

Energy Education in Alaska

Colleen Fisk

Energy Education Director

Renewable Energy Alaska Project

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Go to [menti.com](https://www.menti.com) on your phone or other device that has an internet browser and enter code 30 92 56

Land Acknowledgement

- Colleen grew up and currently lives on the land of the Ahtna and Dena'ina Athabascan, closest to *Nay'dini'aa Na' Kayax'* (Chickaloon Native Village)
- REAP offices are located in Anchorage near Ship Creek, named *Dgheyaytnu* in Dena'ina, the language spoken by the traditional, present, and future caretakers of this land.

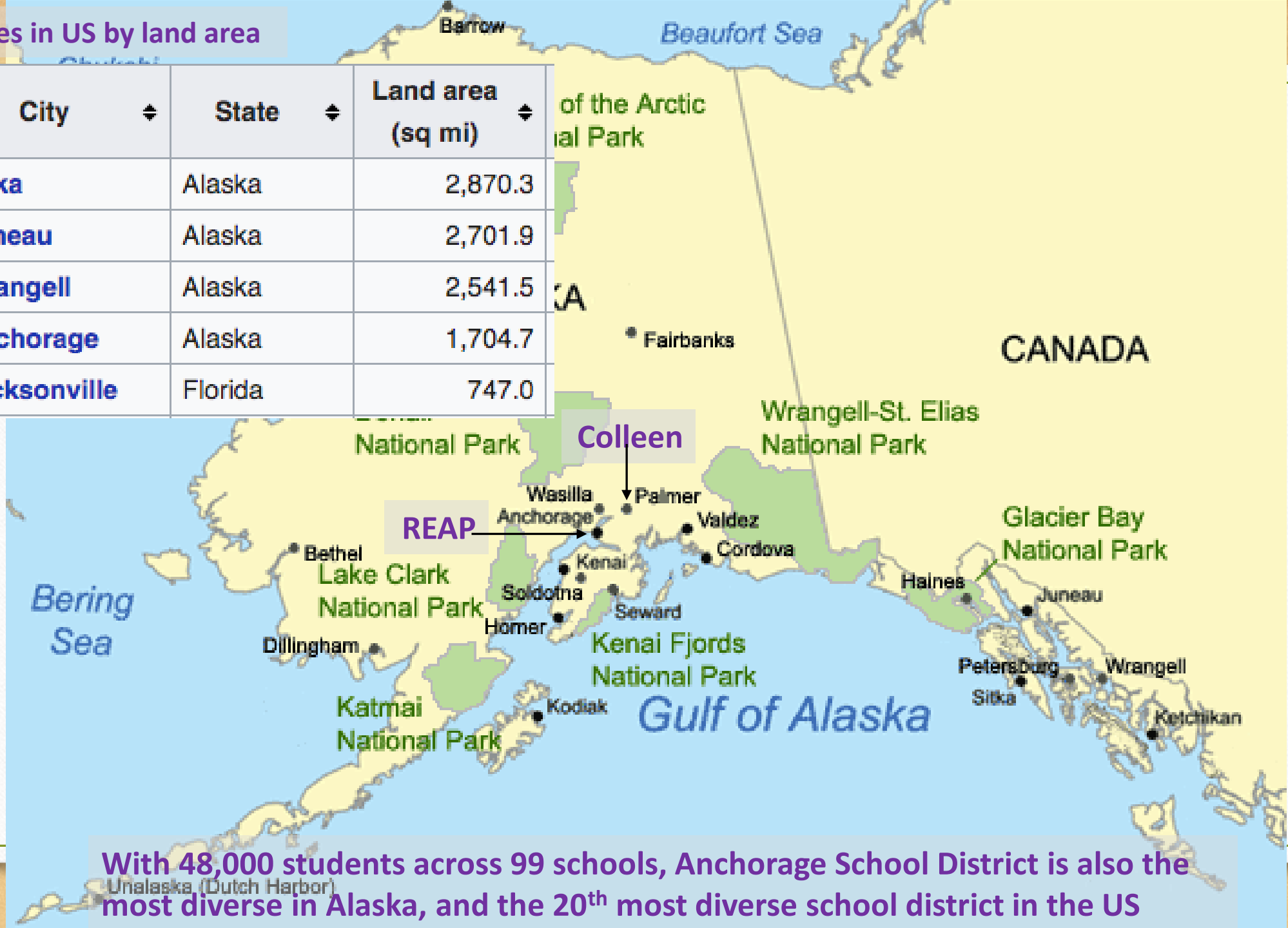
Colleen Fisk

Energy Education
Director at REAP



5 largest cities in US by land area

Rank ↕	City ↕	State ↕	Land area (sq mi) ↕
1	Sitka	Alaska	2,870.3
2	Juneau	Alaska	2,701.9
3	Wrangell	Alaska	2,541.5
4	Anchorage	Alaska	1,704.7
5	Jacksonville	Florida	747.0

