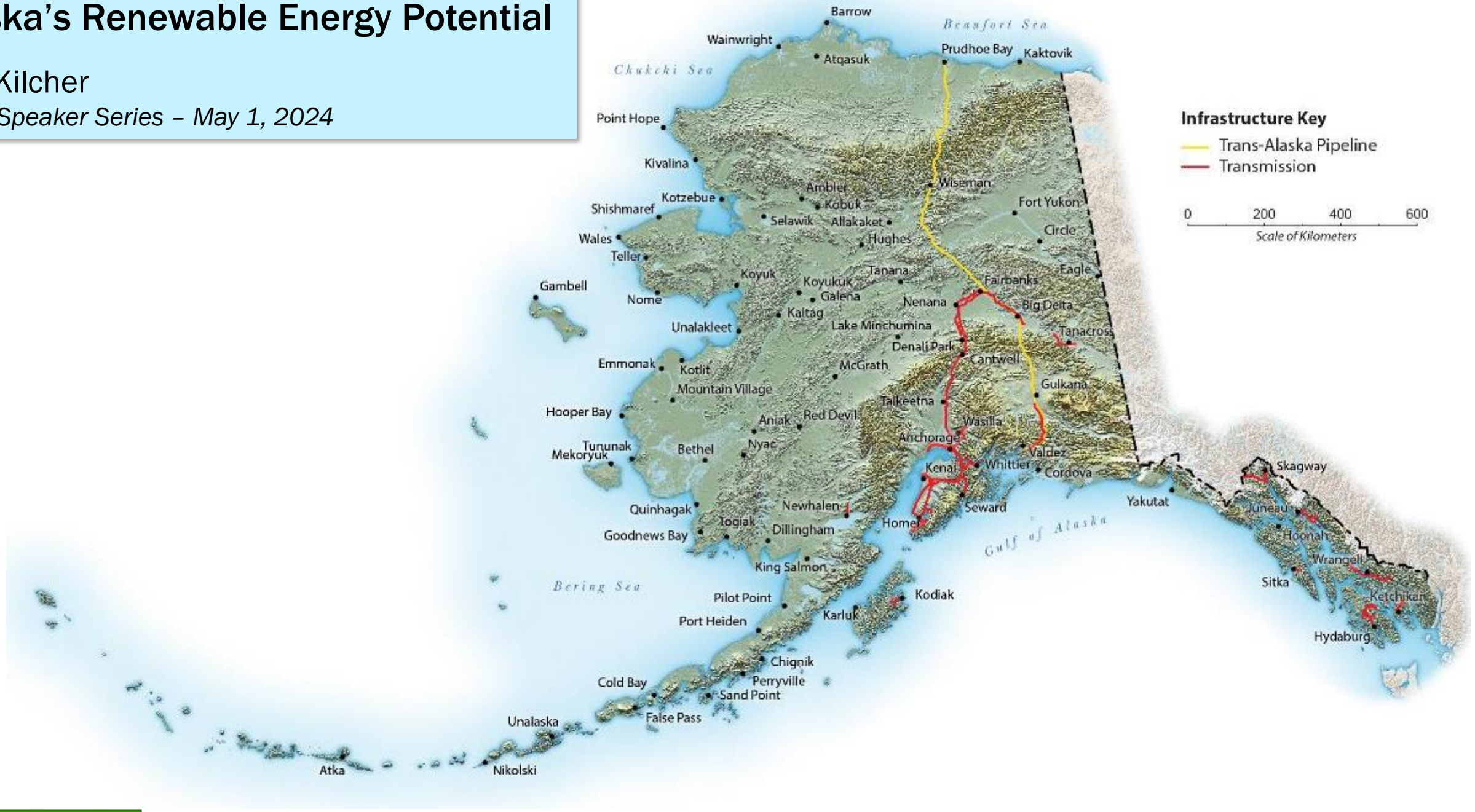
Alaska's Renewable Energy Potential

Levi Kilcher

REAP Speaker Series – May 1, 2024



Selected Recent DOE Award Announcements

February 6, 2024 - $12.5M – Water Power Technologies Office

- $3M – ORPC "American Tidal Energy Project" in Cook Inlet
- $3M – Orcas Power and Light Cooperative (OPALCO) Tidal Energy Pilot Project

} Down-select for $29M 2nd phase to deploy devices

- $9.5M – Galena and UAF-ACEP, Community led river energy project

February 27, 2024 - $125M – Energy Improvements in Rural or Remote Areas (OCED)

- $54.8M – Clean Energy in Northwest Arctic Borough
- $26.9M – Thayer Creek Hydroelectric Project
- $26.0M – Alaskan Tribal Energy Sovereignty (Tanana Chiefs Conference)
- $10.0M – Old Harbor Hydroelectric
- $7.2M – Chignik Hydroelectric Dam and Water Source Project

April 30, 2024 - $20.6M – Energy Improvements in Rural or Remote Areas (OCED)

- $2.5m – Decarbonizing the Tongass with Tribally Owned Heat Pumps
- $2.1M – High Penetration Solar-Battery Project in Ambler, Alaska
- $5M – Kokhanok's Paradigm Shift: Big Battery as our System's Energy Backbone
- $4.3M – New Stuyahok Solar-Battery
- $1.7M – Ouzinkie Independent Power Energy Improvement Project
- $5M – Tanacross Solar PV and Tok Battery Energy Storage System

Publications Discussed Here

- *Feasibility Study for Renewable Energy Technologies in Alaska Offshore Waters*
  R. Meadows, A. Cooperman, M. Koleva, C. Draxl, L. Kilcher, E. Baca, K. Strout Grantham, E. DeGeorge, W. Musial, N. Wiltse, O. Jose Guerra Fernandez, (December 2023), BOEM 2023-076.

