

Kobuk

Laugviik

Native Village of Kobuk:
907-948-2203
City of Kobuk:
907-948-2217
Kobuk Valley Electric Company:
907-948-2251

Demographics –

Native Village Status: Federally Recognized Tribal Council

Alaska Native Name: Laugviik

Population: 144

Avg. Household Size: 5.4

Median Household Income: \$52,500

Access –

Barge Access: Seasonal / None (depending on river water levels)

Runway Ownership: State

Runway Surface: Gravel

Runway 1: 4,020 ft x 75 ft

Runway 2: 4,780 ft x 75 ft

Climate –

Average Summer Temperature: 54 °F

Average Winter Temperature: 7 °F

Heating Degree Days: 15,780

Heat & Power Costs (2021) –

Cost of Diesel Fuel: \$9.27 per gal

Cost of Gasoline: \$9.27 per gal

Cost of Electricity: \$0.67 per kWh

Cost of Electricity, after PCE: \$0.25 per kWh

Tank Farm -

Ownership: City of Kobuk, Northwest Arctic Borough School District (NWABSD)

Bulk Fuel Capacity:

Owner	Fuel	Capacity (gal)
City of Kobuk	Gasoline	4,000
City of Kobuk	Diesel	12,900
NWABSD	Diesel	27,200

Condition: Acceptable

Electric Utility –

Alaska Village Electric Cooperative (based in Shungnak, with electrical intertie to Shungnak)

Power Demand (2020) –

**Values are approximate, based on Kobuk portion of Shungnak total power generated*

Average Summer Load: 69 kW

Average Winter Load: 105 kW

Peak Summer Load: 76 kW

Peak Winter Load: 114 kW

Total Power Purchased – Shungnak: 650,370 kWh

Power System (2020) –

Fuel Efficiency – Shungnak: 13.49 kWh/gal

Line Loss – Shungnak: 4.2%

Number of Community Buildings on PCE: 4

Community PCE kWh Use of Total Allowed: 83% (100,873 kWh - used / 120,960 kWh - total allowed)

Power Generation Infrastructure –

Diesel Engines:

Manufacturer	Model	Capacity	Use
Caterpillar	C9	171 kW	Back-Up

Wind Turbine(s): None

Solar PV:

Installer	Inverter	Capacity	Year Built
Alaska Native Renewable Industries	Solar Edge	223.6 kW bifacial	2021

** Installation located in Shungnak, 37.26 kW owned by Kobuk, distributed via electrical intertie with Shungnak (Additional 7.38 kW installed for water plant, behind the meter)*

Battery Storage System: None; all battery storage is in Shungnak.

Heat Recovery –

Facilities Served: N/A

Opportunity to Expand Waste Heat: N/A

Water & Wastewater –

Ownership: City of Kobuk

Water System: Circulating Loop(s)

Wastewater System: Gravity

Selected Projects –

Maintenance or Replacement of Residential Heating Appliances – *Expected 2022*

- Provided opportunity for every household to repair or replace heating appliances
 - \$10,000 per household; 37 households
 - Hired Northwest Inupiat Housing Authority to perform maintenance services
- \$370,000 of CARES Act funding in 2021

Solar PV/Battery Storage Microgrid – *Completed 2021*

- Installed 223.5 kW Solar PV; 37.26 owned by Kobuk
- Installed 384 kWh Battery Storage System; all Shungnak-owned
- Estimated to displace 9,800+ gallons of diesel per year
- Developed Independent Power Producer agreement with AVEC
- USDA High Energy Cost Grant, Village Improvement Fund
 - \$1.3M awarded from USDA in 2020
 - \$489,000 awarded from VIF in 2020



LED Streetlight Retrofit Borough-Wide – *Completed 2015*

- Installed 13 LED streetlights in Kobuk
- 25-year community savings: ~\$1.4M & ~550,000 gal diesel
- State of Alaska, Grants to Municipalities
 - \$200,000 awarded to Northwest Arctic Borough in 2014



Bulk Fuel Storage Assessment – *Completed 2015*

- 2 tanks evaluated; Condition of tanks is acceptable
- Alaska Energy Authority (AEA)



Water Treatment Plant Biomass – *Completed 2014*

- Installed GARN-1000WHS cordwood biomass boiler
- Displace ~4,400 gallons of diesel fuel annually
- Annual savings of \$24,000
- AK Energy Authority Renewable Energy Fund, Round 5
 - \$350,000 awarded in 2013



