

Bristol Bay Campus & Bristol Bay Energy

Professor Chandler Kemp

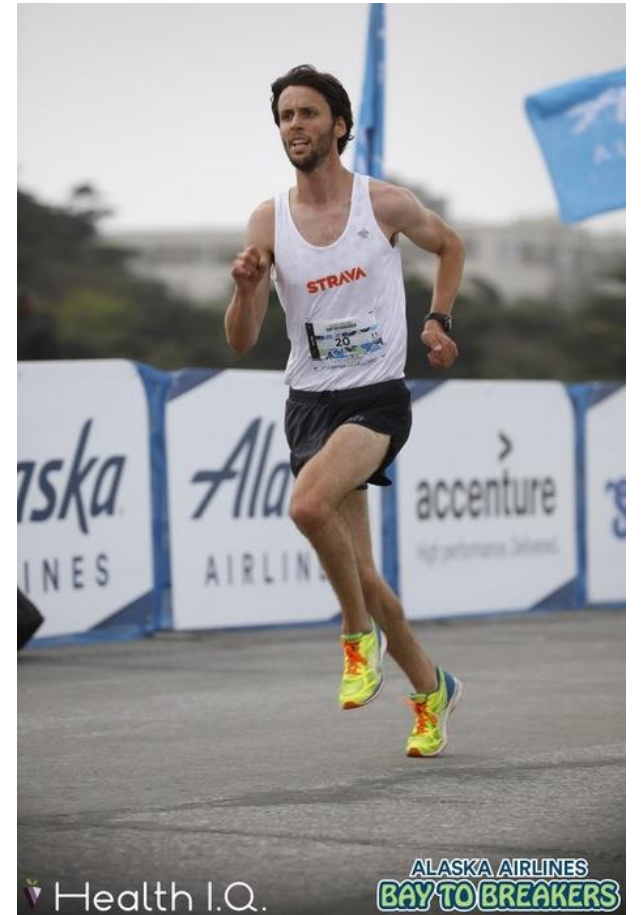
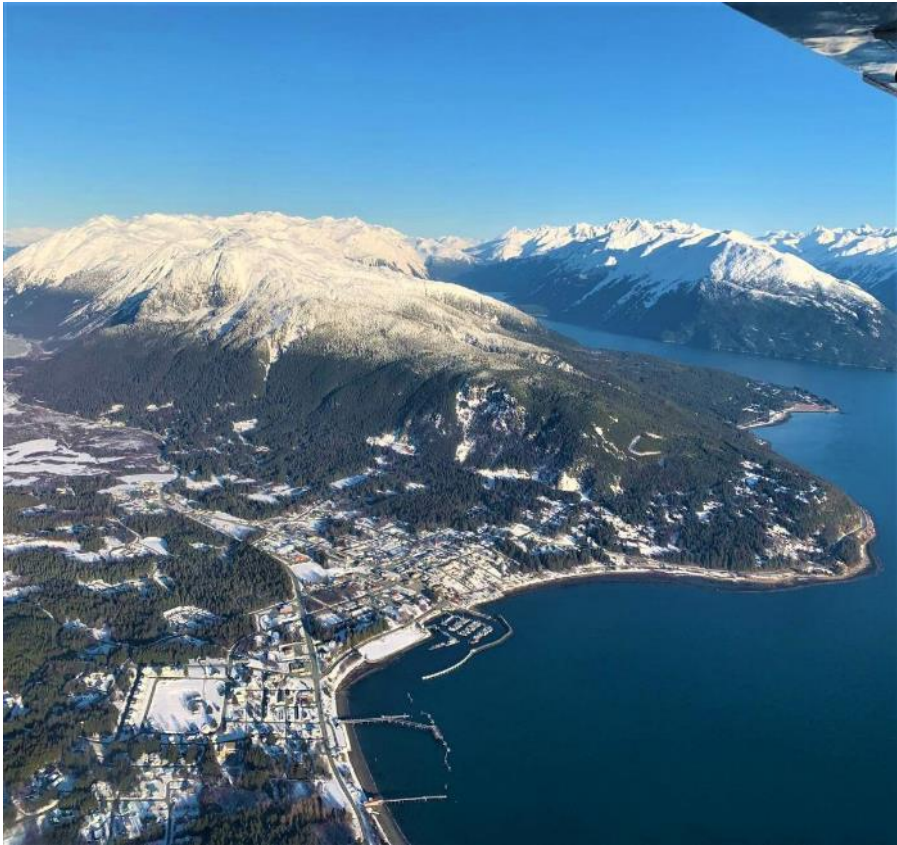
University of Alaska Fairbanks Bristol Bay Campus



