Clean Energy in Rural Alaska: The Good, the Bad, the Ugly

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"Alaska's Clean Energy Future" Discussion

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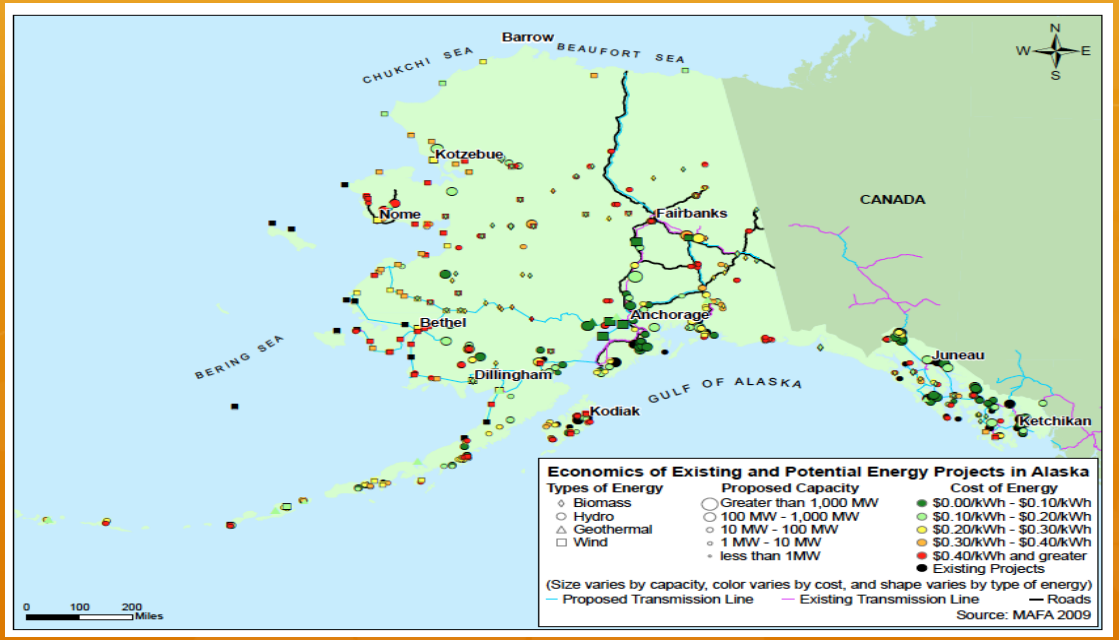
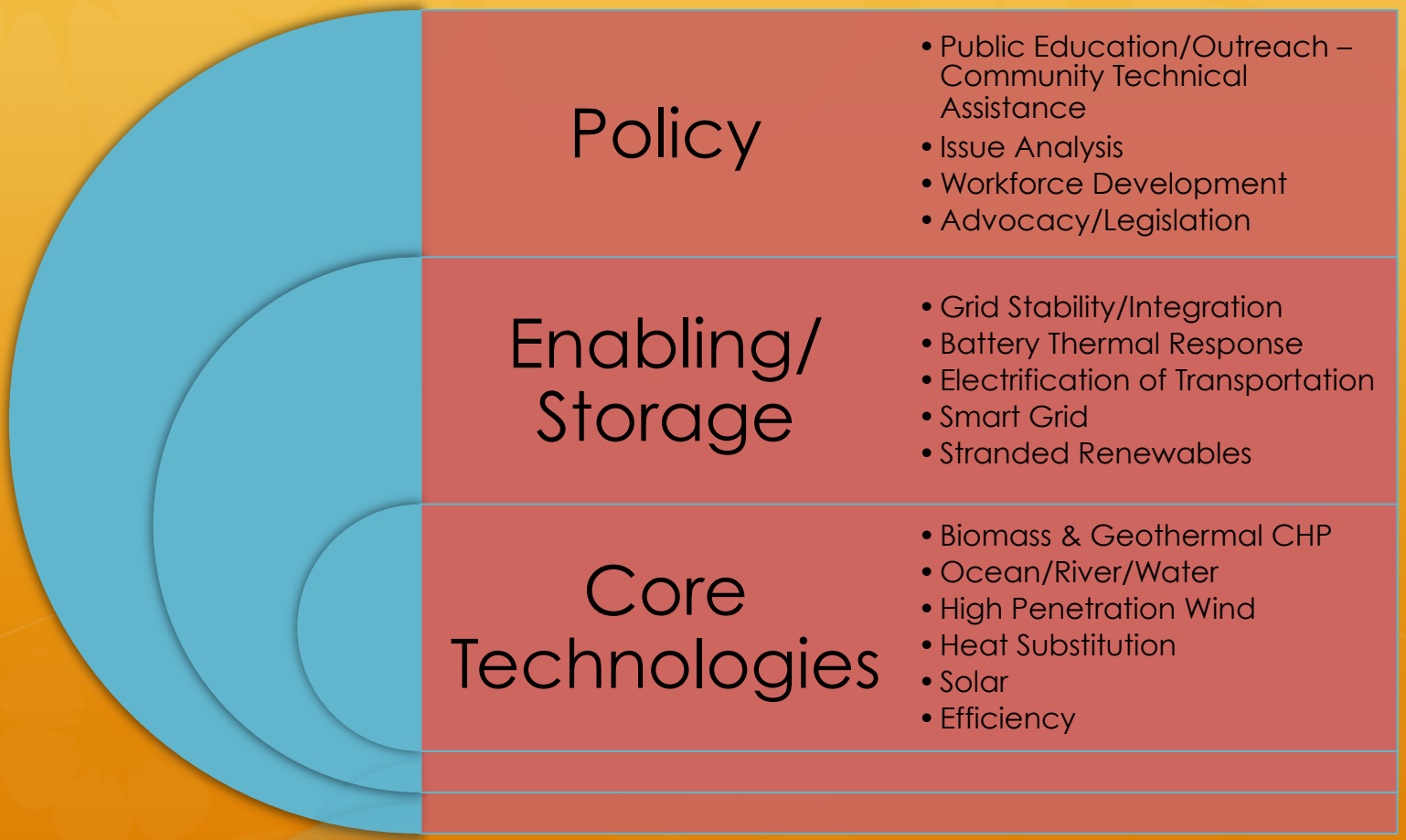
Photo Courtesy Brad Reeve, Kotzebue Electric Association

