Alaska Energy Landscape

Colleen Fisk, Energy Education Director
Renewable Energy Alaska Project
February 16, 2023

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Land Acknowledgement

I live and work on Dena'ina Ełnena, the ancestral and unceded lands of the Dena'ina

I acknowledge the thousands of years of stewardship of this land and the Indigenous knowledge and ways of life that continue to guide us today

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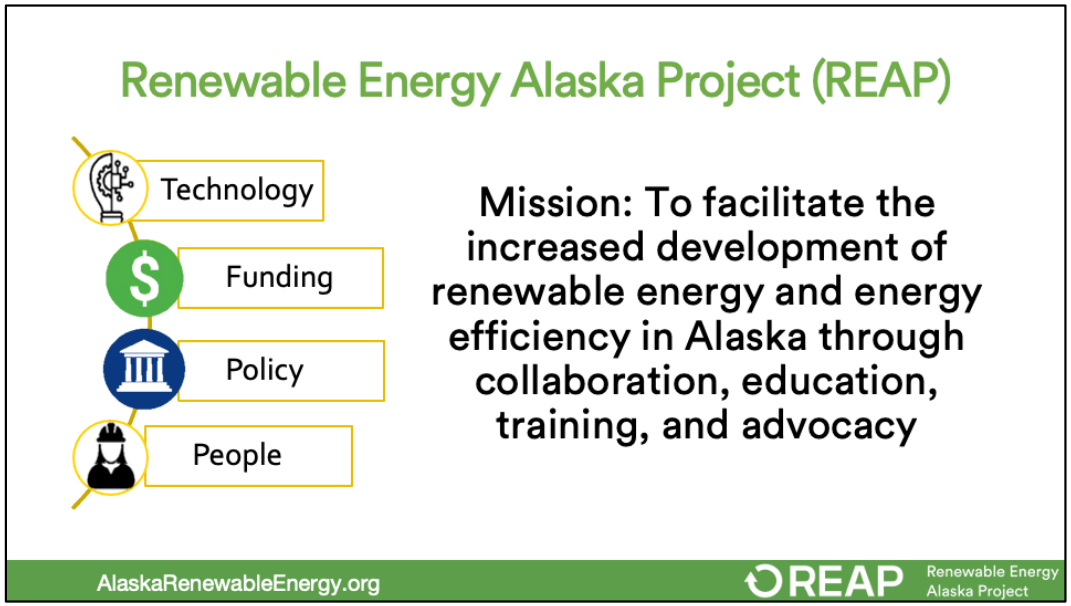
Land Acknowledgment!



REAP is a non-profit organization dedicated to increasing the development of renewable energy and energy efficiency in Alaska. And we believe that in order to initiate the clean energy transition in Alaska, we need to connect four supporting pillars: technology, funding, policy, and people. We usually find themselves working in the people column as relationship building, collaboration, and educational outreach are really our top priorities. And a huge benefit of being a non-profit is that we offer our services totally free.

AK Energy Landscape

- Alaska's Energy Use
- Alaska Energy Ecosystems
- Alaska Nonrenewable Energy Resources
- Alaska Clean Energy Resources
- Clean Energy Solutions

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Alaska’s Energy Use
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Energy Use by End-Sector

Why does the transportation sector in Alaska use so much energy?

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Alaska 2020 from EIA.gov

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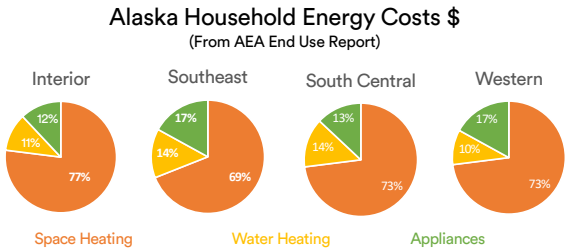
What do you think are Alaska's main industries?

Why does the transportation sector use so much energy in Alaska?

https://www.eia.gov/beta/states/states/ak/overview

Residential Energy Use

- Space heating is the largest use of energy everywhere in Alaska
- Space heating represents almost 90% of energy costs in some rural communities



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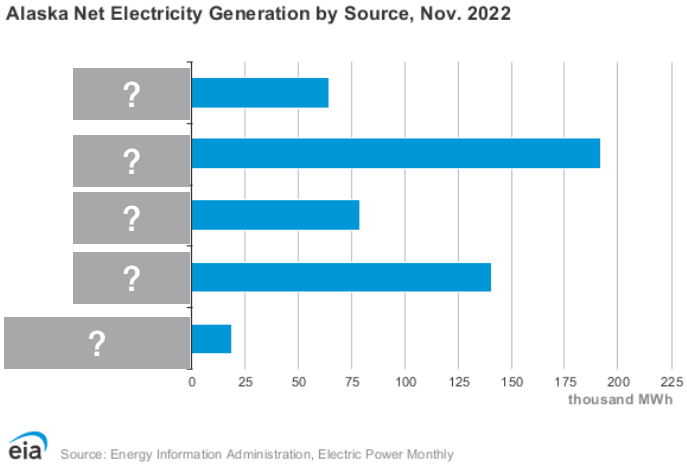
Between space heating, water heating, and electricity, which source do you think uses the most energy in all Alaskan households?