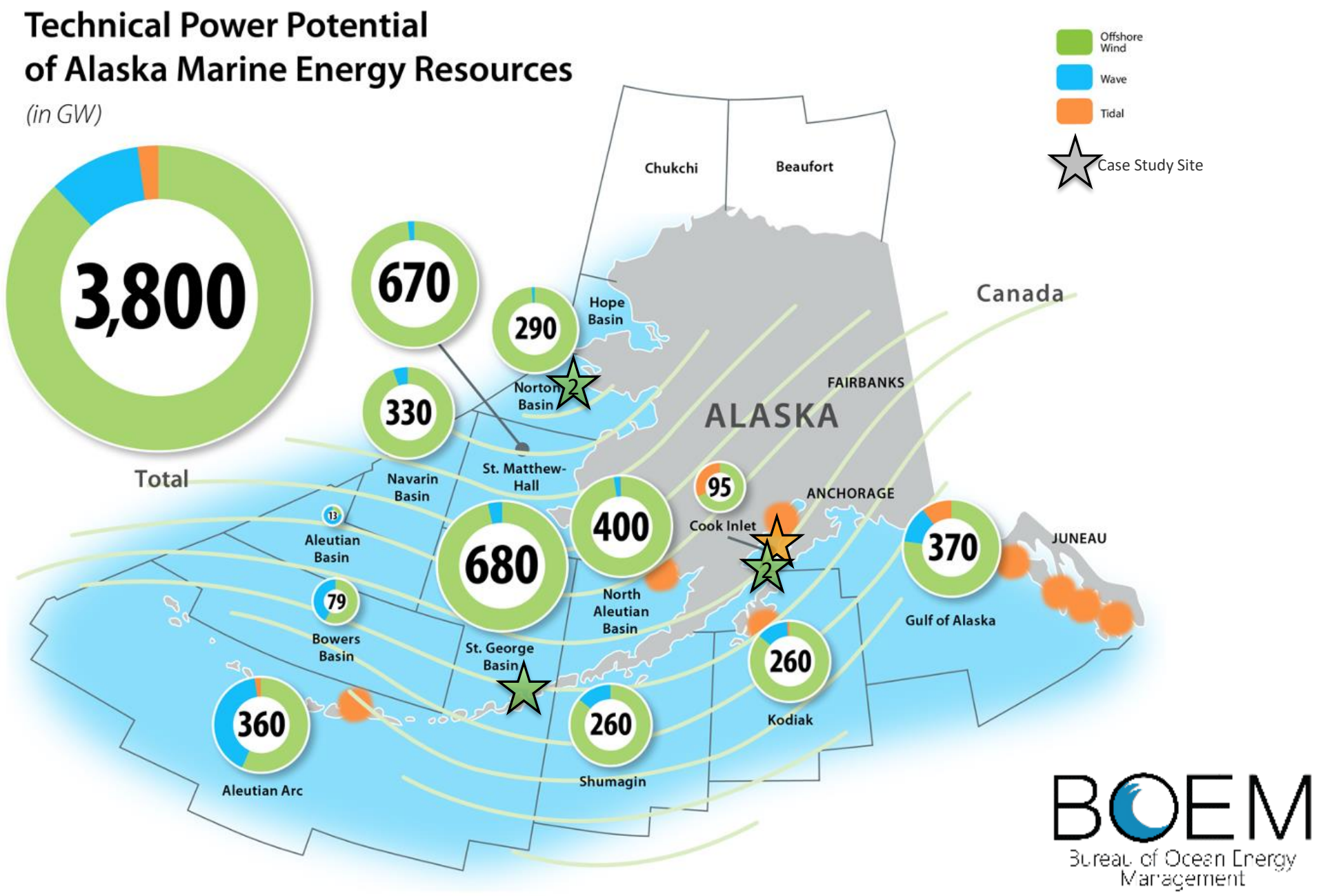
- *Alaska Hydrogen Opportunities Report*
  E. Whitney, M Koleva, L. Kilcher, J. Raun, (April 2024), UAF/ACEP/TP-05-0001.

- *Evaluating the Impact of Tidal Energy in the Cook Inlet on Alaska's Railbelt Electrical Grid*
  M. Schwarz, B. McGilton, L. Kilcher, K. Gjestvang, and G Stark, (April 2024), NREL/TP-5700-8594.

- *Achieving an 80% Renewable Portfolio in Alaska's Railbelt: Cost Analysis*
  P. Denholm, M. Schwarz, and L. Streitmatter, (2024), NREL/TP-6A40-85879.

