Noorvik

Nuurvik

Native Village of Noorvik:
907-636-2144
City of Noorvik:
907-636-2100
AVEC:
907-561-1818

Demographics –
Native Village Status: Federally Recognized Tribal Council
Alaska Native Name: Nuurvik
Population: 629
Avg. Household Size: 4.6
Median Household Income: $48,750

Access –
Barge Access: Seasonal
Runway Ownership: State
Runway Surface: Gravel
Runway 1: 4,000 ft x 100 ft
Runway 2: None

Climate –
Average Summer Temperature: 60 °F
Average Winter Temperature: 32 °F
Heating Degree Days: 15,812

Heat & Power Costs (2021) –
Cost of Diesel Fuel: $5.42 per gal
Cost of Gasoline: $5.00 per gal
Cost of Electricity: $0.57 per kWh
Cost of Electricity, after PCE: $0.24 per kWh

Tank Farm -
Ownership: AVEC, Northwest Arctic Borough School District (NWABSD), City of Noorvik, Native Store
Total Capacity: 461,000

Owner	Fuel	Capacity (gal)
AVEC	Diesel	145,700
NWABSD	Diesel	-
City of Noorvik	-	-
Native Store	-	-
Approximate Total	**-**	**461,000**

Ownership: Deteriorating

Electric Utility –
Alaska Village Electric Cooperative (AVEC)

Power Demand (2020) –
Average Summer Load: 201 kW
Average Winter Load: 284 kW
Peak Summer Load: 212 kW
Peak Winter Load: 329 kW
Total Power Generated: 2,005,153 kWh

Power System (2020) –
Fuel Efficiency: 13.87 kWh/gal diesel
Line Loss: 3.8%
Number of Community Buildings on PCE:
Community PCE kWh Use of Total Allowed: 61% (324,743 kWh / 528,360 kWh)

Power Generation Infrastructure –
Diesel Engines:

Manufacturer	Model	Capacity
Detroit Diesel	S60K4c	363 kW
Cummins	K19G4	499 kW
MTU	12V2000	710 kW

Wind Turbine(s): None

Solar PV:

Installer	Microinverters	Capacity	Year Built
Northwest Arctic Borough	AP Systems YC1000-3	28.8 kW	2016

(Additional 22.7 kW installed for water plant, behind the meter)

Battery Storage System: None

Heat Recovery –
Facilities Served: Water Treatment Plant, City offices
Opportunity to Expand Waste Heat: No

Water & Wastewater –
Ownership: City of Noorvik
Water System: Pressure, Circulating Loop(s)
Wastewater System: Vacuum

Selected Projects –

Heat Recovery System Expansion for Water Treatment Plant – *Completed 2017*

- Remote Alaska Community Energy Efficiency DOE Program
  - Community pledged to reduce energy use 15% by 2020
  - Supported in developing energy efficiency and renewable energy technologies
- Expand heat recovery system
- Implement energy efficiency upgrades
  - Water treatment plant
  - Additional community buildings
- Remote Alaska Community Energy Efficiency DOE Funding

Solar PV Array and Inverter – *Completed 2016*

- Install 28.8 kW solar PV and inverter
- Average 26.3 kWh/day
- Displaces 1,700+ gallons of diesel fuel annually
- Coastal Impact Assessment Program (CIAP)
  - Funding awarded 2009
  - $199,993 awarded

Options Analysis: Intertie & Wind – *Completed 2016*

- Intertie Noorvik and Kiana, Quarry Road
  - Lower capital costs per kilowatt-hour
  - Increase diesel generator efficiency during off-peak hours
  - Increase economies of scale for renewable projects
- Install wind turbines near Noorvik or Kiana
  - Determine location of superior wind resource

LED Streetlight Retrofit Borough-Wide – *Completed 2015*

- Installed 35 LED streetlights in Noorvik
- 25-year community savings: ~$3.8M & ~1.5M gal diesel
- State of Alaska, Grants to Municipalities
  - Funding awarded 2014
  - $200,000 awarded to Northwest Arctic Borough

Water Plant Solar PV – *Completed 2013*

- 12 kW solar PV installed
- Average 22.7 kWh/day; still operational
- Coastal Impact Assistance Program (CIAP)
  - Funding awarded 2009
  - $93,620 awarded

