ALASKA VILLAGE ELECTRIC COOPERATIVE

ENERGIZING RURAL ALASKA SINCE 1968

AVEC's Diverse Energy System

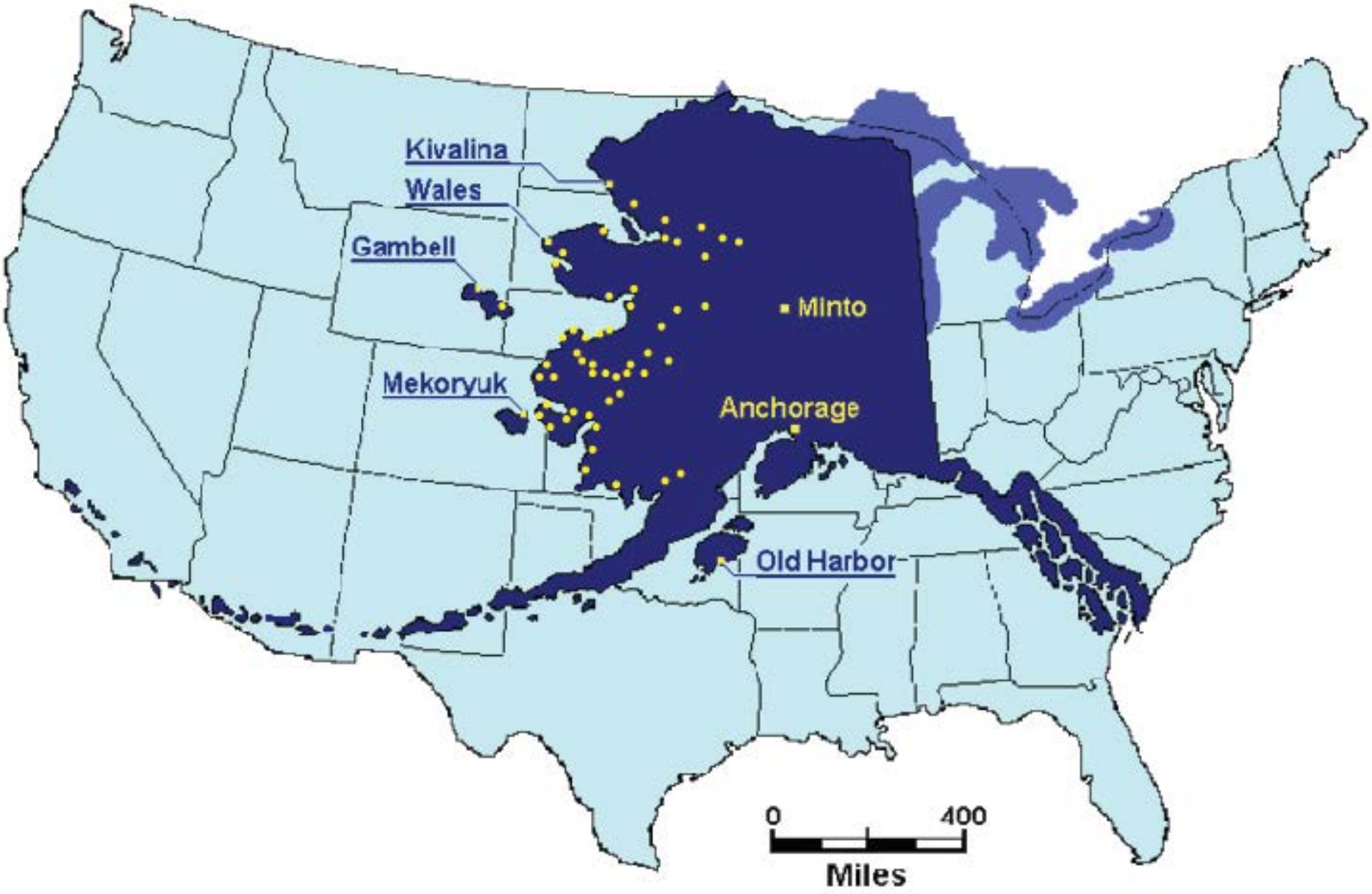