Outer Continental Shelf

Resource Assessment



BOEM
Bureau of Ocean Energy Management

Tidal Energy

—

Southcentral Alaska

BOEM
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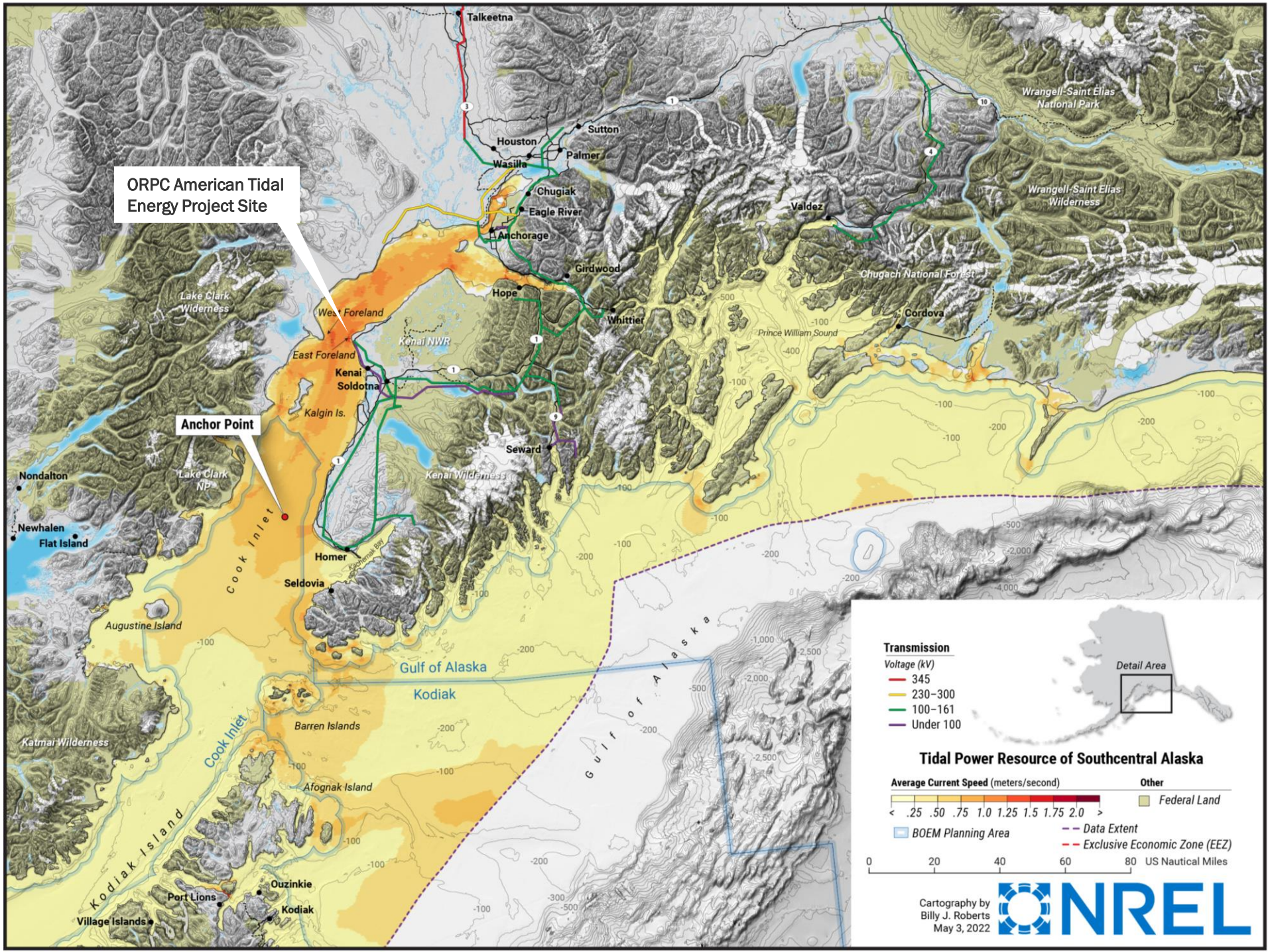
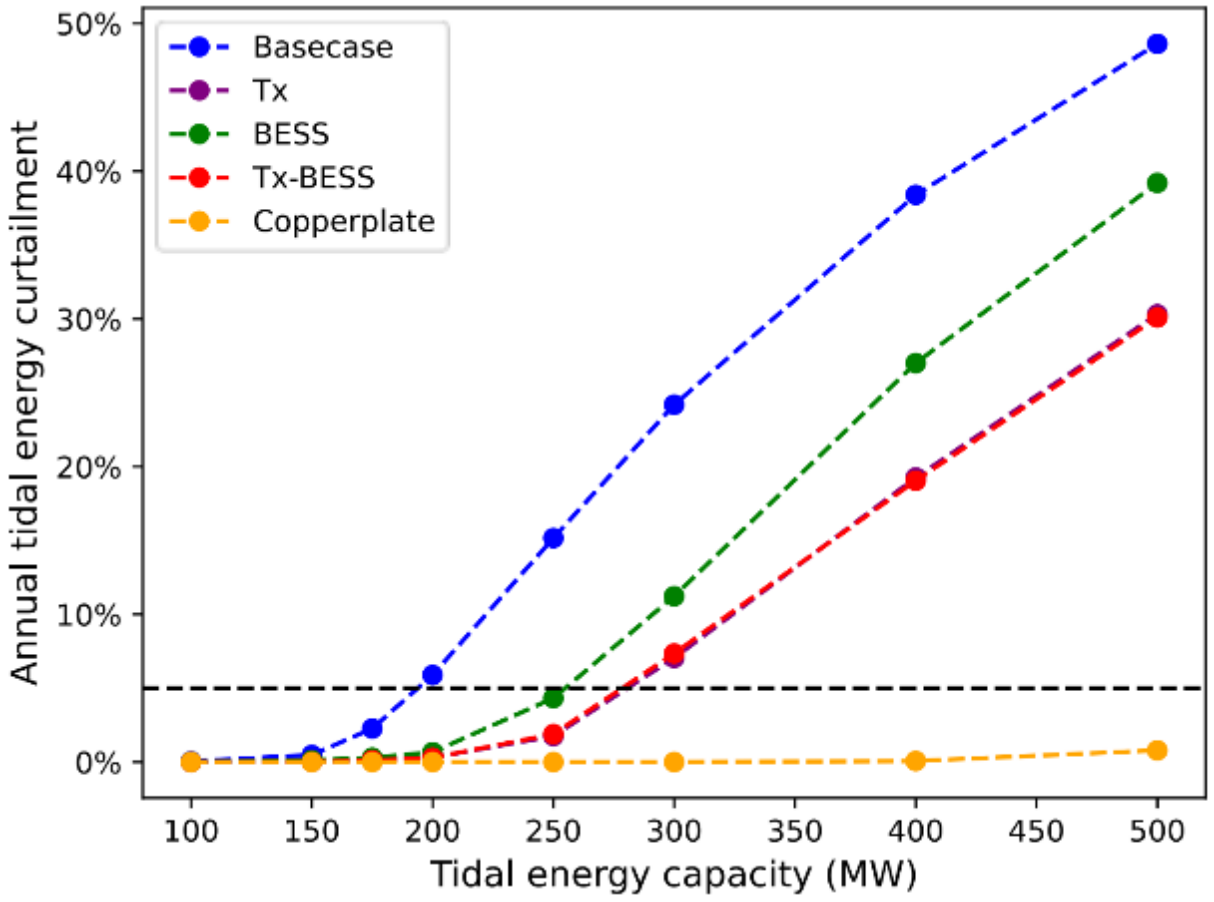


Tidal Energy Integration in the Railbelt

- 200 MW capacity in today's grid
- 300 MW capacity with transmission (Tx) upgrades
- Analysis does not account for: cost, or other new renewables



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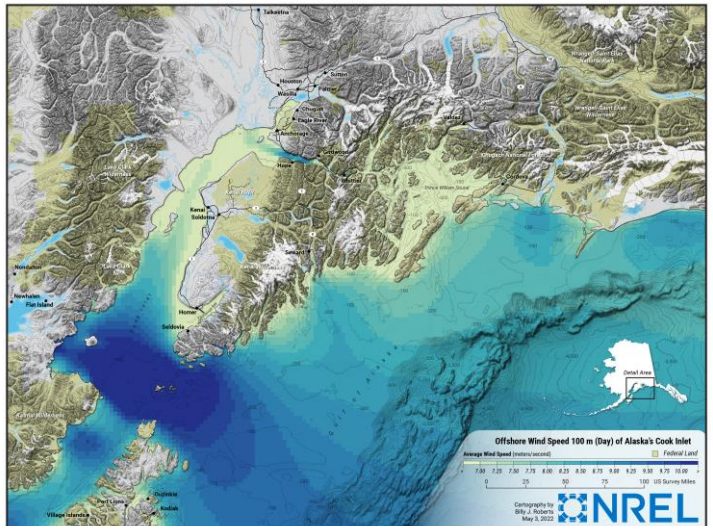
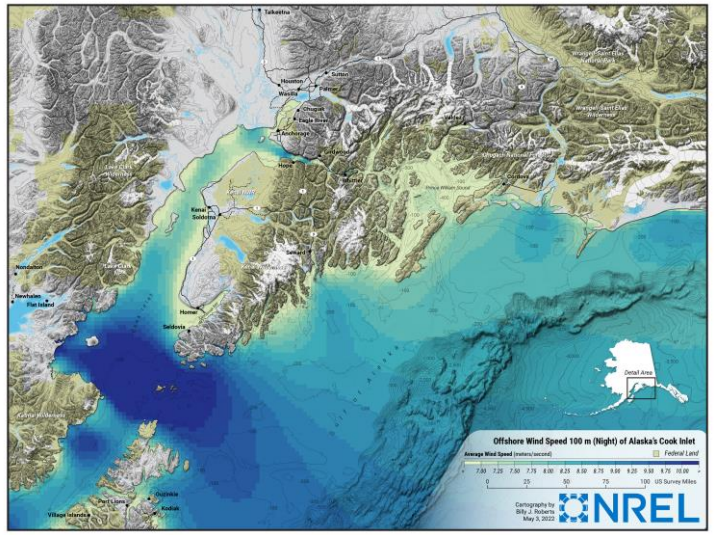
Case Study: Cook Inlet Wind Resource

