Aleutian & Pribilof Islands
Regional Energy Plan

Phase II – Report Update

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Prepared by

Southwest Alaska Municipal Conference
3300 Arctic Blvd., Ste. 203
Anchorage, Alaska 99503

Information Insights
212 Front Street, Suite 100
Fairbanks, Alaska 99701

ALASKA ENERGY AUTHORITY

SWAMC

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vision + creativity = solutions

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Acronyms and Abbreviations

AC	Alternating Current
ACEA	Alaska Commercial Energy Audit (AEA)
ACEP	Alaska Center for Energy and Power (UAF)
ADOLWD	Alaska Department of Labor and Workforce Development
AEA	Alaska Energy Authority
AEDG	Alaska Energy Data Gateway (ISER)
AEERLP	Alaska Energy Efficiency Revolving Loan Fund Program (AHFC)
AHA	Aleutian Housing Authority
AHFC	Alaska Housing Finance Corporation
AkAES	Alaska Affordable Energy Strategy (AEA)
ALARI	Alaska Local and Regional Information (ADOLWD)
ANCSA	Alaska Native Claims Settlement Act
ANTHC	Alaska Native Tribal Health Consortium
APIA	Aleutian Pribilof Islands Association
APICDA	Aleutian Pribilof Island Community Development Association
ARIS	Alaska Retrofit Information System (AHFC)
AVTEC	Alaska Vocational Technology Center (ADOLWD)
B/C	Benefit-Cost Ratio
BEES	Alaska Building Energy Efficiency Standard
BTU	British Thermal Unit
CCHRC	Cold Climate Housing Research Center
CNG	Compressed Natural Gas
DCCED	Alaska Department of Commerce, Community, and Economic Development
DCRA	Alaska DCCED Division of Community and Regional Affairs
DMVA	Alaska Department of Military and Veterans Affairs
DOE-IE	United States Department of Energy Office of Indian Energy
EE or EE&C	Energy Efficiency, or Energy Efficiency and Conservation
EECBG	Energy Efficiency and Conservation Block Grant Program
ESCO	Energy Savings Company
EUI	Energy Use Intensity
FAA	Federal Aviation Administration
FERC	Federal Energy Regulatory Commission
HDPE	Hydro Dynamic Pipe Engineering (manufacturer)

ISER	Institute of Social and Economic Research (UAA)
Gen-set	Diesel Generator Set
HDD	Heating Degree Days
HER	Home Energy Rebate program (AHFC)
HUD	United States Department of Housing and Urban Development
kW	Kilowatt
kWh	Kilowatt hour
kV	Kilovolt
LED	Light-Emitting Diode
LMI	Low and Moderate Income (HUD)
LNG	Liquefied Natural Gas
MMBTU	One million BTUs
MW	Megawatt
MWh	Megawatt hour
N/A	Not Applicable, or Not Available
NAHASDA	Native American Housing Assistance and Self Determination Act (HUD)
O&M	Operations and Maintenance
ORPC	Ocean Renewable Power Company
ORC	Organic Rankine Cycle
PCE	Power Cost Equalization
PV	Photovoltaic
REAP	Rural Energy for America (USDA)
RE Fund	Renewable Energy Fund (AEA)
RPSU	Rural Power System Upgrade (AEA)
SCADA	Supervisory Control and Data Acquisition
SWAMC	Southwest Alaska Municipal Conference
TDX	Tanadgusix Corporation
UAA	University of Alaska Anchorage
UAF	University of Alaska Fairbanks
ULSD	Ultra Low Sulfur Diesel
USDA	United States Department of Agriculture
VEEP	Village Energy Efficiency Program (AEA)

EXECUTIVE SUMMARY

The Aleutian & Pribilof Islands Regional Energy Plan is part of a statewide effort led by the Alaska Energy Authority to identify energy projects that will reduce the long-term cost of energy and dependence on fossil fuels in Alaska. The process is designed to look at the total mix of energy needs in rural Alaska, including electricity, heating and transportation, and consider all local and regional energy resources as well as efficiency and conservation.

This document summarizes public input received in Phase II, especially relating to energy priorities and recommended strategies for development and cost savings. It updates information presented in the Phase I report on energy supply and demand, and it takes a new, more quantitative approach to assessing the potential for renewable and non-renewable energy resources at the community level, which is consistent with what is being done in other regions.

The goal of this phase has been to engage community and regional leaders, residents, utilities, industry representatives, and other key stakeholders in dialog about their priorities for addressing energy needs in the region and to develop a list of projects to be assessed for economic and technical feasibility in the third and final phase of the planning process. The Phase III report will identify broadly supported strategies and a list of fundable projects that can reduce energy costs in the Aleutian and Pribilof Islands region while developing local and regional energy resources.

Phase I Resource Inventory and Recommendations

Phase I provided an inventory of energy-related issues and resources in the region. While this inventory necessarily represented a snapshot in time, it identified both broad and community-specific recommendations that have been used to focus conversations during Phase II on the most technically feasible and economically realistic projects, given the region's mix of resources and the current state of technology. The Phase I regional recommendations are summarized here:

MAXIMIZE ENERGY EFFICIENCY WITH A FOCUS ON REDUCING THE HIGH COST OF SPACE HEATING

- Improve residential energy efficiency and weatherization.
- Improve energy efficiency in public and commercial buildings.
- Improve energy efficiency of water and sewer systems.

FOCUS ON MAINTENANCE AND EFFICIENCY OF EXISTING INFRASTRUCTURE

- Upgrade diesel power system to reduce line losses, improve overall efficiency, and prepare for integration of renewables.
- Implement or expand heat recovery for community buildings where economically feasible.

DEVELOPING LOCAL ENERGY GENERATION WITH A FOCUS ON PROVEN, COST-EFFECTIVE TECHNOLOGY

- Pursue hydro and wind energy power where local opportunities exist.

- Monitor emerging opportunities in tidal and wave power.
- Evaluate availability of fish waste for community energy use.

MAXIMIZE ECONOMIC IMPACT WITH A FOCUS ON COMMUNITY VIABILITY

- Assess potential projects and funding options with an eye to maximizing economic impact in communities, including job creation and economic issues caused by high energy costs.
- Be realistic about growth scenarios when evaluating project economics. Be prepared to make tough decisions about big projects in small communities and adding new infrastructure that will need to be maintained and upgraded over time.

ADDRESS ENERGY ISSUES AND COMMON NEEDS THROUGH COLLABORATION

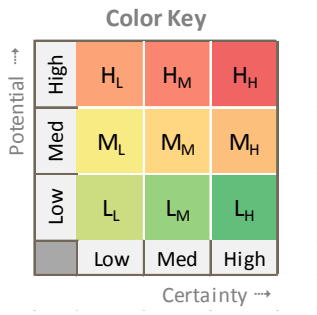
- Identify common issues among small rural utilities that can be addressed more efficiently through information sharing and collaboration, such as training for the current and next generation of utility operators and managers, and technical assistance with PCE reporting, grant writing, project planning and development.
- Convene an energy committee, working group or stakeholder forum to share information on energy projects, identify opportunities for collaboration, and help mediate community and regional differences related to energy resource development.

Phase II Energy Resource Potential Analysis

In Phase 2 we analyzed resources by community using standardized metrics (see Chapter 3). Potential for savings from new, community-scale projects is greatest from energy efficiency, hydro, wind, heat recovery and geothermal energy, though differences exist across communities.

Table 1: Energy resource potential and certainty for new community-scale projects

	Adak	Akutan	Atka	Cold Bay	False Pass	King Cove	Nelson Lagoon	Nikolski	Saint George	Saint Paul	Sand Point	Unalaska
Biomass	L	L	L	L	L	L	L	L	L	L	L	L
Geothermal	M	M	M	L	L	L	L	L	L	L	L	M
Hydro	H	H	H	M	H	H	L	L	L	L	L	H
Solar	L	L	L	L	L	L	L	L	L	L	L	L
Wind	H	L	M	H	L	H	L	L	H	H	H	H
Coal	L	L	L	L	L	L	L	L	L	L	L	L
Oil & Gas	L	L	L	L	L	L	L	L	L	L	L	L
Heat Recovery	M	M	L	M	H	L	M	L	L	L	H	L
Energy Efficiency	H	M	H	H	H	H	H	H	H	H	H	H



The first letter in each square represents resource potential. The subscript indicates the level of certainty in the resource potential rating.

Phase II Stakeholder Engagement and Public Input

In Phase 2, we spoke with regional stakeholders, community leaders and residents about energy projects and priorities with the potential to advance the broad strategies outlined in Phase I. Outreach activities include an online survey to a broad group of stakeholders to collect input on the Phase I resource inventory and recommendations, a half-day Energy Summit in Anchorage in conjunction with SWAMC's Annual Conference in March 2015, interviews with community leaders (in-person for Aleutian cities with offices in Anchorage), and a public website with project information and reports.

During these activities, we informed the communities of the regional energy planning effort and listened for common themes that unite the region, as well as for instances where energy needs or priorities differ.

Regional Energy Roadmap

Based on community/utility interest and resource potential, the planning team developed a list of projects and activities with the potential to advance the regional strategies identified through the energy planning process. This list provides a potential "energy roadmap" for the region. Economic analysis in Phase III will provide additional insights on which projects have the best chance of reducing the long-term cost of energy and dependence on fossil fuels in the region. As this determination is based on currently available technology and community support (demonstrated by active leadership and/or financial support of projects) this roadmap must revisited on a regular basis to ensure emerging opportunities are not missed.

Table 2: Proposed Regional Energy Roadmap

Strategy	Resource	Actions
Short Term		
Planning and Collaboration	Energy Committee	Establish a regional energy committee supported by regular meetings or teleconferences to continue the work of energy planning, support implementation of priorities, including identification of funding sources, and to share information on energy projects and needs.
	Bulk Fuel Cooperative	Assess feasibility of forming a bulk fuel cooperative in the region among interested communities and regional organizations.
	Community Facility PCE	Take full advantage of the PCE subsidy available for community facilities in communities that are not near their limit: Akutan, Sand Point, Unalaska and Adak.
Maximize Energy Efficiency	Energy Efficiency	Expand participation in home energy rebate and weatherization services through education and outreach, and addressing current barriers to participation.
		Complete inventory and benchmarking of non-residential buildings in every community in order to establish baseline data and identify projects with the greatest savings potential.
		Complete recommended commercial and public facility retrofits with short to medium payback periods using loans if necessary. Investigate public ESCO model to fund retrofits in large high-energy use buildings or across multiple buildings.

Strategy	Resource	Actions
		Upgrade streetlights and public facility lighting to LEDs in all communities.
		Conduct energy audits of water and sewer systems and implement cost-effective retrofits. Require new installations and major upgrades to have high standard of energy efficiency.
Maintain and Improve Efficiency of Electric Utilities	Diesel Efficiency and Line Loss	Right size the diesel generation system in Adak to address inefficiencies created by over built system. Improve diesel efficiency in other communities below AEA benchmark, including Atka, Nelson Lagoon and Nikolski.
		Replace distribution lines and transformers in Adak, False Pass and Nelson Lagoon to reduce line loss. Assess reasons and remedies for line loss in other communities with high (over 12%) or moderate (over 5%) line loss.
	Heat Recovery	Expand heat recovery systems to all buildings close to power plants where economically viable. Assess feasibility of using recovered heat from power plant to heat False Pass school and Sand Point water/wastewater facility.
	Workforce Development	Assess training needs for current and next generation of powerhouse operators, managers and utility clerks.
Maintain and Improve Transportation Infrastructure to Reduce Energy Use and Costs	Transportation	Investigate new docks for Akutan and Cold Bay and other communities that need access roads and infrastructure upgrades to reduce costs and improve safety for bulk fuel delivery.
Develop Local Energy Generation	Biomass	Assess feasibility for Biomass projects in Nelson Lagoon, Sand Point, and Unalaska.
	Geothermal	Continue geothermal exploration in coordination with Trident in Hot Springs Bay Valley.
	Hydro	Assess feasibility of hydro resources in Adak, Cold Bay (Russell Creek), Unalaska, and False Pass.
		Complete Atka Hydro-to-Heat Project and move King Cove Waterfall Creek hydro project into development.
	Natural Gas	Study feasibility of importing LNG by tanker to Unalaska for heat and power generation, including testing of LNG generator by the public utility. Conduct market analysis and potential impacts on bulk fuel costs in the region.
	Solar	Assess feasibility of small-scale, community solar PV and solar thermal projects where there is interest (Atka, St. George, St. Paul, and Unalaska). Encourage residential use, especially in off-grid areas and in facilities with high summer energy use.
	Space Heating	Install systems using excess electricity for space heating in public buildings, like the school in Sand Point, and residential structures in communities with excess hydro and wind energy.
	Wind	Support completion of Met tower wind studies started in Cold Bay, Nelson Lagoon, and False Pass. Initiate Met tower wind

Strategy	Resource	Actions
		studies for Adak, Atka, St. Paul, Unalaska, and King Cove (Delta Creek Valley).
		Replace damaged wind turbine in St. George and monitor integration into electricity grid.
		Collect high-quality electrical load data in order to understand power/energy uses and better model wind turbine options in the future.
Medium Term		**Continuation of short-term activities plus…**
Develop Local Energy Generation	Geothermal	Develop Akutan geothermal resource in coordination with Trident in Hot Springs Bay Valley based on results of confirmation wells, and business and operations plans.
		Assess the economics of using heat pumps for space heating in communities where renewable energy generation projects are able to bring electric rates down sufficiently (below $0.23/kWh).
	Hydro	Move hydro projects that prove feasible into design and permitting phase.
	Space Heating	Expand use of heat pumps (air, ground, or seawater) if other renewable energy projects reduce electric rates.
		Add space heating components to wind or hydro project design to create secondary loads, reduce heating costs and improve project economics where excess renewable capacity exists.
	Wind	Install wind turbines in communities where good wind resources and sufficient loads exist. If several projects are planned in the region, consider bundling purchase and installation of turbines to reduce project development costs.
	Natural Gas	Monitor developments in Alaska natural gas pipeline planning and global LNG markets to identify any new opportunities for importing LNG to the region
Long Term		**Continuation of short and medium-term activities plus…**
Develop Local Energy Generation	Hydro	Pursue construction of hydroelectric projects in Adak, Cold Bay, Unalaska, and False Pass if shown to be economically and technically feasible.
	Wind	Continue to look for opportunities to develop viable wind projects within the region
	Geothermal	Continue to look at feasibility of geothermal resources in Adak, Akutan, Atka and Unalaska. Monitor technological advances in use of low-temp geothermal for space heating and electrical generation.
	Hydrokinetic (In River, Tidal and Wave Power)	Monitor technological advances in use of tidal and wave energy for electric generation in False Pass, Nelson Lagoon and any other communities with proven resources. Conduct site-specific feasibility studies as technologies mature and become commercially viable.

Next Steps

In Phase III, rough estimates of project costs and benefits will be developed for projects included in the roadmap for which sufficient data exist. The Phase III report will also provide a draft action plan with steps local communities, utility owners and regional stakeholders can take to implement their priorities. It will be up to those in the region to decide which actions they would like to pursue based on community/utility interest and available funding or financing options. The cost-benefit information provided in Phase III will help with these decisions.

State support for implementing priorities will continue through AEA's Community Assistance program, which provides hands-on assistance in developing energy projects and addressing local issues, and through the Alaska Affordable Energy Strategy (AkAES), which could provide a future funding mechanism for energy infrastructure in areas of the state that do not have direct access to a North Slope natural gas pipeline.

In regions where no regional planning group or stakeholder forum exists for working on energy issues, AEA is recommending the creation of local or regional energy committees or working groups to assist with implementation and continue the work of energy planning into the future. The agency has committed to helping support the creation of these groups as part of the final phase of the regional planning process.

1 | Regional Energy Planning

The Aleutian & Pribilof Islands Regional Energy Plan is part of a statewide effort led by the Alaska Energy Authority to identify energy projects that will reduce the long-term cost of energy and dependence on fossil fuels in Alaska. The process is designed to look at the total mix of energy needs in rural Alaska, including electricity, heating and transportation, and consider all local and regional energy resources as well as efficiency and conservation.

This document summarizes public input received in Phase II, especially relating to energy priorities and recommended strategies for development and cost savings. It updates information presented in the Phase I report on energy supply and demand, and it takes a new, more quantitative approach to assessing the potential for renewable and non-renewable energy resources at the community level, which is consistent with what is being done in other regions.

The goal of this phase has been to engage community and regional leaders, residents, utilities, industry representatives, and other key stakeholders in dialog about their priorities for addressing energy needs in the region and to develop a list of projects to be assessed for economic and technical feasibility in the third and final phase of the planning process.

The Phase III report will identify broadly supported strategies and a list of fundable projects that can reduce energy costs in the Aleut region while developing local and regional energy resources. The economic analysis will use a standard statewide methodology to provide a preliminary evaluation of project costs and benefits. The Phase III report will also provide a draft action plan with steps communities, utility owners and regional stakeholders can take to implement their priorities.

Once complete, the plan is intended to serve as both a guiding document for communities and regional stakeholders and as a practical tool with information on the steps needed to move energy projects forward. Completed plans will also be used as an input to AEA's own statewide energy planning efforts, such as the Alaska Affordable Energy Strategy (AkAES) established by the Alaska Legislature in 2014 (Senate Bill 138).

Beyond the Current Planning Process

Although the state's Regional Energy Planning project will close in 2015, it is hoped that plans will continue to be updated as projects are implemented and circumstances change. A goal of the statewide project has been to develop regional capacity to continue the work of energy planning and implementing priorities. To this end, AEA is recommending the creation of local or regional energy committees or working groups. The agency has committed to helping support the creation of these groups as part of the final phase of the regional planning process. At the end of the project, energy committees or working groups will need to be self-sustaining or find support from regional partners or entities.

State support for implementing priorities identified through Regional Energy Planning will continue through AEA's Community Assistance program, which provides hands-on assistance to communities in developing projects and addressing issues, and through the Alaska Affordable Energy Strategy (AkAES), which could provide a future funding mechanism for energy

infrastructure needed to deliver affordable energy to areas of the state that do not have direct access to a North Slope natural gas pipeline (Figure 1).

The AkAES is a long-term, state-directed effort to help provide affordable energy to all areas of the state if a natural gas pipeline is built from Alaska's North Slope using revenues from a 20 percent set-aside of pipeline revenue.

In 2017, AEA will make recommendations to the Legislature on infrastructure needed to deliver affordable energy to areas in the state that will not have direct access to a natural gas pipeline. To assist in the identification of infrastructure projects, AEA plans to draw on the data collected and publicly vetted through the Regional Energy Planning process.

Figure 1: Regional Energy Planning timeline

PLANNING AREA

The planning area for this project includes the 12 communities within AEA's Aleutian & Pribilof Islands energy region, which follows the boundaries of the Aleut Corporation established under the Alaska Native Claims Settlement Act (ANCSA) as shown in the inset map in Figure 2.

Figure 2: Aleutian & Pribilof Islands Energy Planning Region

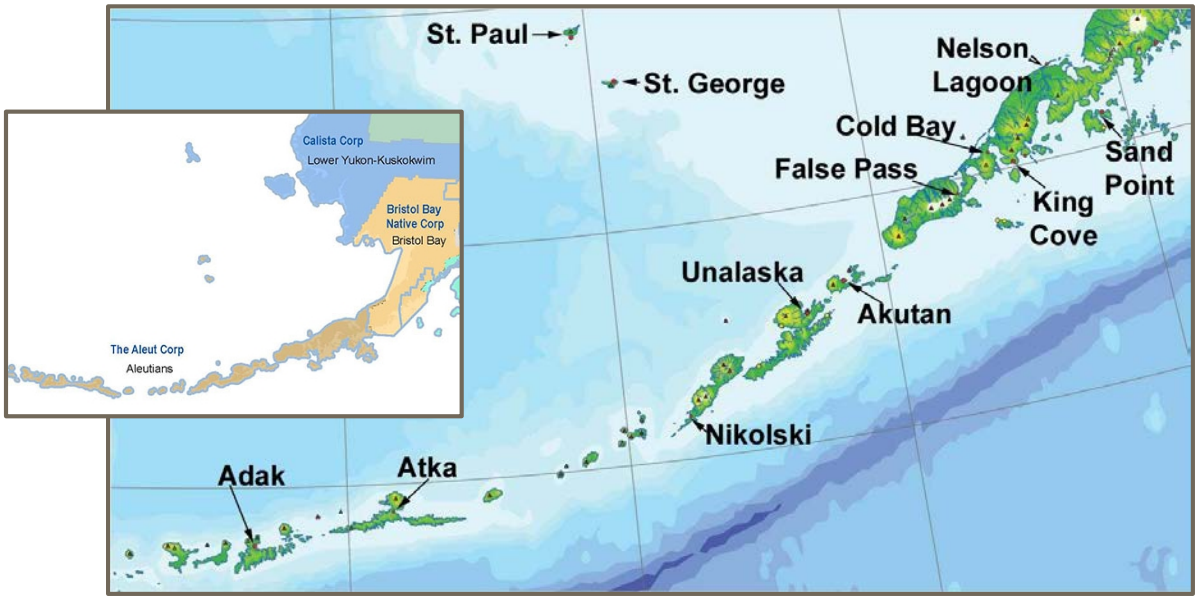


Table 3: Administrative jurisdictions within the Aleutian & Pribilof Islands energy region

ANCSA Region	Tribal Health Corporation	Borough and Census Areas	School Districts	Western Alaska CDQ Program	Legislative Districts
For Profit: **Aleut Corporation** Nonprofit: **Aleutian Pribilof Islands Association** (except Adak, Cold Bay) **Aleutian Housing Authority** (except Adak, Cold Bay)	**Eastern Aleutian Tribes** (Adak, Akutan, Cold Bay, False Pass, King Cove, Nelson Lagoon, Sand Point)	**Aleutians East Borough**[1] (Akutan, Cold Bay, False Pass, King Cove, Nelson Lagoon, Sand Point)	**Aleutians East Borough School District**	**Aleutian Pribilof Island Community Development Association** (Akutan, Atka, False Pass, Nelson Lagoon, Nikolski, St. George) **Central Bering Sea Fisherman's Association** (St. Paul)	Senate District **S** House District **37**
	Aleutian Pribilof Islands Association (Atka, Nikolski, St. George, St. Paul, Unalaska)	**Aleutians West Census Area** (Adak, Atka, Nikolski, St. George, St. Paul, Unalaska)	**Aleutian Region School District** (Adak, Atka, Nikolski) **Unalaska City School District** **Pribilof School District** (St. George, St. Paul)		

Note: 1/ Additional Census Designated Places (CDP) in the Aleutians East Borough include Belkofski Village, Pauloff Harbor, and Unga.

RECOMMENDED STRATEGIES

Regional Recommendations from Phase I

While each community has its own set of challenges and opportunities presented by its geographic, historical, and economic condition, the Phase I report concluded with a number of broad recommendations for regional energy planning.

MAXIMIZE WEATHERIZATION AND ENERGY EFFICIENCY, FOCUS ON SPACE HEATING

More effort needs to go into weatherization and energy efficiency. Since heating is such a high expense for households, more impact can be made on the daily cost of living in communities if homes are properly weatherized and made more energy efficient. The household and commercial heating and electrical loads need to be reduced to what is economically feasible, and communities and regional planners have a role to help households and businesses achieve this effort. Conversion to LED lighting and energy efficient appliances will also improve efficiency and save money over time.

FOCUS ON PROVEN, COST-EFFECTIVE TECHNOLOGY (ESPECIALLY HYDRO AND WIND)

As government energy funds are limited, and likely to tighten in the future, communities should focus on proven technologies that will maximize return on local and government investment.

- Hydropower has been shown to be effective in contributing a majority of a community's electrical load.

- Wind can contribute cost effectively where there is a stable, reliable resource, though due to the variable nature of wind, current technology does not allow it to be a standalone system.
- Insufficient woody biomass exists throughout the region to be a viable community-scale energy resource. Insufficient information is available to evaluate the availability of fish wastes for community energy use—all processors contacted reported utilizing the wastes economically.
- Tidal and wave power are still pre-commercial technologies and not appropriate technologies for isolated communities at this point.
- Geothermal is a high-risk, high-reward proposition: If a suitable reservoir can be found the resource can provide steady, consistent power, but the exploration process is very expensive and risky.

FOCUS ON MAINTENANCE AND EFFICIENCY OF EXISTING INFRASTRUCTURE

Prior to building new energy infrastructure, communities need to ensure that the current infrastructure operates properly through proper maintenance of the generation and distribution systems and recovering waste heat from the diesel powerhouses.

MAXIMIZE ECONOMIC IMPACT, FOCUS ON COMMUNITY VIABILITY

Lower energy costs will not ensure the viability of communities, but high costs can make it more difficult for a community to maintain its economic base. Funding and projects should look to maximize economic impact in the communities. This includes ensuring jobs for the communities, addressing economic issues caused by high energy prices and energy infrastructure, and lowering economic risk for homes and businesses.

Communities need to be realistic about growth and economic opportunities, planning for the most likely scenario and not the stretch goal. As the populations of several communities have declined significantly in the past decade, the region and state need to make tough decisions on whether new energy projects will enhance community viability.

ADDRESS ENERGY ISSUES AND COMMON NEEDS THROUGH COLLABORATION

The use of a number of potential energy resources is hamstrung by disagreements among stakeholders. An independent regional stakeholder forum could increase dialog and help mediate community and regional differences.

Small, independent utilities share many common needs, including training the current and next generation of operators and managers to maximize efficiency. Some common issues may be best addressed through information sharing and collaboration among small rural utility operators.

Strategies for Project Development in Rural Alaska

Some additional strategies for energy project development in rural Alaska have been recommended by energy planners working in other areas of the state as part of AEA's regional energy planning effort.

LOOK AT MANY SMALL SOLUTIONS RATHER THAN FOCUS ON ONE BIG PROJECT

AEA designed the Regional Energy Planning process to facilitate bottom-up, short- to medium-term energy planning driven by the needs and priorities of communities and regions. That means an emphasis on community-focused planning and solutions that can be implemented at the local level and sustained over the long term. Large, capital-intensive projects take years in planning and development and may leave small communities with infrastructure that is expensive to maintain and requires outside expertise to operate.

Like other forms of community planning, the goal of energy planning should be to create sustainable, thriving communities. Rather than focus on one big energy project (or while waiting for it to pass through bureaucratic and funding hurdles), communities and regional stakeholders should consider the universe of smaller projects that can be completed more quickly and cheaply, but which cumulatively can have a big impact.

FOCUS ON ENERGY EFFICIENCY IN THE SHORT TERM

Given the current Alaska state budget crisis and the relatively low price of oil, there are strong reasons to focus on energy efficiency opportunities in the near term:

- The outlook for new State investment in major infrastructure projects is poor, but the State is still funding popular programs to help pay for energy efficiency audits and upgrades.
- Comparatively few households in the Aleutian and Pribilof Islands region have taken advantage of these programs to date and relatively few commercial and public facility energy upgrades have been performed in the region. As a result, there is still a lot of opportunity in this area.
- Even without state funding, many EE&C projects pay for themselves within a few months or years. In the long-run, it costs more to wait to do efficiency upgrades than doing them now, even if a loan is needed to cover up-front costs.
- A good time to invest in energy efficiency is when oil prices are down. By using some of the money not being spent on fuel (due to lower prices) on energy efficiency measures, the pain of high energy costs will be less when oil prices do go back up.

TAKE ADVANTAGE OF FEDERAL PROGRAMS, ESPECIALLY FOR TRIBALLY AFFILIATED GROUPS

The Department of Energy has recently increased its staffing and outreach in Alaska through the Office of Indian Energy (DOE-IE). This is a good time to take advantage of federal energy programs, especially for any entity with an Alaska Native affiliation (including federally recognized tribes, ANCSA regional and village corporations, Native nonprofits, and Public Law 93-638 compactors). Utilities may be able to partner with tribally affiliated entities to leverage these federal funds. To date, no communities in the region have participated in the DOE-IE START program, a competitive technical assistance program that provides three to five years of assistance in energy planning and project development. Every tribe is also eligible for 40 hours of technical assistance per request from DOE in a non-competitive program in which each tribe or eligible group may submit multiple requests per year.

USDA Rural Development provides a source of federal funding open to all rural communities regardless of Native affiliation. Rural Energy for America (REAP) and Rural Utilities Service (RUS) are two USDA programs that can be used by Alaska utilities and small businesses to fund clean energy and energy infrastructure projects.

PAY ATTENTION TO FACTORS FOR SUCCESS

Energy planning and project development are slow and iterative processes. A spirit of optimism is useful for keeping everyone focused on the goal, but it should not prevent clear-eyed vetting of proposed projects in which risks are analyzed as well as benefits. The following lessons learned about developing successful energy projects came from regional energy planners and project developers at the 2013 Alaska Rural Energy Conference (Table 4).

Table 4: Factors for successful energy projects

TO BE SUCCESSFUL…		
Energy projects must be	**Energy projects must have**	**Energy planners must have**
▪ Economically viable ▪ Technologically feasible ▪ Supported by the local community, resource owners, utility operators, and state and local governing entities	▪ A local champion ▪ Long-term, reliable and sustainable fuel sources	▪ Hope and optimism ▪ Many conversations with stakeholders

2 | Energy Supply and Demand

Alaska's Regional Energy Planning process is intended to look at the total mix of energy needs in rural Alaska—for electricity, heating and transportation—and to consider all local and regional energy resources including efficiency and conservation. However, data issues prevent a consistent level of detail and analysis.

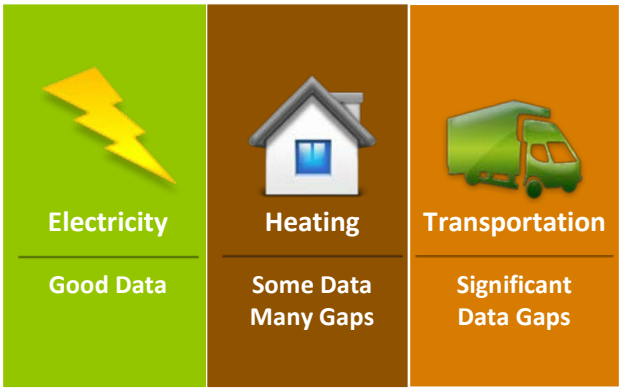


Figure 3: Data availability by energy sector

Good data is available on supply and demand for electrical power from the Power Cost Equalization (PCE) program, the Regulatory Commission of Alaska (RCA), and from utilities themselves.

Space heating costs account for over 80 percent of home energy budgets in Alaska and around 55 percent of the energy costs in public and commercial buildings. Good data on heating fuel use, including heating efficiency and types of fuels used for heating, is increasingly available from the Alaska Housing Finance Corporation through the Alaska Retrofit Information System (ARIS). Data is better for residential buildings.

While we know that transportation costs directly affect total energy and food costs, especially in rural areas, there is little data routinely or consistently collected on transportation costs and fuel consumption. Wholesale fuel cost and sales data is largely the proprietary data of fuel vendors.

Electric Power

Electric power in the region is primarily produced by small, independent, often municipally owned, utilities. The exception is TDX power, which provides electricity to Adak and Sand Point. Six utilities generate and sell 96 percent of the power (Figure 4). Small utilities in the other five communities (False Pass, St. George, Akutan, Atka, Nelson Lagoon, and Nikolski) each produce less than 1,000 MWh per year. Each utility maintains its own distribution grid. No utilities are interconnected by transmission lines.

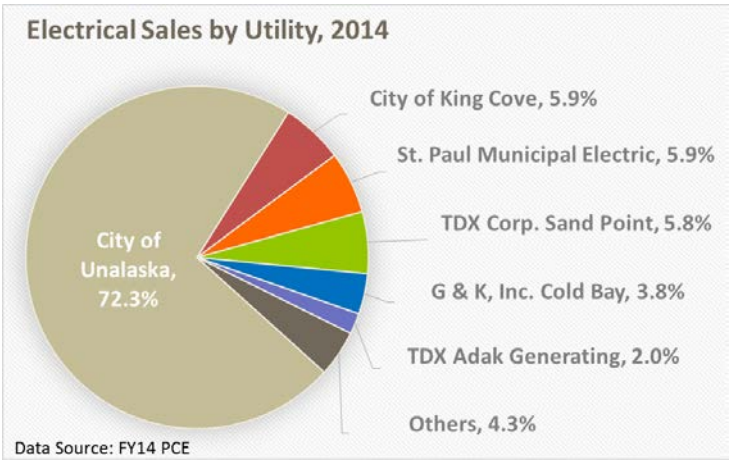
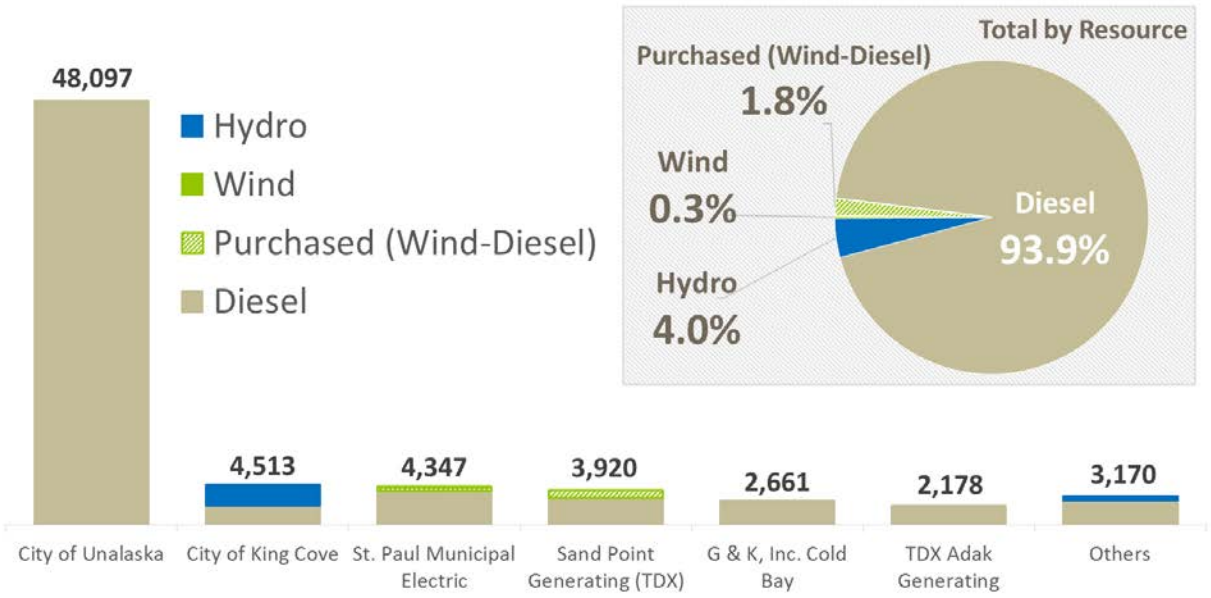


Figure 4: 2014 Electrical sales by utility

The vast majority (94 percent) of power in the region is produced with diesel fuel, though development of renewable resources is growing and now accounts for a significant share of power in a few communities. Hydroelectricity provided 79 percent of Atka's power and 52 percent of the power generated in King Cove in 2014. While there was no hydro power produced in Akutan last year, 25 to 44% of its electricity came from hydro in the two previous years.

Figure 5: Regional electrical generation by utility and resource, 2014 (MWh)



Data source: (1)

Wind energy contributed 22 percent of the municipal power in Sand Point and 13 percent in St. Paul in 2014. In total, hydroelectric projects contributed 4.0 percent of the region's publicly available electricity last year, while another 2.1 percent came from wind energy (Figure 5).

Public Electric Utilities

Extensive profiles of all public electric utilities in the Aleut region are provided in the Phase I report, with updated statistical data included in the Community and Energy Profiles, starting on page 71, in the current report. A brief overview of the region's six largest utilities, which together account for over 95 percent of electric sales, is provided below.

CITY OF UNALASKA

The City of Unalaska owns and operates the electrical utility in Unalaska, which has a generating capacity of 19 MW. In 2014, it produced over 48,000 MWh, accounting for 72 percent of regional electric sales. Power is sold to a largely commercial customer base, as well as to over 700 homes and 50 community facilities. While all power is diesel generated, a new 200 kW Organic Ranking Cycle generator also converts waste heat to electricity at the Dutch Harbor powerhouse. Three seafood processors in Dutch Harbor operate their own diesel powerhouses with a combined load larger than the city's—approximately 62,000 MWh/year (2). Integrating private powerhouses into the municipal grid is one of the energy priorities the city is working on.

CITY OF KING COVE

The City of King Cove owns and operates the electric utility in King Cove. Averaged year round, 60 percent of the city's power is supplied by the 800 kW capacity Delta Creek hydroelectric plant, and the remainder by a diesel power plant with a capacity of 2,700 kW. In summer months, hydro production typically exceeds 90 percent and occasionally approaches 100 percent of total

generation. Conversely in winter, when the electrical consumption in King Cove is greatest, hydro generation drops below 10 percent. The switch gear to integrate the diesel and hydroelectric plants is computer controlled and fully automatic (2).