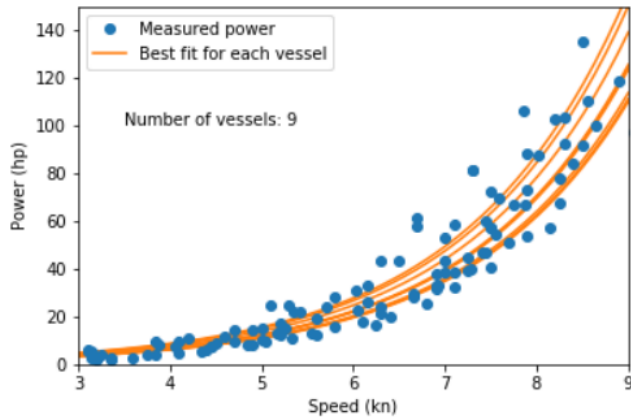
What I plan to talk about:

- Introduction
 - Personal
 - BBC Sustainable Energy Program
- How do we use energy?
- What are our energy options?
- Opportunities for partnership

Where I'm from...



My work in sustainable energy



ENVIRONMENTAL
Science & Technology

Article
pubs.acs.org/est

Comparing Natural Gas Leakage Detection Technologies Using an Open-Source

Chandler E. Kemp



Fisheries Research

journal homepage: www.elsevier.com/locate/fishres



Determining salmon provenance with automated otolith reading

Chandler

ENVIRONMENTAL
Science & Technology

Article
pubs.acs.org/est

New Technologies Can Cost Effectively Reduce Oil and Gas Methane Emissions, but Policies Will Require Careful Design to Establish Mitigation

