

Ambler

Ivisaappaat

Native Village of Ambler:
907-445-2238
City of Ambler:
907-445-2122
AVEC:
907-561-1818

Demographics –

Native Village Status: Federally Recognized Tribal Council

Alaska Native Name: Ivisaappaat

Population: 287

Avg. Household Size: 3.76

Median Household Income: \$44,500

Access –

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

Runway Ownership: State

Runway Surface: Gravel

Runway 1: 2,400 ft x 60 ft

Runway 2: 3,000 ft x 60 ft

Climate –

Average Summer Temperature: 56°F

Average Winter Temperature: -1°F

Heating Degree Days: 15,670

Heat & Power Costs (2021) –

Cost of Diesel Fuel: \$10.30 per gal

Cost of Gasoline: \$10.30 per gal

Cost of Electricity: \$0.64 per kWh

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

Tank Farms -

Ownership: Ambler Traditional Council, Northwest Arctic Borough School District (NWABSD), AVEC, City of Ambler

Bulk Fuel Capacity:

Owner	Fuel	Capacity (gal)	Operational Status
City of Ambler	Gasoline	2,000	In Use
City of Ambler	Diesel	14,200	In Use
NWABSD	Diesel	59,500	In Use
Ambler Traditional Council	Gasoline	78,500	Not in Use
Ambler Traditional Council	Diesel	155,000	Not in Use
AVEC	Diesel	101,200	In Use

Condition: Deteriorating

Electric Utility –

Alaska Village Electric Coop (AVEC)

Power Demand (2020)–

Average Summer Load: 175 kW

Average Winter Load: 232 kW

Peak Summer Load: 190 kW

Peak Winter Load: 260 kW

Total Power Generated: 1,244,815 kWh

Power System (2020) –

Fuel Efficiency: 12.66 kWh/gal diesel

Line Loss: 3.5%

Number of Community Buildings on PCE (2020): 15

Community PCE kWh Use of Total Allowed (2020): 79%
(190,224 kWh - used / 241,080 kWh – total allowed)

Power Generation Infrastructure –

Diesel Engines:

Manufacturer	Model	Capacity
Detroit Diesel	S60K4c	363 kW
Cummins	K19G2 1200	271 kW
Cummins	K19G2 1800	397 kW

Wind Turbine(s): None

Utility-Scale Solar PV: 8.4 kW installed for water plant, behind the meter; 1 kW installed on each residence, not grid-tied

Battery Storage System: None

Heat Recovery –

Facilities Served: Water Treatment Plant

Opportunity to Expand Waste Heat: Yes

Water & Wastewater –

Ownership: City of Ambler

Water System: Circulating Loop(s)

Wastewater System: Gravity

Selected Projects –

Bulk Fuel Storage Design – *Expected 2022*

- Inadequate infrastructure for barged fuel storage
- Complete 95% design for City fuel storage upgrade
- Village Improvement Fund
 - \$180,000 awarded in 2020



Washeteria & City Building Biomass – *Completed 2021*

- Installed GARN-1000WHS cordwood biomass boiler
- Displace 3,500+ gal/year diesel fuel, 70% of annual fuel use
- USDA High Energy Cost Grant, Village Improvement Fund
 - USDA Grant awarded 2018
 - \$443,446 awarded from USDA
 - \$350,000 awarded from VIF



LED Streetlight Retrofit – *Completed 2020*

- Installed 14 LED streetlights
- Village Improvement Fund
 - Funding awarded 2020
 - \$200,000 awarded to Northwest Arctic Borough



Heat Pumps and Energy Efficiency – *Completed 2021*

- Lighting retrofits
- Installation of 1 kW solar per household
- Installation of DC4812VRF solar/DC heat pump
 - Heater & air conditioner
- Village Improvement Fund
 - Funding awarded 2019
 - \$570,225 awarded; Cost per household: ~\$8,000



LED Streetlight Retrofit Borough-Wide – *Completed 2015*

- Installed 38 LED streetlights in Ambler
- 25-year community savings: ~\$4.1M & ~1.6M gal diesel
- State of Alaska, Grants to Municipalities
 - \$200,000 awarded to Northwest Arctic Borough



