

ALASKA VILLAGE ELECTRIC COOPERATIVE

Energizing Rural Alaska since 1968

THE THRILLS AND PERILS OF PROVIDING
ELECTRICITY IN RURAL ALASKA

HOUSE ENERGY COMMITTEE

MARCH 9, 2017

Meera Kohler, President/CEO
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Alaska Village Electric Cooperative

Alaska Village Electric Cooperative

Member owned, not-for-profit

57 Alaska communities

90 full time employees

95 village plant operators

10,800 services

47 power plants

170+ diesel generators

500+ fuel tanks

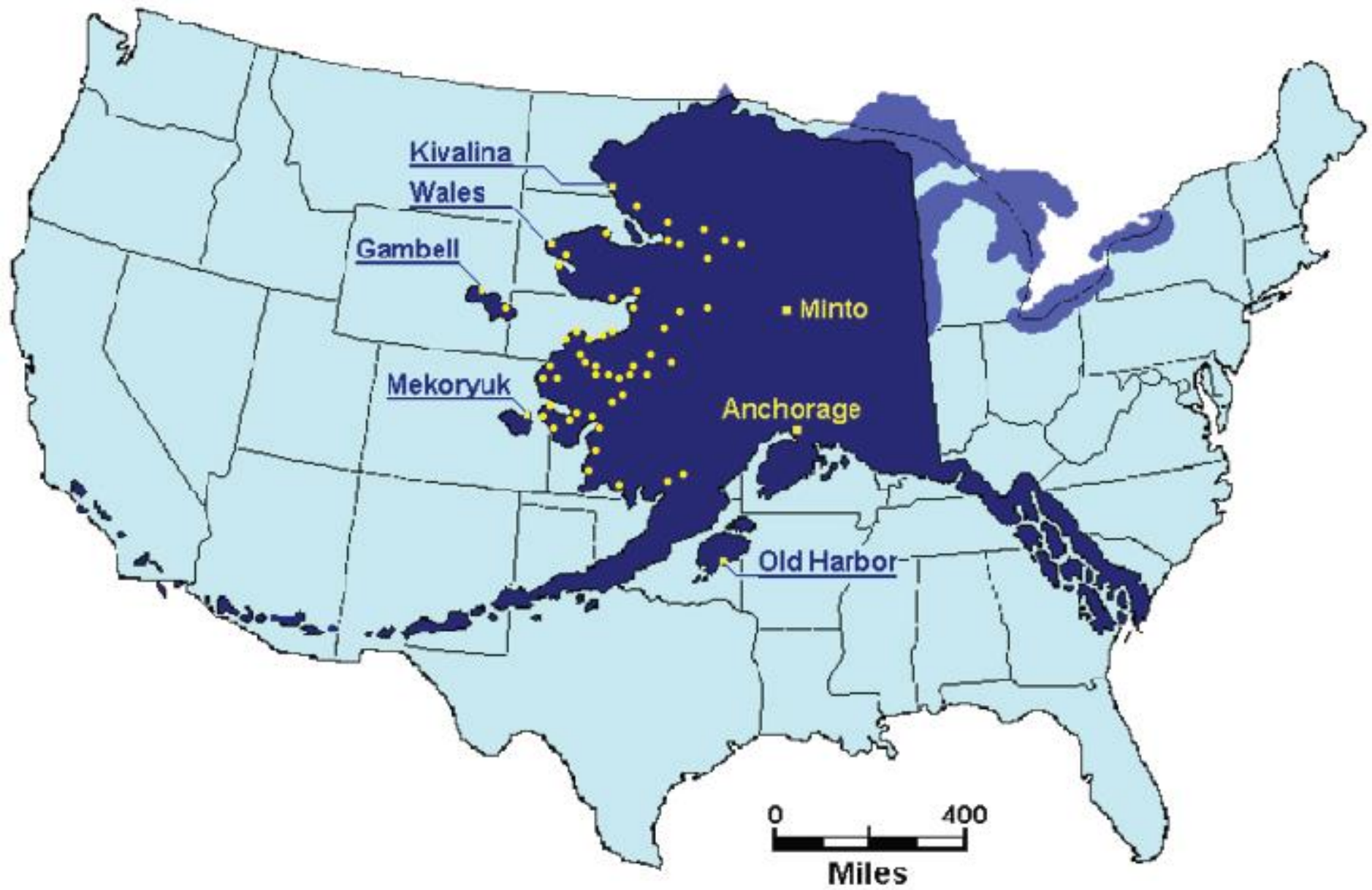
8.5 million gallons of diesel

34 wind turbines serving 15 villages

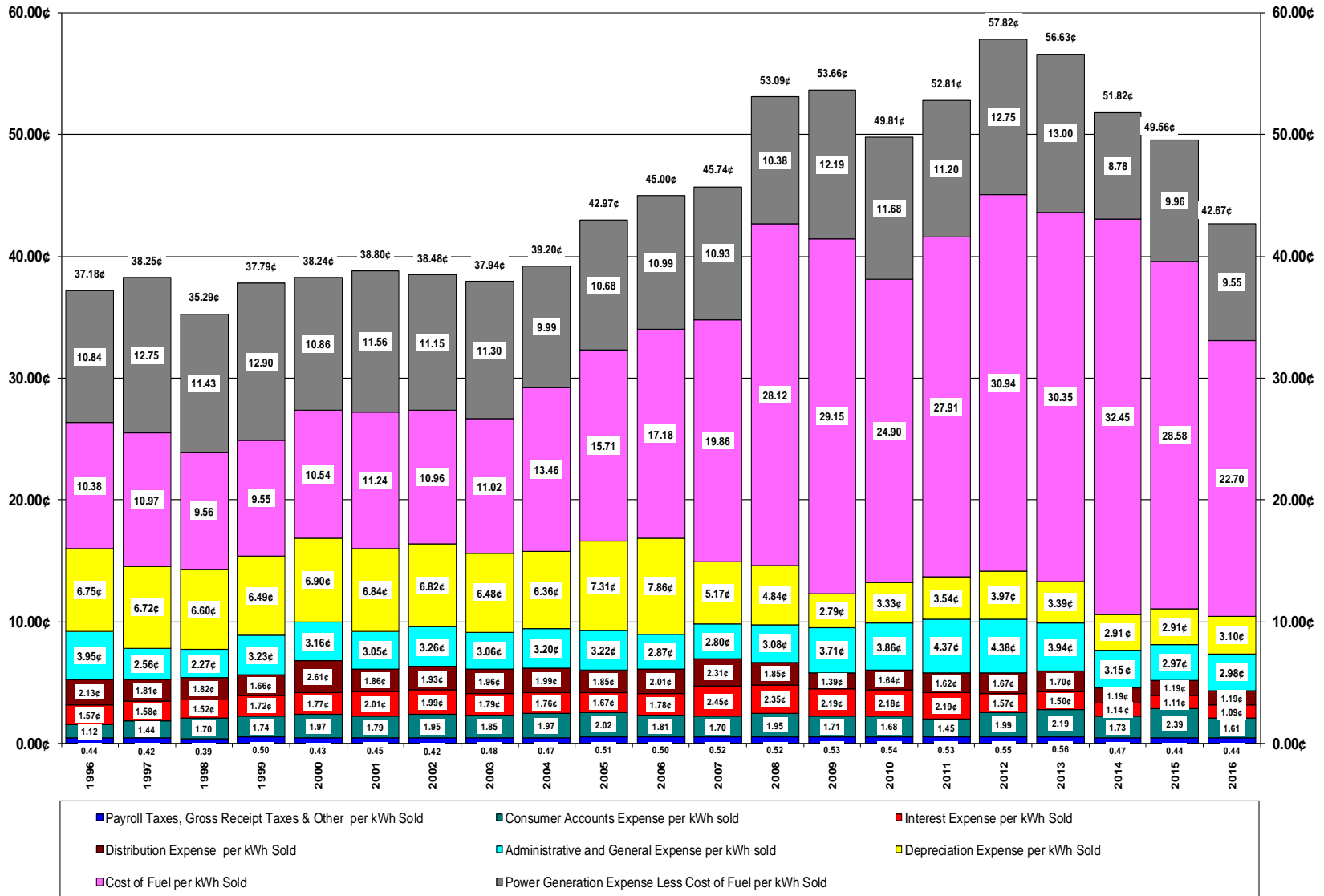
2 Solar PV projects in Kaltag and Noorvik

