U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

WPTO in Alaska

A WPTO R&D Deep Dive Webinar

Welcome!

- This webinar will be recorded and made available to registrants.
- Attendees' microphones are muted and attendees are not visible on video.
- Questions will be answered during the Q&A after the presentation has ended.
- To ask questions:
  - Submit question into the Chat Box
- If you have technical issues, try calling into the webinar via phone.

Thank you for participating!

Speakers and Agenda

Speakers

Tessa Greco Powering the Blue Economy Lead	Yana Shininger Technical Project Officer	Corey Vezina Technology Project Manager	Hill Balliet ORISE Fellow
			

Agenda

- Introduction to DOE and WPTO
- Marine Energy Work in Alaska
- Hydropower Work in Alaska
- Resources
- Q&A

Water Power Technologies Office Overview

The U.S. Department of Energy's Water Power Technologies Office (WPTO) **enables research, development, and testing of emerging technologies** to advance marine energy as well as next generation hydropower and pumped storage systems for a flexible, reliable grid.

Hydropower Program


Non-Powered Dams and Conduits


New Low-Impact Projects


Pumped Storage


Upgrades

Marine Energy Program

Wave 

Tidal 

River Current 

Ocean Current 

Federal Agency Partners

BOEM Bureau of Ocean Energy Management

Bureau of Reclamation

Federal Energy Regulatory Commission

U.S. Fish & Wildlife Service

United States Environmental Protection Agency

National Oceanic and Atmospheric Administration — NOAA — U.S. Department of Commerce

United States Navy

marine energy

In Alaska

Energy Transitions Initiative Partnership Project (ETIPP)

ETIPP is a community-driven technical assistance program meant to advance energy transitions and bolster resilience.

Proven framework fosters high-impact, replicable community energy transitions.

ETIPP connects communities with energy experts to advance development of **resilient energy systems.**

Partnership approach

Communities (11)

Unique challenges, values, goals

- **Identify energy challenges and ideal transitions**
- **Share experiences and learnings**, regionally and nationally

Regional Partners (5)

Local, trusted, community-based

- **Stakeholder engagement and outreach**
- Translate technical content
- Share learnings, support use-case development

ACEP · HNEI · Coastal Studies Institute · Island Institute · REAP

National Labs (4)

Deep energy-sector experience, expertise

- **Technology-neutral technical assistance**
- Identify and advance strategic, tailored solutions
- Address challenges, build capacity, and accelerate sharing of best practices and innovations

Berkeley Lab · Pacific Northwest National Laboratory · NREL · Sandia National Laboratories

U.S. DOE Offices (4)

Funding, support, expertise

- **Support energy assessment, planning, and operations** to achieve energy-resilient communities
- Foster **cross-technology collaboration**, planning, and solutions

U.S. Department of Energy | Office of Energy Efficiency & Renewable Energy
Office of Strategic Programs
Solar Energy Technologies Office
Water Power Technologies Office

U.S. Department of Energy — Office of Electricity

ETIPP Cohort 1 – Aug ‘21 – Dec ‘22

Energy challenges identified by communities in Alaska

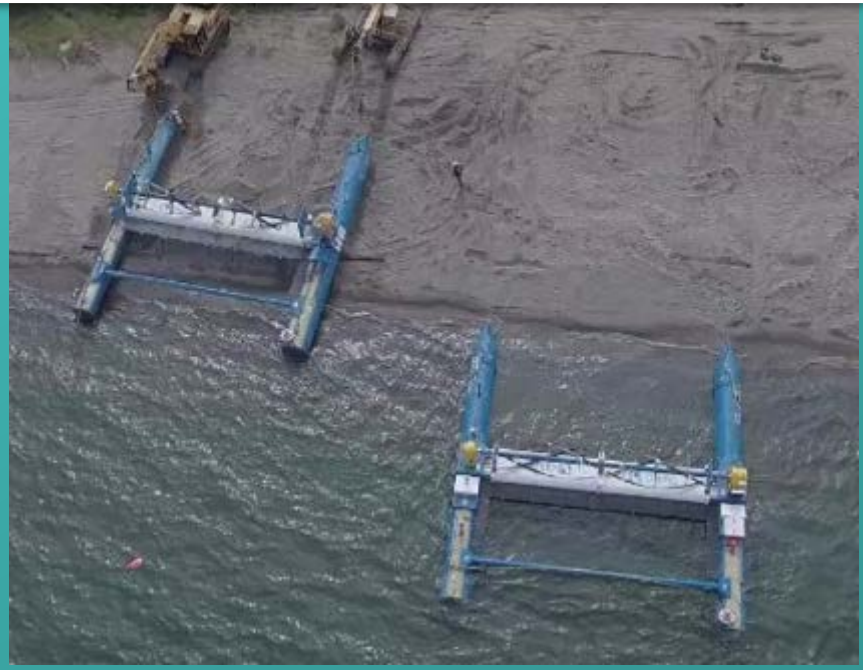
- Reliance on costly diesel fuel
- Diesel imported via barge during ice-free summer months for northernmost communities
- Islanded power grids

