A Resilient and Autonomous Microgrid Powered by Marine Renewable Energy

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Igiugig, Alaska

Igiugig, Alaska

Regional Detail (Alaska)

Local Detail (Iguigig, Alaska)

Project Summary

Project Objective

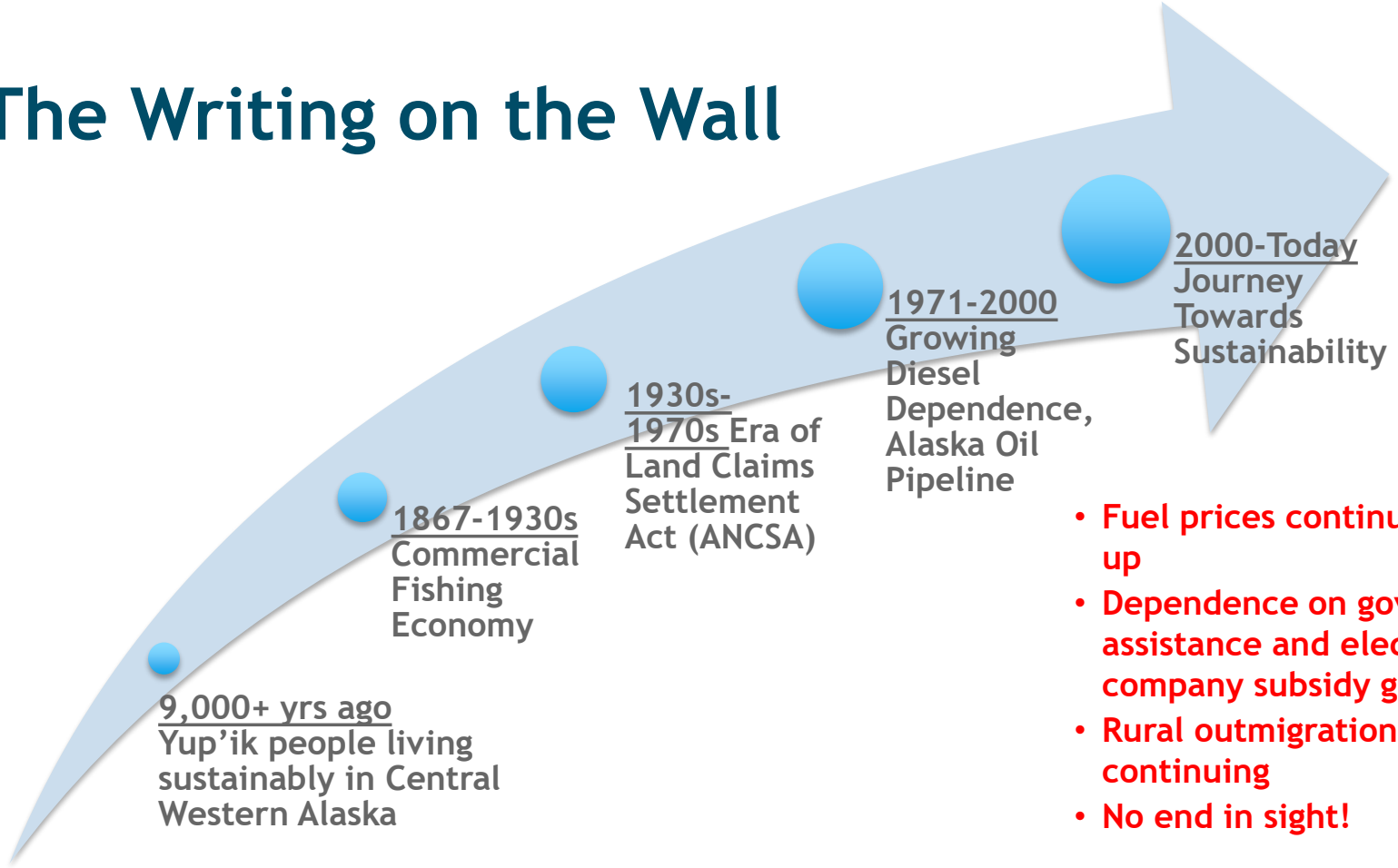
- To acquire and install smart microgrid electronics and energy storage, to provide autonomous operation of the microgrid to power all Village of Igiugig homes and facilities for sustainable energy supply and resilient operations

Project Need

- Igiugig has very high energy costs. Like most remote northern communities, we are not connected to a centralized electrical power grid or fuel supply pipelines
- The power plant is comprised of three diesel generators, each with 65 kW prime power capacity, which produce 325 MWh/year using a total of 24,789 gallons of diesel

Igiugig Self-Governance

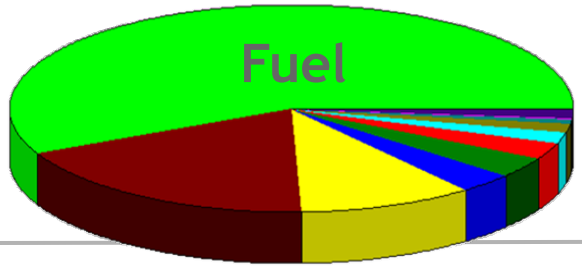
The Writing on the Wall



- Fuel prices continue to go up
- Dependence on gov't assistance and electric company subsidy growing
- Rural outmigration continuing
- No end in sight!