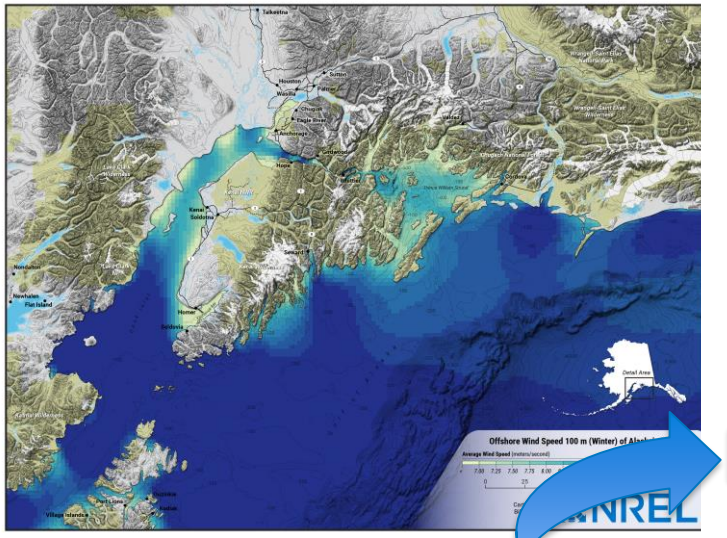
Day



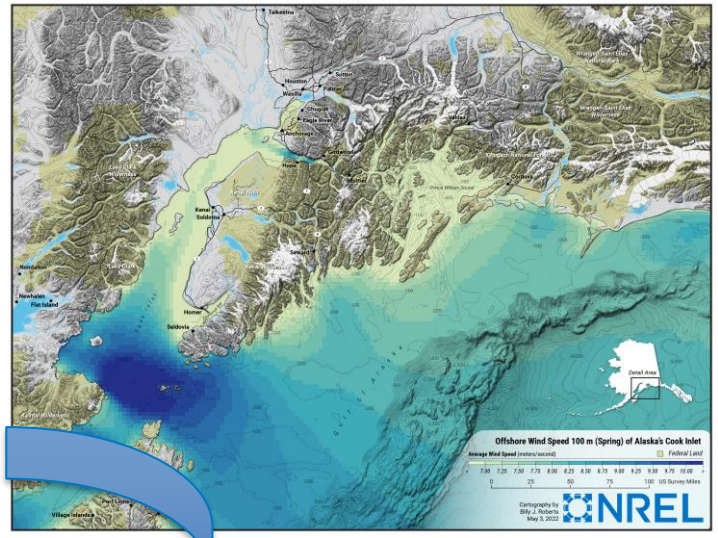
Night



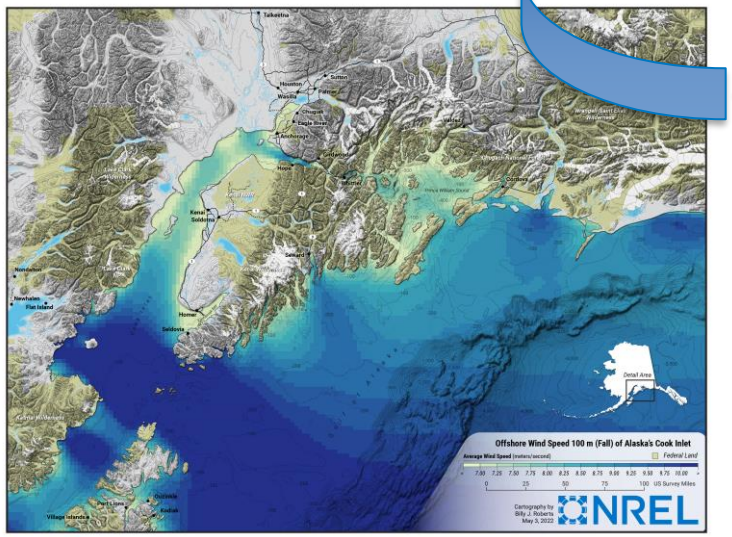
Winter



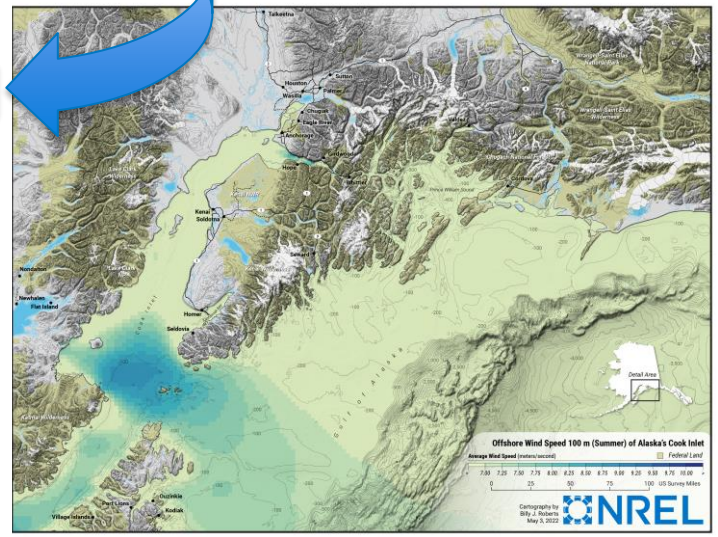
Spring



Fall



Summer



Case Study Costs

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Table ES-2. Estimated LCOE in 2035 for 1-GW (1,000-MW) offshore wind case studies and a 100-device, 65-MW-array tidal case study

