Bering Strait Strategic Energy Plan

Serving the communities of:

Brevig Mission
Council
Diomede
Elim
Gambell
Golovin
King Island
Koyuk
Mary's Igloo
Nome
Savoonga
Shaktoolik
Shishmaref
Saint Michael
Solomon
Stebbins
Teller
Unalakleet
Wales
White Mountain

DRAFT

April 3, 2013

ALASKA ENERGY AUTHORITY

WHPacific

Acknowledgements

Abbreviations

ACEP	Alaska Center for Energy and Power
AEA	Alaska Energy Authority
AHFC	Alaska Housing Finance Corporation
AMR systems	Automated meter reading systems
ANCSA	Alaska Native Claims Settlement Act
ANTHC	Alaska Native Tribal Health Consortium
APT	Alaska Power and Telephone
ARDOR	Alaska Regional Development Organizations
ARECA	Alaska Rural Electric Cooperative Association
ARIS	Alaska Retrofit Information System
ARRA	American Recovery and Reinvestment Act
ARUC	Alaska Rural Utility Cooperative
AVEC	Alaska Village Electric Cooperative
BSDC	Bering Strait Development Council
BSNC	Bering Strait Native Corporation
BSRHA	Bering Strait Regional Housing Authority
BSSD	Bering Strait School District
CFL	compact fluorescent light
DOE	U.S. Department of Energy
FERC	Federal Energy Regulatory Commission
HUD	U.S. Department of Housing and Urban Development
IPP	Independent Power Producer
ISER	Institute for Social and Economic Research
kW	Kilowatt
kWh	Kilowatt hour
MINC	Mary's Igloo Native Corporation
MWh	Megawatt Hours
NAHASDA	Native American Housing and Self Determination Act
NJUS	Nome Joint Utilities System
NSEDC	Norton Sound Economic Development Corporation
NIST	National Institute for Standards and Technology
NREL	National Renewable Energy Laboratory
NSHC	Norton Sound Health Corporation
PCE	power cost equalization
PD&R	Policy Development and Research
PV	Photovoltaic
REAP	Renewable Energy Alaska Program
RUBA	Rural Utility Business Advisory
TED	The Energy Detective

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1 Introduction

Kawerak Inc. prepared this document to serve as the foundation of the Bering Strait Region's Energy Strategy. It builds upon other earlier reports (such as *Bering Strait Regional Energy Report 2009*) and is intended to present strategies to lower energy costs in the region, which includes 15 small, isolated communities and the City of Nome.

The Alaska Energy Authority (AEA) provided the funds to complete this report and it joins other strategic energy plans done or in process throughout the state of Alaska. Kawerak hired WHPacific to assist with the report's development.

Bering Strait Region
Energy Vision and Mission

VISION: Harnessing the strength of the world around us, the energy of the wind, the earth, and the sea, we will encourage, facilitate, and promote fiscally and environmentally responsible sustainable regional energy self-sufficiency.

***MISSION*:** To improve the quality of life across the region and promote long term prosperity and economic stability in our villages, we will enable adoption of local and renewable energy supplies through well informed, competent, and confident strategy, planning, and implementation.

Bering Strait Regional Energy Report 2009

1.1 Issues

Energy issues in the region were identified through discussions with stakeholders, energy providers and "energy champions" throughout the Bering Strait Region. Below is a list of some of the primary concerns. Additional information on the issues discussed may be found in the meeting notes in Appendix A.

- Aged infrastructure, deferred maintenance, construction without concern for energy use, antiquated technologies, shrinking subsidies, extreme construction costs and other conditions contribute to high energy use and delivery costs in the Bering Strait Region.
- Effective energy management, tailored to each community, is lacking resulting inefficient and costly energy systems.
- Funding for energy projects and for properly maintaining existing energy systems is inadequate.
- Trained power plant operators, consistent project managers and skilled grant writers are lacking at the village level.
- There is an absence of current "best practices" for efficiently operating energy systems in rural Alaska.
- Homeowners lack resources to understand how to reduce energy costs.
- Alternative energy opportunities are poorly understood in many communities in the Bering Strait Region.
- There are limited commercial building and home energy audits which limit opportunities to make significant improvements to the energy systems.

One energy issue that affects much of the state is funding eligibility criteria based on median income limits that create inequity between rural and urban Alaska in weatherization assistance programs. This funding formula has its basis in the income limits set by the US Department of Housing and Urban Development (HUD) Office of Policy Development and Research (PD&R). HUD PD&R sets median income standards for the 29 census areas and boroughs across Alaska, as well as for each region throughout the United States. These standards and eligibility formula are then used to determine eligibility for many funding opportunities. The Native American Housing and Self Determination Act (NAHASDA) is HUD's vehicle for provision of housing and rental assistance to Native Americans. All its programs use this funding formula. Alaska State programs such as those administered by the Alaska Housing Finance Corporation (AHFC) also base their funding policies on HUD's formula.

NAHASDA programs require a household to be at or below 60 percent of median income for their region to qualify for eligibility and many rural families are unable to qualify. Currently, AHFC determines community need for the weatherization program ranked on the following criteria:

- Median Income for the region as determined by the HUD PD&R;
- Percent of residents below the federal poverty line as of the most recent Census;
- Overcrowding/Occupants per household.

Households must be at or below 100 percent of median income for services. Those at or below 60 percent of median income receive the highest priority. This is an improvement implemented by AHFC in 2008, before which households had to fall below 60 percent of the median to be eligible at all.

Income-driven eligibility restrictions need to be reassessed so that they don't create a hardship for families in rural Alaska, such as those in the Bering Strait Region.

1.2 Goals

The following energy goals were created during development of the 2009 Energy Report in conjunction with input from stakeholders in the region.

- Reduce and stabilize community-wide energy (power & heating) costs.
- Reduce the region's exposure to fossil fuel-related market fluctuations and environmental risks.
- Improve safe and reliable region-wide energy infrastructure.
- Obtain and catalog data about existing energy related conditions in the Bering Strait Region villages enabling them to rigorously evaluate energy opportunities as they arise and produce professional quality highly competitive funding requests.
- Facilitate the discovery and scientific study of renewable resources near and in the Bering Strait Region villages and maintain a database of the findings.
- Establish a system of village energy metrics enabling villages to set concrete goals and receive feedback on their progress towards meeting those goals.
- Instill the knowledge and understanding demanded by effective energy strategy, planning, and implementation in each Bering Strait village.
- Identify and proliferate the understanding of lessons, opportunities, obstacles, and triumphs.
- Stay abreast of key energy related projects, proposals, technological advancements, and issues.

1.3 Methodology

This report follows the AEA recommended regional methodology outline and is organized according to the items in the approved scope. Specifically, the report presents a summary of local and regional conditions, energy use, and priority energy projects in communities within the Bering Strait Region. Projects include those focused on energy efficiency and alternative energy options. The top priority projects were ranked using the methodology developed by AEA and tailored for the region.

The data collected for this report was gathered from existing data in published reports including the *Bering Strait Regional Energy Report*, 2009, Alaska Energy Authority *Energy Pathways* and *End Use Survey*, the AHFC Alaska Retrofit Information System (ARIS), Alaska Homer Energy Rebate Program, Power Cost Equalization Reports, Institute of Social and Economic Research (ISER) information and data collected by numerous stakeholders.

The plan is developed in two phases with the first phase resulting in a draft document that will be presented in meetings throughout the region in phase II. To complete the analysis, the report consisted of three simultaneous activity tracks including planning, community and stakeholder involvement and preparation of deliverables. Throughout the process, stakeholder input was solicited and the project team and AEA staff met to discuss progress. The overall approach is shown graphically with a general timeline in Exhibit 1.

Exhibit 1: Project Approach Phase I

In the second phase of the project planners will visit each of the villages in the region and meet with local leaders and the public to present the draft plan. Comments will be collected and the plan revised prior to a final submittal.

Exhibit 2: Project Approach Phase II

1.4 Stakeholders

Stakeholders contacted during the development of this energy plan included local city, tribal and corporation personnel, regional energy providers, agency staff and the general public. Near the beginning of the project, stakeholders were interviewed to enable a number of industry participants to provide information and input into a wide array of energy related issues.

In addition to individual interviews, two stakeholder advisory group meetings were held. The first meeting took place from 1:00-7:00 pm on February 26th, 2013. Thirty-nine people from throughout the region attended, to learn of many of the technical aspects of the energy use in the region and for stakeholders to provide input into the planning process. Participants included "energy champions" from the villages who were tasked with acting as a liaison with the other community members and leaders. Other participants included representatives from local utilities, school districts, Norton Sound Economic Development Corporation, Bering Straits Regional Housing Authority and state agency representatives.