Two tug and barge sets



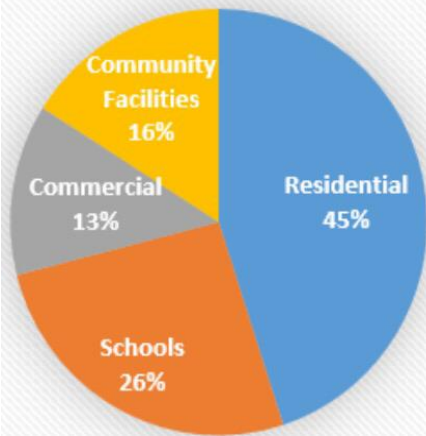


Alaska Village Electric Cost Components per Kilowatt-hour Sold

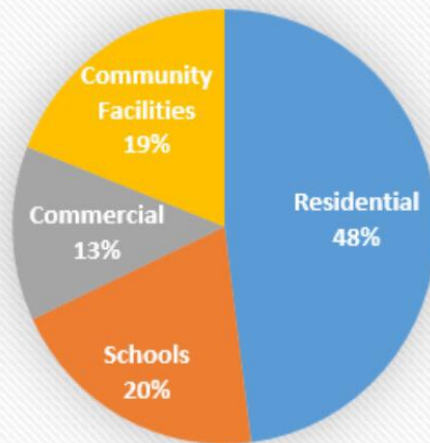


AVEC's Revenue Sources

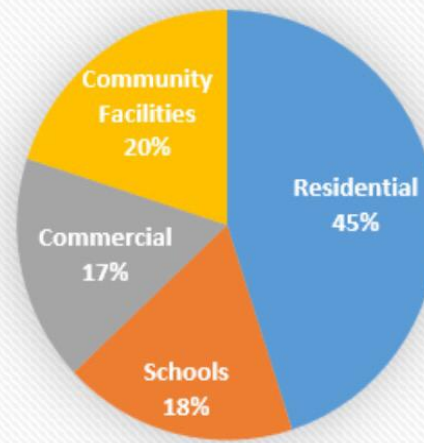
1988



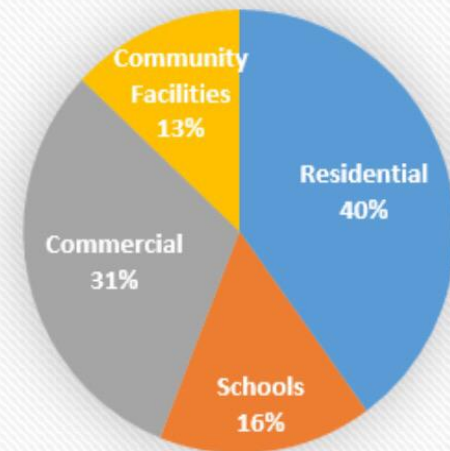
2000



2013



2016



Acquisition of Bethel Utility in
2014



Why is electricity so expensive in rural Alaska?

- Small population – AVEC's average village is ~400
- Small loads – AVEC's average village load is ~140 kW
- No economies of scale. Expensive power = less consumption
- Utilities are capital intensive. \$17,000 per meter in the village
- Remote and difficult to access. Shipping costs \$1.75/pound
- Fuel is expensive – delivery and storage often exceeds diesel cost
- Operations and maintenance is more expensive

AVEC strategies to reduce power cost

- Add cost-effective new communities
- Interconnect villages to improve economies of scale
- Improve generator efficiency whenever possible
- Add renewables where economically feasible
- Capture and sell recovered heat, excess wind energy

Add cost-effective new communities

Non-fuel costs rise as kWh sales/community shrink

- AVEC's village costs are ~25 cents/kWh
- AVEC's Bethel costs are ~8 cents
- Cordova Electric is ~19 cents
- Kotzebue Electric is ~21 cents
- Inside Passage is ~27 cents
- INNEC is ~40 cents

How does a community join AVEC?