Alaska is BIG…with BIG resources & BIG Contradictions

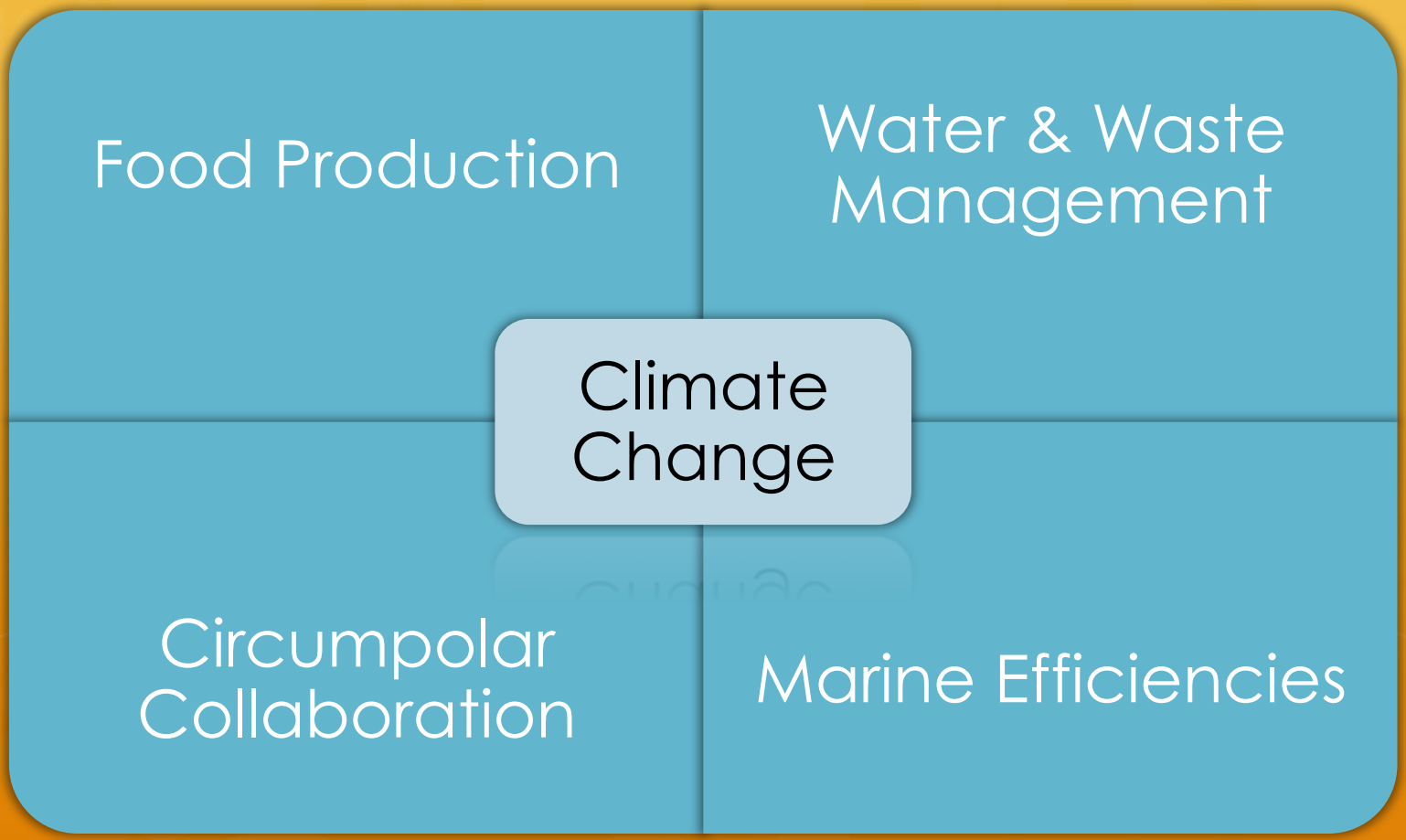


- **Prudhoe Bay (15 BBL & counting, but declining)**
- **Nat gas for 1000+ years (in-state), but no production on North Slope**
- **Crude exports; Processed fuel imports: > 200 small, diesel-dependent communities, some @ $1/kWh & $12/gallon**
- **>> $45 Billion in the bank, but politically untouchable (at least in the past!)**
- **Multi-Billion$ budget deficit, but lots of "rainy day" accounts…and it's Raining!!!**

