

Kiana

Katyaak

Native Village of Kiana:
907-475-2109
City of Kiana:
907-475-2136
AVEC:
907-561-1818

Demographics –

Native Village Status: Federally Recognized Tribal Council

Alaska Native Name: Katyaak

Population: 421

Avg. Household Size: 3.51

Median Household Income: \$42,813

Access –

Barge Access: Seasonal

Runway Ownership: State

Runway Surface: Gravel

Runway 1: 3,400 ft x 100 ft

Runway 2: None

Climate –

Average Summer Temperature: 55 °F

Average Winter Temperature: 0 °F

Heating Degree Days: 15,812

Heat & Power Costs (2021) –

Cost of Diesel Fuel: \$5.67 per gal

Cost of Gasoline: \$5.15 per gal

Cost of Electricity: \$0.60 per kWh

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

Tank Farm -

Ownership: City of Kiana, AVEC, Northwest Arctic Borough School District (NWABSD), Dorsey Family, Native Store, AKDOT

Capacity:

Owner	Fuel	Capacity (gal)
AVEC	Diesel	120,300
Native Store	-	7,100
Margaret and Donald Dorsey	-	51,400
NWABSD	Diesel	-
Other	-	207,100

Condition: Acceptable

Electric Utility –

Alaska Village Electric Coop (AVEC)

Power Demand (2020) –

Average Summer Load: 174 kW

Average Winter Load: 279 kW

Peak Summer Load: 187 kW

Peak Winter Load: 337 kW

Total Power Generated: 1,695,620 kWh

Power System (2020) –

Efficiency: 14.4 kWh/gal diesel

Line Loss: 3.5%

Number of Community Buildings on PCE: 14

Community PCE kWh Use of Total Allowed: 58%
(203,604 kWh - used / 353,640 kWh - total allowed)

Power Generation Infrastructure –

Diesel Engines:

Manufacturer	Model	Capacity
Detroit Diesel	S60K4c	314 kW
Cummins	KTA1150	350 kW
Cummins	KTA19G4	499 kW

Wind Turbine(s): None

Solar PV: 10.53 kW installed for water plant, behind the meter

Battery Storage System: None

Heat Recovery –

Facilities Served: Water Treatment Plant

Opportunity to Expand Waste Heat: Yes, new fire hall

Water & Wastewater –

Ownership: City of Kiana

Water System: Circulating Loop(s)

Wastewater System: Gravity

Selected Projects –

Heat Recovery System Expansion for WTP – *Completed 2021*

- 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 to fully serve water treatment plant
- Implement energy efficiency upgrades
 - Water treatment plant
 - 8 additional community buildings
- Remote Alaska Community Energy Efficiency DOE Funding
 - \$366,992 awarded 2017



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 27 LED streetlights in Kiana
- 25-year community savings: ~\$2.9M & ~1.1M gal diesel
- State of Alaska, Grants to Municipalities
 - Funding awarded 2014
 - \$200,000 awarded to Northwest Arctic Borough



Water Plant Solar PV – *Completed 2015*

- 10.53 kW solar PV installed
- Average 11.8 kWh/day; still operational
- Coastal Impact Assistance Program (CIAP)
 - Funding awarded 2009
 - \$84,078 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 and battery storage
 - Application submitted for Alaska Energy Authority Renewable Energy Fund 14
- Construct solar PV and battery storage
 - Identify funding
- Decrease energy costs and enhance power system resiliency

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

Expand Recovered Heat System

- Evaluate opportunity to expand recovered heat system for new fire hall
 - New fire hall siting
 - Discuss with AVEC
- Evaluate opportunity to expand recovered heat for additional buildings

Wind Turbine & Intertie Feasibility Study

- Collect wind data for Westlake Ridge
 - Expanded access due to new road
 - Install 50 m MET tower
- Update wind-intertie feasibility study for connection with Noorvik
- Design and construct wind turbine
 - Verify Quarry Road site near Noorvik is best option

