Deering
Ipnatchiaq

Native Village of Deering:
907-363-2138
City of Deering:
907-363-2136
Ipnatchiaq Electric Company:
907-363-2157

Demographics –
Native Village Status: Federally Recognized Tribal Council
Alaska Native Name: Ipnatchiaq
Population: 168
Avg. Household Size: 3.53
Median Household Income: $44,375

Access –
Barge Access: Seasonal
Runway Ownership: State
Runway Surface: Gravel
Runway 1: 3,320 ft x 75 ft
Runway 2: 2,660 ft x 75 ft

Climate –
Average Summer Temperature: 50 °F
Average Winter Temperature: 0 °F
Heating Degree Days: 15,751

Heat & Power Costs (2021) –
Cost of Diesel Fuel: $4.12 per gal
Cost of Gasoline: $4.12 per gal
Cost of Electricity: $0.67 per kWh
Cost of Electricity, after PCE: $0.32 per kWh

Tank Farms -
Ownership: City of Deering, Northwest Arctic Borough School District (NWABSD), Ipnatchiaq Electric Company, Deering IRA
Bulk Fuel Capacity:

Owner	Fuel	Capacity (gal)
City of Deering	Diesel	63,000
NWABSD	Diesel	63,000
Ipnatchiaq Electric Company	Diesel	63,000
Deering IRA	Diesel	63,000
Deering IRA	Gasoline	63,000

Condition: Acceptable

Electric Utility –
Ipnatchiaq Electric Company (Subdivision of City)

Power Demand –
Average Load: 65 kW
Peak Summer Load: 150 kW
Peak Winter Load: 180 kW
Total Power Generated (2019): 699,769 kWh

Power System –
Fuel Efficiency (2019): 12.18 kWh/gal diesel
Line Loss (2017 - last reported): 3.2%
Number of Community Buildings on PCE (2020): 5
Community PCE kWh Use of Total Allowed (2020): 77% (108,384 kWh - used / 141,120 kWh – total allowed)

Power Generation Infrastructure –
Diesel Engines:

Manufacturer	Model	Capacity	Year Built
John Deere	6068TDW56	100 kW	2015
John Deere	6081AFM75	180 kW	2007
Cummins	LTA10G3	175 kW	1999
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Wind Turbine(s):

Manufacturer	Model	Capacity	Year Built
Northern Power Systems	Northwind 100	100 kW	2014

Utility-Scale Solar PV:

Installer	Inverter	Capacity	Year Built
BoxPower	SMA Tripower	48.51 kW	2019

(Additional 11.13 kW installed for water plant, behind the meter)

Battery Storage System:

Manufacturer	Model	Capacity	Year Built
SAFT	Intensium Mini-M	277 kW / 109 kWh	2019

Heat Recovery –
Facilities Served: Washeteria/WTP
Opportunity to Expand Waste Heat: Yes

Water & Wastewater –
Ownership: City of Deering
Water System: Delivery; Washeteria
Wastewater System: Vacuum, Honey Bucket

Selected Projects –

EPA DERA Generator Replacement – *Expected 2022*

- Planned replacement of two generators, 2022
  - John Deere 4045, 100 kW; John Deere 6090, 200 kW
- Funding from EPA Diesel Emissions Reduction Act & Volkswagen Settlement Funding
  - $418,140 awarded from EPA in 2022
  - $129,056 from Volkswagen Settlement Funding

Distribution System Upgrade – *Expected 2022*

- Upgraded distribution system, started project in 2016
  - Installed new poles, transformers, and wires
- Reduced line loss and enhanced safety of distribution system
- USDA High Energy Cost Grant and Village Improvement Fund
  - $175,000 awarded from USDA HECG in 2016
  - $375,000 from Village Improvement Fund in 2017
  - $345,000 from Village Improvement Fund in 2021
  - $50,000 contributed by Ipnatchiaq Electric Company

Solar PV Array and Inverter – *Completed 2019*

- Installed 45 kW solar PV and inverter, 2019
  - Solar PV & foundations by BoxPower
- Displaces 4,300+ gal/year diesel fuel
- Contributed to 600+ hours of diesels-off from Apr ‘20 – Apr ‘21
- Department of Energy, Office of Indian Energy
  - $1 million awarded from DOE in 2016
  - $1 million match funding from NANA
    - Shared award: Kotzebue, Buckland, & Deering