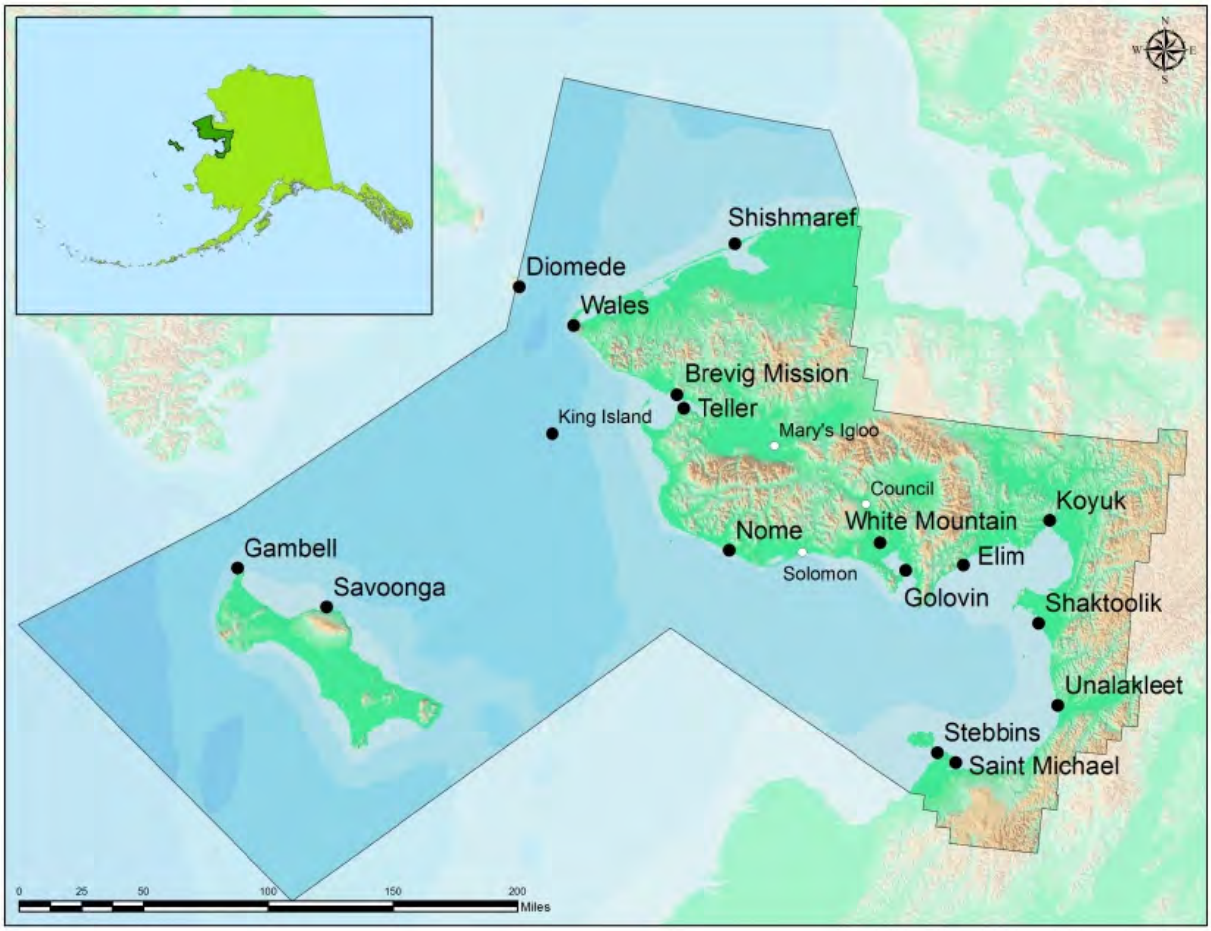
2 Regional Background

This section provides regional background information and describes current energy supply and demand benchmarks and projects for the region and individual communities. Data charts with information on the Bering Strait communities are located in Appendix C.

2.1 Location

The Bering Strait Region contains 22,000 square miles and lies between latitude 63 30' and 66 30' with 570 miles of coastline extending from Shishmaref in the north to Stebbins in the south. It also includes three islands; Saint Lawrence, Little Diomede and King Island. Nome is the transportation and economic hub of the region. There is no road system or unified electrical grid. The ocean is ice-free and passable for barge freight for only four to five months a year.

Figure 1: Bering Strait Region Map



2.2 Physical Conditions

2.2.1 Geography

The Bering Strait Region, located along the western coast of Alaska just south of the Arctic Circle, encompasses the northwest and southern portions of the Seward Peninsula. The terrain varies from gently rising slopes 1,000 to 2,000 feet tall to highland areas marked with steep ridges rising up to about 4,000 feet. Interior areas contain marshy plains. The coastline of the northern Seward Peninsula is dotted with lakes and lagoons. The coast, where many communities are located, is generally low-lying land. Communities sited on sandy soils are becoming more susceptible to coastal erosion due to storms and tidal/wave action. Climate change is exacerbating these conditions. Many river communities fight bank erosion that encroaches on communities and silting river bars impede navigation.

2.2.2 Geology

The geologic history of the Bering Strait Region involves large scale tectonic displacements interspersed with periods of erosion, deposition and volcanism. Significant fault zones include the Kugruk fault zone, that parallels the eastern extent of the Seward Peninsula, and the Kaltag fault which transects the area south of Unalakleet. Rock types in the Bering Strait Region include sedimentary, igneous and metamorphic. The region is underlain with discontinuous permafrost.

2.2.1 Hydrology

Freshwater habitats of the region include rivers; an abundance of lakes, streams, and wetlands; and numerous seasonal ponds and creeks. The thousands of shallow, thaw lakes cover a high percent of the Arctic coastal plain, and much of the Region is considered wetlands.

2.2.1 Climate

Communities in the Bering Strait Region primarily experience a transitional climate with the Bering Sea moderating the climate throughout the year. Normal average summer temperatures range from around 40-60 degrees F and normal average winter temperatures range from about -6 to +10 degrees F. Precipitation averages about 14 inches with an average snowfall of 48 inches.

Table 1: Average Climate Data in Bering Strait Region

-	Minimum	Maximum
Summer temperature	30 degrees	50 degrees
Winter temperature	-10 Degrees	10 Degrees
Snowfall	33 inches	80 inches
Wind	10 knots	15 knots
Average annual rainfall	10”	
Average Freeze up	November	
Average Break up	May-June	

Permafrost is mostly continuous through the region but is thinner than in areas further north.[1] Historically, permafrost is thawed only near deep lakes or major streams; however, there are recent reports of permafrost thawing in many communities. There are no glaciers in the region.

Heating Degree Days

The outside temperature plays a big role in how much energy it will take to keep a structure warm. Heating degree days are one way of expressing how cold a location is and can help in understanding how much fuel might be required at the village level. Heating degree days are a measure of how much (in degrees), and for how long (in days), the outside air temperature was below a certain level. They are commonly used in calculations relating to the energy consumption required to heat buildings. The higher the number the more energy will be required. The figures in Table 2 indicate average heating degree days in select Bering Strait communities. In comparison, New York averages about 5,000 heating degree days and therefore needs much less energy to heat their buildings.[2]

Table 2: Average Heating Degree Days

NORMALS 1961-90	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
Nome, AK	423	459	675	1,147	1,473	1,789	1,798	1,711	1,748	1,422	911	573	14,129
Shishmaref, AK	388	525	727	1,256	1,630	1,762	2,222	2,032	2,008	1,619	1,058	812	16,039

While the more northern communities experience a slightly colder winters, the weather is essentially the same throughout the region. Daylight extends for almost 24 hours a day during the summer, and in the winter the sun is barely seen.

2.3 Demographics

2.3.1 Current Population

According to the 2010 U. S. Census the total population of the Bering Strait Region was about 9,500 with Nome residents making up about a third of the total living in the region. Population by community is listed in Table 3.

Table 3: 2010 Population by Community

Community	2010 Population
Brevig Mission	388
Diomede	115
Elim	330

[1] Department of Community and Economic Development website, community profiles, www.commerce.state.ak.us/dca

[2] Kawerak, Bering Strait Region Energy Report, 2009, page 34-35.

Gambell	681
Golovin	156
Koyuk	332
Nome	3598
Savoonga	671
Shaktoolik	251
Shishmaref	563
Saint Michael	401
Stebbins	556
Teller	229
Unalakleet	688
Wales	145
White Mountain	190

The median age is the age at the midpoint of the population. Half of the population is older than the median age and half of the population is younger. The median age is often used to describe the "age" of a population. In 2010, the US median age increased to a new high of 37.2 years, from 35.3 years in 2000, with the proportion of the population at the older ages increasing similarly. This indicates that the U.S. population is aging.

The median age of a resident in the Bering Strait Region is 27.6, which is low compared to the U.S. (37.2) and to 36.1 years for Alaska. However, these numbers are also higher than they were in the 2000 Census.

2.3.2 Trends

Historical population for the region reveals that between 1970 and 2010 the population in the region almost doubled from 5,572 to 9,492. However, from 2000 to 2010 many villages experienced a decline in population, which follows a statewide trend for rural Alaska.

