

HURDLES TO HYBRID WIND DIESEL SYSTEMS

**ALASKA WIND WORKSHOP
ANCHORAGE, ALASKA – SEPTEMBER 8, 2023**

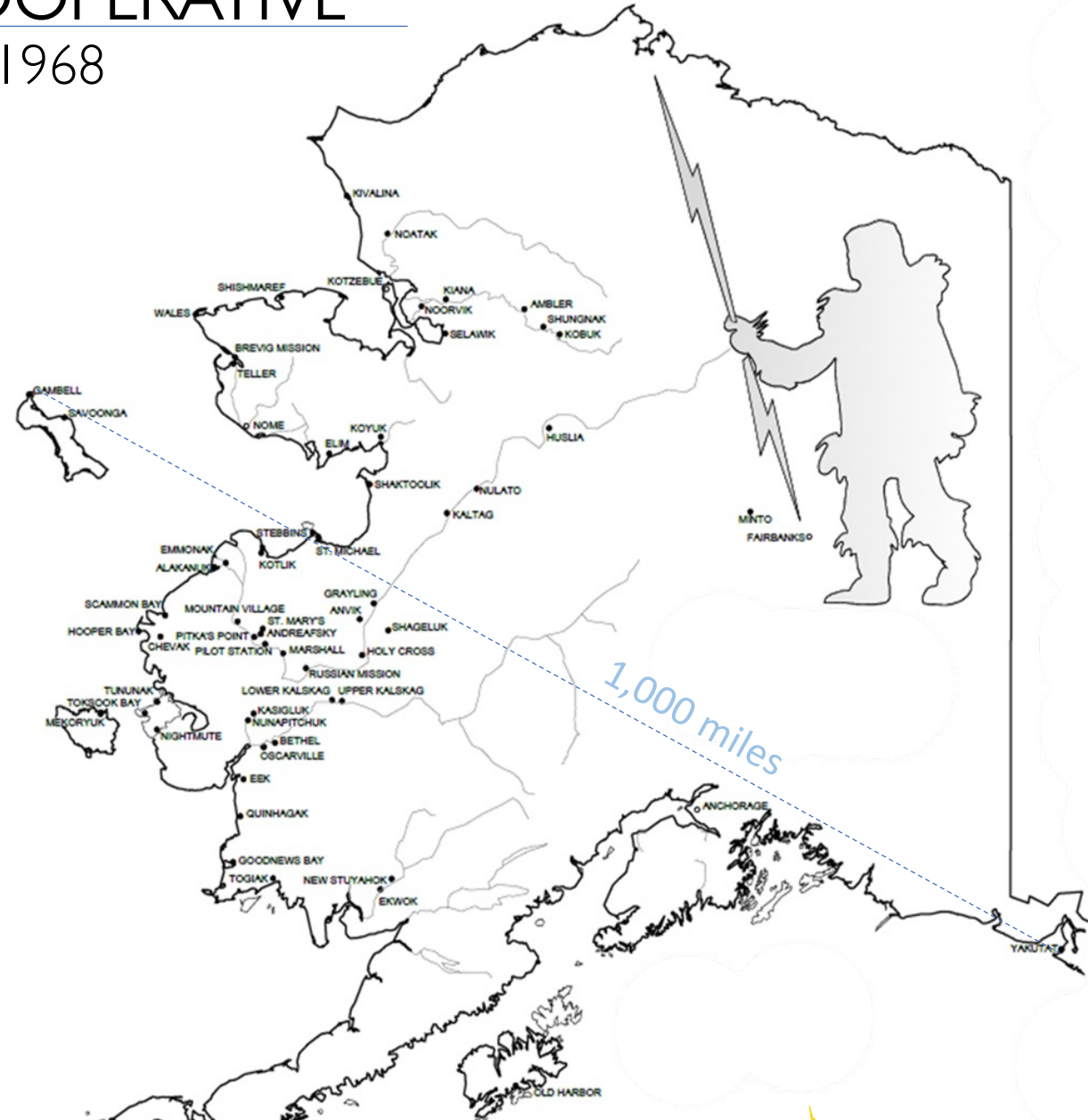
Kasigluk, AK - AVEC Fuel Storage and (3) 100 kW North Wind Turbines