ST. PAUL MUNICIPAL ELECTRIC

The City of Saint Paul owns and operates the electric utility in Saint Paul. Its diesel plant has a total generating capacity of over 2.5 MW. A power purchase agreement (PPA) enables it to also buy wind energy from TDX Power, a subsidiary of Tanadgusix Corporation (TDX), the Alaska Native village corporation of St. Paul Island. (TDX Power also owns and operates utilities in Adak, Sand Point, Manley Hot Springs, and on the North Slope.) TDX Power operates three 225 kW wind turbines at its POSS Camp industrial/airport complex on St. Paul Island. With the PPA, one turbine now produces power for the city. The city's diesel powerhouse was upgraded to integrate wind power into the municipal grid, and it purchased its first wind power from TDX in 2014. The city recently installed a flywheel for storage of excess wind energy. The turbine can be expected to deliver over 800 MWh/year based on performance at the POSS Camp. Trident Seafoods runs a separate, unconnected electrical grid on St. Paul Island with a 2.2 MW capacity.

SAND POINT GENERATING / ALEUTIAN WIND ENERGY

TDX Sand Point Generating, LLC has owned and operated the electric utility in Sand Point since 2000. Its diesel plant has a total generating capacity of 2.6 MW, and the generator controls are fully automatic synchronizing switch gear. TDX also operates two 500 kW wind turbines through a subsidiary, Aleutian Wind Energy, LLC. The turbines have been oversized for existing electrical load and therefore curtailed to 300 kW each. The utility is in the process of installing battery storage and additional secondary heating loads to increase utilization of the excess wind energy and allow it to operate in a "wind only" mode for up to 30 percent of the year (3).

G&K INCORPORATED

G&K, Inc., the electric utility in Cold Bay, was started in 1987 by owner Gary Ferguson, who was contracted by the Department of Military Affairs to supply emergency power to the U.S. Air Force Base in Cold Bay. The State also asked Ferguson to rebuild the electric utility for the community. G&K continues to supply power to the critical loads of the Air Force's Long Range Radar Site and the FAA's navigational equipment. Because of the strict operational requirements of the U.S. Air Force, G&K has never experienced an unplanned outage. The generation system includes older diesel engines that have been well maintained, but are in the second half of their useful life. The switch gear is computer controlled and is fully automatic. Cold Bay has not received funding through the Rural Power Systems Upgrade (RPSU) program (2).

TDX GENERATING ADAK

TDX Adak Generating (TAG) owns and operates the electrical utility in Adak, generating electricity by diesel. Given the decrease in community population since the utility infrastructure was built in the 1990s, the generation and distribution system are grossly oversized for the community load. The powerhouse has a generating capacity of 2.24 MW and manually controlled switch gear. Several generators are in need of a complete overhaul or replacement. Other serious issues include roof leaks and signs of fuel leaks at the powerhouse. The distribution system is generally in poor shape, with transformers, junction boxes, and power poles in need of repair and replacement. A health and safety inspection showed significant problems with the potential for

loss of life. The poor efficiency of the generators, high line losses, and decreasing customer base contribute to the highest residential rates in the region, both before and after PCE reimbursement. A demand charge is levied against residential customers, which can range from $0.15 to $2.00 more per kWh than the commercial rate, and is charged in addition to the power costs. This contributes to the high price volatility in Adak (2).

UTILITIES PRODUCING LESS THAN 2,000 MWH

The City of Akutan owns and operates the electric utility in Akutan. The diesel plant has a total generating capacity of 450 kW. The City also operates the 105 kW Town Creek hydroelectric plant. The actual production of the plant is unknown due to metering issues. The generators were recently replaced and are in good condition. The controls are manually operated synchronizing switch gear. Akutan also received RPSU funds to upgrade its distribution system. Trident Seafoods runs a separate, unconnected electrical grid with a 7 MW peak load. It is estimated to generate more than 36,000 MWh of electricity at a cost of $0.21/kWh (2).

The City of Atka owns and operates the electrical utility in Atka. Electricity is generated by the 283-kW Chuniisax hydropower plant and by diesel generation. Since the hydroelectric plant came online in December 2012, it has supplied nearly 90 percent of the electricity in Atka. The diesel generation system and distribution system are in good shape and are properly sized for the community load. The switch gear is manual (2).

City of False Pass owns and operates the electric utility. The city's diesel plant has a generating capacity of 375 kW. The switchgear is manually synchronizing. New generators were installed in the recent past, however the distribution system is in poor condition, with improperly installed meters in need of replacement (2). The community is interested in renewable energy resources.

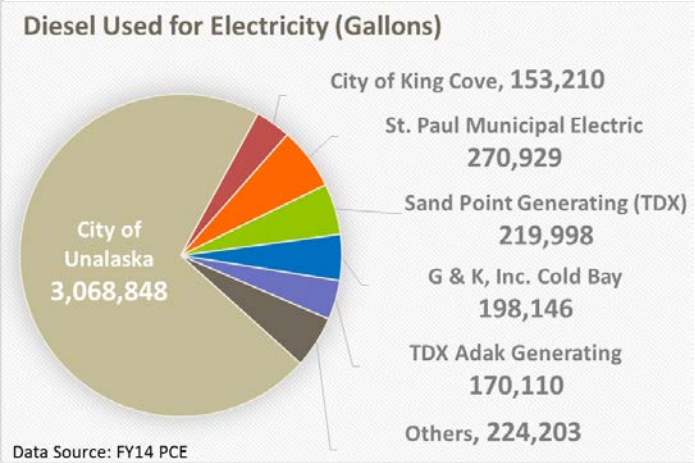
Nelson Lagoon Electric Cooperative has a total generation capacity of 220 kW from diesel gen-sets. A new generator building was built in 1998 and is located near the community dock and tank farm. The powerhouse has fully automatic synchronizing switchgear. Two generators are in fair condition. A third 75-kW generator is out of service. The utility's distribution system is in poor condition. Nelson Lagoon is in line for a Rural Power System Upgrade (RPSU) grant (2).

Umnak Power Company owns and operates the electric utility in Nikolski. The diesel plant has a total generating capacity of 196 kW. Nikolski had its diesel power infrastructure rebuilt under an RPSU grant and its switch gear is fully automatic synchronizing. Generators are in fair condition, and the distribution system in good condition. A refurbished 65 kW Vestas V-15 wind turbine was integrated into the grid in 2010 with an associated heat recovery system. Currently, the system remains inoperable, because the output is more than the diesel power system can handle with the existing community load and the reaction speed of secondary loads. Nikolski applied for additional REF funds in Round 5 to address the issues, but was not funded. (2) (4).

The City of Saint George owns and operates the electric utility, which produces electricity by diesel generators. The residential electric rate is the second highest in the region, due primarily to the high diesel costs on the island. The diesel powerhouse was recently rebuilt and a 95 kW wind turbine installed. The wind turbine burned out and is being replaced in fall 2015 with one of similar size. The new powerhouse includes a Web-based load control system monitored by technicians in Anchorage who are able to adjust the load required by the generators 24/7 to maximize fuel economy (5).

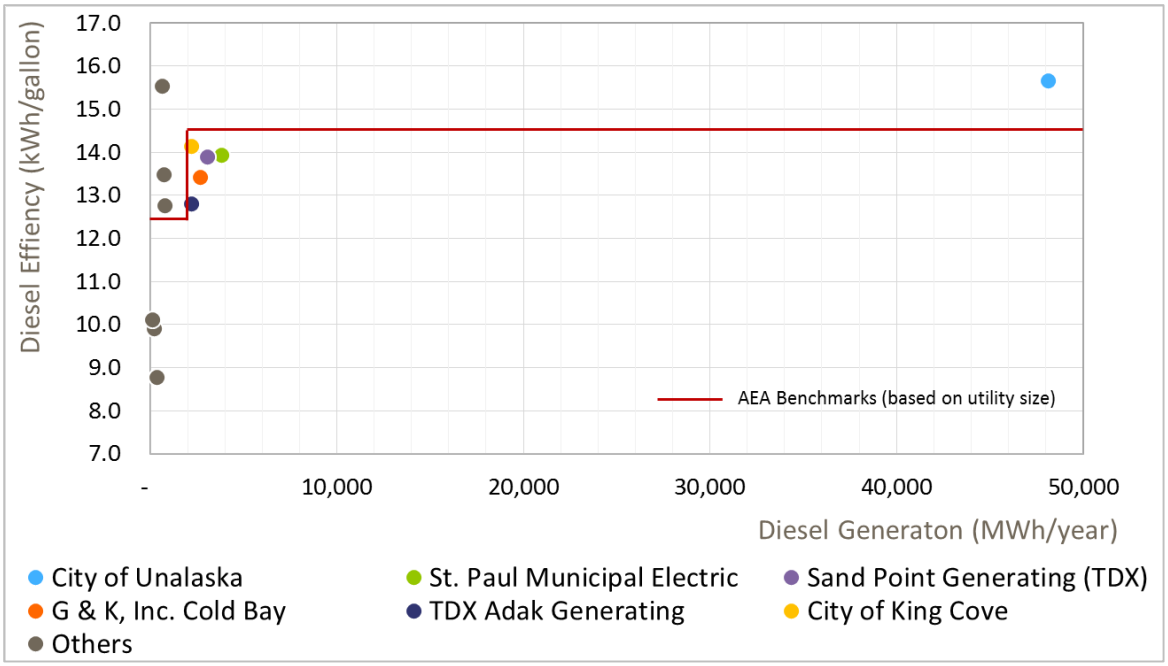
Diesel Efficiency

Figure 6: Diesel fuel used for electrical generation, 2014



Over 4.3 million gallons of diesel fuel are used annually to generate electricity in the region (Figure 6). Diesel efficiency (measured by the number of kWh generated from one gallon of diesel) currently ranges from 8.8 kWh/gallon in Nelson Lagoon to 15.7 in Unalaska (Figure 7). The red line shows AEA's performance benchmarks of 12.5 kWh/gallon for small utilities (those generating under 2,000 MWh/year) and 14.5 kWh/gallon for larger utilities.

Figure 7: Diesel efficiency, 2014



Data source: (1)

While it appears that diesel efficiency in the region is in the ballpark for most utilities, there is room for improvement that would save utilities money and fuel. If utilities below the AEA benchmarks improved system efficiency enough to meet them, they would save anywhere from $0.01 to $0.17/kWh in avoided fuel costs. Collectively these utilities would save 76,000 gallons of fuel oil annually—a savings of $375,000 per year at 2014 fuel prices. See Table 17 (Chapter 3) for an estimate of potential savings from increased diesel efficiency in the region.

Powerhouse and Distribution System Upgrades

See Table 5 for a list of rural power system upgrade (RPSU) and distribution system projects that have been completed or are in progress. It also lists communities with a local priority for addressing line loss or diesel efficiency issues. AEA's RPSU program has been limited in recent years, meaning even priority projects may not be funded in the near future. In 2014, six communities in the region had line loss above 12 percent, the threshold at which reductions in the PCE subsidy take effect. In Adak, line loss was 42 percent in FY 2014. The utility has begun to replace transformers and power lines but a critical need remains for "right-sizing" the vastly oversized powerhouse (6). According to a 2011 renewable energy reconnaissance study, this is a first step before any renewable resources can be integrated in the community (7). Other communities where line loss has been high are King Cove (17%), Akutan (15%), St. Paul (14%), and Nelson Lagoon (12%). Only Sand Point and Unalaska had a line loss of 5 percent or less in FY 2014. The recent RPSU project may have addressed many of the issues in St. George, where line loss had been the second highest in the region and the distribution system was in poor condition. See Table 18 (Chapter 3) for more on line loss and an analysis of potential fuel savings from addressing it.

Table 5: Powerhouse and distribution upgrades completed or in development

Community / Status	Project	Description
Completed		
False Pass, King Cove, Nikolski	RPSU	
Akutan	RPSU Distribution System Upgrade	
St. George	RPSU & Heat Recovery	
Scheduled or In Progress		
TDX Adak	RPSU & Distribution System Upgrade	"Right size" diesel plant and repair distribution system to address inefficiencies created by oversized system that is in poor condition, and to allow integration of one or more renewable resources. TDX Power has replaced transformers for most housing and is replacing power lines along the waterfront (fall 2015). New lines will be buried to increase reliability and protect from weather. There is still a need for a smaller power house and new, smaller generators but no funding has been allocated at this time. The project is included in AEA future project list, but funding is not guaranteed.
Unalaska	Local priority	Integrate private powerhouses into city utility grid
Priority		
Nelson Lagoon	Transformer/Distribution System Upgrade	Critical need to address high line loss through upgrade of distribution system, which is in poor condition. Transformers are beyond their useful life, and commercial and residential meters need replacement. The transmission system was measured to have a greater than 25% load imbalance across the three phases. Nelson Lagoon is in line for a RPSU grant to address these issues.
False Pass	Local priority	Address high line losses and improve diesel efficiency. Distribution system is in poor condition with improperly installed meters in need of replacement. The electricity distribution system was found to be 10-25% out of balance in the 2012 RPSU Survey.

Community / Status	Project	Description
St. Paul	Local priority	Upgrade diesel power system. Determine cause of line loss. Establish emergency generation for homes and essential services.

Data sources: (2) (7), interviews with community and utility representatives (see Appendix A).

Heat Recovery

Heat recovery lowers community energy costs by reducing the cost of heating public buildings near the powerhouse. Even when gen-sets operate at maximum efficiency, 60 percent of the energy in diesel fuel is released as heat. Waste jacket heat can be run through a heat exchanger that transfers heat to a heat loop. This process can recover 10 to 20 percent of the energy in the fuel. The heat can be measured and, if a heat sales contract is developed, can be sold to provide another revenue source for the utility. Potential users are often schools but can be any nearby buildings. While excess or waste heat is primarily a byproduct of diesel generation, heat can be harnessed from hydro or wind projects when their capacity exceeds local electrical needs. The excess power can be dispatched on an interruptible basis to secondary heating loads, such as an electric boiler connected to a single facility's heating system or to a district heat loop.

Table 6: Heat recovery systems completed or in development

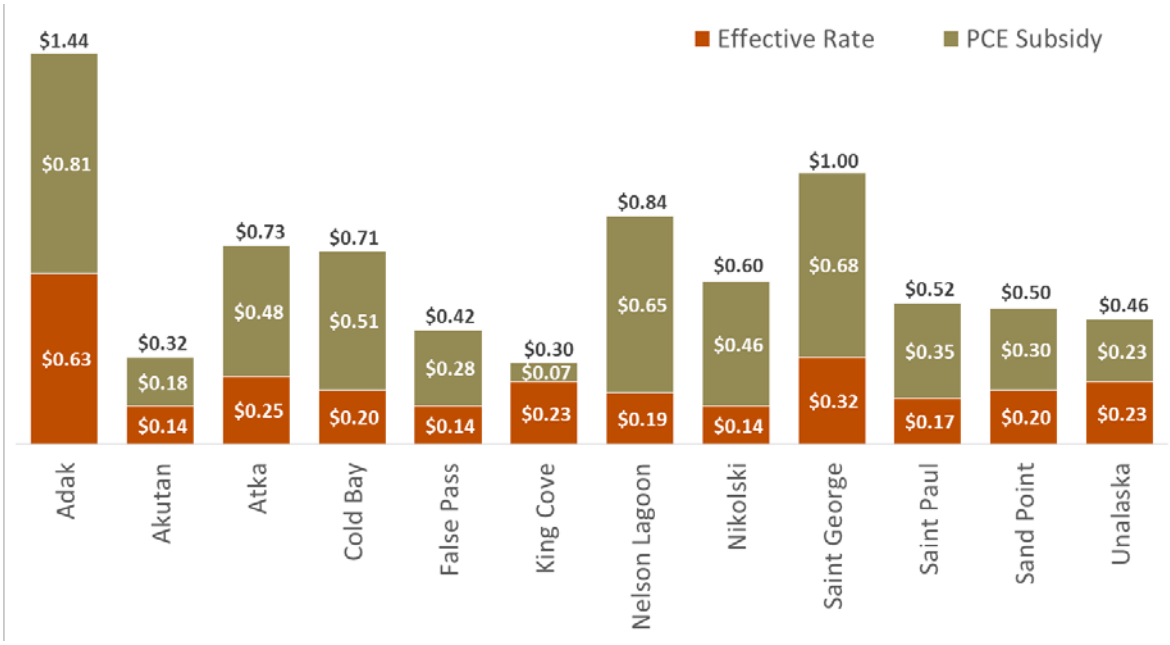
Community	Buildings Heated	Description
Operational		
King Cove	School, clinic, housing, and community center	The powerhouse has a fairly extensive heat recovery system that supplies nearby community buildings and includes a boiler that converts excess hydroelectric power to heat.
False Pass		The powerhouse has a heat recovery system installed. City would like to look at feasibility of delivering waste heat to the school.
Nikolski		The powerhouse has a heat recovery system installed and it is operational.
Sand Point		The powerhouse has a limited heat recovery system
St. George	St. George school, city offices and the public safety building	The powerhouse has a waste heat recovery system installed. The heat recovery loop was recently rebuilt as part of the RPSU project. The new system meets most of the space heating needs of the city and school (5).
St. Paul	Public Works office, machine shop, warehouse, fire station, gas station, bulk fuel office, fuel pump building, power plant office/storage	St. Paul uses recovered heat to heat a total area of 61,000 sq. ft. The city is completing a project to upgrade and extend the heat recovery loop to work with wind-diesel system.
Unalaska	Power plant offices (Significant, additional industrial heating loads exist.)	Unalaska uses recovered heat for hot water and space heat and to produce electricity using a 200 kW Organic Rankine Cycle (ORC) generator at the Dutch Harbor powerhouse. The system is designed for expansion to include excess heat from increased power demands when a new powerhouse is constructed.
Scheduled or In Progress		
Sand Point	School, health clinic	New REF 8 project will install electric boilers at the school and clinic to use excess wind energy for space heating, and integrate building energy use data into the power plant's SCADA system.
Cold Bay	Heat recovery system installed; at present it is not connected to other buildings.	Cold Bay received an REF Round 6 grant to assess the feasibility of implementing heat recovery at power plant. Expected completion in 2016.
No Heat Recovery		
Adak, Akutan, Atka, Nelson Lagoon		Powerhouses do not have a heat recovery system in operation.

Data sources: (2) (7) (8)

Electric Rates and Power Cost Equalization

Residential electricity rates vary widely across the region from $0.30/kWh in King Cove to $1.44/kWh in Adak. The state's PCE subsidy brings down the effective rate for the first 500 kWh of monthly residential use (Figure 8). For comparison, rates were $0.15/kWh in Anchorage in March 2015.

Figure 8: Residential electrical rates by community, 2014



Data source: (1)

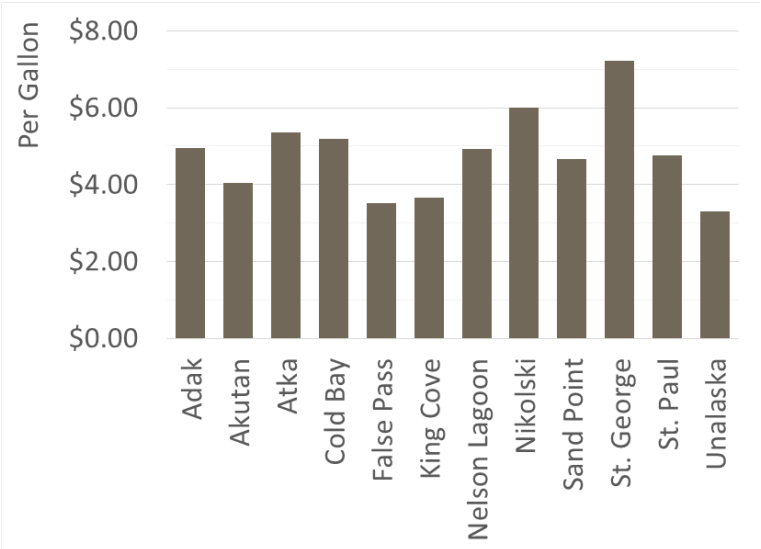
Fuel Vendors and Prices

Fuel Prices

Fuel prices are a large component of electricity rates, especially in communities producing all or most of their power through diesel generation. Fuel prices are set on global markets, but the delivered price can vary widely due to transportation costs. Factors affecting fuel price include distance from the distributor's linehaul routes, volume purchased, safety and ease of offloading at docks, contract terms, and the competitiveness of the market. (Some communities are served by only one vendor.)

The retail price of fuel oil for home heating is usually higher than the prices paid by utilities. Figure 10 shows that prices in four

Figure 9: Average diesel price paid by utilities, 2014



Data source: (1)

communities in the region are an average of $0.60 to $1.78 higher than Anchorage prices in most years.

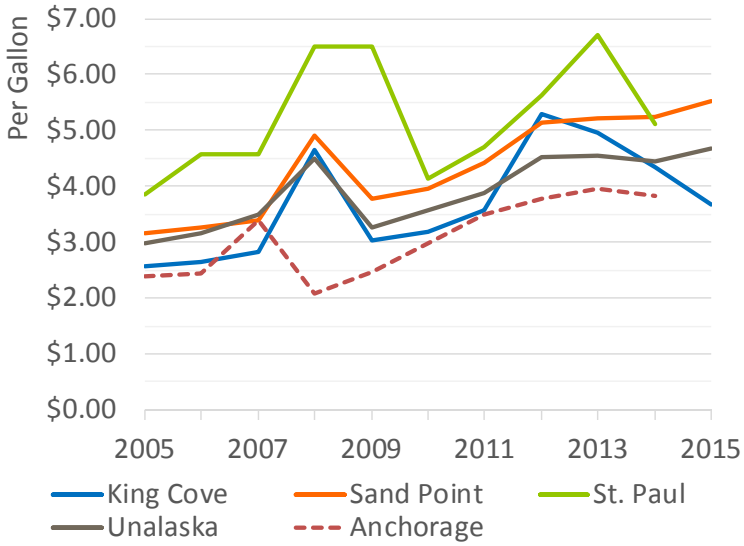
Fuel Vendors

Crowley, Delta Western, Vitus Marine, Trident Seafoods and Adak Petroleum are the primary fuel vendors in the region. Most communities use #2 diesel or #2 Ultra Low Sulfur Diesel (ULSD) for both electrical generation and space heating. A few communities have only one fuel vendor who delivers.

Bulk Fuel Storage

Most communities in the region have adequate bulk fuel storage. Bulk fuel upgrade (BFU) projects have been completed in Akutan, Atka, False Pass, King Cove, Nelson Lagoon, and Nikolski. Future projects are slated (but not scheduled or funded) for Cold Bay, St. Paul and Sand Point. Table 7 lists the known tank capacity for diesel fuels. Storage capacity for other transportation fuels is not included.

Figure 10: Retail price of #1 fuel oil



Note: Prior to 2011, the month in which fuel price data was collected varies by community. When data from the same month was not available, the closest month (within 3 months) was used. Data source: (13).

Table 7: Bulk fuel storage capacity

Fuel	Community	Past Vendors	Capacity (Gals.)	Owner / Uses
Jet A (High Sulfur #1)	Cold Bay	Crowley, Delta Western	300,000	Frosty Fuels: Jet fuel and heating oil
#1 Diesel	Atka		30,000	Residential & community heating
	False Pass		27,000	Peter Pan: Heating oil.
	Nelson Lagoon	Crowley	81,000	Residential heating
#2 Diesel (includes ULSD)	Adak	Adak Petroleum, a subsidiary of the Aleut Corporation	20,000,000	City Power Plant, community buildings, residential heating, fishing
	Akutan		80,000	City of Akutan
			5,000,000	Trident Seafoods facilities, fishing boats
	Atka		60,000	Heating, fishing boats
			40,000	Electrical Generation
	Cold Bay	Crowley, Delta Western	13,450	G&K Power Plant (Typically ULSD #2)
			110,000	Frost Fuels
	False Pass		65,000	City (owner). Power Generation
			300,000	Fishing, etc.

Fuel	Community	Past Vendors	Capacity (Gals.)	Owner / Uses
#2 Diesel (includes ULSD)	**King Cove**		159,500	City of King Cove: power plant, community buildings, some residential heating
			1,000,000	Peter Pan Seafoods: Peter Pan facilities, fishing boats, residential heating, transportation
	Nelson Lagoon	Crowley	54,000	Power generation
	Sand Point	Trident Seafoods	41,000	TDX Power Plant
			800,000	Trident Seafoods facilities, fishing boats, residential heating, transportation
	St. George		1,066,200	Saint George Delta Fuel. Electrical generation and residential heating.
	St. Paul		1,847,500	City of Saint Paul
			1,500,000	TDX Corp.
			300,000	Coast Guard
			12,000	Trident Seafoods
Multiple fuel types	**Unalaska**	Multiple vendors from Cook Inlet and West Coast refineries	16,000,000	Delta Western Fuels
			4,000,000	Petro Star
				(Plus multiple smaller tanks for utility, processors, etc.)

Note: Does not include storage for other transportation fuels (AV gas, unleaded gasoline, etc.). Data source: (2)

Natural Gas

Cleaner burning and lower cost than gasoline or diesel per unit of energy, natural gas could be another energy choice for the region if a reliable, affordable supply can be imported in the forms of LNG, CNG and propane. Liquefied Natural Gas (LNG) is created when natural gas is pressurized and cooled to less than -260 °F allowing it to be easily stored and transported worldwide by tanker. Compressed Natural Gas (CNG) is a transportation fuel that provides a cleaner burning alternative to gasoline. Propane is primarily a space heating and cooking fuel. Though tied to global oil markets, prices for these natural gas products have generally been falling as production has increased (9).

The City of Unalaska continues to look at the option of importing LNG to produce electricity. According to the Unalaska's Director of Public Utilities, preliminary calculations justify further testing in the form of running an LNG generator for a period of time and comparing performance and cost to diesel generators. The city is presently considering moving to this next step (10).

If tests are favorable, a detailed feasibility study is still needed to look at costs for storage, regasification, distribution, and the conversion of energy infrastructure for both power generation and heating. The economics of a project may hinge on the amount of diesel that can be displaced. LNG can be delivered in large bulk tankers, which hold significantly more fuel than Unalaska's yearly consumption, or in smaller individual tanks (10,000 gallons or less).

Regional considerations include whether an Unalaska LNG import project would make LNG more available to other communities or industrial users on the Aleutian chain, as well as the potential impact on bulk fuel prices in the region. If natural gas displaces up to 10 million gallons of diesel fuel used annually in Unalaska, regional prices could rise for other fuel types as the total volume brought to the regional hub is slashed (2).

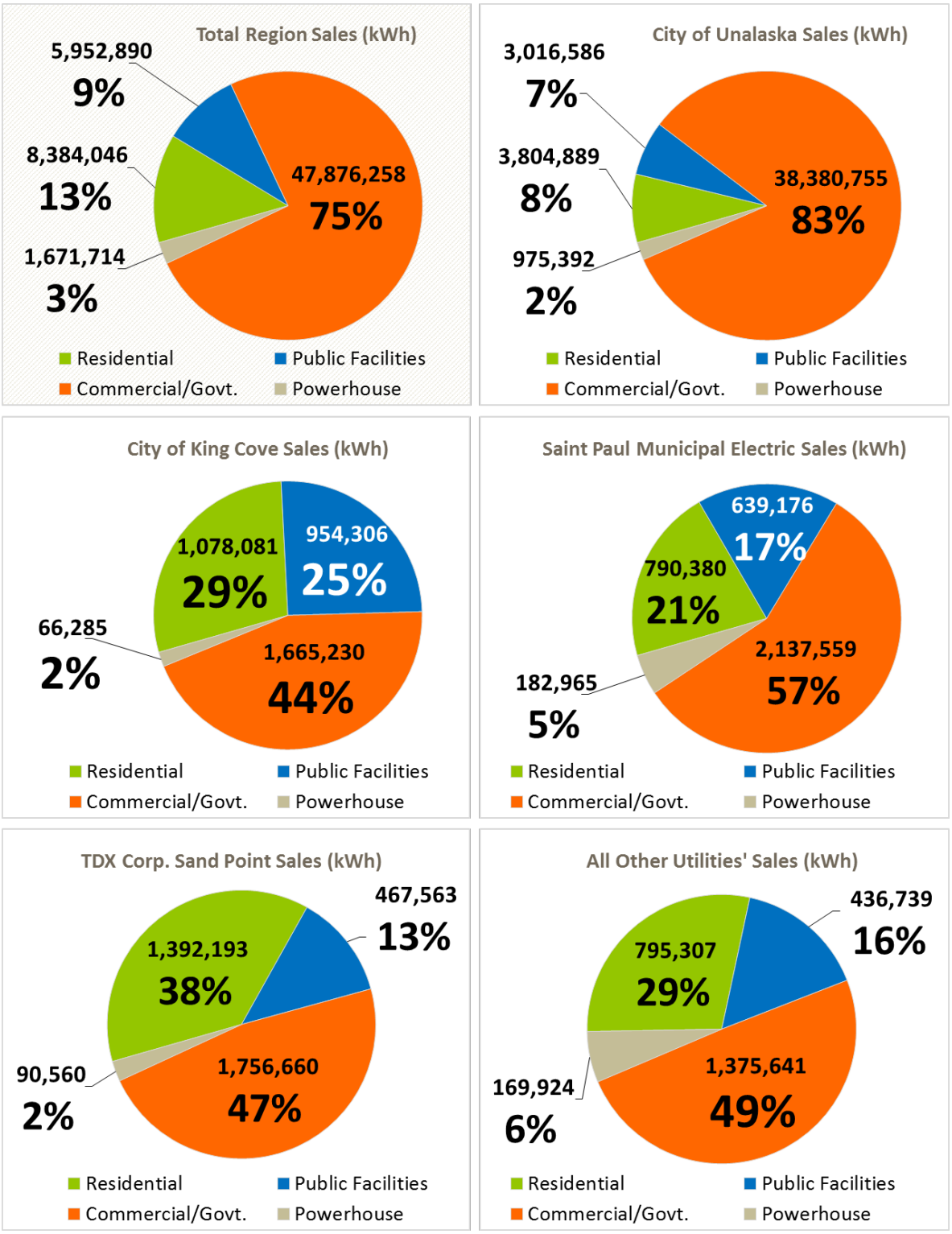
CURRENT AND PROJECTED DEMAND

Demand for Electricity

Nearly 69,000 MWh of electricity are produced and sold annually by public utilities in the Aleut region. Regionwide, 75 percent of this is used by commercial and government customers and 13 percent by residential customers. Public buildings and utility use account for the remaining 12 percent. However, there is considerable variation by utility in where electricity is used, with residential customers accounting for a high of 38 percent of use in Sand Point and public facilities reaching 25 percent of sales in King Cove. The largest commercial use is in Unalaska, accounting for 83 percent of all sales (Figure 11).

Mostly missing from these charts is electrical use by the region's fish processors who maintain their own generators. While the primary energy consumer in the region—possibly consuming more than all residential and commercial consumers combined—there is little data available on the fuel or electrical use of the region's seafood plants (2).

Figure 11: Regional electrical sales by customer type, 2014

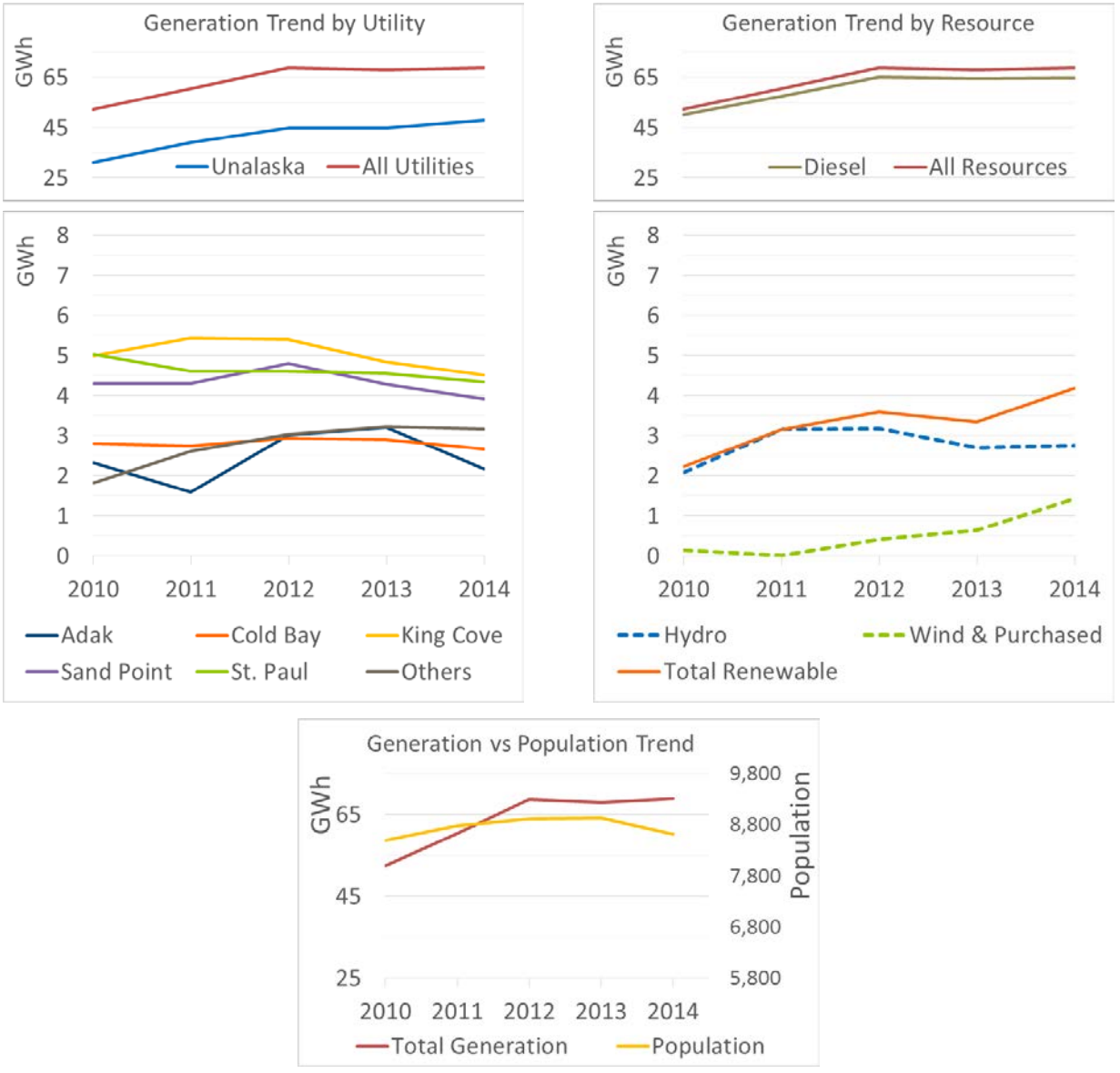


Data: PCE Annual Report (1)

Recent Trends in Electrical Generation

Regionwide, total generation has increased 31 percent since 2010, with increases coming from diesel (↑29%), hydro (↑32%), and wind (↑903%) (Figure 12, right). Growth in total generation has primarily been at the region's largest (Unalaska ↑54%) and a few of its smallest utilities. Generation and sales at other utilities have declined, including St. Paul (↓14%), King Cove (↓10%), and Sand Point (↓9%), while others have remained relatively flat (Figure 12 left), following trends in population (Figure 14). The region's total population grew 1.4% from 2010 to 2014.

Figure 12: Regional trends by utility, resource, and population, 2010-2014

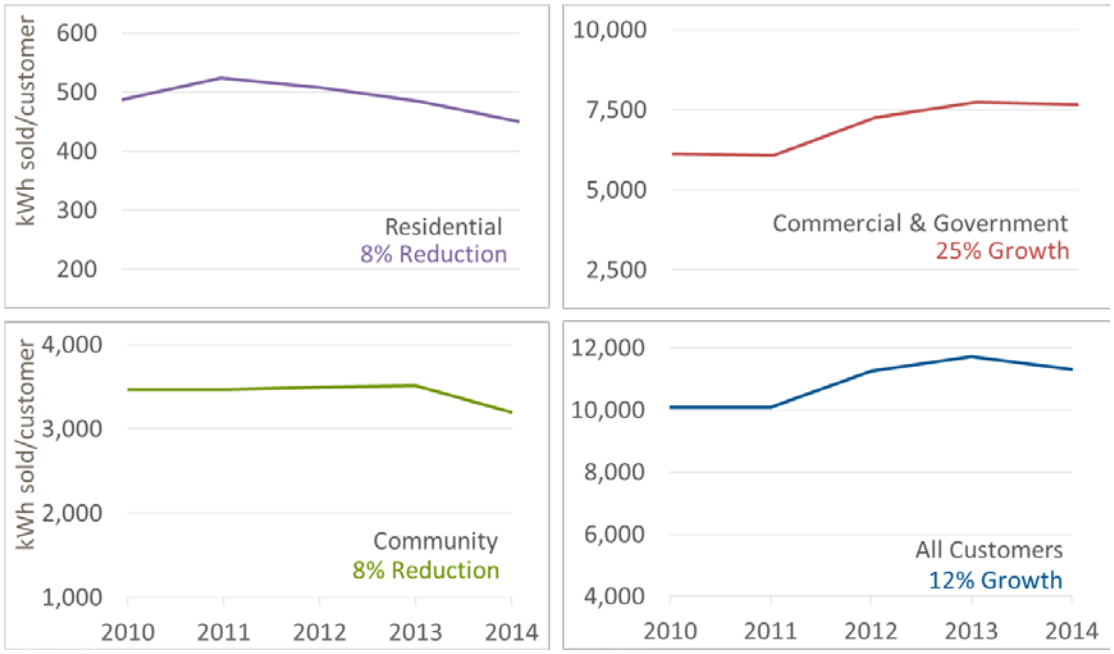


Data sources: (1) (11)

Recent Trends in Average Customer Use

Average monthly electrical use fell slightly over the past 5 years for residential and community facility customers at the region's three largest utilities, which may reflect the impact of higher prices and the push for increased energy efficiency and conservation. These declines have been more than offset by a 25 percent increase in average use among commercial and government customers, resulting in an overall growth of 12 percent in kWh sold *per customer* (Figure 13).