Exhibit 3: Bering Strait Region Historical Population 1990-2010

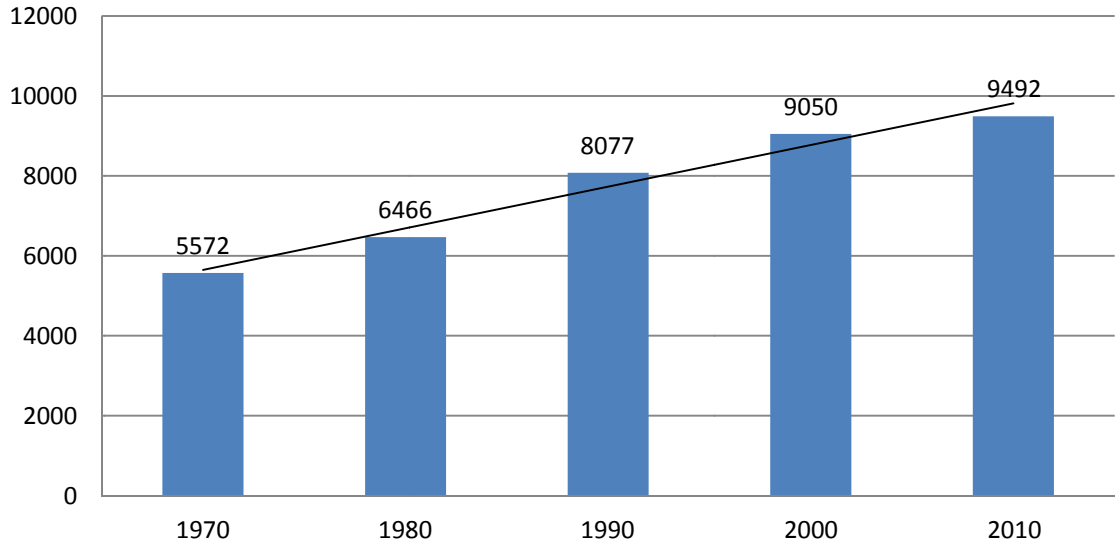
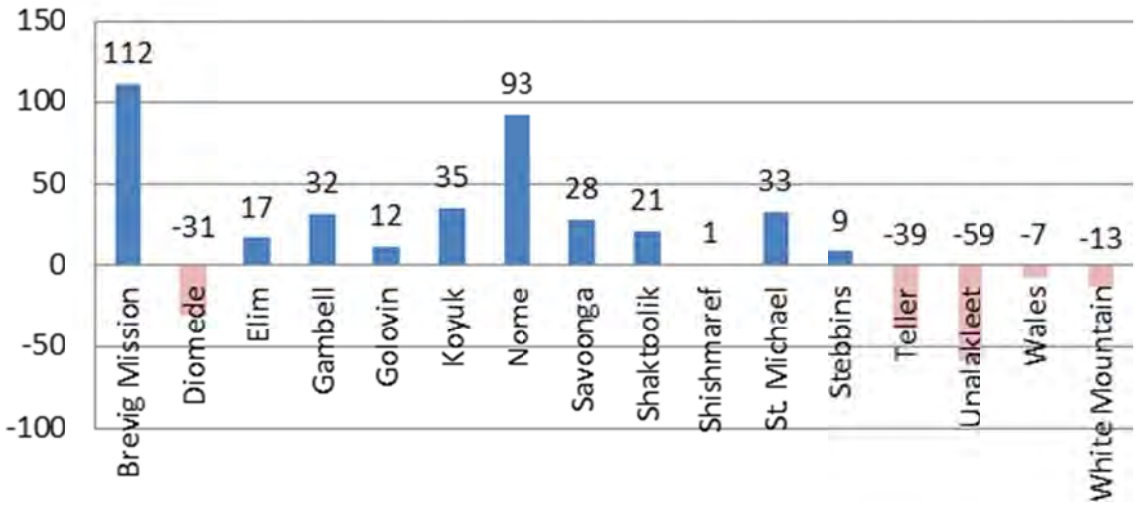


Exhibit 4: Bering Strait Region Population Change 2000-2010



Between 1990 and 2010 the Bering Strait regional population increased at a rate of 0.8 percent. Assuming the regional trend from the past 20 years continues at its current population growth, it is expected that the population of the region will be 10,279 by 2020 and 11,132 by 2030.

Exhibit 5: Population Forecast with Continued 0.8 Percent Growth Rate

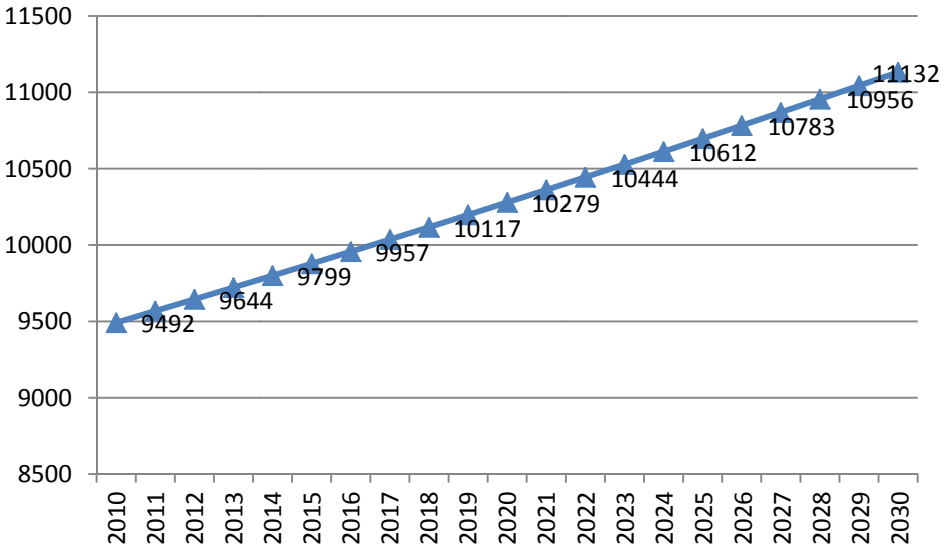


Table 4 provides a profile of the region's demographics[2].

Table 4: Bering Strait Regional Demographics

Total Population	9,492
Percent Female	46.7%
Percent Male	53.3%
Percent Native	75.8%
Percent of population under the age of 18 [perceived as indicator of dependency]	34.1%
Percent persons ages 18 to 64 [perceived as the labor force]	59.5%
Percent of persons over the age of 64 [perceived as indicator of dependency]	6.4%
Median age of total population	27.6
Number of persons age 18 to 64 with permanent, full time employment and % of labor force	4,397/46%
Number and percent of persons 18 to 64 who are unemployed	733/7.7%
Total number of households	2,815
Average number of persons per household	4
Total number of dwelling units	4,008
Number of vacant units	1,193
Number vacant due to seasonal use	744

Source: 2012 U.S. Census

[2] Data taken from Nome Census Are Quick Facts, http://quickfacts.census.gov/qfd/states/02/02180.html and the State of Alaska Community Data Base online http://commerce.alaska.gov/dca/apps/DCRAExternal/community/Details/49c72715-1ddd-4b8d-989f-3231847244c5

2.3.1 Economy

The Bering Strait Region is a sparsely populated, geographically dispersed region with many small remote communities whose cash employment opportunities are limited. Year-round jobs are primarily limited to the School District, Norton Sound Health Corporation, city and tribal employment, Kawerak, transportation services and retail sales. Most communities have part-time or seasonal jobs and unemployment is high. Although cash employment opportunities are limited, residents have a robust subsistence economy

Nome is the regional hub that acts as the supply, service and transportation center of the Bering Strait Region. Funding from local, state and federal government agencies provides approximately 40% of the employee wages in Nome. Other employment opportunities occur in tourism, retail, legal, medical, construction, transportation fishing and mining.

The Bering Straits Native Corporation (BSNC) is one of twelve land-based Alaska Native Corporations created as part of the Alaska Native Claims Settlement Act (ANCSA). It is owned by the region's Native shareholders and pursues development of the area's resources and other business opportunities. BSNC has subsidiaries that provide services to the US Government, including the Army, Navy, Air Force, Coast Guard, Army Corps of Engineers, and the U.S. Departments of Commerce, Justice, Agriculture, and Homeland Security. It owns construction companies that build and renovate structures, install electrical and security systems, fiber optic cable, construct seawalls, engage in demolition, and provide relocation services. BSNC encourages tourism in the region and seeks to facilitate in-region mining. BSNC pays annual dividends to its shareholders.

BSNC maintains an online Career Center where shareholders can update and submit résumés and find assistance with job searches.

As with the rest of Alaska, the Permanent Fund Dividend plays an important role in the Bering Strait Region's economy. The 2012 PFD paid out $878 to each eligible adult and child in Alaska. Over the course of its history PFDs have ranged from a low of $$331.29 in 1984 to a high of $2,069 in 2008. The PFD frequently allows residents to make major purchases they would otherwise be unable to make. Some put money into college or other savings plans, as well.

2.4 Energy Use

2.4.1 Electricity

Villages use diesel fuel to generate electricity. Residential uses include lighting, appliances, consumer electronics, and water heating. City uses include lighting and electronics for city buildings, street lighting, municipal water, and appliances at the washeteria. Schools are the largest electricity user in most villages. Schools use power for classroom electronics, ventilation equipment and lighting, electric ovens and stoves.

Excluding Nome, the cost of electricity varies from a low of $0.39 per kWh to a high of $0.72 per kWh in the region. [3] These costs are offset by the AEA's Power Cost Equalization (PCE) program which provides economic assistance to customers in rural areas of Alaska where the kilowatt-hour charge for electricity can be three to five times higher than the charge in more urban areas of the state.[4]

2.4.2 Heat

Space heating is the most fuel intensive activity in the region. The vast majority of homes in the region rely on fuel oil for heating. Heating with electricity is prohibitively expensive and affordable propane is not readily available. Some communities rely, in part, on nearby wood resources to heat their homes. There is also interest in developing a wood pellet industry which requires specialized stoves. Statistics regarding space heating data is lacking in the region and within the state.

The price of heating fuel varies considerably from village to village. It depends on many things including the village's credit worthiness, the amount and cost of fuel already in the village's bulk storage tanks, whether or not the village was able to take advantage of a multi-village bulk purchase effort, and on the timing of the village's fuel purchase.