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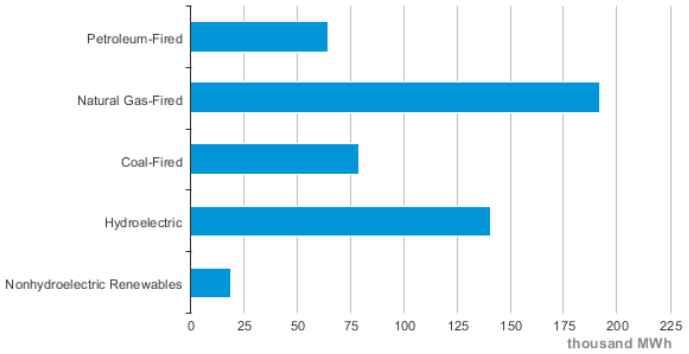
Any guesses what our top electricity source is in the state?
https://www.eia.gov/state/?sid=AK#tabs-4

Alaska Net Electricity Generation by Source, Nov. 2022



eia Source: Energy Information Administration, Electric Power Monthly

Energy Costs

- Alaskan residents pay at least double the national average
- 2nd highest electricity prices in US (average $0.24/kWh)
- 4th highest energy consumption per capita

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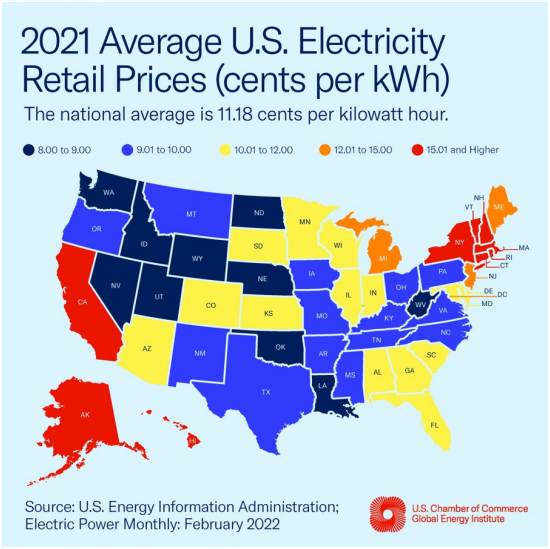
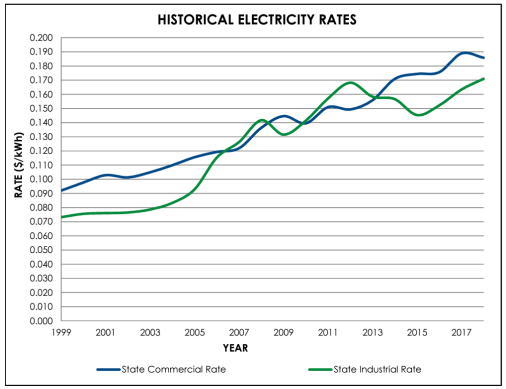


To put kWh into perspective, the average home in AK uses 500kWh/month = $120

Image from https://www.globalenergyinstitute.org/average-electricity-retail-prices-map accessed 2/16/23

ONE ENERGY
AN INDUSTRIAL POWER COMPANY



ELECTRICITY RATE SUMMARY ($/kWh)					
	1999 RATE	2018 RATE	AVERAGE ANNUAL INCREASE	TOTAL INCREASE	PREDICTED 2038 RATE
INDUSTRIAL	$0.073	$0.171	4.3%	133.6%	$0.399
COMMERCIAL	$0.092	$0.186	3.6%	102.0%	$0.375

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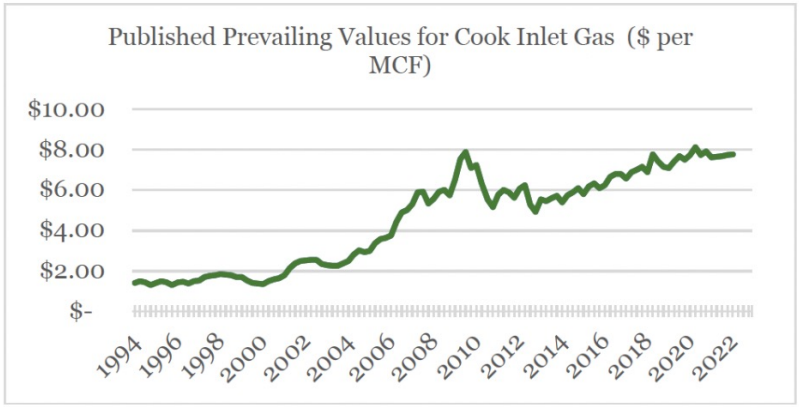
https://oneenergy.com/wp-content/uploads/2020/06/Alaska-AK.pdf