Figure 13: Trends in average monthly use by customer type in Unalaska, St. Paul, and King Cove



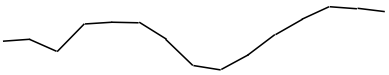
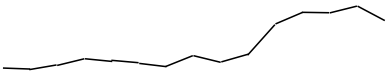
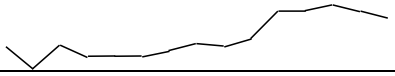
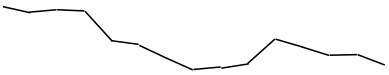
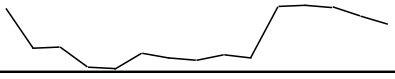
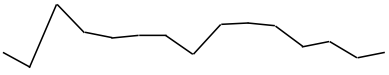
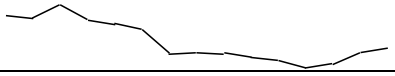
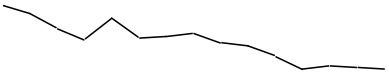
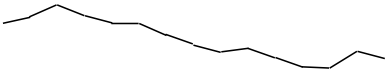
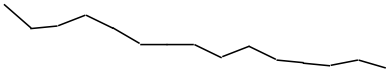
Data source: (1)

Population Trends and Projections

Since 2000, population in the Aleutian and Pribilof Islands has grown nearly 8 percent regionwide, an average of about 0.5 percent per year (Figure 14), though that growth has almost exclusively occurred in communities with populations over 500. Unalaska and Akutan each added 300 to 400 residents since 2000, while King Cove added over 100. In Akutan the increase was in group housing, not in the village, which has seen its population decline in the last 5 years from 90 to 70. The sharpest declines have been in the smallest communities, which have lost around half their population since 2000.

Alaska's state demographers predict the region's population will remain relatively flat at around 9,000 people over the next several decades, possibly declining by a few hundred individuals regionwide (12). Given the importance of the fishing industry to the region's economy, any population projections are highly dependent on the health and sustainability of the fish stocks. The addition of a single, new fish processing plant in a community would increase both its population and power needs.

Figure 14: Population trends by community, 2000-2014

Community	2000 Census		2014 Est.	Change Since 2000	Avg. Annual Growth
Over 500					
Unalaska*	**4,283**		**4,689**	9.5%	**0.6%**
Akutan*	**713**		**1,052**	47.5%	**3.2%**
Sand Point*	**952**		**946**	-0.6%	**0.0%**
King Cove*	**792**		**905**	14.3%	**1.0%**
101 to 500					
St. Paul	**532**		**436**	-18.0%	**-1.2%**
Adak*	**316**		**247**	-21.8%	**-1.5%**
51 to 100					
St. George	**152**		**92**	-39.5%	**-2.6%**
Cold Bay	**88**		**89**	1.1%	**0.1%**
Atka	**92**		**70**	-23.9%	**-1.6%**
50 or Under					
Nelson Lagoon	**83**		**44**	-47.0%	**-3.1%**
False Pass	**64**		**34**	-46.9%	**-3.1%**
Nikolski	**39**		**15**	-61.5%	**-4.1%**

* Includes population in group quarters such as barracks and dorms

Data sources: (13) (11)

Load Forecasts

Looking at trends in electrical sales, population, and the overall economic outlook in the state, it is likely that electrical loads will remain flat or grow slowly unless large industrial users enter the market or expand operations. Royal Dutch Shell was using Unalaska as a base for offshore oil and gas exploration in the Beaufort and Chukchi Seas. With Shell's decision in 2015 to end offshore oil exploration in Alaska for the foreseeable future, increases in the electric and heating loads in Unalaska, the region's largest market, are not expected. However, future changes to drilling operations would likely have an impact on Unalaska's heating and electric load. Increased use of electricity for space heating in communities with excess renewable energy will create secondary loads for electric utilities that pursue "wind to heat" or "hydro to heat" projects. The increased use of heat pumps could also increase loads in communities if they become more

economic due to lower electric rates or improvements in technology. New loads may be offset to some extent by continued investment in energy efficiency, where there is still considerable savings opportunity.

Transportation and Heating Fuel

No public data is available on the volumes of fuels used for transportation and space heating.

Renewable Energy

Renewable resources currently helping to meet energy needs in the region include hydropower and wind energy for electric production, with an increasing use of excess capacity to address space heating needs. Seafood processors in the region are using oil from fish waste as a biodiesel fuel for their own heating and power needs or selling it to market (2). Projects using other renewable resources are either still in development, or there are insufficient resources within the region given the current state of technology.

The Phase I report provides an in-depth inventory of all renewable resources on a community by community basis (2). A further analysis of resource potential is included in the current report in **Chapter 3**. The section below provides a summary of only those renewable energy projects that are operational or are in development in the Aleut region, though in some cases it mentions projects that were previously considered but are not being pursued at the present time. Community energy priorities that are not yet identified with a project are included in **Chapter 5**.

Biomass

Biomass is organic material such as wood, municipal waste or fish byproducts used to produce energy. Most biomass is burned for heat, but some technologies convert it into electricity.

WOODY BIOMASS

Insufficient woody biomass exists throughout the region to be a viable energy source, although local areas of driftwood can be useful for non-community use. Only one community (Nelson Lagoon) reported interest during stakeholder discussions in a pre-feasibility assessment of wood biomass as a community-scale resource.

SOLID WASTE

Unalaska is interested in assessing the feasibility of using solid waste incineration for energy production.

FISH OIL

Seafood processors report using oil from fish waste economically either in boilers or power plant generators, or selling it on the international market. It is not known whether there are sources of fish oil from the region's processing plants that could be available for community energy use (2).

In Akutan, Trident Seafoods uses its fish oil in boilers or sells it commercially, depending on the international demand for fish oil. In Dutch Harbor, Alyeska Seafoods processes fish oil to be blended with diesel—up to 800,000 gallons in a peak year. Westward Seafoods uses fish oil in its boilers to produce steam. It has used fish oil in gen-sets since 2002 in a 50/50 ratio with diesel.

Approximately 400,000 gallons of fish oil are burned annually compared with total diesel consumption in a recent year of approximately 1.7 million gallons, two-thirds for power production (2).

Geothermal

Geothermal energy is a high-risk, high-reward proposition: If a suitable reservoir can be found the resource can provide steady, consistent power, but the exploration process is very expensive and risky. While several geothermal studies have been conducted in the region, no projects have yet been developed, though the Hot Springs Bay Valley project in Akutan is in final design. Several other communities are known to have geothermal potential (Adak, Atka and Unalaska). While power generation has often been the goal of geothermal development, there are cases where using the resource to heat large building loads may be a simpler, more cost effective start to developing promising resources. Given the high risk/high reward nature of geothermal development (and a 90 percent average failure rate, industry-wide, of projects at the feasibility stage), rigorous feasibility work is needed to assess economic viability of these resources (2).

AKUTAN

The Hot Springs Bay Valley geothermal resource on Akutan could potentially supply all heat and electricity needs for the island, including the village, the new harbor, and Trident Seafoods. However, the project is estimated to cost $65 million and given the high risk nature of geothermal drilling, the Phase I report concluded that geothermal development should be a last priority for renewable resource development. Trident Seafoods would be the primary beneficiary of any development, and the power needs of the small community can be met by lower risk and lower cost options. While there is sufficient heat in the valley to power a geothermal plant, it is unknown if a site with sufficient permeability, porosity and fluid volume flow rate can be discovered to build an economically viable project (2).

Preliminary technical feasibility and an economic assessment were completed in 2009-2010. Exploratory drilling of two test wells was completed in August 2010. The project is now in final design and permitting. As part of this phase, a Power Sales Agreement and potentially a direct investment partnership with Trident Seafood Corporation will be enacted, and the economic and financial analysis will be updated to include the most current information and will be developed into a final business and operational plan (7). In January 2015, project engineers recommended the drilling of a 1,500 foot confirmation well to more precisely locate and size the resource for a potential 2-3 megawatt power plant. Drilling permits have been issued, and the drilling is scheduled for summer 2016 (14).

UNALASKA

Significant exploration work has been done at the Makushin geothermal site over the past 35 years, a combination of state, regional, and private interests. The prospect remains undeveloped. A recent study indicates geothermal resources present greater financial risk than the City of Unalaska can take on and the landowner has presented unreasonable demands. This project has been removed from the city's priority list.

Table 8: Geothermal projects in the Aleut region

Project	Lead Entity	Resource	Next Steps	Cost	Funding
Feasibility & Design					
Akutan Geothermal Development Final Design	City Utility	Geothermally active area on flank of Akutan volcano with many hot springs and fumaroles. The valley is about 4 mi. from the city, but not easily accessible.	Drilling of confirmation well in Hot Springs Bay Valley and completion of final design and permitting, power sales agreement with Trident Seafood, business and operations plan.	Total project cost $65 million (estimated)	AEA REF 2/3/4 ($5.82 million total), US DOE ($931,000), Local Match
Previously Considered					
Makushin Site (Unalaska)	City		This project has been removed from the city's priority list		

Hydrokinetic (Tidal and Wave Power)

There are no operational hydrokinetic projects in the region. Tidal and wave power are still emerging technologies that may be able to provide significant renewable energy in the future. Tidal power uses turbines, similar in principle to wind turbines, to convert tidal currents into electricity. Different designs are being tested across the globe, but no commercially available devices have been developed. More designs are being tested for wave power, which uses a number of different mechanical means of converting ocean waves into electricity.

The benefit of hydrokinetic power is that it would represent a predictable, if inconsistent, energy source. Significant issues still exist before it can be proven technically and economically effective in a remote location without significant subsidy and risk. The ocean environment is particularly challenging—the forces acting on the devices are great and the corrosive effects of sea water are well known. In addition, there are logistical challenges in deploying devices, and the lifespan and economics of the devices are still not known (2).

TIDAL POWER MONITORING AND DEMONSTRATION

While several communities in the region (False Pass, Nelson Lagoon) have outstanding tidal basin flows, there still remains to be a successful and continuous demonstration of technology to harness the tidal flows for electric power generation. If a robust and simple demonstration project can be made sustainable by the local utility for several seasons, demonstrated outside the region first, then the possibility for larger investment can occur (2).

The City of False Pass has done reconnaissance and feasibility work on its tidal resource, but its current focus has shifted to conventional hydroelectric feasibility. During the summer of 2012, Ocean Renewable Power Company (ORPC), a company developing a tidal energy turbine, performed a site assessment in Isanotski Strait through a DOE Tribal Energy grant. The completed reconnaissance showed that one site had the potential to produce approximately 600,000 kWh per year using ORPC's prototype 150 kW TidGen^{TM} power system. Although the study showed that the community's total energy could be nearly covered with one tidal power system, the tides, while highly predictable, are not constant. Without cost effective storage, diesel would have to supply power during times the tides are not sufficiently energetic, and the excess produced at peaks would likely need to be dumped as a heat load.

Table 9: Hydrokinetic projects in the Aleut region

Project	Lead Entity	Resource	Next Steps	Cost	Funding
Previously Considered					
False Pass Hydrokinetic Feasibility and Conceptual Design	City	Isanotski Straight	Measure velocities and turbulence at 3-5 sites in Isanotski Straight, do circulation modeling, environmental assessment, conceptual design, economic analysis, and outreach.	$566,466 REF 7. (Total project estimated at $5 million.)	AEA REF 7, APICDA, NREL (DOE funded reconnaissance study)

Hydroelectric Power

Hydropower converts the potential energy of water into electricity by sending it through a turbine connected to an electrical generator. Hydro power projects can either involve a reservoir with a dam or be run-of-river. A dam is generally more expensive and causes greater environmental impact, but it has the benefit of storing water that can be dispatched as power is needed. Without the ability to store water, a run-of-river project is a more seasonal resource. It involves piping the water through a penstock to the powerhouse (2).

There are three operational hydroelectric projects in the region (Table 10). While supplying only 4 percent of the region's total electric power, they typically contribute a majority of their community's annual electric loads. Hydroelectricity provided 79 percent of Atka's power and 52 percent of the power generated in King Cove in 2014. While there was no hydro power reported in Akutan last year, 25 to 44% of its electricity came from hydro in the two previous years.

KING COVE

The 375 kW Waterfall Creek Hydroelectric Project is located approximately 5 miles north of the City of King Cove and is within one half mile of the existing Delta Creek hydroelectric plant. Because the two sites are relatively close to one another, the powerhouse for the Waterfall Creek project will co-locate in an expansion of the existing Delta Creek powerhouse and use the existing transmission line to King Cove. The project will consist of a small diversion dam and intake, a 4,500 HDPE penstock, a 16x40 powerhouse expansion, a Pelton Impulse Turbine and 5,000 ft. of access roads. Expected completion of final design and permitting was November 2014. $3.9 million in construction funds were authorized in REF Round 6 (8).

AKUTAN

The hydroelectric plant at Town Creek was originally built in 1994. The 1.7 acre reservoir has a 20 acre watershed. A 3,300 foot pipe extends 765 vertical feet from the reservoir to the power house. A 150 kW Pelton turbine was originally installed. In 2011, $1.1 million from AEA's Renewable Energy Fund was used to reconstruct the infrastructure.

The hydro system has been operating routinely since 2013. Overall the project's reported capacity factor has been 34%, which is likely higher than actual. Since the renovation and reintegration of the Town Creek hydroelectric plant in 2012 the contribution of hydro to the total power supply is unknown due to metering issues.

ATKA

Since the Chuniisax Creek plant has come online in December 2012, hydroelectricity has supplied up to 90 percent of Atka's power. The hydroelectric plant consists of a 283 kW, cross-flow turbine operating on 116 feet of head. A 13 foot high concrete dam feeds a 1,060 foot penstock that delivers an average of 36 cubic feet per second (cfs) of water to the turbine. 39 acre-feet of storage behind the dam can help extend the yearly production. The project has the potential of generating 1,760,000 kWh/year, well above the community's needs.

A project to dispatch excess hydro power to secondary heat loads has not yet started, pending upgrades at the powerhouse. The city has received $135,289 in REF Round 7 funds, following a previous REF Round 3 grant for a total of $207,874.Table 10: Hydroelectric projects in the Aleut region

Operational	Under Construction	Feasibility & Design	Previously Considered
City of King Cove			
Delta Creek 800 kW Run of River completed in 1995. Provides 50-60% of local electricity.		**Waterfall Creek** 375 kW Run of River in final design and permitting. Will use expanded Delta Creek hydro powerhouse. (REF Rounds 5, 6 funding)	**Ram Creek** (Deemed infeasible)
City of Atka			
Chuniisax Creek Hydroelectric 283 kW Began supplying power in December 2012.	**Atka Dispatchable Heat Design & Construction** Hydro-to-Heat project on hold pending powerhouse upgrades (REF Rounds 3/7 funding)		
City of Akutan			
Town Creek 105 kW Repair and upgrades completed in 2014			**Loud Creek** Feasibility study complete. No further grant funds awarded. City funded continuation of flow measurements.

Potential hydroelectric sites have been identified in a number of other communities that do not have active projects. Among the sites still being considered for future development are the following.

ADAK

In November 2011, a reconnaissance report of renewable energy resources was completed for Adak. It concluded the most promising sites were hydroelectric resources, with some promise for wind energy. A follow up study of hydro resources in 2013 estimated a hydro capacity of 246 kW at Bonnie Rose Lake (which has an existing dam and provides the city's drinking water) and 513 kW at Moffett Creek. Costs of $0.72 to $0.52 per kW respectively were based on the assumption of doubling the average load (15). TDX Adak Generating submitted an application in REF Round 9 to install a small 89 kW hydroelectric turbine in the existing domestic water supply

line at Bonnie Rose Lake, which it estimates would displace about 16,500 gallons annually of diesel fuel used for power generation.

COLD BAY

Four hydropower sites were identified in 1980 with potential capacities between 350 and 1,700 kW. Potential hurdles to these four hydro projects are anticipated to be land ownership and environmental issues. Frosty Creek (Site 1) is located in the Izembek National Wildlife Refuge. The other three sites (on Russell Creek and Thin Point Creek) are located in the Alaska Peninsula National Wildlife Refuge. There is annual salmon migration in all streams. The Russell Creek sites are closest to the community. A dialog with federal landowners is needed to definitively determine the constraints on hydro development at Russell Creek and other streams (15).

FALSE PASS

The City of False Pass submitted a Round 9 REF grant application to conduct a feasibility study and conceptual design of a 125 kW run-of-river hydro on Unga Man Creek. Reconnaissance work funded by the City and performed in August 2015 suggests that Unga Man Creek may have the potential to displace 85 percent of existing diesel generation and save 43,000 gallons of fuel oil annually.

UNALASKA

Pyramid and Shaishnikof Creeks were investigated for hydro potential in the 1980s and ’90s, but with estimated capacities of 260 kW and 700 kW, respectively, either site would provide a fraction of the city’s 10 MW base load. As a result, the City’s interest in developing hydro power is currently low compared with other energy initiatives. There has also been interest in looking at the hydro potential of Kacie Lake.

Solar

Solar has been considered to be economically marginal in Alaska compared with other renewable technologies. However, less expensive solar panels, federal and state tax credits, and net metering programs where available, have combined to shorten the payback period for solar projects, especially in communities where electric rates are highest, customers pay non-PCE rates or utility lines do not reach. Solar PV technology is also relatively simple to install and maintain compared with other renewable technologies. With an average insolation of less than 2kWh/m^2/day, the Aleut region has less of a solar resource than some Interior regions. However, several communities are interested in looking into potential solar projects (see Chapter 5).

Wind

Wind energy is generating an increasing share of municipal electric power in Sand Point and St. Paul, where it provided 22 percent and 13 percent of public generation respectively in FY 2014. Both utilities are in the process of expanding their capacity to utilize excess wind power by installing storage and additional secondary heat loads. A malfunctioning wind turbine is scheduled to be replaced in St. George in fall 2015. Nikolski installed a refurbished wind turbine in 2010, but it is not operational due to difficulties integrating into the community’s small grid and the slow reaction speed of secondary loads (7). Most other communities in the region have

begun or completed wind feasibility studies. See Table 11 for a list of operational projects and those in development or previously considered.

ASSESSING WIND FEASIBILITY: SITING AND SIZING ISSUES

Because the Aleutian & Pribilof Islands have characteristically strong but gusty winds, and have significant geographic volcanic relief (steep hills, narrow valleys), locating proper sites for utility scale wind is still an emerging practice. Turbulence can cause damage to the turbine. Buildings and topography are the main causes of turbulence in the region. Because of the wind strength and turbulence in the region, AEA does not recommend turbines smaller than 95 kW in capacity.

Meteorological (met) towers are used to monitor the wind in an area prior to erecting a wind turbine in order to find an area that will maximize power production. Since the wind varies over time, the resource should be monitored for a minimum of one year. There are several communities in the region where comprehensive met tower monitoring has not been completed despite good potential for utility scale turbines (Adak and Atka) (2).

INTEGRATING WIND ENERGY INTO THE POWER GRID

Because of its variable and unpredictable nature, the total capacity of a wind turbine must be limited compared to the overall size of the grid, or it can cause frequency and voltage issues. Wind gusts can cause power surges that damage devices, and lulls can cause brownouts or blackouts if the diesel generators are unable to respond quickly enough. In order to safely integrate wind power, AEA does not recommend more than 30 to 50 percent wind penetration (the proportion of electrical power provided by wind). Even at these levels specialized controls are needed ensure grid stability.

If a community does not have a sufficient electrical load to use all the wind power produced at peak output, secondary or “dump” loads are required that can operate on a dispatchable, or on-demand, basis. A dump load can be a large resistive bank that vents to the atmosphere (in which case the wind energy is lost) or a secondary heating load, such as an electric boiler, to heat nearby buildings. If a heat sales agreement can be made between the utility and the end user, secondary loads can be another revenue source for the utility. New systems may allow smaller buildings and residences to distribute the heat load throughout a community by directing excess power to buildings via central control and Ethernet connections (2).

PROJECT UPDATES

The following project updates are primarily based on AEA’s January 2015 Renewable Energy Fund Status Report (7).

Cold Bay. A meteorological tower was installed on August 9, 2012. On March 26, 2013, AEA was informed by Marsh Creek that data was finally collected from the met tower but was not retrievable from the data card. The data card and logger are being sent to NRG in the event they can retrieve the data. A new logger has been installed. AEA requires a minimum 12 months of data to demonstrate the wind regimen. Data collection is ongoing but the project will be delayed due to the loss of data.

False Pass received an REF Round 4 grant from AEA to do a wind feasibility assessment. Data collected from 2004 to 2006 was used to draft a Conceptual Design Report (CDR). Based on the amount of turbulence found and the small size of the community grid, AEA recommended that the utility not proceed to the next phase of project development at this time.

King Cove. A 2013 feasibility report, based on 2005-2006 data, showed a Class 7 wind resource in the Delta Creek area. Turbulence levels are too extreme for current technology; AEA does not recommend further development.

Nelson Lagoon received an REF Round 1 grant from AEA to look at wind potential. AEA adjusted the scope and budget to add an avian study to address the avian issues in the community. A modified 40' free standing monopole tower was installed in May 2012 and data collection and the avian study are ongoing. A draft Conceptual Design Report (CDR) will close out the grant.

Nikolski. TDX Power installed a 65 kW V-15 wind turbine on behalf of the utility in 2007, using an USDA Rural Utilities Service grant and financial support from the APICDA. Due to control panel incompatibility, commissioning was not completed until 2010, with an AEA REF Round 1 grant. Currently the turbine is wired to the power plant but not successfully integrated into the grid. The energy produced by the turbine is more than the power plant can handle along with the existing community load and reaction speed of secondary loads. Nikolski requested an additional $331,000 from Round 5 to integrate the turbine into the power system and develop a heat recovery system and provide for electric boilers in the lodge and school to use excess wind energy. The project was approved for funding as a smaller amount, but funding was not allocated.

Sand Point received full funding in REF Round 8 for a Wind-to-Heat project to install electric boiler in the school to heat the swimming pool (per original design of its wind project) to increase wind utilization and improve performance.

St. George worked closely with AEA's Wind and RPSU Programs to install a wind-diesel system that integrated a 95 kW turbine purchased with an REF Round 1 grant from AEA into the new power plant. The turbine was damaged and is scheduled to be replaced in October 2015.

St. Paul. The St. Paul wind diesel project (REF Round 3) connected one or two of TDX's turbines on St. Paul into the City of St. Paul's grid and made necessary upgrades to the city's facilities and transmission system. Because the project was completed under budget and the size of the secondary loads and diesel generators was limiting the amount of wind power produced, the grant was extended to include installation of a flywheel (for energy storage), met tower, and additional secondary loads. The city's newest generator, along with the additional secondary loads, should eliminate the bottle neck. The flywheel has been installed and is now being tested.

Table 11: Wind power projects in the Aleut region

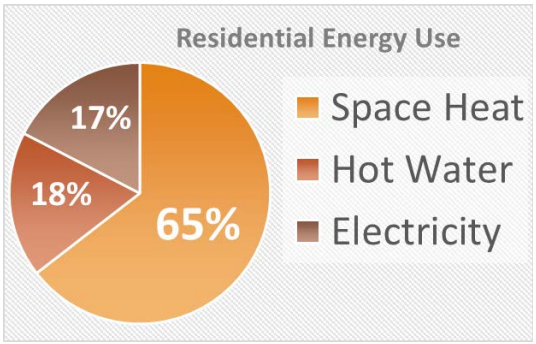
Project	Lead Entity	Scope	Cost	Funding
Operational				
Sand Point Wind Construction	Aleutian Wind Energy (IPP)	Installed 2 Vestas V-39 wind turbines with 395 kW resistive, air cooled load bank, new 455 kW CAT3456 genset, at powerhouse and dump loads in community buildings.	$1.08 million (not including cost to complete	AEA REF 2, US DOE, Local Match

			remote boiler system)	
St. Paul Wind Diesel Construction	TDX Corp. (IPP)	Integrated power from one of three TDX wind turbines to the City grid with necessary upgrades to the powerhouse and transmission system.	$2.1 million (plus $1.5 million for turbines)	AEA REF 3, US DOE, Local Match
In Development				
Atka Wind Energy Feasibility		Installed several met towers in 2015. Complete one year of data collection and draft feasibility study.		APICDA support
Cold Bay Wind Energy Feasibility	G&K Electric Utility (IPP)	Complete feasibility assessment with full year of data from met tower installed in 2012.	$104,075	AEA REF 4, Local Match
King Cove Wind Energy Feasibility		Identify new test sites in Delta Creek Valley; monitor technology to find best system for strong winds; complete study.		
Nelson Lagoon Wind Energy Feasibility & Conceptual Design	Utility Cooperative	Complete avian study and draft CDR based on data collected from modified 40' monopole tower.	$104,075	AEA REF 4, Local Match
Sand Point Energy Storage Design & Construction	TDX Sand Point Generating	Install an inverter and battery bank to store excess wind energy.	$1,397,403	AEA REF 7, Local Match
St. George Wind Farm Construction / Wind Turbine Replacement	City	Replace 95 kW burned-out wind turbine with one of similar size and type. Ensure proper integration with new power plant.		AEA REF 1
St. Paul Flywheel (add-on to Wind-Diesel Construction project)	TDX Corp. (IPP)	Complete testing of flywheel for storage of excess wind energy. Install met tower and additional secondary loads.	$2.1 million total wind-diesel project (plus $1.5 million for turbines)	AEA REF 3, US DOE, Local Match
Previously Considered				
Adak Diesel Hybrid Reconnaissance	TDX Adak	Some potential for wind energy based on 2011 reconnaissance work but need to gather load data and address issues of oversized power plant and distribution system before integrating renewables.	$82,125	AEA REF 2, Local Match
False Pass Wind Energy Feasibility & Conceptual Design	City Utility	Based on wind resource study and draft CDR, AEA concluded that False Pass' electrical system is not currently capable of using wind power.	Total $126,125	AEA REF 4 & 7, Local Match
Nikolski Wind-Diesel System Redesign, Construction and Commissioning	Native Village	Complete integration and commissioning of 65 kW Vestas V15 wind turbine, develop a heat recovery system at powerhouse and provide electric boilers in lodge and school to use excess wind.	$331,240 (estimated cost in 2012)	Previous funding: USDA RUS, APICDA, AEA REF 1

Energy Efficiency & Conservation

Energy Characteristics of Regional Housing Stock

Figure 15: Aleut region residential energy use



The 2014 Alaska Housing Assessment by the Cold Climate Housing Research Center (15) profiled the residential energy use and cost in the Aleut region:

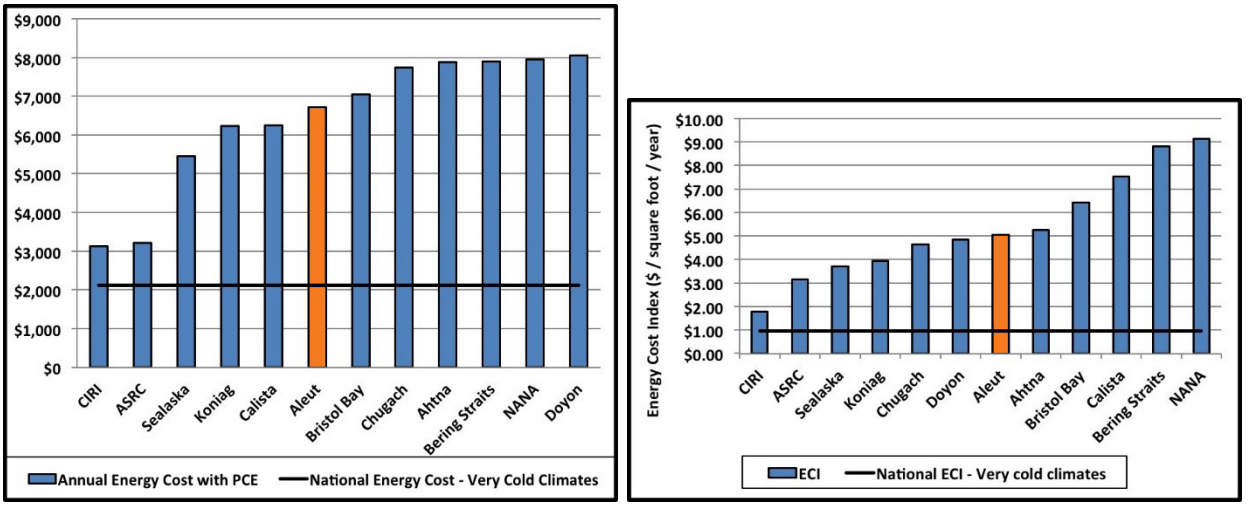
- **Energy Use**: The average home in the region is 1,230 square feet and uses 115,000 BTUs of energy per square foot annually (16 percent less than the state average). Almost two-thirds (65 percent) is used for space heating, another 18 percent for hot water, and 17 percent for electricity.
- **Energy Efficiency:** The average home energy rating in the region is 2-star plus, based on data from over 200 homes. Not surprisingly, newer homes have better energy performance. On average, homes built in the 1940s are currently rated at 1-star plus, compared to an average rating of 4-star-plus for homes built after 2000.
- **Housing Quality:** Within current housing stock, newer homes are tighter. On average, homes built in the last decade exceed the 2012 BEES standard of 4 air-changes per hour at 50 Pascals. In contrast, homes built in the 1950s are 3.5 times leakier than those built since 2000. About 37 percent of occupied housing are relatively air-tight, but lack a continuous ventilation system, putting these home at higher risk for indoor moisture- and air-quality issues.
- **Energy Cost and Affordability:** The average annual energy cost for homes in the Aleut region is $6,710, which constitutes approximately one percent of median area income in the region. Approximately 25 percent of households spend 30 percent or more of their income on housing costs, including rent, water and sewer, and energy costs.
- **Regional Comparison:** Energy costs per square foot are in the middle when compared with homes in other regions of the state (Figure 16). The average annual home energy cost in the region is approximately 2.4 times more than the cost in Anchorage, and 3.2 times more than the national average.

Table 12: Energy characteristics of regional housing stock

Avg. Energy Rating	Avg. House Size	Avg. Annual Energy Use	Avg. Annual Energy Cost	Avg. Energy Use Intensity (EUI)	Avg. Energy Cost Index (ECI)	Avg. Home Heating Index
2-star Plus	1,230 square feet	156 MMBTU	$6,710 (Jan 2013 $)	115 kBTU per square foot	$5.04 per square foot	7.8

Data source: (15)

Figure 16: Aleut region residential energy costs compared with other regions



Source: (15)

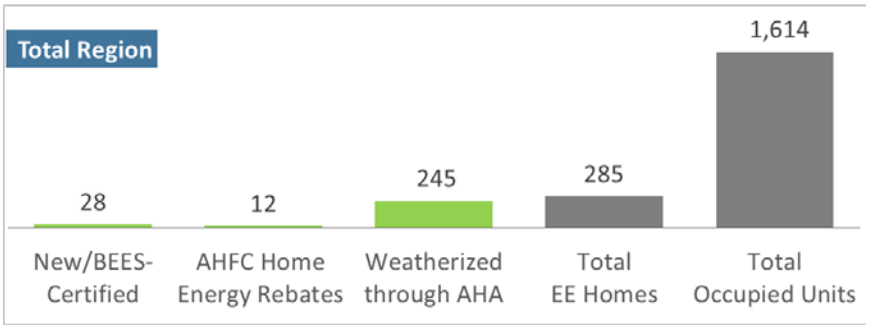
Residential EE&C Program Participation

One in six (18%) occupied homes in the region have completed energy upgrades through the Home Energy Rebate program, a low-income weatherization program, or is a newer BEES-certified home (Figure 17). (This does not include homes weatherized with private funds.)

Participation in AHFC's Home Energy Rebate program is open to homeowners for their primary residence; there is no upper income limit. The HER program requires homeowners to pay for recommended upgrades up front and reimburses them for direct labor and materials up to a certain amount once work is performed and a "post" audit is completed. Residents in Adak, Sand Point, and Unalaska have participated in the program (though none in Adak completed the work in the time provided in order to receive a rebate.) In the Aleut region to date 39 percent of homeowners receiving HER audits have completed upgrades and received rebates.

AHFC's weatherization service provider in the region is the Aleutian Housing Authority (AHA), which has completed weatherization projects in all communities it serves. The program spends up to $30,000 per home in remote rural communities, including transportation, logistics, overhead and health and safety measures (16). There is no cost to the resident or community for participation in the program. A total of 245 homes have been weatherized since the program started in 2008. Regional Housing Authorities may finance additional weatherization work with federal funding, including Native American Housing Assistance and Self Determination Act (NAHASDA) grants through the U.S. Department of Housing and Urban Development.

Figure 17: Energy efficient housing stock, as of April 2014



Data sources: (17) (15)

While no residents in the region have yet received AHFC's New Home Rebate (for buying or purchasing a 5 Star Plus or 6 Star home), 28 homes have been certified as meeting Alaska Building Energy Efficiency Standard (BEES), which is required for AHFC financing. Information on program participation in each community is included in Table 14.

Residential EE&C Savings

Energy efficiency and weatherization measures completed since 2008 have been saving program participants in the region 31 to 35 percent per year on their home energy consumption, according to AHFC data, which translates to over 340 to 460 gallons of heating oil per home (Table 13). Most of the energy savings is in home heating, although lighting upgrades result in some electrical savings. The difference in savings rates between the two programs is most likely due to house size, with smaller homes primarily receiving retrofits through the low-income weatherization program (18).

Table 13: Average EE&C savings per household in the Aleut region

EE&C Program	No. of Homes	Average Energy Savings	Annual Energy Savings	Annual Fuel Savings[1]	Savings at $4.50/gal.
Home Energy Rebate	12 rebates out of 31 audits (39% completion)	31%	64.3 MMBTU	462 gallons	$2,078 per year
Weatherization	145 homes	35%	47.4 MMBTU	341 gallons	$1,532 per year

Note: 1/ Fuel savings model assumes all heating is done with fuel oil. It does not include fuel saved in electrical generation due to reduced kWh use. Data source: (18).

On a regional basis, residential EE measures account for over 12,000 MMBTU (1 MMBTU = 1 million British Thermal Units) annually in energy savings, which translates into nearly 89,000 gallons of heating fuel and over $450,000 in avoided fuel costs per year (Table 14). This does not include savings from lighting or appliance upgrades or other measures that reduce electrical use (or the diesel used to generate electricity).

See **Chapter 3** for an estimate of the savings available from additional residential energy efficiency work in the region.

Table 14: Estimated annual energy savings from residential EE&C, 2008-Apr 2014

	Energy Efficient Housing Stock					Estimated Annual Savings		
Community	Occupied Homes [1] (2014 est.)	New/ BEES-Certified Homes	AHFC Home Energy Rebates	Weather-ized through AHA	Percent Energy Efficient Homes	Annual Energy Savings [2] (MMBTU)	Annual Fuel Savings (Gallons)	Annual Fuel Cost Savings from EE [3] ($)
Adak	54			-	0%		-	$ 0
Akutan	41			26	63%	1,232	8,849	$ 35,395
Atka	24			12	50%	569	4,084	$ 31,242
Cold Bay	14			-	0%		-	$ 0
False Pass	8			4	50%	190	1,361	$ 5,731
King Cove	118	4		49	45%	2,323	16,676	$ 71,541
Nelson Lagoon	14			8	57%	379	2,723	$ 17,017
Nikolski	27			13	48%	616	4,424	$ 30,970
Sand Point	164	5	5	42	32%	2,312	16,602	$ 85,502
St. George	53			7	13%	332	2,382	$ 18,439
St. Paul	263	9		43	20%	2,038	14,634	$ 76,098
Unalaska	834	10	7	41	7%	2,394	17,185	$ 79,740
Total Region	**1,614**	**28**	**12**	**245**	**18%**	**12,385**	**88,921**	$ **451,675**

Notes: 1/ Occupied housing numbers from 2014 Alaska Housing Assessment. 2/ Estimated energy savings based on average energy savings for region achieved by HER and weatherization program participants in ARIS database, 2008-2014. 3/ Fuel cost savings assumes all heating is with fuel oil. Assumes retail heating fuel costs for communities as of August 2014. Data sources: (15) (18)

Non-Residential EE&C Program Participation

Since 2005, a sequence of state and federal programs have funded community-scale, energy efficiency improvements in public facilities in rural Alaska, including indoor lighting retrofits, LED street lighting, heating system upgrades, insulation and sealing, and installation of programmable thermostats and other energy saving building controls. Most communities in the Aleut region have participated in at least one iteration of the programs (Table 15).

See **Chapter 3** for a discussion of the energy savings available from energy efficient lighting retrofits and other upgrades recommended in non-residential building audits.