Villages typically purchase bulk heating fuel during the summer; a time when world petroleum prices are high. Village harbors are shallow and not equipped to safely accommodate larger barges; fuel is shipped to Nome and then transferred to smaller craft for delivery. In the village, fuel is transferred from bulk tanks to smaller storage tanks at residences, businesses, and community facilities. By the time it reaches its destination, regardless of the price of fuel on world markets, heating fuel is expensive in the Bering Strait region.

2.4.3 Transportation

The residents of the Bering Strait region use fossil fuel powered snow machines, four wheelers, and boats for subsistence hunting and fishing activities. People travel to hunting areas, fish camps and other communities by skiffs and small boats on rivers and along the coast during the summer. In the winter, they use snowmachines for hunting, trapping, ice fishing and inter-community travel. Barge delivery of fuel and deck freight and the aviation-based bypass mail systems are critical transport services in the region. Air travel is the only mode of transport into and out of most villages for passengers and for many goods. However, in the summer months, Teller, Solomon and Council are connected to Nome via the Nome-Teller and Nome-Council Highways.

Fuel for transportation rose to more than $8/gallon during winter of 2008-09 though it dropped to an average around $6.20/gallon in 2012.

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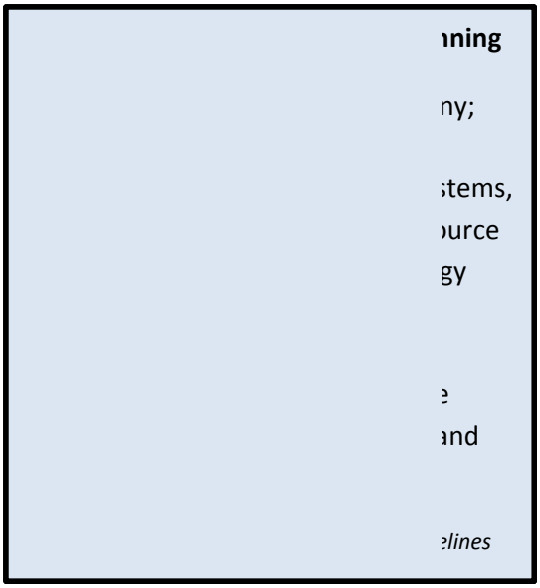
[3] Alaska Energy Authority, 2011 Power Cost Equalization Report, 2012.
[4] Alaska Energy Authority, http://www.akenergyauthority.org/programspce.html

3 Regional Resources

The following sections describe the potential energy resources and energy efficiency opportunities across the region.



3.1 Efficiency Opportunities

Energy efficiency plays a critical role in decreasing energy costs. In the world's arctic regions, energy efficiency is important in order to get the most benefit while expending the fewest resources, which are vital to life in the north. Improving the energy efficiency of structures saves money, conserves fuel and materials, and reduces pollution.

There are several weatherization and energy efficiency programs available to rural Alaska residents including the following:

- Housing Authority Weatherization (AHFC Service Providers – i.e. Bering Straits Regional Housing Authority) – combined state and federal dollars used to provide weatherization to residential homes in Alaska. This is an income based program.
- RurAL CAP Weatherization – homes weatherized by AHFC service providers do not qualify. These are both private and federal funds. Like the Housing Authority Weatherization program, this is an income based program.
- RurAL CAP Energy Wise –no income restrictions. This program provides education on behavior change and energy-efficiency.
- AHFC Home Energy Rebate Program – State of Alaska funded program that reimburses homeowners when energy-efficiency ratings are improved and energy conservation projects are completed. The program has no income restrictions. Participants cannot participate in both the Weatherization and Home Energy Rebate Programs.
- AHFC New Home Efficiency Rebate Program – for new construction. No income restrictions. This is a loan reduction program.
- AKEnergySmart Curriculum http://www.akenergysmart.org/ is an educational tool available through a collaboration from AHFC, Renewable Energy Alaska Project (REAP) and Alaska Center for Energy and Power (ACEP)

AHFC administers weatherization programs that have been created to award grants to non-profit organizations for the purpose of improving the energy efficiency of low-income homes statewide. These programs also provide training and technical assistance in the area of housing energy efficiency. Funds for these programs come from the U.S. Department of Energy as well as AHFC; however, state money makes up the bulk of the funding (Weatherization Programs, 2013).

The focus of weatherization is to increase the energy efficiency, safety, comfort and life expectancy of the homes. Typical improvements include the caulking and sealing of windows and doors, adding insulation to walls, floors and ceilings, and improving the efficiency of heating systems. By making homes more energy-efficient, families spend less for heating, freeing up more household income for other basic necessities and expenditures which help support local economies (Weatherization Services).

Using American Recovery & Reinvestment Act (ARRA) funds through the State Energy Program, the AHFC conducted an extensive benchmarking program that included 1,200 public facilities statewide including several in the Bering Strait region. By benchmarking a facility, owners and managers can identify trends in a building's energy use and compare use and operating costs to other buildings. Also by benchmarking, facility owners become more aware of how their decisions on design, construction and operations dramatically affect energy usage and costs throughout the life of the building. In 2011 and 2012 AHFC also funded 327 audits statewide using ARRA funds through the State Energy Program.

In the Bering Strait Region, AHFC conducted audits primarily on schools and a few other public buildings as shown in Table 5.

Table 5: AHFC Energy Audits in the Bering Strait Region

School Audits	Brevig Mission, Gambell , Elim, Teller, Koyuk, Shaktoolik, Savoonga, Shishmaref, Stebbins, Unalakleet and Unalakleet School office building, and Wales
Nome Public Building Audits	City Hall, Recreation Center, Public Works building, Volunteer Fire Station, Icy View Fire Station

The Alaska Native Tribal Health Consortium (ANTHC), Division of Health and Engineering also has an active program to increase energy efficiency focusing on decreasing energy costs in the sewer and water systems, which have a great potential for energy efficiency improvements. Information on the energy consumption and operating costs of these rural water and sewer utilities is not readily available. In 2009, ANTCH formed the Energy Projects Group to help address energy issues in rural Alaska.

In the Bering Strait Region, ANTHC has conducted energy audits on public buildings particularly in the water treatment plants and health clinics. They have also completed heat recovery studies to identify opportunities to capture waste heat and thus reduce energy costs. A list of these projects is shown in Table 6.

Table 6: ANTHC Heat Recovery Study and Energy Audit Status

Community	Heat Recovery Study	Energy Audit
Savoonga	X	
Savoonga		Water Treatment Plant
Shaktoolik		Tribal Office,
Shaktoolik		Health Clinic
Shaktoolik		Water Treatment Plant
Shishmaref	X	
Teller		Water Treatment Plant
Teller		Health Clinic

Currently, there are no studies of heat loss in water lines, which can be significant, particularly in communities that have above-ground arctic pipe or utilidors.

3.2 Oil and Gas

In the 1980s, off-shore drilling in the Norton Basin was conducted. Based on this and other research the U.S. Department of the Interior does not project undiscovered crude oil resources in the basin, although small amounts of liquid condensate are inferred to be present [5] Unconventional gas potential such as coal bed methane, tight gas sands and gas hydrates are considered low.

3.3 Coal

Coal deposits are present in the region and along a number of riverbanks the eroded remnants of coal deposits can be found among the river gravels. Generally, the coal beds are thin and low grade and often in irregularly-shaped lenses rather than lateral continuous coal seams. There is some evidence to suggest thicker layers may be present at depth.

Historically, locals in Koyuk picked up coal along Norton Bay beach and nearby at Coal Creek. There has also been some coal gathered on Saint Lawrence Island where locals mixed the coal with driftwood to heat their homes. The thickest documented coal deposit on the Seward Peninsula is located east of the Darby Mountains. There, the coal seams are up to 175 feet thick. In the 1980s, geologists explored for coal near Unalakleet at the mouth of Coal Mine Creek but much of the deposits were at unminable depths or were depleted in the early 1900s.

There is a small outcrop of low rank coal at the Sinuk River Bridge crossing, about 32 miles west of Nome on the Nome–Teller Highway. Natives from the village at the mouth of the Sinuk River brought the information about this coal to the attention of gold prospectors in 1902, and efforts to mine this coal were attempted that year (Collier and others, 1908).

[5] Minerals Management Service (MMS) 2006, Undiscovered Oil and Gas Resources, Alaska Federal Offshore: U.S. Department of the Interior Minerals Management Service Alaska OSC Region.

3.4 Geothermal

Central and eastern Seward Peninsula has areas with shallow thermal waters. Known hot springs (surface temperatures greater than 122 degrees F) include Lava Creek, Clear Creek, Serpentine and Pilgrim Hot Springs. Many of the potential geothermal resources are isolated from population and not economically feasible to develop. However Pilgrim Hot Springs, located 60 road miles north of Nome, has seen a long history of drilling, mapping and feasibility studies and is exploration is ongoing at that site. The Alaska Center for Energy and Power (ACEP), in collaboration with the Geophysical Institute, is testing an innovative remote sensing technique that could reduce the cost of geothermal exploration for low and moderate temperature geothermal sites around the world. By testing and verifying this technique at the Pilgrim Hot Springs site and hopefully locating the source of the geothermal water, ACEP will be able to assess the feasibility of developing this site to benefit the region and its residents. Match funding for the project has been provided by AEA through the Renewable Energy Fund.

Other known geothermal springs near Elim include the Elim Hot Springs or Kwiniuk Hot Springs, located approximately eight miles directly inland from the community, and Clear Creek Hot Springs located approximately 15 miles northwest of the community.

