9,000+ yrs ago
Yup’ik people living sustainably in Central Western Alaska

1867-1930s
Commercial Fishing Economy

1930s-1970s
Era of Land Claims

1971-2000
Growing Diesel Dependence, Alaska Oil Pipeline

2000-Today
Journey Towards Sustainability & Self-Determination

The Why

- Fuel prices continue to rise
- Dependence on gov’t assistance and electric company subsidy growing
- Environmental concerns

Igiugig
Annual cost of Igiugig Electric Company: $250,000

Fuel Prices in Igiugig Today
- Heating oil: $6.00 per gal
- Gas: $7.80 per gal

Electricity
- $0.91/kWh
- $0.62/kWh power cost equalization subsidy

Igiugig is one of 250 microgrid communities in Alaska.
The **HOW**: Navigating from a Test Site to Commercialization

- 2008: Locally driven strategic planning process identifies “Alternative Energy” and a goal to transition from diesel as main source of power by 2025. IVC begins testing wind, solar, and hydro options.
- 2011: Power Plant Upgrade
- 2012-13: Igiugig opens the Kvichak River Test Site (profiling & permitting)
- 2014: Hydrokinetic companies test emerging technologies
- 2015-present: Igiugig selects one company to move forward for hydrokinetic power – Ocean Renewable Power Company with integration options for other energy sources (e.g. wind)

[https://youtu.be/GxjELfnX5xc](https://youtu.be/GxjELfnX5xc)
We have come a LONG way...

Reassembly in Igiugig

Anchor installation in the Kvichak River
Economic & environmental benefits

- Noise and environmental risk decreased
- Diesel usage down 90%
- CO₂ down 230 metric tons/year
- O&M costs down $50,000/year

Project Phases 2 & 3
2020-2021

Predictable baseload power

Diesel Backup

Variable power

RivGen® Power System
2nd device installed 2021

Smart Microgrid System
Installed 2020

Energy Storage
Installed 2020

Power to the community

The Smart Microgrid Solution for Igiugig
1. The RivGen is the only component of the control system that is located far from the microgrid controller. Radio link is needed to monitor and control the RivGen.
2. Woodward easy gen to replace GCP-31
<table>
<thead>
<tr>
<th>TASK</th>
<th>Responsible</th>
<th>Consulted</th>
<th>Not Available</th>
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<tbody>
<tr>
<td>Procurement of the easyGEN controller</td>
<td>R &amp; A</td>
<td>C</td>
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<tr>
<td>Power setpoint division among the easyGENs</td>
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<tr>
<td>Black-start sequence using BESS or GEN</td>
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<tr>
<td>BESS power management</td>
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</tr>
<tr>
<td>Monitoring of village feeder breaker status</td>
<td>I</td>
<td>R &amp; A</td>
<td>NA</td>
</tr>
<tr>
<td>Standalone wall mounted controls panel with microgrid controller, ethernet switch and UPS</td>
<td>C</td>
<td>R &amp; A</td>
<td>NA</td>
</tr>
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<td>Trends, alarms and sequence of events recorder for the whole system</td>
<td>I</td>
<td>R &amp; A</td>
<td>NA</td>
</tr>
<tr>
<td>Local and remote HMI for the complete system (BESS+RivGen+ Power plant)</td>
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<td>R &amp; A</td>
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</tr>
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<tr>
<td>Commissioning and testing of the radio comms</td>
<td>I</td>
<td>C</td>
<td>R &amp; A</td>
</tr>
</tbody>
</table>

**Generator Management system modifications**

In the context of the IGUGIG MICROGRID, the following tasks are assigned roles with the respective Responsible and Consulted parties:

- **Procurement of the easyGEN controller**: Responsible by R & A, Consulted by C.
- **Modification in rockwell PLC to interface with the new easy gen controllers**: Responsible by R & A, Consulted by C.
- **Modification in rockwell PLC to interface with the new MG controller**: Responsible by R & A, Consulted by C.
- **Power setpoint division among the easyGENs**: Responsible by R & A, Consulted by C.

**Core Microgrid control**

- **Black-start sequence using BESS or GEN**: Consulted by R & A.
- **BESS power management**: Responsible by R & A, Consulted by C.
- **BESS SOC management**: Responsible by R & A, Consulted by C.
- **RivGen control**: Consulted by R & A.
- **Monitoring of village feeder breaker status**: Consulted by R & A.
- **Standalone wall mounted controls panel with microgrid controller, ethernet switch and UPS**: Consulted by R & A.
- **Trends, alarms and sequence of events recorder for the whole system**: Consulted by R & A.
- **Local and remote HMI for the complete system (BESS+RivGen+ Power plant)**: Consulted by R & A.

**Ethernet Radio Comms**

- **Procurement of the radio equipment**: Responsible by R & A, Consulted by C.
- **Commissioning and testing of the radio comms**: Consulted by R & A.

**Comments**

- **GEN paralleling controller is expected to be housed in the paralleling SWGf. The microgrid controller and the HMI is also expected to be mounted in the GEN controls section.**
- **The MG controller will treat the rockwell PLC as the GEN system controller. It will send power setpoints to the PLC and receive monitoring inputs such as power, GEN status and alarms.**
- **The MG controller will send a global power setpoint to the rockwell PLC. The PLC must divide the setpoints among the generators as per the demand table.**
Concluding Thoughts...

- Solid teamwork has been key
- Opportunity for Business Ventures...how do we invest?
- Diesels are here to stay
- Navigating State policies and programs and permitting (smolt)
- Growing our own local capacity