Table 15: Participation in non-residential EE&C programs since 2008

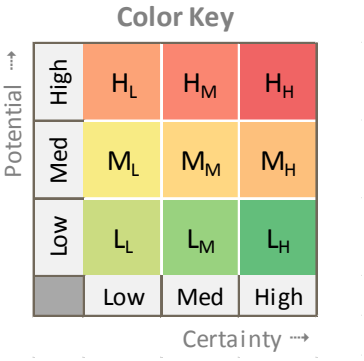
Community	Community EE&C Grants	EE Lighting Upgrades		Public Facility Energy Audits[2]			Private Commercial
	VEEP / EECBG VEUEM[1]	Interior Lighting	LED Street Lighting	School Audits	Health Clinic Audits	Sanitation System	Building Audits
Adak	X						
Akutan	X	X					
Atka	X						
Cold Bay	X			A			
False Pass	X	X		A	A		1
King Cove	X	X	X	A			
Nelson Lagoon							
Nikolski	X	X					
Sand Point				A			
St. George	X						
St. Paul	X			A			
Unalaska	X	X	X				5

Notes: X=Completed, A=Audit, P=Planned or in Progress. 1/ Includes participation in VEUEM (2005-2010), EECBG (2010-2012) and VEEP (2010-2014). 2/ Information on completed retrofits not available. Data Sources: (16) (19) (20)

3 | Energy Resource & Savings Potential

Energy Resource Potential

Phase I of the Regional Energy Planning process included an inventory of potential energy resources in the Aleut region. In Phase II, a preliminary assessment of resource potential was performed. The goal was to develop a consistent set of criteria for rating resource potential that could be applied across communities and regions. This assessment looks at the resource's potential for producing energy savings from *new, community-scale* project development given the best available information (i.e. projects that are already in operation or under development are not counted towards the resource's potential to generate additional savings in a community). These *Potential* ratings of Low (L), Medium (M), or High (H) are accompanied by a *Certainty* rating (also L, M, H) which indicates the amount of feasibility work that has been done or the availability of other information. Low certainty generally signifies that no reconnaissance or other resource assessment has been performed. See Appendix B for a detailed description of the criteria used in the analysis.



The first letter in each square represents resource potential. The subscript indicates the level of certainty in the resource potential rating.

Table 16 shows the results of this assessment for energy resources in Aleutian and Pribilof Island communities, including energy efficiency. Potential for energy savings from new, community-scale projects is generally greatest from energy efficiency, hydro, wind, heat recovery and geothermal energy, though differences exist across communities. See Appendix B for more details on each resource and a description of the criteria used in the analysis.

Table 16: Energy resource potential and certainty for new community-scale projects

	Adak	Akutan	Atka	Cold Bay	False Pass	King Cove	Nelson Lagoon	Nikolski	Saint George	Saint Paul	Sand Point	Unalaska
Biomass	L	L	L	L	L	L	L	L	L	L	L	L
Geothermal	M	M	M	L	L	L	L	L	L	L	L	M
Hydro	H	H	H	M	H	H	L	L	L	L	L	H
Solar	L	L	L	L	L	L	L	L	L	L	L	L
Wind	H	L	M	H	L	H	L	L	H	H	H	H
Coal	L	L	L	L	L	L	L	L	L	L	L	L
Oil & Gas	L	L	L	L	L	L	L	L	L	L	L	L
Heat Recovery	M	M	L	M	H	L	M	L	L	L	H	L
Energy Efficiency	H	M	H	H	H	H	H	H	H	H	H	H

Notes: Letters refer to resource potential: High (H), Medium (M), Low (L). Color indicates both potential and certainty (see color key). See Appendix B for an explanation of the criteria used in assessing resource potential.

SAVINGS POTENTIAL FROM INCREASED DIESEL EFFICIENCY

Figure 7 in Chapter 2 shows recent diesel efficiency performance for the region's public utilities. While it appears that diesel efficiency in the region is in the ballpark for most utilities, there is room for improvement that would save utilities money and fuel. If utilities below the AEA benchmarks improved system efficiency enough to meet them, they would save anywhere from $0.01 to $0.17/kWh in avoided fuel costs (Table 17, top). Collectively utilities would save 76,000 gallons of fuel oil annually—or $375,000 per year at 2014 fuel prices. Additional savings are available if all utilities improve diesel efficiency from where they are at now. A 10 percent increase in efficiency across the region would reduce annual fuel consumption by nearly 400,000 gallons, saving nearly $1.5 million per year in avoided fuel costs (Table 17, bottom).

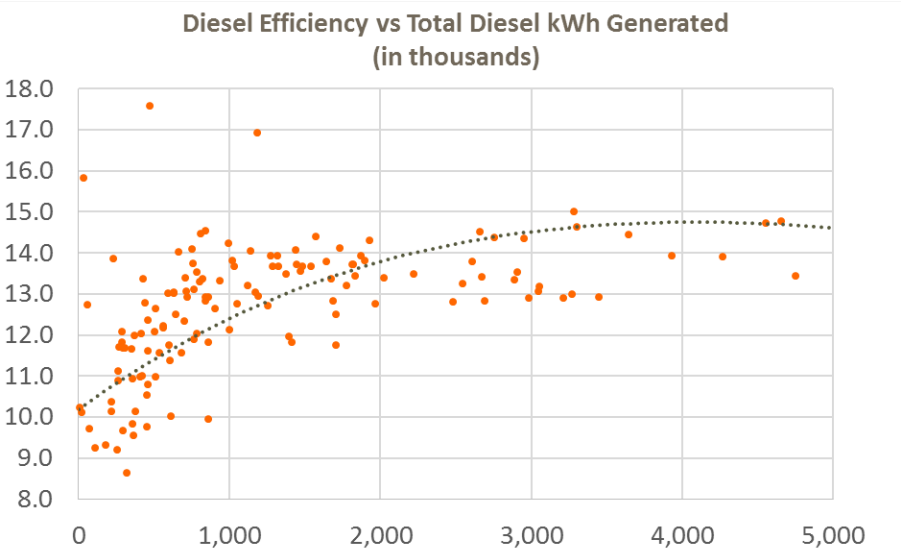
Table 17: Projected annual savings from meeting diesel efficiency benchmarks

FY2014 Diesel Use & Efficiency			Savings from Increase to Benchmark Efficiency				
Community (Ranked by total annual generation)	Diesel Used for Generation (gals.)	Diesel Efficiency (kWh/gal.)	Increase to benchmark efficiency (kWh/gal.)	New Fuel Use (gals.)	Annual Fuel Savings (gals.)	Annual Savings ($)	Savings per KWh
Saint Paul	270,929	13.9	14.5	260,549	10,380	$49,513	$0.01
Sand Point	219,998	13.9	14.5	210,918	9,080	$42,313	$0.01
Cold Bay	198,146	13.4	14.5	183,495	14,651	$76,036	$0.03
Adak	170,110	12.8	14.5	150,225	19,885	$98,628	$0.05
King Cove	153,210	14.1	14.5	149,461	3,749	$13,757	$0.01
Nelson Lagoon	39,158	8.8	12.5	27,519	11,639	$57,379	$0.17
Nikolski	20,940	9.9	12.5	16,615	4,325	$25,904	$0.12
Atka	10,765	10.1	12.5	8,711	2,054	$11,011	$0.10
All utilities	**1,083,256**	**13.4**		**998,784**	**73,707**	**$363,531**	**$0.03**
FY2014 Diesel Use & Efficiency			**Savings from 10% Increase in Efficiency**				
Unalaska	3,068,848	15.7	17.2	2,789,862	278,986	$ 920,654	$ 0.02
Saint Paul	270,929	13.9	15.3	246,299	24,630	$ 117,485	$ 0.03
Sand Point	219,998	13.9	15.3	199,998	20,000	$ 93,199	$ 0.03
Cold Bay	198,146	13.4	14.8	180,133	18,013	$ 93,489	$ 0.04
Adak	170,110	12.8	14.1	154,645	15,465	$ 76,704	$ 0.04
King Cove	153,210	14.1	15.6	139,282	13,928	$ 51,116	$ 0.02
False Pass	60,967	12.8	14.0	55,425	5,542	$ 19,454	$ 0.02
Saint George	51,429	13.5	14.8	46,754	4,675	$ 33,756	$ 0.05
Akutan	40,944	15.5	17.1	37,222	3,722	$ 15,000	$ 0.02
Nelson Lagoon	39,158	8.8	9.7	35,598	3,560	$ 17,550	$ 0.05
Nikolski	20,940	9.9	10.9	19,036	1,904	$ 11,403	$ 0.05
Atka	10,765	10.1	11.1	9,786	979	$ 5,245	$ 0.05
All Utilities	**4,305,444**	**15.0**	**16.5**	**3,914,040**	**391,404**	**$ 1,455,056**	**$ 0.02**
Small Utilities	**224,203**	**12.4**	**13.6**	**203,821**	**20,382**	**102,409**	**$ 0.04**

Data source: (1)

According to AEA program managers, even small utilities are able to achieve diesel efficiencies of 14.0 and above. Every utility should be able to achieve the efficiency on the trend line in Figure 18 (21).

Figure 18: Diesel Efficiency at Different Load Sizes, FY2013 PCE Data



Source: (21)

Even if a community produces most of its electricity with renewable energy—or hopes to in the future—optimizing diesel efficiency is important since almost any renewable resource needs to integrate with existing generators to ensure that power is available in the community when variable energy sources like wind or run-of-river hydro are offline.

To integrate renewable energy systems, the primary powerhouse infrastructure must be in good working order and well maintained with adequate switchgear and controls installed. This is necessary so the integration of wind or hydro does not damage diesel equipment or lead to a marked decrease in generator efficiency that can result from operating at low capacity when the renewable resource is online (22).

Another reason for getting the diesel powerhouse in order before pursuing renewable energy opportunities is that potential funders typically look at a community's capacity for maintaining its current infrastructure (and for record keeping and business administration) before awarding funds for new projects.

SAVINGS POTENTIAL FROM ADDRESSING LINE LOSS

Line loss refers to the percent of the electricity generated by a utility that is not sold. Line loss may be due to physical losses in the distribution network (possibly caused by deteriorating lines or old or poorly sized transformers) or from unmetered use. The result is a direct financial loss to the utility and, in the case of diesel generation, a waste of thousands of gallons of fuel each year.

Line loss also affects the PCE rate available to a utility; losses above 12 percent reduce the PCE subsidy. In 2014, six communities in the region (shaded in brown in the table below) had a line loss above 12 percent, while four more (shaded in tan) had a line loss above 5 percent. Measurable savings would result from addressing the causes of line loss in these systems.

Table 18: Line loss by community, FY2014

Community	Total kWh Generated	Line Loss	Power Lost (kWh)	Diesel Lost (Gallons)
Adak	2,178,268	42%	919,673	71,793
Saint George[1]	693,419	19%	133,920	9,935
King Cove	4,513,471	17%	749,569	52,973
Akutan	636,366	15%	93,758	6,033
Saint Paul	4,347,407	14%	597,327	42,850
Nelson Lagoon	343,990	12%	42,550	4,846
False Pass	778,559	9%	70,763	5,541
Atka	510,211	8%	38,948	3,852
Cold Bay	2,660,684	8%	210,562	15,678
Nikolski	207,693	6%	12,688	1,279
Sand Point	3,919,804	5%	212,828	15,311
Unalaska	48,097,173	4%	1,919,551	122,498

Notes: 1/ St. George recently completed an RPSU project that should result in lower line loss for FY 2015. Data source: (1)

Legend	
	High Savings Potential (12%+ line loss)
	Medium Savings Potential (6% to 11% loss)
	Limited Savings Potential (5% or less line less)

SAVINGS POTENTIAL FROM EXPANDING COMMUNITY PCE USE

The Power Cost Equalization program subsidizes electric rates of residents as well as eligible community buildings and facilities. The PCE statute defines a community facility as a water, sewer or charitable educational facility, public outdoor lighting, or a community building that is not operated for profit, is open to the general public, and whose operation is not paid for by the State or Federal government or by a private commercial organization. AEA determines eligible community facilities based on applications and information submitted by the facility owner and utility provider. As with the residential PCE program, there are limits on the amount of PCE-eligible electricity (kWh) that may be used by a community facility. This monthly limit is set at 70 kWh per resident. In a community with 100 residents the total community facility use eligible for PCE cost reductions is 7,000 kWh per month, spread across all eligible community facilities.

Communities in Table 19 are ranked by PCE savings potential. This is calculated based on average electricity use by community facilities in each community and the amount of electricity (kWh) still eligible for PCE subsidies in each community.

Many communities are close to this limit, but a significant opportunity exists to save on public facilities' electric bills in communities not at or near the community limit. Reasons communities in rural Alaska do not take full advantage of this subsidy include: turnover in utility management, lack of training, lack of coordination between community facility owners and utilities, and lengthy processing time of applications and rejection notices that do not provide information on why an application was rejected. AEA reports progress on addressing these issues.

Table 19: Savings potential for community facilities through PCE

Community/ Utility	PCE kWh/person		PCE Savings Potential
	Eligible	Used	
Akutan	70	6	10+ buildings
Sand Point	70	29	10+ buildings
Unalaska	70	51	10+ buildings
Adak	70	57	1 to 5 buildings
Atka	70	57	At or near max
Cold Bay	70	70	At or near max
False Pass	70	68	At or near max
King Cove	70	68	At or near max
Nelson Lagoon	70	53	At or near max
Nikolski	70	70	At or near max
Saint Paul	70	70	At or near max
Saint George	70	64	At or near max

Data source: (1)

Legend	
	High Savings Potential *(5+ buildings)*
	Medium Savings Potential *(1 to 5 buildings)*
	Limited Savings Potential *(At or near max)*

SAVINGS POTENTIAL FROM INCREASED ENERGY EFFICIENCY

Residential Energy Efficiency

Only 18 percent of occupied homes in the region have participated in one of the state-funded residential energy efficiency programs since 2008 or been certified as meeting the BEES energy efficient building standard (see Table 14). If the remaining energy inefficient housing stock is upgraded (or in some cases rebuilt), the savings from residential EE&C could save another 41,000 MMBTU per year. This would save over 295,000 additional gallons of heating oil and nearly $1.5 million annually, at 2014 fuel prices. This does not include savings from lighting or appliance upgrades or other measures that reduce electrical use (or the diesel used to generate electricity).

Table 20: Estimated energy savings and potential energy savings from residential EE&C

	EE&C Savings Achieved			EE&C Savings Opportunity [1]			
Community	Annual Energy Savings (MMBTU)	Annual Diesel Savings (Gallons)	Annual Fuel Cost Savings ($)	Remaining Residential EE&C Opportunity	Annual Energy Savings (MMBTU)	Annual Diesel Savings (Gallons)	Annual Fuel Cost Savings ($)
Adak	0	-	$ 0	100%	1,701	12,215	$56,431
Akutan	1232	8,849	$35,395	37%	429	3,078	$12,311
Atka	569	4,084	$31,242	50%	680	4,880	$37,328
Cold Bay	0	-	$ 0	100%	454	3,263	$17,586
False Pass	190	1,361	$5,731	50%	98	702	$2,954
King Cove	2323	16,676	$71,541	55%	2,244	16,110	$69,111
Nelson Lagoon	379	2,723	$17,017	43%	220	1,583	$9,893
Nikolski	616	4,424	$30,970	52%	492	3,534	$24,735
Sand Point	2312	16,602	$85,502	68%	4,171	29,948	$154,233
St. George	332	2,382	$18,439	87%	2,137	15,341	$118,740
St. Paul	2038	14,634	$76,098	80%	8,077	57,990	$301,549
Unalaska	2394	17,185	$79,740	93%	20,412	146,556	$680,018
Aleut Region	**12,385**	**88,921**	**$451,675**	**82%**	**41,114**	**295,198**	**$1,484,891**

1/ Model assumptions: All non-BEES-certified, income-eligible homes are weatherized and remaining owner-occupied homes participate in Home Energy Rebate program. Based on average energy savings for region based on 2008-14 ARIS data. Assumes retail heating fuel costs for communities as of August 2014.

Energy Efficient Lighting

INDOOR LIGHTING UPGRADES

Many communities have used Village Energy Efficiency Program (VEEP) or Energy Efficiency and Conservation Block Grant Program (EECBG) grants to complete lighting upgrades in one or more community buildings. VEEP is an AEA program that provides energy efficiency audit and upgrade services to Alaska communities with populations of 8,000 or less. EECBG was a national U.S. DOE program funded through the 2009 American Recovery and Reinvestment Act

that provided block grants to cities, communities, and Native tribes to develop, promote, implement, and manage energy efficiency and conservation projects.

Based on statewide data for 33 small communities, annual savings from indoor lighting retrofits can save communities over $1,300 and 3,100 kWh of electricity per building per year. Savings achieved by three communities in the Aleut region are shown in Table 21.

Lighting upgrades generally have shorter payback periods than other building efficiency measures making them smart investments even without the incentive of grant funding (19). While some of these savings have already been captured, there is still opportunity for additional savings in the region by investing in more energy efficient lighting upgrades—both in communities that did not participate in VEEP or EECBG programs and communities in which only some buildings (e.g. only schools or only city or tribally owned buildings) received lighting retrofits previously.

The Community and Energy Profiles that start on page 71 include a list of non-residential buildings in each community. A good place for communities to start is by updating this building list with information on which buildings have received energy audits and which have had retrofits completed.

Table 21: Savings from energy efficient lighting upgrades in 3 Aleutian communities

	One-time Investment	Annual Savings	Annual Electricity Saved (kWh)	Average Simple Payback Period
Average per community	$6,963	$2,341	2,938	
Average per Building	$2,611	$878	3,103	**3.0 years**
Total	**$20,888**	**$7,022**	**23,505**	

Based on lighting upgrades completed with VEEP and EECGB grants in Akutan, False Pass and King Cove (19).

LED STREET LIGHTING

Rural Alaska communities that have replaced street lights with LED lighting are saving an average of $10,000 per year each, with an average payback period of 3.7 years. In the Aleut region, at least two communities have completed LED streetlight retrofits. Estimated savings are shown in Table 22.

Table 22: Savings from LED street lighting retrofits in 2 Aleutian communities

Community	One-time Investment	Annual Savings	Annual Electricity Saved (kWh)	Average Simple Payback Period
King Cove	$35,184	$10,532	40,506	3.3 years
Unalaska	$153,500	$65,497	198,475	2.3 years
Total	**$188,684**	**$76,028**	**238,981**	**2.5 years**

Based on VEEP and EECBG-funded lighting upgrades completed through 2013. Data source: (19)

Public Facility and Commercial Energy Audits

Only five of the region's schools and a small number of other community buildings (mostly in St. Paul) have been audited through AHFC's Commercial Energy Audit (ACEA) program. Because the program covers the cost of the audit but does not pay for retrofits, it is believed that most of

the potential savings identified in the commercial energy audits performed in Alaska have not been achieved. This represents a huge missed savings opportunity. If just the most cost-effective retrofits are completed and some behavioral changes (like setting back thermostats) public building owners can typically save 20 percent on annual energy costs (23).

Privately-owned buildings are eligible for whole-building energy audits through AEA's Commercial Building Energy Audit (CBEA) program. Like the public building audits performed by AHFC, the CBEA program covers the cost of the audit (up to a limit based upon the size and type of building), but does not pay for retrofits. Though most private commercial building audits are done in urban Alaska, a few have been completed in Aleutian communities (see Table 15).

As with public building audits, the lack of grant funding to pay for retrofits up front has meant that a small minority of audits are followed by recommended upgrades. In buildings where energy efficiency investments have been made, building owners typically cut their overall energy use by one-third, with average simple paybacks of just over six years.

Table 23: Savings potential for public and commercial facilities

Savings from Behavioral Changes Only	Behavioral Changes plus the Most Cost-Effective Retrofits	Savings from Implementing All Audit Recommendations
10-15% Savings	15-25% Savings	25-35% Savings

Source: (23)

Water and Sewer

Sanitation systems are one of the single largest energy users in rural communities, accounting for 10 to 35 percent of a community's energy use. Alaska Native Tribal Health Consortium (ANTHC) estimates that for every one dollar spent on energy retrofits of rural sanitation facilities (including the cost of audits), there will be a 50 cent return each year to communities plus a 50 cent annual return to the State's operating budget through lower PCE payments (24). ANTHC has performed energy audits of sanitation facilities in many small communities in Interior, Southwest and Western Alaska, and is interested in expanding its focus to the Aleutians. Table 24 shows average cost and savings based on audits of water systems in over 50 rural communities.

Table 24: Potential savings from sanitation system energy efficiency

Number of Water Systems Audited	One Time Investment per Facility	Electricity Savings (kWhs)	Diesel Savings (Gallons)	Cost Savings ($)	Average Simple Payback (years)
51	$107,214	22,010	2,663	$25,404	4.2

Data Source (24)

4 | Stakeholder Outreach

Public outreach and stakeholder engagement are major components of the second phase of AEA's regional energy planning process. In the Aleutian and Pribilof Islands region, these goals were met through a variety of activities:

- Community/Utility Interviews (Summer 2015)
- Aleutian Energy Summit (March 2015)
- Breakout Sessions at SWAMC Annual Meeting (2013- 2015)
- Online Survey (Spring 2014)
- Project website: www.aleutiansenergy.org (Since 2014)
- Community and Utility Site Visits (2012-13)

Outreach Activities

Community/Utility Interviews | May-August 2015

The community-level outreach for Phase II included telephone interviews with representatives from each community in summer 2015. The purpose of the interviews was to update information on energy projects and priorities. See Appendix A for a list of interviews.

Aleutian Regional Energy Summit | March 2015

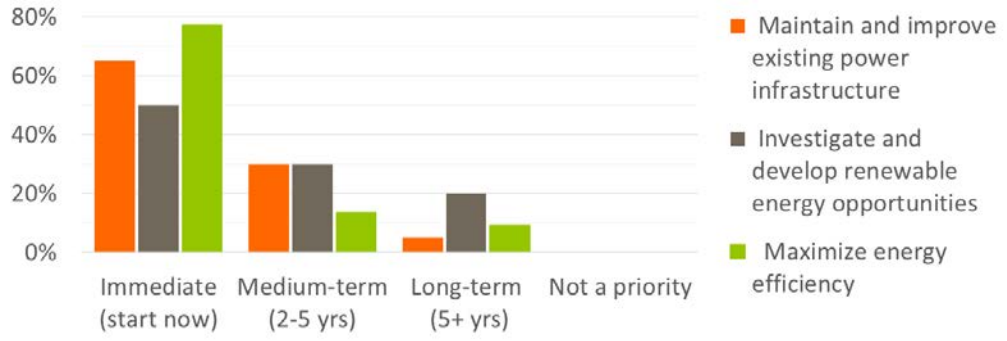
The capstone event of Phase II was a regional energy summit held on March 3, 2015. Over 20 representatives from local and regional organizations and industry attended the summit, which was held in conjunction with the SWAMC annual conference in Anchorage. Ten communities were represented (all but Nikolski and False Pass). See Appendix A for a list of participants and speakers.

Summit topics were tailored to the energy issues and priorities identified through previous outreach and research. They included energy efficiency, powerhouse efficiency, wind integration, and project development and financing. Additional sessions highlighted success stories from the region with speakers from King Cove and TDX Power, and provided brief overviews of energy programs and services available from resources agencies. Speakers included AEA technical staff, Alaska Industrial Development and Export Authority (AIDEA), Siemens, Alaska Housing Finance Corporation (AHFC), UAF Interior-Aleutians Campus, USDA Rural Development, US Department of Energy, Alaska Native Tribal Health Consortium, and the state's Bulk Fuel Loan Program.

The summit concluded by polling participants on priorities for short, medium and long-term projects at the regional level. Due to a technical failure, only partial results are available. Overall the survey results show that among summit participants there is the greatest urgency for actions to maximize energy efficiency, followed by maintaining and improving existing infrastructure, and investigating and developing renewable energy generation opportunities, though there was strong support (over 50%) for pursuing all strategies (Figure 19). Community representatives were also asked about support for and timing of specific energy projects in their communities.

This input has been used to develop the list of projects and priorities in Chapter 5 and is reflected in the draft Energy Roadmap in the Executive Summary.

Figure 19: Prioritization of regional energy strategies



Online Survey | Feb-April 2014

An online survey of community and regional stakeholders was conducted at the end of Phase I to identify any errors in the Phase I Resource Inventory and gather input on the most broadly supported energy projects and priorities. SWAMC reached out to 72 stakeholders by phone and email, contacting each up to three times, to publicize the release of the Phase I document, request their review, and solicit input through an online survey. In all, 85 percent of the stakeholders contacted confirmed that they had received the Phase I inventory; 40 percent took time to review it; and 63 percent completed the online survey. Those who took the survey represented a cross-section of the region, with at least one stakeholder from every community, except Nikolski, and multiple respondents from larger communities. (See Appendix A for a list of survey respondents).

Many individuals expressed enthusiasm for the project and a desire to be involved. Overall, they emphasized the need for improved energy efficiency at all levels (residential, community, and businesses) and expressed significant support for renewable energy projects (wind, hydro, and tidal, etc.). Respondents emphasized that cost reduction in heating, followed by electricity, and travel to and from communities as areas of greatest need for energy relief. Every community ranked at least four of the specific projects identified for their community as important to extremely important. Complete survey results are published in the May 2014 *Phase II Survey Results* report available on the project website (www.aleutiansenergy.org).

Based on survey input, the following list of short term and long term strategies and priorities emerged from the analysis of survey results.

SHORT TERM: FOCUS ON AFFORDABLE ENERGY (LOWER FUEL AND ELECTRICITY COSTS)

- Complete and maintain current energy projects
- Continue with weatherization and other energy efficiency and conservation efforts
- Look at LNG
- Improve diesel generator efficiency

LONG TERM: FOCUS ON RELIABLE, LOCAL, SUSTAINABLE ENERGY

- Develop alternative energy sources (wind, hydro, geothermal, heat pumps, tidal)
- Prioritize energy efficiency and conservation
- Upgrade distribution systems

Community and Utility Site Visits | 2012-13

Phase I of the project involved in-person site visits to most of the communities in 2012 and 2013 by Andy Baker of Your Clean Energy, LLC to assess existing resources and potential for renewable energy systems. Detailed findings from these visits are summarized in the Phase I Resource Inventory available on the project website (www.aleutiansenergy.org).

NEXT STEPS

Create Regional Energy Committee to Advance Shared Goals

The creation of energy committees or working groups has been recommended by AEA as a way to implement local and regional priorities and continue the work of energy planning into the future. Broad goals and objectives include:

- Bring energy champions together from across the region.
- Identify similar local priorities and opportunities to create economies of scale.
- Share local knowledge and capacity to create the structure and relationships needed to carry ideas forward.
- Seek broad sustainable engagement, including youth.
- Keep a clear focus on regional energy goals and priorities.
- Look for ways stakeholders can support the long-term sustainability of energy working groups and regional energy planning.

Regional energy committees and stakeholder groups have been instrumental in addressing energy issues and advancing shared goals in Southeast Alaska and the Northwest Arctic Borough, and regional groups are now being established in the Kodiak Island Borough and Bering Straits region. Effort is also going into the creating or reviving working groups focused on specific resources (energy efficiency and biomass) in the Copper River region.

Despite the large distances that separate them, communities and utilities in the Aleut region share many issues related to energy development and have similar resources. Those hoping to develop new hydroelectric projects could learn from successful projects in Atka, Akutan, and King Cove. Similarly, there have been successful wind projects in St. Paul and Sand Point that could be a template for development of wind energy in other communities of the region.

The challenge of making an energy committee work in the Aleut region is the remote and fragmented nature of the region. Most meetings could be held by teleconference with most communication by email and telephone. An annual face-to-face meeting would be useful in maintaining momentum and keeping an energy working group together. A pre-conference meeting in Anchorage a day before the start of the SWAMC Economic Summit and Membership Meeting may be the best time for such a gathering.

Steps to establish a regional energy committee in the Aleut region include:

- Engage regional and subregional organizations and government entities to ensure a regionwide perspective in energy planning and integrate work on energy priorities into the mission and daily operations of governing bodies and service providers. across the region.
- Seek representation of all communities by soliciting resolutions from local governing bodies appointing a local energy champion to the committee
- Secure organizational support from regional entities for holding regular meetings or teleconferences and an annual face-to-face meeting.

Based on level of interest, an Aleutian and Pribilof Islands Energy Committee presents an opportunity to work on regional goals and shared priorities including: maximizing energy efficiency, maintaining and upgrading existing infrastructure, transitioning to locally produced energy resources, and promoting community sustainability by looking for all opportunities to reduce the cost of energy in the Aleut region.

5 | ENERGY PROJECTS & PRIORITIES

At least 18 energy-related projects are planned or in progress in the region. The list in Table 25 is based on information provided by project sponsors as well as data published in the Phase I report, Renewable Energy Fund applications and status reports, and project lists from AEA. Completed Projects are not shown. Active projects or those that have been scheduled or funded are highlighted in brown in the table below. The list also includes community or utility energy priorities that are not yet associated with a specific project. These have been identified through discussions with community leaders and utility managers. The timeframes shown indicate a best guess for project timing given available resources, readiness of the technology, and competing priorities.

- Short range: expected to start within 1-5 years
- Medium range: expected to occur between 5-10 years
- Long range: expected to occur beyond 10 years

Table 25: Energy projects planned or in progress

Project	Communities	Lead Entity	Status	Scope / Next Steps	Output	Timing	Cost	Funding
Planning and Collaboration								
Regional Energy Planning	All	SWAMC, AEA	Active	Economic and technical analysis of projects and startup of Energy Committee.	Identification of viable energy projects with broad support. Implementation plan that includes regional Energy Committee.	Ongoing		AEA
Energy Committee	All	SWAMC, AEA	Planned	Appointment of representatives by communities. Seek organizational support for regular teleconferences and annual meet up.	Regional forum for sharing information on energy projects, collaboration on common issues and barriers, continuation of energy planning into the future.	2015-16 startup		ARDOR, AEA, with Regional Support
Bulk Fuel Purchase Cooperative	All		Priority	Identify interested communities and	Lower bulk fuel costs through competitive	Medium		

Project	Communities	Lead Entity	Status	Scope / Next Steps	Output	Timing	Cost	Funding
				review existing structures and studies to decide on path forward.	bidding on higher volumes and administrative savings.			
Renewable Energy Alternatives	Atka	City	Priority	Assess renewable energy options for fish plant and/or for residential heating	Cost savings focused on space heating and reduced dependence on fossil fuels.	Short		
Oil and Gas								
Bulk Fuel Upgrade	St. George	AEA	Planned	Conceptual Design	Conceptual Design Report (CDR) for new bulk fuel tank farm infrastructure	Short		AEA Partial funding
Bulk Fuel Upgrade	Cold Bay, St. Paul, Sand Point	AEA	Planned			Medium		AEA 10-year plan: funding not guaranteed
LNG Demonstration Project	Unalaska	City	Priority	Assess feasibility of importing LNG by tanker for use in generating electricity, including performance testing of LNG generator.	Determination to proceed or table based on current costs and technology.	Short		
Bulk Fuel Storage	St. George, St. Paul	City	Priority	Share fuel storage through inter-island ferry. Install new tanks for aviation fuel at or near airport (St. Paul)				
Diesel Efficiency and Heat Recovery								
Rural Power System Upgrade	Adak	AEA, TDX Power	Planned	Properly size diesel plant to address inefficiencies created by hugely oversized system in poor condition.	Improved efficiency and cost savings through right-sizing system and ability to integrate with local hydro resources.	Medium		AEA 10-year plan: funding not guaranteed

Project	Communities	Lead Entity	Status	Scope / Next Steps	Output	Timing	Cost	Funding
Rural Power System Upgrade and Heat Recovery	St. George	AEA	Active		Improved diesel efficiency and cost savings.	Short	$6,035,821	AEA Partial funding
St. Paul Fuel Economy Upgrade	St. Paul	City Utility	Active	Design upgrade and extension of heat recovery loop to work with wind-diesel system.	Lower space heating costs and reduced fossil fuel dependence.	Short (2014)	$114,834	AEA REF 3, Local Match
Waste Heat Recovery Feasibility and Conceptual Design	Cold Bay	G&K Electric Utility / Aleutians East Borough	Active	Assess feasibility of implementing heat recovery at power plant.	Lower space heating costs and reduced dependence on fossil fuels.	Short (2016)	$35,000	AEA REF 6, Local Match
Integrate private powerhouses into the city grid	Unalaska	City	Active					
Rural Power System Upgrade	St. Paul	City	Priority	Upgrade diesel power system. Determine cause of line loss. Establish emergency energy generation for homes and essential services	Cost and fuel savings from diesel efficiency and lower line loss. Improved safety and emergency preparedness.			
Rural Power System Upgrade	False Pass	City	Priority	Address high line losses and diesel efficiency	Cost and fuel savings from diesel efficiency, lower line loss. Improved safety.			
Transformer/Distribution System Upgrade	Nelson Lagoon	Tribal Council	Critical Need	Address high line loss through upgrade of distribution system and replacement of transformers that are beyond useful life.	Cost and fuel savings from lower line loss. Improved safety.			
Waste Heat Recovery Feasibility	False Pass	City	Priority	Assess feasibility of delivering waste heat to school.	Determination to proceed or table based on current costs and technology.			

Project	Communities	Lead Entity	Status	Scope / Next Steps	Output	Timing	Cost	Funding
Waste Heat Recovery Feasibility	Unalaska	City	Priority	Expand number of buildings heated with waste heat.	Determination to proceed or table based on current costs and technology.	Medium		
Successor Operator Training	Adak, Nelson Lagoon		Priority	Look into AEA's Utility operator successor training program.	Training for next generation of operators to ensure well-maintained powerhouse with good diesel efficiency.	Short	Free AVTEC training (excluding travel)	
Biomass								
Wood Biomass Pre-feasibility	Nelson Lagoon	Tribal Council	Priority	Assess whether sufficient wood biomass exists for community-scale project	Determination to proceed or table based on current costs and technology.			
Waste-to-Energy Feasibility	Unalaska	City	Priority	Assess feasibility of using of solid waste incineration for biomass energy production.	Determination to proceed or table based on current costs and technology.			
Geothermal								
Akutan Geothermal Development Final Design	Akutan	City Utility	Active	Drilling of confirmation well in Hot Springs Bay Valley and completion of final design and permitting, power sales agreement with Trident Seafood, business and operations plan.	Establish precise location and size of resource. Potential for 2-3 MW power plant.	Short	$3,050,000 REF 4 ($5.82 million total REF). Total project cost estimated at $65 million.	AEA REF 2/3/4, Local Match (US DOE grant will support drilling costs)
Heat Pump Feasibility	Unalaska	City	Priority	Study costs and benefits of heat pumps for space heating.	Better understanding of heat pump technologies and at what electrical rates they become economic in Unalaska.			
Hydro								
Atka Dispatchable Heat Design & Construction	Atka	City	Active / On Hold	Start construction of heat project once PLC	Cost savings and reduced dependence on fossil	Short	$135,289 REF 7. (Total $207,874)	AEA REF 3/7, Local Match

Project	Communities	Lead Entity	Status	Scope / Next Steps	Output	Timing	Cost	Funding
				and controls have been upgraded.	fuels from heating 7 community buildings with excess hydroelectric energy.			
Waterfall Creek Hydro Final Design & Construction	King Cove	City	Active	Complete construction of 375 kW run-of-river hydro with transmission to existing Delta Creek hydro powerhouse.	Displace diesel used for electric generation at the city utility and by selling dispatchable power to Peter Pan Seafoods.		$3.90 million REF 6. ($4.50 million total)	AEA REF 5/6, Local Match
Hydro Power Generator Adak	Adak	TDX Adak Generating	Priority	Install small (89 kW) hydroelectric turbine in the existing City of Adak domestic water supply line at Bonnie Rose Lake	Displace up to 16,500 gallons diesel used for electric generation and reduce power plant emissions.		$420,146 (TDX Bonnie Rose turbine project)	AEA REF 9 application submitted
Hydro Feasibility Updates	Unalaska	City	Low Priority	Update feasibility assessment of potential sites at Pyramid Creek (260 kW), Shaishnikof Creek (700 kW), and Kacie Lake.	Determination to proceed or table based on current costs and technology.			
Small-scale Run-of-River Hydro Feasibility	False Pass	City, AEA	Priority	Feasibility assessment of potential 125 kW run-of-river hydro resource at Unga Man Creek.	Determination to proceed or table based on current costs and technology.		$4.4m ($187,000 REF 9 request)	AEA REF 9 application submitted
Russell Creek Run-of-River Hydro Feasibility	Cold Bay	G&K Electric Utility	Priority	Dialog with federal landowners to determine constraints on development at Russell Creek and other streams.	Determination to proceed or table.			
Hydrokinetic (Tidal)								
Tidal Energy Pre-feasibility	Nelson Lagoon	Tribal Council	Priority	Monitor emerging tidal power developments with eye to potential project under dock.	Determination to proceed or table based on current costs and technology.	Ongoing		

Project	Communities	Lead Entity	Status	Scope / Next Steps	Output	Timing	Cost	Funding
Solar								
Solar Energy Pre-feasibility	Unalaska	City	Priority	Monitor success of solar installations at other locations to determine efficacy of solar in Unalaska	Determination to proceed or table based on current costs and technology.			
Solar Streetlight Feasibility	Atka	City	Priority	Assess feasibility of solar-powered streetlights.	Determination to proceed or table based on current costs and technology.			
Solar Energy Feasibility	Nelson Lagoon, St. George		Priority	Assess feasibility of community-scale solar to reduce costs and/or diesel dependence.	Determination to proceed or table based on current costs and technology.			
Wind								
Atka Wind Energy Feasibility	Atka		Active	Installed several met towers in 2015. Complete one year of data collection and draft feasibility study.	Determination to proceed or table based on current costs and technology.	Short		APICDA support
Cold Bay Wind Energy Feasibility	Cold Bay	G&K Electric Utility (IPP)	Active	Complete feasibility assessment with full year of data from met tower installed in 2012.	Determination to proceed or table based on data from met tower site.	Short	$104,075	AEA REF 4, Local Match
Sand Point Excess Wind Utilization	Sand Point	TDX Sand Point Generating	Active	Install electric boilers at the school and clinic to use excess wind energy for space heating, and integrate building energy use data into the plant SCADA system.	Cost savings and reduced fuel consumption from use of wind energy now being dumped and ability to measure and optimize building performance through SCADA system.	Short	$383,900	AEA REF 8, Local Match
Sand Point Energy Storage Design & Construction	Sand Point	TDX Sand Point Generating	Active	Install an inverter and battery bank to store excess wind energy.	Cost savings and reduced fuel use through increased utilization of wind energy and ability		$1,397,403	AEA REF 7, Local Match

Project	Communities	Lead Entity	Status	Scope / Next Steps	Output	Timing	Cost	Funding
					to run at "wind only" for up to 30% of the year.			
St. Paul Flywheel (add-on to Wind-Diesel Construction project)	St. Paul	TDX Corp. (IPP)	Active	Complete testing of flywheel for storage of excess wind energy. Install met tower and additional secondary loads.	Cost savings and reduced fuel use through increased utilization of wind energy.		$2.1 million total wind-diesel project (plus $1.5 million for turbines)	AEA REF 3, US DOE, Local Match
King Cove Wind Energy Feasibility	King Cove		NA	Identify new test sites in Delta Creek Valley; monitor technology to find best system for strong winds; complete study.	Determination to proceed or table based on current technology for strong/ turbulent winds.			
Nelson Lagoon Wind Energy Feasibility & Conceptual Design	Nelson Lagoon	Utility Cooperative	Active	Complete avian study and draft CDR based on data collected from modified 40' monopole tower.	Determination to proceed or table based on data from met tower site and environmental (avian) issues.	Short (2015)	$104,075	AEA REF 4, Local Match
St. George Wind Farm Construction / Wind Turbine Replacement	St. George	City	Active	Replace 95 kW burned-out wind turbine wind turbine with one of similar size and type. Ensure proper integration with new power plant.	Lower energy costs and reduced dependence on fossil fuel from properly integrated wind energy.	Short (Oct 2015)		AEA REF 1
Nikolski Wind-Diesel System Redesign, Construction and Commissioning	Nikolski	Native Village	Priority	Complete integration and commissioning of 65 kW Vestas V15 wind turbine in coordination with AEA wind program managers.	Cost savings and reduced diesel dependence from having a functioning wind-diesel power system.		$331,240 (estimated cost in 2012)	
Transportation								
UMC Dock Project	Unalaska	City	Active	Complete UMC dock project.				