Examples of Technical Assistance provided by the National Labs

- Electrification/hybridization of fishing fleet
- Renewable energy resource assessments
- Grid modeling
- Building performance assessments
- Design of monitoring systems to mitigate climate change impacts on energy generation

Igiugig, Alaska

- Igiugig Village Council is working with the Ocean Renewable Power Company (ORPC) on marine energy solutions
- RivGen, a current energy converter power system has a rated capacity of 35 kW at 2.25 meters per second of current speed. Deployed September 2019 - August 2021. The longest operating current energy converter in the U.S., RiveGen2.0 will be refurbished and re-deployed in Summer 2022.
- Research and Development is focused on studying potential impacts on smolt and adult salmon migrations and whether the device will be affected by Igiugig's icy winter conditions.
- A second device funded by Office of Indian Energy is deployed!
- The Igiugig community has the capabilities to deploy and retrieve the device with very little help from outside contractors - a valuable component of a successful and sustainable renewable energy system operating in a remote community. The local workforce is also able to deploy and retrieve the device for inspections and maintenance which contributes to the system's cost effectiveness and long-term community resilience.



Cook Inlet

Photos courtesy of Christopher Pike

Cook Inlet contains one of the largest tidal power resources in the world. Midway up the inlet, the water flow accelerates as it squeezes between the eastern and western forelands. Researchers at the National Renewable Energy Laboratory (NREL) are assessing the site for potential energy farms in the future.

- Estimated capacity of 6-18 GW of theoretical tidal power
- An easy tie in with Alaska's railbelt electrical grid, serving most road-connected communities from Home to Fairbanks

Mooring was deployed on July 1, 2021 and retrieved August 31, 2021

Water Horse Hydrokinetic Power Harvester

University of Alaska Fairbanks (UAF), Alaska Center for Energy and Power (ACEP)

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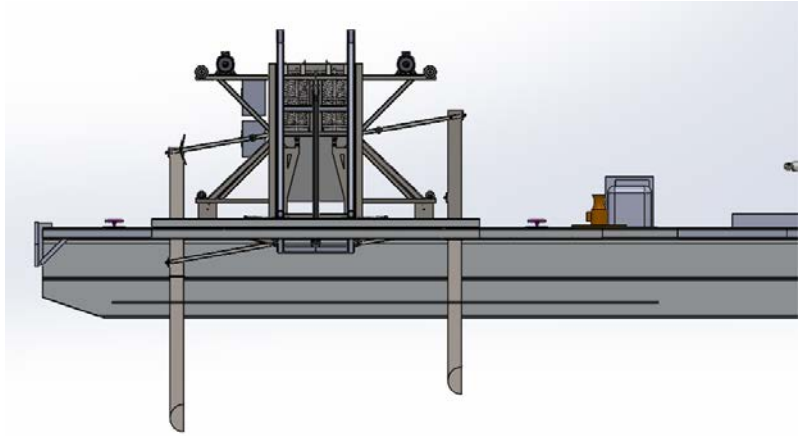
WATER POWER TECHNOLOGIES OFFICE

- The Water Horse is a vertical oscillator, hydrokinetic harvester designed by Renergé, Inc to harvest energy from turbulent water conditions, previously deemed as unrecoverable.
- Technology focus is on small, remote riverine applications where deployment of large tidal turbines could be challenging due to water depth limitations
- Major objectives include redesign of the current engineering scale prototype to a scale appropriate for a minimum viable product (including the development of a new signal conditioning system) and demonstration of the prototype under expected operational conditions