Water Plant Solar PV – *Completed 2013*

- 7.38 kW solar PV installed
- Average 13.8 kWh/day; still operational
- Coastal Impact Assistance Program (CIAP)
 - \$57,576 awarded in 2009



Intertie: Shungnak & Kobuk – *Completed 1994*

- Electrically connect Shungnak and Kobuk
- Constructed 10 mi. of distribution line
 - Also supports telecommunication cables
- Substantial maintenance required in near future
- Owner: Alaska Energy Authority; Now for sale



Future Projects –

Residential Heat Pumps

- Install residential heat pumps
 - Reduce cost of residential heating
 - Increase resiliency of residential heating systems
 - Enhance comfort through improved heating and cooling
- Secure funding to install a heat pump in every home in the community
 - Submit funding request to Village Improvement Fund

Solar PV

- Conduct options analysis for installation of additional solar PV to reduce the cost of operating heat pumps
 - Evaluate distributed residential solar versus community solar PV array
 - Determine size of solar PV array
 - Utilize location next to AVEC shed identified for Shungnak-Kobuk solar PV project
 - Identify gravel source
- Quantify siting benefits of locating solar PV in Kobuk
 - Reduced line loss
 - Increased resiliency of power system
- Secure funding for options analysis

Harvest Management Plan Update

- Update wood harvest management plan for biomass boiler
 - Engage all stakeholders
 - Develop long-term solution
 - Balance needs of residents and community biomass installation

Community-Wide Residential LED Lighting Upgrade

- Upgrade all residential lighting fixtures to energy efficient LED lighting
 - Survey type and quantity of lighting fixtures in all homes
 - Apply for Village Improvement Fund support
 - Procure and install energy efficient lighting
 - Reduce residential electricity costs

Tie-Line Maintenance

- Shungnak-Kobuk tie-line is in need of substantial maintenance in near future
 - State of Alaska put tie-line up for sale
 - Engage in discussions regarding future surcharges on Kobuk power
 - Identify long-term solution to maintain tie-line and minimize cost of electricity
 - Displace additional diesel fuel and increase hours of diesels-off