RCA sample monthlyutility rates:
https://rca.alaska.gov/RCAWeb/RCALibrary/SampleMonthlyRates.aspx



https://tax.alaska.gov/programs/oil/prevailing/cook.aspx

https://alaskarenewableenergy.org/event/cook-inlet-energy-forum/


Alaska Energy Ecosystems
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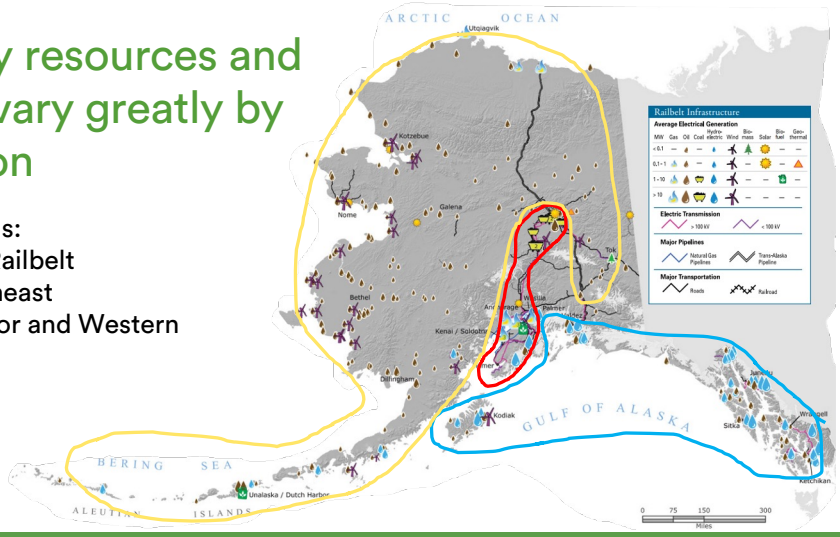
Energy resources and costs vary greatly by location

- 3 Regions:
  - The Railbelt
  - Southeast
  - Interior and Western



1MW=power for 650 homes

When you look at this map, does anything jump out at you?

What percentage of AK's population do you think lives in this corridor between Fairbanks and Homer?

The Railbelt

- Continuous electrical power grid connecting Fairbanks to Homer
- Supplies electricity to 80% of AK's population
- Managed by 5 utility companies
- Integrates multiple non-renewable and renewable resources
- Average cost of electricity: $0.22/kWh

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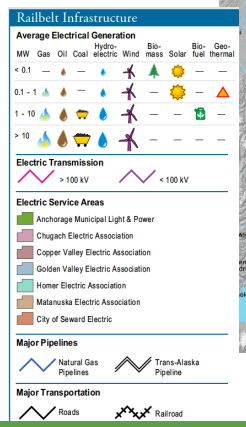

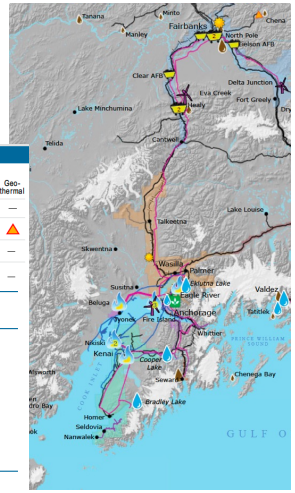

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Southeast

- Includes all Southeast communities plus Kodiak, Valdez, and Cordova
- Some communities share a grid, many are micro
- Electricity generated mainly with hydro
- Several communities are 100% RE
- Average cost of electricity: $0.15/kWh
- Low cost drives electrification

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What makes SE Alaska such a hydro powerhouse?

