

# Food Energy Water Nexus in Islanded Communities and High Latitudes

*Issues, Pathways, and Implications*

FOUNDATION PANEL: ENERGY

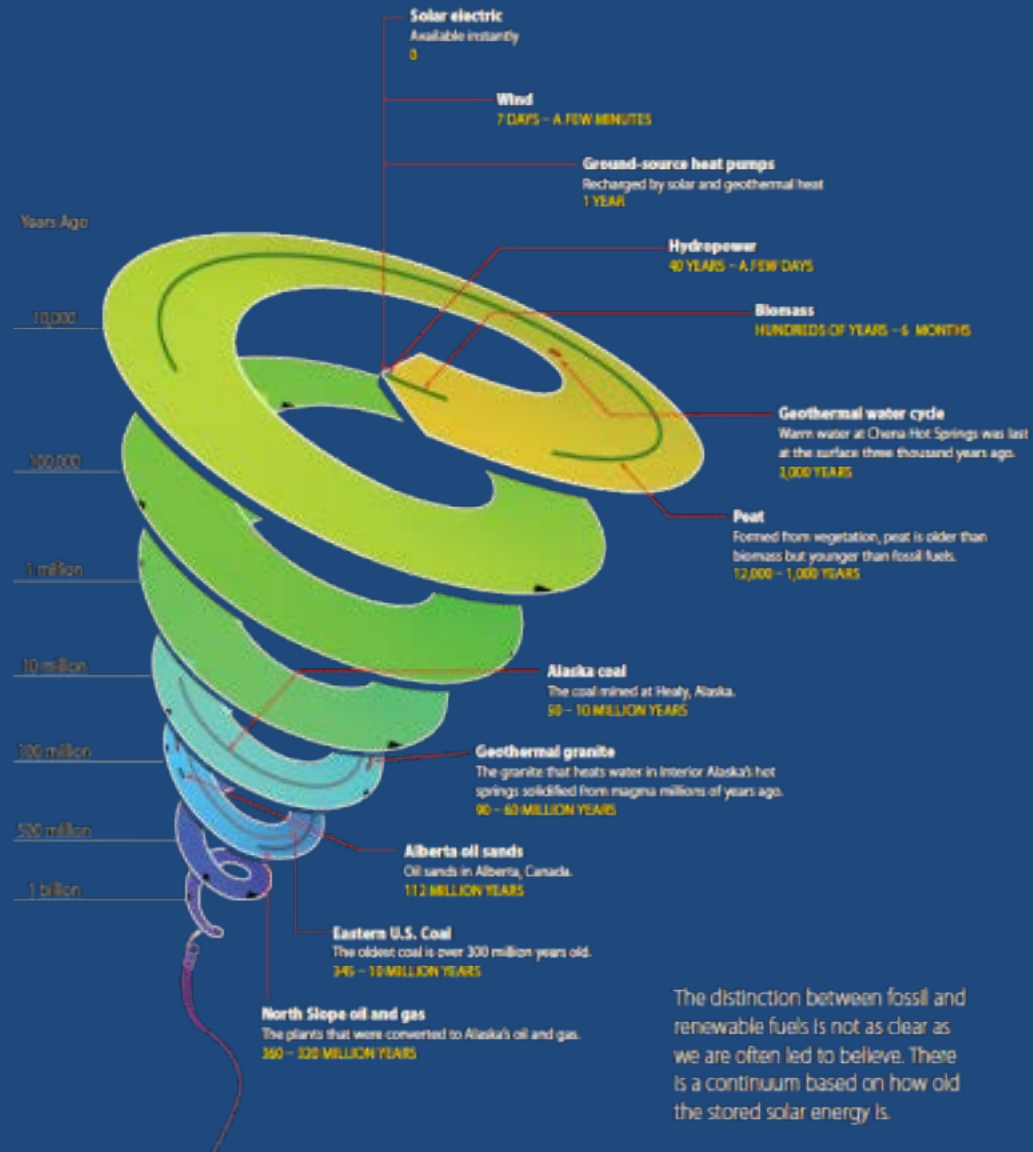
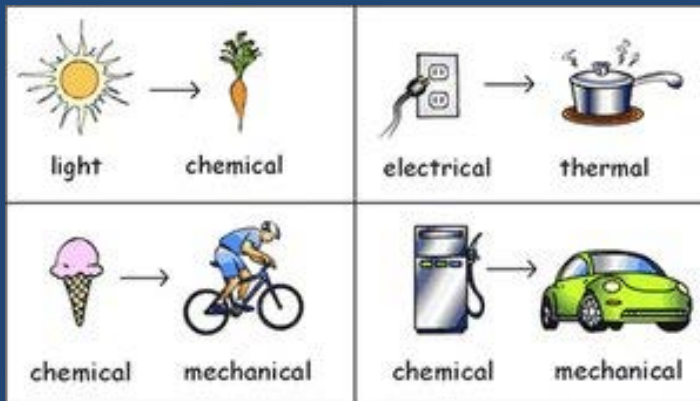
*Gwen Holdmann, Director  
Alaska Center for Energy and Power  
University of Alaska Fairbanks*