Canadian Energy Symposium

September 5 – 8, 2017

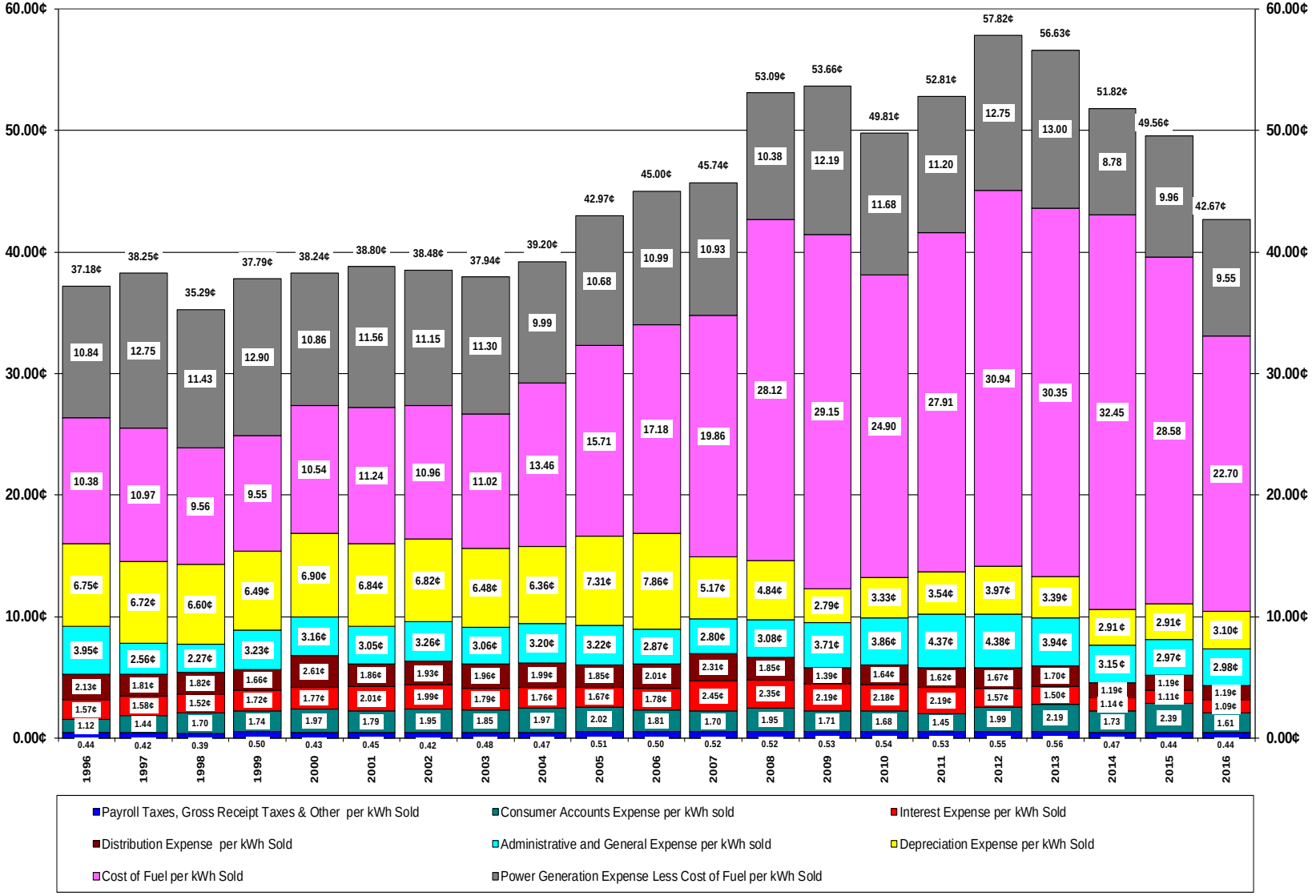
Meera Kohler, President/CEO
Alaska Village Electric Cooperative