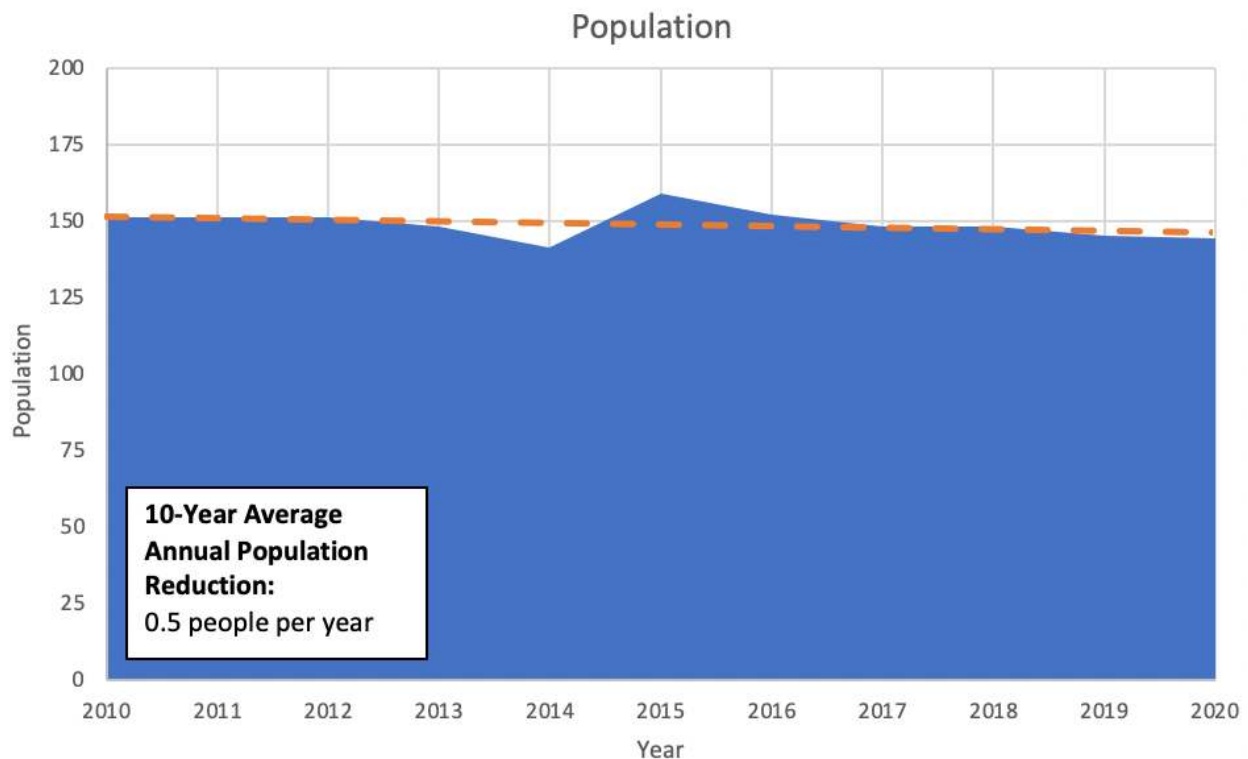
Milestones –

- Developed first Independent Power Producer agreement with AVEC – *Completed 2021*
- Installed first utility-scale solar PV serving Kobuk – *Completed 2021*
- Installed first solar PV in Kobuk – *Completed 2013*

Community Goals –

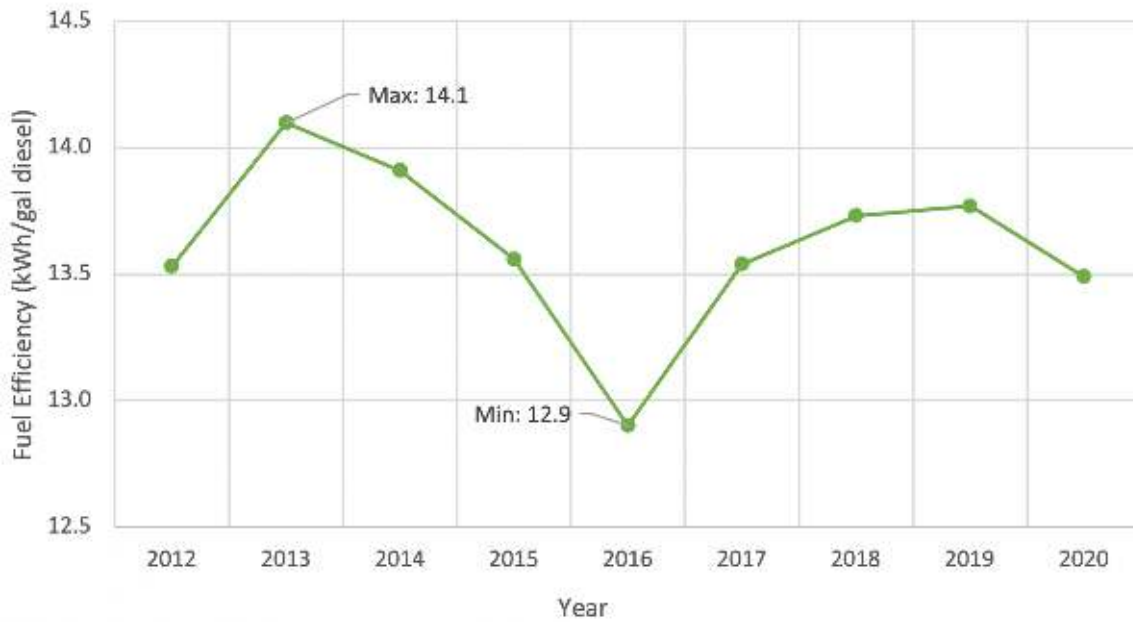
- Reduce cost of residential space and water heating
 - Install heat pumps in all homes
 - Expand renewable energy microgrid
 - Implement energy efficiency measures
 - Maintain and/or replace aging residential heating appliances
- Enhance resiliency of residential heating by diversifying heating appliances and fuel types
- Update harvest management plan for the community biomass boiler
 - Develop long-term plan
 - Engage all stakeholders
- Enhance the resiliency of the back-up power system
 - Increase bulk fuel capacity for power plant
 - Develop additional renewable energy generation sources
- Explore regional opportunities for fuel cooperative with Ambler and Shungnak
 - Optimize fuel storage to reduce need for flown-in fuel
 - Consider cost savings if diesel use is reduced below margin where flown-in fuel is required
- Partner with Northwest Inupiat Housing Authority to implement policy changes to prioritize and invest in energy efficiency in newly constructed homes