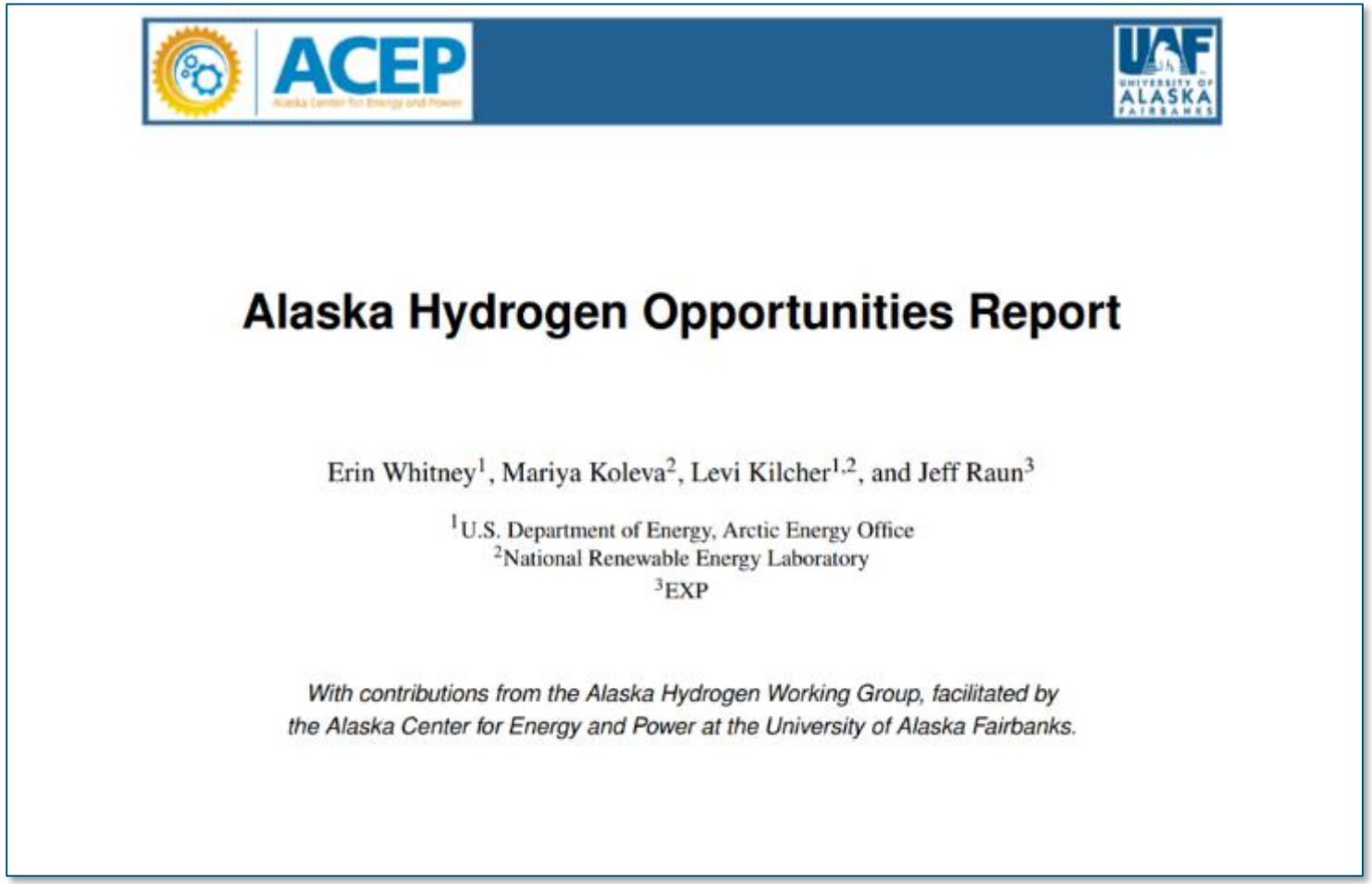
Estimated capital expenditures (CapEx) and operational expenditures (OpEx) are also given for each case study.

	Southcentral Alaska: Lower Cook Inlet Floating Offshore Wind Case Study	Southcentral Alaska: Lower Cook Inlet Fixed-Bottom Offshore Wind Case Study**	Alaska Peninsula and Eastern Aleutians: Dutch Harbor Floating Offshore Wind Case Study**	Western Alaska: Nome 1 Fixed-Bottom Offshore Wind Case Study**	Western Alaska: Nome 2 Fixed-Bottom Offshore Wind Case Study**	Southcentral Alaska: Lower Cook Inlet 65-MW Tidal Case Study
CapEx ($/kW)	$5,385	$4,292	$4,661	$4,980	$5,397	$5,100
OpEx ($/kW/yr)	$65	$65	$59	$73	$74	$163
LCOE ($/MWh)*	$100	$83	$87	$103	$106	$280

*MWh = megawatt-hour

**These offshore wind scenarios would likely not exist without the clean hydrogen component; thus, the reader should not make direct comparisons across the LCOE numbers without adding in the cost of clean hydrogen production in these locations.

Alaska Hydrogen Opportunities Report (April 2024)



ACEP Alaska Center for Energy and Power

UAF University of Alaska Fairbanks

Alaska Hydrogen Opportunities Report

Erin Whitney[1], Mariya Koleva[2], Levi Kilcher[1,2], and Jeff Raun[3]

[1]U.S. Department of Energy, Arctic Energy Office
[2]National Renewable Energy Laboratory
[3]EXP

With contributions from the Alaska Hydrogen Working Group, facilitated by the Alaska Center for Energy and Power at the University of Alaska Fairbanks.

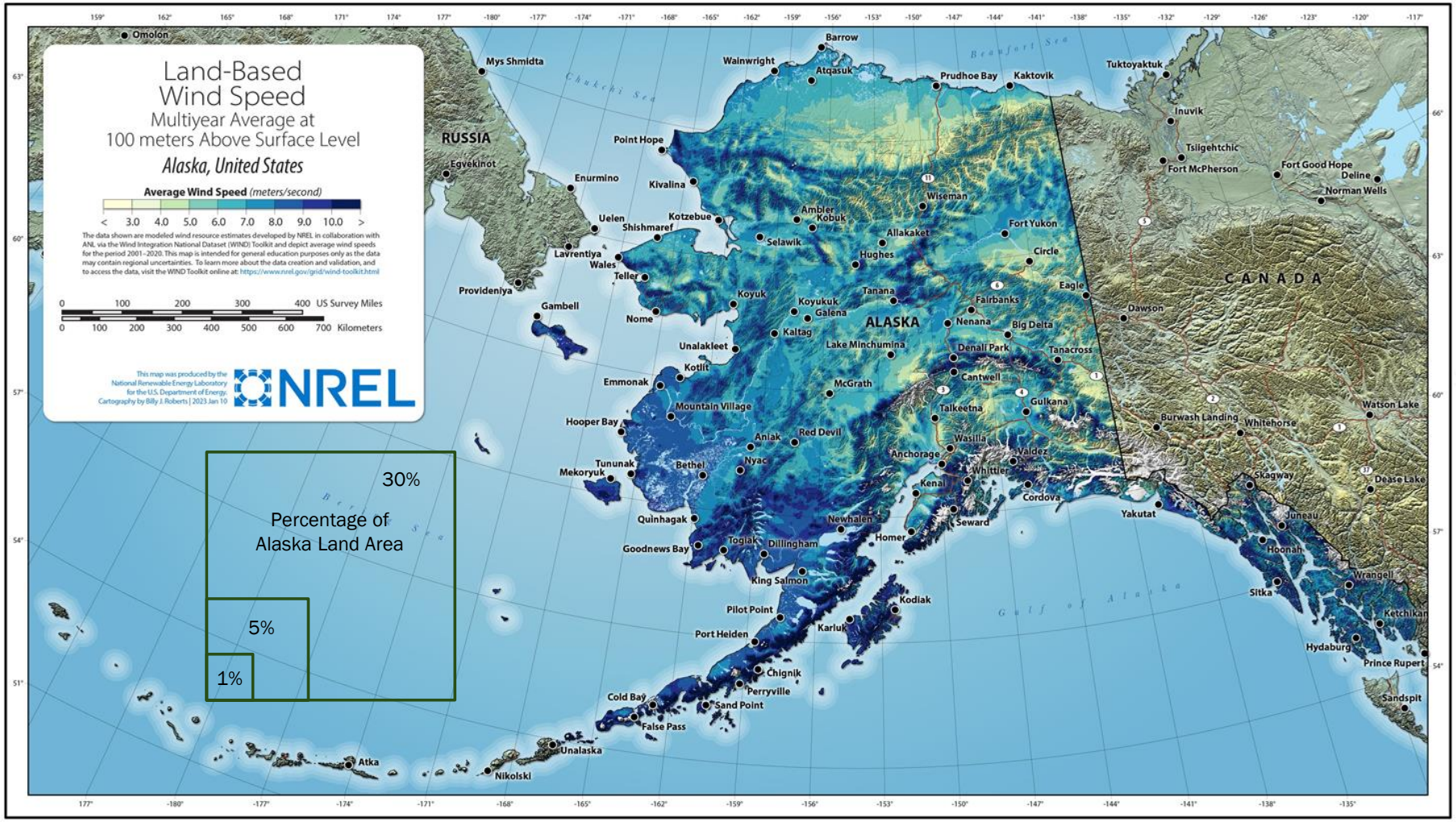
- Follows publication of U.S. National Clean Hydrogen Strategy & Roadmap (June 2023)
- Alaska has the potential to make progress in a number of hydrogen ecosystem components, including:
  - Hydrogen production from both vast renewable energy potential as well as natural gas resources combined with carbon capture;
  - Seasonal energy storage for Alaskan communities;
  - Storage in depleted oil and gas reservoirs to enable affordable delivery of hydrogen at scale.
- Near-term demonstrations will help pave the way.