Chandler E. Kemp and Arvind P. Ravikumar*



www.kempyenergetics.com

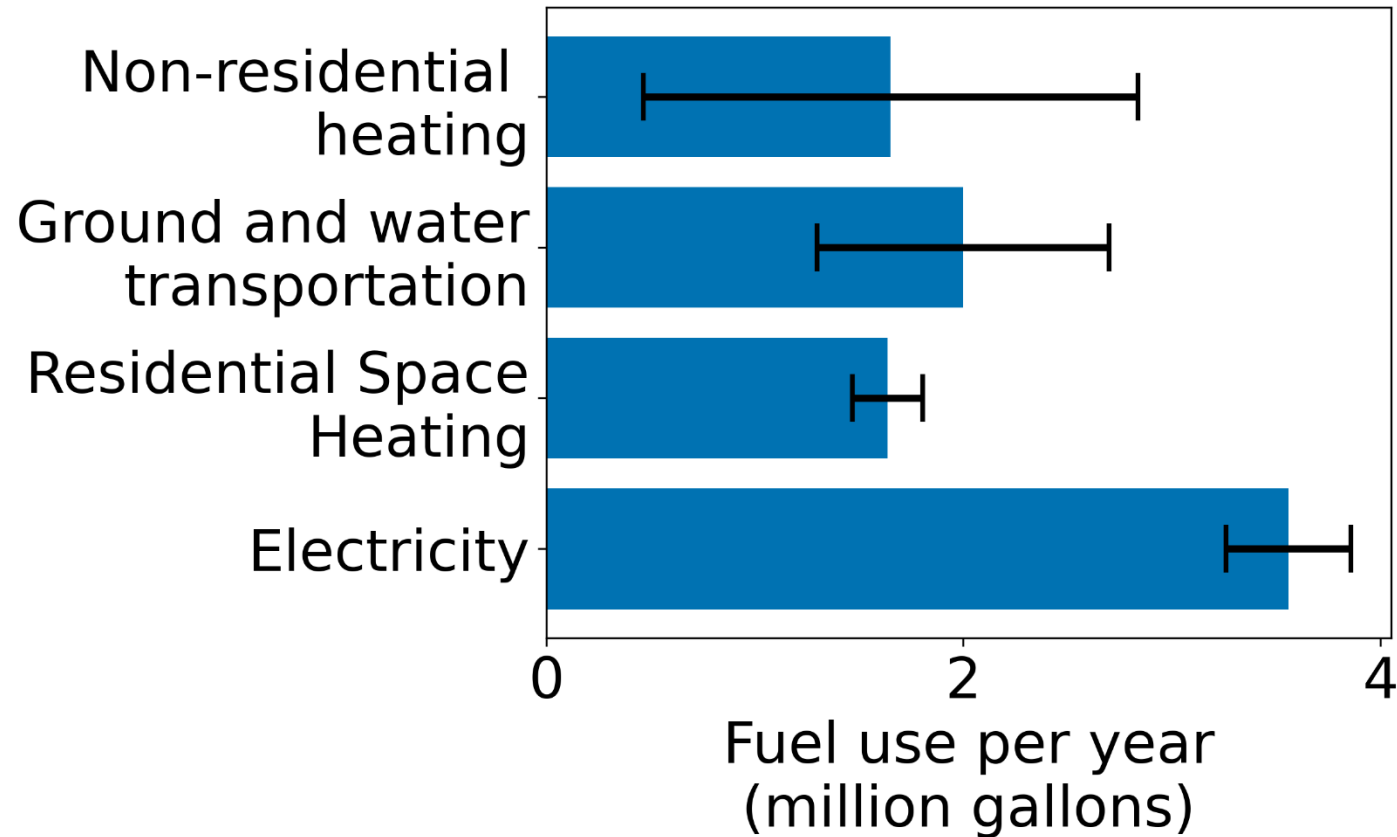
Sustainable Energy Program Goals

- Help students learn energy fundamentals
- Communicate Alaskan strategies to transition to a clean energy future
- Introduce students to clean energy pathways
 - Careers
 - Further training/education
 - Personal achievement

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Heating, electricity and transportation use similar amounts of fuel.



Data adapted from Bristol Bay Regional Energy Plan Phase 1. SWAMC, BBNA and Information Insights. 2013. [Link](#).

Nonresidential heating based on data for Bethel from Alaska Energy Authority End Use Study: 2012. WHPacific. 2012. [Link](#). Rescaled for Bristol Bay based on population and heating degree days.

Uncertainty ranges based on Kemp's analysis, details available on request.

Right now, most energy in Bristol Bay comes from petroleum.

- Heating, transportation and electricity are primarily derived from heating oil, gasoline, or diesel fuel
- Some communities have renewable energy projects that generate electricity, including Tazimina Falls hydro, Kokhanok wind
- Some wood heat

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There are many energy options to consider.

- Efficiency
- Renewable resources
- Electrification



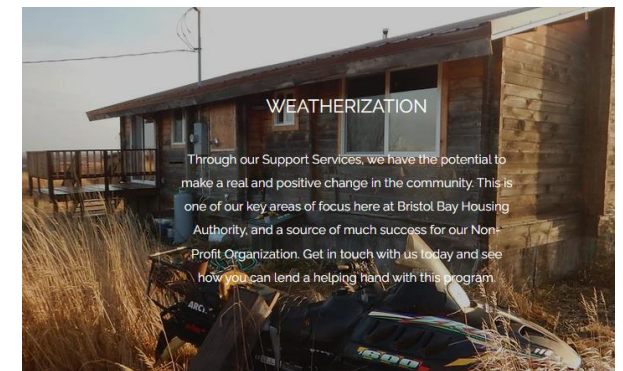
Proposed [Nuyakuk Hydro](#)



[Kokhanok Wind](#)