Battery Storage and Controls – *Completed 2019*

- Installed 277 kW/109 kWh battery storage and controls
  - Necessary to make solar PV array effective
- Integrated solar PV & battery storage with microgrid, 2019
- Contributed to 600+ hours of diesels-off from Apr ‘20 – Apr ‘21
- USDA High Energy Cost Grant Program
  - $1.6 million awarded in 2016
    - Shared award: Buckland and Deering

Wind/Diesel Microgrid – *Completed 2015*

- Installed Northwind 100 kW wind turbine, 2014
- Integrated wind turbine with microgrid, 2015
- Displaces 7,200+ gallons diesel fuel annually
- Contributed to 600+ hours of diesels-off from Apr ‘20 – Apr ‘21
- AK Energy Authority Renewable Energy Fund, Round 1
  - $10.5 million awarded in 2009

        - Shared award: Noorvik, Buckland, & Deering

LED Streetlight Retrofit Borough-Wide – *Completed 2015*

- Installed 15 LED streetlights in Deering
- 25-year community savings: ~$1.6M & ~630,000 gal diesel
- State of Alaska, Grants to Municipalities
    - Funding awarded 2014
    - $200,000 awarded to Northwest Arctic Borough

Water Plant Solar PV – *Completed 2013*

- 11.13 kW solar PV installed
- Average 21.9 kWh/day; still operational
- Coastal Impact Assistance Program (CIAP)
    - Funding awarded 2009
    - $86,833 awarded

Future Projects –

Energy Audits

- Conduct additional energy audits
    - Health clinic, school, sewer building, and City offices
- Complete energy efficiency recommendations to reduce heating and operational costs

Residential Heat Trace Design Upgrade

- Survey residential heat trace infrastructure and operation
- Design and implement improved system to maintain water system functionality in winter
    - Reduce energy consumption and enhance reliability

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

Solar PV

- Increase capacity of solar PV array and battery storage
    - Displace additional diesel fuel and increase hours of diesels-off
        - Reduce the cost of electricity
    - Enhance resiliency of system