https://www.uaf.edu/acep/files/media/Alaska_hydrogen_report_ACEP_publication.pdf

Alaska Wind Resource

Wind Projects over:

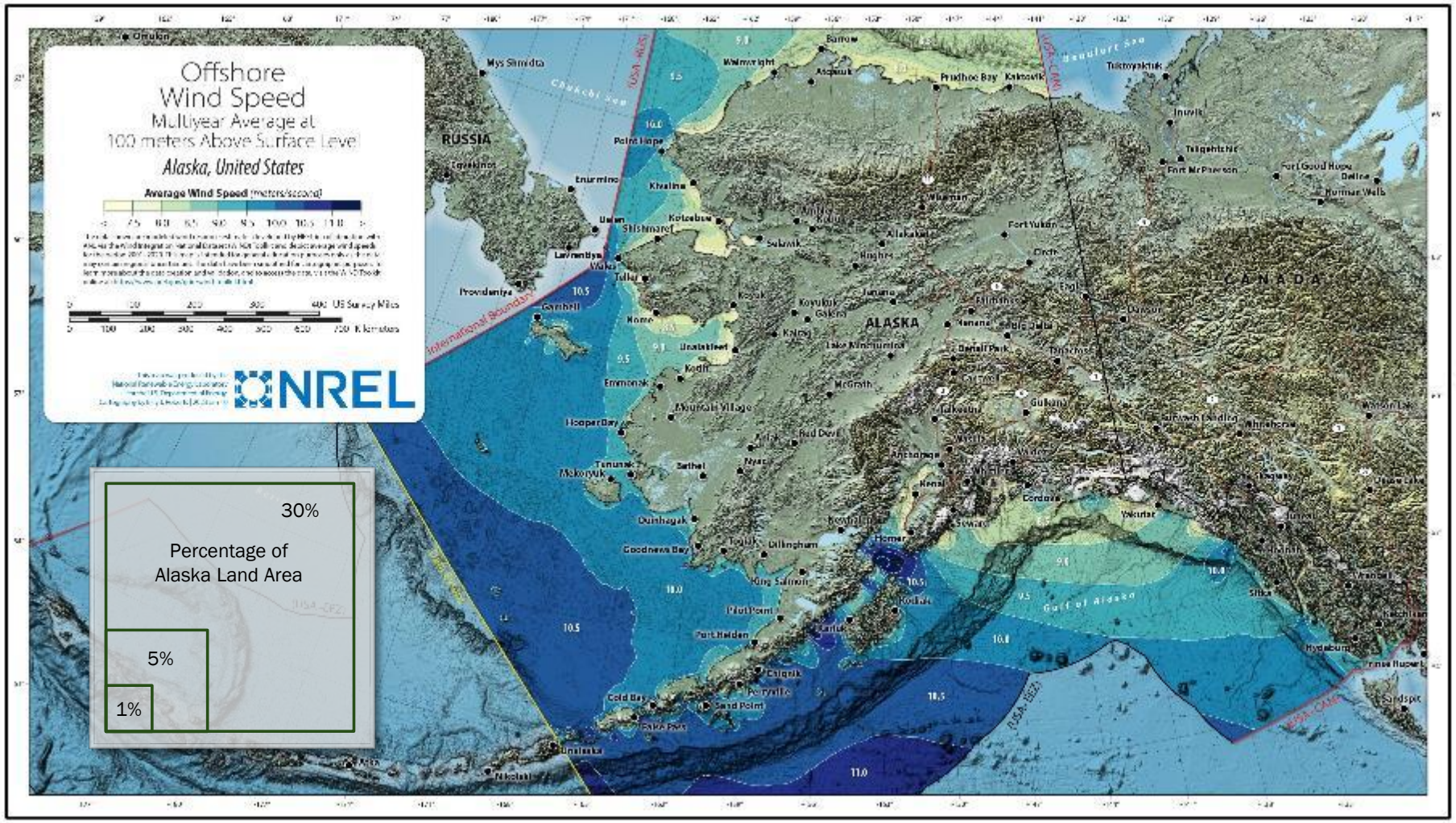
- 30% of Alaska Land: **18,600 Tbtu/yr (in bar graph)**
- 2.1% of Alaska would have energy equivalent of Alaska's current energy *production*
- 1.1% of Alaska would have energy equivalent to Alaska's current energy *consumption*