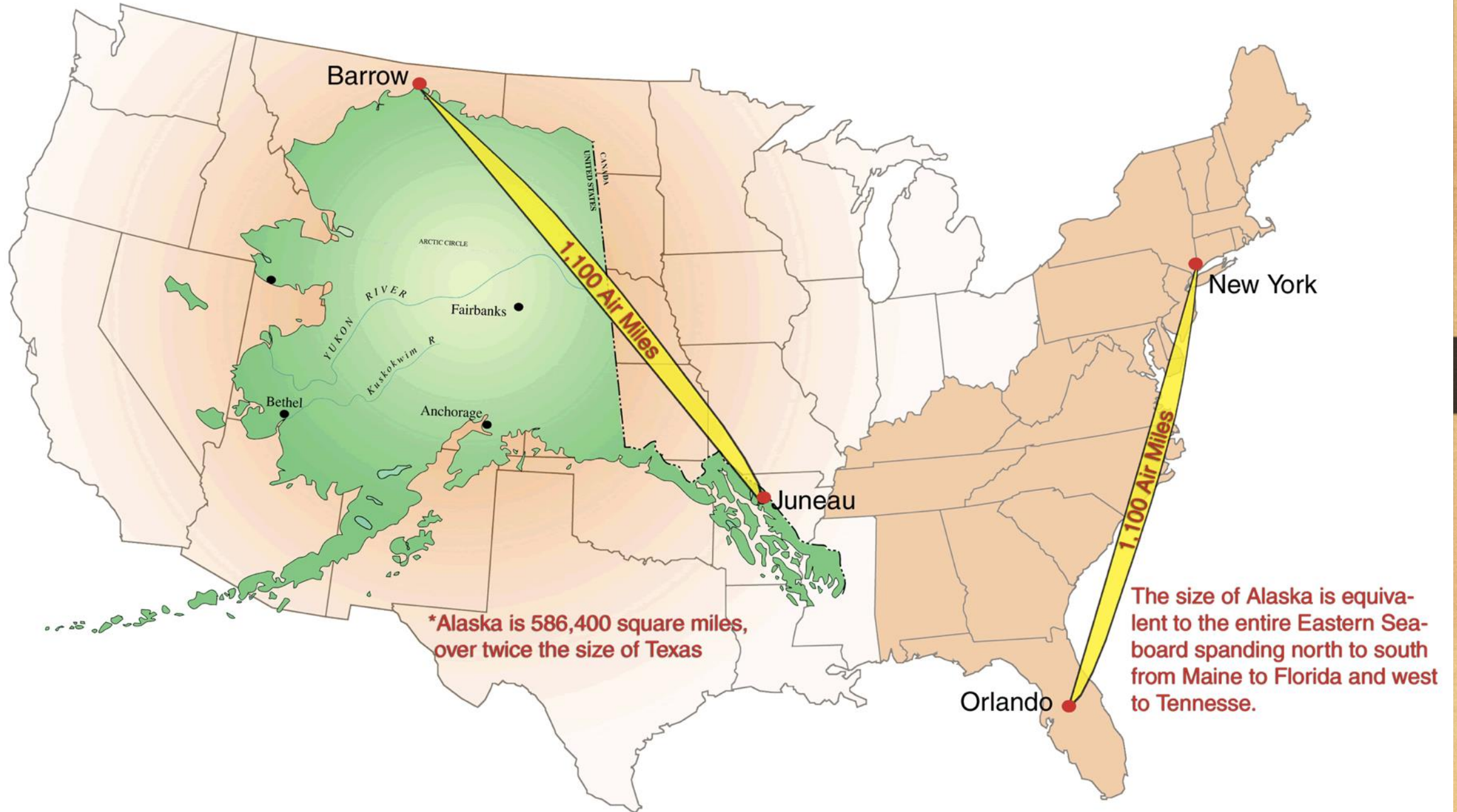


With 48,000 students across 99 schools, Anchorage School District is also the most diverse in Alaska, and the 20th most diverse school district in the US

REAP EDUCATION PROGRAMS

- Hands on classroom visits: 7,311 students in 2019
- 18 teacher trainings to 329 teachers in 2019
- Curriculum development: AK EnergySmart 25 lessons
- Alaska Network for Energy Education & Employment (ANESEE)

SIZE AND DISTANCE COMPARISON



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Energy & Climate Literacy

- Energy Literacy Principles from Department of Energy (2017)
- Climate Literacy: The Essential Principles of Climate Science from NOAA (2006)
- Climate Literacy and Energy Awareness Network (<https://cleanet.org/>)

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.



Clim

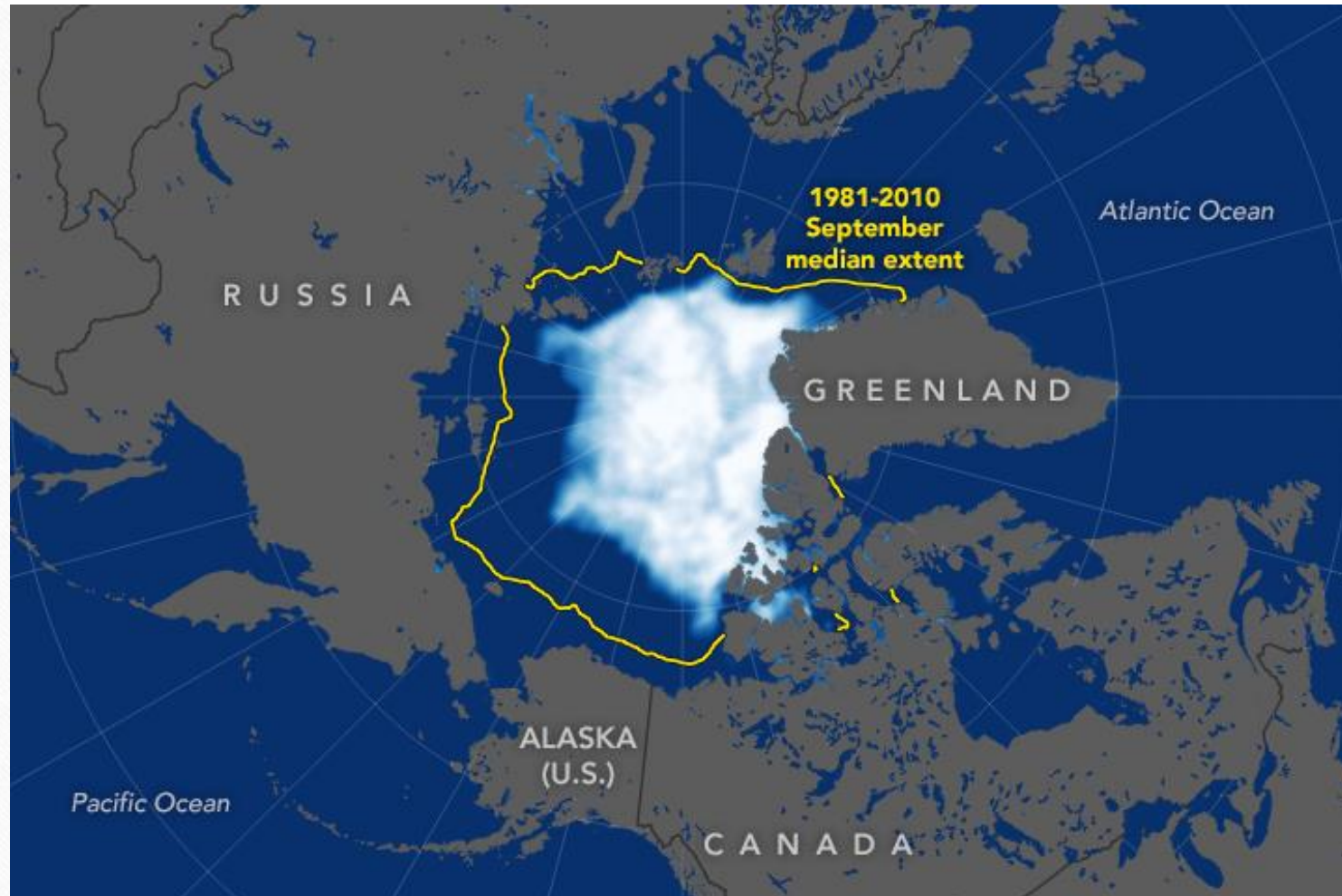
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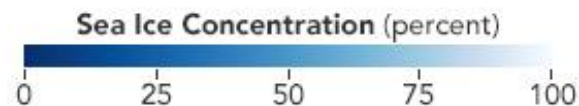
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Clean Energy is Risk Management: The Earth's Climate is Changing