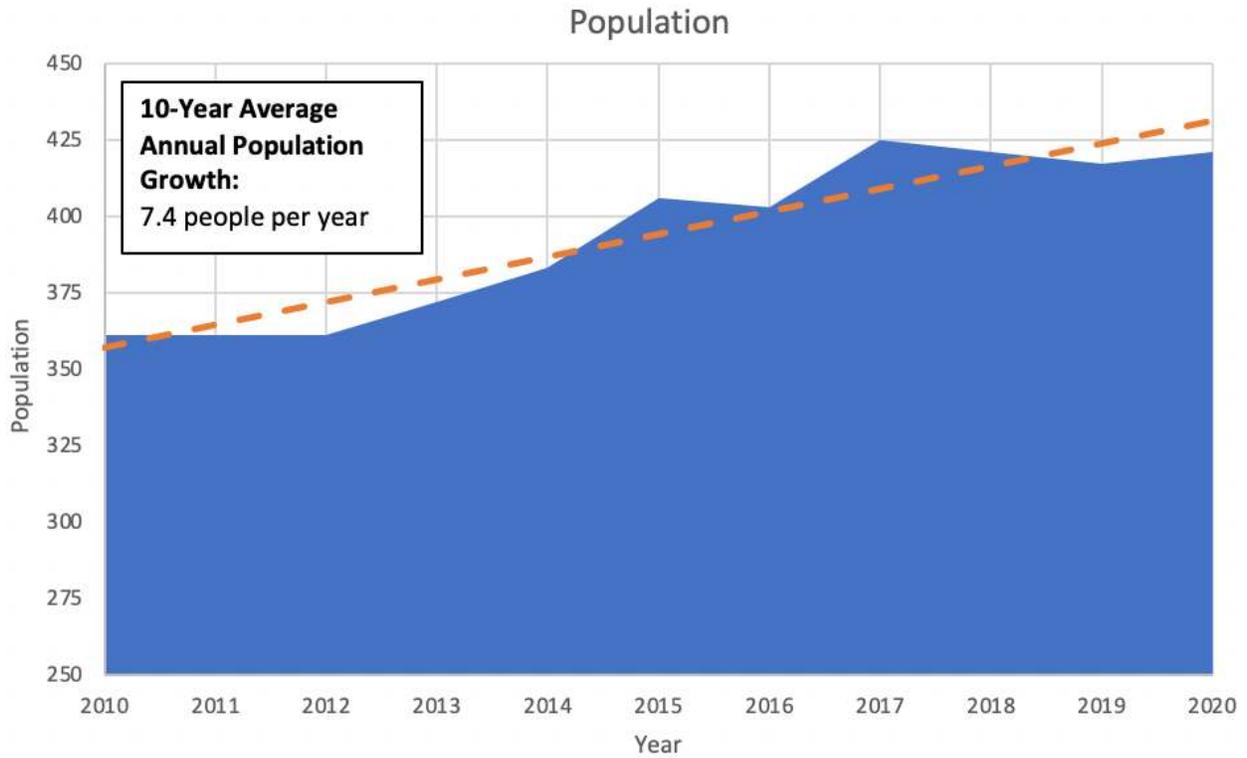
Energy Milestones –

- Installed first solar PV in Kiana – *Completed 2015*

Community Goals –

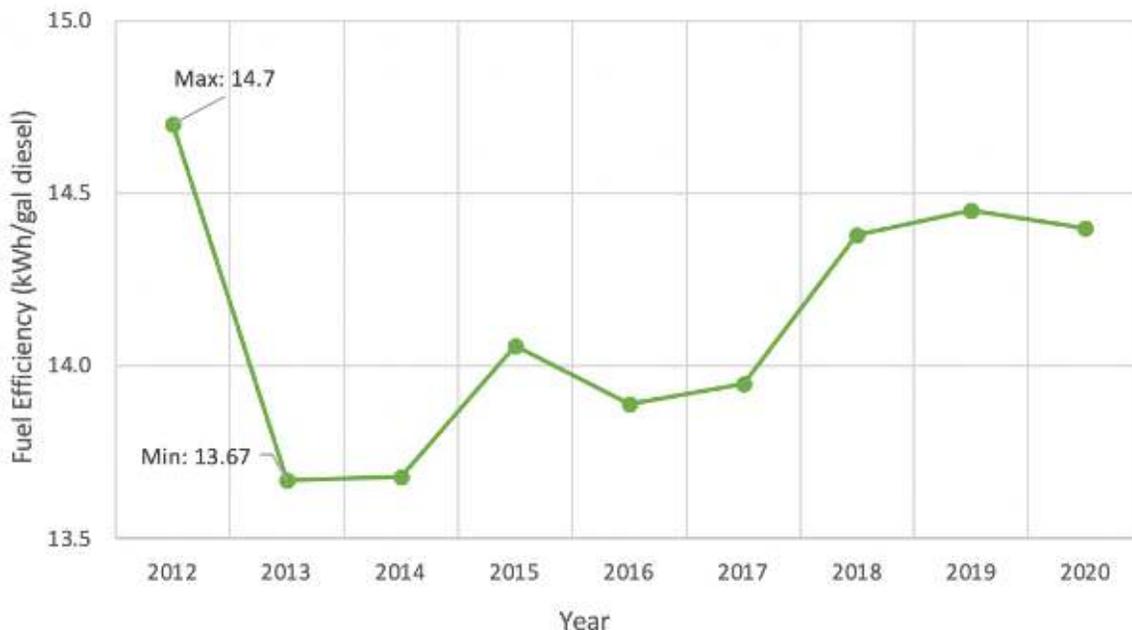
- Reduce cost of residential space and water heating
 - Develop renewable energy microgrid
 - Implement energy efficiency measures
 - Maintain and/or replace aging residential heating appliances
- Reduce cost of electricity to make a community garden feasible
- Develop renewable energy microgrid
 - Solar PV and battery storage
 - Wind turbine(s) and battery storage
 - Develop Independent Power Producer agreement to sell power to AVEC