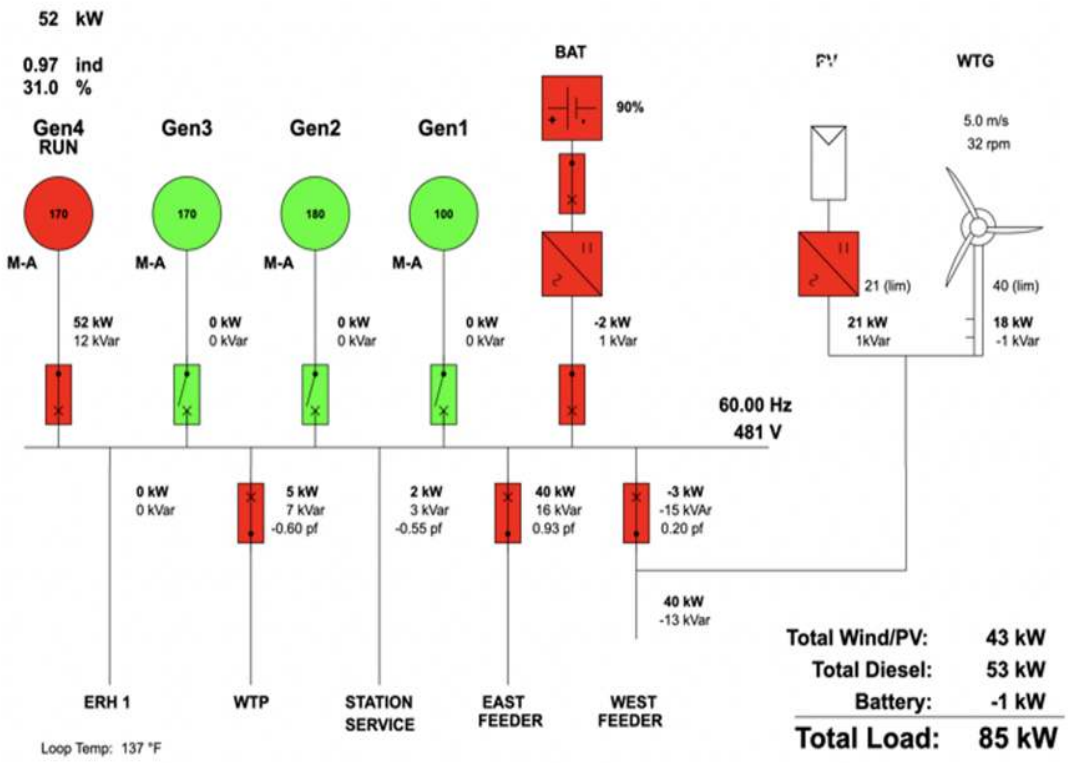
Energy Milestones –

- Achieved diesels-off operation – *October 11th, 2019*
- Installed first solar PV in Deering – *Completed 2013*

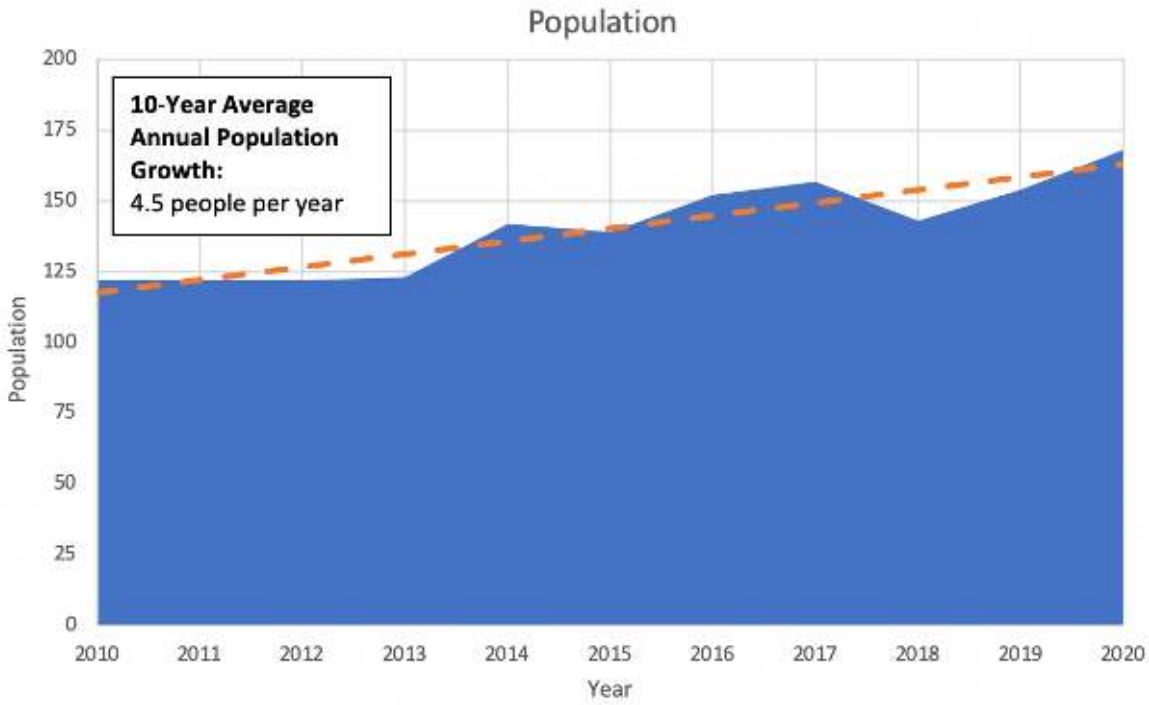
Community Goals –

- Reduce cost of residential space and water heating
    - Expand renewable energy microgrid
        - Solar PV, wind turbine
    - Implement energy efficiency measures
    - Maintain and/or replace aging residential heating appliances
- Upgrade diesel generators #1 and #3 to enhance reliability of power system
- Enhance energy efficiency of water and sewer systems
- Conduct feasibility study to determine how much additional solar PV and battery storage to install
- Create additional training opportunities for operators to enhance skills and understanding of microgrid
- Partner with Northwest Inupiat Housing Authority to implement policy changes to prioritize and invest in energy efficiency in newly constructed homes