Energy System Trends –



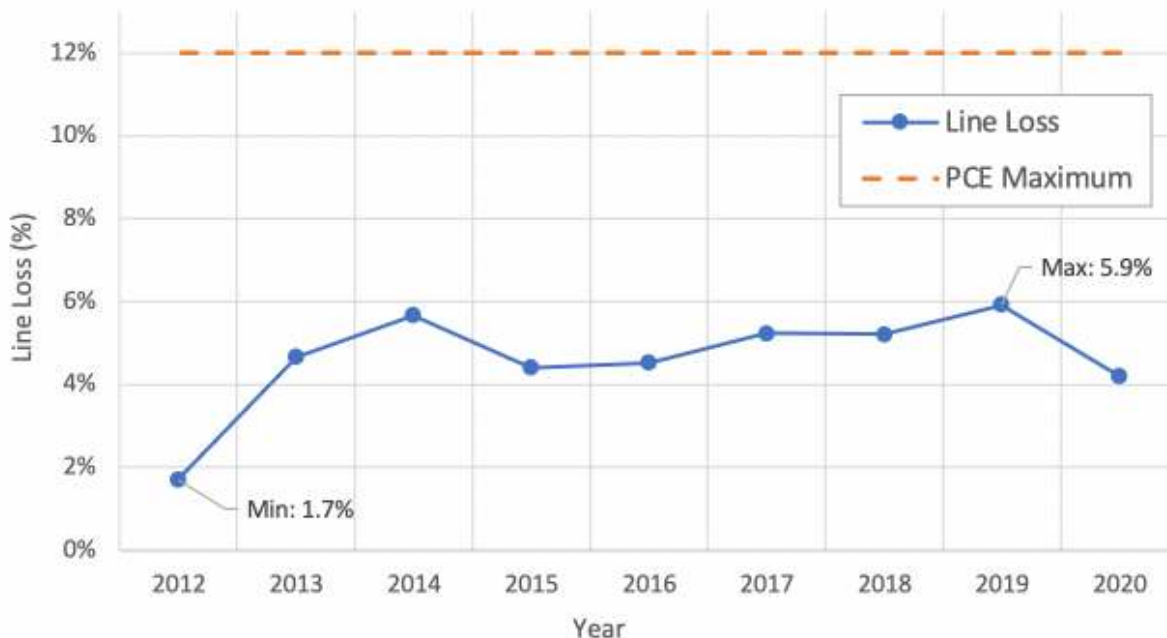
Dramatic changes in population impact the long-term community planning necessary to meet future power demand. The population in Kobuk is nearly unchanged since 2010.

Fuel Efficiency



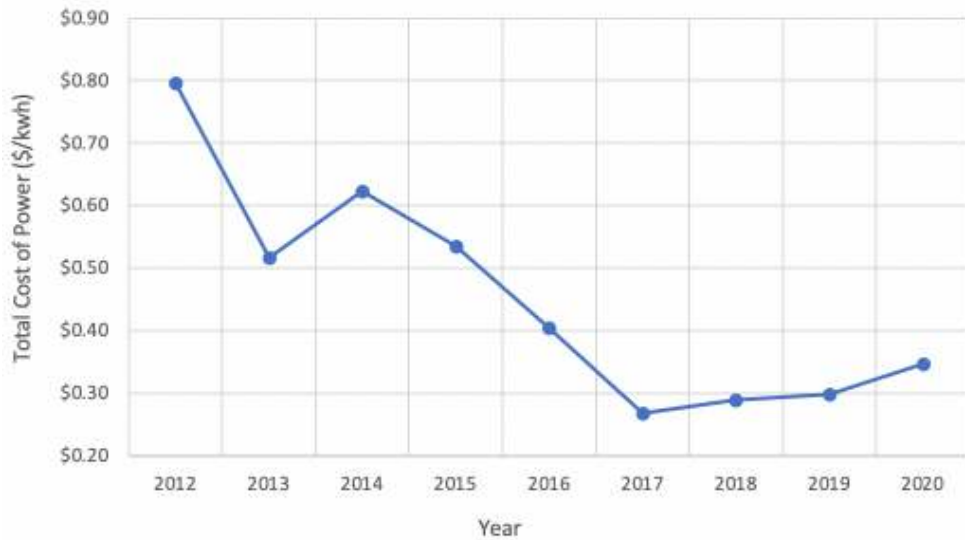
A higher fuel efficiency results in less diesel fuel use and a lower cost to generate power. A fuel efficiency below 12 kWh/gal is poor; a fuel efficiency above 14 kWh/gal is excellent. The data for Kobuk reflects the utility operations in Shungnak. Kobuk is intertied to Shungnak and does not generate power except in the case of unplanned blackouts in Shungnak. The fuel efficiency in Shungnak is typically very good. In 2016 the fuel efficiency dipped below 13 kWh/gal, which was unusually low for Shungnak.