Project	Communities	Lead Entity	Status	Scope / Next Steps	Output	Timing	Cost	Funding
Trans-load Dock and Access Road	Akutan	City	Priority	Add trans-load dock and build access road between village and harbor.	Potential for reduced bulk fuel transportation costs.	Long	$1.78 million dock. $22.13 million road	
Protected Marine Infrastructure Development	Cold Bay	City	Priority	Develop protected marine infrastructure.	Improved safety. Potential for reduced bulk fuel transportation costs.			
Harbor Reconstruction and Dredging	St. George	City	Priority		Improved safety. Potential for reduced bulk fuel transportation costs.			
Runway Improvements	Akutan, Atka, Unalaska	Cities	Priority	Lengthen and widen airport runways, other improvements	Improved safety and potential to reduce cargo and other transportation costs.			
Energy Efficiency & Conservation								
Waste and Sewer Plant Design & Construction	Unalaska	ANTHC	Active	Finish construction and monitor efficiency of new water and wastewater plants.	Reduced costs and fossil fuel dependence through improved energy efficiency of sanitation system.	Short		
Improve energy efficiency of residential, community, and commercial buildings	All		Priority					

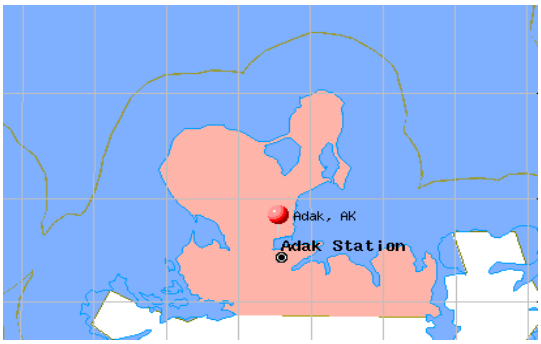
6 | COMMUNITY AND ENERGY PROFILES

This section contains profiles for communities in the Aleutian region. The first part contains general information about the location, economy, historical and cultural resources, planning, demographics, contacts and infrastructure in each community. It provides a broad overview of community size, location and resources to give context to the energy profile.

The second part of each profile is the energy profile, which provides an overview of energy production and distribution. It is intended to provide a snapshot of local energy conditions. The energy profile also includes a partial inventory of non-residential buildings in the community and its participation in state and federal energy efficiency programs.

The data sources used to compile the profiles are shown in Appendix E. Though based on the latest available data from state and federal sources, we know that not all information is accurate due to sampling and reporting errors. To try to correct these inaccuracies, we emailed draft versions of the Community and Energy Profile to contacts in each community in the spring and summer of 2015. The profiles in this report include the revisions we received. The summary of community Energy Priorities and Projects on the first page of each profile has also been updated from the Phase I report based on the public input gathered in Phase II, including interviews with community leaders where possible.

Community Profile: Adak



Incorporation	2nd Class City

Location

Adak is located on Kuluk Bay on Adak Island. It lies 1,300 miles southwest of Anchorage and 350 miles west of Unalaska or its port Dutch Harbor in the Aleutian Island Chain. Adak is the southern-most community in Alaska.

Longitude	-176.6286	**Latitude**	51.8725
ANCSA Region	Aleut Corporation		
Borough/CA	Aleutians West Census Area		
School District	Aleutian Region School District		
AEA Region	Aleutians		

Alaska Native Name (definition)

AdaQ ("Father")

Taxes	**Type (rate)**	**Per-Capita Revenue**
	Sales (4%), Bed (5%), Raw Fish (2%)	$ 2,060

Historical Setting / Cultural Resources

The Aleutian Islands were historically occupied by the Unangas. The Native population continued to actively hunt and fish around the island over the years, until World War II broke out. Adak was tje site of a Naval Air Station, which closed on March 31, 1997. In 2001, the community formed as a second-class city. As of 2009, all naval installations were closed. Ownership of the facilities passed to the Aleut Corporation and the City of Adak.

Economy

Local government, trade, and transportation/warehousing are main employers. There are four fishing permits for the village. Fish processing/final sales.

Climate	**Avg. Temp.**	**Climate Zone**	**Heat. Deg. Days**
	41.1	7	9,046

Natural Hazard Plan	**Year**

Notes

Energy Priorities and Projects

Workforce development/utility op. training; Wind - id less turbulent sites; Investigate geothermal potential; secure funds/continue FS for Bonnie Rose Lake Hydro; Heat recovery for community bldgs.; Space heating strategy

Community Plans	**Year**

Local Contacts	**Email**	**Phone**	**Fax**
City of Adak	clerk@adak-ak.gov	907-592-4500	907-592-4262
Eastern Aleutian Tribes, Inc		907-277-1440	907-277-1446
Aleut Corporation	receptionist@aleutcorp.com	907-561-4300	907-276-3924

Demographics	**2000**	**2010**		**2013**
Population	316	326	**Percent of Residents Employed**	65%
Median Age	36	46	**Denali Commission Distressed Community**	No
Avg. Household Size	3	3	**Percent Alaska Native/American Indian (2010)**	5.52%
Median Household Income	$52,727	$88,750	**Low and Moderate Income (LMI) Percent (2014)**	32.6%

Electric Utility	**Generation Sources**	**Interties**	**PCE?**
TDX Adak Generating LLC	Diesel	No	Yes

Landfill	**Class**	3	**Permitted**	Yes	**Location**	Adak

Water/Wastewater System	City of Adak	**Homes Served**	**System Volume**
Water	Piped	220	N/A
Sewer	Piped	**Energy Audit?**	
Notes		Yes	

Access

Road	No				
Air Access	Publicly owned; Asphalt	**Runway**	2 runways: 7,790'x200' & 7,605'x200'		
Dock/Port	Yes	**Barge Access?**	Yes	**Ferry Service?**	No

Notes

Energy Profile: Adak

Diesel Power System

Utility	TDX Adak Generating LLC		
Engine	**Make/Model**	**Condition/Hrs**	**Gen Capacity**
Unit 1	Caterpillar	Good/375	500
Unit 2	Caterpillar	Poor/33,770	1135
Unit 3	Caterpillar	Poor/Destroyed	800
Unit 4	Caterpillar	Poor/35,427	800
Unit 5	Caterpillar	Poor/40,155	800
Line Loss	42.2%		
Heat Recovery?	No		

Upgrades	Priority	Projects	Status
RPSU Powerhouse	High		
RPSU Distribution	High		

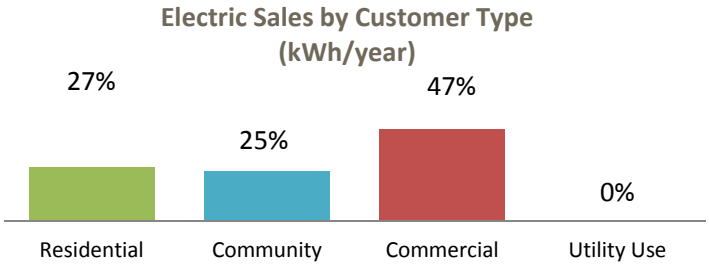
Outage History/Known Issues

Facilities damaged in fire; Serious risks to health & safety.

Operators	No. of Operators	Training/Certifications
	1	PPO

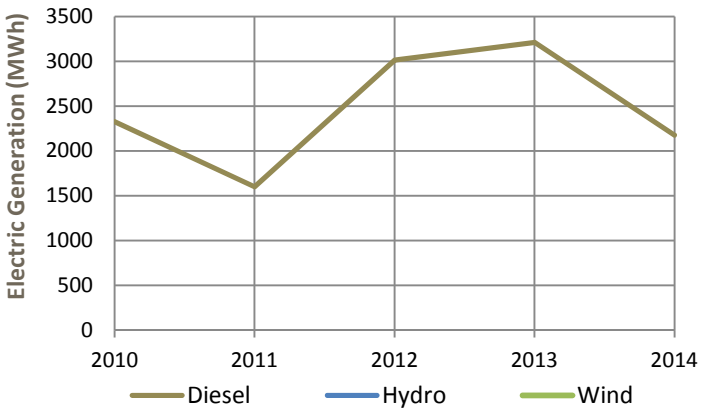
Maintenance Planning (RPSU)	Good

Electric Sales	No. of Customers	kWh/year	kWh/Customer
Residential	90	345,241	3,836
Community	7	319,341	45,620
Commercial	105	594,013	5,657
Utility Use		0	



Power Production

Diesel (kWh/yr)	2,178,268	**Avg. Load (kW)**	200
Wind (kWh/yr)	0	**Peak Load (kW)**	904
Hydro (kWh/yr)	0	**Efficiency (kWh/gal)**	13
Total (kWh/yr)	2,178,268	**Diesel Used (gals/yr)**	170,110



Electric Rates ($/kWh)		Cost per kWh Sold ($/kWh)	
Rate with PCE	$0.63	**Fuel Cost**	$0.67
Residential Rate	$1.44	**Non-fuel Cost**	$0.30
Commercial Rate		**Total Cost**	$0.97

Fuel Prices ($)	Utility/Whlsale	Retail	Month/Year
Diesel (1 gal)	$4.88	$4.62	6-13; 8-13
Other Fuel? (1 gal)			
Gasoline (1 gal)			
Propane (100#)			
Wood (1 cord)			
Pellets			
Discounts?			

Alternative Energy	Potential	Projects	Status
Hydroelectric	High	Adak Hydroelectric	Feasibility Study
Wind Diesel	High	Wind Data Collection	Preliminary Design
Biomass	Low		
Solar	Pending		
Geothermal	Medium		
Oil and Gas	Low		
Coal	Low		
Emerging Tech	Not Rated		
Heat Recovery	Medium		
Energy Efficiency	High	EECBG	Complete

Bulk Fuel

Tank Owner	Fuel Type(s)	Capacity	Age/Condition
Adak Petroleum	#2 ULS Diesel	20,000,000	

Purchasing	Deliveries/Year	Gallons/Delivery	Vendor(s)
By Barge			Adak Petrol.
By Air			

Cooperative Purchasing Agreements

Bulk Fuel Upgrade	Priority	Project	Status

Notes

Energy Profile: Adak

Housing Units	Occupied	Vacant	% Owner-Occup.
	54	770	37%

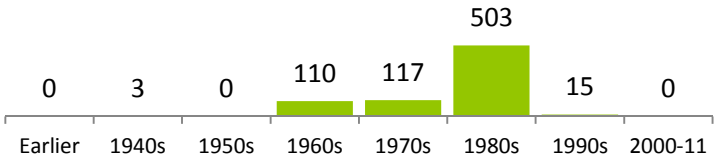
Regional Housing Authority	Weatherization Service Provider
Aleutian HA	Aleutian HA

Housing Need	Overcrowded	1-star
	3.7%	N/A

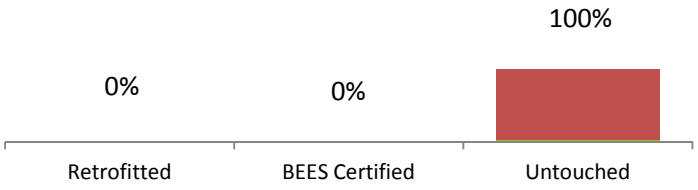
Data Quality	Low

Energy Use	Average Home Energy Rating	Average Square Feet	Avg. EUI (kBTU/sf)
	N/A	N/A	N/A

Age of Housing Stock



Energy Efficient Housing Stock

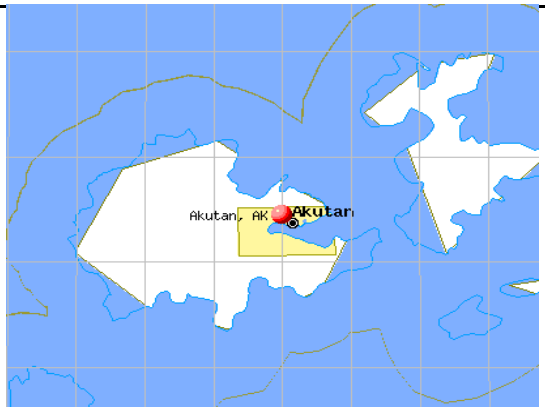


Street Lighting	Owner	Number/Type	Retrofitted?	Year	Notes
City of Adak					

Non-residential Building Inventory

Building Name or Location	Year Built	Square Feet	Audited?	Retrofits Done?	In ARIS?
Bering Hill Chapel/Tsunami Shelter		15,000			No
City Hall		77,100			No
City Shop		8,081			No
EMS Bldg./Line Shack		16,800			No
Lift Station 12		168			No
Lift Station 13		180			No
Lift Station 7		288			No
Lift Station 9		100			No
Maintenance Shop/Aleut Corp.?/telephone		12,000 (?)			Yes
Pat Kelly Airport Terminal		15,000			No
Pressure Reducing Valve 1		912			No
Sewer Treatment Plant		2,500			No
SRE Bldg.		5,000			Yes

Community Profile: Akutan



Incorporation	2nd Class City

Location

Akutan is located on Akutan Island in the eastern Aleutians, one of the Krenitzin Islands of the Fox Island group. It is 35 miles east of Unalaska and 766 air miles southwest of Anchorage

Longitude	-165.7731	**Latitude**	54.1356
ANCSA Region	Aleut Corporation		
Borough/CA	Aleutians East Borough		
School District	Aleutians East Borough School District		
AEA Region	Aleutians		

Alaska Native Name (definition)

Achan-ingiiga ("I made a mistake")

Taxes	**Type (rate)**	**Per-Capita Revenue**
	Raw Fish (1.5%)	$ 1,490

Historical Setting / Cultural Resources

Akutan began in 1878 as a fur storage and trading port. The Pacific Whaling Co. built a whale processing station across from Akutan in 1912, which closed in 1939. After the Japanese attacked Unalaska in 1942, the U.S. gov't evacuated the area. The village was re-established in 1944, though many did not return, changing the traditional lifestyle. The majority of the population is transient fish processing workers.

Economy

Manufacturing provides more than 50% of employment with local government and trade as other top employers.

Climate	**Avg. Temp.**	**Climate Zone**	**Heat. Deg. Days**
	40.9	7	8,554

Natural Hazard Plan	**Year**

Notes

Energy Priorities and Projects

Maintain and upgrade hydro at Town Creek; Monitor tidal and wave power opportunties; Complete harbor projects; Build access road between village and harbor; Improve airport runway

Community Plans	**Year**
City of Akutan Community Plan	2005

Local Contacts	**Email**	**Phone**	**Fax**
City of Akutan	akutanadmin@gci.net	907-698-2228	907-698-2202
Eastern Aleutian Tribes, Inc.		907-277-1440	907-277-1446
Native Village of Akutan	akutanaleuttribe@hotmail.com	907-698-2300	907-698-2301

Demographics	**2000**	**2010**		**2013**
Population	713	1,027	**Percent of Residents Employed**	92%
Median Age	41	45	**Denali Commission Distressed Community**	No
Avg. Household Size	3	3	**Percent Alaska Native/American Indian (2010)**	5%
Median Household Income	$33,750	$38,333	**Low and Moderate Income (LMI) Percent (2014)**	63.4%

Electric Utility	**Generation Sources**	**Interties**	**PCE?**
City of Akutan	Diesel; Hydro	No	Yes

Landfill	**Class**	3	**Permitted?**	No	**Location**	Akutan

Water/Wastewater System	Aleutians East Borough	**Homes Served**	**System Volume**
Water	Piped	95	50,001-100,000 gpd (water)
Sewer	Piped	**Energy Audit?**	
Notes		Yes	

Access

Road	No				
Air Access	Publicly owned; asphalt	**Runway**	4,500' x 75'		
Dock/Port	Yes	**Barge Access?**	Yes	**Ferry Service?**	Yes

Notes

Energy Profile: Akutan

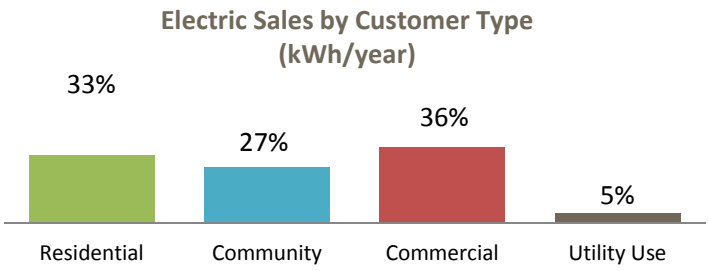
Diesel Power System

Utility	City of Akutan		
Engine	**Make/Model**	**Condition/Hrs**	**Gen Capacity**
Unit 1	John Deere	Fair/10,342	117
Unit 2	John Deere	Poor/44,980	150
Unit 3	John Deere	Good/6,267	140
Unit 4			
Line Loss	14.7%		
Heat Recovery?	No		

Upgrades	**Priority**	**Projects**	**Status**
RPSU Powerhouse	Med.		
RPSU Distribution	Low		
Outage History/Known Issues			

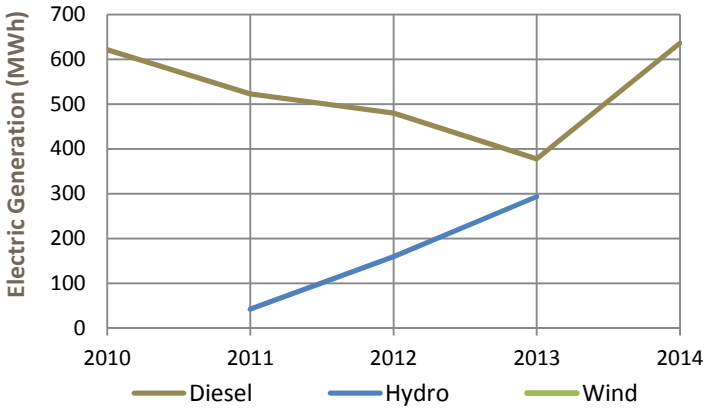
Operators	**No. of Operators**	**Training/Certifications**
	8	PPO, Hydro, BF Book, Clerk, BF Manager
Maintenance Planning (RPSU)		Acceptable

Electric Sales	**No. of Customers**	**kWh/year**	**kWh/Customer**
Residential	41	176,745	4,311
Community	14	143,868	10,276
Commercial	18	196,674	10,926
Utility Use		25,321	



Power Production

Diesel (kWh/yr)	636,366	**Avg. Load (kW)**	59
Wind (kWh/yr)	0	**Peak Load (kW)**	131
Hydro (kWh/yr)	0	**Efficiency (kWh/gal)**	16
Total (kWh/yr)	636,366	**Diesel Used (gals/yr)**	40,944



Electric Rates ($/kWh)		**Cost per kWh Sold ($/kWh)**	
Rate with PCE	$0.14	**Fuel Cost**	$0.32
Residential Rate	$0.32	**Non-fuel Cost**	$0.42
Commercial Rate		**Total Cost**	$0.74

Fuel Prices ($)	**Utility/Wholesale**	**Retail**	**Month/Year**
Diesel (1 gal)	$4.03	$4.00	6-13; 8-14
Other Fuel? (1 gal)			
Gasoline (1 gal)			
Propane (100#)			
Wood (1 cord)			
Pellets			
Discounts?			

Alternative Energy	**Potential**	**Projects**	**Status**
Hydroelectric	High	Town Creek Hydroelectric Plant, 105 kW	Operational
Wind Diesel	Low		
Biomass	Low	Fish byproducts used by Trident Seafood Corp.	
Solar	Pending		
Geothermal	Medium	Exploration at Hot Springs Valley	Reconaissance
Oil and Gas	Low		
Coal	Low		
Emerging Tech	Not Rated		
Heat Recovery	Medium		
Energy Efficiency	Medium	EECBG, AHFC-R	Both Complete

Bulk Fuel

Tank Owner	**Fuel Type(s)**	**Capacity**	**Age/Condition**
City of Akutan	#2 Diesel	72,400	Good
Trident Seafood	#2 Diesel	1,786,590	

Purchasing	**Deliveries/Year**	**Gallons/Delivery**	**Vendor(s)**
By Barge			
By Air			
Cooperative Purchasing Agreements			

Bulk Fuel Upgrade	**Priority**	**Project**	**Status**

Notes

Energy Profile: Akutan

Housing Units	Occupied	Vacant	% Owner-Occup.
	18	4	44%

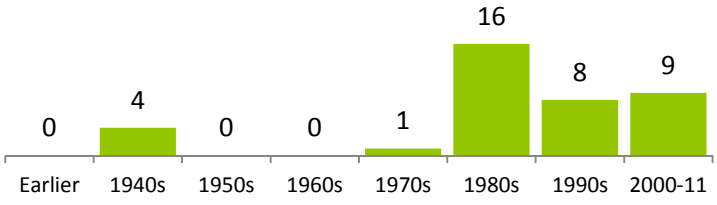
Regional Housing Authority	Weatherization Service Provider
Aleutian HA	Aleutian HA

Housing Need	Overcrowded	1-star
	N/A	N/A

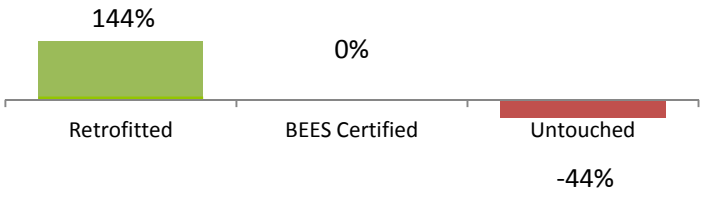
Energy Use	Average Home Energy Rating	Average Square Feet	Avg. EUI (kBTU/sf)
	N/A	N/A	N/A

Data Quality	Med.

Age of Housing Stock



Energy Efficient Housing Stock



Street Lighting	Owner	Number/Type	Retrofitted?	Year	Notes

Non-residential Building Inventory

Building Name or Location	Year Built	Square Feet	Audited?	Retrofits Done?	In ARIS?
Akutan K-12 School		11,425			Yes
Clinic		1,448			No
Nurse Duplex		941			No
Public Library/Museum		2,860			No
SRE/Sand Storage Bldg. (Heated)		7,150			Yes
VPSO Duplex		941			No
VPSO Office/Garage		1,021			No

Community Profile: Atka

Incorporation	2nd Class City

Location

Atka is located on Atka Island, 1,200 air miles southwest from Anchorage and 350 miles west of Unalaska.

Longitude	-174.2006	**Latitude**	52.1961
ANCSA Region	Aleut Corporation		
Borough/CA	Aleutians East Borough		
School District	Aleutian Region School District		
AEA Region	Aleutians		

Alaska Native Name (definition)

Atx̂ax̂

Taxes	**Type (rate)**	**Per-Capita Revenue**
	Bed (10%), Raw Fish (2%)	$ 980

Historical Setting / Cultural Resources

The island has been occupied by Unangas for at least 2,000 years. After the Japanese attacked Unalaska in 1942, the U.S. gov't evacuated the area. Atka was burned to prevent use by Japanese forces. The community was rebuilt by the U.S. Navy, and residents were allowed to return. The St. Nicholas Russian Orthodox Church is central to village life. Sea lions and other sea mammals are important to subsistence lifestyle.

Economy

Local government, manufacturing, and professional-business services are the main employers.

Climate	**Avg. Temp.**	**Climate Zone**	**Heating Deg. Da**
	38	7	9,054

Natural Hazard Plan	**Year**
None	

Notes

Energy Priorities and Projects

Continue wind reconnaissance; Maintain hydro & use excess electricity for heating; Investigate solar powered streetlights; Assess renewable energy options for fish plant or for residential heat

Community Plans	**Year**
Atka Community Development Plan	2006
Atka Comprehensive Plan	2014

Local Contacts	**Email**	**Phone**	**Fax**
City of Atka	dirksjuliea@gmail.com	907-839-2233	907-839-2234
Native Village of Atka	atkaira@gci.net	907-839-2229	907-839-2269
Atxam Corporation		907-839-2237	907-839-2217

Demographics	**2000**	**2010**		**2013**
Population	92	61	**Percent of Residents Employed**	75%
Median Age	36	36	**Denali Commission Distressed Community**	No
Avg. Household Size	3	3	**Percent Alaska Native/American Indian (2010)**	95.08%
Median Household Income	$30,938	$60,000	**Low and Moderate Income (LMI) Percent (2014)**	60.0%

Electric Utility	**Generation Sources**	**Interties**	**PCE?**
City of Atka	Diesel/Hydroelectric	No	Yes

Landfill	**Class**	3	**Permitted?**	Yes	**Location**	Atka

Water/Wastewater System	City of Atka	**Homes Served**	**System Volume**
Water	Piped	35	N/A
Sewer	Piped	**Energy Audit?**	
Notes		Yes	

Access

Road	No				
Air Access	Publicly owned; Asphalt	**Runway**	4,500' x 100'		
Dock/Port	Yes	**Barge Access?**	Yes	**Ferry Service?**	No

Notes

Energy Profile: Atka

Diesel Power System

Utility	City of Atka		
Engine	**Make/Model**	**Condition/Hrs**	**Gen Capacity**
Unit 1	John Deere	Fair/28,935	110
Unit 2	John Deere	Poor/27,565	110
Unit 3	John Deere	Good/16,727	37
Unit 4			
Line Loss	7.6%		
Heat Recovery?	No		

Upgrades	**Priority**	**Projects**	**Status**
RPSU Powerhouse	Medium		
RPSU Distribution	High	Old Vlge Distr.	Complete: 2011

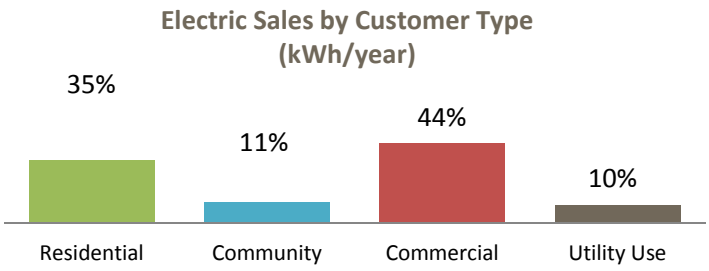
Outage History/Known Issues

#2 engine failure due to oil pressure

Operators	**No. of Operators**	**Training/Certifications**
	12	APPO, BF Bus., BFO, Elec. Util. Bus., Hydro, BFO, PPO, Clerk

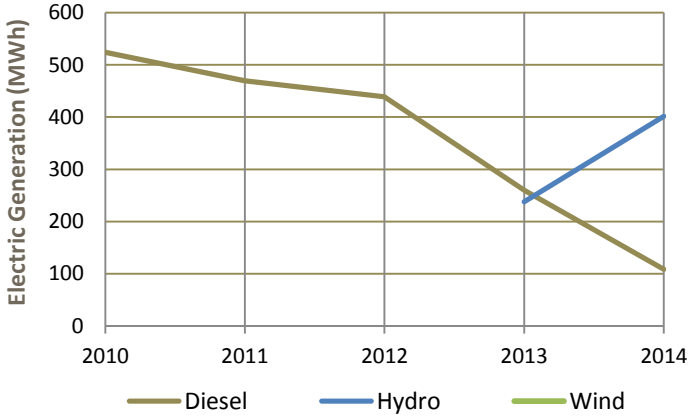
Maintenance Planning (RPSU)	Excellent

Electric Sales	**No. of Customers**	**kWh/year**	**kWh/Customer**
Residential	30	163,699	5,457
Community	2	52,928	26,464
Commercial	12	206,947	17,246
Utility Use		47,689	



Power Production

Diesel (kWh/yr)	108,883	**Avg. Load (kW)**	59
Wind (kWh/yr)		**Peak Load (kW)**	111
Hydro (kWh/yr)	401,328	**Efficiency (kWh/gal)**	10
Total (kWh/yr)	510,211	**Diesel Used (gals/yr)**	10,765



Electric Rates ($/kWh)		**Cost per kWh Sold ($/kWh)**	
Rate with PCE	$0.25	**Fuel Cost**	$0.14
Residential Rate	$0.73	**Non-fuel Cost**	$0.08
Commercial Rate		**Total Cost**	$0.22

Fuel Prices ($)	**Utility/Wholesale**	**Retail**	**Month/Year**
Diesel (1 gal)	$5.29	$7.65	6-13; 8-14
Other Fuel? (1 gal)			
Gasoline (1 gal)			
Propane (100#)			
Wood (1 cord)			
Pellets			
Discounts?			

Alternative Energy	**Potential**	**Projects**	**Status**
Hydroelectric	High	Chuniisax Hydro Plant	Operational as of 2012
Wind Diesel	Medium	Atka Wind Power Project	Recon/Feasibility
Biomass	Low		
Solar	Pending		
Geothermal	Medium		
Oil and Gas	Low		
Coal	Low		
Emerging Tech	Not Rated		
Heat Recovery	Medium (Diesel Generators)	Atka Hydro Dispatched Excess Electrical Power	Construction in 2015
Energy Efficiency	High	1) EECBG 2) Streetlight Upgrade	Complete

Bulk Fuel

Tank Owner	**Fuel Type(s)**	**Capacity**	**Age/Condition**
Alaska Native Store	#1 Diesel; Gas	40,000; 10,000	
Atka Pride	#2 Diesel	60,000	
City of Atka	#2 Diesel	40,000	

Bulk Fuel Upgrade	**Priority**	**Project**	**Status**

Purchasing	**Deliveries/Year**	**Gallons/Delivery**	**Vendor(s)**
By Barge	1	100,000+	Delta Western
By Air			

Cooperative Purchasing Agreements

None

Notes

Energy Profile: Atka

Housing Units	Occupied	Vacant	% Owner-Occup.
	24	23	92%

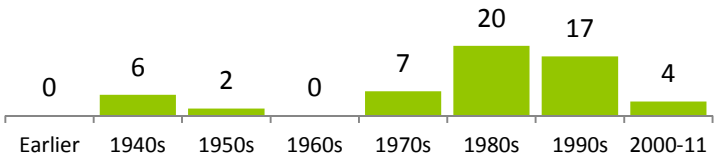
Regional Housing Authority	Weatherization Service Provider
Aleutian HA	Aleutian HA

Housing Need	Overcrowded	1-star
		N/A

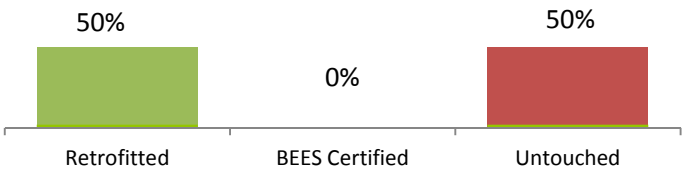
Data Quality	Med.

Energy Use	Average Home Energy Rating	Average Square Feet	Avg. EUI (kBTU/sf)
	5 star	1,018	73

Age of Housing Stock



Energy Efficient Housing Stock



Street Lighting	Owner	Number/Type	Retrofitted?	Year	Notes
		12/Mer. Vapor	Yes		Replaced with LEDs

Non-residential Building Inventory

Building Name or Location	Year Built	Square Feet	Audited?	Retrofits Done?	In ARIS?
ARCS Bldg.		200			No
Atxam Bldg.	2000	1,400			No
City of Atka (office)	2014	1,920			
Clinic	1979	1,980			No
Post Office	2003	600			No
Public Safety Bldg.	2010	600			No
Shop/Garage	1999	2,400			No
SRE Bldg.		4,250			Yes
Water Treatment Plant	2013	900			No
Yakov E. Netsvetov School	1982	8,130			No

Community Profile: Cold Bay

Incorporation	2nd Class City

Location

Cold Bay is located in the Izembek National Wildlife Refuge at the western end of the Alaska Peninsula. It lies 634 miles southwest of Anchorage and 180 miles northeast of Unalaska.

Longitude	-162.7211	**Latitude**	55.1858
ANCSA Region	Aleut Corporation		
Borough/CA	Aleutians East Borough		
School District	Aleutians East Borough School District		
AEA Region	Aleutians		

Alaska Native Name (definition)

Udaamagax

Taxes	**Type (rate)**	**Per-Capita Revenue**
	Bed (10%), Fuel Transfer ($.04/gal)	$ 900

Historical Setting / Cultural Resources

Archaeological sites indicate the area around Cold Bay was inhabited by a large Native population. During World War II, Cold Bay was the site of Fort Randall. Cold Bay serves the fishing industry and houses a number of federal offices. Subsistence and recreational fishing and hunting are a part of the local culture. Izembeck Lagoon offers the world's largest eelgrass beds, providing feeding grounds for brant during their migrations.

Economy

Trade/transportation/utilities, health services, and state government are the main employers.

Climate	**Avg. Temp.**	**Climate Zone**	**Heating Deg. Days**
	38.8	7	9,877

Natural Hazard Plan	**Year**

Notes

Energy Priorities and Projects

Feasibility of District Heating Loop for gov't bldgs; Electric utility wind energy project; Feasibility of Russel Creek Hydro; Waste heat recovery project; Monitor tidal power opportunities; Investigate city fuel farm

Community Plans	**Year**
Cold Bay Economic Development Plan	2008

Local Contacts	**Email**	**Phone**	**Fax**
City of Cold Bay	coldbayak@arctic.net	907-532-2401	907-532-2671
Eastern Aleutian Tribes, Inc.		907-277-1440	907-277-1446
G & K, Incorporated		907-532-2407	907-532-2513

Demographics	**2000**	**2010**		**2013**
Population	88	108	**Percent of Residents Employed**	74%
Median Age	34	45	**Denali Commission Distressed Community**	No
Avg. Household Size	3	3	**Percent Alaska Native/American Indian (2010)**	12.04%
Median Household Income	$55,750	$54,688	**Low and Moderate Income (LMI) Percent (2014)**	24.7%

Electric Utility	**Generation Sources**	**Interties**	**PCE?**
G & K, Incorporated	Diesel	No	Yes

Landfill	**Class**	3	**Permitted?**	No	**Location**	Cold Bay

Water/Wastewater System	Aleutians East Borough	**Homes Served**	**System Volume**
Water	Piped	97	N/A
Sewer	Piped	**Energy Audit?**	
Notes		Yes	

Access

Road	No				
Air Access	Publicly owned; Asphalt	**Runway**	2 runways: 10,180' x 150' & 6,235' x 150'		
Dock/Port	Yes	**Barge Access?**	Yes	**Ferry Service?**	Yes

Notes

Energy Profile: Cold Bay

Diesel Power System

Utility	G&K Inc.		
Engine	**Make/Model**	**Condition/Hrs**	**Gen Capacity**
Unit 1	Caterpillar	Good/87,188	875
Unit 2	Caterpillar	Good/75,653	850
Unit 3	Caterpillar	Good/81,925	875
Unit 4			
Line Loss	7.9%		
Heat Recovery?	No		

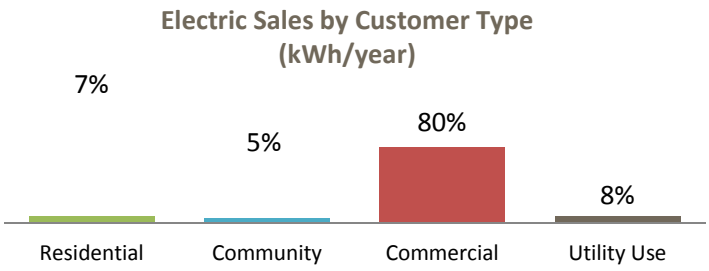
Upgrades	**Priority**	**Projects**	**Status**
RPSU Powerhouse	Low		
RPSU Distribution	Low		

Outage History/Known Issues

Operators	**No. of Operators**	**Training/Certifications**

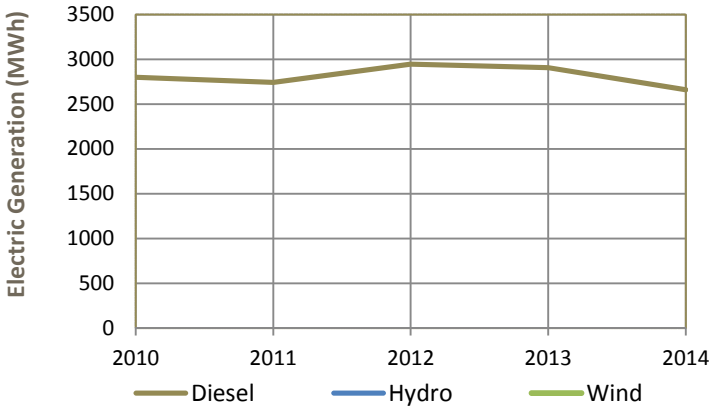
Maintenance Planning (RPSU)

Electric Sales	**No. of Customers**	**kWh/year**	**kWh/Customer**
Residential	38	177,955	4,683
Community	4	119,179	29,795
Commercial	75	1,966,400	26,219
Utility Use		186,588	



Power Production

Diesel (kWh/yr)	2,660,684	**Avg. Load (kW)**	295
Wind (kWh/yr)	0	**Peak Load (kW)**	480
Hydro (kWh/yr)	0	**Efficiency (kWh/gal)**	13
Total (kWh/yr)	2,660,684	**Diesel Used (gals/yr)**	198,146



Electric Rates ($/kWh)		**Cost per kWh Sold ($/kWh)**	
Rate with PCE	$0.20	**Fuel Cost**	$0.45
Residential Rate	$0.71	**Non-fuel Cost**	$0.28
Commercial Rate		**Total Cost**	$0.73

Fuel Prices ($)	**Utility/Wholesale**	**Retail**	**Month/Year**
Diesel (1 gal)	$5.19	$5.39	6-13; 8-14
Other Fuel? (1 gal)			
Gasoline (1 gal)			
Propane (100#)			
Wood (1 cord)			
Pellets			
Discounts?			