3.5 Hydroelectric

Hydroelectric power does not pose significant opportunities in the Bering Strait Region. Utility grade hydroelectric requires a significant change in elevation; most of this region is relatively flat. Additionally, rivers in this region are frozen solid much of the time; for these reasons and others the region is not particularly well suited for hydroelectric.

There is some potential for hydroelectric power in Elim.

3.6 Biomass

Alaska's primary biomass fuels are wood, sawmill wastes, fish byproducts, and municipal waste. In the Bering Strait region, wood, driftwood and fish oil are the most prevalent biomass resources. Biomass is a viable energy source in several communities in the Bering Strait including Elim, Golovin, Nome, Shaktoolik, Saint Michael, Stebbins, Teller, Unalakleet, and White Mountain. Wood stoves are already installed in many of the homes and when fuel oil is expensive, residents have historically found it cost effective to gather and burn wood to heat their homes.

There are regional wood resources in the driftwood from the Yukon River. Fishermen confirm that this driftwood can clog portions of Norton Sound and create a hazard to navigation in the spring. Large amounts wash up along the Seward Peninsula with each big storm. However, in some communities, such as Shaktoolik, the driftwood provides a breakwater that reduces erosion to the community, so harvest must be regulated.

Carefully planned harvesting of wood is needed to have a sustainable woody biomass project. Funding ($50,000) is available through the Department of Natural Resources to prepare forest stewardship plans.

One of the primary monetary benefits of using biomass as a fuel source is that the money spent on heating fuel will remain in the local economy. This will promote economic sustainability in communities that have struggled to maintain healthy local economies. In addition, using biomass for heat will stabilize heat energy costs with future costs rising much less than projected oil costs. Other benefits of using wood as an energy resource include that it can provide wildfire mitigation, cause a reduction in fuel spills and enhance wildlife habitat if managed correctly.

In 2009, an estimated 2,951,592 acres of forest burned throughout Alaska (Division of Forestry, 2009)[6]. Development of a five-year harvest plan in conjunction with a Community Wildfire Protection Plan will add additional forest thinning and firebreak development that will further reduce the risk of wildfire in the participating regions. Proper timber harvest, soil scarification and good seedling establishment can increase food supplies for moose 20-45 fold over mature forests[7].

Challenges of biomass include:

- Lack of access to the wood resource.
- Harvested wood takes time to cure;
- Requires planning and management of resources;
- Permission is needed to cut wood;
- Driftwood may be saltwater saturated presenting additional challenges; and
- Space must be allocated for boiler, wood processing, and resource storage.

In Elim, ANTHC recently installed wood fired boilers to offset heating costs at the water treatment plant. The project will enable Elim to utilize locally available wood resources to offset an average of 4,000 gallons of fuel per year and reduce the water utility's operating costs by over $12,000 annually[8] The system is being carefully monitored to determine its effectiveness.

Wood pellet manufacture in increasing in Alaska, with both small and large scale operations in place in the state. The largest facility, Superior Pellets of North Pole has an estimated production capacity of 30,000 tons per year.

Nome and Unalakleet have fish processing plants which can be a source for pollock oil. Much of the oil is used as boiler fuel for drying fishmeal or is exported to Pacific Rim markets. However, in 2001 UniSea, Inc., in cooperation with the State of Alaska, conducted successful tests of raw fish oil/diesel blends in a 2.2 MW engine generator.[9]

3.7 Wind

The Bering Strait Region has abundant wind resources available for energy development. Costs associated with fossil fuel-based generation and improvements in wind power technology make this

[6] (Division of Forestry, 2009)
[7] (Collins, 1998)
[8] (Hanssen, 2012)
[9] (Alaska Energy Authority, 2011)

clean, renewable energy source attractive to many communities and individuals. Several communities in the region already have wind systems constructed and others are being assessed for feasibility as shown in Table 7.[10]

The quality of a wind resource is key to determining the feasibility of a wind project. But other important factors to consider include the size of a community's electrical load, the price of displaced fuel such as diesel, turbine foundation costs, the length of transmission lines, and other site-specific variables. Potential wind power is rated on a scale of one to seven with seven being strongest. [11]

Each of the communities in the Bering Strait region that has been rated for wind potential has a Wind Power Class of 3-7 indicating a high potential for wind power in the region. Table 7 lists the communities and their power class ratings along with the best potential wind areas identified.

Table 7: Bering Strait Region Community Wind Power Class Ratings

Community	Estimated Wind Power Class (Location)	Project and Status (if any)
Brevig Mission	7 (Port Clarence)	
Diomede	7 (Area wide)	
Elim	6 (Hill 744), 4 (more easily accessed western ridge)	Feasibility study
Gambell	7 (Airport)	AEA and AVEC constructed 3-turbine 300KW system. (2010)
Golovin	6 (Point 712), 4 (ridge east of town), 3+ (Airport)	Met Tower pending
Koyuk	5 (Hill 418 four miles SW), 4 (Hill 408 for miles NE of town),	Feasibility study
Nome	7 (Newton Peak), 6 (Banner, Anvil and Newton Peaks)	Constructed 18-turbine, 2.97 MW system, plus intertie. (2010, 2012) 2 additional turbines 1.8 MW, are expected to be installed in 2013
Saint Michael	6 (Saint Michael Mountain), 4 (1.5 miles NW)	Wind resource study currently underway
Savoonga	6, 5 (Airport)	AEA and AVEC constructed 2-turbine 200KW system. (2008)
Shaktoolik	4 (one mile NW), 3 (in town)	AEA and AVEC constructed 2-turbine 100KW system.(2012)
Shishmaref	5 (1.5 miles SW), 4 (Airport)	Wind resource study proposed
Stebbins	6 (one mile N at Cape Stephens, one mile S at Hill 225)	Wind resource study currently underway
Teller	6 (Hill 519 3.5 miles SW, also along the road to Nome at 700 feet elevation about 7 miles S of town.	Wind resource study currently underway
Unalakleet	4 (Airport)	AEA and Unalakleet Valley Electric Cooperative constructed a 6-turbine system, with boiler and heat recovery loop. (2009)

[10] (Alaska Energy Authority, 2012)
[11] (Alaska Energy Authority, 2011)

Community	Estimated Wind Power Class (Location)	Project and Status (if any)
Wales	7 (much of region)	AEA and AVEC constructed 2-turbine system with battery storage. (1998, currently funded a for retrofit/upgrade)
White Mtn.	3 (Hill 396, E of town)	MET Tower Pending

One identified potential project was a combined wind power project for Stebbins and Saint Michael, with the turbines to be located at Saint Michael Mountain. It is anticipated that wind power generation in each case would be used in combination with diesel to create a reduced oil dependency and lower power generation costs.

3.8 Solar

Alaska's high latitude presents the challenge of having minimal solar energy during the long winter months when energy demand is greatest. Solar energy can tap both direct and reflected sunlight. This makes April the most productive time of year for solar collection, even though days are longer in the summer. However, most of the communities in the Bering Strait region have an Annual Average Solar Insolation of less than 3.5 kWh/m^2/day, a relatively low amount. Insolation is a measure of the amount of solar radiation received on a given surface area.

"Solar thermal" heating systems use pumps or fans to move energy to a point of use and is generally used for small projects such as domestic hot water. A larger role for solar thermal hot water systems is emerging as advances in heating systems allow solar-heated fluid to supply in-floor systems currently heated by conventional fuel boilers. A solar thermal heating demonstration project is underway in Nome.[12] In 2008, solar collectors were installed on the BSNC office building to provide 16.8 kW of power displacing 1,000 gallons of diesel fuel per year. BSNC has also installed solar water heaters for two of their apartment buildings. Nome is experimenting with the use of evacuated tube solar collectors which, in Nome's climate, are more efficient and more cost effective than panels.

Solar collectors on the BSNC building in Nome.

Currently photovoltaic (PV) power is one of the most expensive energy options in Alaska, though the price has dropped significantly over the past several years and the technology is improving. At this time,

[12] (Alaska Energy Authority, 2011)

it is considered an ideal power source for remote fish camps, lodges, cabins or other stand-alone systems. But the use of PV technology for utility-scale power generation in Alaska is not yet cost effective.[13]

3.9 Other

Another potential power source in Alaska is Ocean and River Hydrokinetic. Alaska's long coastline and extensive river networks provide potential to meet some of the state's energy needs. Ocean and river energy projects convert the kinetic energy of the moving water into electricity via hydrokinetic devices. Hydrokinetic power is supplied by tidal waters, waves, and river flow.[14]

There is a potential hydrokinetic resource in the channel between Brevig and Teller. In 2011, AVEC did bathymetric surveys as part of other research in the area and discovered bottom scouring from ice. AVEC chose not to go further with the project and surrendered their Federal Energy Regulatory Commission (FERC) permit. Brevig Mission or Teller could apply for a permit and go forward with the project; however, residents fear that the hydrokinetic devices may interfere with subsistence activities.