Line Loss



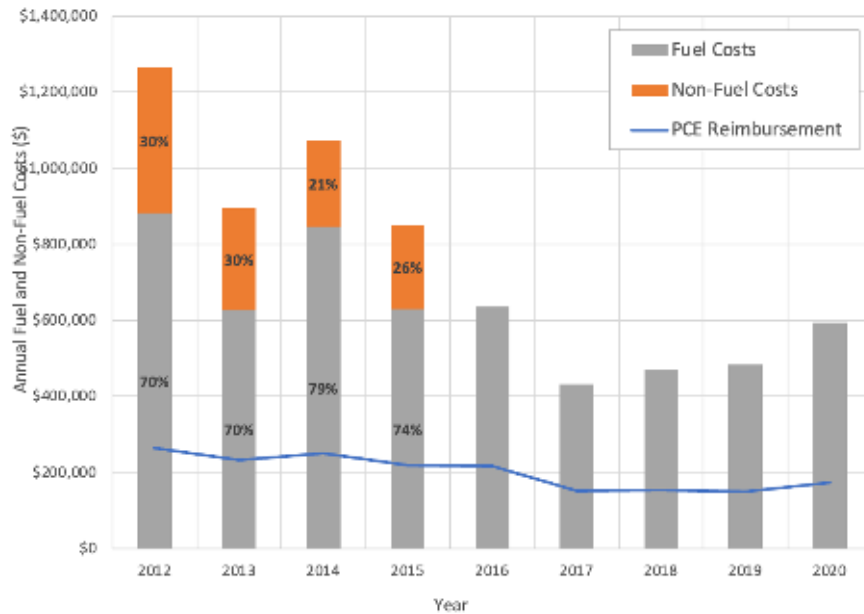
The maximum allowable line loss to maintain eligibility for PCE benefits is 12%. The data for Kobuk reflects the utility operations in Shungnak. Kobuk is intertied to Shungnak and does not generate power except in the case of unplanned blackouts in Shungnak. In Shungnak the line loss is very low and has been very low for the past nine years, indicating the distribution system is in good condition and all power use is accounted for. Kobuk benefits directly from this low line loss.