Sea ice extent on Sept 18, 2019 was the second lowest since the 70s

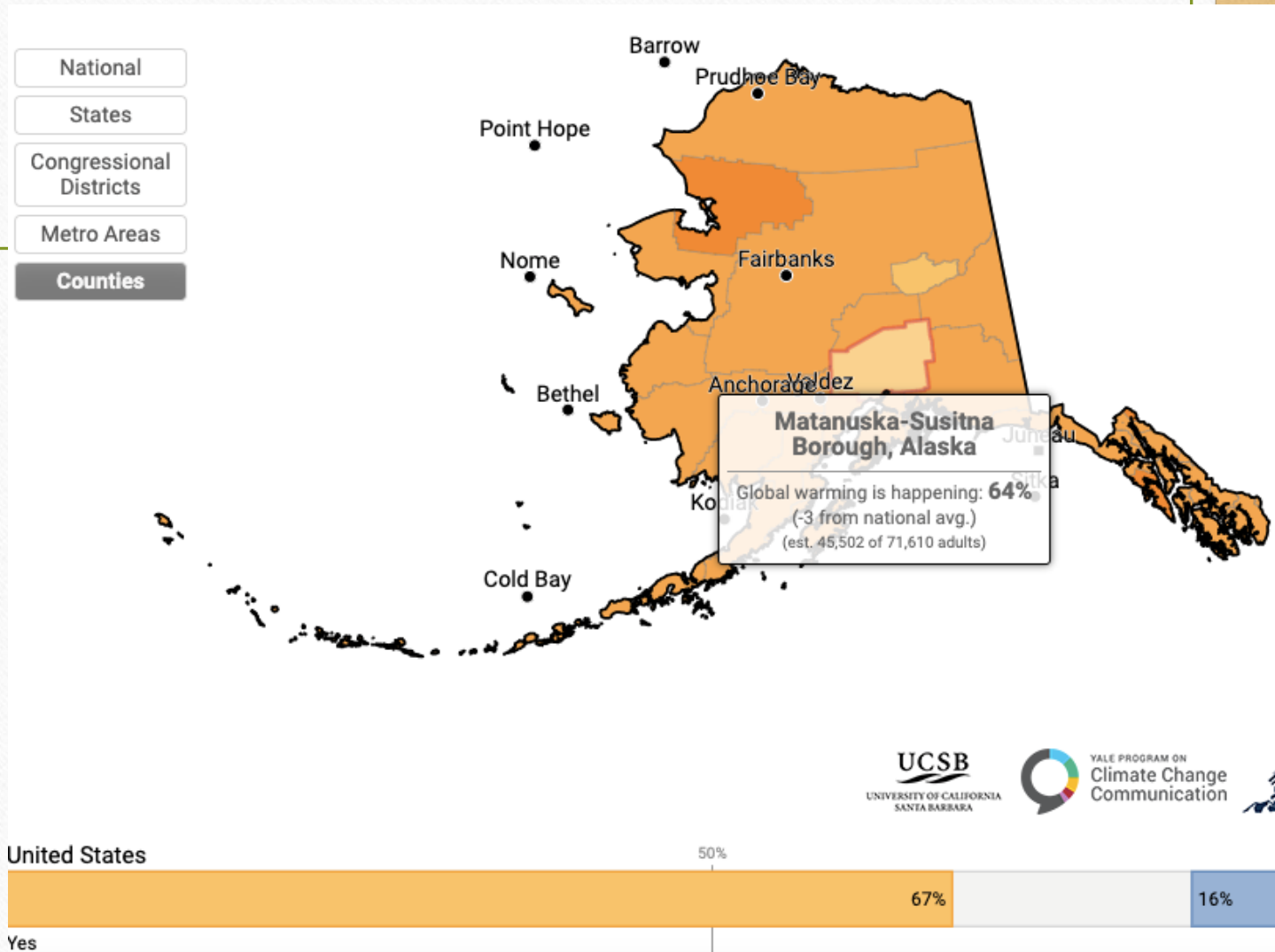


Alaskan Challenges

- High Energy costs
- Climate change & high energy costs disproportionately affecting predominately Alaska Native communities
- Remote locations
- Economy based on oil
- Conservative government
- Not connected to other electrical grids

Alaskan Opportunities

- High Energy costs
- Climate change widely considered an issue to address
- Culture of cooperation
- Leader in microgrids