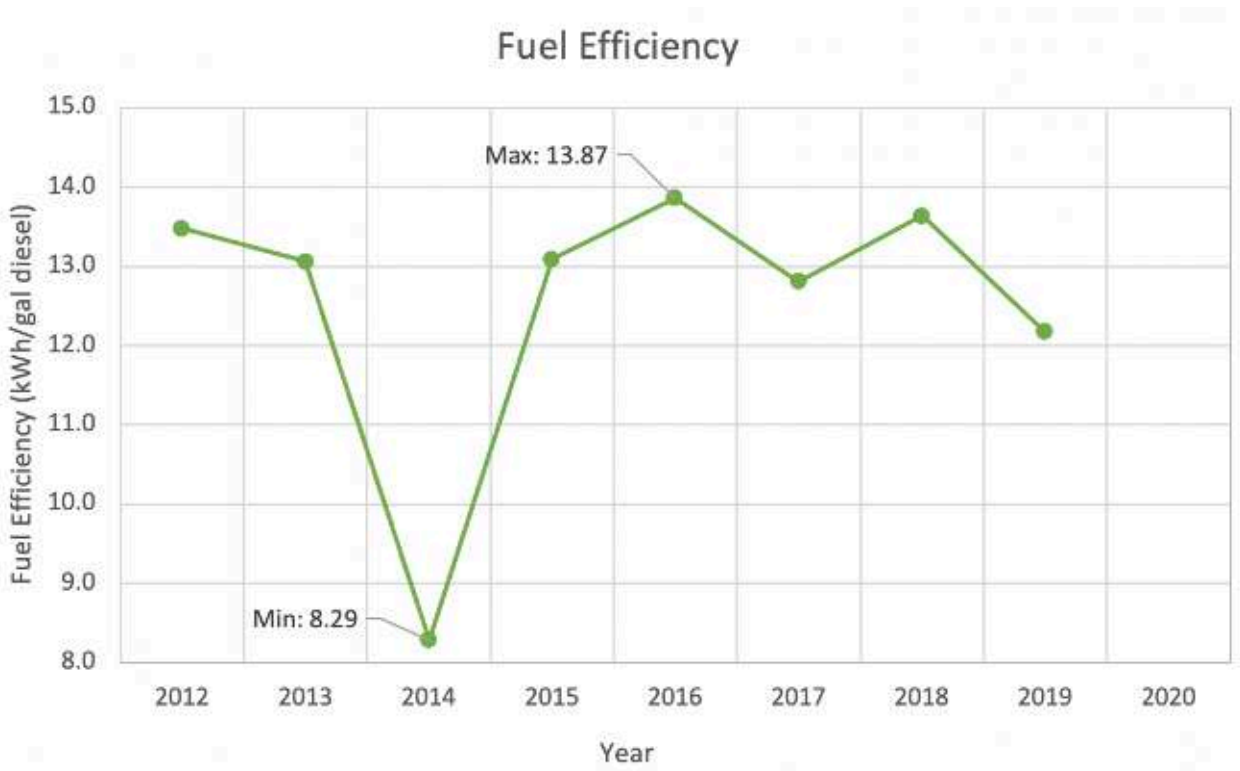
Microgrid System Schematic –



Energy System Trends –

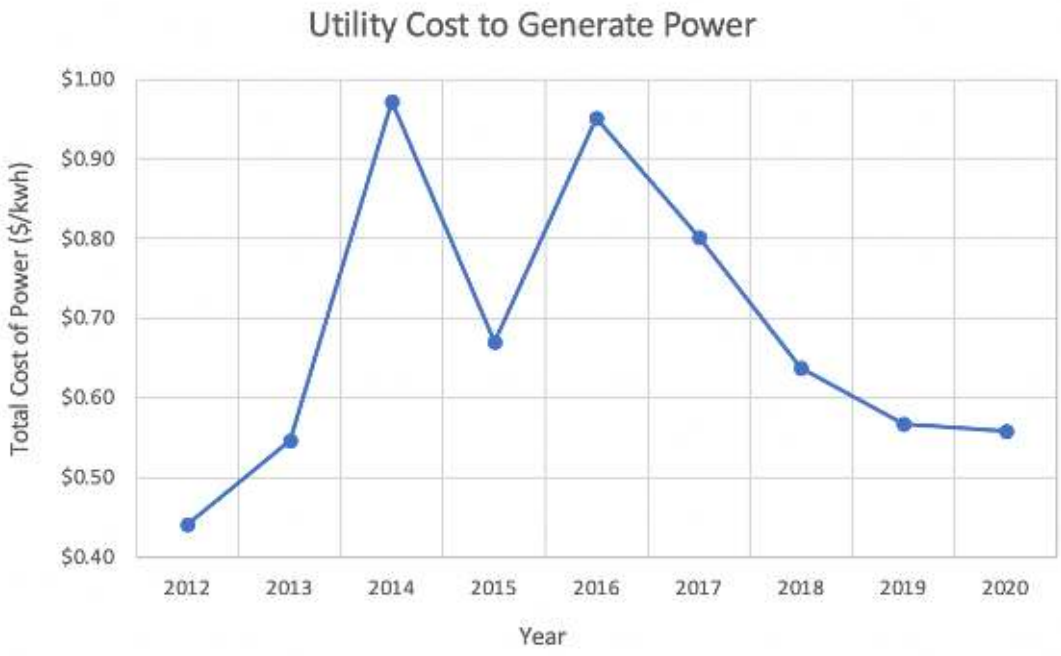


Dramatic changes in population impact the long-term community planning necessary to meet future power demand. The population in Deering is not changing dramatically. Over the last ten years the population has increased an average of 3.7% each year.