Bulk Fuel Storage Assessment – *Completed 2015*

- 7 tank farms evaluated: AVEC, NWABSD, City, Traditional Council
- Condition of tanks varies: acceptable - deteriorating
- Conducted by Alaska Energy Authority (AEA)

Water Plant Solar PV – *Completed 2013*

- 8.4 kW solar PV installed
- Average 12.8 kWh/day; still operational
- Coastal Impact Assistance Program (CIAP)
 - \$65,534 awarded in 2009



Future Projects –

Bulk Fuel Storage

- Develop plan to upgrade bulk fuel storage for residential use
 - Limited capacity for stove oil storage, often results in fuel rationing in spring
 - Deteriorating bulk fuel storage tanks in need of repair and replacement
- Identify funding sources
 - Village Improvement Funding 2020 awarded \$180,000
 - 95% design of City fuel storage upgrade
 - Opportunity to partner with Denali Commission
- Engage all stakeholders in operational plan
 - City, Tribe, AVEC, NWABSD

Biomass Harvest Management Plan

- Develop a harvest management plan
 - Refer to the wood resource assessment to determine location and quantity of resource availability
- Engage all stakeholders and balance competing needs
 - Wood resource land owner: NANA
 - Biomass boiler owner: City
 - Prior consumers of wood resources: residents

Solar PV and Battery Storage

- Conduct feasibility study to ensure project viability
 - HOMER modeling and feasibility study completed, 2020
- Design and permit solar PV and battery storage
 - Application submitted for Alaska Energy Authority Renewable Energy Fund 14
- Construct solar PV and battery storage; establish Independent Power Producer
 - Identify funding
- Decrease energy costs and enhance power system resiliency

Energy Milestones –

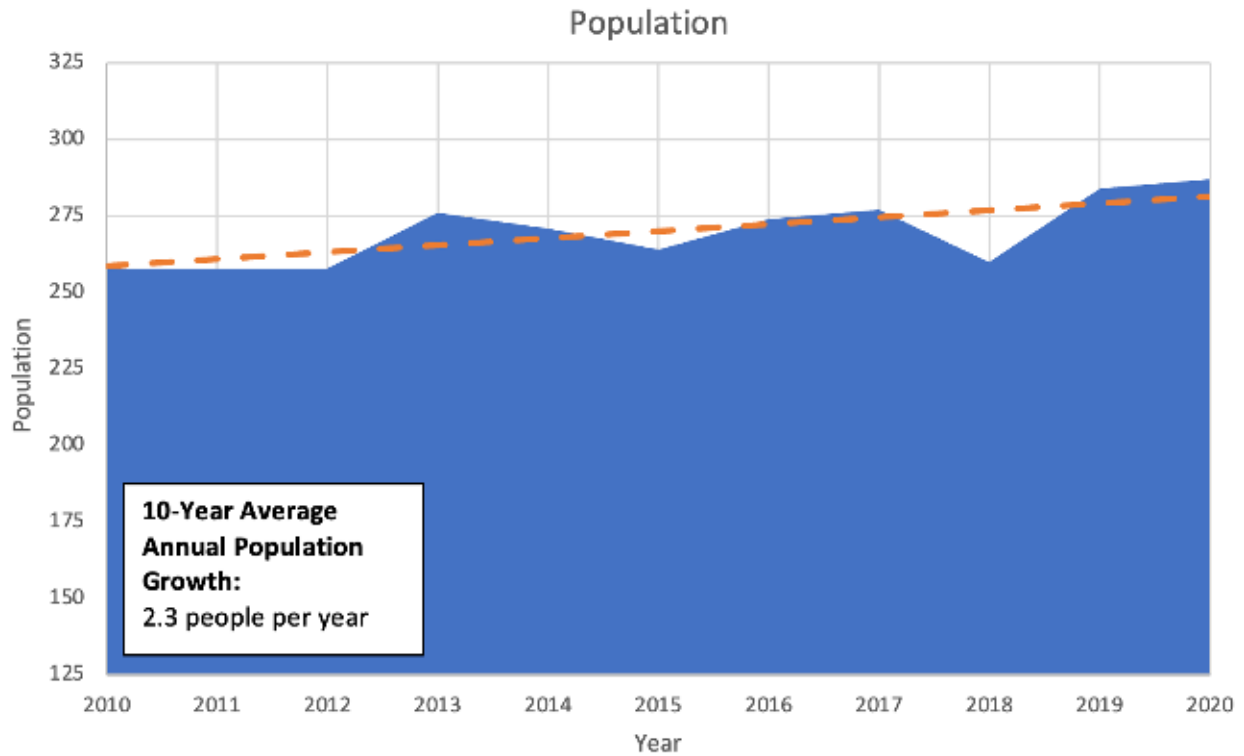
- Installed heat pumps and 1kW solar PV on all homes in Ambler – *Completed 2021*
- Upgraded majority of streetlights to LED – *Completed 2020*
- Installed first solar PV in Ambler – *Completed 2013*