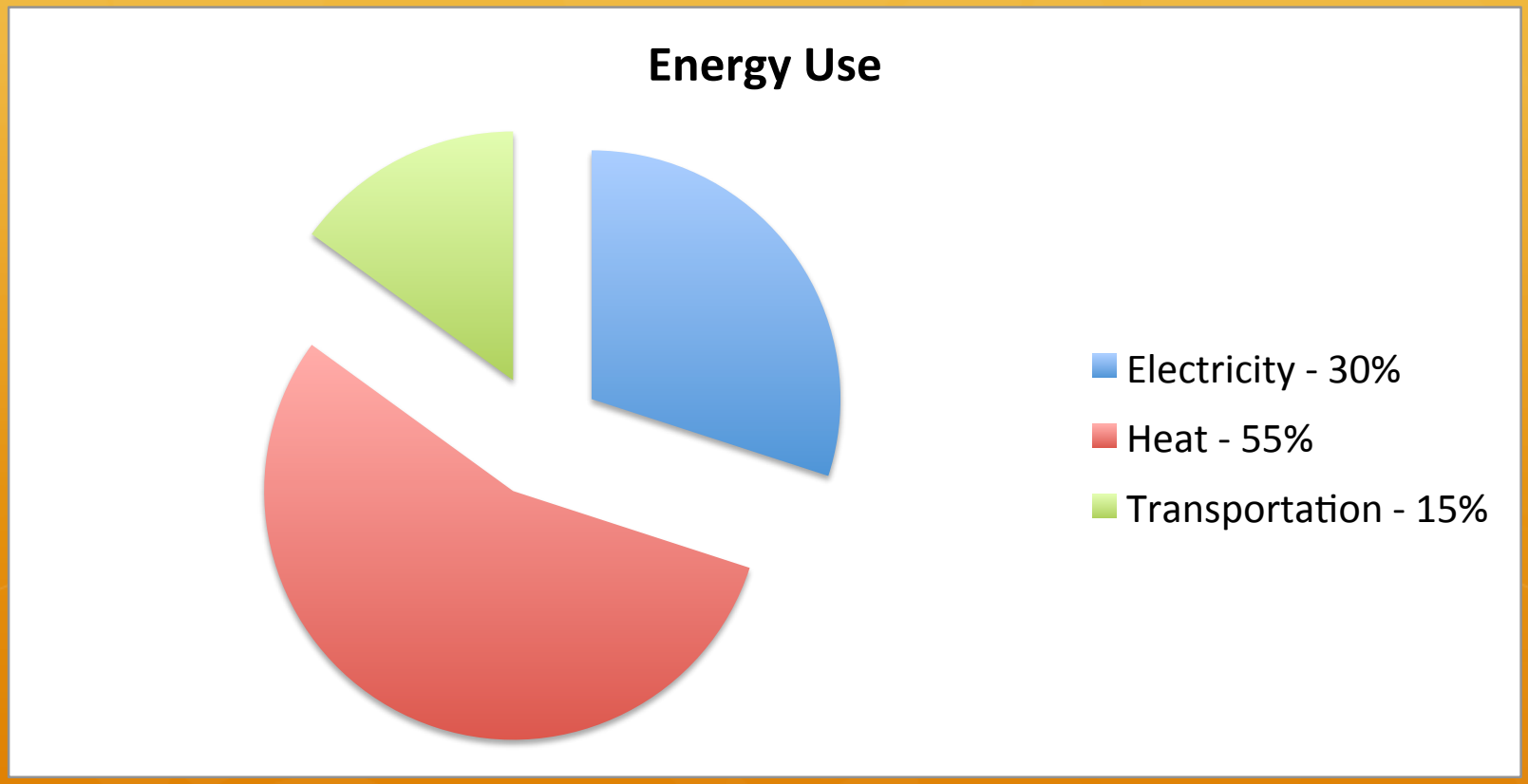
Alaska Strategic Energy Priorities



Cross Sector Opportunities

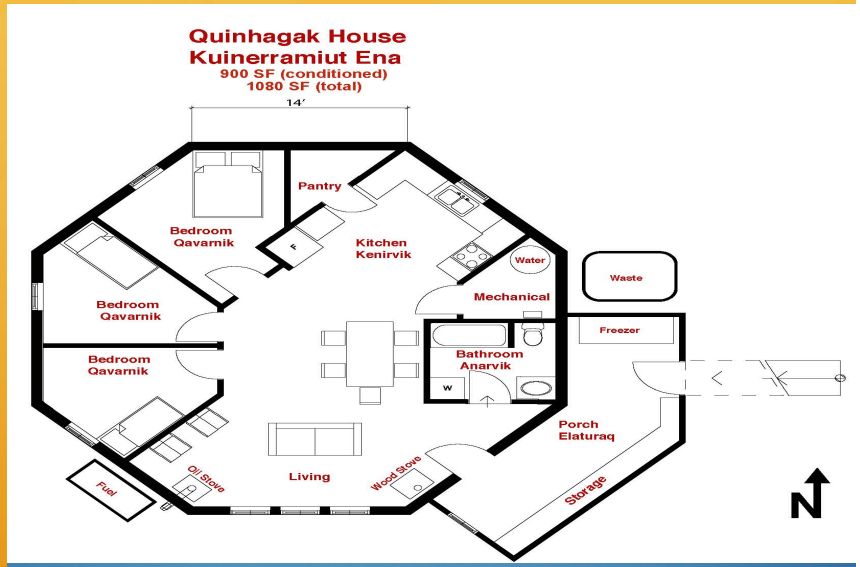


Typical AK Village Energy Consumption



Sustainable Northern Shelter Program

- Aiming for Net Zero…
- Villages of Anaktuvuk Pass and Quinhagak
- Inidigenous/traditional design; local materials; low capital cost; fits in an airplane
- Cold Climate Housing Research Center
- Evaluate energy and ventilation performance of newly constructed, highly efficient homes
- Current success: from 1000 gallons/yr of diesel heating fuel to 150 gallons/yr in AKP
- Identifying ways to improve performance over time