# Energy Basics

1) Energy is neither created or destroyed (it just changes form)

2) Some forms of energy are more useful than others



The distinction between fossil and renewable fuels is not as clear as we are often led to believe. There is a continuum based on how old the stored solar energy is.



Islanded, Off-Grid, PCE, Rural

# Definition of 'Remote' Community

A 'remote' community not connected to central energy infrastructure (e.g. natural gas pipeline or statewide electricity grid) resulting in a reliance on liquid fuels, lower quality energy supply, and higher energy costs (IEA-RETD, 2012).



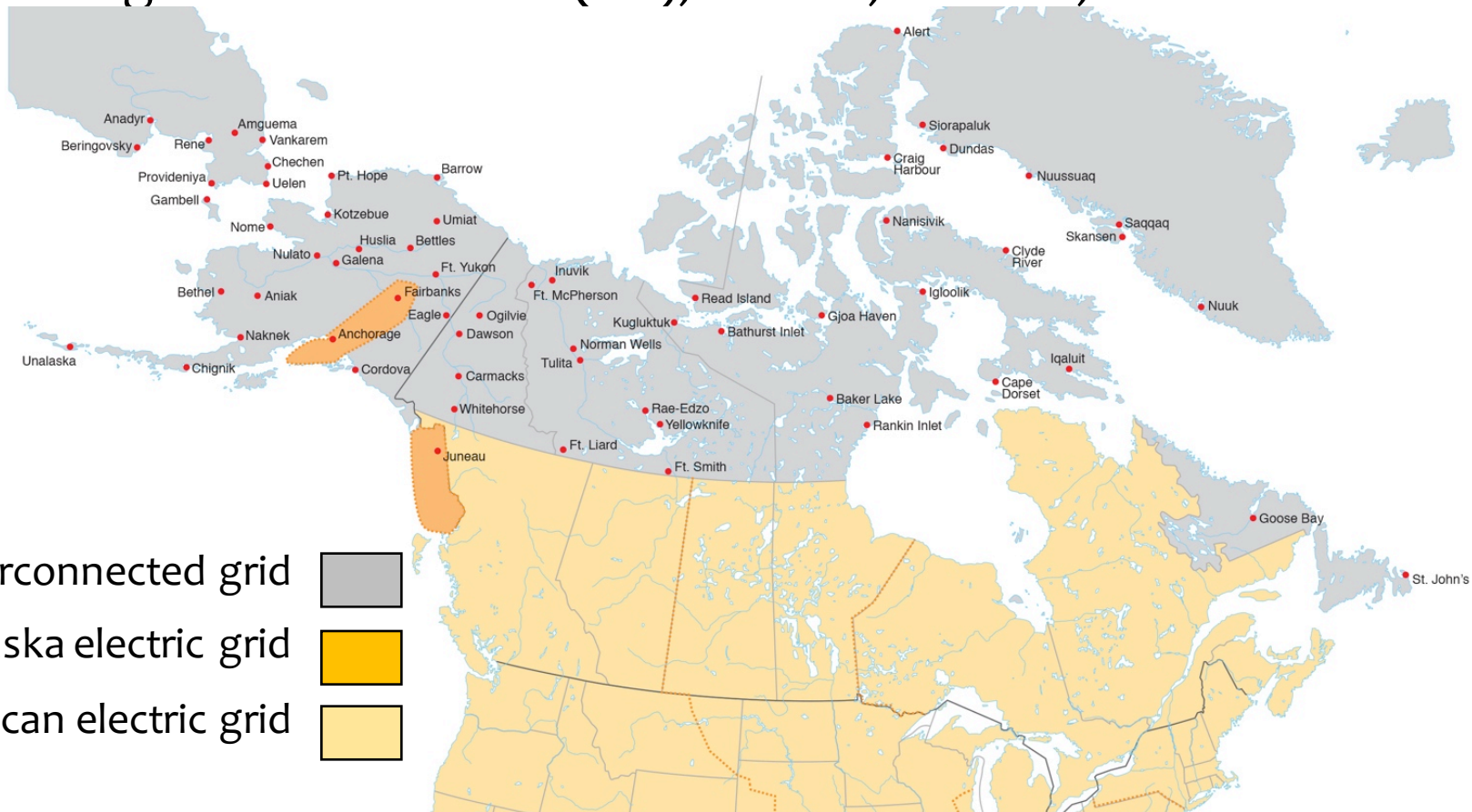
Teller, Alaska

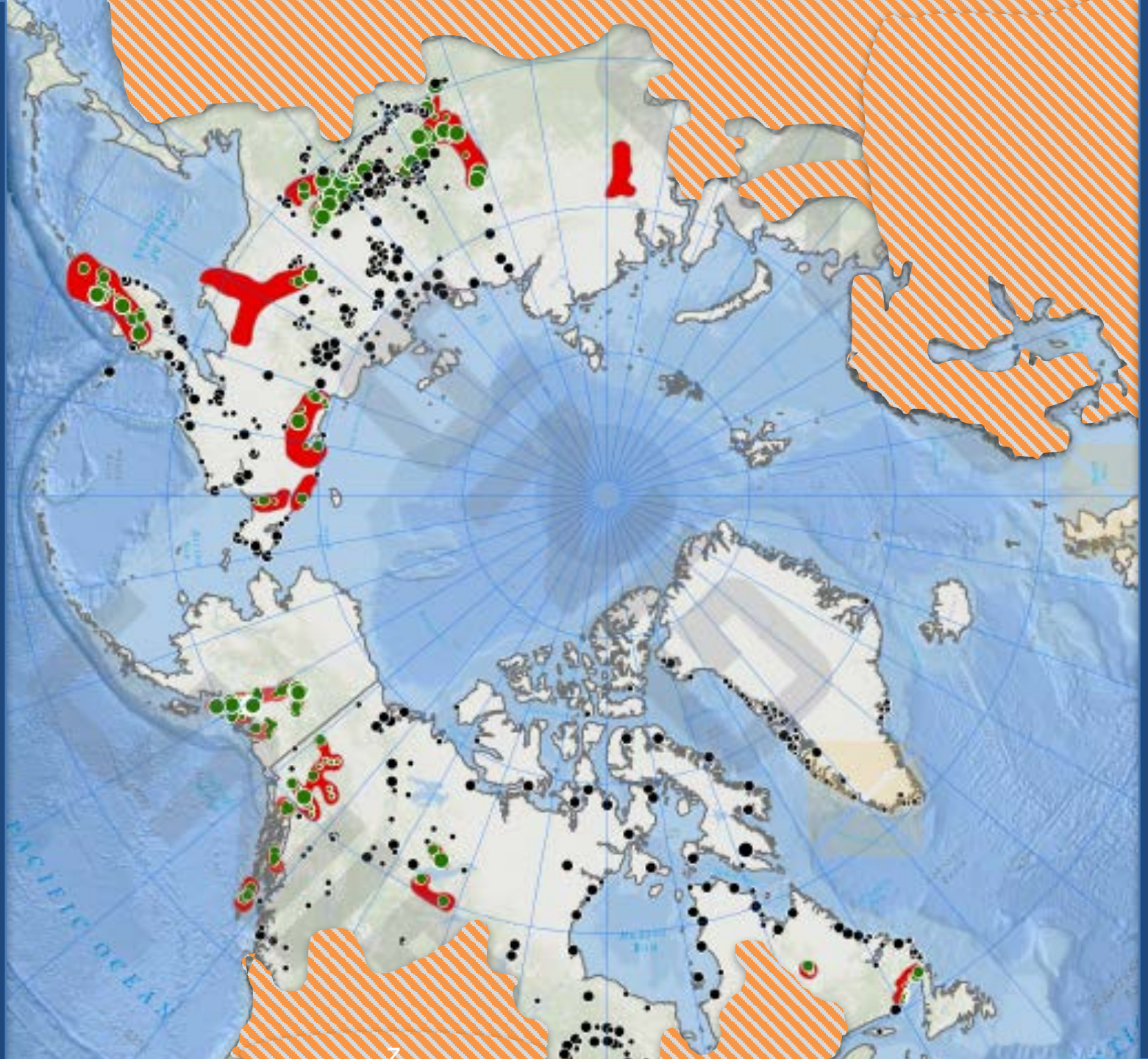


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# The 'Remote' Arctic

A significant portion of the Arctic population lives beyond the