Alternative Energy	**Potential**	**Projects**	**Status**
Hydroelectric	Medium		
Wind Diesel	High	Cold Bay Wind Energy Project	Feasibility
Biomass	Low		
Solar	Pending		
Geothermal	Low		
Oil and Gas	Low		
Coal	Low		
Emerging Tech	Not Rated		
Heat Recovery	Medium	Cold Bay Waste Heat Recovery Project	Feasibility
Energy Efficiency	High	EECBG, AHFC-C	Complete

Bulk Fuel

Tank Owner	**Fuel Type(s)**	**Capacity**	**Age/Condition**
Frosty Fuels	#2 Diesel; Jet A	110,000; 300,000	
G&K	#2 Diesel	12,500	

Purchasing	**Deliveries/Year**	**Gallons/Delivery**	**Vendor(s)**
By Barge	3 to 4		Delta W./Crowley
By Air			

Cooperative Purchasing Agreements

Bulk Fuel Upgrade	**Priority**	**Project**	**Status**

Notes

Energy Profile: Cold Bay

Housing Units	Occupied	Vacant	% Owner-Occup.
	14	34	43%

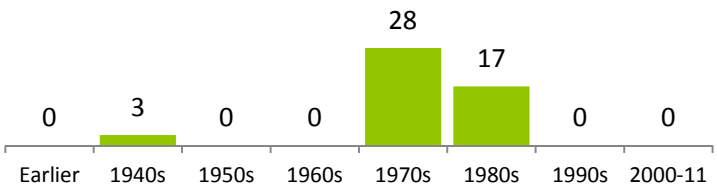
Regional Housing Authority	Weatherization Service Provider
Aleutian HA	Aleutian HA

Housing Need	Overcrowded	1-star
	N/A	N/A

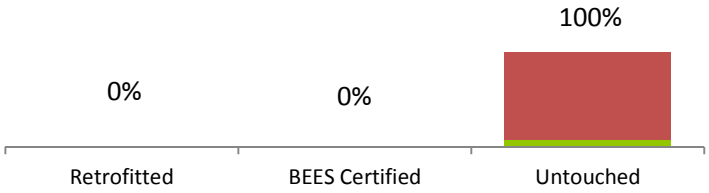
Energy Use	Average Home Energy Rating	Average Square Feet	Avg. EUI (kBTU/sf)
	N/A	N/A	N/A

Data Quality	Low

Age of Housing Stock



Energy Efficient Housing Stock



Street Lighting	Owner	Number/Type	Retrofitted?	Year	Notes

Non-residential Building Inventory

Building Name or Location	Year Built	Square Feet	Audited?	Retrofits Done?	In ARIS?
ARFF Bldg.		3,731			Yes
City Housing Duplex		2,400			No
Cold Bay RTH					Yes
Cold Bay School	1957-1983	11,747	Yes		Yes
Living Quarters 4		1,820			Yes
Living Quarters 5		1,820			Yes
Living Quarters 6		1,820			Yes
Living Quarters 9		1,820			Yes
Maintenance Shop		5,400			Yes
Old CFR Bldg.		5,560			Yes
Sand Storage		4,200			Yes
Warm Storage		2,624			Yes

Community Profile: False Pass

Incorporation	2nd Class City

Location

False Pass is located on the eastern shore of Unimak Island on a strait connecting the Pacific Gulf of Alaska to the Bering Sea. It is 646 air miles southwest of Anchorage.

Longitude	-163.4088	**Latitude**	54.8539
ANCSA Region	Aleut Corporation		
Borough/CA	Aleutians East Borough		
School District	Aleutians East Borough School District		
AEA Region	Aleutians		

Alaska Native Name (definition)

Isanak ("Gap, hole or tear")

Taxes	**Type (rate)**	**Per-Capita Revenue**
	Sales (3%), Bed (6%), Raw Fish (2%)	$ 3,020

Historical Setting / Cultural Resources

The area was originally settled by a homesteader in the early 1900s and grew with the establishment of a cannery in 1917. Natives immigrated from Morzhovoi, Sanak Island, and Ikatan when the cannery was built. The community is primarily Unangan. Fishing, fish processing, and subsistence activities are mainstays of the lifestyle.

Economy

Local government, manufacturing, and financial activities are the main employers.

Climate	**Avg. Temp.**	**Climate Zone**	**Heating Deg. Days**
	38.5	7	9,733

Natural Hazard Plan	**Year**
None	

Notes

Energy Priorities and Projects

Address high line loss and diesel efficiency; Assess feasibility of expanding heat recovery to school; finish wind feasibility study; hydro feasibility for run of river sites

Community Plans	**Year**
None	

Local Contacts	**Email**
City of False Pass	cityoffalsepass@ak.net
Eastern Aleutian Tribes, Inc.	
Isanotski Corporation	

Demographics	**2000**	**2010**		**2013**
Population	64	35	**Percent of Residents Employed**	78%
Median Age	32	33	**Denali Commission Distressed Community**	No
Avg. Household Size	3	3	**Percent Alaska Native/American Indian (2010)**	77.14%
Median Household Income	$49,375	$43,750	**Low and Moderate Income (LMI) Percent (2014)**	34.7%

Electric Utility	**Generation Sources**	**Interties**	**PCE?**
City of False Pass	Diesel	No	Yes

Landfill	**Class**	3	**Permitted?**	Yes	**Location**	False Pass

Water/Wastewater System	City of False Pass	**Homes Served**	**System Volume**
Water	Piped	60	10,000-50,000 gpd (water)
Sewer	Piped	**Energy Audit?**	
Notes		Yes	

Access

Road	No				
Air Access	Publicly owned; Gravel	**Runway**	2,150' x 60'		
Dock/Port	Yes	**Barge Access?**	Yes	**Ferry Service?**	Yes

Notes

Energy Profile: False Pass

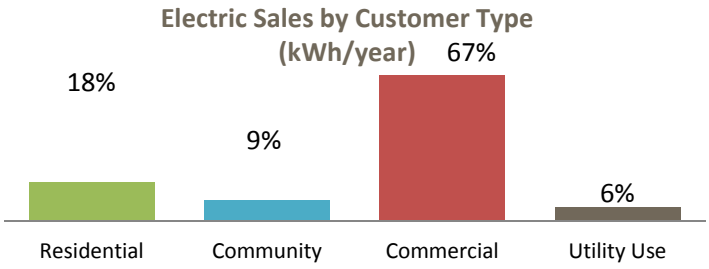
Diesel Power System

Utility	City of False Pass		
Engine	**Make/Model**	**Condition/Hrs**	**Gen Capacity**
Unit 1	John Deere	Fair/4	75
Unit 2	John Deere	Fair/11,483	125
Unit 3	John Deere	Fair/17,789	175
Unit 4			
Line Loss	9.1%		
Heat Recovery?	Yes; City Shop		

Upgrades	**Priority**	**Projects**	**Status**
RPSU Powerhouse	Med.		
RPSU Distribution	Med.		
Outage History/Known Issues			

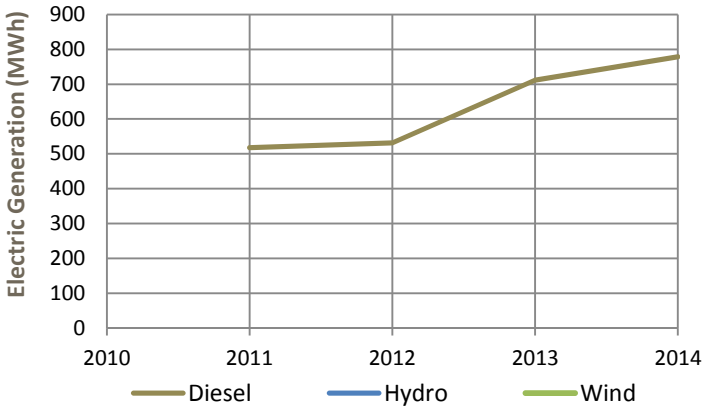
Operators	**No. of Operators**	**Training/Certifications**
	5	BF Manager, Clerk, BF Book, BFO

Maintenance Planning (RPSU)	Acceptable		
Electric Sales	**No. of Customers**	**kWh/year**	**kWh/Customer**
Residential	27	124,174	4,599
Community	11	66,925	6,084
Commercial	19	473,264	24,909
Utility Use		43,433	



Power Production

Diesel (kWh/yr)	778,559	**Avg. Load (kW)**	69
Wind (kWh/yr)	0	**Peak Load (kW)**	190
Hydro (kWh/yr)	0	**Efficiency (kWh/gal)**	13
Total (kWh/yr)	778,559	**Diesel Used (gals/yr)**	60,967



Electric Rates ($/kWh)		**Cost per kWh Sold ($/kWh)**	
Rate with PCE	$0.14	**Fuel Cost**	$0.32
Residential Rate	$0.42	**Non-fuel Cost**	$0.12
Commercial Rate		**Total Cost**	$0.45

Fuel Prices ($)	**Utility/Wholesale**	**Retail**	**Month/Year**
Diesel (1 gal)	$3.52	$4.21	6-13; 8-14
Other Fuel? (1 gal)			
Gasoline (1 gal)			
Propane (100#)		$286.43	8-14
Wood (1 cord)			
Pellets			
Discounts?			

Alternative Energy	**Potential**	**Projects**	**Status**
Hydroelectric	High		
Wind Diesel	Low	2.4 kW wind turbine; Utility wind project	Pilot project; feasibility study
Biomass	Low		
Solar	Pending		
Geothermal	Low		
Oil and Gas	Low		
Coal	Low		
Emerging Tech	Not Rated	False Pass Hydrokinetic	on hold
Heat Recovery	High	Waste Heat Recovery System to City Shop	Operational/Ageing
Energy Efficiency	High	EECBG, ACEA, AHFC-C	Complete

Bulk Fuel

Tank Owner	**Fuel Type(s)**	**Capacity**	**Age/Condition**
City of False Pass	#2 Diesel	65,000	11 yrs.
Peter Pan Seafood	#1 Heat; #2 Diesel	27,000; 300,000	

Purchasing	**Deliveries/Year**	**Gallons/Delivery**	**Vendor(s)**
By Barge	1		
By Air			
Cooperative Purchasing Agreements			

Bulk Fuel Upgrade	**Priority**	**Project**	**Status**

Notes

Energy Profile: False Pass

Housing Units	Occupied	Vacant	% Owner-Occup.
	8	45	38%

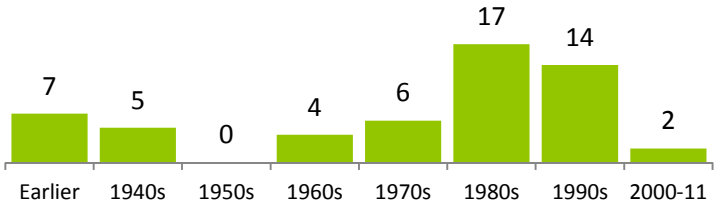
Regional Housing Authority	Weatherization Service Provider
Aleutian HA	Aleutian HA

Housing Need	Overcrowded	1-star
	N/A	N/A

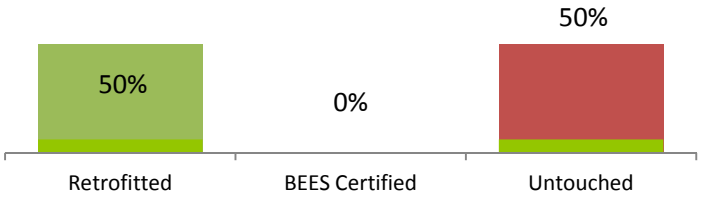
Energy Use	Average Home Energy Rating	Average Square Feet	Avg. EUI (kBTU/sf)
	N/A	N/A	N/A

Data Quality	
	Low

Age of Housing Stock



Energy Efficient Housing Stock

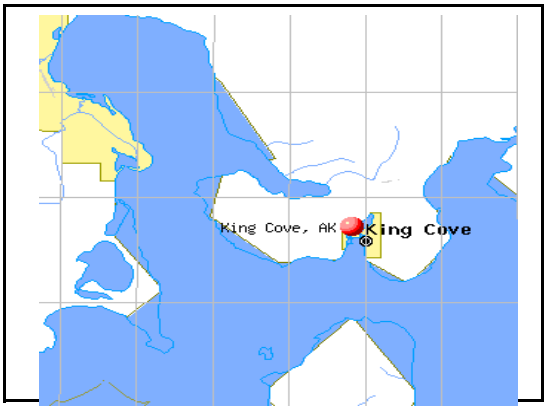


Street Lighting	Owner	Number/Type	Retrofitted?	Year	Notes

Non-residential Building Inventory

Building Name or Location	Year Built	Square Feet	Audited?	Retrofits Done?	In ARIS?
Bering Pacific Seafoods Bunkhouse		6,800			No
Bering Pacific Seafoods Multipurpose		4,000			No
Bering Pacific Seafoods Plant		13,200			No
City Office/Community Center 1	1986	2,448	Yes	Yes; VEEP	Yes
City Office/Community Center 2		2,432		Yes; VEEP	Yes
City Shop	1995	6,000		Yes; VEEP	Yes
Clinic/Medical Center	1998	1,280		Yes; VEEP	Yes
Clinic/Public Safety Office		4,629			Yes
False Pass City Hall	1985				No
False Pass Public Safety Bldg. 1	1996	4,591			Yes
False Pass Public Safety Bldg. 2	2002	2,994			Yes
False Pass Public Safety Bldg. 3	2002	4,629			Yes
False Pass School 1	1986	9,584		Yes; VEEP	Yes
False Pass School 2	1986	10,939		Yes; VEEP	Yes
Grocery Store				Yes; VEEP	No
Isanotski Office/Triplex				Yes; VEEP	No
Library/Post Office				Yes; VEEP	No
Liquor Store				Yes; VEEP	No
Old Generator Bldg.				Yes; VEEP	No
SRE Bldg.		1,104			Yes
Tribal Office/Warehouse				Yes; VEEP	No
Water Treatment Plant				Yes; VEEP	No

Community Profile: King Cove



Incorporation	1st Class City

Location

King Cove is located on the south side of the Alaska Peninsula, on a sand spit fronting Deer Passage and Deer Island. It is 18 miles southeast of Cold Bay and 625 miles southwest of Anchorage.

Longitude	-162.3103	**Latitude**	55.0617
ANCSA Region	Aleut Corporation		
Borough/CA	Aleutians East Borough		
School District	Aleutians East Borough School District		
AEA Region	Aleutians		

Alaska Native Name (definition)

Agdaaĝux̂

Taxes	**Type (rate)**	**Per-Capita Revenue**
	Sales (4%), Raw Fish (2%), Fisheries ($100k)	$ 1,750

Historical Setting / Cultural Resources

King Cove was founded in 1911 when Pacific American Fisheries built a salmon cannery. Early settlers were Unangan, Scandinavian, and other European fishermen. King Cove remains tied to fishing and fish processing. Scandinavians have historically influenced the cultural, economic, and social structures. King Cove is a mixed non-Native and Unangan community.

Economy

Local government, trade, transportation/utilities, and health services are main employers. Fishing & processing is a major employer.

Climate	**Avg Temp**	**Climate Zone**	**Heat. Deg. Days**
	38.3	7	9,733

Natural Hazard Plan	**Year**
None	
Notes	

Energy Priorities and Projects

Identify funding to complete Waterfall Creek hydro; Complete wind feasibility study; Secure a Power Purchase Agreement with Peter Pan

Community Plans	**Year**
Comprehensive Community Plan	2006
City of King Cove Waterfront Util. Plan	2003

Local Contacts	**Email**	**Phone**	**Fax**
City of King Cove	cityclerk@kingcoveak.org	907-497-2340	907-497-2594
Agdaagux Tribe	ettakuzakin@yahoo.com	907-497-2648	907-497-2803
The King Cove Corp.		907-497-2312	907-497-2444

Demographics	**2000**	**2010**		**2013**
Population	792	938	**Percent of Residents Employed**	60%
Median Age	35	42	**Denali Commission Distressed Community**	No
Avg. Household Size	3	3	**Percent Alaska Native/American Indian (2010)**	38.38%
Median Household Income	$45,893	$62,917	**Low and Moderate Income (LMI) Percent (2014)**	46.5%

Electric Utility	**Generation Sources**	**Interties**	**PCE?**
City of King Cove	Diesel, Hydropower	No	Yes

Landfill	**Class**	3	**Permitted?**	Yes	**Location**	King Cove

Water/Wastewater Systen	AE Borough/City of KC	**Homes Served**	**System Volume**
Water	Piped	972	100,001 - 500,000 gpd (water)
Sewer	Piped	**Energy Audit?**	
Notes		Yes	

Access

Road	No				
Air Access	Publicly owned; gravel	**Runway**	3,500' x 115'		
Dock/Port	Yes	**Barge Access?**	Yes	**Ferry Service?**	Yes

Notes

Energy Profile: King Cove

Diesel Power System

Utility	City of King Cove		
Engine	**Make/Model**	**Condition/Hrs**	**Gen Capacity**
Unit 1	Caterpillar	Good/9,343	1050
Unit 2	Caterpillar	Good/4,529	650
Unit 3	Caterpillar	Good/1,450	500
Unit 4	Caterpillar	Good/8,367	500
Line Loss	16.6%		
Heat Recovery?	Yes, community buildings		

Upgrades	**Priority**	**Projects**	**Status**
RPSU Powerhouse	Low		
RPSU Distribution	Med.		

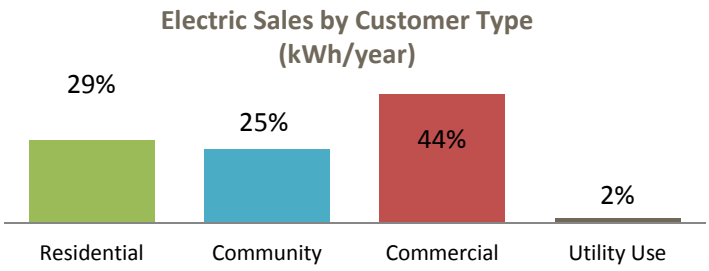
Outage History/Known Issues

No RPSU data.

Operators	**No. of Operators**	**Training/Certifications**
	12	APPO, BF Book, BFO, Hydro, PPO, Clerk

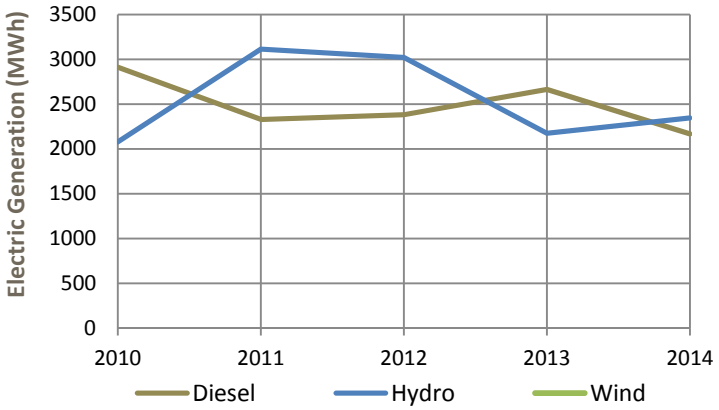
Maintenance Planning (RPSU)

Electric Sales	**No. of Customers**	**kWh/year**	**kWh/Customer**
Residential	193	1,078,081	5,586
Community	32	954,306	29,822
Commercial	203	1,665,230	8,203
Utility Use		66,285	



Power Production

Diesel (kWh/yr)	2,167,190	**Avg. Load (kW)**	486
Wind (kWh/yr)	0	**Peak Load (kW)**	904
Hydro (kWh/yr)	2,346,281	**Efficiency (kWh/gal)**	14
Total (kWh/yr)	4,513,471	**Diesel Used (gals/yr)**	153,210



Electric Rates ($/kWh)		**Cost per kWh Sold ($/kWh)**	
Rate with PCE	$0.23	**Fuel Cost**	$0.15
Residential Rate	$0.30	**Non-fuel Cost**	$0.01
Commercial Rate		**Total Cost**	$0.16

Fuel Prices ($)	**Utility/Wholesale**	**Retail**	**Month/Year**
Diesel (1 gal)	$3.75	$4.29	6-13; 8-14
Other Fuel? (1 gal)			
Gasoline (1 gal)			
Propane (100#)			
Wood (1 cord)			
Pellets			
Discounts?			

Alternative Energy	**Potential**	**Projects**	**Status**
Hydroelectric	High	Delta Creek, 800 kW; Waterfall Creek, 375 kW	Operational; Construction
Wind Diesel	High	Ram Creek Wind	Met Tower Installed
Biomass	Low		
Solar	Pending		
Geothermal	Low		
Oil and Gas	Low		
Coal	Low		
Emerging Tech	Not Rated		
Heat Recovery	Low	Diesel Gen Heat Recovery; Hydro Electric Boiler	Operational
Energy Efficiency	High	EECBG, AHFC-C, VEEP, Streetlight Upgrade	Complete

Bulk Fuel

Tank Owner	**Fuel Type(s)**	**Capacity**	**Age/Condition**
City of King Cove	#2 Diesel	159,500	Unknown
Peter Pan	#Diesel/Gas.	1,000,000	15 yrs.

Purchasing	**Deliveries/Year**	**Gallons/Delivery**	**Vendor(s)**
By Barge	3 to 4		Delta W.; Crowley
By Air			

Cooperative Purchasing Agreements

Bulk Fuel Upgrade	**Priority**	**Project**	**Status**

Notes

Energy Profile: King Cove

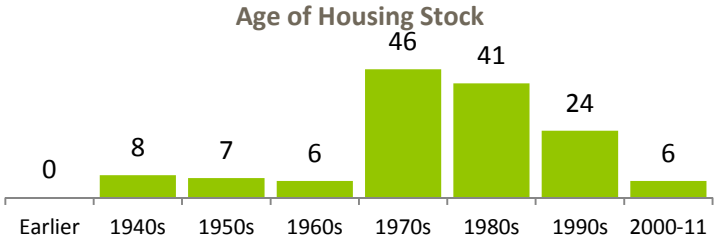
Housing Units	Occupied	Vacant	% Owner-Occup.
	118	16	52%

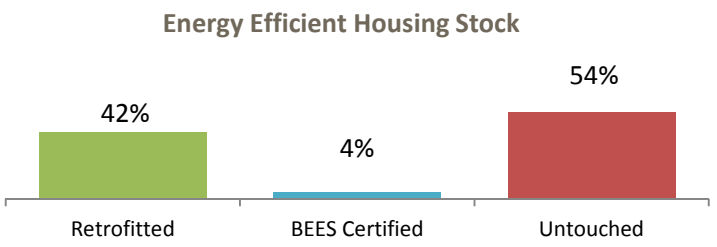
Regional Housing Authority	Weatherization Service Provider
Aleutian HA	Aleutian HA

Housing Need	Overcrowded	1-star
	2.5%	13.2%

Data Quality	
	Med.

Energy Use	Average Home Energy Rating	Average Square Feet	Avg. EUI (kBTU/sf)
	4 star	864	106





Street Lighting	Owner	Number/Type	Retrofitted?	Year	Notes
	City	68/HPS	Yes	2012	Replaced with LED; Est. savings of 40,506 kWh

Non-residential Building Inventory

Building Name or Location	Year Built	Square Feet	Audited?	Retrofits Done?	In ARIS?
Bible Chapel Church		2,365		Yes; VEEP	No
King Cove Corp. Hotel		8,768		Yes; VEEP	No
King Cove K-12 School 2	2007	43,843			Yes
King Cove K-12 School 1	2007	43,308	Yes		Yes
Public Safety Bldg.		3,180			No
SRE Bldg. (Heated)		2,200			Yes
Tribal Office		2,172		Yes; VEEP	No

Community Profile: Nelson Lagoon

Incorporation Unincorporated

Location

Nelson Lagoon is located on the northern coast of the Alaska Peninsula, on a narrow sand spit that separates the lagoon from the Bering Sea. It is 580 miles southwest of Anchorage.

Longitude	-161.2028	**Latitude**	56.0019
ANCSA Region	Aleut Corporation		
Borough/CA	Aleutians East Borough		
School District	Aleutians East Borough School District		
AEA Region	Aleutians		

Alaska Native Name (definition)

Niilsanam Alĝuudaa

Taxes	**Type (rate)**	**Per-Capita Revenue**
		N/A

Historical Setting / Cultural Resources

Nelson Lagoon has been used historically as an Unangan summer fish camp. The resources of the lagoon and nearby Bear River are excellent. In 1965 a school was built, and the community began to be occupied year-round. The culture is focused on commercial fishing and subsistence activities. There is a strong community pride and loyalty among the residents.

Economy

Local government, health services, and utilities are main employers. Fishing is a major part of the economy.

Climate	**Avg. Temp**	**Climate Zone**	**Heating Deg. Days**
	32	7	8,865

Natural Hazard Plan	**Year**
None	

Notes

Energy Priorities and Projects

Biomass feasibility; Install met tower for wind study; Interest in solar; Monitor tidal energy opps; Look into AVTEC utility operator training; Overhaul generator & upgrade distribution system

Community Plans	**Year**
Strategic Economic and Community Development Plan	2001

Local Contacts	**Email**	**Phone**	**Fax**
NV of Nelson Lagoon	jgunde1125@aol.com	907-989-2204	907-989-2233
Eastern Aleutian Tribes, Inc.		907-277-1440	907-277-1446
Nelson Lagoon Corporation		907-989-2204	907-989-2233

Demographics	**2000**	**2010**		**2013**
Population	83	52	**Percent of Residents Employed**	65%
Median Age	34	41	**Denali Commission Distressed Community**	No
Avg. Household Size	3	3	**Percent Alaska Native/American Indian (2010)**	75%
Median Household Income	$43,750	$52,708	**Low and Moderate Income (LMI) Percent (2014)**	48.7%

Electric Utility	**Generation Sources**	**Interties**	**PCE?**
Nelson Lagoon Electrical Cooperative	Diesel	No	Yes

Landfill	**Class**	3	**Permitted**	Yes	**Location**	Nelson Lagoon

Water/Wastewater System	Aleutians East Borough	**Homes Served**	**System Volume**
Water	Piped	103	10,000 - 50,000 gpd (water)
Sewer	Piped	**Energy Audit?**	
Notes		Yes	

Access

Road	No				
Air Access	Publicly owned; Gravel	**Runway**	4,003' x 75'		
Dock/Port	Yes	**Barge Access?**	Yes	**Ferry Service?**	No

Notes

Energy Profile: Nelson Lagoon

Diesel Power System

Utility	Nelson Lagoon Electrical Coop

Engine	Make/Model	Condition/Hrs	Gen Capacity
Unit 1	Perkins	Condemned	75
Unit 2	John Deere	Fair/29,221	100
Unit 3	John Deere	Fair/25,452	150
Unit 4			

Line Loss	12.4%
Heat Recovery?	No

Upgrades	Priority	Projects	Status
RPSU Powerhouse	High		
RPSU Distribution	High		

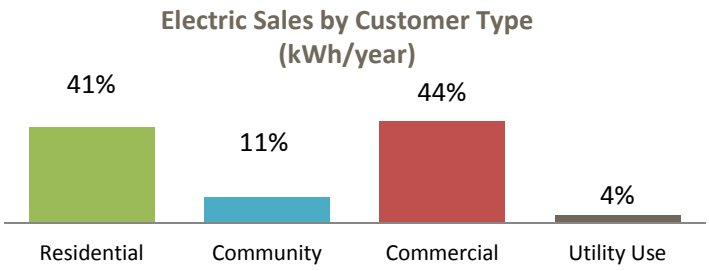
Outage History/Known Issues

Unit 1 condemned; Meters need to be replaced.

Operators	No. of Operators	Training/Certifications
	5	BFO, BF Book, Clerk

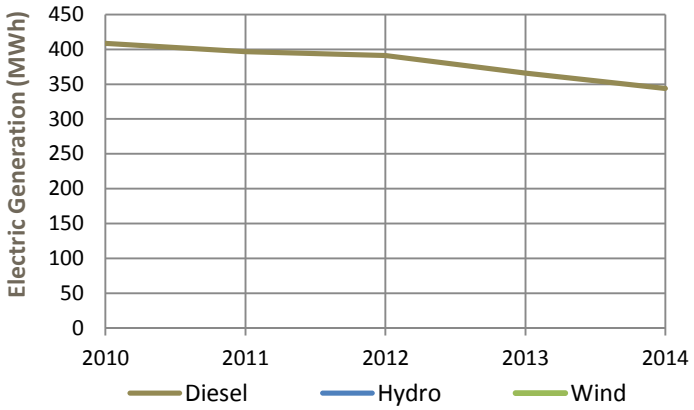
Maintenance Planning (RPSU)	Acceptable

Electric Sales	No. of Customers	kWh/year	kWh/Customer
Residential	32	124,562	3,893
Community	5	33,735	6,747
Commercial	21	132,482	6,309
Utility Use		10,661	



Power Production

Diesel (kWh/yr)	343,990	**Avg. Load (kW)**	46
Wind (kWh/yr)	0	**Peak Load (kW)**	96
Hydro (kWh/yr)	0	**Efficiency (kWh/gal)**	9
Total (kWh/yr)	343,990	**Diesel Used (gals/yr)**	39,158



Electric Rates ($/kWh)		Cost per kWh Sold ($/kWh)	
Rate with PCE	$0.19	**Fuel Cost**	$0.66
Residential Rate	$0.84	**Non-fuel Cost**	$0.69
Commercial Rate		**Total Cost**	$1.36

Fuel Prices ($)	Utility/Wholesale	Retail	Month/Year
Diesel (1 gal)	$4.33	$6.25	6-13; 8-14
Other Fuel? (1 gal)			
Gasoline (1 gal)			
Propane (100#)			
Wood (1 cord)			
Pellets			
Discounts?			

Alternative Energy	Potential	Projects	Status
Hydroelectric	Low		
Wind Diesel	Low	2.4 kW wind turbine	Pilot project
Biomass	Low		
Solar	Pending		
Geothermal	Low		
Oil and Gas	Low		
Coal	Low		
Emerging Tech	Not Rated		
Heat Recovery	Medium		
Energy Efficiency	High	AHFC-R	Complete

Bulk Fuel

Tank Owner	Fuel Type(s)	Capacity	Age/Condition
Nelson Lagoon Entps	Diesel #2; Heat #1	54,000; 81,000	11 yrs.
Nelson Lagoon Entps	AV Gas; Gasoline	54,000; 54,000	11 yrs.

Purchasing	Deliveries/Year	Gallons/Delivery	Vendor(s)
By Barge	1		Crowley
By Air			

Cooperative Purchasing Agreements

Bulk Fuel Upgrade	Priority	Project	Status

Notes

Energy Profile: Nelson Lagoon

Housing Units	Occupied	Vacant	% Owner-Occup.
	14	12	57%

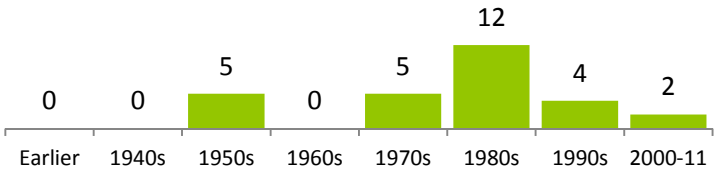
Regional Housing Authority	Weatherization Service Provider
Aleutian HA	Aleutian HA

Housing Need	Overcrowded	1-star
	21.4%	N/A

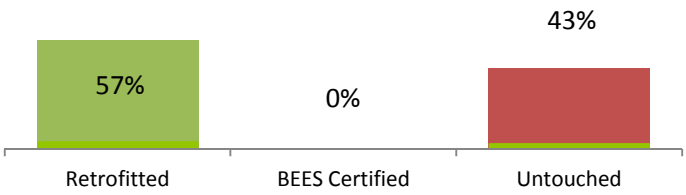
Data Quality	Med.

Energy Use	Average Home Energy Rating	Average Square Feet	Avg. EUI (kBTU/sf)
	N/A	N/A	N/A

Age of Housing Stock



Energy Efficient Housing Stock



Street Lighting	Owner	Number/Type	Retrofitted?	Year	Notes

Non-residential Building Inventory

Building Name or Location	Year Built	Square Feet	Audited?	Retrofits Done?	In ARIS?
Community Bldg.					No
Council Office		660			No
Health Clinic					No
Nelson Lagoon School		5,776			No
Nelson Lagoon Storage Co.		6,500			No
SRE Bldg.		1,104			Yes
Village Public Safety Office					No

Community Profile: Nikolski

Incorporation	Unincorporated

Location

Nikolski is located on Nikolski Bay, off the southwest end of Umnak Island, one of the Fox Islands. It lies 116 air miles west of Unalaska and 900 air miles from Anchorage.

Longitude	-168.8678	**Latitude**	52.9381
ANCSA Region	Aleut Corporation		
Borough/CA	Aleutians West Census Area		
School District	Aleutian Region School District		
AEA Region	Aleutians		

Alaska Native Name (definition)

Chalukaŷ

Taxes **Type (rate)** **Per-Capita Revenue**

N/A

Historical Setting / Cultural Resources

Nikolski is reputed by some to be the oldest continuously-occupied community in the world. Archaeological evidence dates back 8,500 years. In 1834, it was the site of sea otter hunting. In 1942, when the Japanese attacked Unalaska and seized Attu and Kiska, residents were evacuated. Locals returned in 1944. Subsistence activities, sheep and cattle raising, and fishing-related employment sustain the community.

Economy

Local government, health services, and leisure/hospitality are main employers.