Future Projects –

Solar PV and Battery Storage

- Conduct feasibility study to ensure project viability
    - HOMER modeling and feasibility study completed, 2020
- Design and permit solar PV, battery storage, and switchgear upgrade
    - Application submitted for Alaska Energy Authority Renewable Energy Fund 14
- Upgrade power plant switchgear
    - Essential for successful integration of additional renewable energy
    - AVEC-estimated cost is more than $1 million for switchgear upgrade
        - Partner with AVEC
- Construct solar PV and battery storage; establish Independent Power Producer
    - Identify funding

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

Wind Turbine & Intertie Feasibility Study

- Update wind-intertie feasibility study for connection with Kiana
    - Identify specific impacts, benefits, challenges on utility if intertied
- Design and construct wind turbine
    - Verify Quarry Road site near Noorvik is best option

Energy Scholarship

- Develop scholarship program to enhance local involvement & interest in local energy systems
    - Train scholarship recipients to be experts in local energy systems
    - Target local youth

Milestones –

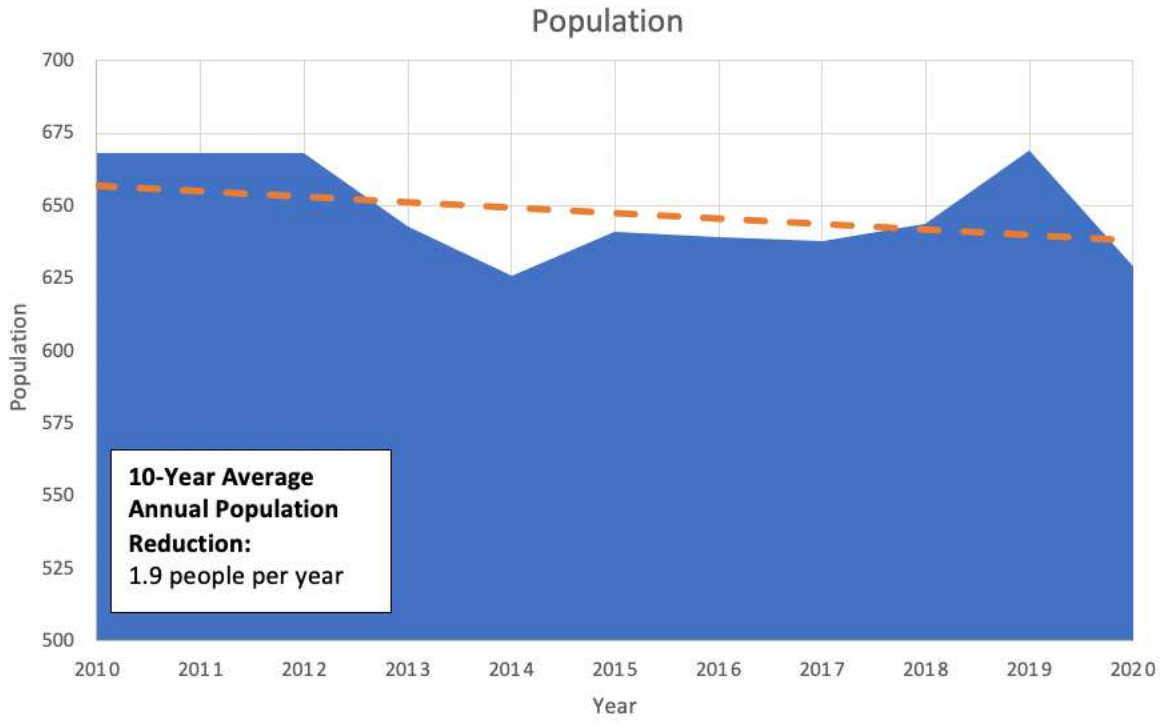
- Installed first utility-scale solar PV in Noorvik – *Completed 2016*
- Installed first solar PV in Noorvik – *Completed 2013*