Biomass

Alaska Wood Energy Development Task Group

- **Guides pre-feasibility assessments of community biomass thermal projects**

Fort Yukon, Galena, Tanana, Tok

- **Multi-agency/entity effort to displace diesel heating fuel with wood energy for commercial district heating**

U.S. Coast Guard Kodiak Island

- **Aims to displace ~1 million gallons of diesel heating fuel with wood pellets**
- **Completed feasibility study**
- **Need to develop contracting and financing options to implement project**

Bureau of Land Management, Fairbanks, AK

- **Wood pellets from local supply & mfg; displace diesel; FEMP feasibility**

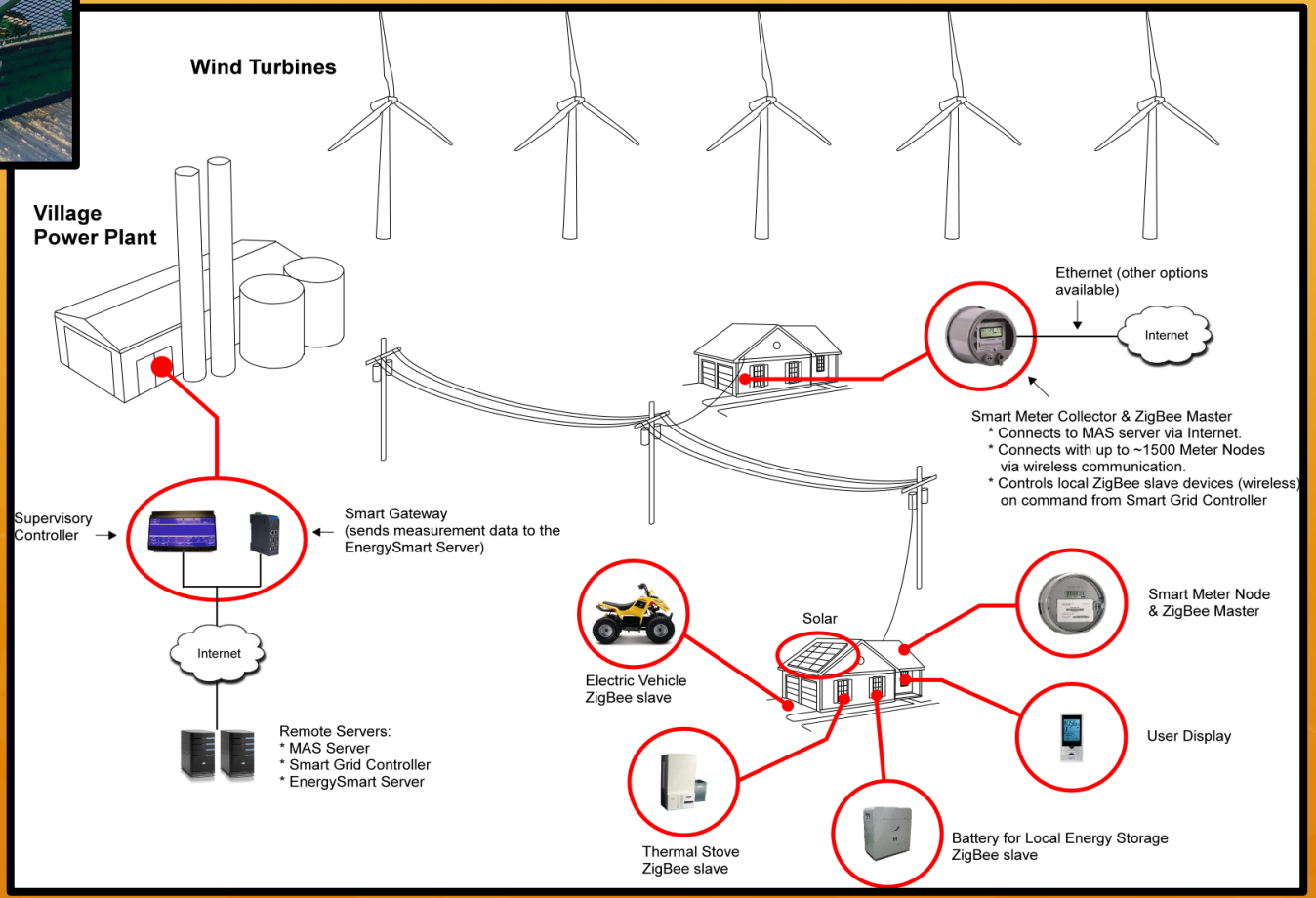
Alaska Renewables: Wind Availability

Technology Innovation & Community Development

Village Wind-Heat Smart Grid System

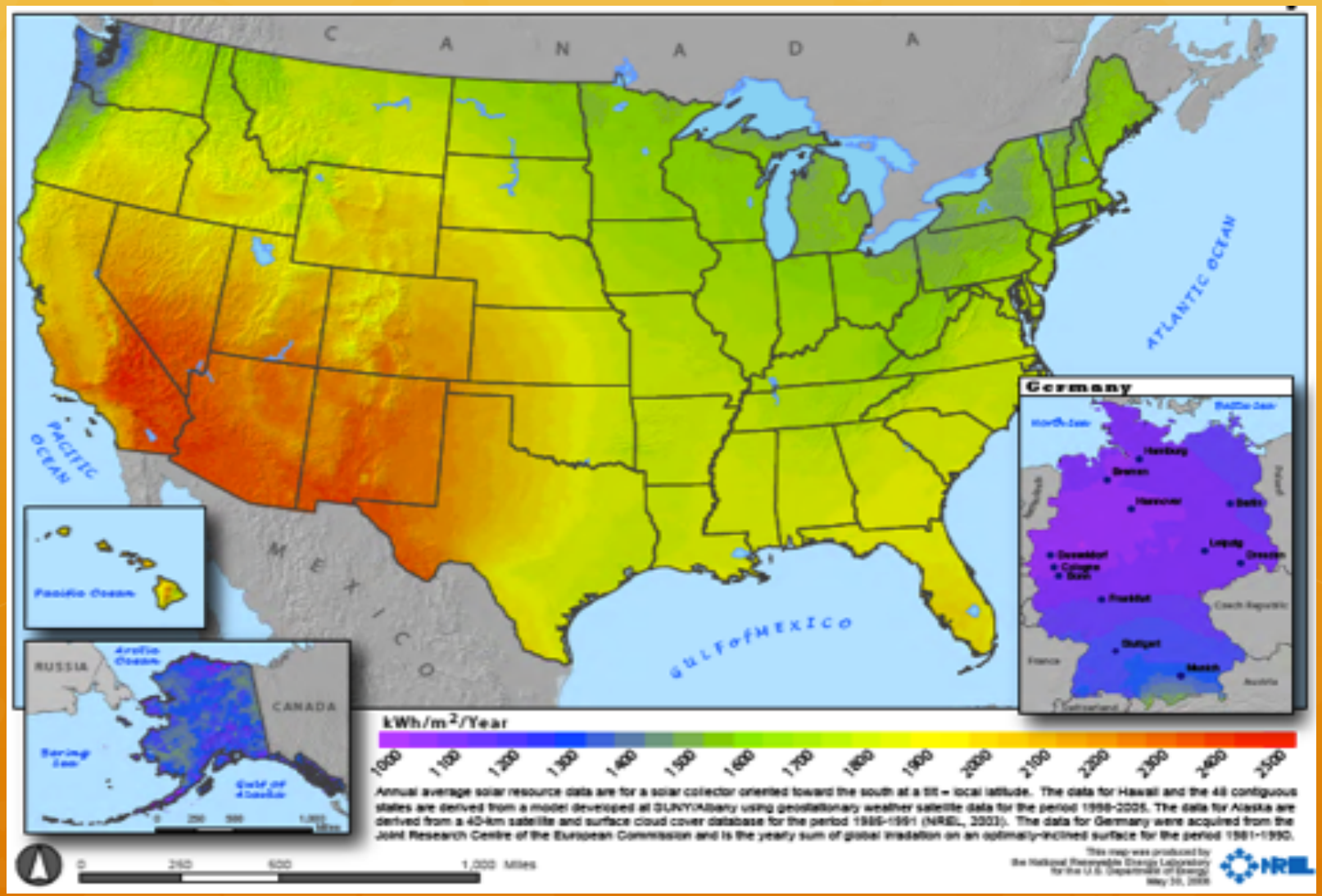
in Chaninik Wind Group Villages

Kwigillingok, Kongiganak, Tuntutuliak and Kipnuk, Alaska



Presentation created by Intelligent Energy Systems. For more information please contact Dennis Meiners at 907-770-6367 or dennis@iesconnect.net.

Solar Insolation: Alaska ≅ Germany



What's Unique About Solar PV

- NO MOVING PARTS!
- 25 year warranty
- Operates only when the sun is shining
  - Can extend this with trackers or energy storage, but then you have moving parts, hazards, etc.
- Clouds have very significant, and rapid, impact on power production (difficult integration)
- Always direct current (but so are batteries)
- Policy Incentives…

What's NOT Unique About Solar PV

- Policy Incentives
- Prices for modules are plummeting
- Grid integration can be a major challenge
- Modern inverters produce high quality power, but are subject to the weakest link in the system
- It's difficult (or at least expensive and inefficient) to store the energy
- In rural Alaska, except for small applications (fish camps, hunting cabins, etc), power systems are not built around PV (diesel is still king)
- No "silver bullet" solutions, but each technology & resource can contribute to diesel savings