WaterHorse was tested for 10 days of field testing at the Tanana River Test Site (TRTS) in Nenana, Alaska this July (currently anticipating analysis)

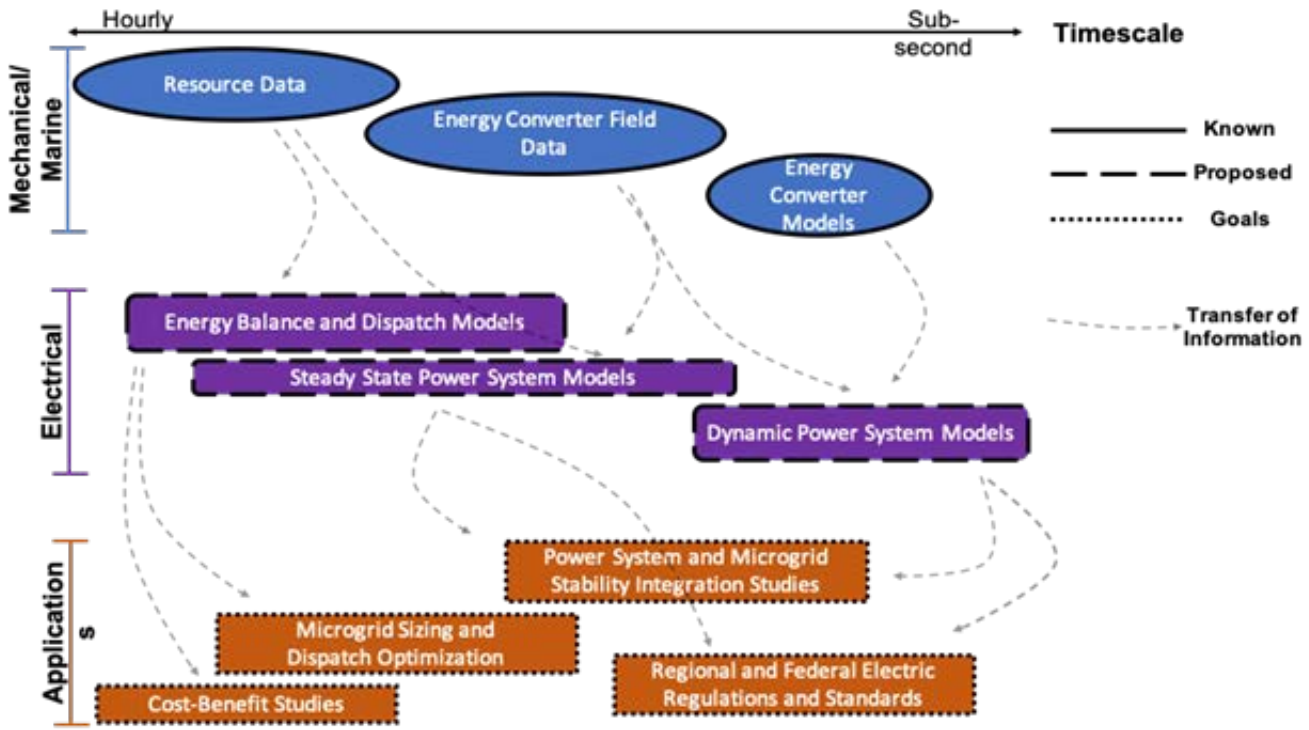
renerge | ACEP Alaska Center for Energy and Power

UAF UNIVERSITY OF ALASKA FAIRBANKS

Modeling the Integration of Marine Energy into Microgrids

University of Alaska Fairbanks (UAF), Alaska Center for Energy and Power (ACEP)