Community Goals –

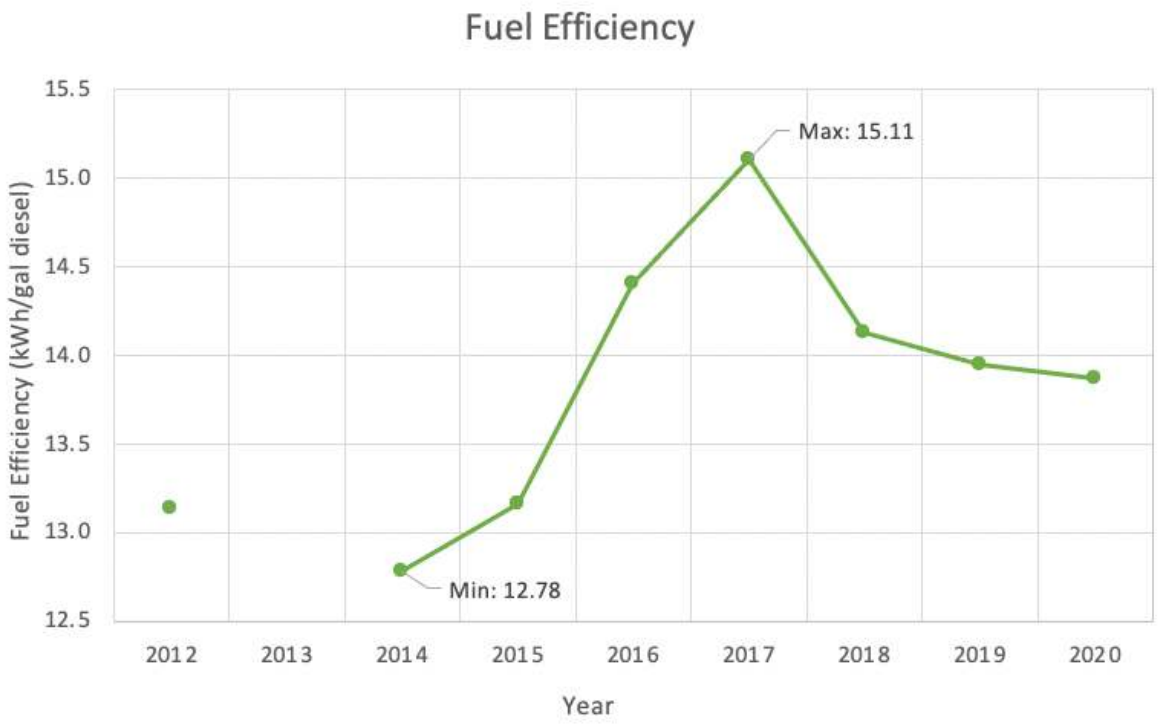
- Reduce cost of residential space and water heating
    - Expand renewable energy microgrid
    - Implement energy efficiency measures
    - Maintain and/or replace aging residential heating appliances
- Enhance resiliency of residential heating by diversifying heating appliances and fuel types
- Develop renewable energy microgrid
    - Solar PV and battery storage
    - Wind turbine(s) and battery storage

    - Develop Independent Power Producer agreement to sell power to AVEC
- Create additional training opportunities for operators to enhance skills and understanding of microgrid
- Engage youth in community energy system
- Partner with Northwest Inupiat Housing Authority to implement policy changes to prioritize and invest in energy efficiency in newly constructed homes