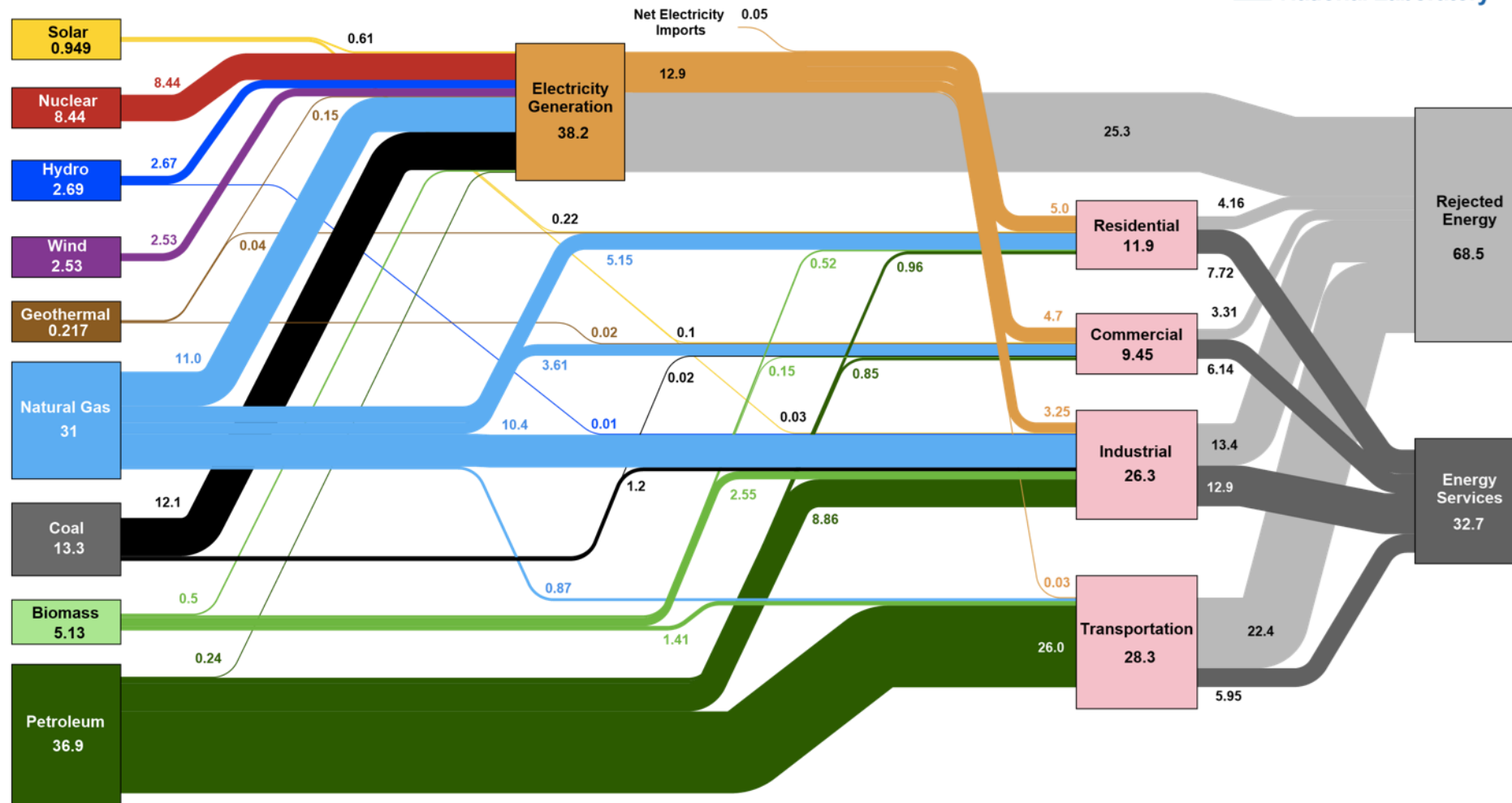


**With less
than 5% of
the world
population,
the US
consumes
about 18% of
its energy**



AK Energy consumption

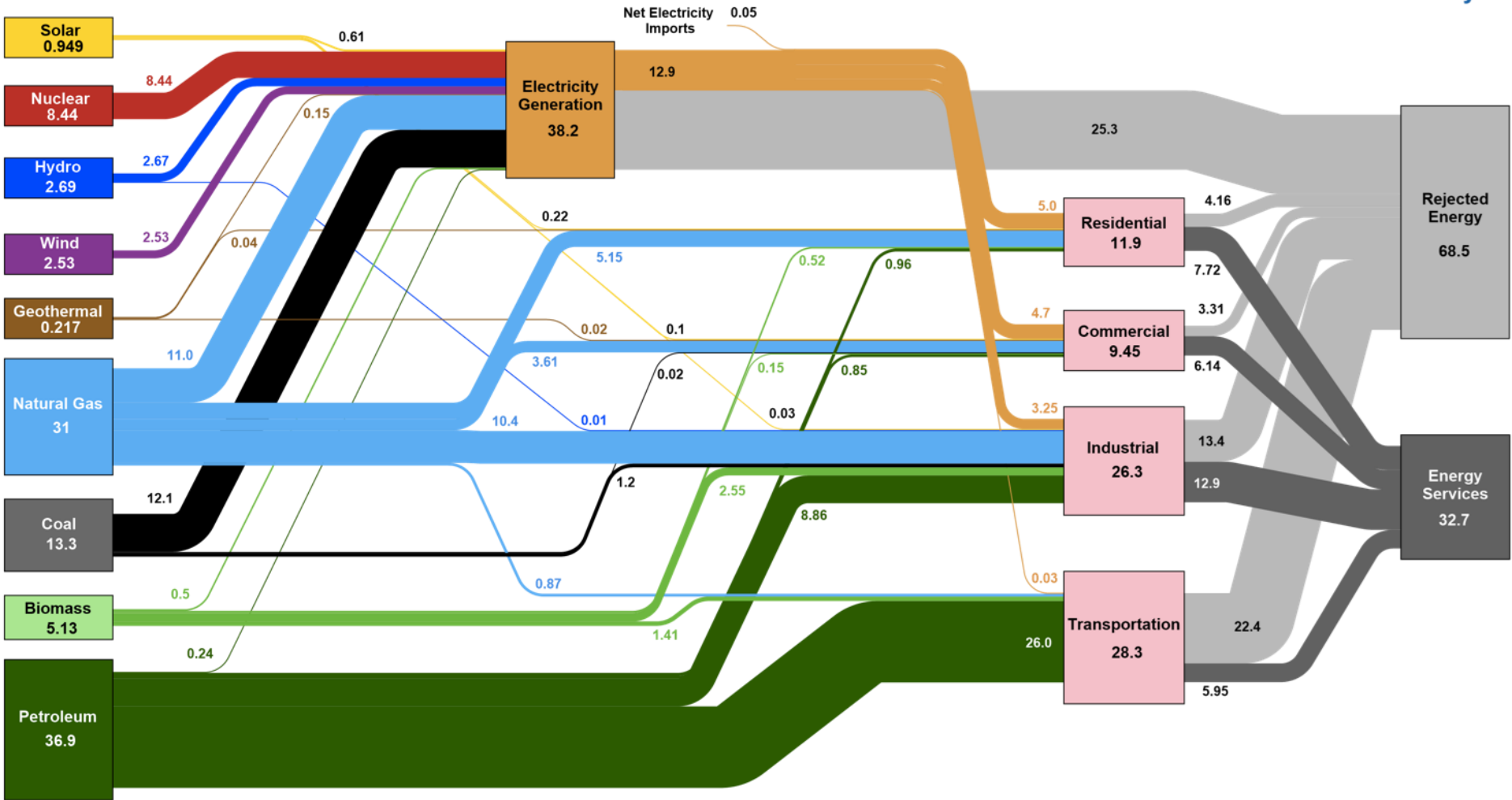
Estimated U.S. Energy Consumption in 2018: 101.2 Quads