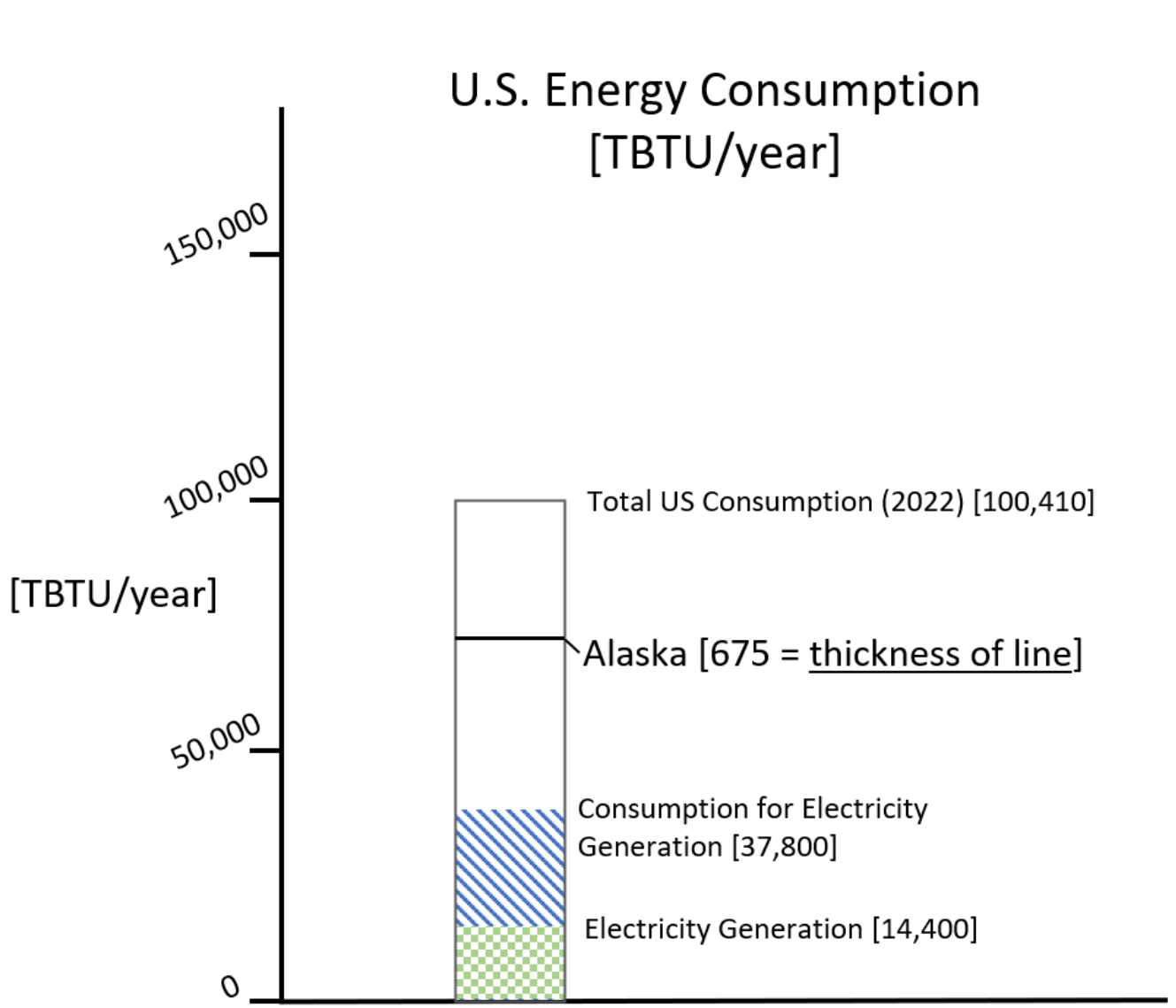
Alaska Offshore Wind Resource

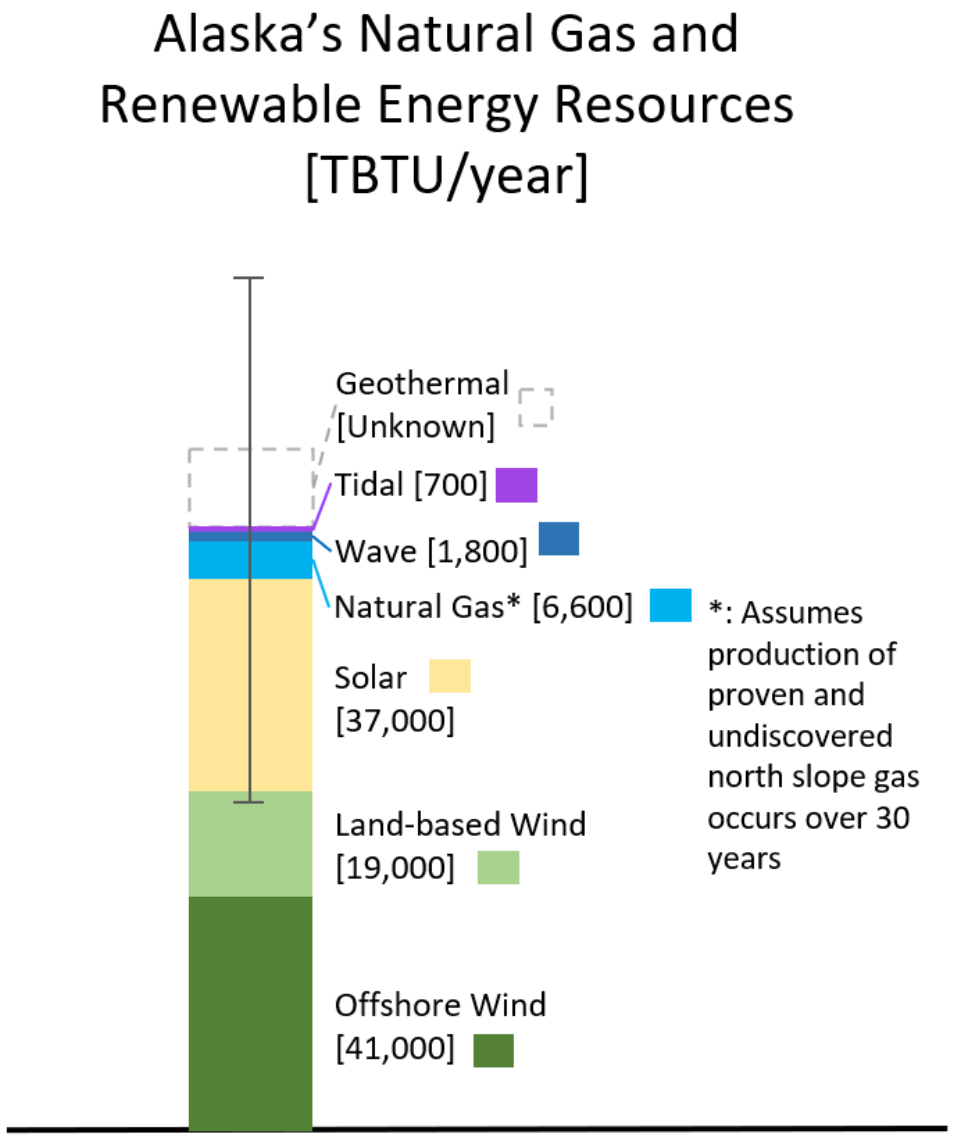
Wind Projects over:

- 30% of Alaska OCS: **41,000 Tbtu/yr (in bar graph)**
- 1% of Alaska OCS would have energy equivalent of Alaska's current energy *production*
- 0.6% of Alaska OCS would have energy equivalent to Alaska's current energy *consumption*