Interior and Western (rural communities)

- Everything outside of the Railbelt and Southeast
- Over 200 island-grid communities
- Rely HEAVILY on imported diesel fuel for electricity and heat
- RE systems are all small
- Electricity cost is subsidized by Power Cost Equalization (PCE)
- Average cost of electricity:
  - $0.50/kWh (before PCE)
  - $0.25/kWh (after PCE)

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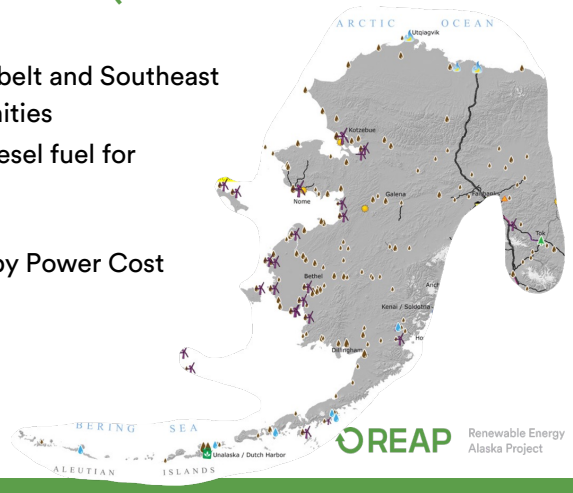
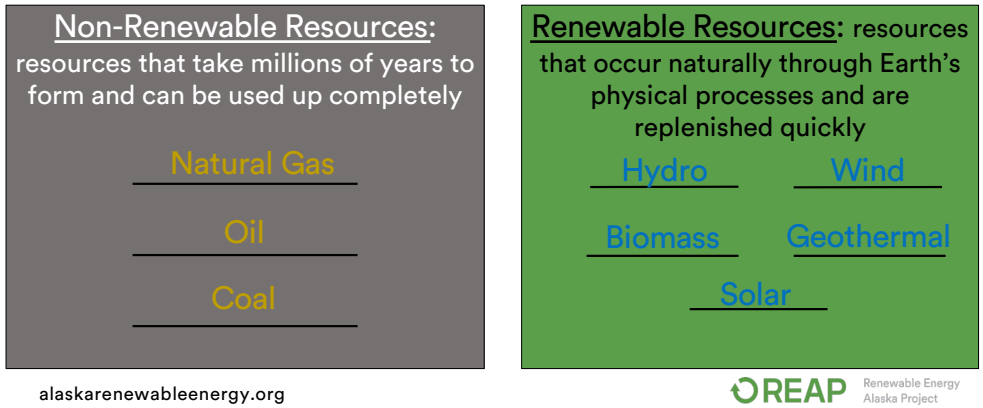


Has anyone visited some of our rural communities? What do you notice?

Why can't the communities in this region rely on wood fire for heat?


Alaska Nonrenewable
Energy Resources
REAP

Energy Resources in Alaska

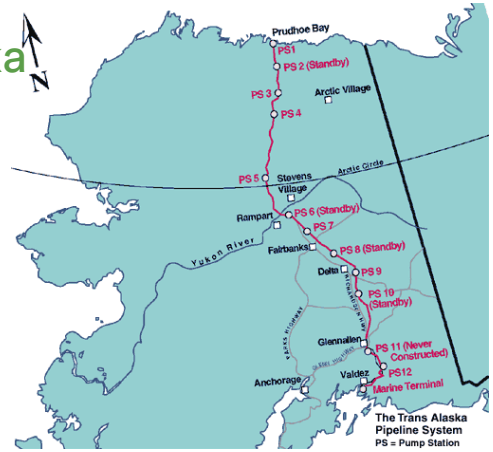


What are the three fossil fuel or non-renewable resources used in AK? Is these a non-renewable resource that this table is missing?
And what are our five main renewable resources used in AK?
Where does all of the imbedded energy within these resources come from?
What are some big differences between non-renewable and renewable resources?

Nuclear is non-renewable but not included because it is not currently used in Alaska

Oil Extraction in Alaska

Prudhoe Bay



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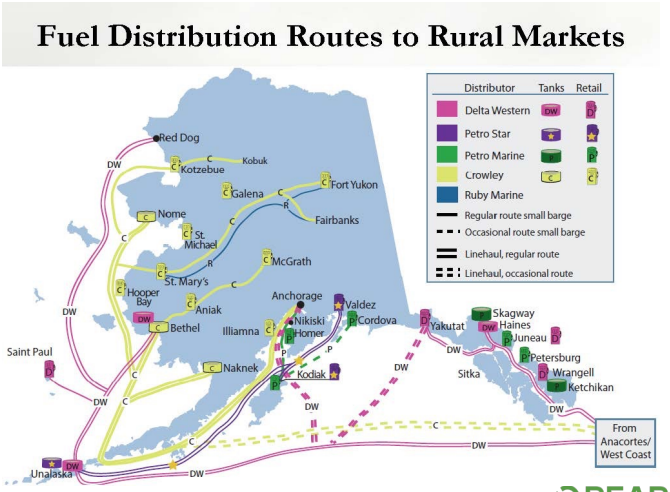

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Has anyone visited some of our rural communities? What do you notice?
Why can't the communities in this region rely on wood fire for heat?