Current utility owner petitions AVEC

Management assesses the prospect community

- What condition is the power plant in?
- Is generation and fuel storage adequate?
- What condition is the distribution system in?
- Is the school buying power from the utility?
- Are kWh sales adequate to cover incremental costs?

AVEC board considers and acts – acquisition must be in the existing membership's best interest

Interconnecting Villages

The Positives...

- Greater diesel efficiencies can be gained
- Shutting down a power plant saves \$150,000/year
- Renewables generally become more cost-effective

The Negatives...

- Intertied village loses recovered heat possibilities
- One part time job (out of two) is usually lost

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
- Interconnection enabled less wind to heat diversion
- However, gen-sets must often run inefficiently at low outputs in order to provide spinning reserve.



Toksook Bay

Improve generator/distribution efficiency

A top priority since inception!

Thirty years ago, AVEC sold 6.5 kWh per gallon of fuel

In 2016 we sold 13.5 kWh per gallon

Twenty years ago, fuel was 28% of total cost

In 2016, fuel was 53% of total cost

Adding renewables improves efficiency

Larger generators improve efficiency

Reducing line loss improves efficiency

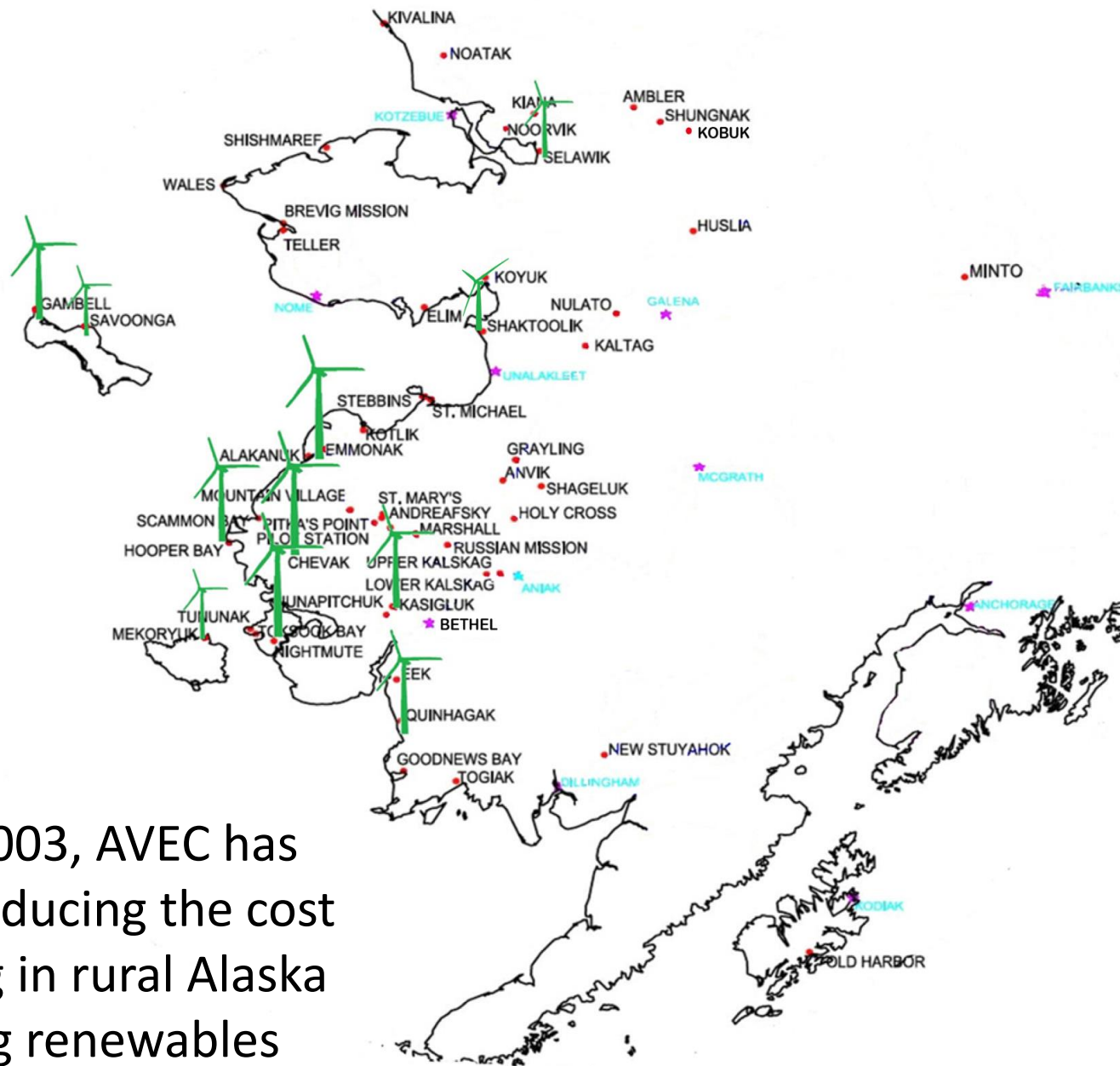
Add renewables where feasible

Most of AVEC's communities are on the west coast

Wind regimes range from 3 (ok) to 7 (terrific!)

AVEC has installed 34 wind turbines

- 11 locations, with another 4 intertied
- Displace up to 37% of diesel in a community
- 900 kW turbines planned for Bethel, St. Mary's
- Solar PV has not been as effective
- PV costs are coming down however...



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%

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



Kaltag 9.6kW Connex



YOU ARE 24 HOURS OF SUN!
Visit website for more information

Overview Realtime **Archive** Reports Service messages Administration

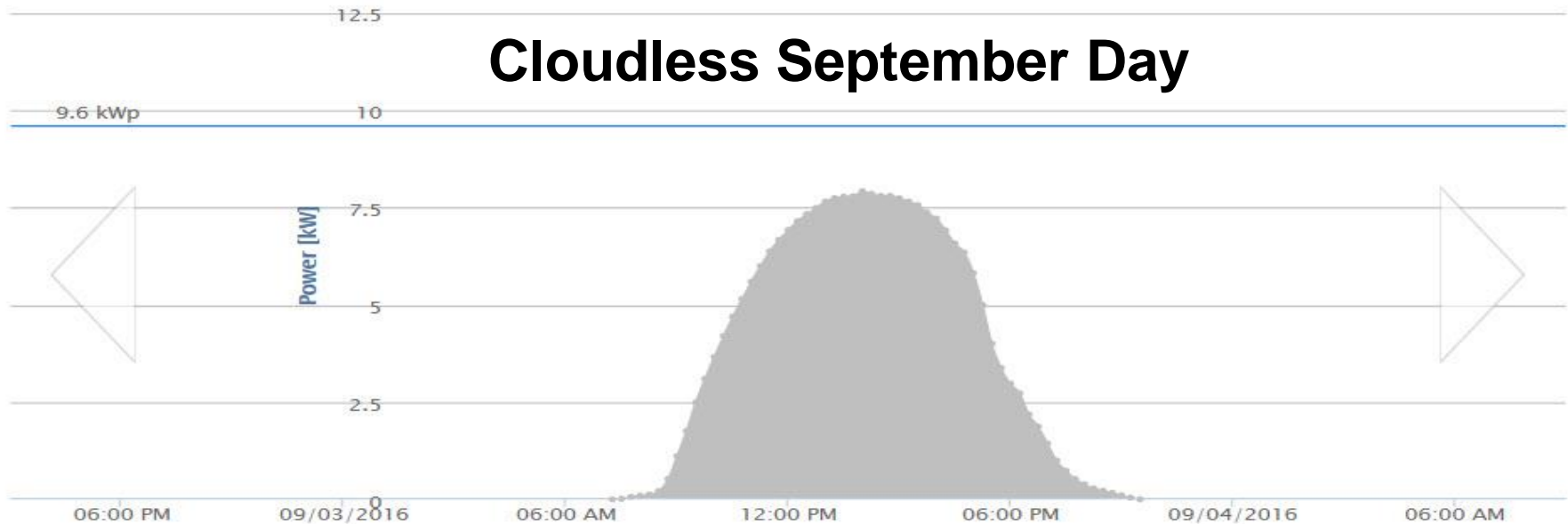
Select all Deselect all



58.09kWh
09/03/2016

IG Plus V 12.0-3 WYE (# 99)