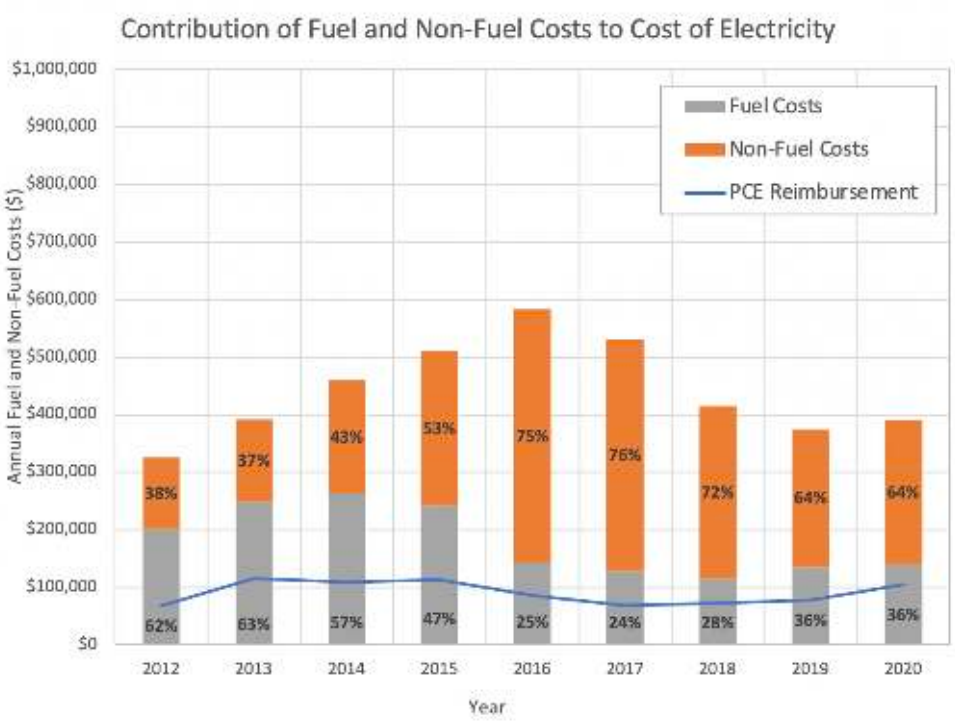


A higher fuel efficiency results in less diesel fuel use and a lower cost to generate power. A fuel efficiency below 12 kWh/gal is poor; a fuel efficiency above 14 kWh/gal is excellent. The fuel efficiency in Deering has typically been very good, but there is some variation year to year. The data for 2014 may be inaccurate as it is exceptionally low. No data was available for 2020.