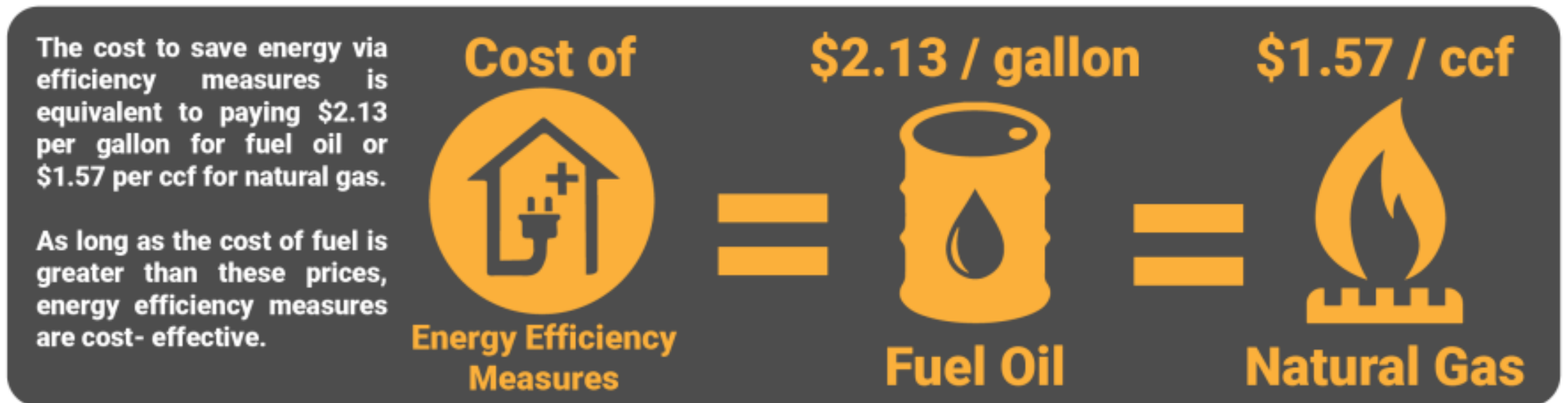


Solar training at BBC.



[Weatherization by Bristol Bay Housing Authority](#) ¹⁰

Investing in energy efficiency is often the most cost effective way to reduce fuel consumption.



Weatherization Program Impacts Report. Cold Climate Housing Research Center. 2019. [Link](#)

Here's a personal example from this year:

- My bedroom needed to be refinished.
- I added insulation as part of the project.
- Annual fuel savings of ~18 gallons ~\$100
- Material cost \$530



Regionally, homes and commercial buildings participating in efficiency programs typically reduced energy consumption by 30%.



That's 300-450 gallons of heating oil per year in most homes!

Data from Bristol Bay Regional Energy Plan Phase 1. SWAMC, BBNA and Information Insights. 2013. [Link](#).

A super efficient home in Dillingham uses zero heating oil and 2/3 the electricity of a typical house.



	Electricity	Heating Fuel	Total
Average house in Dillingham	5930 kWh \$1270	700 gallons \$4200	\$5470
Marsik House	3760 kWh \$900	None	\$900

The Bristol Bay campus offers an online class in home energy efficiency. It covers:

- Insulation
- Air sealing with heat recovery ventilation
- Energy star appliances
- Efficient heat sources