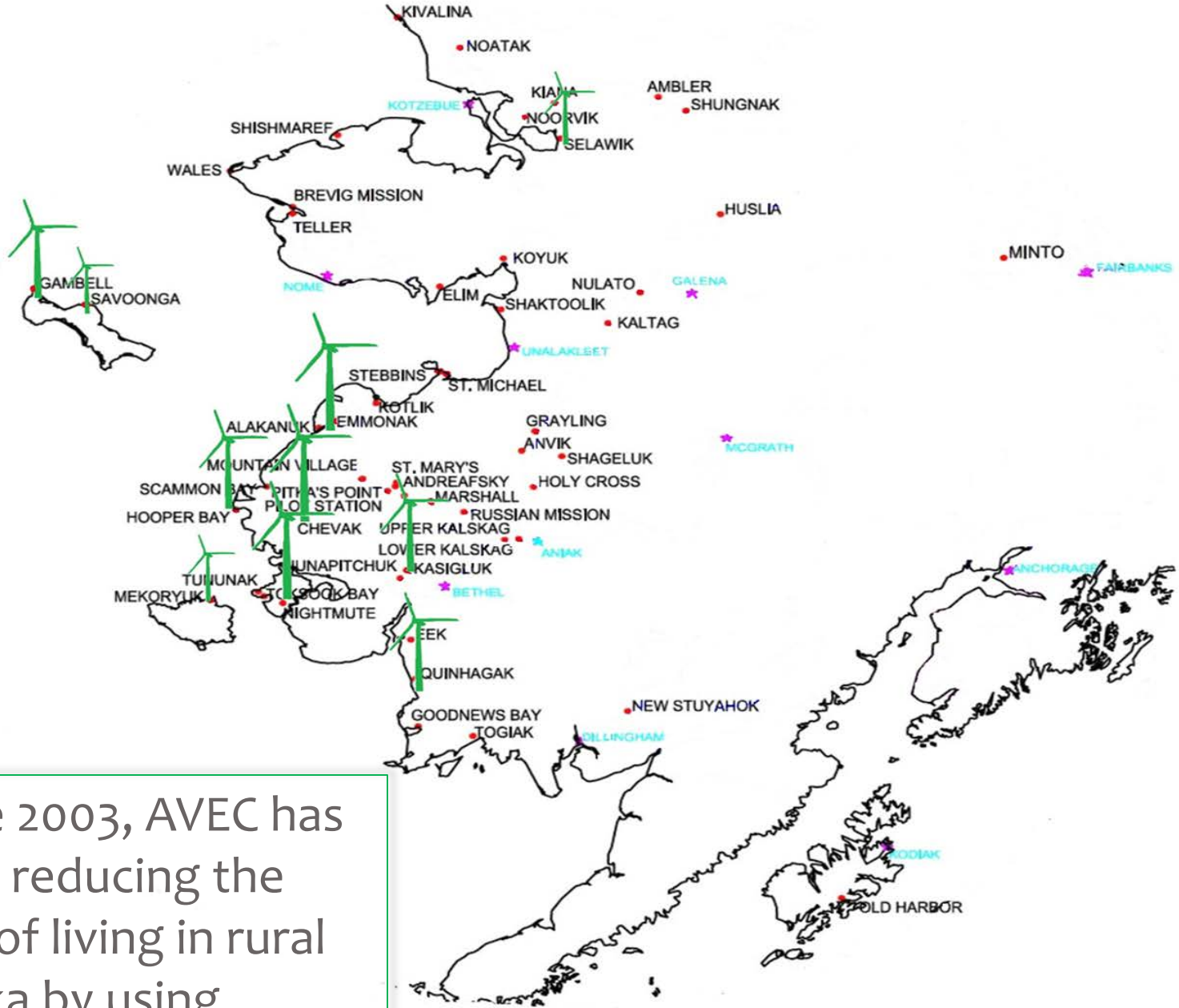
ALASKA VILLAGE ELECTRIC COOPERATIVE
MEMBER OWNED, NOT-FOR-PROFIT

- 58 Alaska communities
- 185 FT/PT employees
- 11,000 services
- 50 power plants
- 8.5 million gallons of diesel
- 113 million kWh sales
- 34 wind turbines serving 15 villages
- 2 Solar PV projects in Kaltag and Noorvik
- Two tug and barge sets
- 2 900 kW wind turbines in 2018


Kivalina
Wales
Gambell
Minto
Mekoryuk
Anchorage
Old Harbor
0
400
Miles

Alaska Village Electric
Cost Components per Kilowatt-hour Sold





Since 2003, AVEC has been reducing the cost of living in rural Alaska by using renewables

A SNAPSHOT OF WIND PRODUCTION IN 2016

Community	Pop.	mWh Sales	Average kW load	kW Wind Installed	Wind Percent
Selawik	876	2,700	325	260	2.23%
Kasigluk +1	1,163	2,900	348	300	18.86%
Toksook Bay +2	1,288	3,300	401	400	19.27%
Hooper Bay	1,178	3,200	386	300	15.88%
Savoonga	718	2,300	265	200	7.74%
Gambell	713	1,800	223	300	34.07%
Chevak	989	2,400	288	400	28.86%
Mekoryuk	210	800	106	200	13.86%
Quinhagak	724	2,000	248	300	31.27%
Shaktoolik	282	1,000	120	200	36.69%
Emmonak +1	1,571	4,400	542	400	28.86%
Kaltag Solar PV	182	500	68	10	1.22%

THE SHAKTOOLIK EXAMPLE

- Population 282
- Diesel Capacity 971 kW
- Wind Capacity 200 kW
- Total sales 1,000,000 kWh
- Average load 115 kW
- Wind generation 37% of total

Shaktoolik typically operates a larger diesel than necessary when there is wind production, because the smallest diesel is too small to be stable during wind variations.