Alaska Village Electric Cooperative
Bill Stamm President & CEO

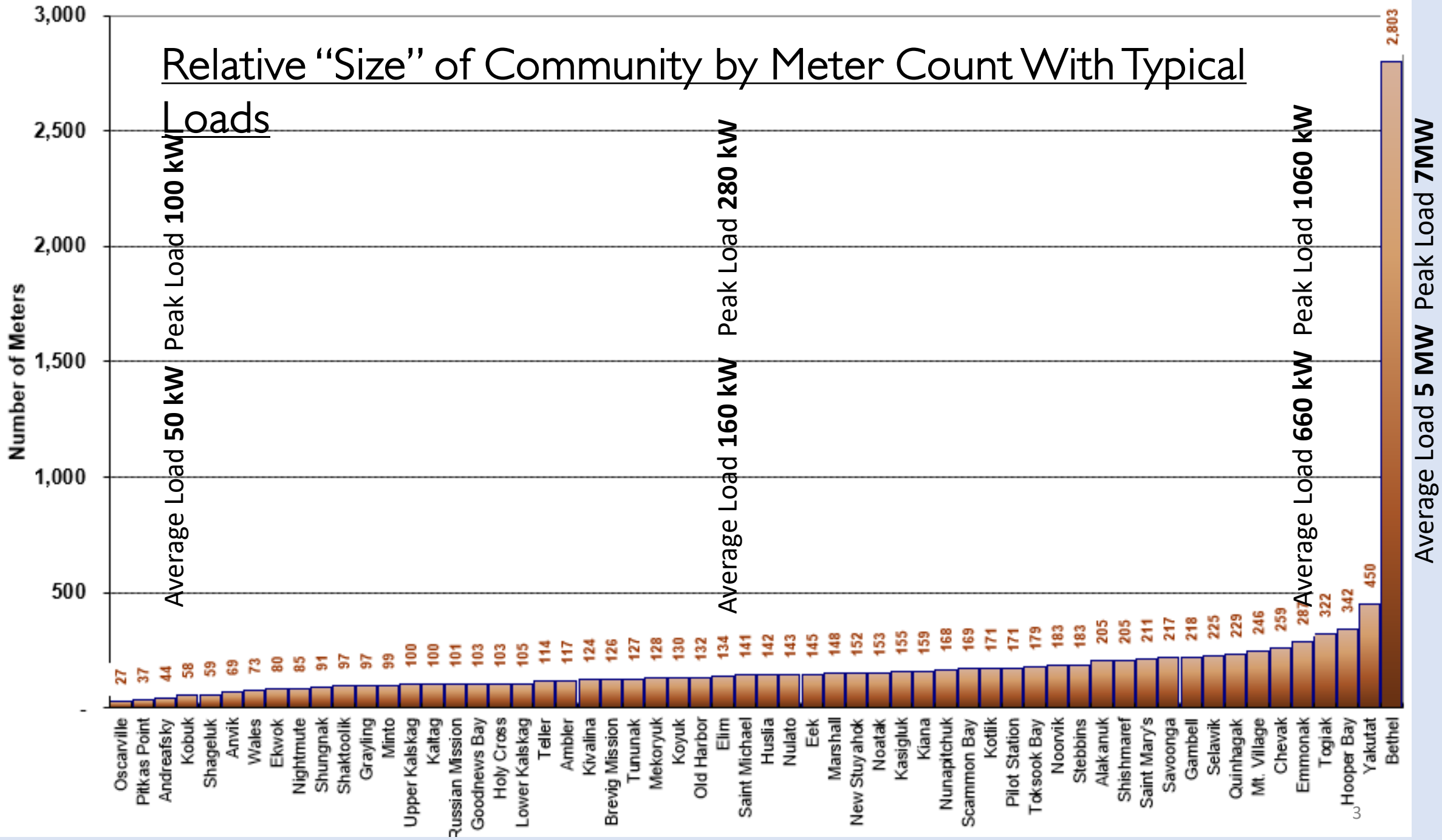
ALASKA VILLAGE ELECTRIC COOPERATIVE

Energizing Rural Alaska Since 1968

- Nonprofit 501(c)12 -Electric Cooperative
- 59 Rural Communities, 31,000+ Residents
- 48 Power Plants, 160 Diesel Generators
- 9.1M Gallons of Diesel in 2022 (**\$35.3M**)
- 520 miles of Distribution Lines
- 12 Wind Sites, 32 Wind Turbines, Serving 20 Communities
- **\$60.7M** Annual Revenue
- 2022 Total Electricity Sold 124.5 MWh