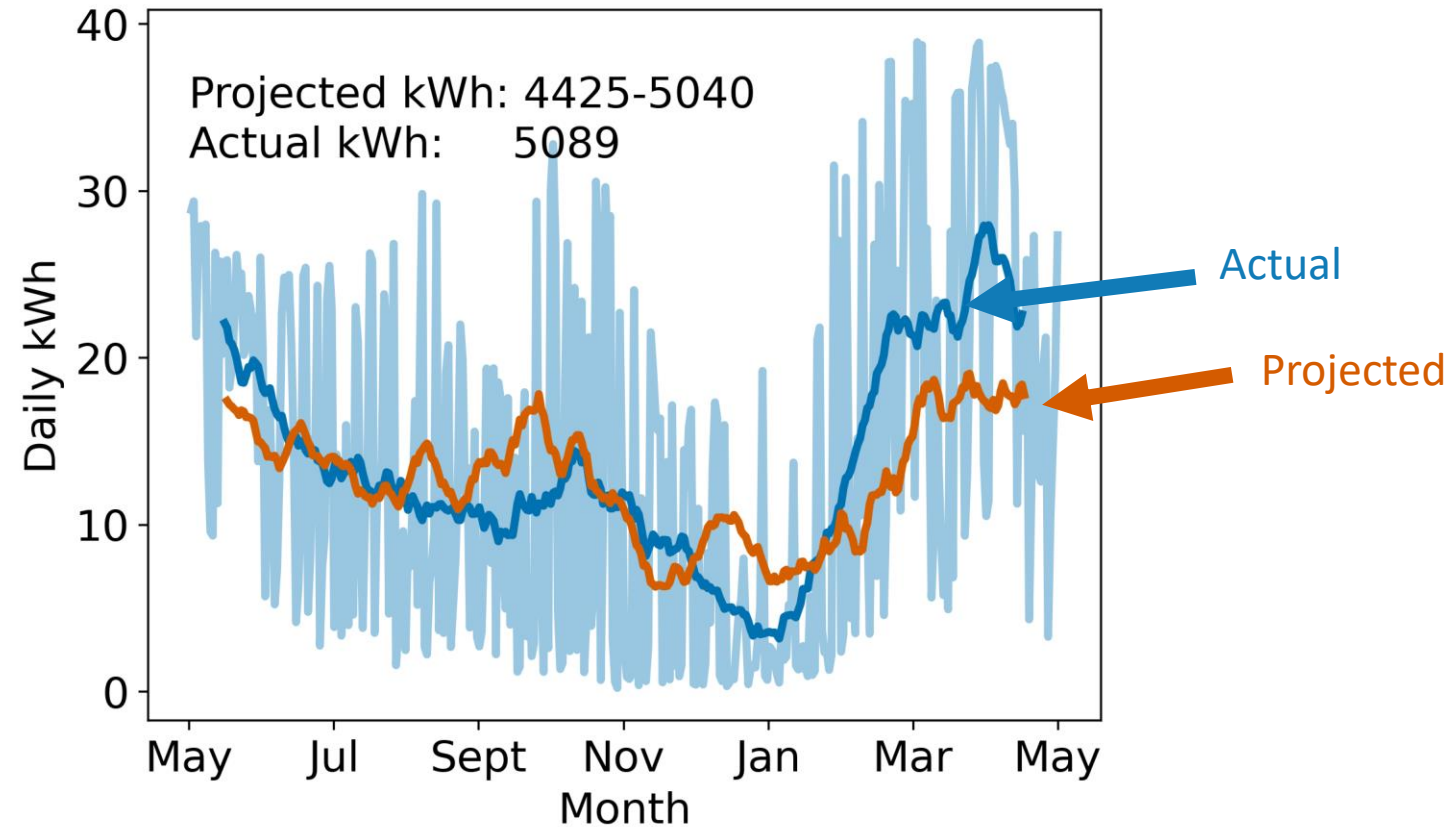


Our campus has been leading solar installation classes.