Community Goals –

- Reduce cost of residential space and water heating
 - Develop 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
- Enhance reliability of access to fuel for residential use
- Enhance resiliency of power system by diversifying power generation sources
- Develop renewable energy microgrid
 - Solar PV and battery storage

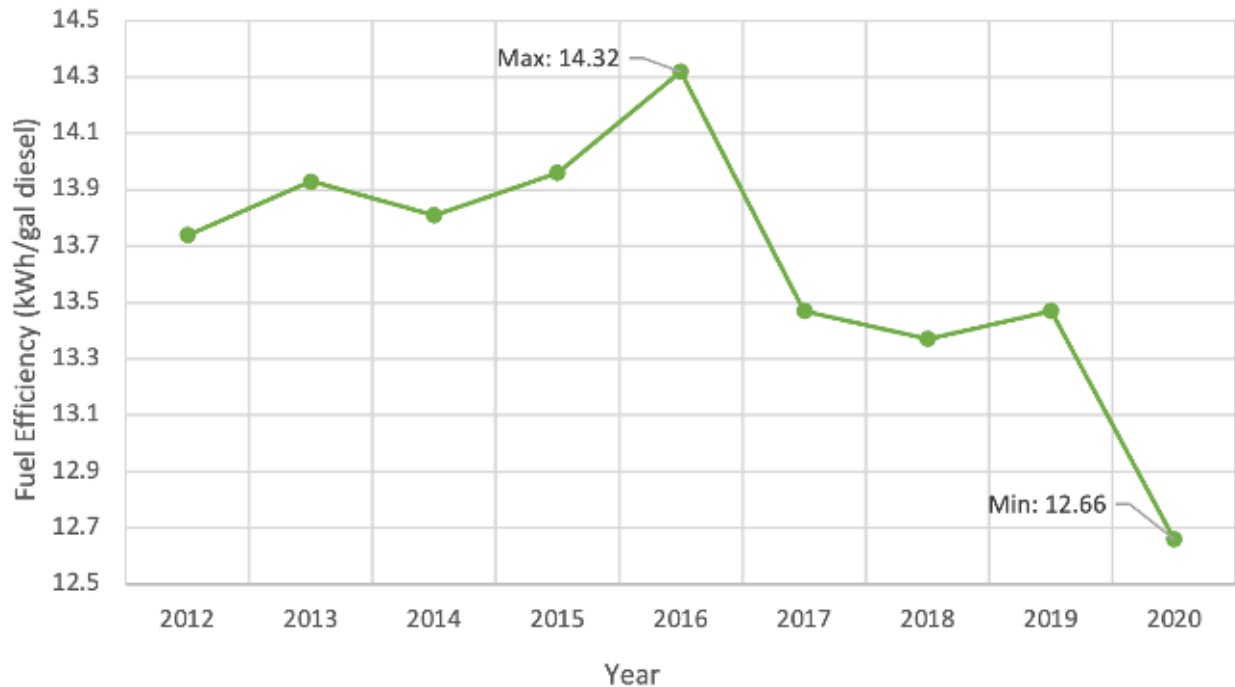
- Develop Independent Power Producer agreement to sell power to AVEC
- Explore regional opportunities for fuel cooperative with Shungnak and Kobuk
 - Optimize fuel storage to reduce need for flown-in fuel
 - Consider cost savings if diesel use is reduced below margin where flown-in fuel is required
- Construct new homes with a focus on long-term comfort and livability, especially well-built foundations and energy efficient construction/appliances