Community Solar in China

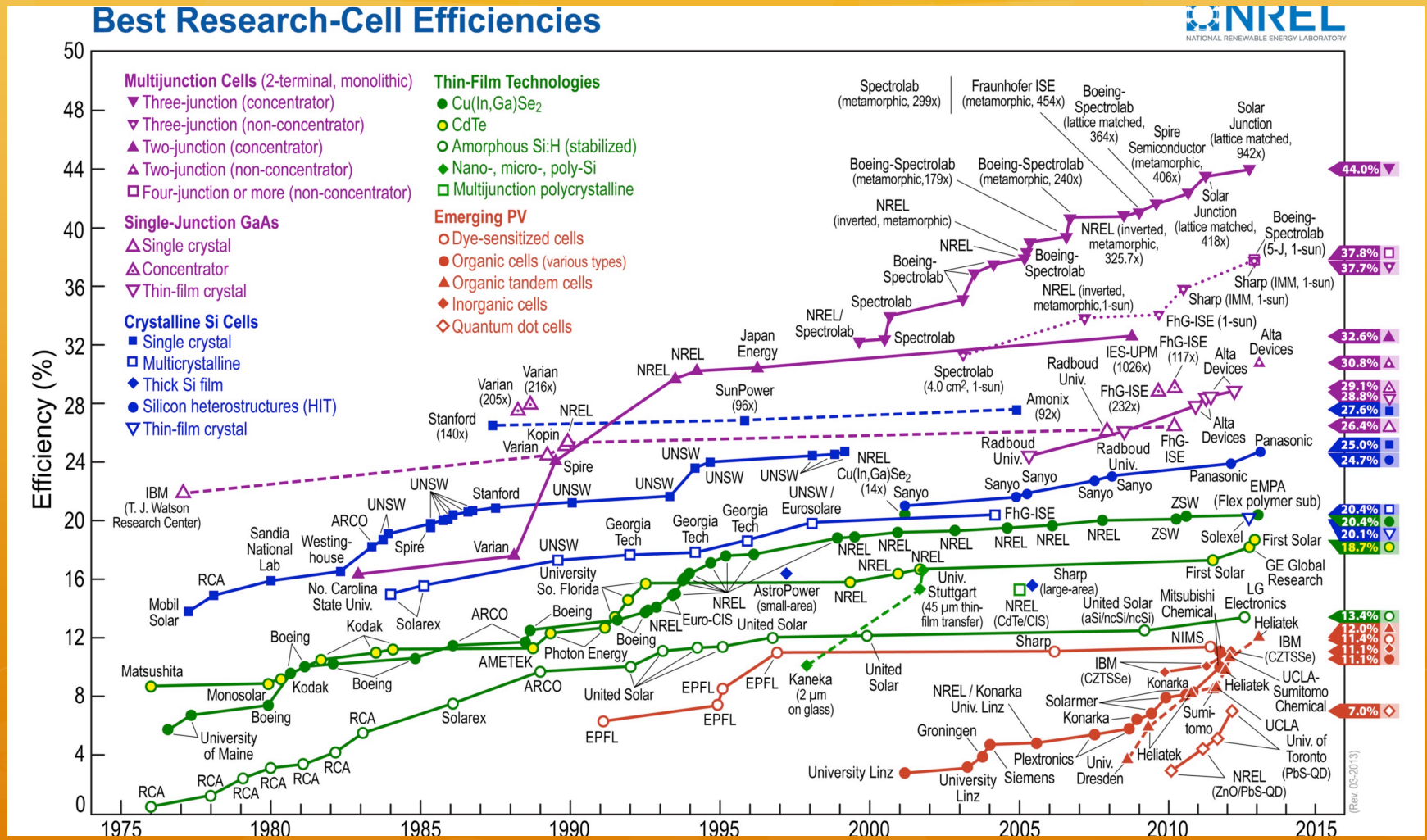
China, Yushu Valley, 2 MW PV Plant – Courtesy of Lu Fang.