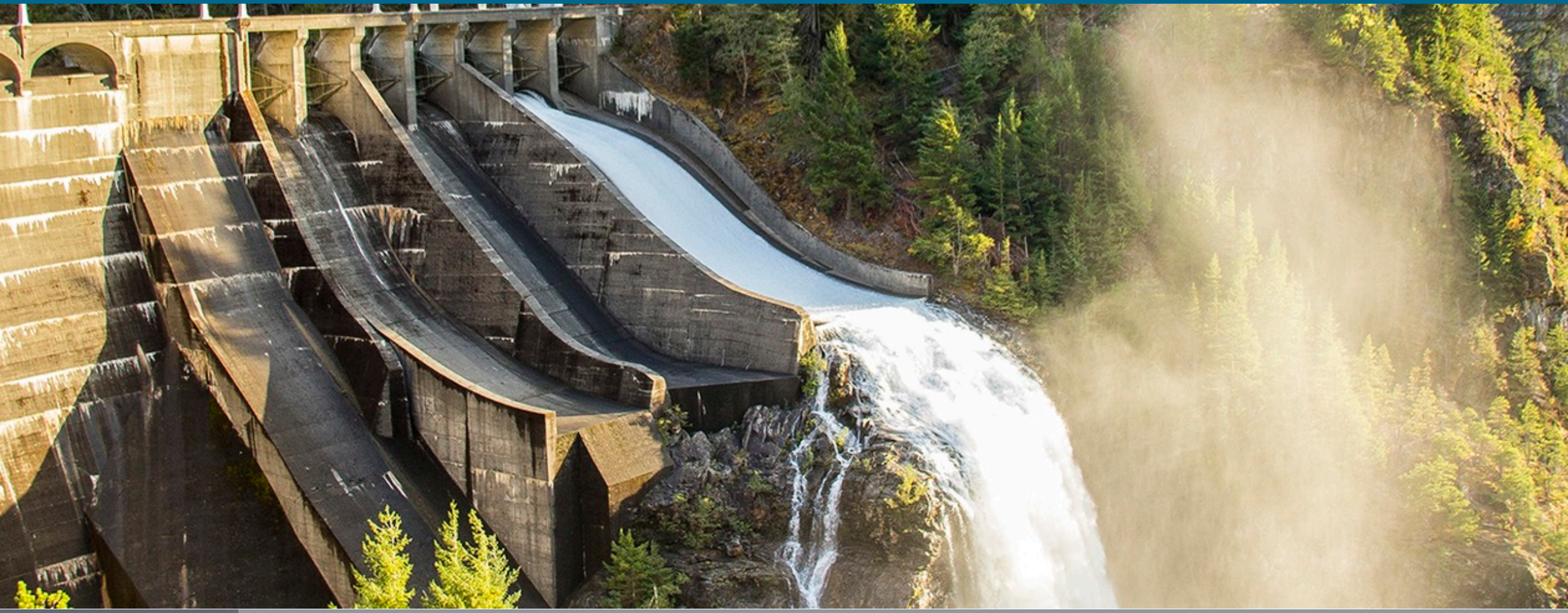
	Key Milestones or Deliverables
Year 1	• Marine Resource Data Compilation
Year 2	• Validated WEC and CEC Simulation and Temporal Performance • Complete steady-state power flow model(s) of available MHK energy devices in MATLAB Simulink and PSS®E
Year 3	• Dynamic Power Converter and Energy Storage Model at the MHK Component Level
Year 4	• Alaskan Microgrid Case Study of MHK Device Integration



- Objective: to develop Marine Energy device power system models necessary for micro- and macro-grid studies for Marine Energy device sizing and design, energy balance and dispatch, and steady-state and dynamic stability impacts
- Final products will be open-source tools for the integration of high-fidelity numerical representations of marine energy converters into utility platforms widely used by the electrical utility industry for both macro as well micro-grids.