edge of the 'grid front': Alaska (US), Russia, Canada, Greenland





# Long fuel distribution routes



# Typical Diesel Power Plant

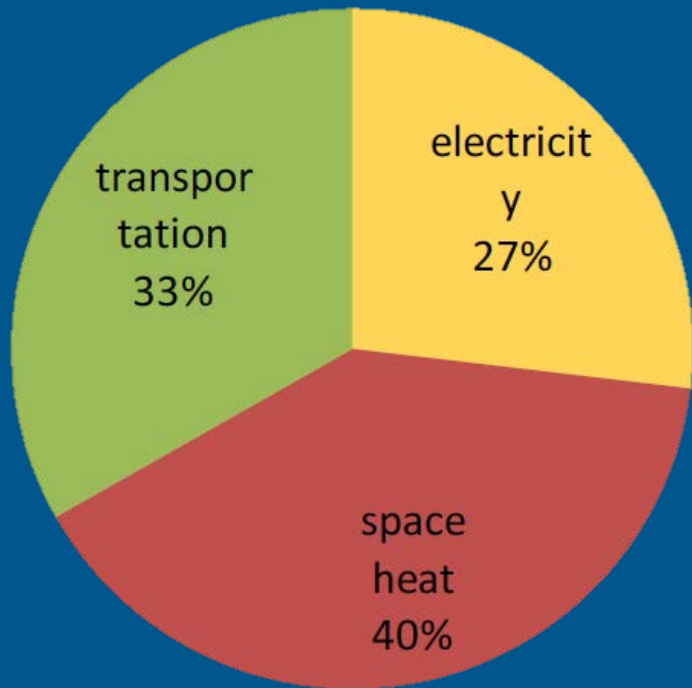


Community of Shungnak, Alaska.  
Image courtesy of Rob Bensin

# Energy Use in PCE Communities

*In rural Alaska, up to 80% of energy is used for space heating \**

*(WHPacific Report: "Alaska Energy Authority End Use Study: 2012", April 30, 2012)*