Wind often results in lower diesel efficiency even though there is a net positive fuel displacement.

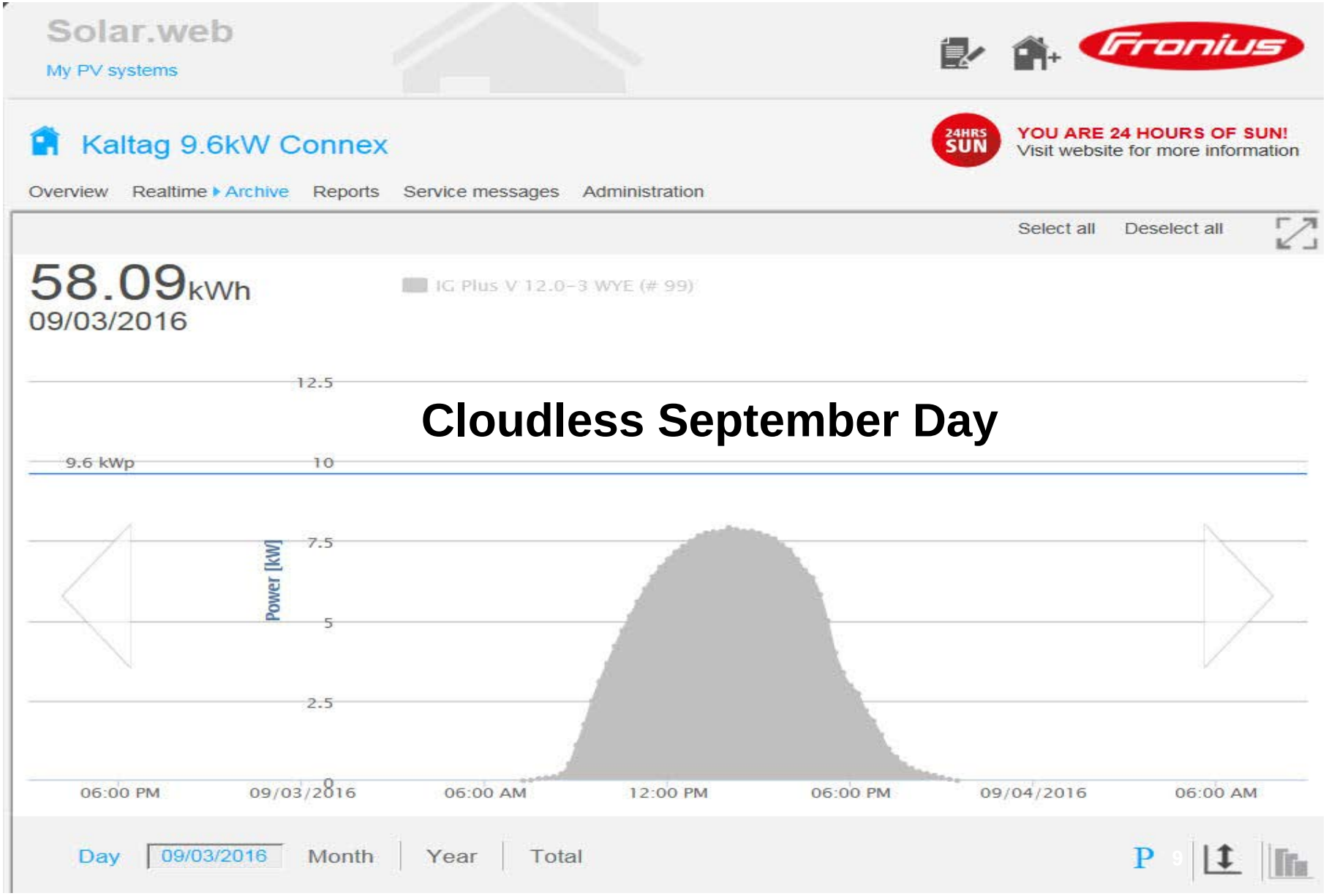
Shaktoolik

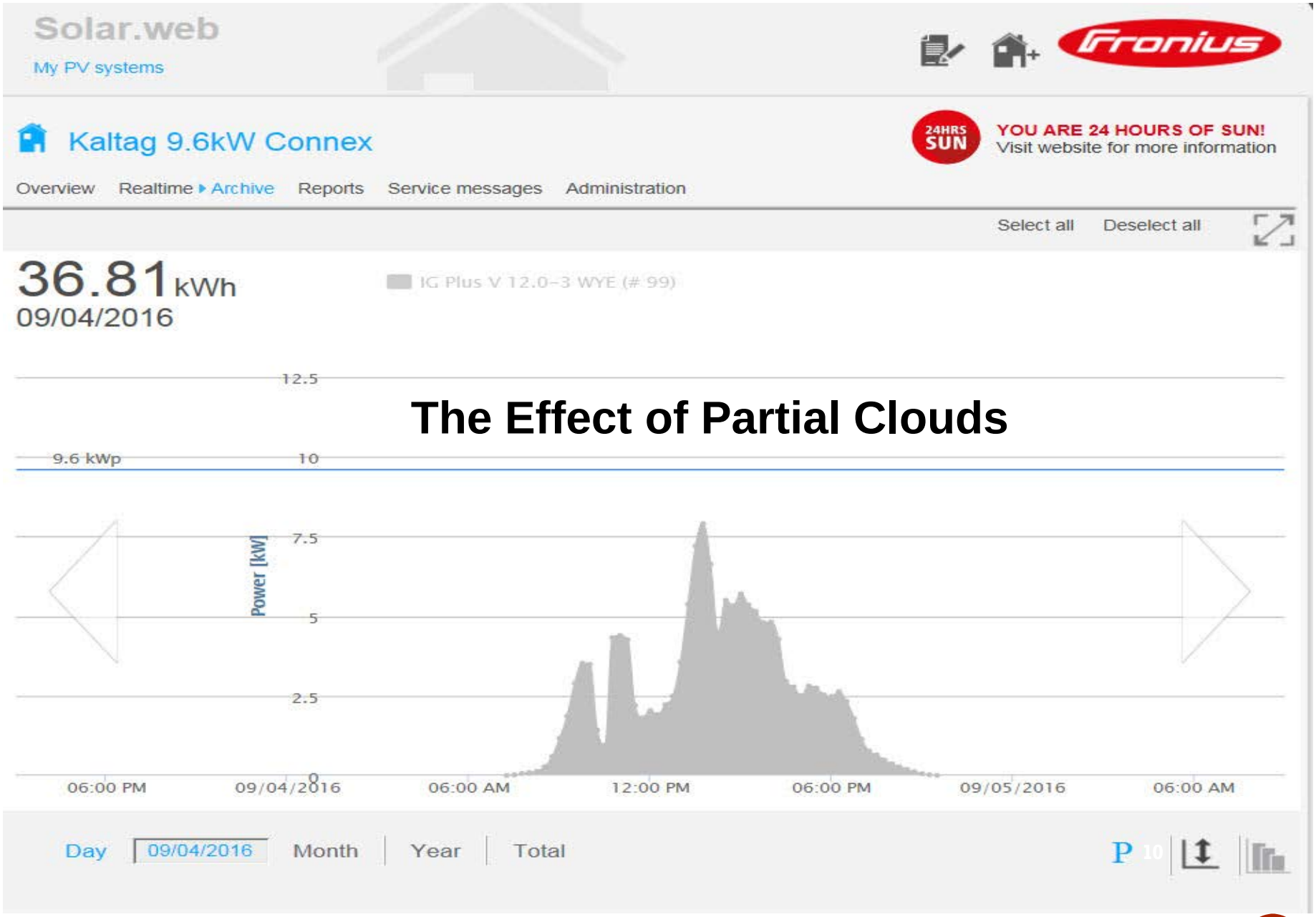
Kaltag Solar Project

- Installed in 2012
- 10 kW stationary PV array
- Latitude 64.3 degrees.
- The angle of the panels is changed seasonally. In winter these panels are vertical.
- Capital cost was $120,000
- 60 year simple payback

PV capital costs have declined significantly since this installation.