Energy System Trends –



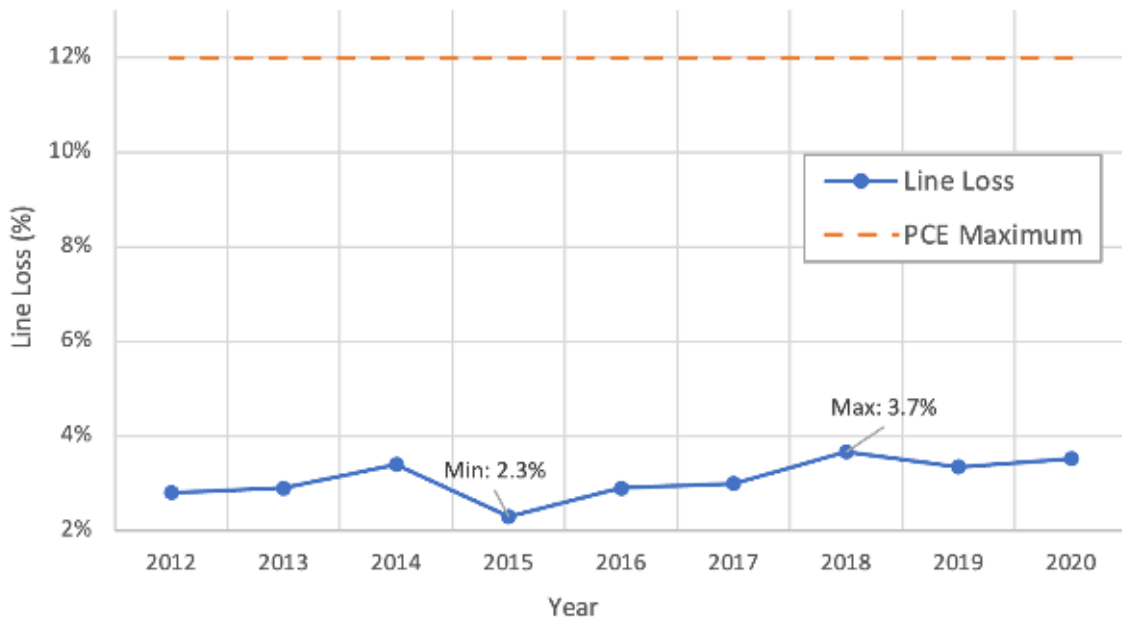
Dramatic changes in population impact the long-term community planning necessary to meet future power demand. The population in Ambler is not changing dramatically. Over the last ten years the population has increased an average of 0.9% each year.

Fuel Efficiency



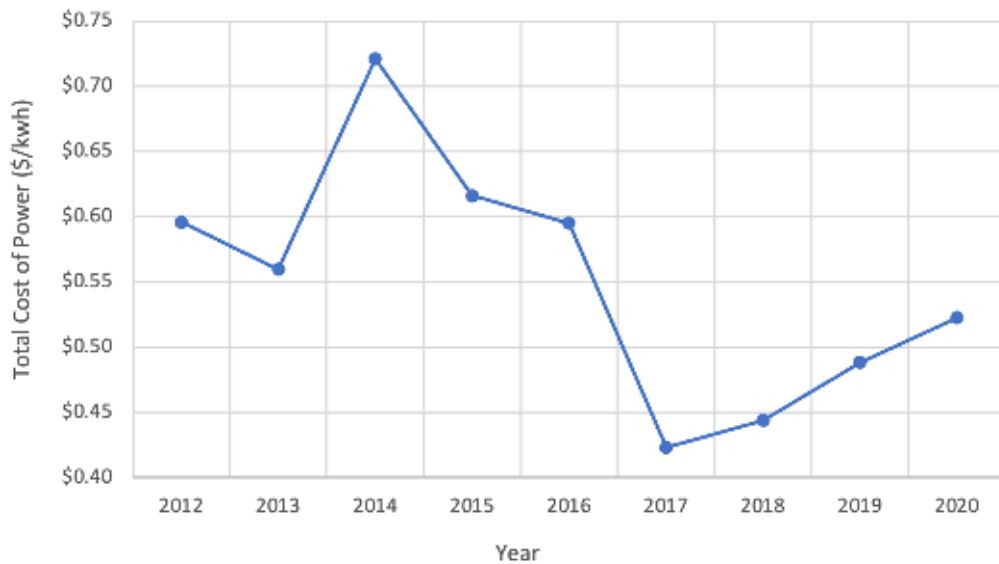
A higher fuel efficiency results in less diesel fuel use and a lower cost to generate power. A fuel efficiency below 12 kWh/gal is poor; a fuel efficiency above 14 kWh/gal is excellent. The fuel efficiency in Ambler has typically been very good, but there was a distinct reduction in efficiency starting in 2017. Due to the method that is used to calculate this value in the PCE data, there are a variety of potential causes for this reduction in fuel efficiency. Further investigation is required to understand this decline in fuel efficiency.