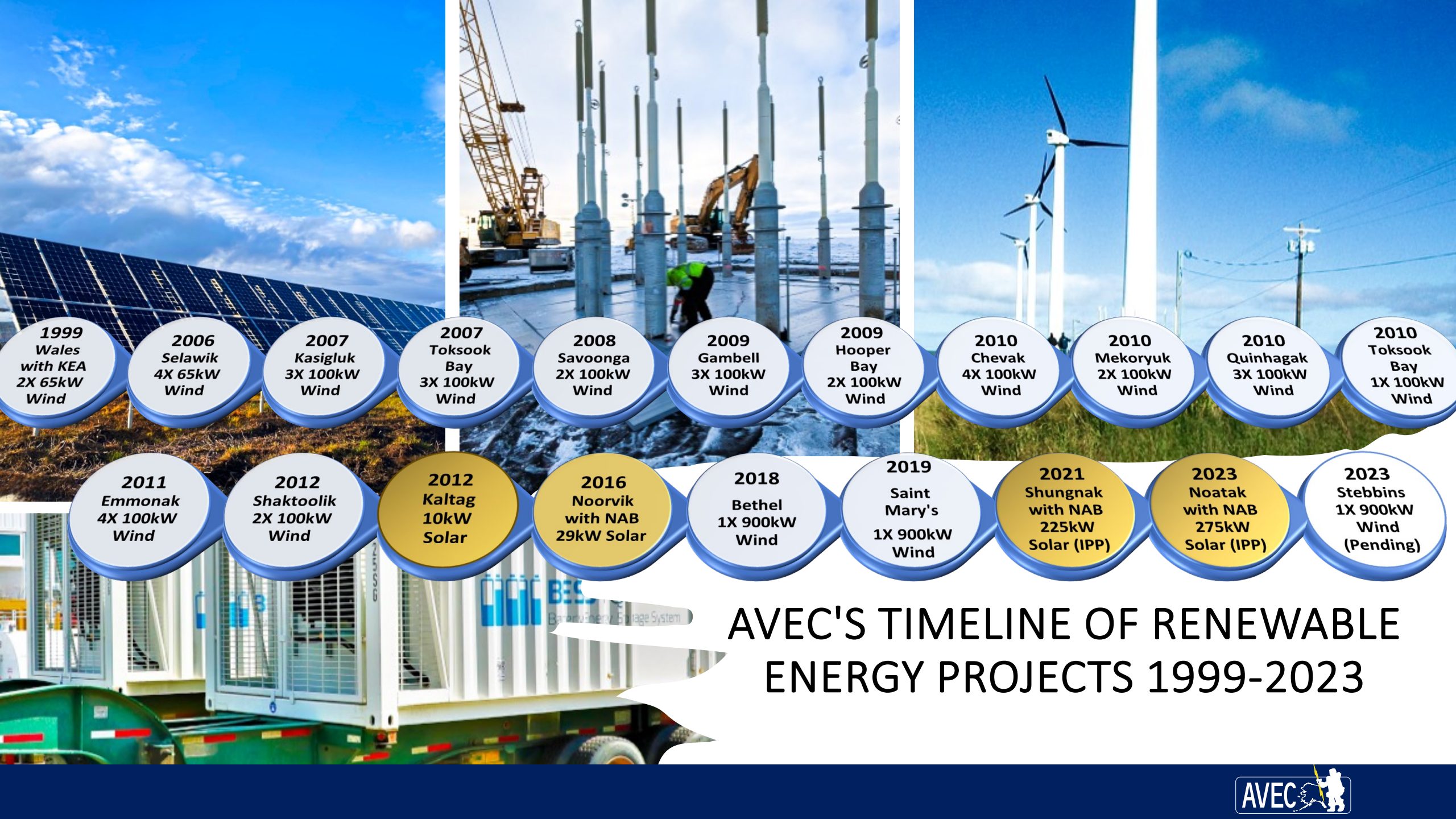


Relative "Size" of Community by Meter Count With Typical Loads





Toksook Bay, AK, now with (4) 100 kW North Wind Turbines
Also provides power to Nightmute and Tununak



- 1999 Wales with KEA 2X 65kW Wind
- 2006 Selawik 4X 65kW Wind
- 2007 Kasigluk 3X 100kW Wind
- 2007 Toksook Bay 3X 100kW Wind
- 2008 Savoonga 2X 100kW Wind
- 2009 Gambell 3X 100kW Wind
- 2009 Hooper Bay 2X 100kW Wind
- 2010 Chevak 4X 100kW Wind
- 2010 Mekoryuk 2X 100kW Wind
- 2010 Quinhagak 3X 100kW Wind
- 2010 Toksook Bay 1X 100kW Wind
- 2011 Emmonak 4X 100kW Wind
- 2012 Shaktoolik 2X 100kW Wind
- 2012 Kaltag 10kW Solar
- 2016 Noorvik with NAB 29kW Solar
- 2018 Bethel 1X 900kW Wind
- 2019 Saint Mary's 1X 900kW Wind
- 2021 Shungnak with NAB 225kW Solar (IPP)
- 2023 Noatak with NAB 275kW Solar (IPP)
- 2023 Stebbins 1X 900kW Wind (Pending)

AVEC'S TIMELINE OF RENEWABLE ENERGY PROJECTS 1999-2023

Many of the early concerns still apply...