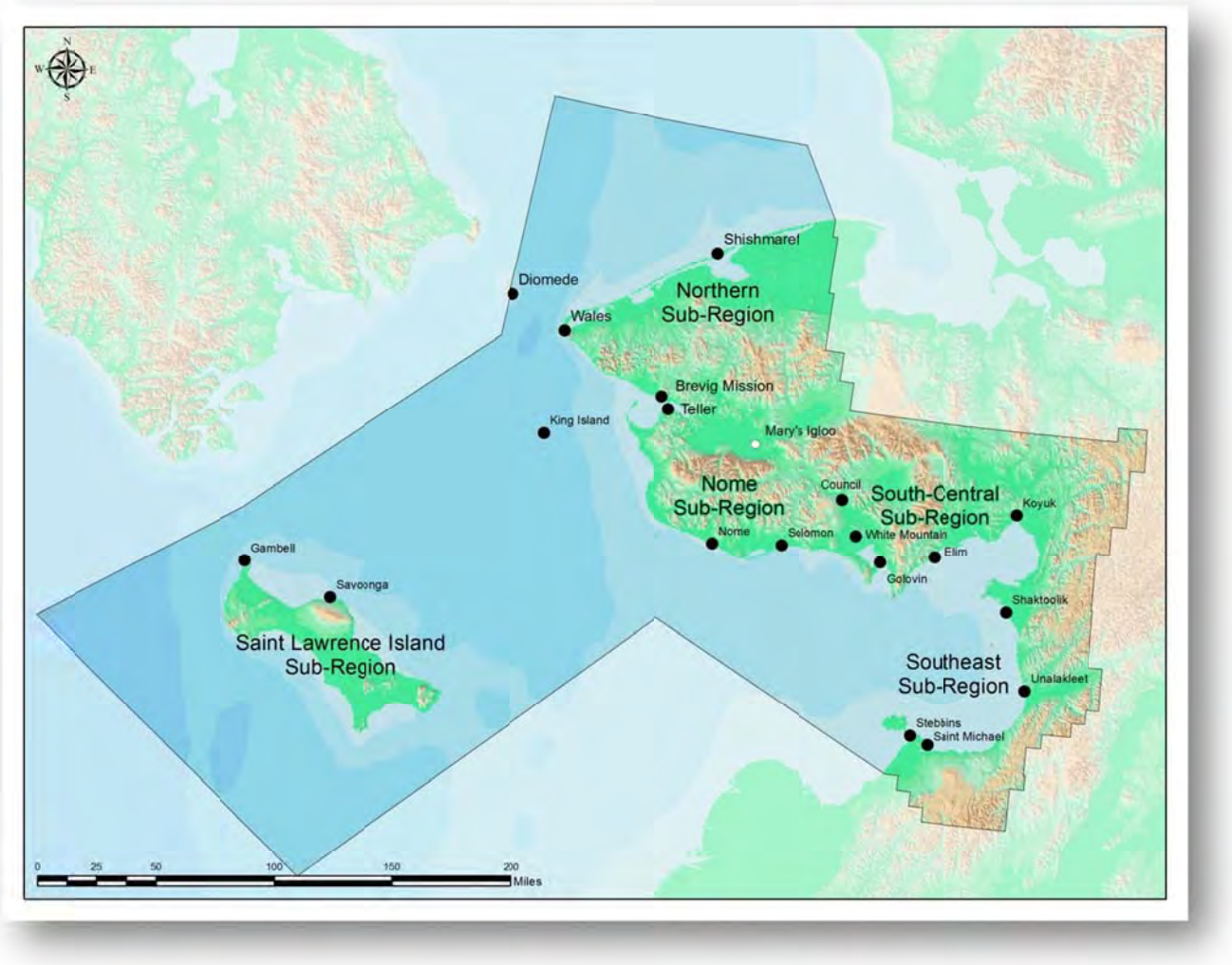
[13] (Alaska Energy Authority, 2011)
[14] (Triplett, 2011)

4 Community Sub-Regional Summaries

The Bering Strait Region is divided into five sub-regions that coincide with the sub-regions used by Bering Straits Development Council and Kawerak Incorporated. Some of the communities in the sub-regions can be considered energy clusters because of potential or existing interties and similar energy resources.

The sub-regions include the Northern, South-central, Southeast, Saint Lawrence Island and Nome sub-regions. The communities within each sub-region are described below and shown in the overview map in Figure 2.

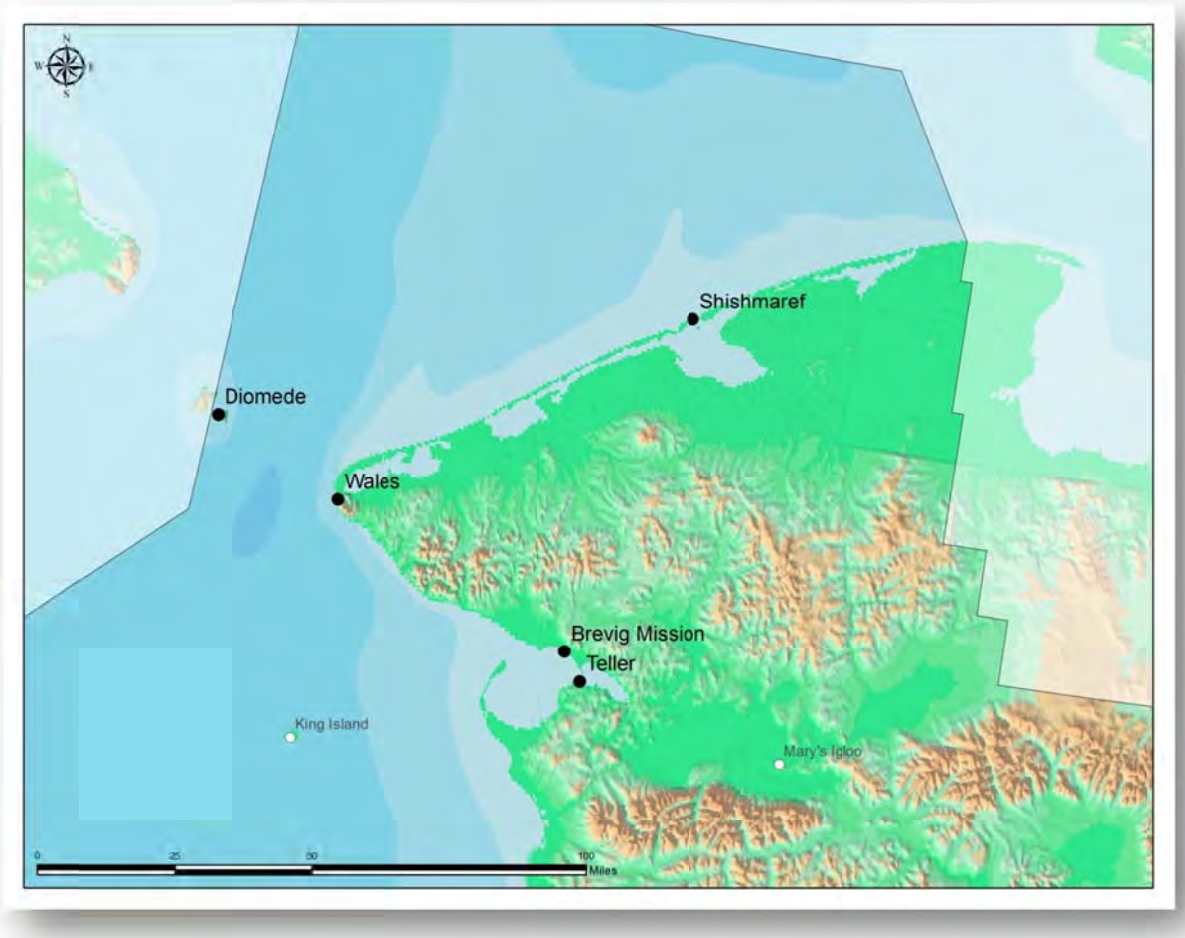
Figure 2: Bering Strait Region, Sub-Regions and Communities



4.1 Northern Sub-Region

The Northern Sub-Region includes Brevig Mission, Diomede, Shishmaref, Teller and Wales. The 2010 U.S. Census reports a total population of 1,440. Teller is 57 miles from Nome and is the only community accessible by road from about June through November. Diomede is located on the island of Little Diomede located 80 miles northwest of Teller and 130 miles northwest of Nome. The island is located only 2.5 miles from Big Diomede Island, which belongs to Russia.

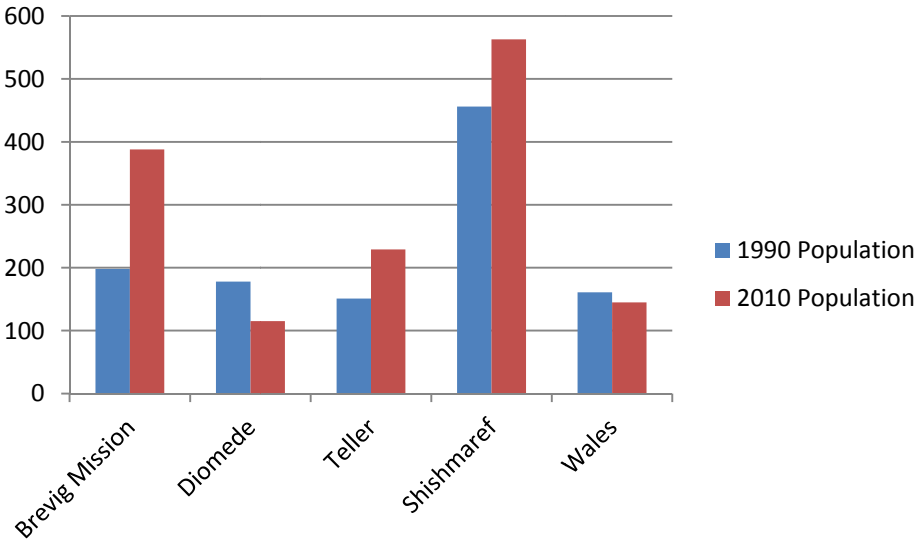
Figure 3: Northern Sub-Region



4.1.1 Demographics

Brevig Mission (population 388), Diomede (population 115), Shishmaref (population 563), Teller (population 229) and Wales (population 145) experienced an average population growth of about 1% over the past 20 years.