Utility Cost to Generate Power



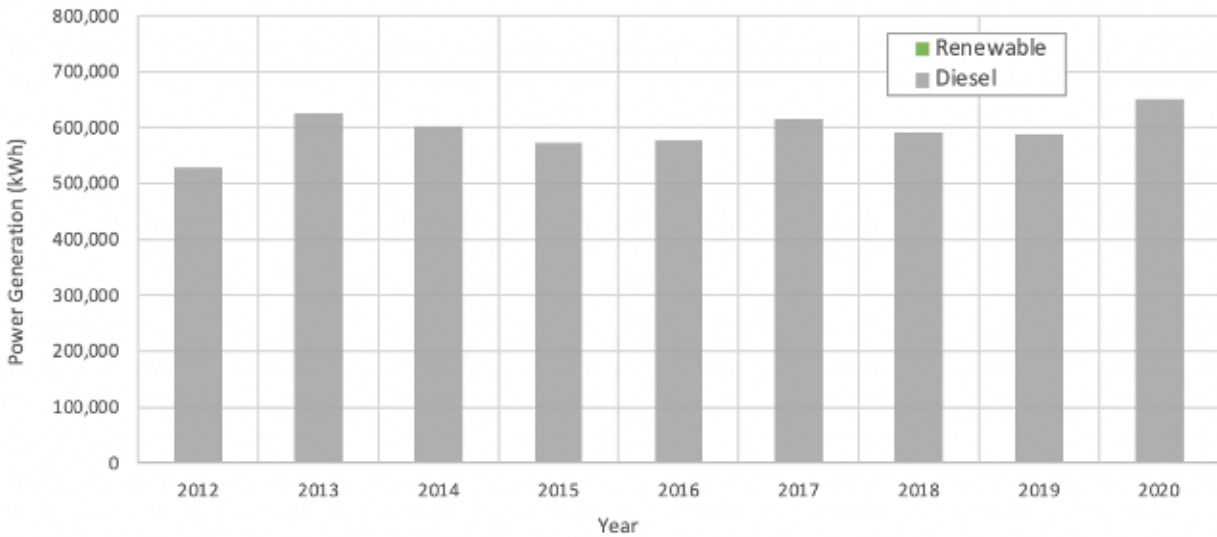
Over the long-term, a lower utility cost to generate power typically correlates with a lower cost of electricity for residents. The major factors that affect the cost to generate power are the cost of fuel, generator fuel efficiency, maintenance, and operations. Major system breakdowns may cause the cost to generate power to spike on a particular year, as will high fuel prices. Kobuk is intertied to Shungnak and does not generate power except in the case of unplanned blackouts in Shungnak. In Shungnak the cost to generate power has decreased substantially since 2012. The low costs to generate power from 2016 to 2020 are misleading as they do not include the cost of fuel, whereas the previous years do, as shown below.

Contribution of Fuel and Non-Fuel Costs to Cost of Electricity



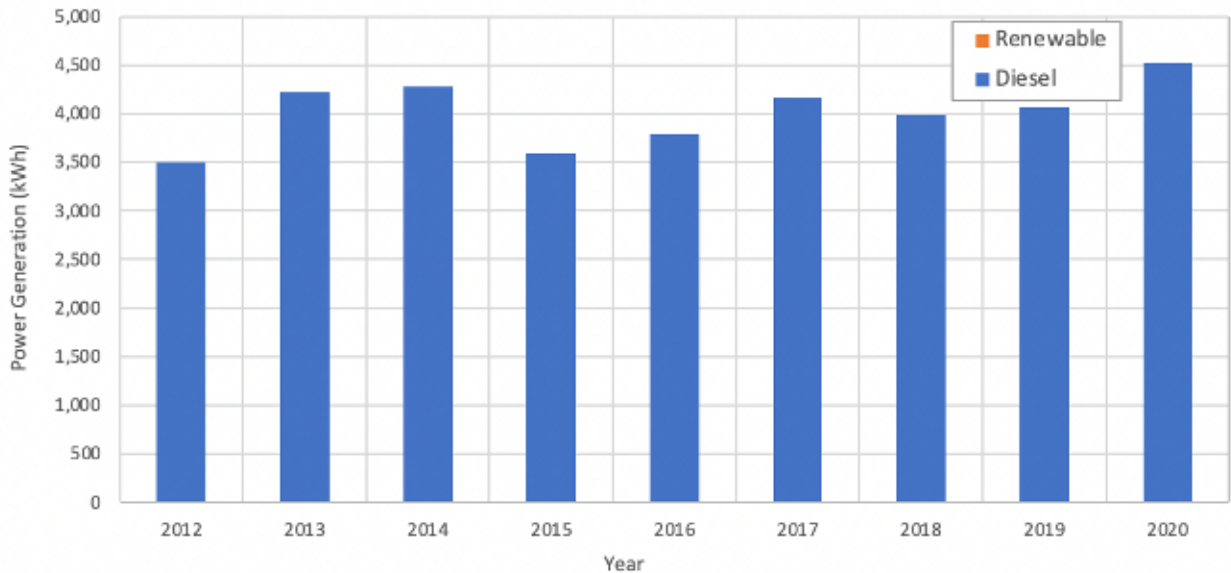
For many utilities, the non-fuel costs associated with generating power do not change dramatically each year. Fuel costs, on the other hand, are highly susceptible to annual fluctuations based on the global price of fuel, transportation costs, and the amount of power generated. PCE reimbursement is meant to offset the high fuel costs in rural Alaska. As the overall efficiency of the system increases, the PCE reimbursement offsets a larger portion of the total fuel costs. Kobuk is intertied to Shungnak and does not generate power except in the case of unplanned blackouts in Shungnak. In Shungnak, no non-fuel costs were reported starting in 2016. This is because in 2016 AVEC started reporting fuel costs for all communities in a summarized report rather than individually for PCE reporting. In prior years, the reported portion of the costs spent on fuel is relatively low relative to other communities in the region.