Line Loss



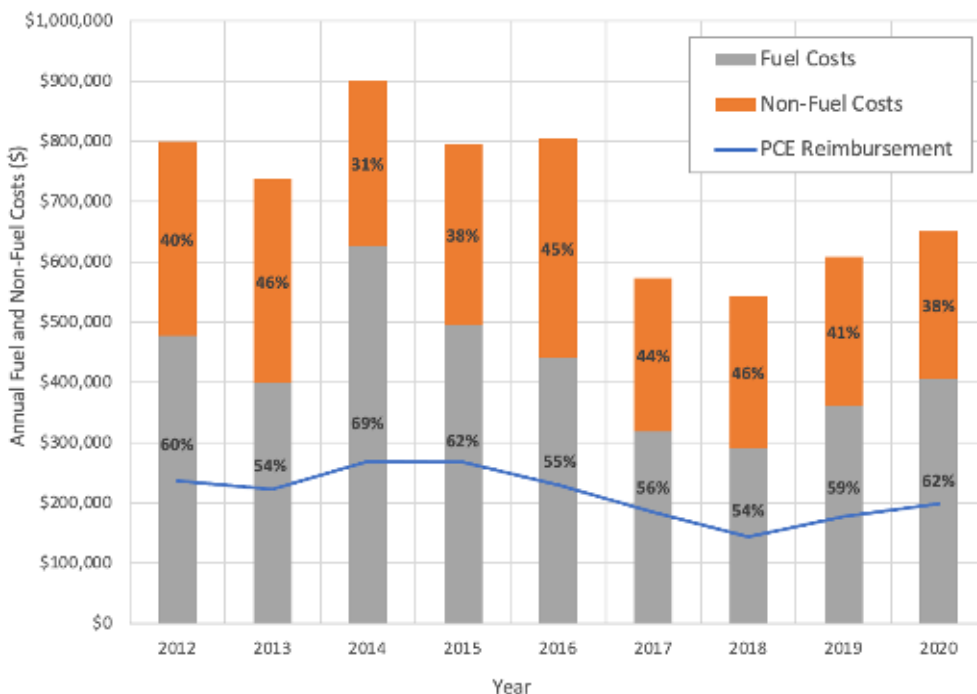
The maximum allowable line loss to maintain eligibility for PCE benefits is 12%. In Ambler, the line loss is very low and has been very low for the past nine years, indicating the distribution system is in good condition and all power use is accounted for.