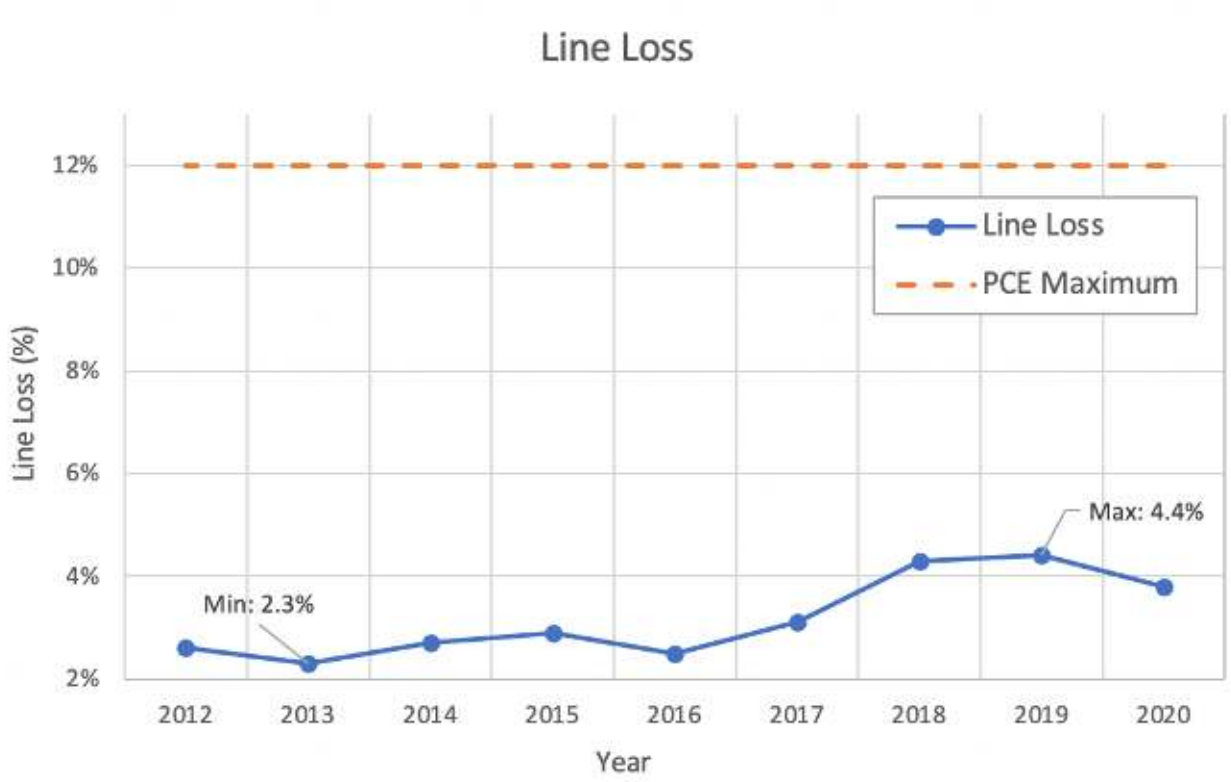
Energy System Trends –



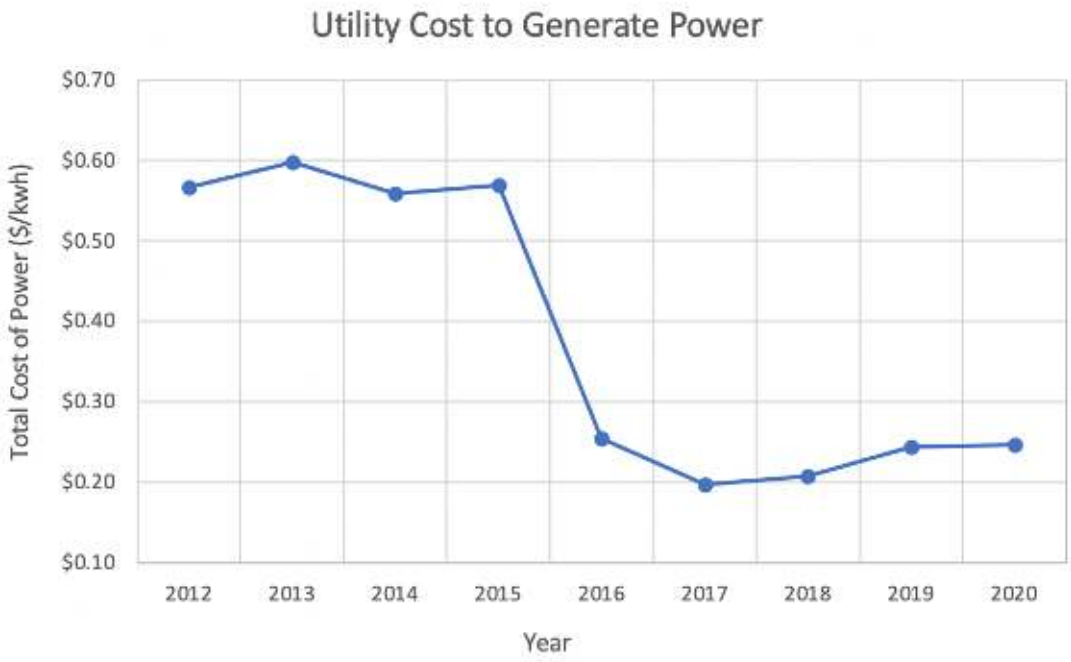
Dramatic changes in population impact the long-term community planning necessary to meet future power demand. The population in Noorvik has experienced small periods of growth and decline, but over the last ten years the population has only decreased an average of 0.2% each year.