Coal in Alaska

Usibelli Coal Mine, Healy

UAF Combined Heat and Electricity Plant

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Natural Gas Extraction in Alaska

Hilcorp announced last year that they are no longer guaranteeing past current contracts.

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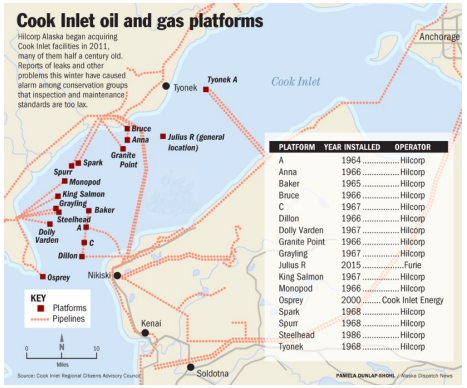

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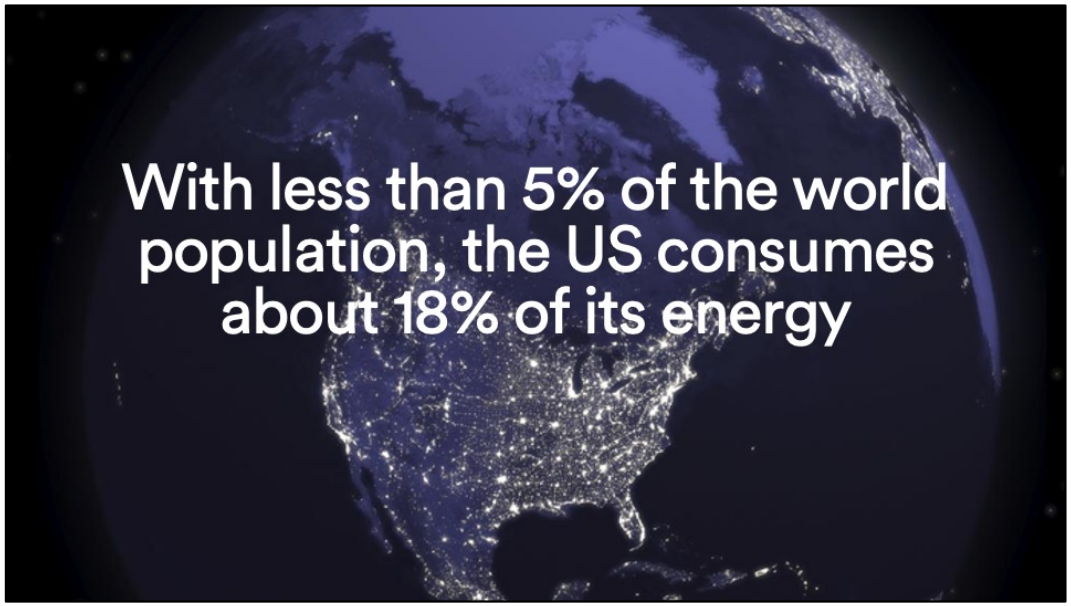
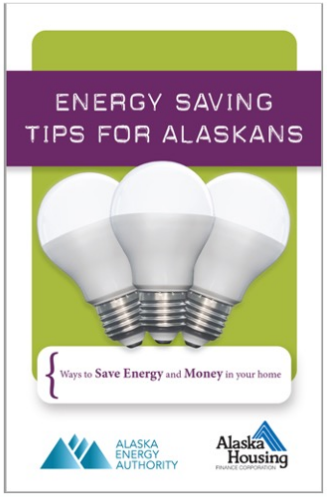
https://alaskarenewableenergy.org/event/cook-inlet-energy-forum/
https://alaskapublic.org/2023/01/24/oil-production-in-cook-inlet-will-continue-to-decline-as-north-slope-holds-steady-state-says/


Alaska Clean Energy
Resources
REAP



Reducing our energy use is important to save money and to reduce our impact on the environment. We live in a consumer society that is using more than we need for comfort or even happiness.
Statistic from NEED intermediate energy infobook, 2017; stock photo



Efficiency First

- From zero cost at-home behavior changes to more expensive upgrades
- Residential energy conservation & efficiency tips for heating, insulation & air sealing, water, and appliances inside the home
- Available for free download on REAP's website

https://alaskarenewableenergy.org/library/energy-savers-tips-for-alaskans/

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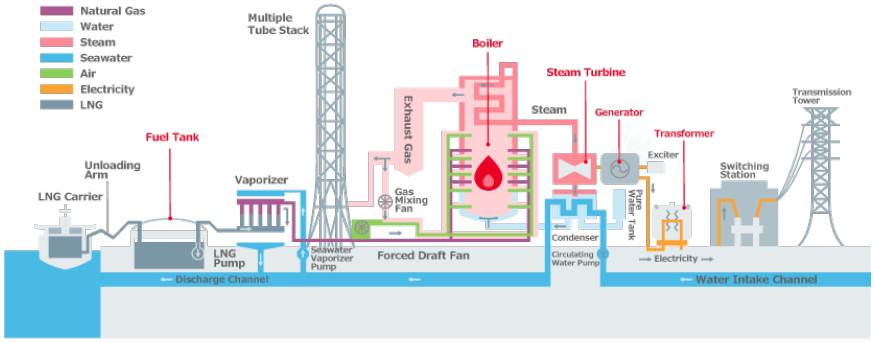
Extracting Electricity from Fossil Fuels