Source: LLNL March, 2019. Data is based on DOE/EIA MER (2018). If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports consumption of renewable resources (i.e., hydro, wind, geothermal and solar) for electricity in BTU-equivalent values by assuming a typical fossil fuel plant heat rate. The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 65% for the residential sector, 65% for the commercial sector, 21% for the transportation sector and 49% for the industrial sector, which was updated in 2017 to reflect DOE's analysis of manufacturing. Totals may not equal sum of components due to independent rounding. LLNL-MI-410527

US Energy consumption

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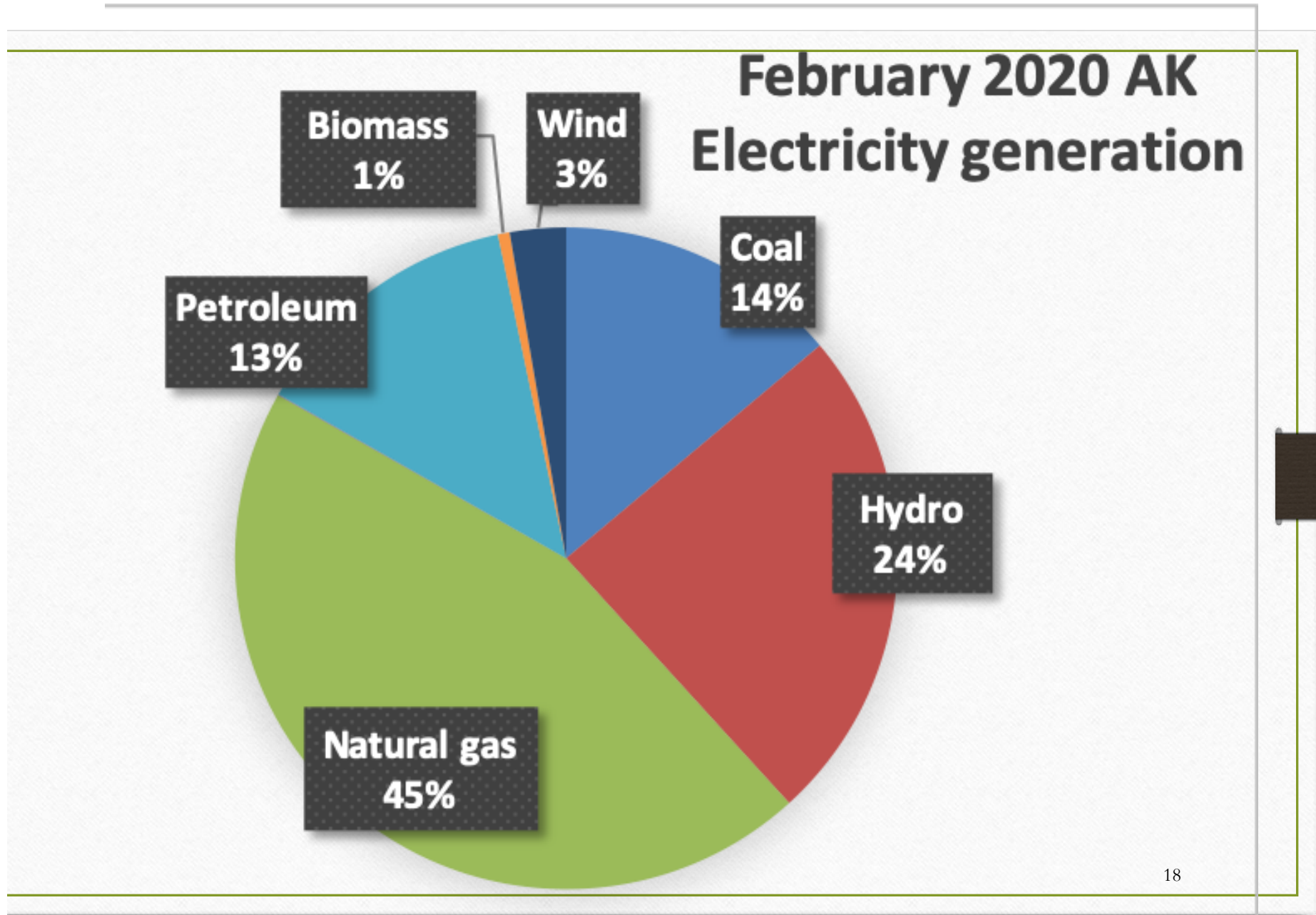
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Watt is love?