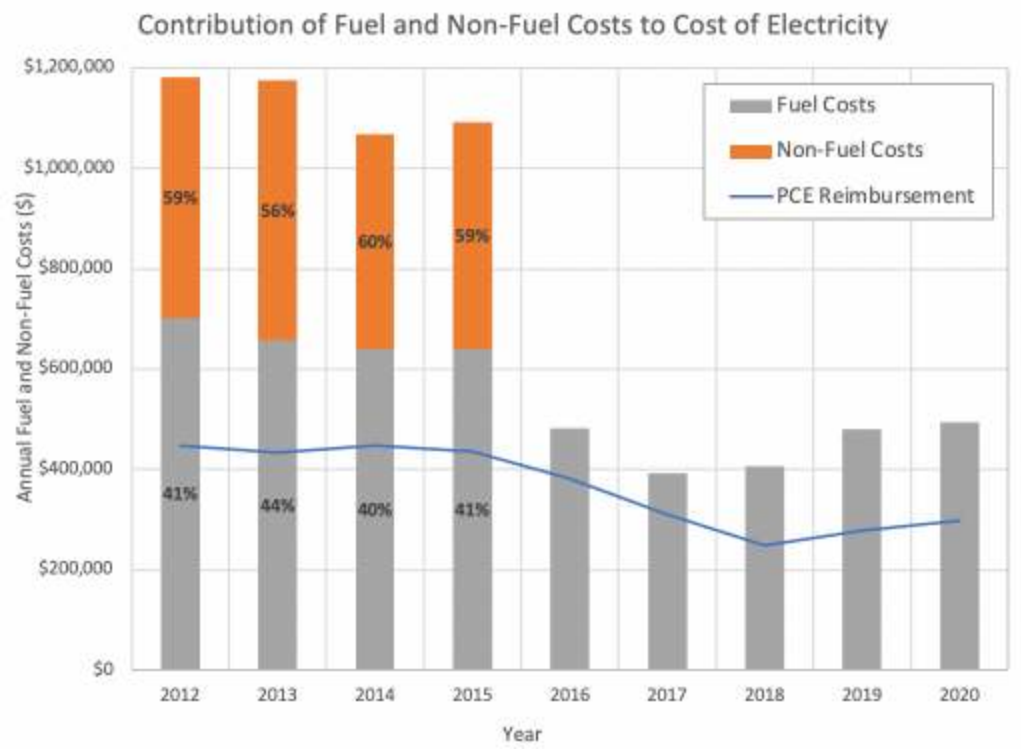
A higher fuel efficiency results in less diesel fuel use and a lower cost to generate power. A fuel efficiency below 12 kWh/gal is poor; a fuel efficiency above 14 kWh/gal is excellent. The fuel efficiency in Noorvik made a distinct improvement in 2016. Although the fuel efficiency has been very good over the last nine years, it has been excellent since 2016, with values near or in excess of 14 kWh per gallon of diesel. In 2017 the fuel efficiency was 15.11 kWh/gal. This is an uncommonly high fuel efficiency value and it should be verified for accuracy.



The maximum allowable line loss to maintain eligibility for PCE benefits is 12%. In Noorvik, 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.