Annual Cost to Operate Igiugig Electric Co. 2018

Fuel	57.21%
Depreciation Expense	18.60
Payroll Expenses	10.18
General Administrative	3.32
Power Plant	3.25
Freight	2.80
Miscellaneous	1.76
Casual Labor	1.40
Utilities	0.71
Internet	0.29
Other	0.50
Total	$255,707.79



Fuel Prices in Igiugig

Heating oil

$6.00 per gal

Gas

$7.80 per gal

Electricity

$0.91/kWh

$0.62/kWh power cost equalization subsidy

Igiugig Hydrokinetic Project: Phase I

Phase I Project Funding and Technology Partner

- Funded by the Department of Energy Water Power Technology Office
- Igiugig Village Council selected ORPC for its patented marine renewable energy technology proven in both tidal and river environments

Technology Selection

Ensuring long-term viability through local ownership

Igiugig Hydrokinetic Project

Longest-operating river hydrokinetic project in the Americas

Phase I Highlights

- First tribal entity to hold a FERC hydrokinetic pilot license
- Recorded tens of millions of sockeye salmon transiting past the device, with no observed injuries or mortalities
- Survived Alaskan winter (-40^{o}C) and two frazil ice events
- During spring ice break-up, over 2 ft of lake ice flowed safely over device

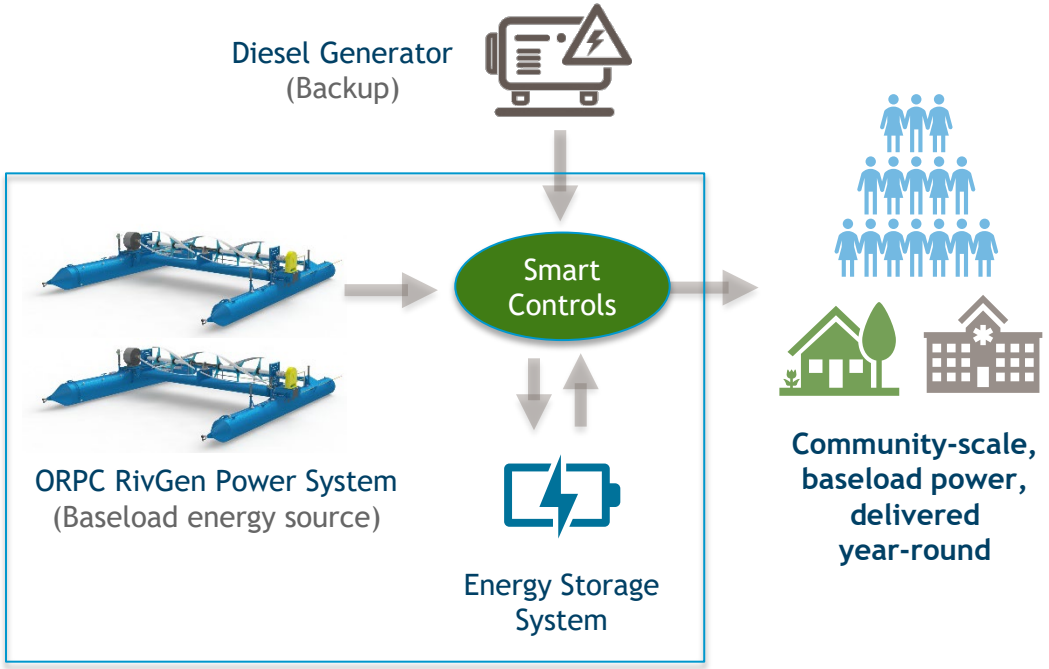
Igiugig Hydrokinetic Project: Phase II

Phase II Project Funding and Technology Partners

- Funded by the Department of Energy Office of Indian Energy
- ORPC and Schneider Electric

A microgrid delivers baseload renewable energy from free-flowing rivers and tides

- A RivGen-powered smart microgrid can relegate diesel generators to backup only.
- RivGen provides constant, predictable power (baseload).
- Energy storage and smart controls, coupled with RivGen baseload power, improve the value proposition of intermittent sources like wind and solar.



Work Completed to Date and Lessons Learned

Work Completed to Date

- During Phase I, we installed one RivGen Power System including device, cabling, anchor, shore station with electronics, and interconnect to Igiugig Electric Corporation

Work Completed to Date: Battery Energy Storage System

- Installed fall 2021, commissioning in November/December
- Ability to be grid following or forming
- Rated for 253 kWh, 125kW inverter

Lessons Learned

- Phase II of the project is still happening…lessons learned to come…
- Phase I provided lessons we applied to work in Phase II
  - Weather and seasonality can impact project timelines
    - Prepare for ice, and then prepare more
  - Communication between project teams is key
  - Interconnection will never go as you plan

Thank You