Utility Cost to Generate Power



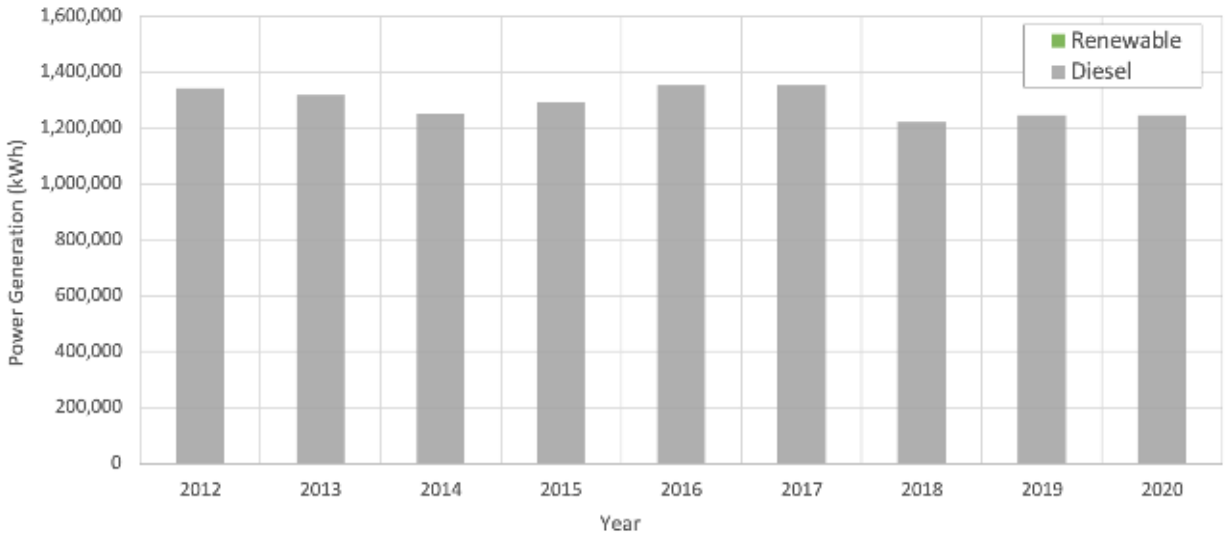
Over the long-term, a lower utility cost to generate power typically correlates with a lower cost of electricity for residents. The major factors that affect the cost to generate power are the cost of fuel, generator fuel efficiency, maintenance, and operations. Major system breakdowns may cause the cost to generate power to spike on a particular year, as will high fuel prices. In Ambler the cost to generate power decreased from 2014 to 2017, and then has been steadily, although gradually, increasingly each year since.

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



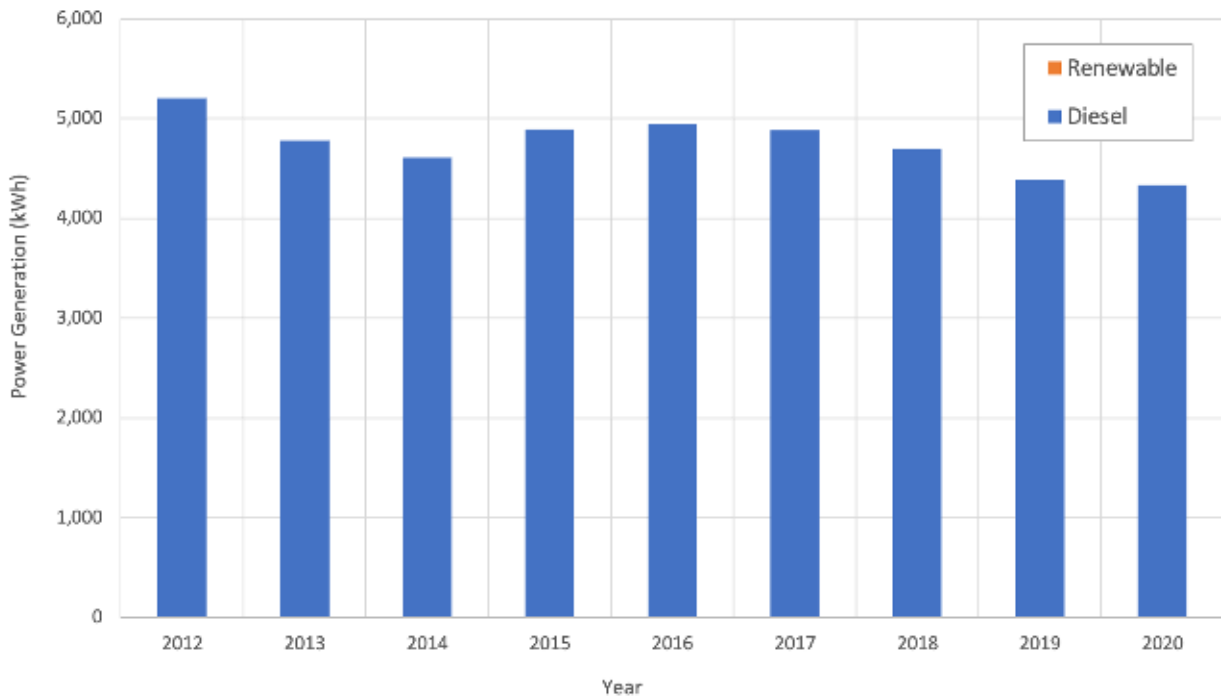
For many utilities, the non-fuel costs associated with generating power do not change dramatically each year. Fuel costs, on the other hand, are highly susceptible to annual fluctuations based on the global price of fuel, transportation costs, and the amount of power generated. PCE reimbursement is meant 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. In Ambler, the portion of the costs spent on fuel costs and non-fuel costs have been relatively steady over the last nine years, with the exception of 2014. In 2014 the fuel costs dominated the annual spending.