Exhibit 6: Northern Sub-Region 20-Year Population Change



4.1.2 Economy

The economy in the Northern sub-region is largely based upon subsistence activities supplemented by part-time earnings. Within the sub-region, residents harvest from the sea and land including fish, whale, seal, birds, moose and reindeer. Residents in the sub-region also harvest a variety of berries, roots, mushrooms, and greens. The community of Diomede has a particularly limited cash economy and residents there rely very heavily on subsistence resources.

Income in the sub-region is supplemented by part-time wage earnings. Employment is provided through the city, Tribe, local Village Corporation, school, clinic, and store. Trapping, as well as selling Native arts and crafts, also provide income to residents in the sub-region. The unemployment rate averages 31% and 39% of the residents in the sub-region live below the poverty level.

4.1.3 Infrastructure

There are 364 occupied homes in the Northern sub-region. Each community has a school operated by the Bering Strait School District, a health clinic, a post office and city and tribal government buildings and churches.

There is an above ground circulating water system and a gravity buried sewer system in Brevig Mission but the other communities in the region have to haul water from the washeteria and dump their honey buckets at the landfill. There is a Class 3, non-permitted landfill in each community.

4.1.4 Energy Issues

In 2010, AVEC completed a 6.5-mile intertie between Brevig Mission and Teller. Last year, a storm damaged the cable making the system inoperable. AVEC requested Federal Emergency Management Administration (FEMA) funds to replace the cable. Brevig Mission and Teller are currently completing

hazard mitigation plans and it may be necessary to complete these plans before FEMA will consider funding for the cable replacement.

In 2009, the Federal Energy Regulatory Commission issued a permit to AVEC to study the feasibility of the Port Clarence Hydrokinetic Project. The project would be located within the waters of Port Clarence between the communities of Teller and Brevig Mission and would use the tidal currents of Port Clarence to produce electricity. The work included a bathymetric study and a basic flow study plan in the Port Clarence and Grantley Harbor Area. In 2011, AVEC determined that the long, cold arctic winters made studies of the tidal flow regime too difficult to complete within the permit timeline and requested that the permit be cancelled.

Another energy issue is that the wind turbines in Wales are no longer functioning. This is complicated by the fact that AVEC provides electrical services in Wales but the wind turbines are owned by Kotzebue Electric Association. AVEC is coordinating with Kotzebue Electric Company to discuss options to get the Wales wind turbines functioning.

Diomede has wind energy potential but has challenges due to sensitive bird habitat. Diomede faces the greatest transportation challenges in the Bering Strait Region due to its lack of an airstrip and poor weather. Cargo barge stops are irregular. This impacts the community's ability to respond to energy (and other) emergencies.

Residents in this sub-region state that there is a lack of energy efficient housing, home energy audits and energy efficiency education. They also have indicated they lack grant writers to assist in the submission and management of energy grants.

Table 8 summarizes Northern sub-region energy facts.

Table 8: Northern Sub Region Quick Facts

Northern Sub- Region Quick Facts Brevig Mission, Diomede, Shishmaref, Teller, Wales	
Population (U.S. Census, 2010) 1440	1440
Utility	AVEC, Diomede Utility
Total Electricity Production, mWh (AEA, 2010) 4,627	4,627
Diesel Fuel Consumed to Produce Electricity, per year (AEA, 2010)	366,793
Annual Heating Oil Consumption, gallons (AEA, 2010)	455,977
Average Household Electricity PCE Rate per kWh up to 500,000 kWh, after that customers pay full rate (based on avg. residential customer) (AVEC, 2012)	$0.22
Average Commercial Electricity Rate, per kWh, (AVEC, 2012)	$0.63
Annual Transportation Fuel Use, gallons (AEA, 2010)	152,876
2012 Average Diesel Fuel Price (Kawerak, 2012)	$6.48

4.1.5 Community Plans

Each community has a Local Economic Development plan. Brevig Mission and Teller have hazard mitigation plans in process and Shishmaref's hazard mitigation plan was completed in 2009. The Alaska Department of Transportation's Northwest Alaska Transportation Plan includes this sub-region. Planning meetings and discussions have also taken place to address Shishmaref's erosion that threatens village structures on a regular basis. The state has funding to assist the community in this planning effort over the next two years.

4.1.6 Energy Improvement Opportunities/Alternatives

Table 9 shows the energy opportunities that exist in the Northern sub-region.

Table 9: Northern Region Energy Improvement Opportunities

Energy Opportunity	Potential
Existing Generation	High potential, improvements to heat recovery systems.
Interties	High potential; In 2010, an intertie between Brevig Mission and Teller was installed but the cable was destroyed during a storm in 2012. AVEC applied to FEMA for funding to repair the cable.
Wind	High potential; Class 7 winds in area of Port Clarence and in areas of Bering Strait. Diomede has challenges because of sensitive bird habitat and turbulence and airport operation conflicts impact wind potential in Brevig Mission.
Energy Efficiency program	High potential; home weatherization and energy education projects needed. Commercial building audits completed include the Brevig Mission, Shishmaref and Teller Schools, and the Teller Health clinic, Water Treatment Plant. More commercial buildings and sanitation system energy audits needed.
Heat Recovery	High potential; there are heat recovery systems in place but improvements are needed. ANTHC completed a heat recovery study for Shishmaref.
Hydroelectric	Low potential; with little terrain in the area, there are few hydropower opportunities.
Solar	Low potential; Annual Average solar insolation less than 4kWh/m²/day.
Biomass	Low potential; biomass resources are primarily limited to driftwood.
Hydrokinetic	Medium potential; the area experiences some tidal action, particularly in the Port Clarence area near Brevig Mission.
Geothermal	Low potential; geothermal resources are not known in the area.
Gas	Low potential; gas opportunities undiscovered.
Coal	Low potential; coal resources are not known in this area. .

4.1.7 Priority Energy Actions

Representatives from the sub-region provided the following information in the first stakeholder advisory meeting.

Table 10: Northern Sub-Region Priority Energy Actions

Immediate Actions 1 year	***Community***	***Project***	***Estimated Costs***
	Brevig Mission	Intertie Repair between Brevig Mission and Teller	$1.25 M
	Brevig Mission	Seek funding and support for Wind Feasibility Study	N/A
		Seek support to prioritize weatherization for residential units	N/A
		Final design and construction of shared wind turbines	
	Diomede	Technical Assistance for Power Plant personnel	$10,000
		Heat Recovery System Upgrade	$155,000
		Partner with UAF to study ocean currents and potential for offshore wind generation	
	Shishmaref	Heat Recovery System	$327,000
		Wind energy Feasibility Study and Conceptual Design	$142,500
	Teller	Install back up power plant	
		Seek support to prioritize weatherization for residential units	
		Seek funding for additional bulk fuel storage for gasoline	
	Wales	Power Plant Upgrade	$1.2 M
		Heat Recovery System Upgrade and Repair	$182,000
		Wind Energy Feasibility Study	$142,500
		Repair Existing Wind turbine System	$180,000
Near Term Actions 1-5 years	Brevig Mission	Partner with UAF Conduct study of off shore currents for hydrokinetic energy system between Brevig Mission and Teller	
		Complete weatherization for residential units	
	Diomede	Feasibility study, if warranted, for hydrokinetic energy and off shore wind generation	
		Weatherization and repair	
	Wales	Wind Turbine operational improvements	
	Shishmaref	Implement recommendations from wind study	
	Teller	Install additional bulk fuel storage for gasoline	

4.2 South-Central Sub-Region

The South-Central sub-region includes Elim, Koyuk and White Mountain. This sub-region has rolling hills and small stands of trees. The four communities that make up this sub-region are on the north side of Norton Sound and are either on the coast or near it. Koyuk is the furthest to the east at the head of Norton Bay. Winter trails connect these villages and include part of the Iditarod Trail race checkpoint system. The communities have no roads between them and range from 62 miles (White Mountain) to 130 miles (Koyuk) from Nome which must be accessed by air.

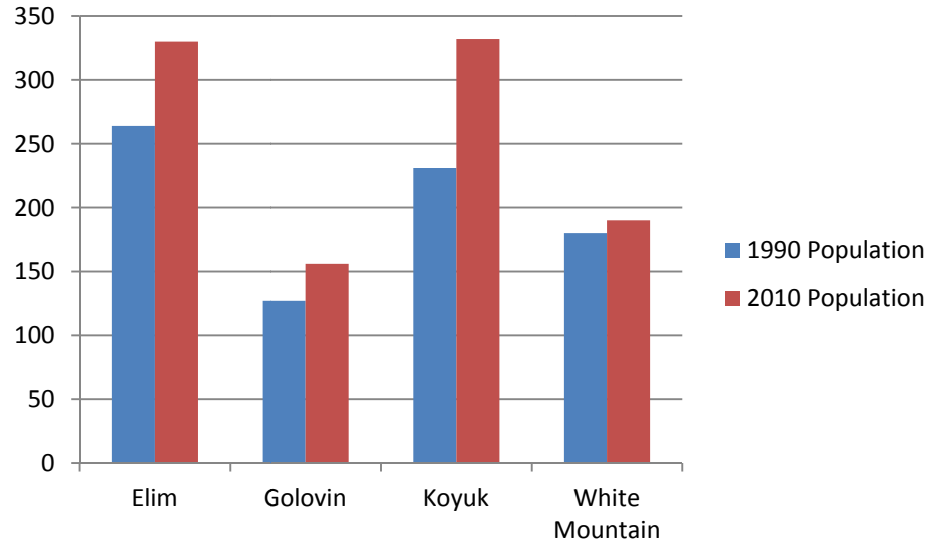
Figure 4 shows the communities in the South central sub-region.