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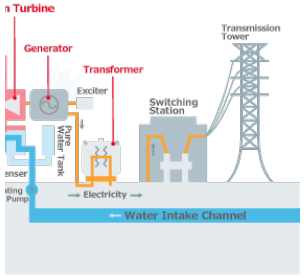
Extracting Electricity from Renewable Energy



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Many fewer steps!

Hydroelectric in Alaska

Bradley Lake, Homer (across the bay)

Humpback Creek, Cordova

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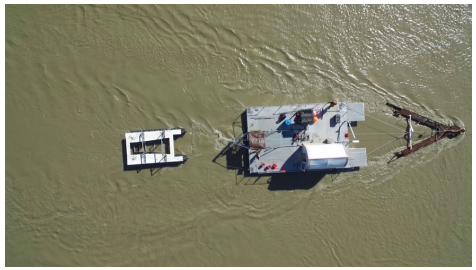
Bradley Lake 120MW, cheapest electricity on the Railbelt at $0.04/kWh
Humpback Creek 1.25MW

Hydrokinetic in Alaska

RivGen hydrokinetic, Kvichak River, Igiugig



Blade Runner, Nenana River, Tanana

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Igiugig case study: https://www.nrel.gov/docs/fy23osti/83816.pdf

Wind in Alaska

Fire Island Wind Farm, Cook Inlet

Banner Peak Wind Farm, Nome

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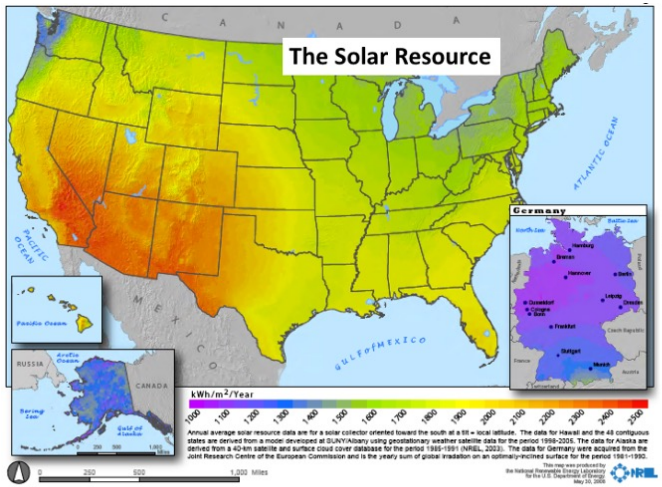
Fire Island Wind Farm, 11 turbine, room for 22 more! 17.6MW

Banner Peak Wind Farm 1.8MW



Solar resource vs Germany

- Alaska's inSOLation is similar to Germany, a leader in solar
- Despite Alaska's lack of sunlight during the long winter months, solar energy systems can be a viable option in MANY areas of the state for much of the year

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https://www.washingtonpost.com/news/wonk/wp/2013/02/08/germany-has-five-times-as-much-solar-power-as-the-u-s-despite-alaska-levels-of-sun/

Alaska Solar Projects

Golden Valley Solar Farm, Fairbanks

Water Treatment Plant, Deering

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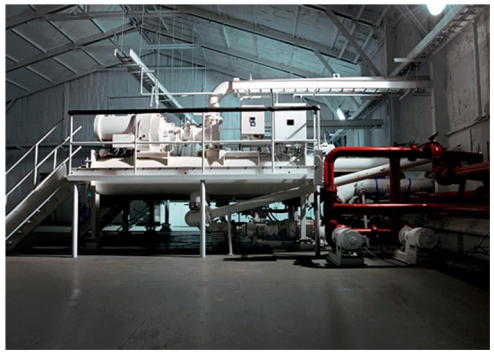
Golden Valley solar farm, Fairbanks 500kW, enough to power 70 homes (due to Fairbanks high energy use)

