE performed prior to product release
3. One integrator for powerhouse and BESS
4. Summer time louver system for BESS heat

Specific ABB Powerstore issues:

- ABB Sales team got ahead of engineering
- Key ABB designer/tech left during production and ABB was purchased by Hitachi
- FAT documentation was never found
- Unit was originally destined for Puerto Rico then rerouted to Hughes?
- Unit’s PLC code was NOT finalized
- System Coms/alarm logic was not working
- Multiple components changed out at the site
- No remote ability to tune the EPC inverter
- No remote access to the HMI interface

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

"Self Sufficiency is the greatest of All Wealth"
- Epicurus

Questions?

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