- Enhance community understanding of renewable energy technologies and benefits and maintenance costs associated with each (biomass, solar PV, wind)
- Partner with Northwest Inupiat Housing Authority to implement policy changes to prioritize and invest in energy efficiency in newly constructed homes

Energy System Trends –



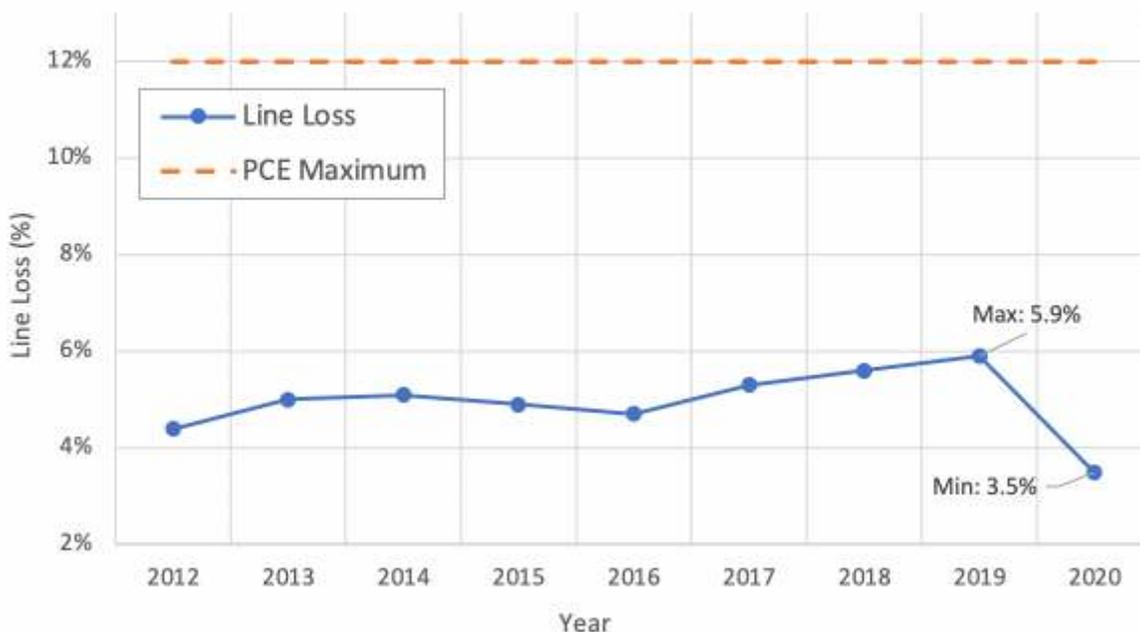
Dramatic changes in population impact the long-term community planning necessary to meet future power demand. The population in Kiana is not changing dramatically. Over the last ten years the population has increased an average of 2.0% each year.