IEA – PVPS Report, 2013

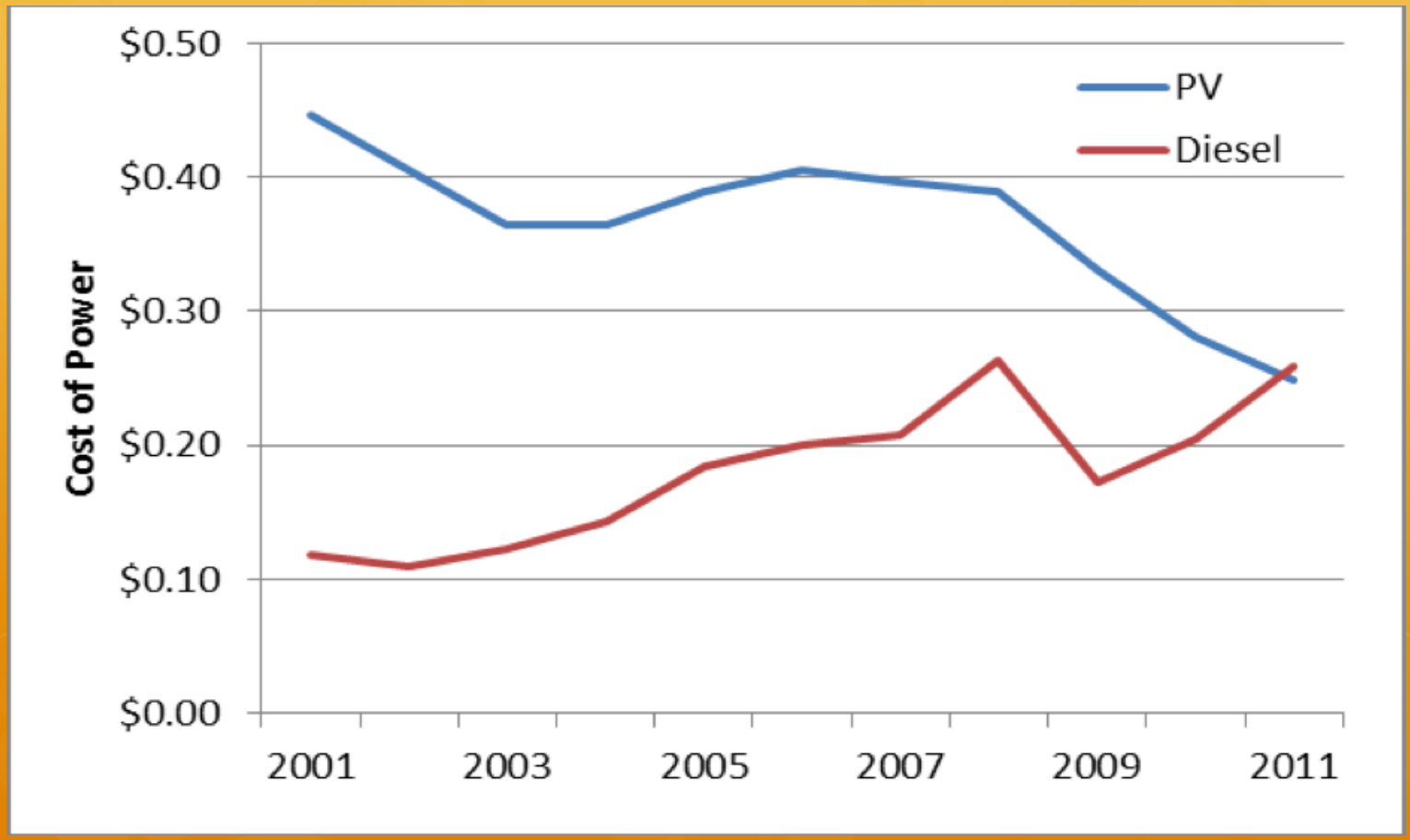
Community Solar in Kaltag, AK

- Utility (AVEC) ownership, construction, O&M
- The first year of operation (2013) produced approximately 8,200 kWh-- fuel cost savings of ~ $1,800
- Performance prediction (prior to installation) was correct

Steady March of Progress

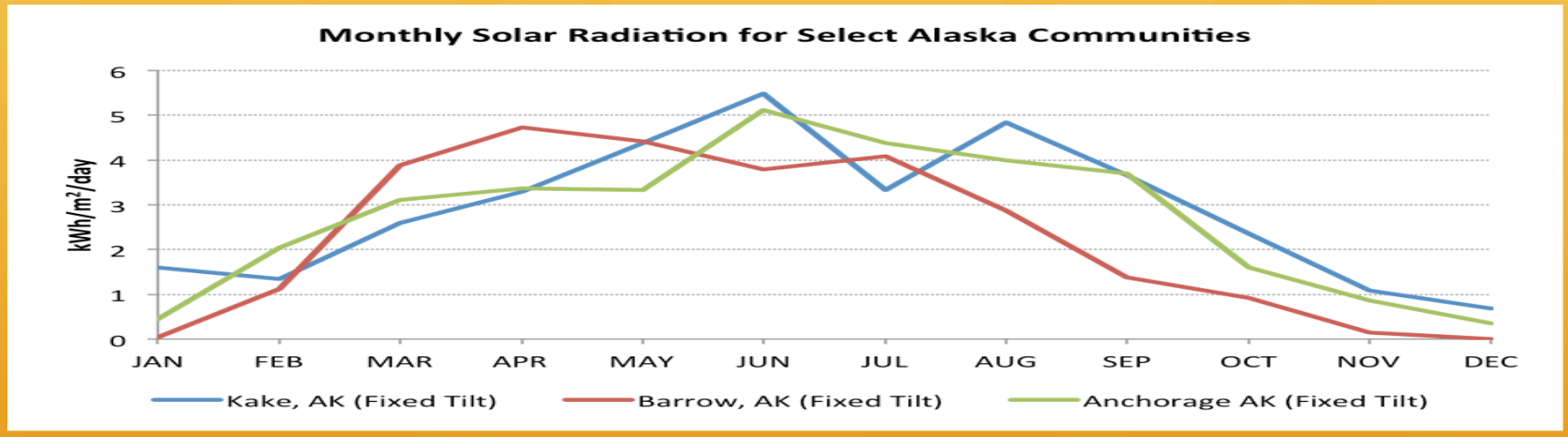


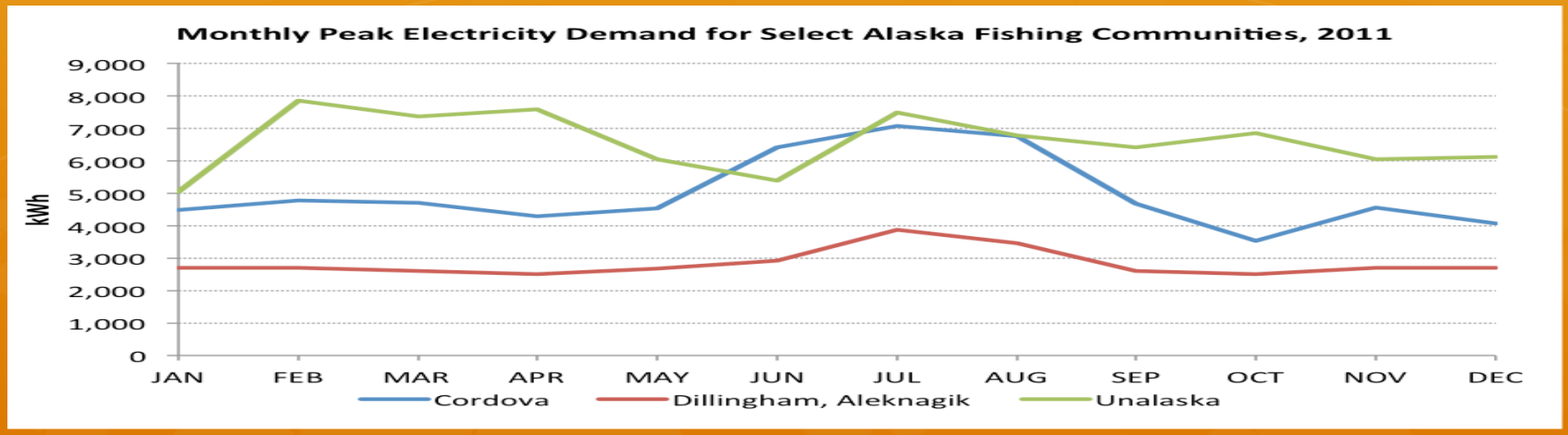
Solar & Diesel Cost Trends, 2001 - 2011



Source: Navigant Research

Supply & Demand – Do They Match Up?