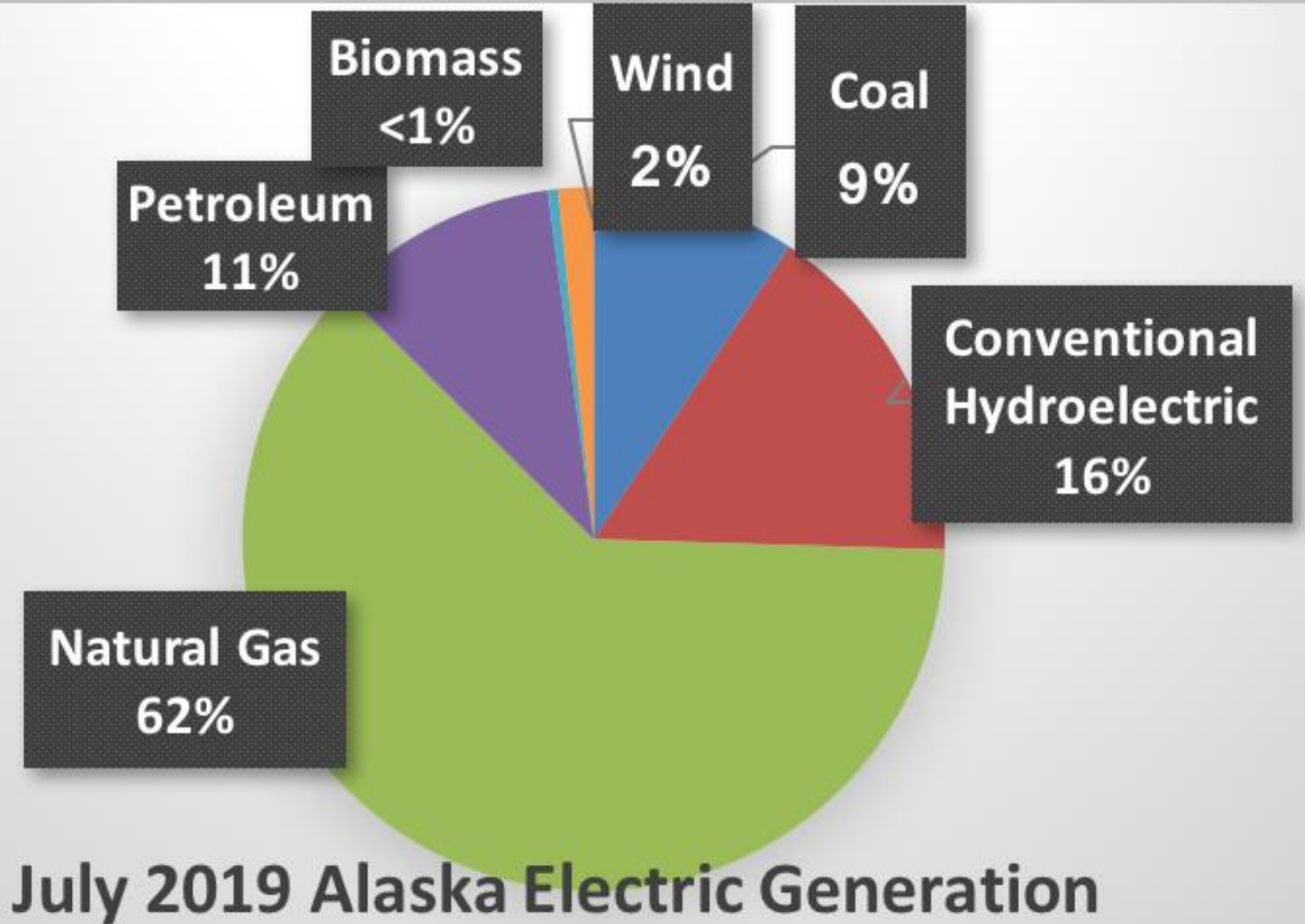


Baby don't hertz me
n-ohm-ore

**Alaska's
Energy
Profile:
Electricity is
mostly
generated
from
natural gas
and hydro**

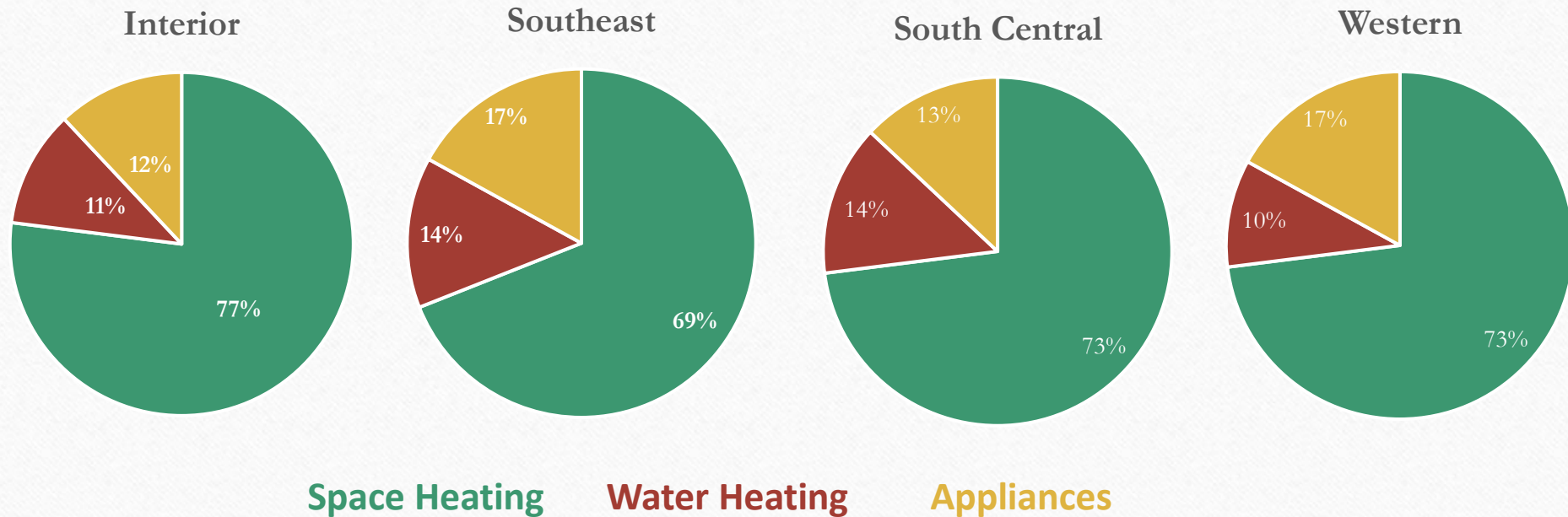


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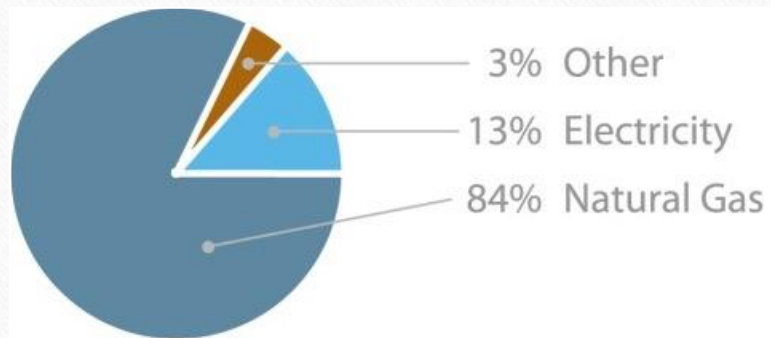


Space heating is the largest cost for energy everywhere in Alaska

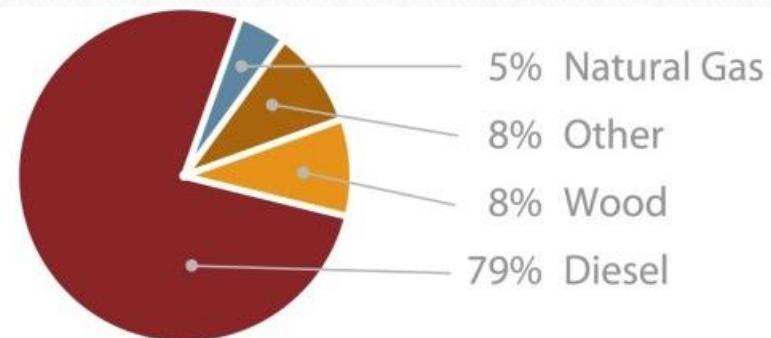
Alaska Household Energy Costs \$



Today, nearly 80% of rural Alaskan communities are dependent on diesel fuel for their primary energy needs



Anchorage



Rural Communities

Teaching Energy

- AK EnergySmart (AKES): Energy Efficiency & Conservation
 - Power Pledge Challenge
- Wind for Schools (WfS): 12 states – Wind & Solar