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 Kiana is very good, especially since 2018 with fuel efficiencies that are consistently greater than 14 kWh/gal of diesel.

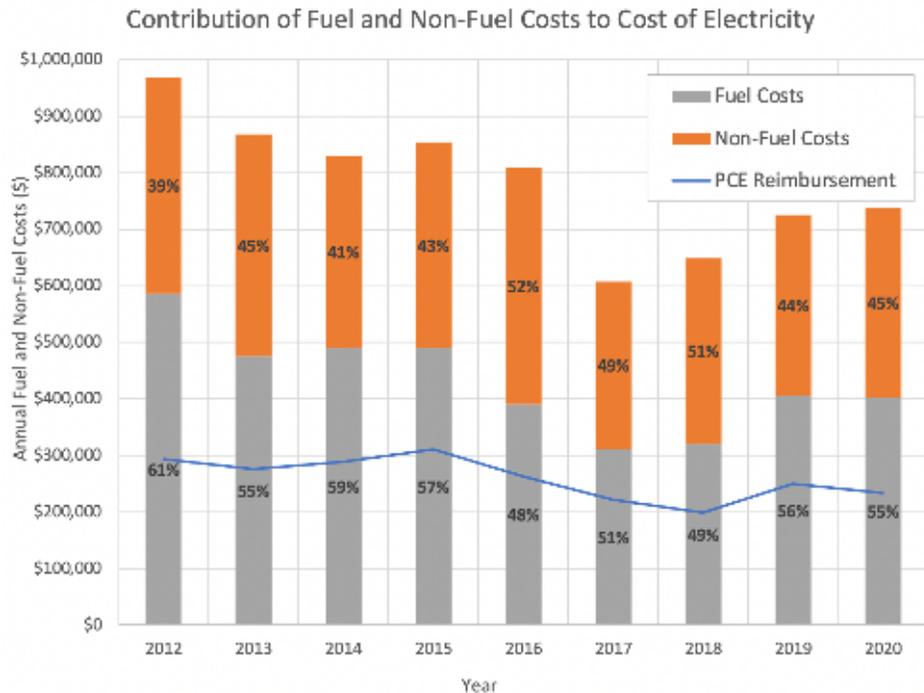
Line Loss



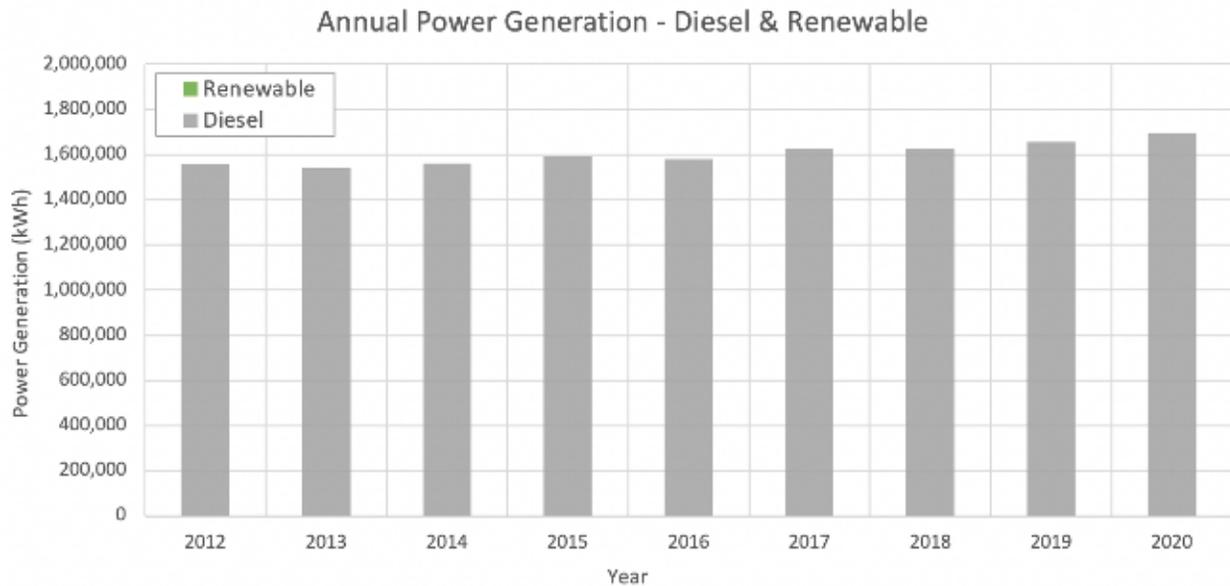
The maximum allowable line loss to maintain eligibility for PCE benefits is 12%. In Kiana, the line loss is very low and has been very low for the past nine years, indicating the distribution system is in good condition and all power use is accounted for.