Annual Power Purchased - Diesel & Renewable

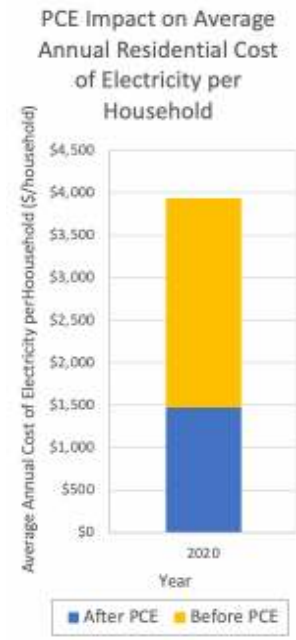
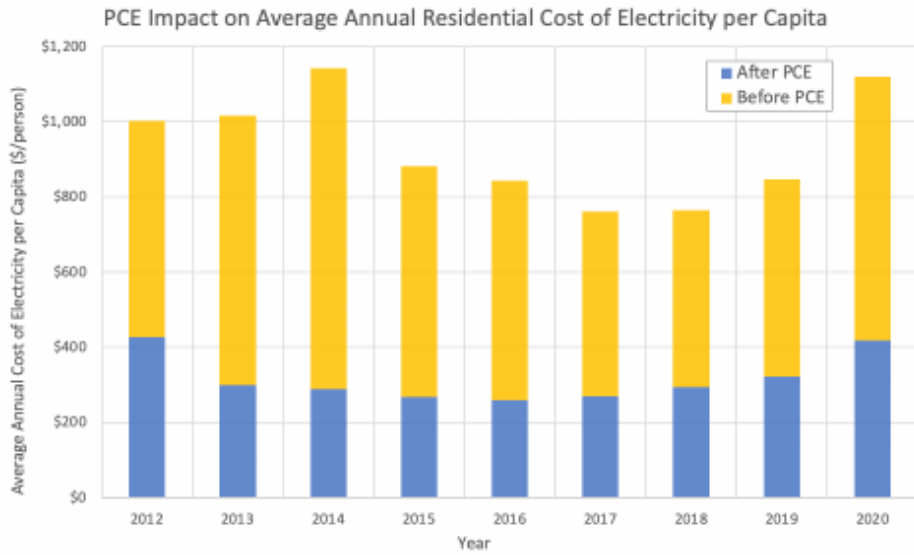


Renewable sources of power generation reduce diesel fuel use and can increase resiliency, in addition to offering many other benefits. The portion of power that is generated by renewable energy sources depends both on the capacity of the installed infrastructure as well as the performance of that infrastructure. In this way, the renewable energy generated may vary annually depending on the availability of the resource and availability of the equipment. There was no renewable power generation at the utility scale in Shungnak prior to 2021. All of the power was generated by diesel generators. The total power generated has fluctuated minimally year-to-year since 2012. This graph is expected to change significantly with the new solar PV and battery storage system installed in Shungnak and connected to Kobuk.

Annual Power Purchased per Capita - Diesel & Renewable



In general, people choose to power more electric devices each year, so the power generation per capita is expected to increase over time. When power generation per capita instead decreases over time, it is often correlated with reductions in power consumption as a result of energy efficiency upgrades. Power generation is also affected by the weather and corresponding heating needs each year. Kobuk is intertied to Shungnak and does not generate power except in the case of unplanned blackouts in Shungnak. Power generation per capita in Kobuk/Shungnak has varied very little throughout the last nine years.



The PCE reimbursement reduces the residential cost of electricity by a different amount each year. In communities where the main factor that affects the cost of power is the price of fuel, the PCE reimbursement will tend to levelize the residential cost of electricity from one year to the next. Kobuk is intertied to Shungnak and does not generate power except in the case of unplanned blackouts in Shungnak. This price stability is the case in Shungnak and Kobuk, where the residential cost of electricity per capita after PCE has remained steady for the last nine years between \$250 and \$400 per year.