hydropower

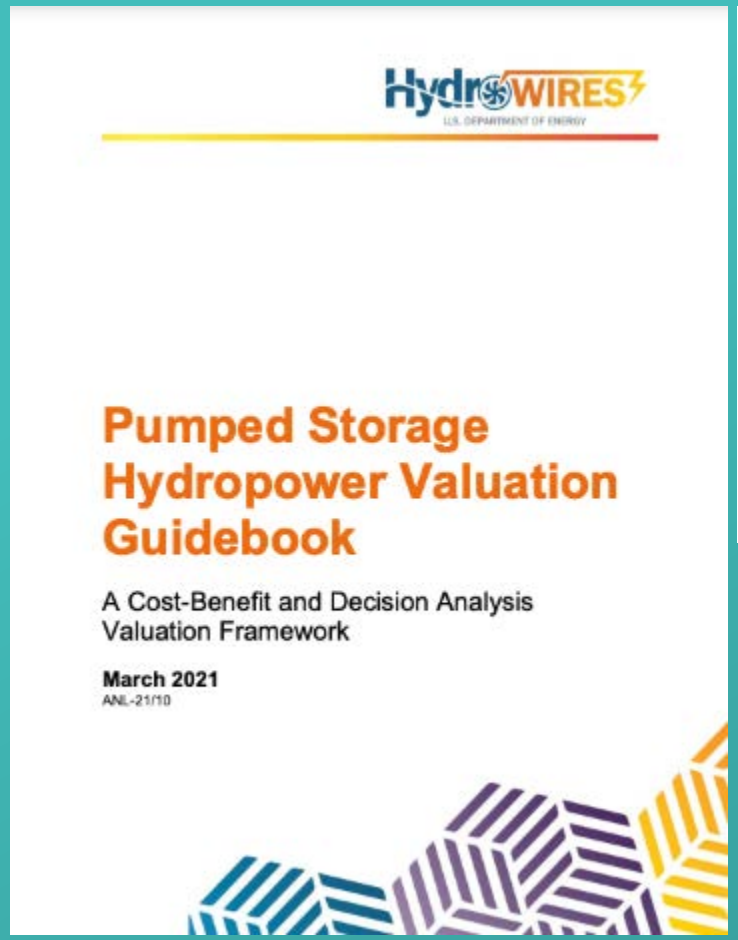
In Alaska



Assessing the Potential of PSH in Alaska

Investigating the prospects and opportunities for PSH in the Railbelt and rural communities in Alaska using DOE's PSH Valuation Guidebook

- In 2010, the Alaska legislature enacted a non-binding goal for 50% of renewable electricity generation by 2025.
- PSH may be able to help support the 20 percentage point growth in renewables required to meet that goal.
- Techno-economic assessment will be performed to determine potential PSH capacity in Alaska
- The results of this study will provide decision makers with actionable information about the viability of PSH in Alaska that can be used to develop effective policy, regulation, and system operation practices



Using Hydropower and Other Smart-Grid Solutions to Increase Alaskan Community Energy Resilience (RADIANCE)

Coordinating energy storage and hydropower facilities for a more resilient microgrid in Cordova, Alaska

- Originally hydropower produced 70% of Cordova's energy, while diesel fills in the gap producing 30% of their energy.
- The project deployed advanced technologies and methods to support operations that enhance grid resiliency under harsh weather, cyber-threats, and dynamic grid conditions, and reduced the need for diesel fuel.

Humpback Creek Hydroelectric Plant
1250kW (2 x 500 kW + 1 x 250 kW)
17,000 foot UG and submarine transmission line

Power Creek Hydroelectric
6278kW (2 x 3124 kW)
25 kV transmission ties to Eyak Substation, Inflatable dams