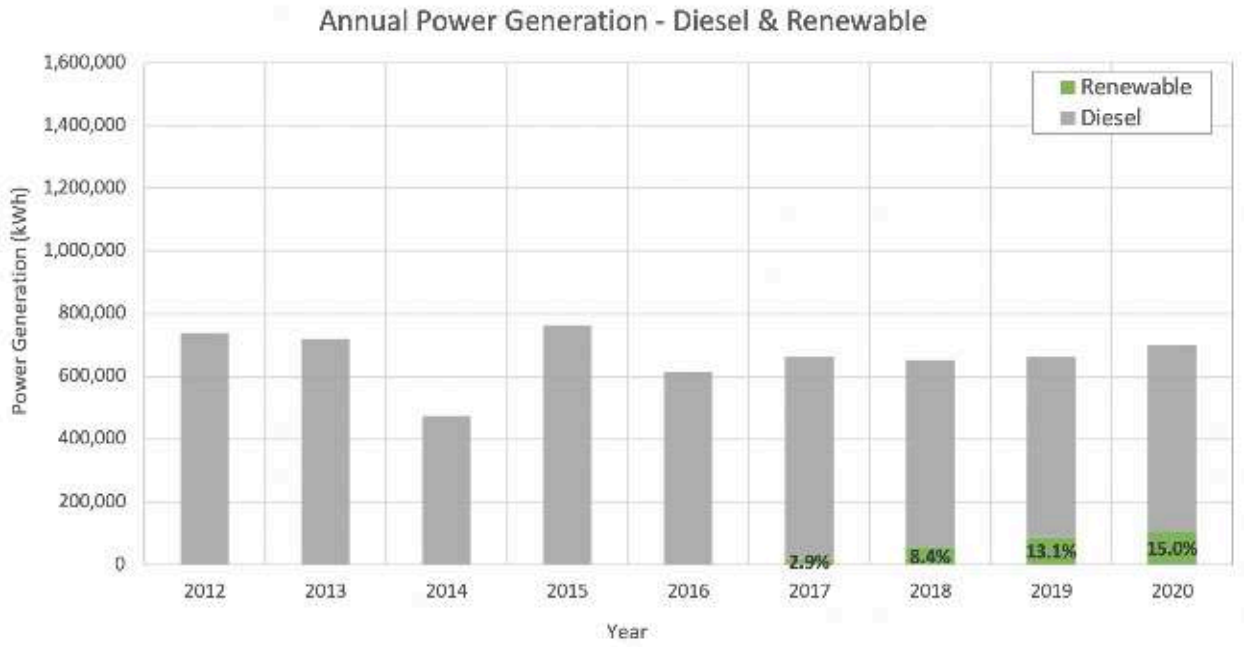
The maximum allowable line loss to maintain eligibility for PCE benefits is 12%. In Deering, the line loss has decreased dramatically since 2021 as a result of a distribution system capital upgrade. The gaps in the data indicate that either no data was available or the data was incorrect.



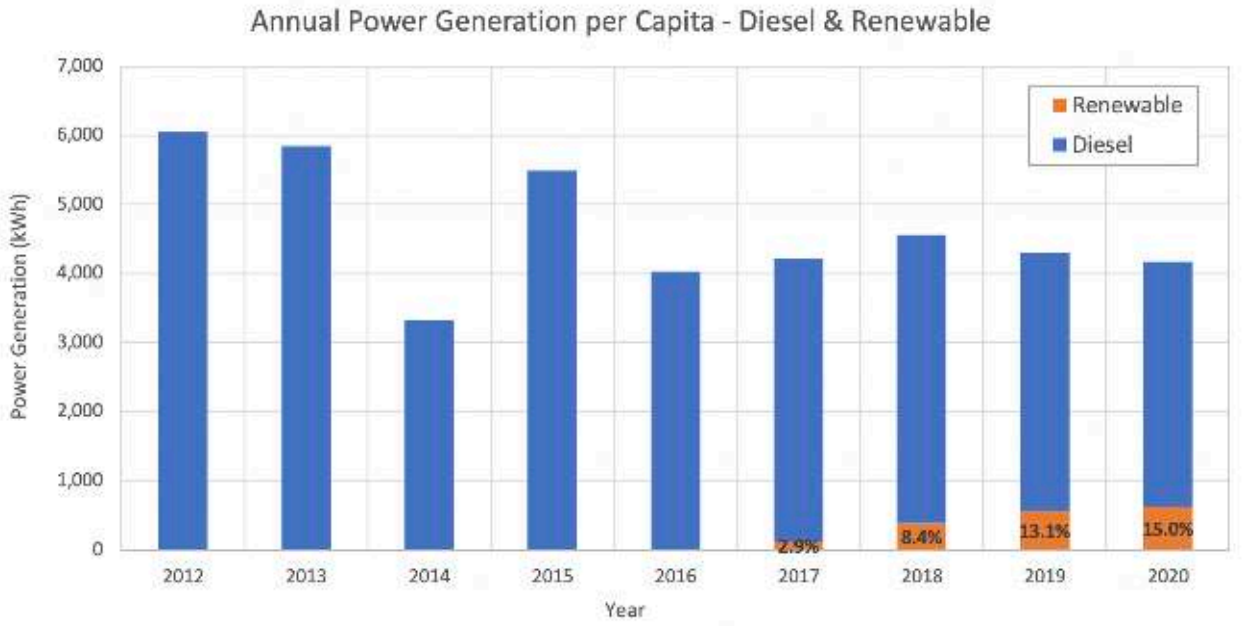
Over the long-term, a lower utility cost to generate power typically correlates with a lower cost of electricity for residents. The major factors that affect the cost to generate power are the cost of fuel, generator fuel efficiency, maintenance, and operations. Major system breakdowns may cause the cost to generate power to spike on a particular year, as will high fuel prices. In Deering the cost to generate power has been trending lower each year since 2016. Fuel savings from power generated by renewable energy sources are likely contributing to this reduction.