 - KidWind Challenge
 - WindWise and REcharge lessons
- National Energy Education Development (NEED)

AK ENERGYSMART

ALASKA'S K-12 ENERGY EFFICIENCY CURRICULUM

- **Purpose:** give Alaskan youth a better awareness of how they use energy and the importance of taking measures to use energy wisely both at home and school
- 25 lessons broken into K-2, 3-5, 6-8 and 9-12
- Funded by the Alaska Housing Finance Corporation (AHFC) in 2011-2012, 2014-2015; developed by the Alaska Center for Energy and Power (ACEP) and REAP
- **Power Pledge Challenge:** partner with utilities in communities for students to enter to win prizes

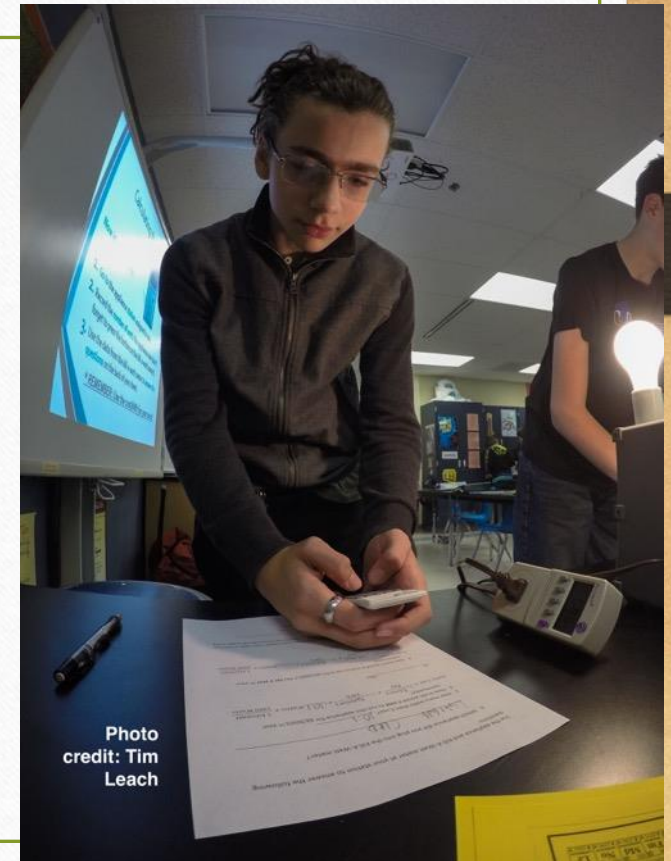
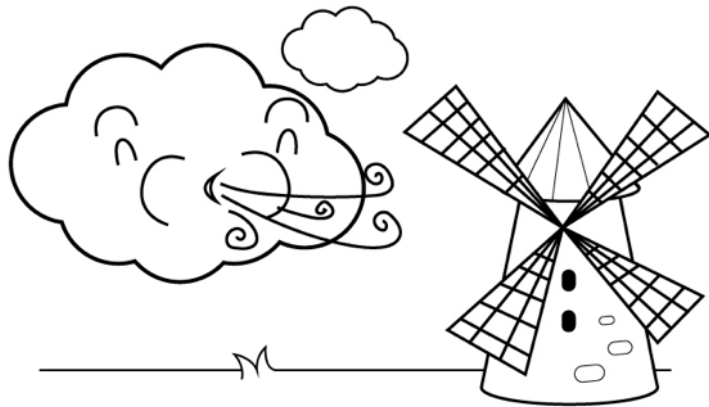