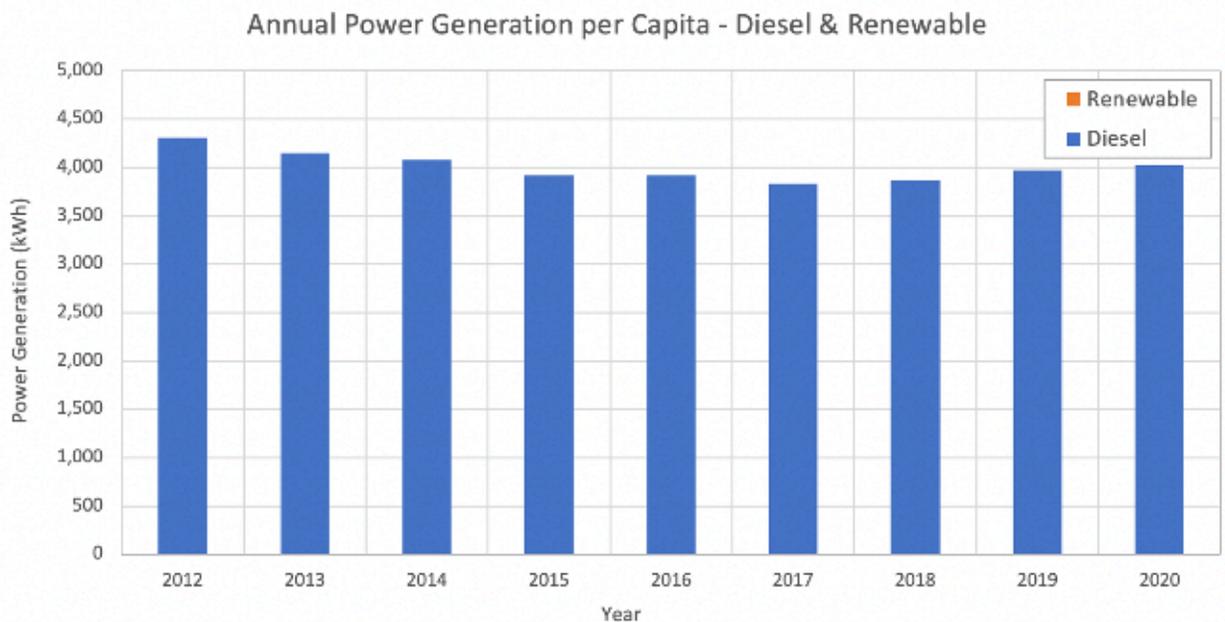
Over the long-term, a lower utility cost to generate power typically correlates with a lower cost of electricity for residents. The major factors that affect the cost to generate power are the cost of fuel, generator fuel efficiency, maintenance, and operations. Major system breakdowns may cause the cost to generate power to spike on a particular year, as will high fuel prices. In Kiana the cost to generate power has been generally declining for the last nine years with only a small increase in the last three years.