Cloudless September Day



Day | 09/03/2016 | Month | Year | Total

P





Kaltag 9.6kW Connex



YOU ARE 24 HOURS OF SUN!
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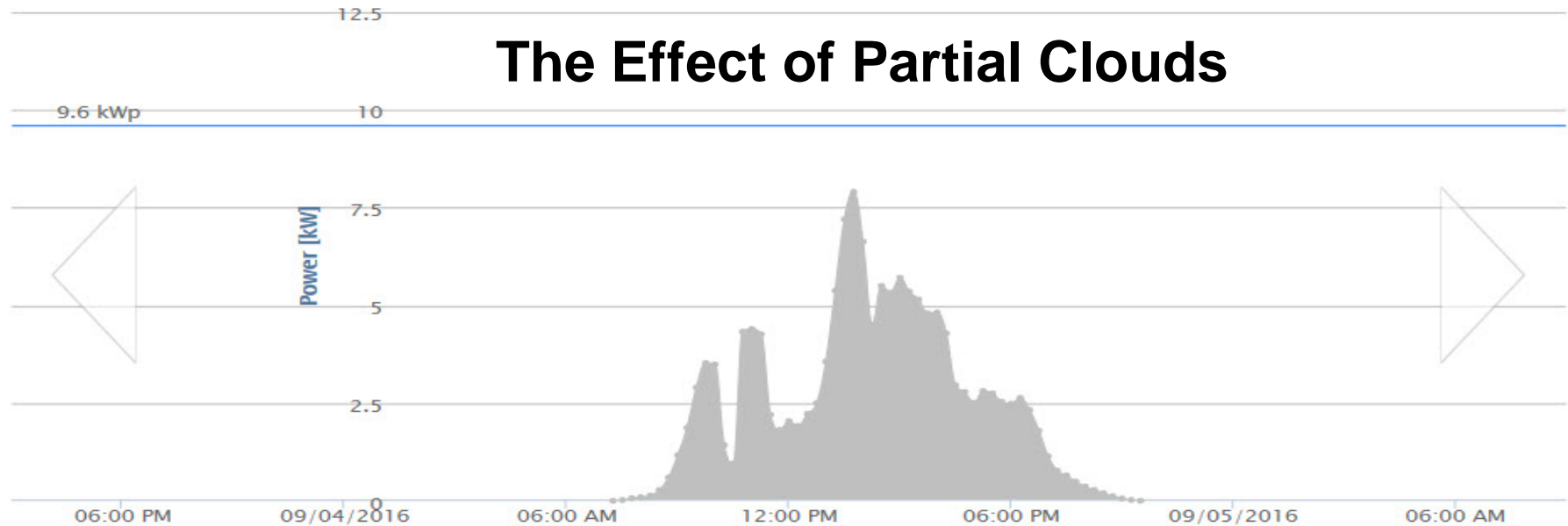
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36.81 kWh
09/04/2016

IG Plus V 12.0-3 WYE (# 99)

The Effect of Partial Clouds



Day **09/04/2016** Month Year Total

P



Sell recovered heat, wind energy

Typical diesel generator efficiency...

- 33% to electricity
- 33% to jacket water cooling system
- 33% up the exhaust

Heat is captured in most AVEC communities

Where practical, heat is sent to priority users

Current practice is to sell heat for 30-50% of fuel value

Selling heat and surplus wind allows AVEC to absorb increased costs without raising rates

What makes it all possible?

- Dedicated board and staff
- Commitment to improve efficiencies
- Members willing to tolerate higher outage rates
- 1.5 FTEs per community
- Fending off the carpetbaggers/snake oil salespeople
- P O W E R C O S T E Q U A L I Z A T I O N !!!
- Persistence

Thank You!



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