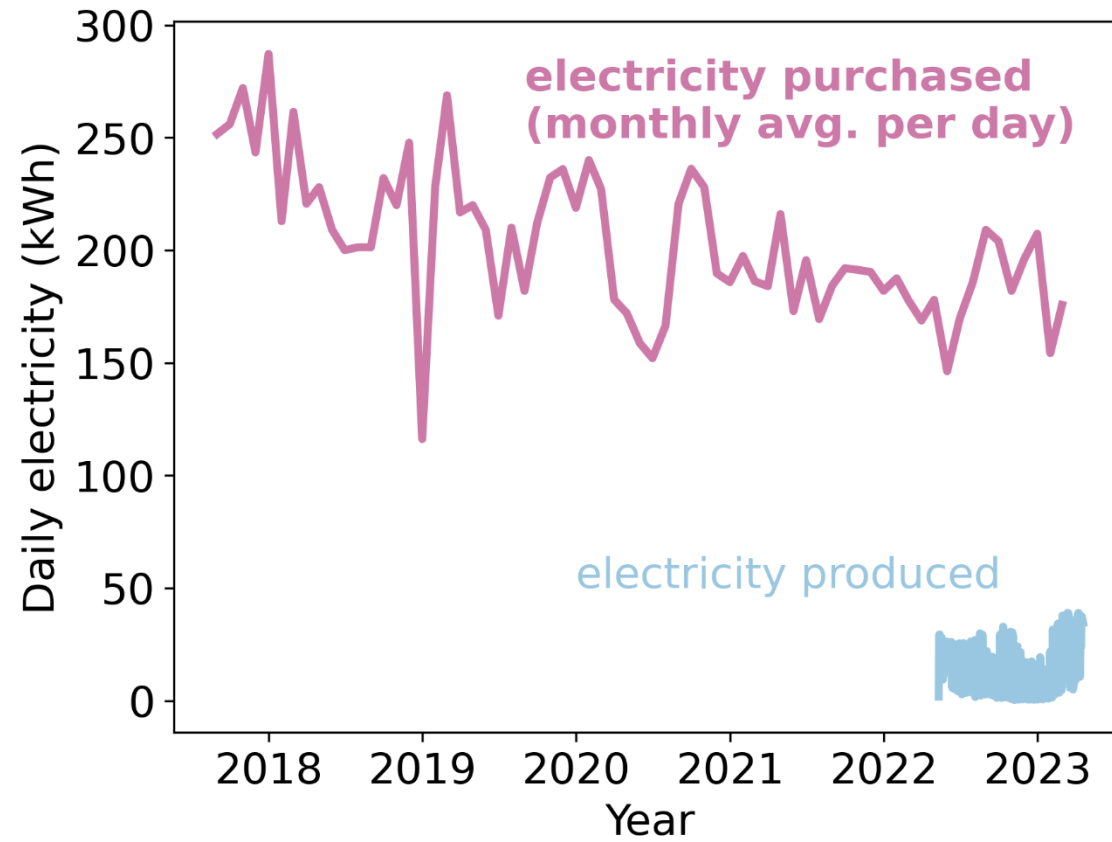


Solar Energy International instructors
Kyle Bolger and Tom Honey

Solar array is producing near the upper bound of projections.



Electricity production from solar at the campus is small compared to usage.



Simple payback time at 45 cents/kWh is less than 5 years (excluding installation).

- Projected annual production of 4.7 MWh
- Offsetting \$2100/yr at 45 cents/kWh
- Equipment cost of \$9933
- No installation costs for campus → installation might double the cost in other installations
- Installations like this are eligible for a 30% tax credit under the Inflation Reduction Act ([link](#))

Implications of the data:

- Energy efficiency is an excellent way to reduce fuel consumption.
- Solar generation is technically feasible in our region and can be economical in some cases.
- Other renewable energy resources including hydropower, wind and biomass have potential.

What do you think are some of the gaps and challenges in the region to addressing the energy crisis?

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The Bristol Bay campus faculty and staff can provide facilities, instructor support and teach classes.

- We welcome community events on our campus.
- We recruit and support instructors from within the region and beyond.
- We offer online and in person classes.



The Bristol Bay campus can contribute to grant writing.

- I write about the facilities and education programs the campus can provide for grant applications.
 - Currently supporting BBNA's NOAA climate resilience regional challenge application

NOAA CLIMATE RESILIENCE REGIONAL CHALLENGE

COVER PAGE

To: NOAA Office for Coastal Management

Purpose: NOAA Climate Resilience Regional Challenge (2023)