Alaska Has Vast Untapped Renewable Energy Potential





Energy Earthshots™ Portfolio

ENERGY earthshots
U.S. DEPARTMENT OF ENERGY

Generation & Grid	Industry	Transportation	Buildings
Floating Offshore Wind	Industrial Heat		
Enhanced Geothermal	Clean Fuels & Products		Affordable Home Energy
Long Duration Storage	Hydrogen		
Removing Carbon	Carbon Negative		

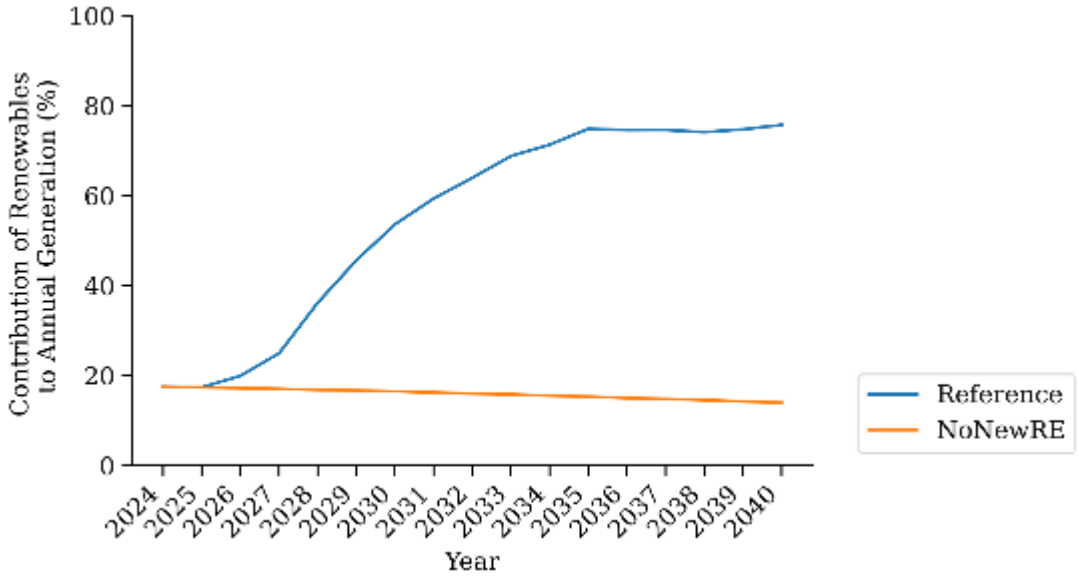
Achieving the Energy Earthshots™ can save $850 billion and avoid ~3.9 Gt CO_2

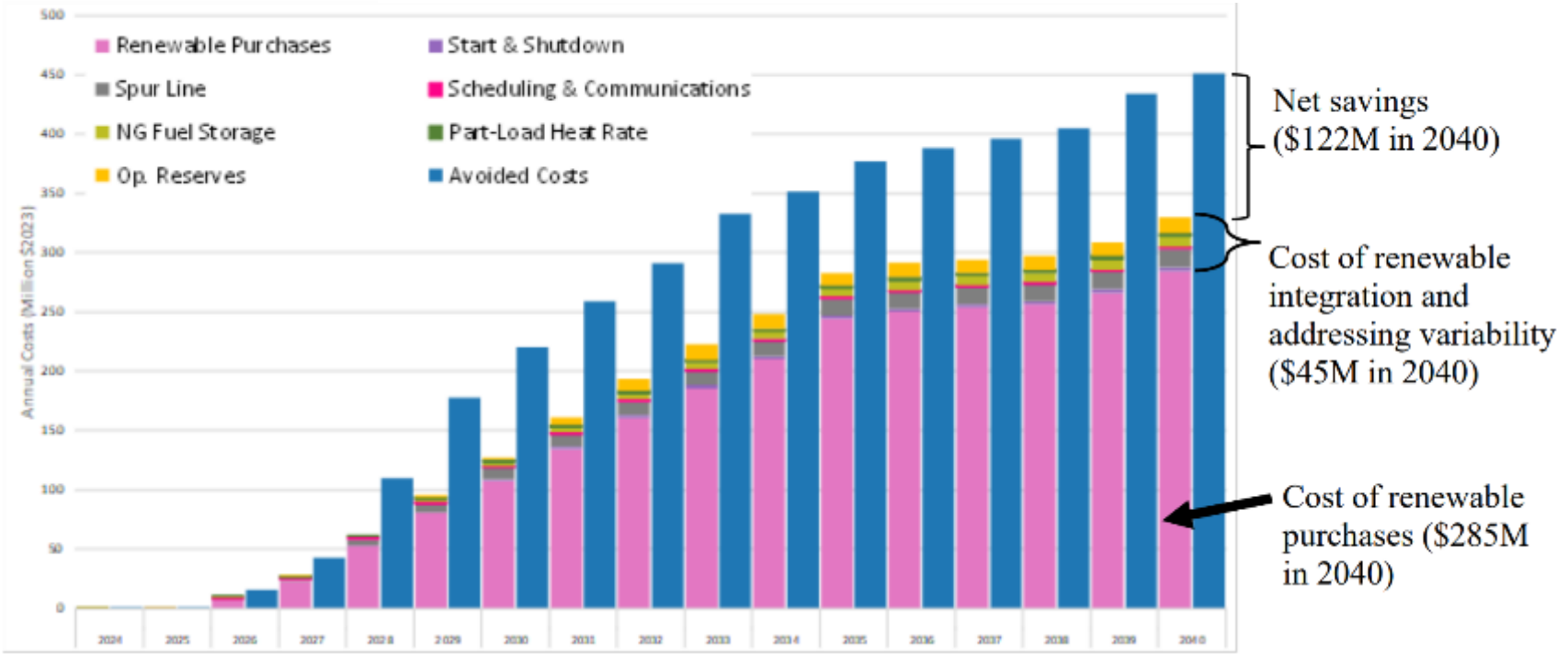
Independent analysis by Third Way for the *Cumulative and Combined Impacts* (2021-2050) *(Published before CFP and AHE Shots)*

Announced June 2021- October 2023

NREL's 80% Railbelt RPS Analysis

The least-cost scenario is substantial deployment of Renewable Energy, with cost savings of $1.3B by 2040.





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Concluding Thoughts

- **Alaska has vast untapped energy production potential**
  - NREL RPS Analysis: Renewable energy projects are economical in Alaska now!
  - As costs of emerging technology come down (Earthshots), will Alaska be ready to develop its resources?
  - Pilot projects are critical to building capacity and proving technology in Alaska
  - Hydrogen can be key to bringing stranded renewables to market
- **Energy projects create jobs**
  - Alaska's oil and gas sector will be critical to building projects and infrastructure
  - New jobs! – wind turbines, solar installers, and more
  - Old jobs! – pipelines, permitting, operations, safety, fuel production, others…
- **Alaska is an energy producing state**
  - Alaska currently produces twice as much energy as it consumes
  - Energy production is energy intense and involves environmental impacts. Weighing impacts against the value of energy is challenging and important.

Get In Touch

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Thank You!