Geothermal and Geoexchange



Geothermal Power Plant, Chena Hot Springs

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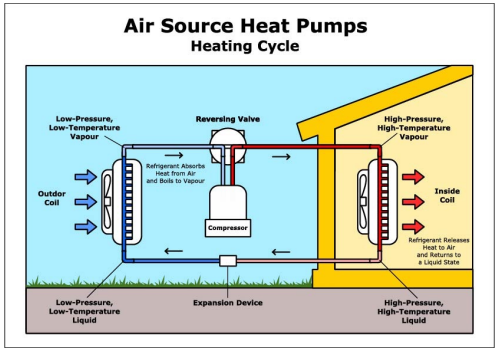

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Chena Hot Springs generates 680kW, more than enough to power the resort, photo courtesy of AEA

ASHP image: https://www.energy.gov/energysaver/air-source-heat-pumps

Biomass in Alaska

Tok School Chip-Fired Facility, Tok

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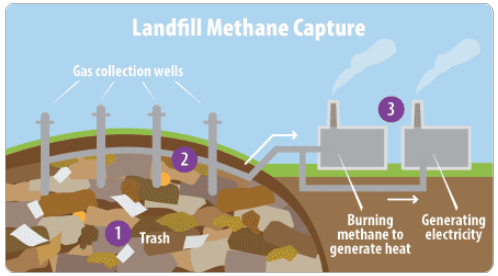

Methane Capture, Anchorage Landfill

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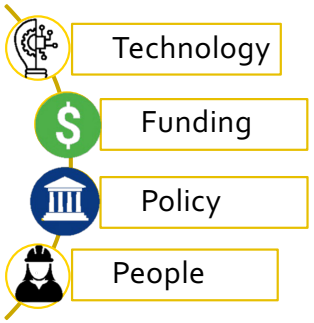
Anchorage landfill methane capture system generates 5.6MW of electricity, enough to power 25% of JBER

Renewable Energy Limitations

- Most renewable energy is an “Intermittent Resource” - unpredictable supply
- Switching back and forth from fuel generation to RE generation can be tricky
- Lack of local training
- The technology is still being improved
- Funding can be tricky
- Not the “magic bullet” to save all our energy and climate woes, but when dispersed properly can provide cheap, reliable, clean energy

Juneau electric bus: https://alaskapublic.org/2023/01/18/juneaus-first-electric-bus-is-a-bust-but-the-city-will-move-forward-with-electrifying-the-fleet/

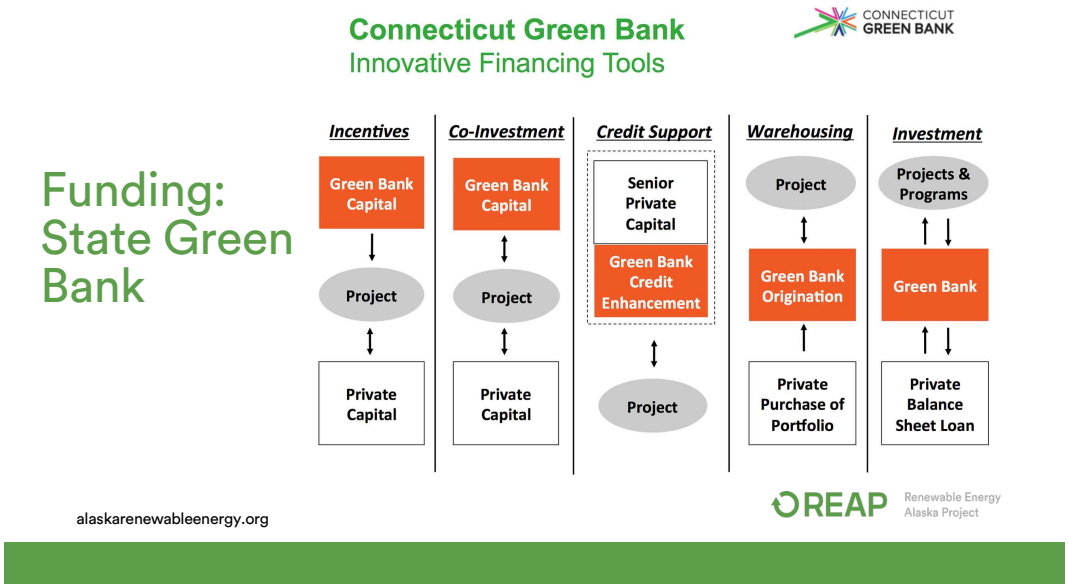
Four pillars for increasing clean energy



Technology: Storage & Electrification

- Advancements in storage will allow us to store available energy when the resource isn't available
- Some storage options already exist:
  - BIG batteries
  - Flywheel
  - Pumped hydro
  - Hydrogen fuel cells?
- Electrification: heating, cooking & transportation switched to renewable electricity