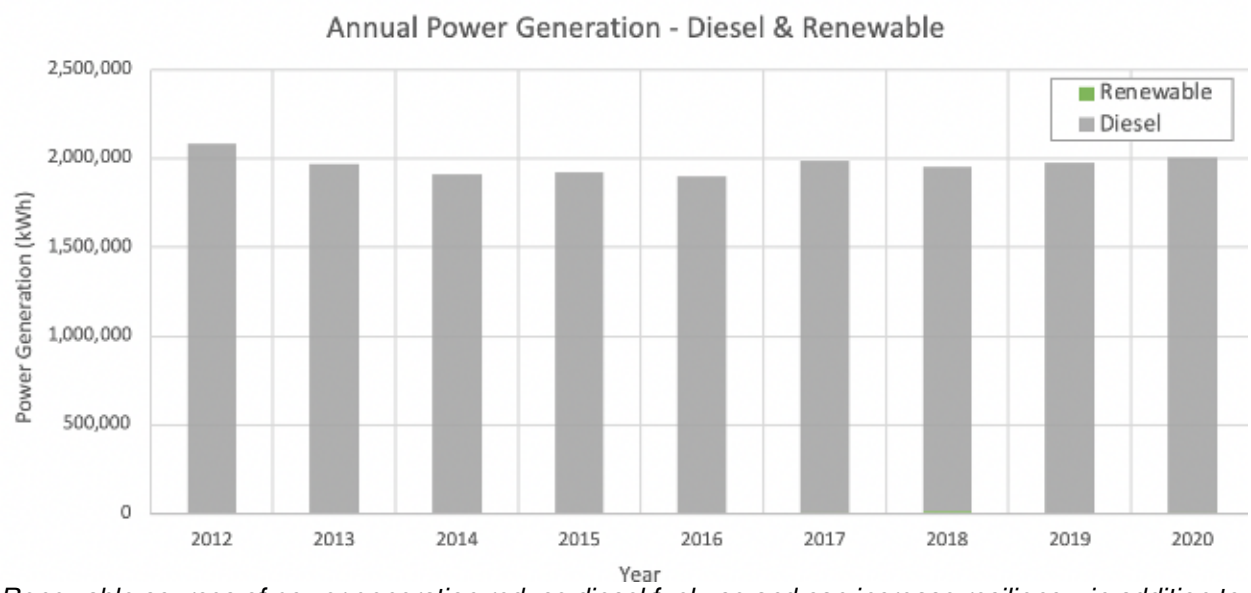


Over the long-term, a lower utility cost to generate power typically correlates with a lower cost of electricity for residents. The major factors that affect the cost to generate power are the cost of fuel, generator fuel efficiency, maintenance, and operations. Major system breakdowns may cause the cost to generate power to spike on a particular year, as will high fuel prices. In Noorvik the cost to generate power was consistent from 2012 to 2015. 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.