*Steve Colt, ISER, 2011: estimated % for PCE communities (chart above)*

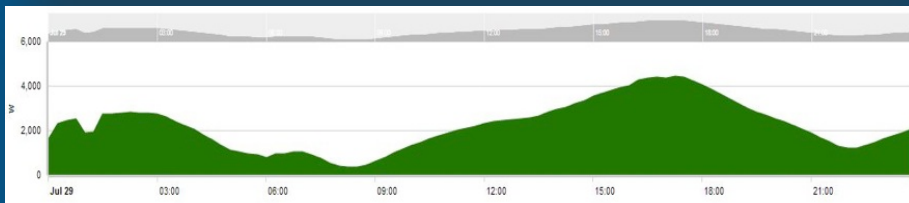


*Example of typical residential heating system in Huslia*





# Connection to FEW Nexus



Deering, Alaska. Solar on water treatment facility with 24 hours output in July



Food production at Pilgrim and Chena Hot Springs

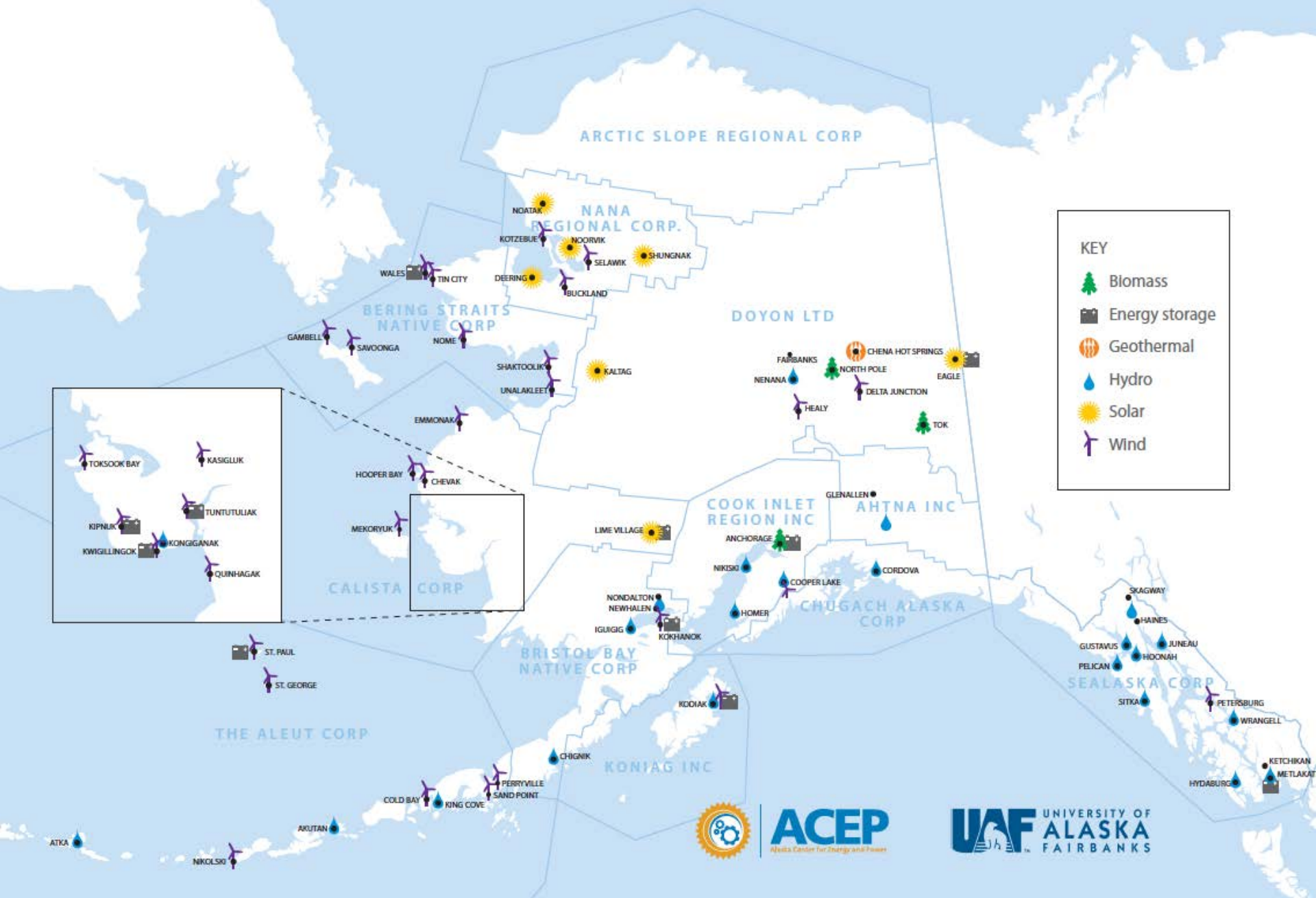


# Definition of Energy Security

Energy security has been defined as "access to clean, reliable and affordable energy services for cooking and heating, lighting, communications and productive uses", and as "uninterrupted physical availability [of energy] at a price which is affordable, while respecting environment concerns" (United Nations)



*Alaska has ~10% of the worlds microgrids that incorporate grid scale renewable resources. (Navigant Research).*



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# Kodiak Island: 99% renewable generation

Hydropower + Wind + Energy Storage (Battery and Flywheel)



# Barriers to RE Development

- Scale and population density
- Terrain and climate
- Oil and transportation markets
- Subsidies (for status quo)
- Utility structure
- Lack of awareness/familiarity
- Institutional knowledge
- Heterogeneous nature of projects



# Thank you!