City of Cordova
1,566 customers, 18MW
One Substation
78mi UG distribution lines

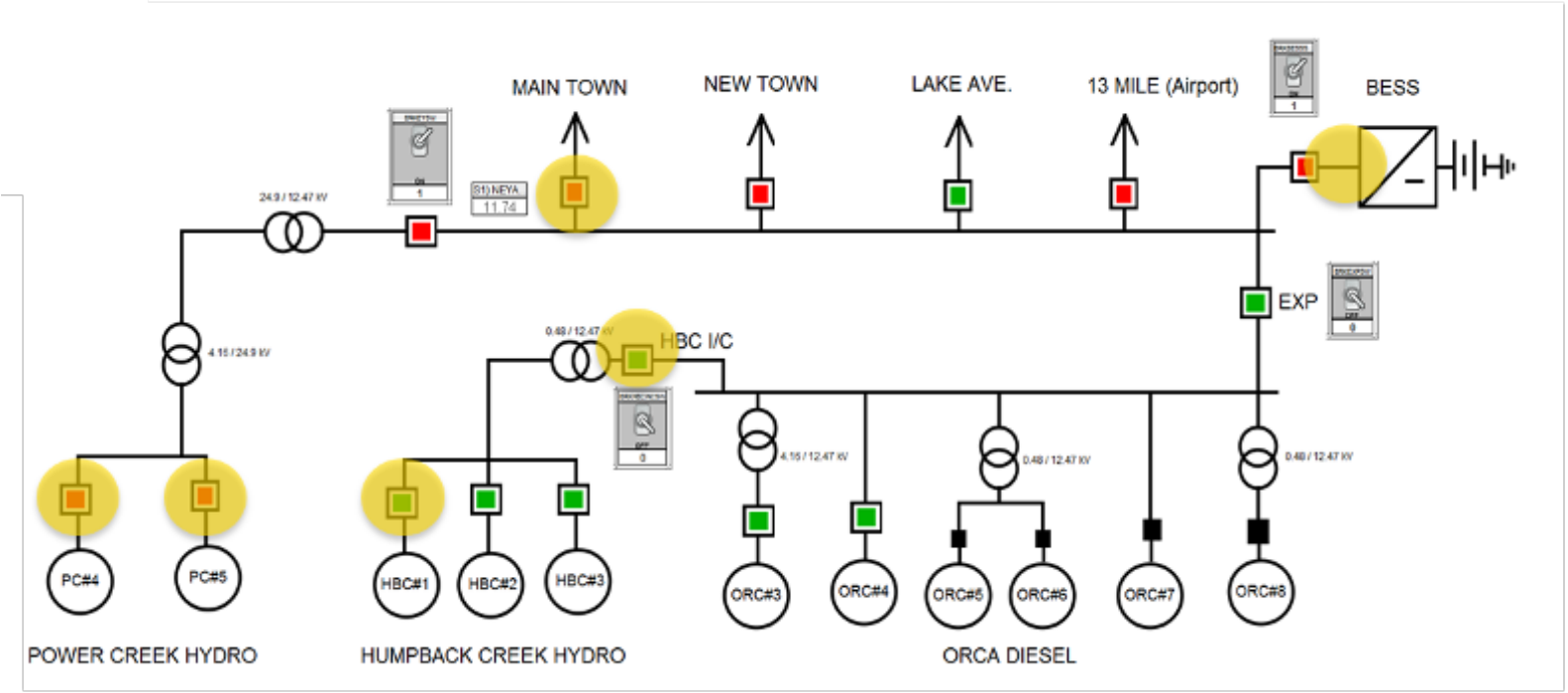
Orca Power Plant
10.8 MW Diesel
Control Center, CEC

Crater Lake Dam Storage
may offset 25% Diesel consumption

Battery
1MW Li-ion
Eyak Substation

RADIANCE Progress

- Installed a battery system with controls and requirements from sub-seconds to hours and optimized in coordination with existing hydropower facilities.
- Upgraded the grid's network communications to improve cybersecurity and reliability.
- Deployed advanced PMUs and replicated subsequently measured contingency events in simulation models for analysis.
- To be deployed: microgrid controller, advanced metering (AMI) controller, advanced governor for diesel generators



Littoral Power Systems, Inc. (LPS)

Two awards with WPTO, conducting work in Alaska for Hydropower and Marine Energy programs.

- Hydropower: Prefabricated Standard Modular Hydropower (SMH) Installations For Low-cost Small Hydropower
  - To produce a detailed conceptual design of an SMH facility, meet targeted metrics, and can be replicated for at least three sites --> with no major changes to design features, and while maintaining environmental compatibility.
    - Make cost below $3,500 / kW,
    - Complete construction in < 2 years
    - Up to 10 MW, capable of passing up to 5,000 cfs at a hydraulic head of up to 30 ft.
- Thayer Creek Hydro project, under the management of the AK Native Village Company, Kootznoowoo, is a proposed 1.1MW greenfield hydropower plant near Angoon AK, generating approximately 6.2 GWh of electricity per year.

- Marine Energy: Cross-Cutting Turbine (XCT) System for Harvesting In-Current Hydrokinetic Energy from Low-Velocity Sites
  - The XCT system does not have a gearbox and aims to lower the levelized cost of energy and reduce maintenance requirements.
  - Device is planned to be 2-6 meters in diameter, representing about a 1/10-scale version of an ocean current device, and a ¼-scale to full-scale version of a riverine device.
  - XCT-1 will be deployed in Summer 2022 for 10 days of field testing at the Tanana River Test Site (TRTS) in Nenana, Alaska.