Project Title: Bristol Bay Climate Resilience

Funding Track: Track One and Track Two

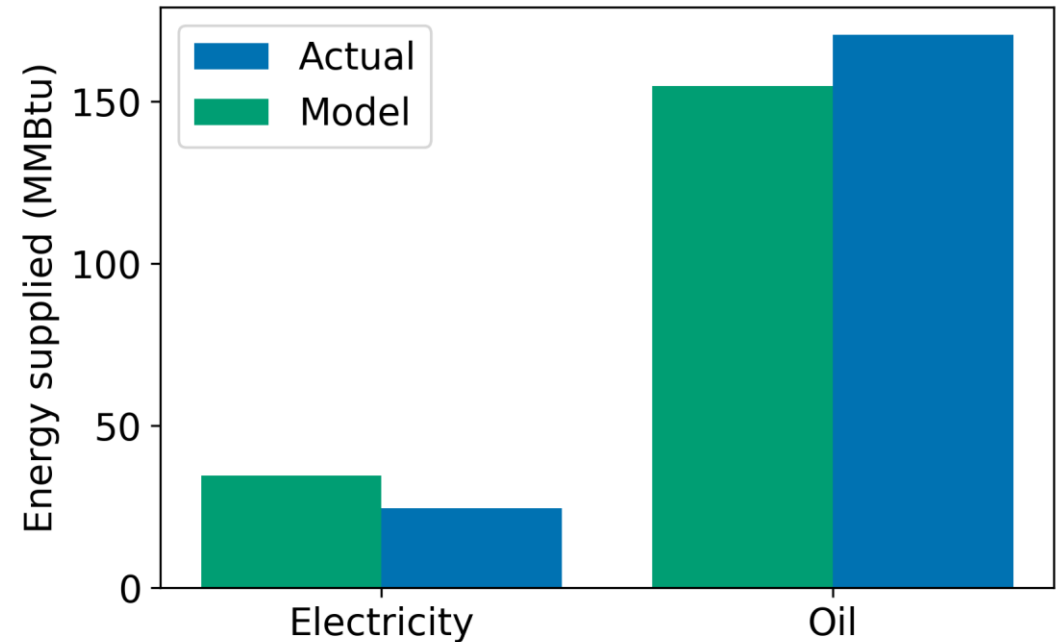
Lead Applicant: Bristol Bay Native Association (BBNA) (Regional non-profit)
PO Box 310
Dillingham, AK 99576
(907) 842-5257 Main

Project Director: Dan Breedon, BBNA Director of Transportation & Infrastructure Development
PO Box 310
Dillingham, AK 99576
dbreedon@bbna.com email
(907) 842-6219 Office
(907) 843-9752 work cell
(907) 227-8696 cell
(833) 964-0940 fax

The Bristol Bay Campus can help interpret data.

- My research is focused on quantifying the impact of efficiency measures.
- I would happily support any efficiency research in our region.

Example results from a recent energy audit.



Quyana!

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A holistic interdisciplinary approach

Natural Sciences

- Physics
- Chemistry
- Earth Science
- Biology

**Engineering/
Technology**

Social Sciences

- Civics
- Economics
- Psychology

Energy Literacy Principles

1

Energy is a physical quantity that follows precise natural laws.



2

Physical processes on Earth are the result of energy flow through the Earth system



3

Biological Processes depend on energy flow through the Earth System



4

Various sources of energy can be used to power human activities, and often this energy must be transferred from source to destination.



5

Energy decisions are influenced by economic, political, environmental, and social factors.



6

The amount of energy used by human society depends on many factors.



7

The quality of life of individuals and societies is affected by energy choices.



Our student “markets”

- People seeking careers (and career changes)
- People who want to understand energy in order to achieve their goals (community, economy, personal, etc.)
- People interested in the *future* of energy
- DIY and “personal enrichment” – usually related to cost of energy and/or environmental concerns

Equipment costs were \$1.62/watt.