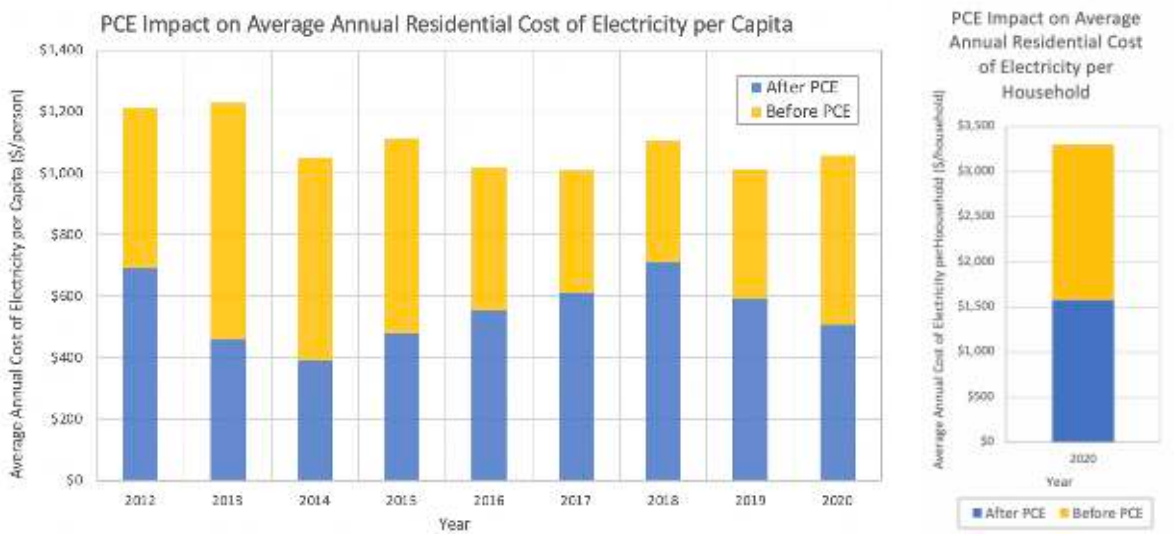
For many utilities, the non-fuel costs associated with generating power do not change dramatically each year. Fuel costs, on the other hand, are highly susceptible to annual fluctuations based on the global price of fuel, transportation costs, and the amount of power generated. PCE reimbursement is meant 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 Deering, the portion of the costs spent on fuel dramatically decreased in 2016, after the installation of the wind turbine. The portion of the costs spent on non-fuel costs as well as the total non-fuel costs increased dramatically in 2016, but have been decreasing since 2018.



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. In Deering the portion of power generated by renewable energy sources has increased each year since 2017.



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. Excluding 2014, there was a dramatic step-down in power generation per capita in Deering in 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. In Deering, the residential cost of electricity per capita after PCE has varied dramatically over the last nine years from less than $400 per year to more than $700 per year.