242 - Who is Eligible under the Original Statute?

- QUALIFIED HYDROELECTRIC FACILITY.—The term ‘‘qualified hydroelectric facility’’ means a new turbine or other generating device which is added to an existing dam or conduit that was constructed before August 8, 2005 – as defined by the original authority in EPAct 2005 Section 242
- BEGIN OPERATIONS of the qualified facility after October 1, 2005 and before September 30, 2015
- PAYMENTS for 10 years beginning with the fiscal year the facility began commercial operation
- CAP at $750K for a given calendar year for a given facility

Energy Act 2020: FY21 Eligibility Updated

(1) Qualified hydroelectric facility.–The term 'qualified hydroelectric facility' means a turbine or other generating device owned or solely operated by a non-Federal entity--

(A) that generates hydroelectric energy for sale; and

(B)(i) that is added to an existing dam or conduit; or

(ii)(I) that has a generating capacity of not more than 20 megawatts;

(II) for which the non-Federal entity has received a construction authorization from the Federal Energy Regulatory Commission, if applicable; and

(III) that is constructed in an area in which there is inadequate electric service, as determined by the Secretary, including by taking into consideration--

(aa) access to the electric grid;

(bb) the frequency of electric outages; or

(cc) the affordability of electricity.''

Program Extension:

Reauthorizes appropriation for each of FYs 2021-2036.

Next Steps:

- Evaluate how best to implement the amended language
- Technical analysis of the terms to determine metrics
- Review feedback from stakeholders

Open Funding Opportunities and Requests for Information

Funding Opportunity Announcement (FOA)

- Released in July, this FOA will provide funding to marine energy developers looking to test their devices at the new PacWave Facility. Opportunity closes on 10/5.
- This FOA supports projects that advance wave energy technologies intended for remote and microgrid commercial and open-source applications as well as R&D for supporting wave energy technologies.

Notice of Intent (NOI)

- The HydroWIRES program will be releasing a funding opportunity later this month.

Section 242 Request for Information (RFI)
Closed on September 7

Released in July, this RFI sought stakeholder input on factors to consider in relation to defining "an area where there is inadequate electric service", which will inform future eligibility criteria for the Hydroelectric Production Incentive Program.

Defining this term will allow the Section 242 Hydroelectric Production Incentive Program to be executed, and increase access to clean, hydroelectric power to U.S. citizens in communities with inadequate electric services. This may include rural, remote, and underserved communities.

EERE Inclusive Energy Innovation Prize

- Scheduled to open later this month
- Will provide cash prizes of up to $250,000 each ($2.5 million total) to groups and organizations to support entrepreneurship and innovation in communities historically underrepresented and underserved in the energy sector.

Goals

- Advance equity, civil rights, racial justice, and equal opportunities, a responsibility of the entire U.S. government, including DOE
- Identify and incentivize activities that help traditionally underrepresented groups apply for and receive DOE funding.

Technical Assistance

ETIPP

- Applications to be part of ETIPP Cohort 1 have closed and the new communities will receive their assistance this Fall and Winter. However, be on the look out for Cohort 2!

TEAMER Announcement

- The TEAMER Program is now accepting applications for Technical Support on a rolling basis!
- There is a review period open now (RFTS4) that will close on September 16
- The TEAMER Program will be opening a new Alaskan test site - Tanana River Test Site

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- energy.gov/water

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- Hydropower
- Water Wire

Drop Us a Line

- WaterPowerTechnologiesOffice@ee.doe.gov

Resources

The following are free to use and have been developed by WPTO and National Lab researchers to aid in research and development in water power

- Marine Energy Atlas
  - An interactive mapping tool developed to explore potential for marine energy resources
- RAPID Toolkit
  - The Hydropower Regulatory and Permitting Information Desktop makes permitting information easily accessible from one online location
- PRIMRE
  - The Portal and Repository for Information on Marine Renewable Energy provides broad access to information on engineering and technologies, resource characterization, device performance, and environmental effects of Marine Renewable Energy (MRE) projects.