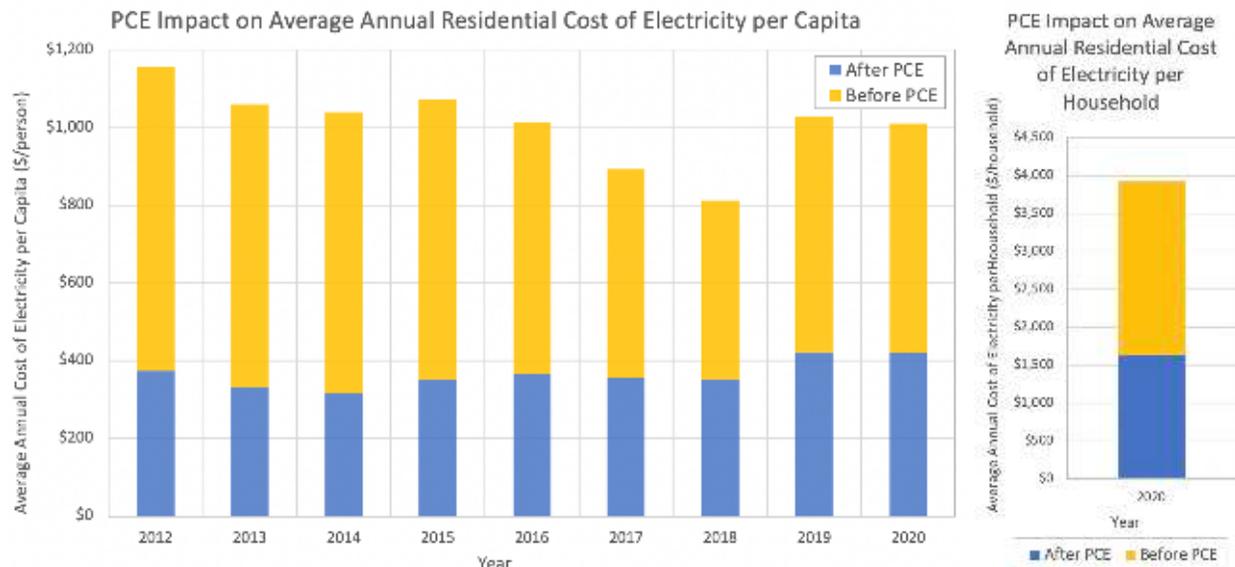
For many utilities, the non-fuel costs associated with generating power do not change dramatically each year. Fuel costs, on the other hand, are highly susceptible to annual fluctuations based on the global price of fuel, transportation costs, and the amount of power generated. PCE reimbursement is meant 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 Kiana, the portion of the costs spent on fuel costs decreased in 2016 and have maintained this lower value in recent years.



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 Kiana. All of the power is generated by diesel generators. The total power generated has increased steadily but minimally since 2018.



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 Kiana decreased from 2012 to 2017 and then increased in recent 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. This is the case in Kiana, where the residential cost of electricity per capita after PCE has remained steady for the last nine years between \$300 and \$500 per year.