- Purchased in 2021
 - From “Alaska Solar Supply” vendor
- Solar modules
 - 6.1 kW installed capacity
 - Total price: \$3,971
- Enphase Qcell Micro Inverters
 - \$2,850 total
- Racking Re-Used and miscellaneous
- Total = \$9,933 (65% less)
- Equipment cost: \$1.62/watt

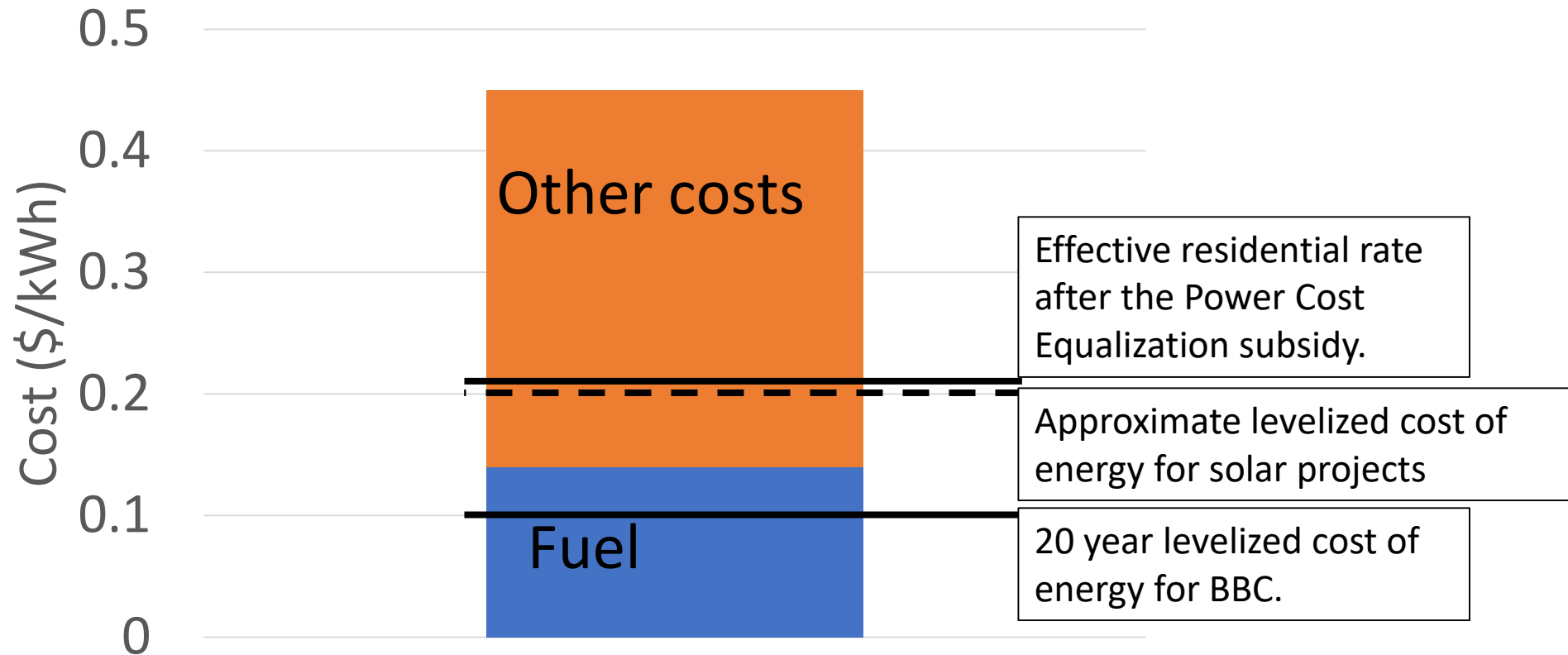


We offer an occupational endorsement in sustainable energy.

Occupational Endorsement Certificate (OEC)

- UAF/Bristol Bay (12 credits) – online and in-person delivery
 - Required: Introduction to Sustainable Energy
 - Required: Intermediate Algebra or equivalent
 - Electives: Choose 6 credits from a variety of classes including Home Energy Basics, Solar Installation, Alaska Utility Lecture Series.
- Asst. Prof. Chandler Kemp
- Dr. Tom Marsik

At a fuel cost of 15 cents/kWh, the campus system has a payback of 14 years (but remember, no install costs).



Power Cost Equalization Program Statistical Report. Alaska Energy Authority. 2022.

[Link.](#)