Photo
credit: Tim
Leach

NEED curriculum

- Building science lessons
- School energy assessments
- Renewable energy units
- Non renewable energy units



WIND IS MOVING AIR

We can use the energy in wind to do work. Early Egyptians used the wind to sail ships on the Nile River. People still use wind to move sailboats. In the Netherlands, people used windmills to grind wheat. The Pilgrims used windmills to grind corn, to pump water, and to run sawmills. Today, we use wind to make electricity.



Top Hydropower Producing States, 2016



Data: Energy Information Administration

Wind for Schools

- 12 states participate in Wind for Schools:
<https://windexchange.energy.gov/windforschools>
- Wind curriculum list:
https://openei.org/wiki/Wind_for_Schools_Portal
- KidWind Challenge



KidWind

- WindWise & REcharge lessons
<https://www.kidwind.org/activities>
- National KidWind Challenge June 2-4, Denver CANCELLED
- Check for local, regional/state challenges
- Monthly ONLINE wind turbine design challenge

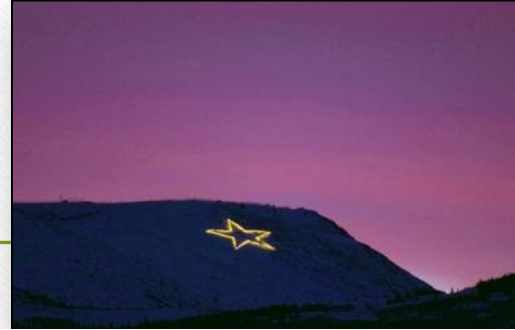


Wind Tunnel Test



Place-based lessons & school as a laboratory

- Visit your local power plant/generation
- Calculate the energy used in your classroom/school
- Meet with a school facility manager
- Local resources – energy, food, etc, & relate to local ecosystems



How much did it cost to power the Arctic Star last year?



Arctic star

From the day after Thanksgiving until the Iditarod ends with the Red Lantern winner, the Arctic Star is lit (November 23 to March 18 = 116 days). The star has 370 bulbs that use 75 watts each and are on for 16 hours a day. If you assume that the cost per kWh is \$0.19, how much does it cost?

$$\begin{array}{ccccccc} \boxed{16} & \times & \boxed{116} & \times & \boxed{0.19} & \times & \boxed{27,750} \div 1,000 \\ \text{hours} & \times & \text{days} & \times & \text{\$/kWh} & \times & \text{Watts} \end{array}$$

$$= \$9,785.76$$

Calculating the cost!

Ex 2: How much would it cost to play your PS4 for 4 hours in Lime Village **FOR A YEAR?**

The rate in Lime Village is \$0.99/kWh (with PCE).

$$\begin{array}{ccccccc} \boxed{4} & \times & \boxed{365} & \times & \boxed{0.99} & \times & \boxed{280} \div 1,000 \\ \text{hours} & \times & \text{days} & \times & \text{\$/kWh} & \times & \text{Watts} \end{array}$$

$$\frac{\$404,712}{1,000} = \$404.712 = \$404.71$$

Arctic star

How much would it cost to power the Arctic Star with 10 watt LEDs instead?

370 bulbs x 10 W each = 3,700 W

$$\begin{array}{ccccccc} \boxed{16} & \times & \boxed{116} & \times & \boxed{0.19} & \times & \boxed{3,700} \div 1,000 \\ \text{hours} & \times & \text{days} & \times & \text{\$/kWh} & \times & \text{Watts} \end{array}$$

= **\$1,304.77**

Arctic star

Cost savings per year by switching to LEDs =
\$8,480.99



Distance Education

- Virtual Science Fair
- Zoom lessons
- Distance teacher trainings
- Sustainable Energy Endorsement (UAF Bristol Bay Campus)



and



Renewable Energy
Alaska Project

present

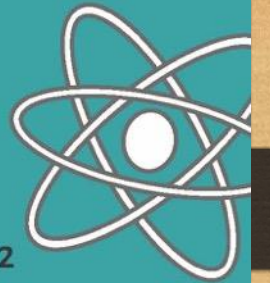
NATURAL RESOURCE SCIENCE FAIR

Show off your science project focused on energy, renewables, minerals, or forestry!

Prizes for each age category: K-2, 3-5, 6-8, 9-12

VIRTUAL JUDGING APRIL 28TH & 29TH
SIGN UP AT [TINYURL.COM/RESOURCE-SCIENCE-FAIR](https://tinyurl.com/resource-science-fair)

For questions please contact btoussaint@akresource.org



Education Partnerships

- GLOBE/Arctic and Earth SIGNs
- Alaska Native Science and Engineering Program
- 4-H STEM Energy clubs (Palmer)
- Tlingit Language Learning Center (Juneau)
- Electric Co-ops
- Alaska Resource Education
- Many member and supporting organizations of REAP

Future of REAP's Education in Alaska

- More distance lessons & trainings
- Assessment of impact on students and teachers
- Regional focus
- Work more with student groups like 4-H and Scouts
- Develop/improve in-state network of teachers

RESOURCES

- Free Alaska-specific curriculum:
AKEnergySmart.org/
- Library of resources, education or otherwise:
<https://alaskarenewableenergy.org/resources/library/>
- REcharge Academy – Renewable energy education. Cancelled this year, usually in July



QUESTIONS?

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Renewable Energy
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