Climate	**Avg. Temp**	**Climate Zone**	**Heating Deg. Days**
	10.8	7	9,555

Natural Hazard Plan	**Year**

Notes

Energy Priorities and Projects

Community Plans	**Year**
Nikolski Community and Economic Development Plan	2006

Local Contacts	**Email**	**Phone**	**Fax**
Native Village of Nikolski	nvnikolski@hotmail.com	907-576-2225	907-576-2205
Chaluka Corporation		907-576-2215	

Demographics	**2000**	**2010**		**2013**
Population	39	18	**Percent of Residents Employed**	62%
Median Age	40	57	**Denali Commission Distressed Community**	No
Avg. Household Size	3	2	**Percent Alaska Native/American Indian (2010)**	94.44%
Median Household Income	$38,750	$24,375	**Low and Moderate Income (LMI) Percent (2014)**	77.6%

Electric Utility	**Generation Sources**	**Interties**	**PCE?**
Umnak Power Company	Diesel, Wind		Yes

Landfill	**Class**	**Permitted?**	**Location**

Water/Wastewater System		**Homes Served**	**System Volume**
Water	Piped		
Sewer	Piped	**Energy Audit?**	
Notes		No	

Access

Road	No				
Air Access	Privately Owned; Gravel	**Runway**	3,512' x 135'		
Dock/Port	No	**Barge Access?**	No	**Ferry Service?**	No

Notes

Energy Profile: Nikolski

Diesel Power System

Utility	Umnak Power Company

Engine	Make/Model	Condition/Hrs	Gen Capacity
Unit 1	John Deere	Fair/43,463	71
Unit 2	John Deere	Fair/11,091	71
Unit 3	John Deere	Fair/7,830	54
Unit 4			

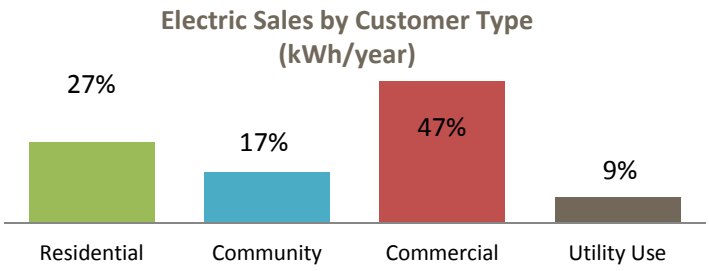
Line Loss	6.1%
Heat Recovery?	Yes; Utility Office

Upgrades	Priority	Projects	Status
RPSU Powerhouse	Med.		
RPSU Distribution	Low		
Outage History/Known Issues			

Operators	No. of Operators	Training/Certifications
	5	PPO, Clerk

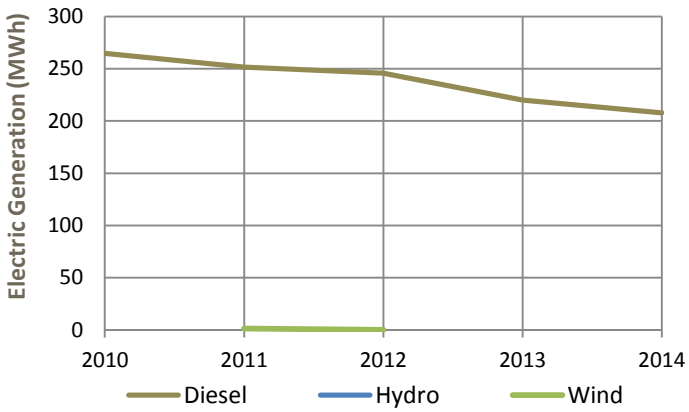
Maintenance Planning (RPSU)	Unacceptable

Electric Sales	No. of Customers	kWh/year	kWh/Customer
Residential	14	52,727	3,766
Community	5	33,056	6,611
Commercial	8	92,206	11,526
Utility Use		17,016	



Power Production

Diesel (kWh/yr)	207,693	**Avg. Load (kW)**	24
Wind (kWh/yr)	0	**Peak Load (kW)**	55
Hydro (kWh/yr)	0	**Efficiency (kWh/gal)**	10
Total (kWh/yr)	207,693	**Diesel Used (gals/yr)**	20,940



Electric Rates ($/kWh)		Cost per kWh Sold ($/kWh)	
Rate with PCE	$0.14	**Fuel Cost**	$0.71
Residential Rate	$0.60	**Non-fuel Cost**	$0.24
Commercial Rate		**Total Cost**	$0.95

Fuel Prices ($)	Utility/Wholesale	Retail	Month/Year
Diesel (1 gal)	$6.00	$7.00	6-13; 8-13
Other Fuel? (1 gal)			
Gasoline (1 gal)			
Propane (100#)			
Wood (1 cord)			
Pellets			
Discounts?			

Alternative Energy	Potential	Projects	Status
Hydroelectric	Low		
Wind Diesel	Low	Nikolski Wind Project, 65 kW	Installed; Not connected to grid
Biomass	Low		
Solar	Pending		
Geothermal	Low		
Oil and Gas	Low		
Coal	Low		
Emerging Tech	Not Rated		
Heat Recovery	Low	Heat Recovery to utility office	Operational
Energy Efficiency	High	AHFC-R	Complete

Bulk Fuel

Tank Owner	Fuel Type(s)	Capacity	Age/Condition
Nikolski Tribal Counc	#2 Diesel	54,000	Good
Nikolski Tribal Counc	Gasoline	5,000	Good

Bulk Fuel Upgrade	Priority	Project	Status

Purchasing	Deliveries/Year	Gallons/Delivery	Vendor(s)
By Barge	1		
By Air			
Cooperative Purchasing Agreements			

Notes

Barge delivery in early fall.

Energy Profile: Nikolski

Housing Units	Occupied	Vacant	% Owner-Occup.
	27	4	30%

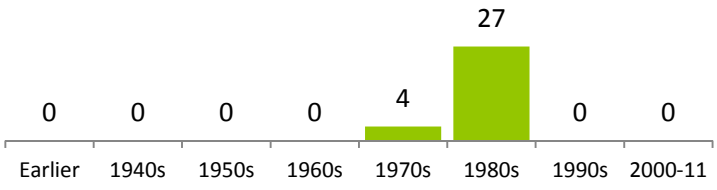
Regional Housing Authority	Weatherization Service Provider
Aleutian HA	Aleutian HA

Housing Need	Overcrowded	1-star
	N/A	N/A

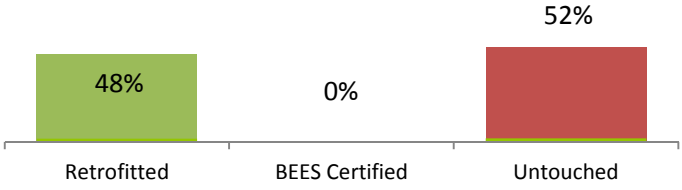
Energy Use	Average Home Energy Rating	Average Square Feet	Avg. EUI (kBTU/sf)
	N/A	N/A	N/A

Data Quality	Med.

Age of Housing Stock



Energy Efficient Housing Stock

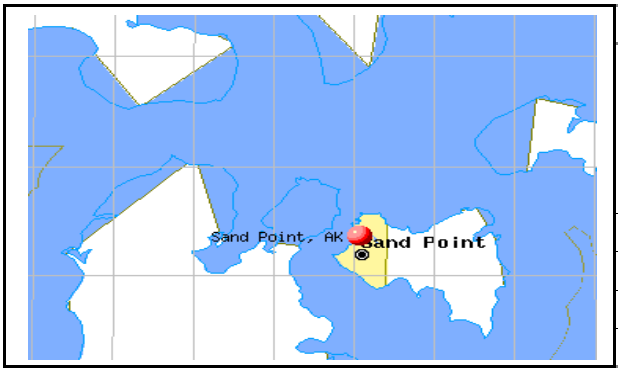


Street Lighting	Owner	Number/Type	Retrofitted?	Year	Notes

Non-residential Building Inventory

Building Name or Location	Year Built	Square Feet	Audited?	Retrofits Done?	In ARIS?
Nikolski School				Yes	No
Teacher Housing				Yes	No
Tribal Office/Community Hall		2,400		Yes	No

Community Profile: Sand Point



Incorporation	1st Class City

Location

Sand Point is located on Humboldt Harbor on Popof Island, off the Alaska Peninsula, 570 air miles from Anchorage.

Longitude	-160.4972	**Latitude**	55.3397
ANCSA Region	Aleut Corporation		
Borough/CA	Aleutians East Borough		
School District	Aleutians East Borough School District		
AEA Region	Aleutians		

Alaska Native Name (definition)

Qagun Tayagungin

Taxes	**Type (rate)**	**Per-Capita Revenue**
	Sales (4%), Bed (7%), Raw Fish (2%)	$ 1,640

Historical Setting / Cultural Resources

Sand Point was founded in 1898 by a San Francisco fishing company as a trading post and fishing station. Aleuts from surrounding villages and Scandinavian fishermen were the first residents. Sand Point served as a center for gold mining in the early 1900s, but fish processing became the dominant activity in the 1930s. Today, it is home to the largest fishing fleet in the Aleutian Chain. There is a large transient population for fishing and cannery work.

Economy

Local government, manufacturing, and trade are the main employers. Fishing is a major part of the economy.

Climate	**Avg. Temp**	**Climate Zone**	**Heating Deg. Days**
	41.1	7	8,865

Natural Hazard Plan	**Year**
None	

Notes

Energy Priorities and Projects

Expand wind capacity, integration into grid; Biomass feasibility; Monitor tidal power opportunities; Install electric boiler in school to harness excess wind energy and improve performance; Assess feasibility of district heating with waste heat

Community Plans	**Year**
City of Sand Point Comprehensive Community Development Plan	2004
Harbor Land Use Plan for Sand Point	2003

Local Contacts	**Email**	**Phone**	**Fax**
City of Sand Point	sptcity@arctic.net	907-383-2696	907-383-2698
Qagan Tayagungin Tribe	qttadmin@arctic.net	907-383-5616	907-383-5814
Shumagin Corporation		907-383-3525	907-383-5356

Demographics	**2000**	**2010**		**2013**
Population	952	976	**Percent of Residents Employed**	58%
Median Age	37	41	**Denali Commission Distressed Community**	No
Avg. Household Size	3	3	**Percent Alaska Native/American Indian (2010)**	39.04%
Median Household Income	$55,417	$70,500	**Low and Moderate Income (LMI) Percent (2014)**	41.7%

Electric Utility	**Generation Sources**	**Interties**	**PCE?**
TDX Sand Point	Diesel, Wind	No	Yes

Landfill	**Class**	3	**Permitted?**	Yes	**Location**	Sand Point

Water/Wastewater System	City of Sand Point	**Homes Served**	**System Volume**
Water	Piped	962	100K – 500K gpd (water); 100K – 500K gpd (ww)
Sewer	Piped	**Energy Audit?**	
Notes		Yes	

Access

Road	No				
Air Access	Publicly Owned; Asphalt	**Runway**	5,213' x 150'		
Dock/Port	Yes	**Barge Access?**	Yes	**Ferry Service?**	Yes

Notes

Energy Profile: Sand Point

Diesel Power System

Utility	TDX Corp.		
Engine	**Make/Model**	**Condition/Hrs**	**Gen Capacity**
Unit 1	Caterpillar	Fair/41,053	900
Unit 2	Caterpillar	Fair/65,437	875
Unit 3	Caterpillar	Fair/1,948	455
Unit 4	Caterpillar	Fair/26,593	650
Line Loss	5.4%		
Heat Recovery?	Yes; TDX Bldg.		

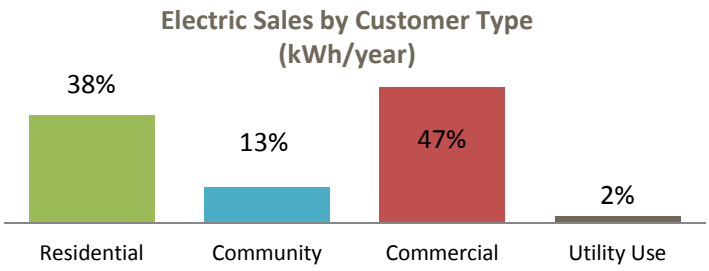
Upgrades	Priority	Projects	Status
RPSU Powerhouse	High		
RPSU Distribution	High		

Outage History/Known Issues

Operators	No. of Operators	Training/Certifications

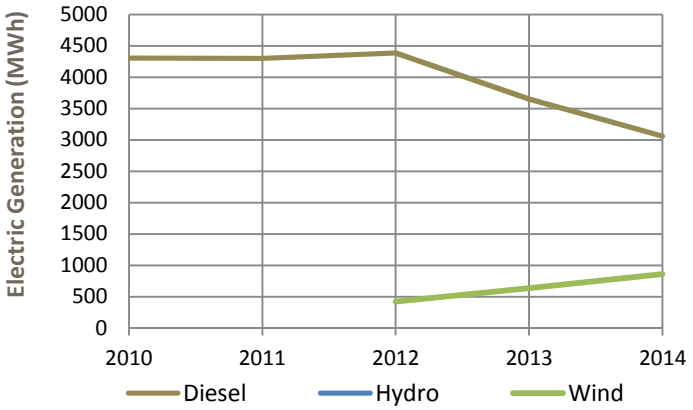
Maintenance Planning (RPSU)	Good

Electric Sales	No. of Customers	kWh/year	kWh/Customer
Residential	289	1,392,193	4,817
Community	27	467,563	17,317
Commercial	93	1,756,660	18,889
Utility Use		90,560	



Power Production

Diesel (kWh/yr)	3,058,309	Avg. Load (kW)	440
Wind (kWh/yr)	861,495	Peak Load (kW)	992
Hydro (kWh/yr)	0	Efficiency (kWh/gal)	14
Total (kWh/yr)	3,919,804	Diesel Used (gals/yr)	219,998



Electric Rates ($/kWh)		Cost per kWh Sold ($/kWh)	
Rate with PCE	$0.20	Fuel Cost	$0.28
Residential Rate	$0.50	Non-fuel Cost	$0.12
Commercial Rate		Total Cost	$0.41

Fuel Prices ($)	Utility/Whlsale	Retail	Month/Year
Diesel (1 gal)	$4.55	$5.15	6-13; 8-14
Other Fuel? (1 gal)			
Gasoline (1 gal)			
Propane (100#)		$187.14	8-14
Wood (1 cord)			
Pellets			
Discounts?			

Alternative Energy	Potential	Projects	Status
Hydroelectric	Low		
Wind Diesel	High	Sand Point Wind	Operating
Biomass	Low		
Solar	Pending		
Geothermal	Low		
Oil and Gas	Low		
Coal	Low		
Emerging Tech	Not Rated		
Heat Recovery	Low	Heat recovery to TDX building	Operating
Energy Efficiency	High	EECBG, AHFC-C, AHFC-R	

Bulk Fuel

Tank Owner	Fuel Type(s)	Capacity	Age/Condition
Trident Seafood	#2 Diesel	800,000	
SPG/TDX	#2 Diesel	41,000	

Bulk Fuel Upgrade	Priority	Project	Status

Purchasing	Deliveries/Year	Gallons/Delivery	Vendor(s)
By Barge			
By Air			

Cooperative Purchasing Agreements

Notes

Energy Profile: Sand Point

Housing Units	Occupied	Vacant	% Owner-Occup.
	164	67	53%

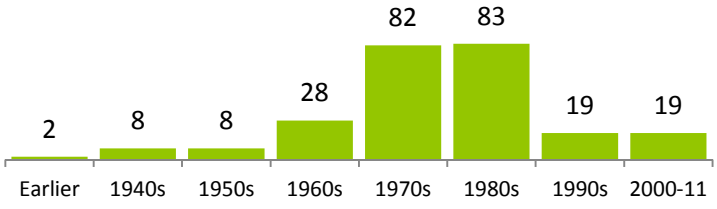
Regional Housing Authority	Weatherization Service Provider
Aleutian HA	Aleutian HA

Housing Need	Overcrowded	1-star
	3.7%	8.5%

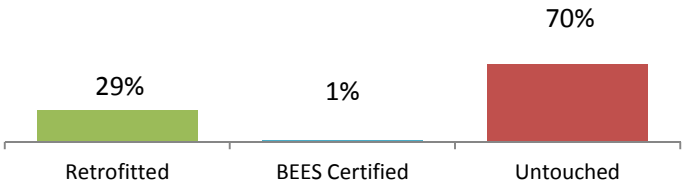
Data Quality	
	High

Energy Use	Average Home Energy Rating	Average Square Feet	Avg. EUI (kBTU/sf)
	3 star	1,466	122

Age of Housing Stock



Energy Efficient Housing Stock



Street Lighting	Owner	Number/Type	Retrofitted?	Year	Notes
		95/ Incandescent	Yes	2011	Replaced with LEDs

Non-residential Building Inventory

Building Name or Location	Year Built	Square Feet	Audited?	Retrofits Done?	In ARIS?
AC Store					
AEB Office Building					
Airport Terminal					No
Aleutians East Borough District Office 1	1996	3,739			Yes
Aleutians East Borough District Office 2	1996	4,600			Yes
ARFF (Aircraft Rescue & Firefighting) Bldg.		5,369			Yes
Bozo Burgers					
City Bldg.					No
City Shop					
Community Recreation Center					No
Harbor Café					
Recycling Center					
Sand Point Office	2000	2,700			Yes
Sand Point School	1983	49,293	Yes		Yes
Sand Point Tavern					
Sand Storage (Heated)		3,378			Yes
Teen Center					
Toys Plus					
Trident Store/Facility					
Unga Office					
Water Treatment Plant					

Community Profile: Saint George

Incorporation	2nd Class City

Location

St. George is located on the northeast shore of St. George Island, the southern-most of the four Pribilof Islands. It lies 47 miles south of St. Paul Island, 750 air miles west of Anchorage, and 250 miles northwest of Unalaska.

Longitude	-169.5417	**Latitude**	56.6000
ANCSA Region	Aleut Corporation		
Borough/CA	Aleutians West Census Area		
School District	Pribilof School District		
AEA Region	Aleutians		

Alaska Native Name (definition)

Anĝaaxchalux̂

Taxes	**Type (rate)**	**Per-Capita Revenue**
	Sales (3%), Raw Fish (3%)	N/A

Historical Setting / Cultural Resources

For centuries, Aleuts traveled to St. George for hunting and fishing. The Russian American Company enslaved Aleut hunters from Siberia, Unalaska, and Atka and relocated them to St. George and St. Paul to harvest fur seal. During World War II, the Pribilof Aleuts were confined at Funter Bay. In 1979, Aleut Islanders received $8.5M in compensation for this treatment. Residents are working to develop fisheries and tourism.

Economy

Local government provides roughly 75% of the employment for St. George. Fishing is a major part of the economy.

Climate	**Avg. Temp**	**Climate Zone**	**Heating Deg. Days**
	36.3	7	10,242

Natural Hazard Plan	**Year**
None	

Notes

Energy Priorities and Projects

Install 95 kW wind turbine, integrate into existing grid; Solar feasibility study; Complete AEA Rural Power System Upgrade and heat recovery; Lower bulk fuel costs by partnering with other buyers; Harbor reconstruction and dredging

Community Plans	**Year**
St. George Community Strategic Plan	2007
St. George Traditional Council Strategic Plan	2006

Local Contacts	**Email**	**Phone**	**Fax**
City of St. George	pat714swet@yahoo.com	907-859-2236	907-859-2242
Saint George Island	chris_merculief@yahoo.com	907-859-2205	907-859-2242
St. George Tanaq Corp		907-272-9886	907-272-9855

Demographics	**2000**	**2010**		**2013**
Population	152	102	**Percent of Residents Employed**	71%
Median Age	33	39	**Denali Commission Distressed Community**	No
Avg. Household Size	3	3	**Percent Alaska Native/American Indian (2010)**	88.24%
Median Household Income	$57,083	$44,792	**Low and Moderate Income (LMI) Percent (2014)**	36.4%

Electric Utility	**Generation Sources**	**Interties**	**PCE?**
City of St. George	Diesel	No	Yes

Landfill	**Class**	3	**Permitted?**	Yes	**Location**	Saint George

Water/Wastewater System	City of St. George	**Homes Served**	**System Volume**
Water	Piped	200	N/A
Sewer	Piped	**Energy Audit?**	
Notes		Yes	

Access

Road	No				
Air Access	Publicly Owned; Gravel	**Runway**	4,982' x 150'		
Dock/Port	Yes	**Barge Access?**	Yes	**Ferry Service?**	No

Notes

Energy Profile: Saint George

Diesel Power System

Utility	City of Saint George		
Engine	**Make/Model**	**Condition/Hrs**	**Gen Capacity**
Unit 1	Detroit Diesel	Fair/77,345	350
Unit 2	Caterpillar	Fair/10,993	175
Unit 3	Caterpillar	Poor/25,000	175
Unit 4	Detroit Diesel	Poor	480
Line Loss	19.3%		
Heat Recovery?	No; City Shop (Defective)		

Upgrades	**Priority**	**Projects**	**Status**
RPSU Powerhouse	In Progress		
RPSU Distribution	Low		

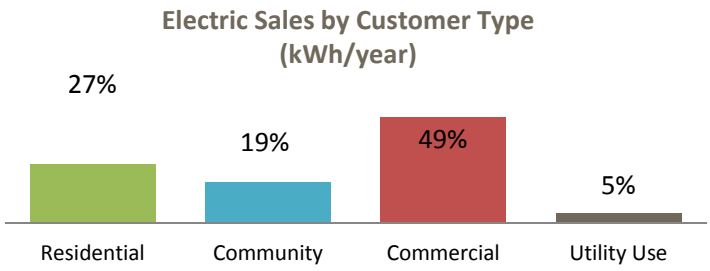
Outage History/Known Issues

No coolant. Engine hours in question.

Operators	**No. of Operators**	**Training/Certifications**
	5	BFO, PPO, Clerk

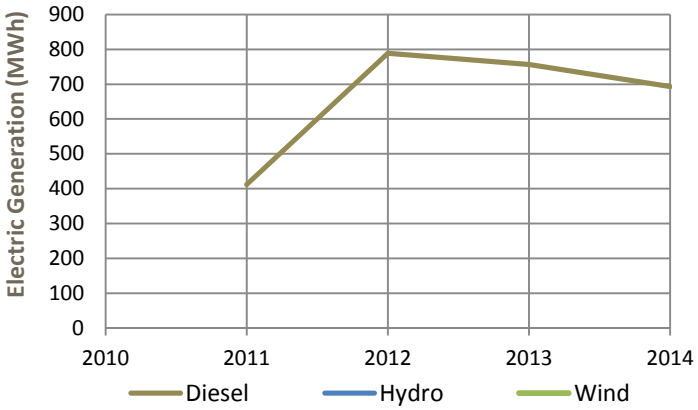
Maintenance Planning (RPSU)	Acceptable

Electric Sales	**No. of Customers**	**kWh/year**	**kWh/Customer**
Residential	39	153,400	3,933
Community	7	106,227	15,175
Commercial	29	274,068	9,451
Utility Use		25,804	



Power Production

Diesel (kWh/yr)	693,419	**Avg. Load (kW)**	73
Wind (kWh/yr)	0	**Peak Load (kW)**	139
Hydro (kWh/yr)	0	**Efficiency (kWh/gal)**	13
Total (kWh/yr)	693,419	**Diesel Used (gals/yr)**	51,429



Electric Rates ($/kWh)		**Cost per kWh Sold ($/kWh)**	
Rate with PCE	$0.32	**Fuel Cost**	$0.70
Residential Rate	$1.00	**Non-fuel Cost**	$0.12
Commercial Rate		**Total Cost**	$0.82

Fuel Prices ($)	**Utility/Wholesale**	**Retail**	**Month/Year**
Diesel (1 gal)	$7.43	$7.74	6-13; 8-14
Other Fuel? (1 gal)			
Gasoline (1 gal)			
Propane (100#)		$302.62	8-14
Wood (1 cord)			
Pellets			
Discounts?			

Alternative Energy	**Potential**	**Projects**	**Status**
Hydroelectric	Low		
Wind Diesel	High	St. George Wind Farm	Construction (near operation)
Biomass	Low		
Solar	Pending		
Geothermal	Low		
Oil and Gas	Low		
Coal	Low		
Emerging Tech	Not Rated		
Heat Recovery	Low		
Energy Efficiency	High	EECBG	Complete

Bulk Fuel

Tank Owner	**Fuel Type(s)**	**Capacity**	**Age/Condition**
City of Saint George	#2 Diesel	1,066,200	Unknown

Bulk Fuel Upgrade	**Priority**	**Project**	**Status**

Purchasing	**Deliveries/Year**	**Gallons/Delivery**	**Vendor(s)**
By Barge	2		
By Air			

Cooperative Purchasing Agreements

Notes

Barge delivery in Spring & Fall.

Energy Profile: Saint George

Housing Units	Occupied	Vacant	% Owner-Occup.
	53	23	72%

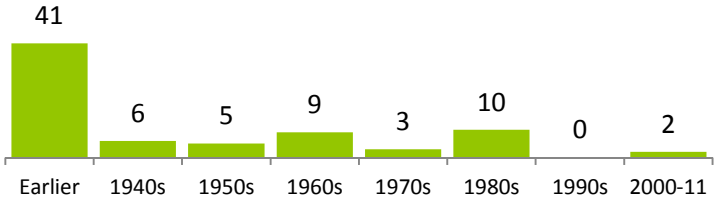
Regional Housing Authority	Weatherization Service Provider
Aleutian HA	Aleutian HA

Housing Need	Overcrowded	1-star
	5.7%	N/A

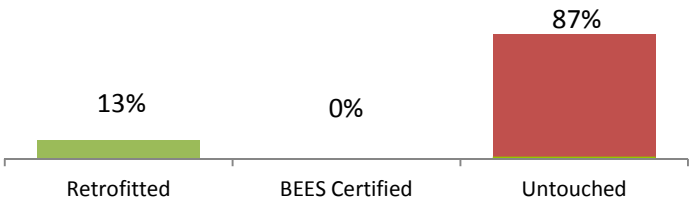
Data Quality	Low

Energy Use	Average Home Energy Rating	Average Square Feet	Avg. EUI (kBTU/sf)
	N/A	N/A	N/A

Age of Housing Stock



Energy Efficient Housing Stock

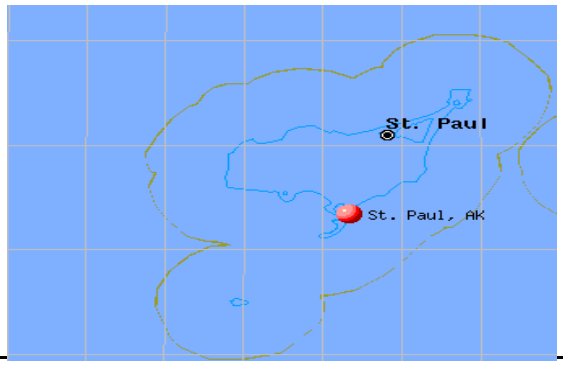


Street Lighting	Owner	Number/Type	Retrofitted?	Year	Notes

Non-residential Building Inventory

Building Name or Location	Year Built	Square Feet	Audited?	Retrofits Done?	In ARIS?
Carpentry Shop					No
City Office					No
Fish Plant					No
Health Clinic		3,675			No
Power Plant		6,000			No
Public Works Bldg.		1,200			No
Recreation Hall/Admin Office		4,800			No
SRE Bldg.		1,104			No
SRE Bldg.		4,250			Yes
SRE Bldg. (Heated)	2007	1,104			No
St. George Hotel					No
St. George Island School		14,352			No
Store					No
Tanaq Corp. Office Bldg.					No

Community Profile: Saint Paul



Incorporation	2nd Class City

Location

St. Paul lies 47 miles north of St. George Island, 240 miles north of the Aleutian Islands, 300 miles west of the Alaska mainland, and 750 air miles west of Anchorage.

Longitude	-170.275	**Latitude**	57.1222
ANCSA Region	Aleut Corporation		
Borough/CA	Aleutians West Census Area		
School District	Pribilof School District		
AEA Region	Aleutians		

Alaska Native Name (definition)

Tamaŷ Amiŷ

Taxes **Type (rate)** — **Per-Capita Revenue**

Sales (3%), Raw Fish (3%) — $ 5,400

Historical Setting / Cultural Resources

Aleuts traveled to the Pribilofs seasonally for hunting. In 1870, the US government awarded the Alaska Commercial Company a sealing lease. Fur seals were over-harvested, and poverty ensued. During World War II, the Pribilof Aleuts were confined in to Funter Bay. In 1979, Aleut Islanders received $8.5M in compensation for this treatment. Commercial harvesting ceased in 1985.

Economy

Local government, professional/business services, and trade are the main employers.

Climate	**Avg. Temp**	**Climate Zone**	**Heating Deg. Days**
	35.4	7	11,178

Natural Hazard Plan	**Year**
Local Multi-Hazard Mitigation Plan	2008

Notes

Energy Priorities and Projects

Integrate TDX wind turbines into grid & add wind turbines; Feasibility of heating with electric boilers/excess wind; Emergency energy generation for essential services; Upgrade diesel power system; Determine cause of line loss; Shared fuel storage with St. George; Store aviation fuel near airport

Community Plans — **Year**

Local Contacts	**Email**	**Phone**	**Fax**
City of St. Paul	phyllis@stpaulak.com	907-546-3100	907-546-3188
Saint Paul Island	president@aleut.com	907-546-3200	907-546-3253
Tanadgusix Corporation		907-278-2312	907-278-2350

Demographics	**2000**	**2010**		**2013**
Population	532	479	**Percent of Residents Employed**	68%
Median Age	32	35	**Denali Commission Distressed Community**	No
Avg. Household Size	3	3	**Percent Alaska Native/American Indian (2010)**	82.25%
Median Household Income	$50,750	$38,750	**Low and Moderate Income (LMI) Percent (2014)**	48.2%

Electric Utility	**Generation Sources**	**Interties**	**PCE?**
TDX, LLC; City of St. Paul	Diesel, Wind	No	Yes

Landfill	**Class**	3	**Permitted?**	Yes	**Location**	St. Paul

Water/Wastewater System	City of St. Paul	**Homes Served**	**System Volume**
Water	Piped	747	1,000,001 - 5,000,000 gpd (water)
Sewer	Piped	**Energy Audit?**	
Notes		Yes	

Access

Road	No				
Air Access	Publicly Owned; Asphalt	**Runway**	6,500' x 150'		
Dock/Port	Yes	**Barge Access?**	Yes	**Ferry Service?**	No

Notes

Energy Profile: Saint Paul

Diesel Power System

Utility	Saint Paul Municipal Electric		
Engine	**Make/Model**	**Condition/Hrs**	**Gen Capacity**
Unit 1	Caterpillar	Fair/66,694	855
Unit 2	Caterpillar	Fair/40,804	260
Unit 3	Caterpillar	Fair/45,696	300
Unit 4	Caterpillar	Fair/22,229	650
Unit 5	Caterpillar	Fair/19,815	480
Line Loss	13.7%		
Heat Recovery?	Yes; Motor Pool, Public Works, Fire Station		

Upgrades	Priority	Projects	Status
RPSU Powerhouse	High		
RPSU Distribution	Med.		

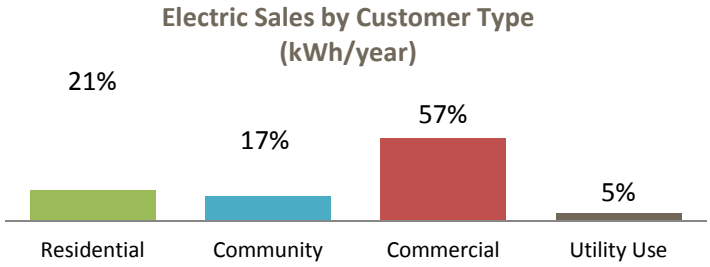
Outage History/Known Issues

Two outages in 2012 due to overheating and pressure loss.

Operators	No. of Operators	Training/Certifications
	2	APPO, BFO, PPO

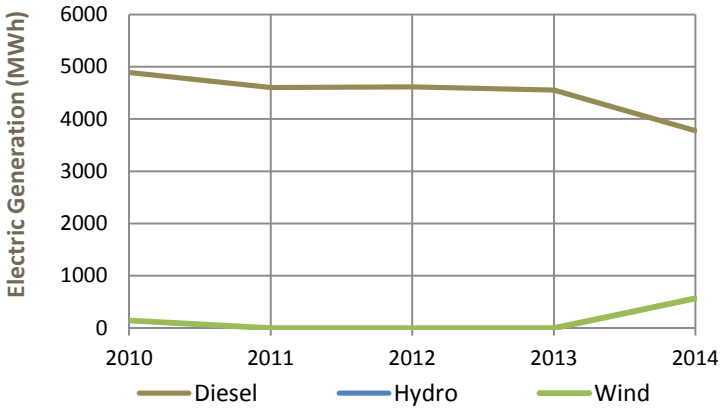
Maintenance Planning (RPSU) Excellent

Electric Sales	No. of Customers	kWh/year	kWh/Customer
Residential	149	790,380	5,305
Community	31	639,176	20,619
Commercial	50	2,137,559	42,751
Utility Use		182,965	



Power Production

Diesel (kWh/yr)	3,777,959	**Avg. Load (kW)**	444
Wind (kWh/yr)	569,448	**Peak Load (kW)**	904
Hydro (kWh/yr)	0	**Efficiency (kWh/gal)**	14
Total (kWh/yr)	4,347,407	**Diesel Used (gals/yr)**	270,929



Electric Rates ($/kWh)		Cost per kWh Sold ($/kWh)	
Rate with PCE	$0.17	**Fuel Cost**	$0.36
Residential Rate	$0.52	**Non-fuel Cost**	$0.21
Commercial Rate		**Total Cost**	$0.57

Fuel Prices ($)	Utility/Wholesale	Retail	Month/Year
Diesel (1 gal)	$4.85	$5.20	6-13; 8-14
Other Fuel? (1 gal)			
Gasoline (1 gal)			
Propane (100#)			
Wood (1 cord)			
Pellets			
Discounts?			

Alternative Energy	Potential	Projects	Status
Hydroelectric	Low		
Wind Diesel	High	St. Paul Wind Diesel Project, 675 kW	Operating/not supplied to St. Paul
Biomass	Low		
Solar	Pending		
Geothermal	Low		
Oil and Gas	Low		
Coal	Low		
Emerging Tech	Not Rated		
Heat Recovery	Low	Diesel Generator Heat Recovery	Operating
Energy Efficiency	High	AHFC-C,R	Complete

Bulk Fuel

Tank Owner	Fuel Type(s)	Capacity	Age/Condition
City of St. Paul	#2 Diesel	1,847,500	27 yrs.
TDX	#2 Diesel	1,500,000	
Trident Seafoods	#2 Diesel	12,000	

Bulk Fuel Upgrade	Priority	Project	Status

Purchasing	Deliveries/Year	Gallons/Delivery	Vendor(s)
By Barge			Petro M.; Delta W
By Air			

Cooperative Purchasing Agreements

Notes

Energy Profile: Saint Paul

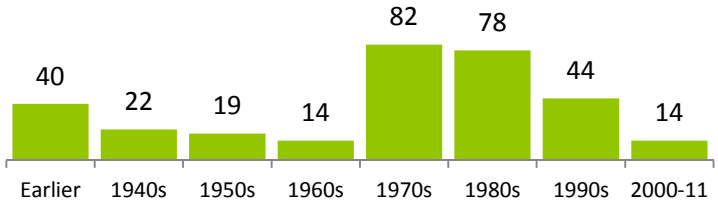
Housing Units	Occupied	Vacant	% Owner-Occup.
	263	50	50%

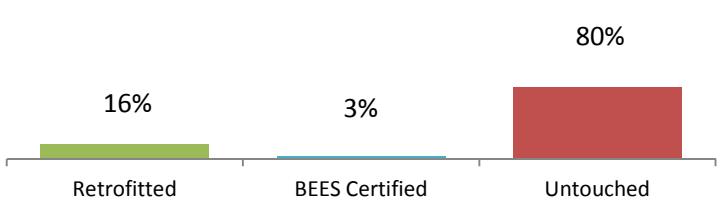
Regional Housing Authority	Weatherization Service Provider
Aleutian HA	Aleutian HA

Housing Need	Overcrowded	1-star
	10.3%	N/A

Data Quality	Med.

Energy Use	Average Home Energy Rating	Average Square Feet	Avg. EUI (kBTU/sf)
	N/A	N/A	N/A



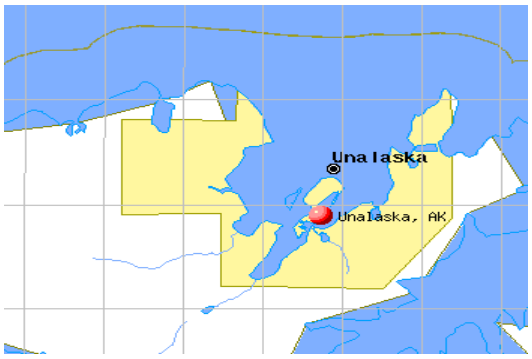


Street Lighting	Owner	Number/Type	Retrofitted?	Year	Notes

Non-residential Building Inventory

Building Name or Location	Year Built	Square Feet	Audited?	Retrofits Done?	In ARIS?
AC Commercial Company Store		13,896			No
ARFF Bldg.		3,200			Yes
City Hall	1940	14,000			Yes
Civic Center		1,200			Yes
Fire Station 1	2009	5,947			Yes
Fire Station 2	2009	5,970			Yes
Landfills		4,400			No
Machine Shop	2002	21,990			No
Machine Shop 1	2002	21,800			Yes
Machine Shop 2	2002	21,990			Yes
Polar Star	2002	12,000			Yes
Pribilof Island School District Office	1950	3,566			Yes
Public Works Bldg./Maintenance Bldg. 1	2002	9,600			Yes
Public Works Bldg./Maintenance Bldg. 2	2002	9,725			Yes
Recreation Center					No
Saint Paul School	1973	33,050	Yes		Yes
SRE Bldg. (Heated)	2006	3,500			Yes
Tanadguisiz Corporation					No
Tribal Admin. Office					No

Community Profile: Unalaska



Incorporation	1st Class City

Location

Unalaska overlooks Iliuliuk Bay and Dutch Harbor on Unalaska Island in the Aleutian Chain. It lies 800 air miles from Anchorage and 1,700 miles northwest of Seattle. Dutch Harbor is within the boundaries of the City of Unalaska.

Longitude	-166.5367	**Latitude**	53.8736
ANCSA Region	Aleut Corporation		
Borough/CA	Aleutians West Census Area		
School District	Unalaska City School District		
AEA Region	Aleutians		

Alaska Native Name (definition)

Ounalashka ("Near the Peninsula")

Taxes	**Type (rate)**	**Per-Capita Revenue**
	Property, Sales (3%), Bed (5%), Raw Fish (2%)	$ 4,660

Historical Setting / Cultural Resources

The native Unangan people have inhabited the island of Unalaska for more than 3,000 years. Since Aleuts were not forced to give up their language or culture by the Russian Orthodox priests, the church became strong in the community. During WWII, almost all of the Aleuts on the Island were interned for the duration of World War II.

Economy

Manufacturing, transportation/warehousing, and trade are the main employers.