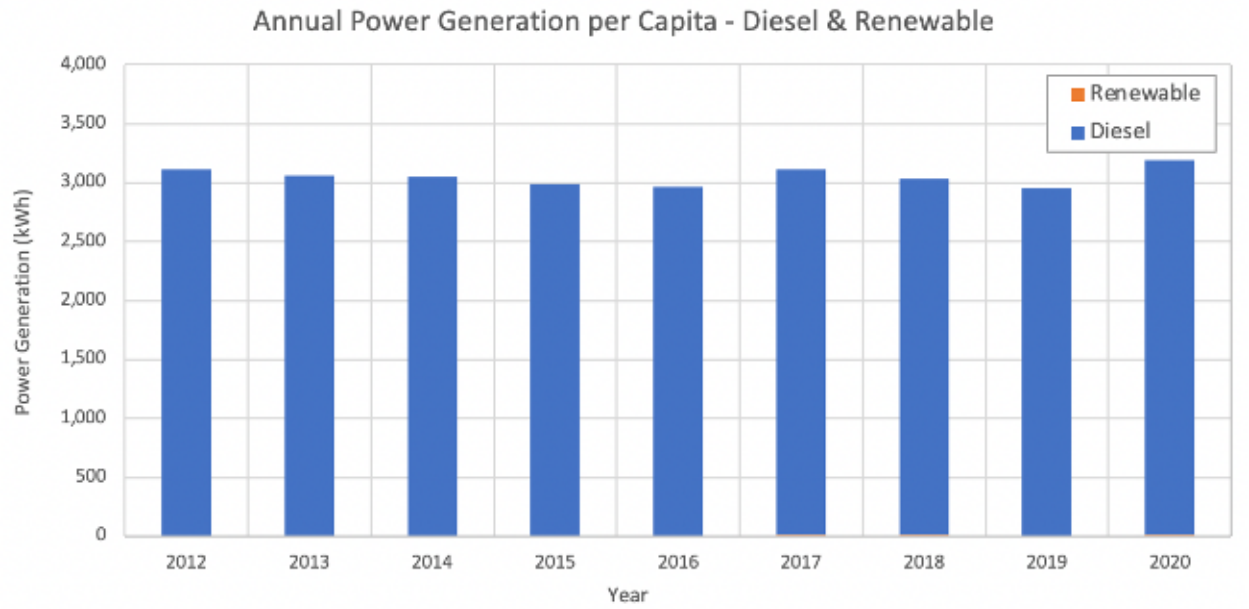


For many utilities, the non-fuel costs associated with generating power do not change dramatically each year. Fuel costs, on the other hand, are highly susceptible to annual fluctuations based on the global price of fuel, transportation costs, and the amount of power generated. PCE reimbursement is meant 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. In Noorvik, no non-fuel costs were reported

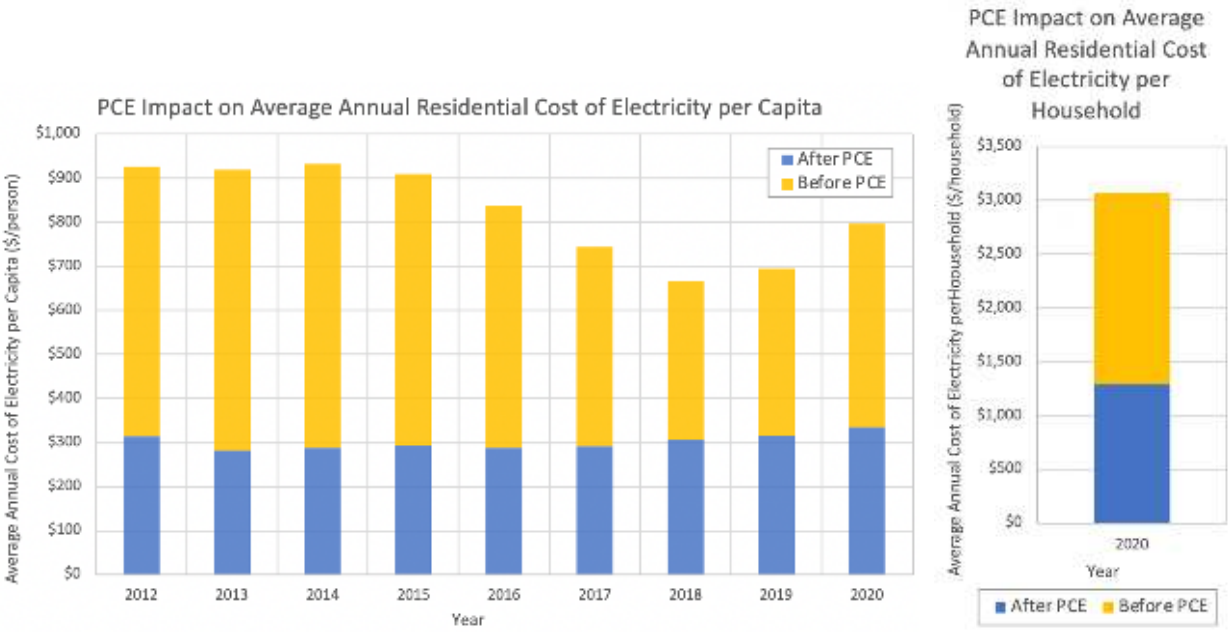
starting in 2016. This is because in 2016 AVEC started reporting fuel costs for all communities in a summarized report rather than individually for PCE reporting.



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 is minimal renewable power generation at the utility scale in Noorvik. There is a very small solar PV installation, 23 kW, that is not accounted for in this chart. The total power generated has fluctuated minimally year-to-year since 2012.



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. Power generation per capita in Noorvik has been nearly unchanged since 2012, excluding a noticeable increase in 2020 that may have been the result of people's changed behavior caused by the Covid-19 pandemic.



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. This is the case in Noorvik, where the residential cost of electricity per capita after PCE has remained steady for the last nine years, around $300 per year, excluding a noticeable increase in 2020.