Ocean Energy – Tidal Current & Wave

Many good sites in Alaska 109 TWh/yr

US Totals (Tidal)
- **Primary Energy – 115 TWh/yr**
- **Average Power – 13,000 MW**

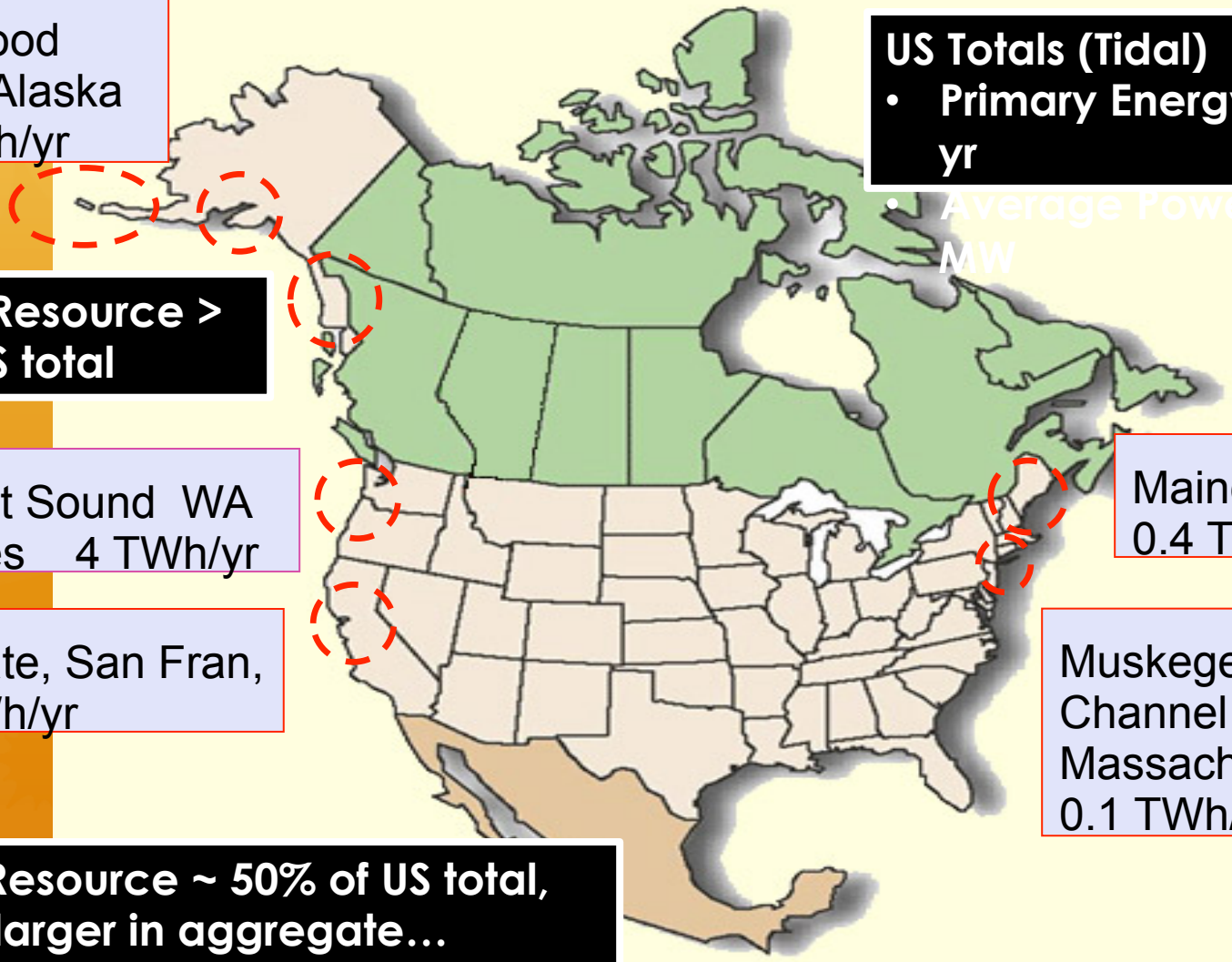
AK Tidal Resource > 90% of US total

Puget Sound WA
8 sites 4 TWh/yr

Maine 7 Sites
0.4 TWh/yr

Golden Gate, San Fran, CA <2 TWh/yr

Muskeget Channel Massachusetts
0.1 TWh/yr



AK Wave Resource ~ 50% of US total, but much larger in aggregate… though dispersed

Alaska Clean & Rural Energy Policy: Renewable Energy Fund, Emerging Energy Technology Fund, Power Cost Equalization Program

- State supported initiatives in a very difficult fiscal environment
- REF: Resource Assessments & Capital Funding to reduce energy costs (Heating & Electricity); Authorized@ $50 Million annually, but down to ~ $11 Million…sort of
- EETF: Fund promising technologies w/ unique AK applications; pre-commercial; 3 years of project pipeline; now dormant but about to revive?
- PCE: Designed to reduce rural electricity costs, but essentially a diesel subsidy; ~ $1Billion Endowment (mini-Permanent Fund); Less diesel = less subsidy ("misaligned incentive" especially in conjunction w/ REF
- Foster clean energy industry development and unique expertise in the state, with some export potential
- State commitment to weatherization funding: > $500 M over last decade + DOE assistance

Photo courtesy Jason Meyer, UAF-ACEP