Annual Power Generation - Diesel & Renewable

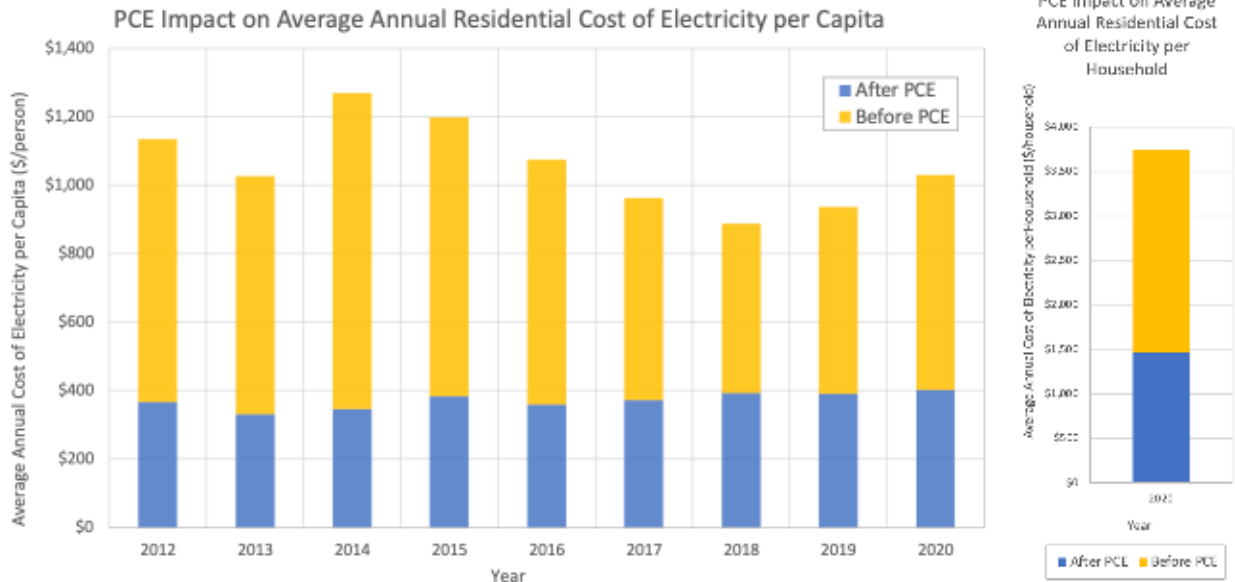


Renewable sources of power generation reduce diesel fuel use and can increase resiliency, in addition to offering many other benefits. The portion of power that is generated by renewable energy sources depends both on the capacity of the installed infrastructure as well as the performance of that infrastructure. In this way, the renewable energy generated may vary annually depending on the availability of the resource and availability of the equipment. There is no renewable power generation at the utility scale in Ambler. All of the power is generated by diesel generators. The total power generated has fluctuated by less than 10% year-to-year since 2012.

Annual Power Generation 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. Power generation per capita in Ambler has been decreasing slightly each year since 2016.



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 Ambler, where the residential cost of electricity per capita after PCE has remained steady for the last nine years between \$300 and \$400 per year.