Climate	**Avg. Temp**	**Climate Zone**	**Heating Deg. Days**
	40.9	7	9,014

Natural Hazard Plan	**Year**
Unalaska LHMP	2013

Notes

Energy Priorities and Projects

Continue wind study; biomass- solid waste incineration for heat; investigate solar uses; Update Pyramid and Shaishnikof Creeks hydro plans; heart recovery; heat pumps; integrate private powerhouses; LNG; expand use of waste heat

Community Plans	**Year**
Unalaska Economic Development Plan	2004

Local Contacts	**Email**	**Phone**	**Fax**
City of Unalaska		907-581-1251	907-581-1417
Qawalangin Tribe		907-581-2920	907-581-3644
Ounalashka Corporation		907-581-1276	907-581-1496

Demographics	**2000**	**2010**		**2013**
Population	4,283	4,376	**Percent of Residents Employed**	83.5%
Median Age	37	41	**Denali Commission Distressed Community**	No
Avg. Household Size	3	3	**Percent Alaska Native/American Indian (2010)**	6.12%
Median Household Income	$69,539	$89,706	**Low and Moderate Income (LMI) Percent (2014)**	26.0%

Electric Utility	**Generation Sources**	**Interties**	**PCE?**
City of Unalaska	Diesel	No	Yes

Landfill	**Class**	1	**Permitted?**	Yes	**Location**	Unalaska

Water/Wastewater System	City of Unalaska	**Homes Served**	**System Volume**
Water	Piped	9200	5M - 10M gpd (water); 1M - 5M gpd (ww)
Sewer	Piped	**Energy Audit?**	
Notes		Yes	

Access

Road	No				
Air Access	Publicly owned; Asphalt	**Runway**	4100'x100'		
Dock/Port	Yes	**Barge Access?**	Yes	**Ferry Service?**	Seasonal

Notes

Energy Profile: Unalaska

Diesel Power System

Utility	City of Unalaska		
Engine	**Make/Model**	**Condition/Hrs**	**Gen Capacity**
Unit 1	Wartsila	Good/8,831	5,400
Unit 2	Wartsila	Good/8,549	5,400
Unit 3	Caterpillar	Good/2,942	4,600
Unit 4	Caterpillar	Fair/161,819	1,180
Unit 5	Caterpillar	Fair/161,819	1,230
Unit 6	Caterpillar	Good/29	250
Unit 7	Caterpillar	Fair	1,000
Line Loss	4.0%		
Heat Recovery?	Yes; Power plant building heat		

Upgrades	**Priority**	**Projects**	**Status**
RPSU Powerhouse	Med.		
RPSU Distribution	Low		

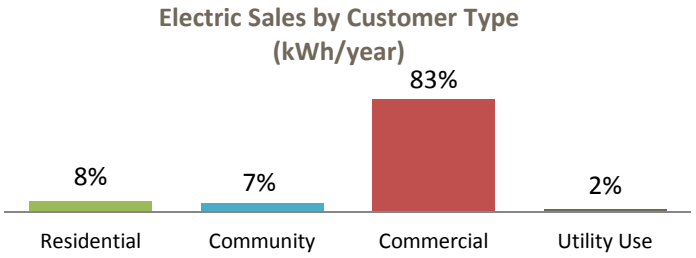
Outage History/Known Issues

PCE reporting errors due to meter malfunctions. RPSU includes Dutch Harbor

Operators	**No. of Operators**	**Training/Certifications**
	1	PPO

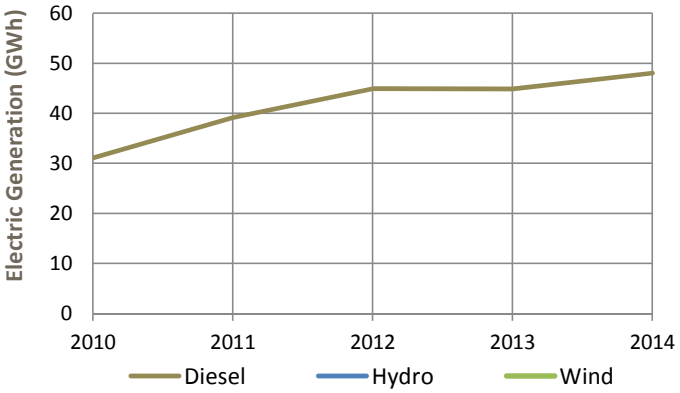
Maintenance Planning (RPSU)	Excellent

Electric Sales	**No. of Customers**	**kWh/year**	**kWh/Customer**
Residential	709	3,804,889	5,367
Community	57	3,016,586	52,923
Commercial	206	38,380,755	186,314
Utility Use		975,392	



Power Production

Diesel (kWh/yr)	48,097,173	**Avg. Load (kW)**	4,583
Wind (kWh/yr)	0	**Peak Load (kW)**	8,840
Hydro (kWh/yr)	0	**Efficiency (kWh/gal)**	15.7
Total (kWh/yr)	48,097,173	**Diesel Used (gals/yr)**	3,068,848



Electric Rates ($/kWh)		**Cost per kWh Sold ($/kWh)**	
Rate with PCE	$0.23	**Fuel Cost**	$0.22
Residential Rate	$0.46	**Non-fuel Cost**	$0.07
Commercial Rate		**Total Cost**	$0.29

Fuel Prices ($)	**Utility**	**Retail**	**Month/Year**
Diesel (1 gal)	$3.47	$4.64	6-13; 8-14
Other Fuel? (1 gal)			
Gasoline (1 gal)		$4.59	6-13
Propane (100#)		$120.48	8-14
Wood (1 cord)			
Pellets			
Discounts?			

Alternative Energy	**Potential**	**Projects**	**Status**
Hydroelectric	High		
Wind Diesel	High		
Biomass	Low		
Solar	Pending		
Geothermal	Medium	Geothermal exploration; heat pumps	Not pursuing; feasibility study
Oil and Gas	Low		
Coal	Low		
Emerging Tech	Not Rated		
Heat Recovery	Low	HR to electric, 200kW Rankine Cycle generator	Construction
Energy Efficiency	High	EECBG, ACEA, AHFC-R, Streetlight Upgrade	Complete

Bulk Fuel

Tank Owner	**Fuel Type(s)**	**Capacity**	**Age/Condition**
Delta Western	Diesel/Gas.	16,000,000	
Petro Star	Diesel/Gas	4,000,000	

Purchasing	**Deliveries/Year**	**Gallons/Delivery**	**Vendor(s)**
By Barge	Frequent		
By Air			

Cooperative Purchasing Agreements

Bulk Fuel Upgrade	**Priority**	**Project**	**Status**

Notes

Energy Profile: Unalaska

Housing Units	Occupied	Vacant	% Owner-Occup.
	834	141	31%

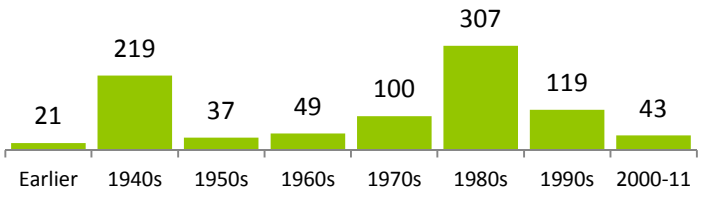
Regional Housing Authority	Weatherization Service Provider
Aleutian HA	Aleutian HA

Housing Need	Overcrowded	1-star
	9.5%	7.8%

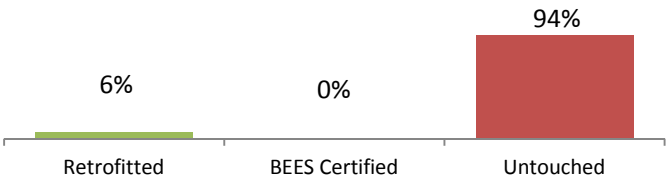
Energy Use	Average Home Energy Rating	Average Square Feet	Avg. EUI (kBTU/sf)
	2 star plus	1,469	123

Data Quality
High

Age of Housing Stock



Energy Efficient Housing Stock



Street Lighting	Owner	Number/Type	Retrofitted?	Year	Notes
		163 /HPS	Yes	2012	Replaced with LEDs

Non-residential Building Inventory

Building Name or Location	Year Built	Square Feet	Audited?	Retrofits Done?	In ARIS?
Aerology Museum		4,236			No
Alyeska Seafood, LLC.					No
Amaknak Fire Station					No
Ballyhoo Dock					No
Bowling Alley					No
C&M Breakwater					No
Carl E. Moses Small Boar Harbor					No
Carl's Bayview Inn					No
Chemical Storage Bldg.					No
Church of the Holy Ascension, Russian Orthodox					No
Court Bldg.					No
Dutch Harbor Post Office					No
Eagle's View Elementary Achigaalux					No
Employee Housing					Yes
Father Ishmail Gromoff Senior Center					No
Icicle Seafoods					No
Iliuliuk Medical Center					No
Museum of the Aleutians/WWII Nat'l. Park					No
North Pacific Fuel					No
OC Office					No
Off Shore Systems Inc.					No
Oonalaska Wellness Center					No
Ounalashka Corporation Office					No
Public Library					No
Qawalangin Tribal Office					No
Radiant Heating Fuel Service					No
Robert Storrs Int'l. Small Boat Harbor					No
Royal Aleutian Seafoods					No
Seaplane Base					No
State Troopers Post					No
The Grand Aleutian					No
Trident Bunkhouse					No

A | Stakeholder Participation

Community/Utility Interviews, Summer 2015

SWAMC staff conducted phone interviews from May to August 2015 to get updates on energy projects and priorities from the following community and utility representatives.

Table 26: Community/utility interviews, May-Aug 2015

Community	Name	Position
Adak	Layton Lockett	City Manager
Akutan	Mary Tesche	Asst. City Administrator
Atka	Julie Dirks	City Administrator
Cold Bay	Gary Ferguson	Electric Utility Owner/Manager
False Pass	Chris Emrich	Bookkeeper/Clerk
King Cove	Gary Hennigh	City Administrator
Nelson Lagoon	Paul Gunderson	Tribe President
Sand Point	Andy Varner	City Administrator
St. George	Patrick Pletnikoff	Mayor
St. Paul	Phyllis Swetzof	City Clerk
Unalaska	Don Moore	Interim City Manager
	Dan Winters	Director of Public Utilities

Aleutian Energy Summit, March 2015

The following individuals and organizations participated in the regional energy summit held on March 3, 2015 in conjunction with the SWAMC Annual Meeting.

Table 27: Aleutian Energy Summit attendance, March 2015

Organization	Name	Role
Local Government / Public Utilities		
City of Adak (also representing SWAMC Board)	Layton Lockett	
City of Akutan	Mary Tesche	
City of Atka	Julie Dirks	
City of King Cove	Gary Hennigh	Speaker
City of St. George	Pat Pletnikoff	
City of St. Paul (also representing CBSFA)	Jeff Kauffman	
City of Unalaska	Chris Hladick	
	Shirley Marquardt	
Nelson Lagoon Tribal Council	Paul Gunderson	
Qagan Tayagungin Tribe (Sand Point)	Tiffany Jackson	

Organization	Name	Role
Private Industry		
Private Utilities / Independent Power Producers		
G&K Utility (Cold Bay)	Gary Ferguson	
TDX Power (Adak, Sand Point, St. Paul)	Kord Christianson	Speaker
	James Dunn	
	Agafon Krukoff	
Fuel Vendors		
Frosty Fuels (Cold Bay)	Michael Tickle	
Vitus Marine	Mark Smith	
ESCO Services		
Siemens, Inc.	Amber McDonough	Speaker
Other		
Shumagin Corporation (Sand Point)	Charlotte Gunderson	
Westward Seafoods / Alyeska Seafoods (Dutch Harbor)	Sinclair Wilt	
Crimp & Associates	Peter Crimp	Planner
Information Insights	Jamie Hansen	Speaker, Planner
Resource Agencies		
Regional		
Aleutian Housing Authority	Dan Duame	Resource Panel
Aleutian Pribilof Island Association	Bruce Wright	
Aleutian Pribilof Island Community Development Association	Angel Drobnica	
Southwest Alaska Municipal Conference	Erik O'Brien	Planner
	Laura Vaught	Planner
State (Government, Nonprofit & Educational)		
Alaska Energy Authority	Katie Conway	Speaker
	Josh Craft	Speaker
	Jed Drolet	Resource Panel
	Chris Gobah	
	Jessie Huff	
	David Lockard	Speaker
Alaska Housing Finance Corporation	Scott Waterman	Speaker, Panel
Alaska Industrial Development and Export Authority	Mike Catsi	Speaker
Alaska Native Tribal Health Consortium	Gavin Dixon	Resource Panel
DCCED DCRA Bulk Fuel Loan Program	Jane Sullivan	Speaker
UAF Interior-Aleutians Campus	Mike Hirt	Resource Panel
	Bryan Uher	Resource Panel
Federal		
U.S. Department of Energy	Givey Kochanowski	Resource Panel
USDA Rural Development	Jolene John	Resource Panel

Online Survey, Spring 2014

An online survey of community and regional stakeholders was conducted at the end of Phase I to identify any errors in the Phase I Resource Inventory and gather input on broadly supported energy projects and priorities. The following individuals completed the survey.

Table 28: Online survey respondents, Feb-April 2014

Community	Organization	Name	Title
Local Government, Utility and Industry			
Adak	City of Adak	Layton J. Lockett	City Manager
Akutan	City of Akutan	Tuna Scanlan	
		Mary Tesche	Asst. City Administrator
	RMA Consulting Group	Raymond Mann	
Atka	City of Atka	Jennifer Kost	City Clerk
Cold Bay	City of Cold Bay	Dawn Lyons	City Clerk/Administrator
	G&K, Inc.	Gary Ferguson	President
False Pass	City of False Pass	Chris Emrich	
	Isanotski Corporation	Sue Parker	Manager
King Cove	Agdaagux Tribal Council	Della Trumble	
	City of King Cove	Gary Hennigh	City Administrator
	Peter Pan Seafoods (King Cove)	Glenn Guffey	Plant Manager
Nelson Lagoon	Nelson Lagoon Tribal Council & Corp.	Paul (Butch) Gundersen	President
Nikolski	Nikolski Clinic	Doris Kompkoff	CHP/C
Sand Point	City of Sand Point	Andy Varner	Administrator
	Qagan Tayagungin Tribe of Sand Point	Jason Bjornstad	
		Tiffany Jackson	Executive Director
	Shumagin Corporation	Glen Gardner Jr.	President
St. George	City of St. George	Patrick Pletnikoff	Mayor
St. Paul	City of St. Paul	Kenneth Weaver, PhD	ICMA-CM
	St. Paul Fishing Company, LLC	Jeff Kauffman	CEO
	TDX Power	Kord Christianson	President
		Ron Philemonoff	Chairman
Unalaska / Dutch Harbor	City of Unalaska	Chris Hladick	City Manager
		Daniel Winters	
	Ounalashka Corporation	David Gregory	
	UniSea, Inc.	Tom Enlow	Executive VP
	Westward Seafoods / Alyeska Seafoods	Sinclair Wilt	VP, Fisheries Specialist
Regional Government, Nonprofit and Native Organizations			
Regional	Aleutian Housing Authority	Dan Duame	Executive Director
	Aleutian Pribilof Island Community Development Association	Angel Drobnica	Renewable Energy and Fisheries Liaison
	Aleutian Pribilof Islands Association	Bruce Wright	

Community	Organization	Name	Title
	Aleutians East Borough	Ernest Weiss	Natural Resources Director
	Eastern Aleutian Tribes	Edgar Smith	Operations Director
		Jennifer Harrison	Executive Director
	The Aleut Corporation	Janet Reiser	
Schools	Aleutian Region School District	Joseph Beckford	
	Aleutians East Borough School District	Doug Conboy	Superintendent
	Pribilof School District	Connie A. Newman	Superintendent
Other			
	Petro Star Inc.	Don Castle	VP Sales & Operations

B | Analysis of Resource Potential

The data in the following tables has been compiled from multiple sources including the Alaska Energy Data Gateway (25), the Renewable Energy Atlas of Alaska (26), the Alaska Energy Efficiency Map (19), the Division of Geological & Geophysical Services report, Fossil Fuel and Geothermal Energy Sources for Local Use in Alaska (27), personal communication with Alaska Energy Authority program managers for Biomass Energy, Geothermal Energy, Heat Recovery, Hydroelectric Power, and Wind Energy, and data shared by the region's electric utilities.

Note that each table estimates the savings potential from new, community- or utility-scale energy projects. The analysis does not reflect the value of infrastructure or programs already in place. Except in the case of energy efficiency, it does not look at opportunity from residential- or building-scale projects. This is an important caveat especially in the area of solar and biomass technologies, where a low rating for community- or utility-scale solutions does not mean there is not significant potential to save money from residential projects.

The rating criteria for individual resources were developed in collaboration with AEA program managers. See Table 37 for an explanation of the criteria used in the analysis.

Table 29: Wood biomass resource potential

	20-Year Average Diesel Fuel Price ($)	Resource Potential	Productive Forest	Project in Operation	Rough B/C Ratio	Existing Study (R,F) or Development (D,C)	Certainty
Adak	5.80	L	L		NA	NA	L
Akutan	4.72	L	L		NA	NA	L
Atka	5.80	L	L		NA	NA	L
Cold Bay	5.65	L	L		NA	NA	L
False Pass	4.17	L	L		NA	NA	L
King Cove	4.19	L	L		NA	NA	L
Nelson Lagoon	5.30	L	L		NA	NA	L
Nikolski	5.80	L	L		NA	NA	L
Saint George	6.89	L	L		NA	NA	L
Saint Paul	5.15	L	L		NA	NA	L
Sand Point	5.19	L	L		NA	NA	L
Unalaska	3.99	L	L		NA	NA	L

See Page B-7 for data sources and notes.

Table 30: Geothermal resource potential

	Resource Potential	Identified Resource within 20 Miles	Significant Resource within 20 Miles	Certainty
Adak	M	Y		L
Akutan	M	Y		L
Atka	M	Y		L
Cold Bay	L			L
False Pass	L			L
King Cove	L			L
Nelson Lagoon	L			L
Nikolski	L			L
Saint George	L			L
Saint Paul	L			L
Sand Point	L			L
Unalaska	M	Y		L

See Page B-7 for data sources and notes

Table 31: Hydropower resource potential

	Resource Potential	Projects in Operation	Hydro Resource	Identified in Pathway	Existing Study (R,F) or Development (D,C)	Viable Resource based on Visual Assessment	Certainty
Adak	H		Y	NA	NA	H	M
Akutan	H	Y	Y	NA	NA	H	H
Atka	H	Y	Y	NA	NA	H	H
Cold Bay	M		Y	NA	NA	M	M
False Pass	H		Y	NA	NA	H	M
King Cove	H	Y	Y	NA	NA	H	H
Nelson Lagoon	L		Y	NA	NA	L	M
Nikolski	L		Y	NA	NA	L	M
Saint George	L			NA	NA	L	M
Saint Paul	L			NA	NA	L	M
Sand Point	L		Y	NA	NA	L	M
Unalaska	H		Y	NA	NA	H	M

See Page B-7 for data sources and notes.

Table 32: Wind energy resource potential

	Resource Potential	Wind Resource	Developability	Site Accessible	Permitability	Site Availability	Load	Certainty	Notes
Adak	H	H	H	Y	Y	Y	Y	L	Concern related to existing oversized generation system.
Akutan	L	H	L	Y		Y		L	Load <100 kw
Atka	M	H	M	Y	Y	Y	NA	L	Need load from Atka pride
Cold Bay	H	H	H	Y	Y	Y	Y	H	
False Pass	L	H	L	Y	Y	Y		H	CDR by Marsh Creek. Need RPSU.
King Cove	H	H	H	Y	Y	Y	Y	L	One study found turbulence; other sites likely available but not studied
Nelson Lagoon	L	H	L	Y		Y		M	Permitting difficult because on spit. Monopole anemometer, vane onsite.
Nikolski	L	H	L	Y	Y	Y		H	Project in place but not functioning.
Saint George	H	H	H	Y	Y	Y	Y	H	RPSU completed. Project to operate soon.
Saint Paul	H	H	H	Y	Y	Y	Y	H	Operating
Sand Point	H	H	H	Y	Y	Y	Y	H	Operating
Unalaska	H	H	H	Y	Y	Y	Y	L	1999 study indicated strong turbulence, no met tower installed.

See Page B-7 for data sources and notes.

Table 33: Coal resource potential

	Resource Potential	Potential Deposits Identified	High Quality/ Developability	Project Planned or in Development	Certainty
Adak	L		NA		L
Akutan	L		NA		L
Atka	L		NA		L
Cold Bay	L	Y	NA		L
False Pass	L	Y	NA		L
King Cove	L	Y	NA		L
Nelson Lagoon	L	Y	NA		L
Nikolski	L		NA		L
Saint George	L		NA		L
Saint Paul	L		NA		L
Sand Point	L	Y	NA		L
Unalaska	L		NA		L

Note: The Herendeen Bay Field and Unga Island Field are the two main southern peninsula regions with coal exposures. Villages within 100 miles include Port Heiden, Nelson Lagoon, Sand Point, King Cove, Cold Bay, and False Pass. See Page B-7 for data sources and notes.

Table 34: Oil and gas resource potential

	Resource Potential	Source Rock, Traps and Reservoirs Present	Wells Drilled, Economic Resource Identified	Certainty	Notes
Adak	L	NA	NA	L	Additional drilling may be warranted
Akutan	L	NA	NA	L	
Atka	L	NA	NA	L	
Cold Bay	L	NA	NA	L	
False Pass	L	NA	NA	L	
King Cove	L	NA	NA	L	
Nelson Lagoon	L	NA	NA	L	
Nikolski	L	NA	NA	L	
Saint George	L	NA	NA	L	
Saint Paul	L	NA	NA	L	
Sand Point	L	NA	NA	L	
Unalaska	L	NA	NA	L	

See Page B-7 for data sources and notes.

Table 35: Heat recovery resource (HR) potential

	Resource Potential	HR Equipment at Powerhouse	HR in Operation	Recoverable Heat Available	Nearby Thermal Loads	Existing Study (R,F) or Development (D,C)	Certainty	Notes
Adak	M			Y	Y	NA	L	Needs RPSU first.
Akutan	M			NA	NA	NA	L	Possible RPSU.
Atka	L				NA	NA	H	Possible hydro heat recovery after controls upgraded.
Cold Bay	M			Y	Y	F	M	
False Pass	H	Y		Y	Y	NA	M	Existing system failed; needs feasibility evaluation.
King Cove	L	Y	Y		NA	NA	H	
Nelson Lagoon	M	NA	NA	NA	NA	NA	L	Needs RPSU, no information.
Nikolski	L	Y	NA		NA	NA	M	Based on RPSU database.
Saint George	L	Y	Y		NA	AEA CDR	H	
Saint Paul	L	Y	Y		NA	C	H	Construction complete
Sand Point	H	Y	Y	Y	Y	NA	M	Information from 2012 RPSU survey.
Unalaska	L	Y	Y	NA		NA	H	Organic Rankine Cycle system operational; electrotherm data to be verified

See Page B-7 for data sources and notes.

Table 36: Energy Efficiency savings potential

	Resource Potential	Residential EE Potential	% of Homes without HER or AHFC/RHA Weatherization	Commercial/Public Building EE Potential	Water/Sewer System Audit	School Audit	Street Light Upgrades	Community EE Program (VEEP, EECBG, etc.) or Multiple Commercial Building Audits	Certainty
Adak	H	H	100%	H				Y	H
Akutan	M	L	0%	H				Y	H
Atka	H	M	50%	H			Y	Y	H
Cold Bay	H	H	100%	H		Y		Y	H
False Pass	H	M	50%	H		Y		Y	H
King Cove	H	M	54%	H		Y	Y	Y	H
Nelson Lagoon	H	M	43%	H					H
Nikolski	H	M	52%	H					H
Saint George	H	H	87%	H				Y	H
Saint Paul	H	H	80%	H		Y		Y	H
Sand Point	H	H	71%	H		Y	Y	Y	H
Unalaska	H	H	94%	H			Y	Y	H

See Page B-7 for data sources and notes.

Table 37: Criteria used in resource potential analysis

Resource		Potential			Certainty		
Resource	What it Includes	Low	Medium	High	Low	Medium	High
Alternative Power Generation							
Coal	Resource development* and power generation	Local, quality resource absent.	Quality resource identified; further study needed	High quality, local resource identified; project in development	No information documented.	Based on documented opinion of credible source or recon level study.	Based on feasibility or higher level study .
Geothermal	Resource development and power generation	No documented resource within 20 miles.	Significant resource within 20 miles.	Significant resource within economic distance.	"	"	"
Hydro	Resource development and power generation	No hydro resource present or, if present, economic viability is nil to highly unlikely based on visual inspection.	Economic viability is unlikely to possible based on visual inspection.	Hydro project is present or under construction. Or, economic viability is possible to highly likely based on visual inspection.	No information documented.	Based on documented opinion of credible source or recon level study, including hydro database.	Based on feasibility or higher level study .
Hydrokinetic	Resource development and power generation	No river, tidal or wave energy potential documented within 10 miles.	Substantial resource documented within 10 miles.	Substantial resource adjacent to power system.	"	"	"
Oil & Natural Gas	Resource development and power generation	No source rock, traps or reservoirs present.	Source rock, traps or reservoirs present. Needs investigation.	Wells drilled and economic resource identified.	"	"	"
Solar	Photovoltaic	Economic criteria are more important than resource data. Projects should be evaluated on a case-by-case basis. See notes on solar technologies following table.					
Wind	Resource development and power generation	Wind resource or developability low***.	"	Project in operation, or wind resource and developability high***.	"	Based on recon level study.	Resource based on 12+ months onsite resource assessment, hourly load data, feasibility or higher level study.
Other	Nuclear, emerging energy technology	Low (See notes on emerging technologies following table.)					

Resource		Potential			Certainty		
Resource	What it Includes	Low	Medium	High	Low	Medium	High
Heat							
Biomass	Resource development and heat generation	Low productivity of nearby forest. And, if study is available, B/C ratio less than 1.0.	Medium or higher productivity of nearby forest; and, B/C ratio between 1.0 and 1.5, based on either rough analysis**** or existing study.	Medium or higher productivity of nearby forest; and B/C ratio greater than 1.5, based on either rough analysis**** or existing study.	No information documented.	Based on documented opinion of credible source or recon level study.	Based on feasibility or higher level study .
Heat Pumps	Ground, sea water, and air source heat pumps	Economic criteria are more important than resource data. Projects should be evaluated on a case-by-case basis. See notes following table on heat pumps in communities with diesel electric generation.					
Diesel Heat Recovery	CHP from diesel, other	Thermal loads remote from powerhouse, minimal recoverable heat remains.	<--->	HR equipment installed at powerhouse, thermal loads nearby, much recoverable heat remains.	No information documented.	Based on documented opinion of credible source or recon level study (e.g. power system inventory).	Based on feasibility or higher level study (e.g. RPSU CDR).
End User							
Efficiency - Based on residential & public/commercial ratings^	Residential	More than 70% of homes have received recent EE upgrades	41 - 70% of homes have NOT received recent EE upgrades.	Less than 40% of homes have NOT received recent EE upgrades	Little to no information available on buildings or recent EE upgrades.^^		Little to no information available on buildings or recent EE upgrades.
	Public & Commercial	See Note ^^	Completed all: Water/Sewer system audit, school audit, streetlight replacements, EECBG, AHFC Commercial or VEEP	Completed 3 to 0 of the infrastructure audits/upgrades/programs	Little to no information available on buildings or recent EE upgrades.^^^		Little to no information available on buildings or recent EE upgrades.
Transmission							
Interties	Power lines between communities or to remote generation						
Gas Lines	Natural gas or LNG lines						

Resource		Potential			Certainty		
Resource	What it Includes	Low	Medium	High	Low	Medium	High
Notes							
* Resource development: Activities that include energy resource assessment, infrastructure development, transportation, fuel storage and handling.							
**Visual assessment by AEA hydro PM indication L=None to Highly Unlikely, M=Unlikely to Maybe, H=Maybe to Highly Likely							
*** Wind potential defined by two factors:	1. Wind resource: L=class 2 or lower, M=class 3-4, H=class 5 or higher.						
	2. Developability, Indicated by four factors (Y=yes, N=likely no, X=fundamental problem that indicates low wind potential)						
	a. Access in place: is there a road, power transmission, or other suitable access to a viable wind site?						
	b. Permitability: Can habitat, FAA, or other factors be resolved without significant difficulty?						
	c. Site availability: Is there suitable land that is available for siting wind turbines?						
	d. Load: Is there sufficient load such that wind can be integrated economically with the existing diesel system (X: less than 50 kW average load)?						
**** Rough analysis of biomass project benefit/cost estimated based on these assumptions:	1. Fuel price estimated as simple 20-year average of ISER projections of power-sector fuel price plus an adder of $0.50 per gallon for heating fuel (ftp://www.aidea.org/REFund/Round%208/Documents/EvaluationModel.xlsm)						
	2. Fuelwood with an energy content of 20 MMBtu/cord and price of $250/cord						
	3. Wood and oil combustion efficiency equal						
	4. Installed cost of system estimated at $35/gallons per year of displaced fuel						
	5. O&M cost of 1% installed cost						
Energy Efficiency Rating^	The rating is conservative in giving a high potential for communities with any high rating whether in residential or public/commercial. Medium ratings are used for communities with two mediums or a low and a high. No community is rated as low for overall energy efficiency potential.						
Energy Efficiency Low^^	Low is not used as a resource potential for public and commercial building energy efficiency because even if all programs and audits are completed there is substantial work left to be done on implementing retrofits. Where information on audits especially for public and commercial buildings is sufficient, information on whether retrofits have been implemented is often lacking. To reflect that these criteria are not the full story of energy efficiency in commercial and public infrastructure, this the low potential rating is not used.						
Energy Efficiency Certainty^^^	The assumption is audits and streetlights that have been completed are recorded by AHFC and EE programs are recorded in multiple locations - REAP, AK Energy Efficiency, and AEA. Therefore, these ratings are based on collected data and have a high level of certainty.						

Notes on Specific Technologies

SOLAR PV AND THERMAL

In Alaska, the sun's energy is abundant in the summer when daylight hours are long. Owners and residents of off-grid lodges, fish camps, and remote cabins may find solar photovoltaic or solar thermal systems to be viable options. However, long, dark winters with six or more months of snow cover in most of the state make the economics of solar energy challenging. This is particularly true when the economics of solar energy are compared to those of energy efficiency and conservation, which can provide similar fuel-saving benefits at a fraction of the cost of solar energy.

The Alaska Energy Authority has funded the construction of one solar photovoltaic and one solar thermal project through the Renewable Energy Fund in recent years. Each of these projects was designed and constructed properly and is operating as anticipated. The Kaltag solar photovoltaic project cost $126,000 and saved $2,600 in energy costs in FY2014. The McKinley Village solar thermal project cost more than $190,000 and saved approximately $7,000 in FY2014. Once operations and maintenance costs are factored in, neither of these projects is likely to pay for itself over its expected life.

The National Renewable Energy Laboratory (NREL) has developed a valuable tool for analyzing solar photovoltaic performance and economics. It is called PVWatt's Calculator and is available at http://pvwatts.nrel.gov. Alaskans interested in learning about the potential for solar photovoltaic development can use PVWatt's as a preliminary analysis tool to analyze solar potential at their site. NREL also has a tool for analyzing solar thermal projects called System Advisor Model (SAM) and is available at https://sam.nrel.gov. Alaska residents can request assistance from the Alaska Energy Authority (David Lockard at 907-771-3062) in performing either solar PV or solar thermal analysis.

HEAT PUMPS IN COMMUNITIES WITH DIESEL ELECTRICAL GENERATION

Given the high installation costs and efficiency limitations of current technology, heat pumps do not appear economically competitive with fuel oil heaters in rural communities that rely on diesel for electrical generation.

Heat pumps use a working fluid in a refrigeration cycle to move heat from a lower temperature source to a higher temperature load, consuming electricity in the process. Heat sources can include the ground (via glycol filled loops in vertical boreholes or horizontal trenches), air, ground water, lakes, and seawater. Heat pump performance is expressed as a ratio of thermal energy delivered to electrical energy consumed which is referred to as the Coefficient of Performance (COP).

Unit oil fuel heaters typical of rural Alaska operate at approximately 90% efficiency. Diesel gen-set conversion efficiencies typical of rural Alaska communities are in the range of 30-35% (in other words, 30-35% of the energy available in diesel fuel is converted to electricity). Based on these assumptions, a heat pump would need to operate with a minimum average COP greater than of 2.5 in order to supply the same amount of heat from electricity generated from 1 gallon of diesel fuel as would be supplied by burning 1 gallon of diesel fuel. While this level of performance may be attainable in many areas of the state, the cost of installation—which Cold Climate Housing Research Center has estimated to range from $25,000 to $35,000 for ground

source heat pump systems—almost certainly precludes the economic viability of heat pumps in communities reliant on diesel generation. Additional factors to take into account:

- Powerhouse heat recovery adds significant additional value to each gallon of diesel consumed for electricity generation.
- Transmission losses reduce the amount of electrical energy actually available per gallon of diesel.
- Maintenance requiring specially trained technicians and equipment further increase operational costs.

EMERGING TECHNOLOGIES

River and marine hydrokinetics, including tidal and wave power, are emerging technologies with no commercial projects currently in operation in the United States. Considerable resources are being invested in advancement of the technologies at the state and federal level although at this point they are considered pre-commercial.

C | COMMUNITY INPUT AND PRIORITIES

D | WORKS CITED

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E | DATA SOURCES

Table 38: Data sources for community profiles

		Source	Date
Alaska Native Name		UAF	2014
Historical Setting		DCRA	2014
Cultural Resources		DCRA	2014
Energy Priorities		Phase I rpt, Phase II input	2015
Contacts	City	DCRA	2014
	Tribal	DCRA	2014
	Village Corp	DCRA	2014
Demographics			
2000	Population	DCRA	2000
	Median Age	DCRA	2000
	HH Size	DCRA	2000
	% Native	DCRA	2000
2010	Population	DCRA	2010
	Median Age	DCRA	2010
	HH Size	DCRA	2010
	% Native	DCRA	2010
Landfill	Class	DCRA	2014
	Permitted	DCRA	2014
W/W System	Water	Phase I Report	2013
	Sewer	Phase I Report	2013
	Condition	Phase I Report	2013
Road Access		DCRA	2014
Air Access	Owner	DCRA	2014
	Runway (lxw)	FAA	2014
	Surface	FAA	2014
Dock/Port Facilities			
	Ferry Service	DCRA	2014
	Barge Access	DCRA	2014

		Source	Date
Location		DCRA	2014
Climate	Avg. Temp	ACRC; weatherbase.com	
	Climate Zone	CCHRC	2014
	HDD	CCHRC	2014
Taxes		Alaska Taxable	2013
Economy		DCRA	2014
Natural Hazards Plan		DMVA	2014
Community Plans		DCRA	2014
Demographics (cont.)			
	HH Income	DCRA	2010
	% Employed	ALARI	2013
	LMI%	HUD	2014
	Distressed	Denali Commission	2013
Landfill	Location	DCRA	2014
	Condition/Life	DCRA	2014
W/W Sys.	Audited?		
	Homes Served		
	Gallons		
Interties			
Air Access	Lighted	FAA	2014
	Flight Rules	FAA	2014
	Condition	FAA	2014
Notes		Phase II public input	2015

Note: See page 7 for a list of acronyms.

Table 39: Data sources for energy profiles

		Source	Date
Utility	Name	DCRA	2014
Power House			
	Engine Make	RPSU (2012), Utilities (2015)	
	Line Loss	PCE	2014
	Heat Recovery	RPSU	2012
	Upgrades	RPSU (2012), Utilities (2015)	
	Outages/Issues	RPSU	2012
Operators			
	Number		
	Training/Certs	AEA Training Database	2014
	Maint. Planning	RPSU	2012
Electric Sales	Customers	PCE, Utilities	2014
	kWh sold	PCE, Utilities	2014
Resources	All	See Appendix B	2015
Bulk Fuel	Tanks		
	Purchasing		
	Coop Purchase		
	Other		
Housing Units	Occupied	CCHRC	2014
	Vacant	CCHRC	2014
Housing Need	Overcrowded	CCHRC	2014
	Owners/Occup	CCHRC	2014
Data Quality	1-star	CCHRC	2014
Housing Age	By Decade	CCHRC	2014
Non-residential Bldg Inventory		ARIS (2014), DCRA maps (2008)	

		Source	Date
Power Production			
	Diesel	PCE, Utilities	2014
	Wind	PCE, Utilities	2014
	Hydro	PCE, Utilities	2014
	Avg Load	Alaska Energy Pathway	2010
	Peak Load	Alaska Energy Pathway	2010
	Diesel Eff.	PCE	2014
	Diesel Use	PCE	2014
	5-yr Trend	AEDG	2014
Electric Rates	Residential	PCE, Utilities	2014
	Commercial	PCE	2014
Cost per kWh	All	PCE	2014
Fuel Prices	Utility	AEDG, PCE	2014
	Retail	AEDG	2014
	Discounts		
	Other sources	Fuel Vendor interviews	2015
Regional Housing Authority		AHFC	2014
Wx Service Provider		AHFC	2014
Energy Use			
	Avg Star Rating	CCHRC	2014
	Avg Sq Feet	CCHRC	2014
	Avg. EUI	CCHRC	2014
EE Housing Stock			
	Retrofitted	CCHRC, AHFC	2014
	Retrofitted	Regional Housing Auth.	2014
	Retrofitted	Wx Service Provider	2014
	BEES Certified	CCHRC, AHFC	2014
Lighting	All	AHFC audit reports	

Note: See page 7 for a list of acronyms.