Kaltag


Solar.web
My PV systems
Kaltag 9.6kW Connex
24HRS SUN
YOU ARE 24 HOURS OF SUN!
Visit website for more information
Overview
Realtime
Archive
Reports
Service messages
Administration
Select all
Deselect all
58.09kWh
09/03/2016
IG Plus V 12.0-3 WYE (# 99)
Cloudless September Day
9.6 kWp
Power [kW]
12.5
10
7.5
5
2.5
0
06:00 PM
09/03/2016
06:00 AM
12:00 PM
06:00 PM
09/04/2016
06:00 AM
Day
09/03/2016
Month
Year
Total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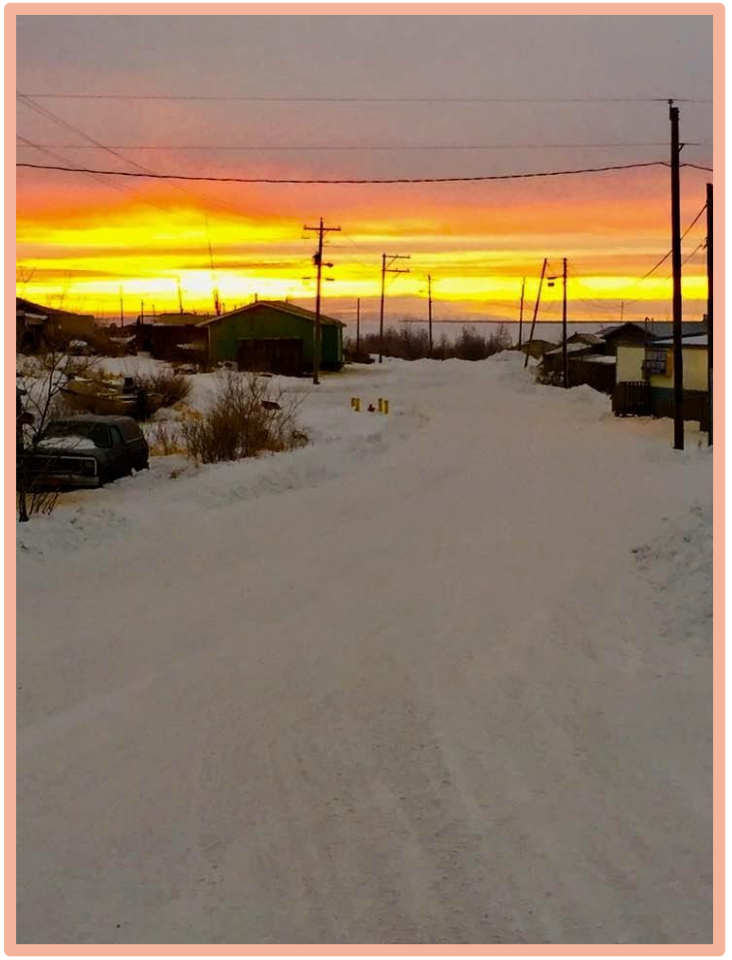
Service messages
Administration
Select all
Deselect all
36.81 kWh
09/04/2016
IG Plus V 12.0-3 WYE (# 99)
The Effect of Partial Clouds
12.5
9.6 kWp
10
7.5
Power [kW]
5
2.5
0
06:00 PM
09/04/2016
06:00 AM
12:00 PM
06:00 PM
09/05/2016
06:00 AM
Day
09/04/2016
Month
Year
Total

AVEC's Community Challenges

Key issues

* Small power plants (~1 MW)
* Low generation efficiencies
  * Larger communities ~15 kWh/gallon
  * Small communities ~13 kWh/gallon
  * Micro communities ~10 kWh/gallon
* Lack of technical resources – manpower
* High cost of fuel – electricity and heat
* Alternative technologies too expensive to operate/maintain
* Lack of capital for renewals/overhauls
  * Dependence on State for support



THE VALUE OF CONNECTING VILLAGES

- In 2006, Toksook Bay, Tununak and Nightmute were interconnected
- 400 kW of wind was installed
- Combined village average load is 400 kW
- Investment in renewable generation is better optimized with less wind to heat diversion
- Diesels running at lower efficiencies to provide spinning reserve

Toksook Bay

What we are doing today

- Pursuing efficiencies
- Connecting communities
- Adding communities
- Developing technical resources
- Optimizing our people
- Developing partnerships that will lead to a sustainable, self-sufficient vibrant rural Alaska

QUESTIONS?

Thank You from Alaska – The Great Land!

Meera Kohler * President and CEO * Alaska Village Electric Cooperative