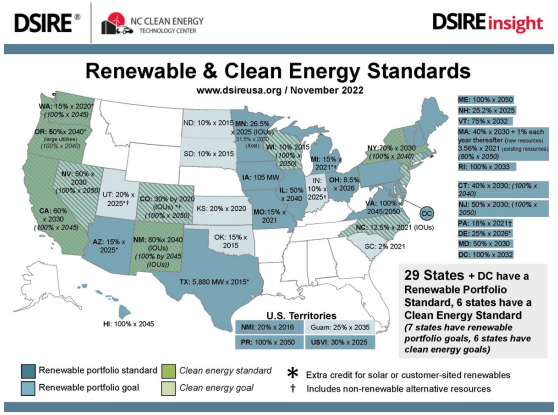
Battery Energy Storage System (BESS), Fairbanks



https://alaskarenewableenergy.org/initiatives/green-financing/

https://www.nrel.gov/state-local-tribal/basics-green-banks.html

Policy: Renewable Portfolio Standard



- Require the utilities on the Railbelt to source 80% of their electricity from renewables by a certain date
- Rural utilities say this would also benefit them for the increased workforce and expertise in state
- NREL assessment unequivocally found that 80% renewables by 2040 was very feasible and would save $426 to $506 million every year. Currently studying cost

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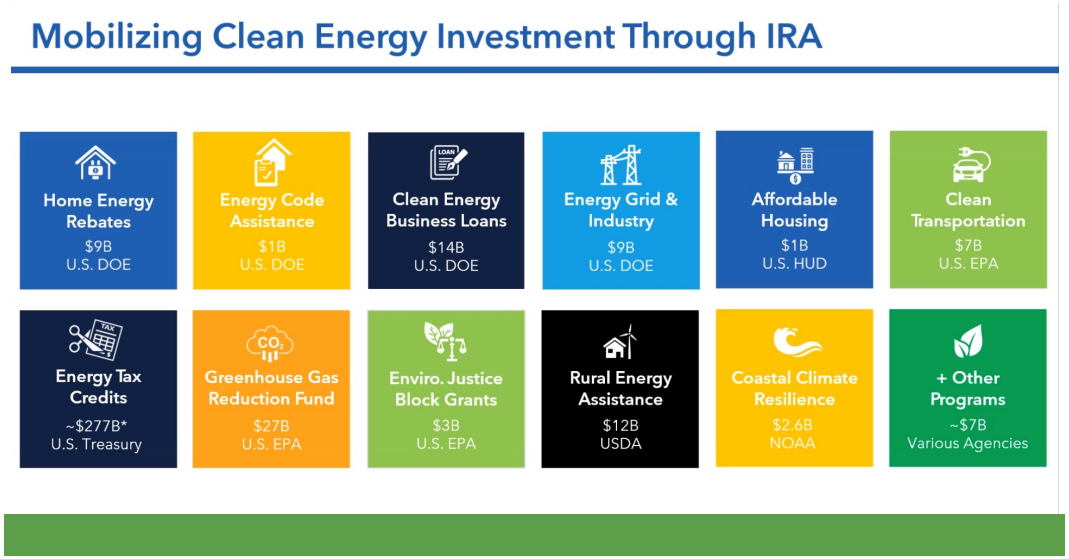
NREL study:
https://alaskarenewableenergy.org/library/renewable-portfolio-standard-assessment-for-alaskas-railbelt/

Image: https://www.dsireusa.org/resources/detailed-summary-maps/



Presentation from Department of Energy to Energy Efficiency Partnership Meeting on February 14, 2023

People: Workforce Development

Many programs at REAP are directed towards this including:

- AK EnergySmart Curriculum
- Teacher Trainings
- Class Visits
- Summer camps
- Alaska Network for Energy Education and Employment
- People in Power
- Clean Energy Olympics
- Career Booklet

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CLEAN ENERGY CAREERS IN ALASKA

Further Resources

- Alaska Just Transition: https://www.justtransitionak.org/
- Cook Inlet Gas Forum Recording: https://alaskarenewableenergy.org/event/cook-inlet-energy-forum/
- Energy Issues & Trends Jan 2023 report: https://uaf-iarc.org/Alaska-arctic-policy-trends
- ACEP YouTube: https://www.youtube.com/playlist?list=PLJ_aYEKT8q8wQh2b053stawln7MRR0gp1
- Alaska Heat Smart: https://akheatsmart.org/
- K-12 Curriculum, AK EnergySmart: https://akenergysmart.org/

THANK YOU!

QUYANA TSÍN'ĘĘ

MAHSI' BASI

GUNALCHÉESH TSIN'AEN

BAASEE' TSEN'ANH

XASADIGAGHISIDHOOT

IGAMSIQANAGHHALEK

QUESTIONS?

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