Limited availability of appropriately sized machines

Reliability concerns of equipment – especially in remote arctic conditions

Lack of sufficient machines to support service providers and supply chain

Difficulty in integrating intermittent wind with small diesel engines & small grids



Raising second of two 65 kW AOC wind turbines in Wales circa 1999

Lessons learned from Wales...

Avoid retrofits where possible

**Capability of existing equipment
matters**

**Managing secondary loads and
maintaining communication
between all system components is
critical**

**Lower penetration (no diesels-off)
is easier to manage**

**Logistics-combine with other work
to reduce cost**



Selawik modular power plant, tank farm and
(4) Entegriy (AOC) 65 kW wind turbines

Enduring Development Challenges...

Funding, Site Control, Community Buy-in

Wind Resource Studies, Permitting, Geotech

Accessibility, Local infrastructure

Renewable Readiness
Control Gear
Engine compatibility
(low loads & ramp rates)
Load control
communication,
communication,
communication



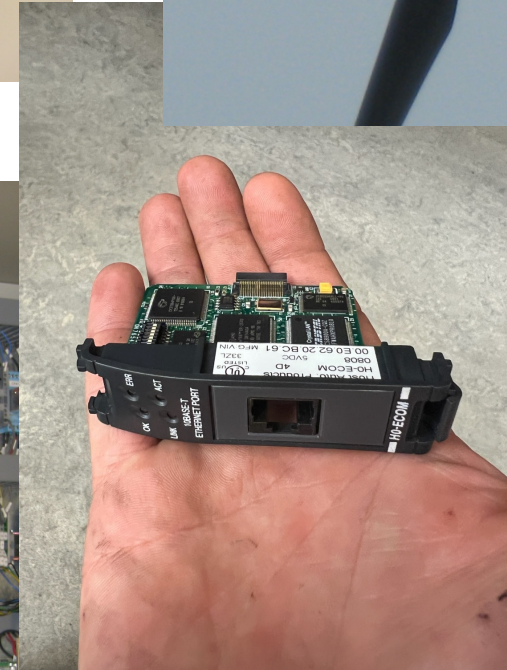
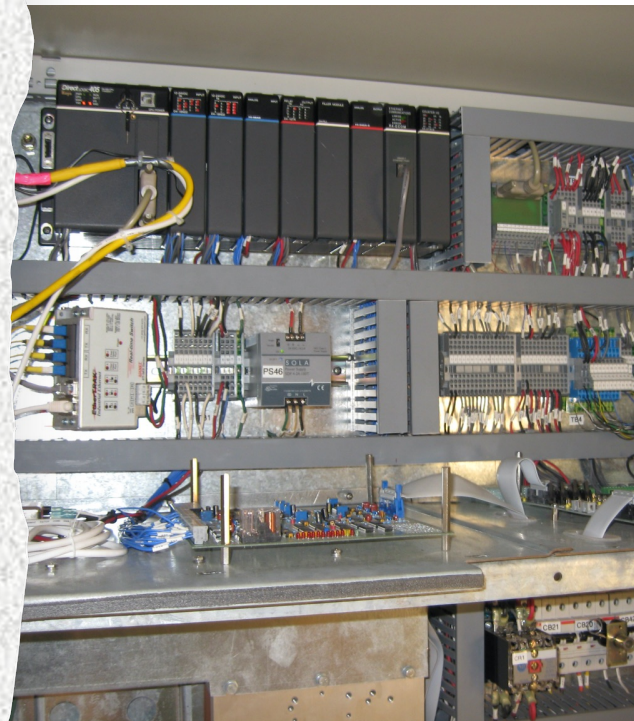
Keeping the Systems Running....

People- Unique skills sets required to troubleshoot, repair and maintain complex systems

Parts- commercial availability of parts, lead times and coordination

Performance- monitoring and adjusting systems to optimize output without compromising power quality

With greater complexity comes more challenging maintenance.



St. Mary's Family of Projects

- 900kW EWT Wind Turbine and Distribution Upgrades
- 20 Mile Intertie to Mt. Village
- 3MW Power Plant
- 35-40% Annual Diesel Displacement (without energy storage)
- GBS Energy Storage (2023)



Image © 2021 CNES / Airbus
Image Landsat / Copernicus

Google Earth



Thank you,

Chevak, AK, (4) North Wind 100B