Figure 4: South-Central Sub-Region

4.2.1 Demographics

Elim (population 330), Golovin (population 156), Koyuk (population 332) and White Mountain (population190), experienced an average annual growth rate over the past 20 years of over one percent. The unemployment rate was 35 percent and about 37 percent of the residents were below the poverty rate.

Exhibit 7: South-Central Sub-Region 20 year Population Change



4.2.2 Economy

Subsistence harvests constitute the majority of the economy of Elim with only 27 residents holding commercial fishing licenses. There are a limited number of wage earning jobs available. The community has placed fish processing plant high on their list of priorities. The community of Golovin is also an area that relies heavily on subsistence in their economy. Only 14 residents hold commercial fishing licenses. Koyuk has 10 residents with commercial fishing licenses and also relies heavily on subsistence. Only one resident in White Mountain holds a commercial fishing permit. Subsistence resources play a really large part in the economy and wage earning jobs are few.

4.2.3 Infrastructure

There are 292 occupied homes in the South-Central Sub-Region according to the 2010 census numbers reported by the DCRA. Each community has a school operated by the Bering Strait School District; a Post Office; health clinic; and a buried piped water and sewer system. AVEC operates the utility in Elim and Koyuk and the Cities of Golovin and White Mountain operate the utilities in those communities.

The landfills in Elim and Golovin are permitted by the Alaska Department of Environmental Conservation. Landfills in Koyuk and White Mountain operate without permits.

All communities have City and Tribal Offices, power plants, water plants and, in some cases, washeterias. Golovin and Elim have fire halls

All communities have state-owned and operated airports.

4.2.4 Energy Issues

Efficiency in electric generation is not as well coordinated as it could be if there were plans for village electric line interties. Interties are made more difficult because there are four villages in this Sub-Region and three different electricity providers.

The community of Elim has identified the need to renovate the electrical system and to upgrade electrical systems in older houses to assist residents with energy needs. Along with the new wood-fired boiler for the clinic, a hydroelectric dam has been looked at as a way to provide alternative energy for the community. The community has also been applying to AEA for funds to complete a feasibility study to examine nearby geothermal potential. The known geothermal springs, called Elim Hot Springs or Kwiniuk Hot Springs, is located approximately 8 miles inland from the community, and Clear Creek Hot Springs located approximately 15 miles northwest from the community.

The community of Golovin has identified that they need to relocate the generator building to higher ground, investigate alternative energy sources and renovate older homes for energy efficiency.

Residents of Koyuk would like to upgrade existing housing for energy efficiency and provide newer, energy efficient housing.

White Mountain recently upgraded their power plant and would like to capture waste heat and explore alternative energy. Existing lines and poles need maintenance.

Table 11: South-Central Sub Region Quick Facts

South-Central Sub Region Quick Facts Elim, Golovin, Koyuk, White Mountain	
Population (U.S. Census, 2010)	1008
Utility	AVEC Golovin Power Utility White Mountain Utilities
Total Electricity Production, mWh (AEA, 2010)	3,900
Diesel Fuel Consumed to Produce Electricity, per year (AEA, 2010)	293,705
Annual Heating Oil Consumption, gallons (AEA, 2010)	325,866
Average Household Electricity PCE Rate per kWh up to 500,000 kWh, after that customers pay full rate (based on avg. residential customer) (AVEC, 2012)	$0.2581
Average Commercial Electricity Rate (AVEC, 2012)	$0.6044
Annual Transportation Fuel Use, gallons (AEA, 2010)	112,036
2012 Average Diesel Fuel Price (Kawerak, 2012)	$5.46

4.2.5 Community Plans

All four South-Central Sub-Region communities have Local Economic Development Plans. The Elim Plan was dated 2005-2010 and was updated in January 2008. Important goals for this community include a wind energy power plant and a hydroelectric dam. The community of Golovin Plan is dated June 2009 and the Number 2 priority is to relocate the generator building to higher ground. The Koyuk Plan was approved May 2004, for 2005-2010 and discusses the need for additional bulk fuel facility design and construction. The White Mountain Plan is dated January 2009, for 2008-2013 with an addendum added

in February 2012. A high priority for the community is to have a utility evaluation and upgrade, and to capture waste heat.

Neither White Mountain nor Koyuk have Hazard Plans, but a Hazard Plan was completed for Golovin in December 2008 and one is in process for Elim.

All four sub-region communities have BIA Long Range Transportation Plans also supported by Kawerak. These plans assist the communities in targeting their transportation shares under the BIA transportation program.

4.2.6 Energy Improvement Opportunities/Alternatives

Table 12 shows the energy opportunities that exist in the Northern sub-region.

Table 12: Energy Improvement Opportunities/Alternatives

Energy Opportunity	Potential
Existing Generation	Medium potential; power plant projects were completed in2003 for Elim and 2004 for Koyuk.
Interties	Low to medium potential depending on local interest and coordination in discussing intertie opportunities
Wind	Medium to high potential; Data from Golovin indicate that wind in the village is poor but there are Class 4 winds available within 4 miles and Class 7 winds available within 7 miles of the village. A wind study is being conducted to determine wind potential in the area of Golovin and White Mountain for a possible shared resource. Elim and Koyuk are also undergoing wind studies. Studies are anticipated to be complete at the end of June 2014.
Energy Efficiency program	High potential; home weatherization and energy education projects needed. Commercial building audits are also needed.
Heat Recovery	High potential; there are heat recovery systems in place but improvements are needed. The Elim and Koyuk schools have had AHFC Energy Audits.
Hydroelectric	Hydroelectric power generation opportunities were looked at in the area around Elim in the early 1980s as well White Mountain by the Alaska Power Authority. Studies were very preliminary and concluded waste heat recovery or other means may be better applications for the villages.
Solar	Low potential; Annual Average solar insolation less than 3.5kWh/m²/day.
Biomass	ANTHC is working in Elim to install a biomass-burning boiler (Summer 2012) to serve the water treatment plant. Moderate potential; biomass resources are available but collection, transportation and sustainability are issues
Hydrokinetic	Low potential; the area experiences some tidal action, but energy generation is not likely.

Energy Opportunity	Potential
Geothermal	Elim continues to seek funding for a Geothermal Resource Assessment Feasibility Study with the Alaska Renewable Energy Fund, but is 71 on a list of 85 total projects. Moderate potential overall; geothermal resources are known to exist in the area, but may be costly to access efficiently.
Gas	Low potential; gas opportunities have been studied in Norton Sound but found too sparse for economic development.
Coal	Low potential; coal resources were minimally explored in the Koyuk area in the 1980s, but coal has not been found to be economically viable.

4.2.7 Priority Energy Actions

Representatives from the sub-region provided the following information in the first stakeholder advisory meeting.

Table 13: South-Central Sub-Region Priority Energy Actions

Immediate Actions 1year		***Project***	***Estimated Costs***
	Elim	Power plant operator technical assistance and training	$10,000
		Diesel Engine Heat Recovery system upgrade	$355,000
		Collect water temperature data and water samples from hot springs and deliver to UAF	
		Apply for funding to study biomass boilers	
		Apply for Forest Stewardship Program	$5,000
	Golovin	Power plant operator technical assistance and training	$10,000
		Diesel Engine Heat Recovery system repair	
		Wind Energy Feasibility Study for shared resource with White Mountain	$65,000
		Develop wind intertie feasibility study	
		Partner with UAF to study ocean currents for potential hydrokinetic energy project	
	Koyuk	Power plant operator technical assistance and training	$10,000
		Update outdated residential boilers and circulation pumps	
		Diesel Engine Heat Recovery system upgrade.	$435,000
		Complete woody biomass feasibility for community buildings	
		Apply for Forest Stewardship Program	$5,000
	White Mountain	Secure funding to study Diesel Engine Heat Recovery system to municipal water and sewer.	$120,000
		Apply for Forest Stewardship Program	$5,000
Near Term Actions 1-5 years	Elim	Install Wind Turbines	
		Install woody biomass boilers	
		Develop Geothermal resource if study proves good geothermal potential	
		Conduct Forest Stewardship plan	$50,000
		Implement Forest Stewardship program	
		Make local wood pellets and bricks for local and regional distribution if feasible	
	Golovin	Develop shared energy wind resource with White Mountain	
		Install wind turbines if feasible	
		Partner with UAF to study hydrokinetic energy	
		Seek funding to complete study for potential port at Cape Darby	
	Koyuk	Install Wind Turbines if studies prove good wind potential	
		Implement Woody biomass system for heating for community buildings	
		Conduct Forest Stewardship plan	
		Implement Forest Stewardship program	

	White Mountain	Develop wind turbine transmission line with Golovin	
		Complete MET farm	
		Continue to work with UAF on in-river hydroelectric project	
		Complete Forest Stewardship Plan	$50,000
		Implement Forest Stewardship program Install Diesel Engine Heat Recovery system.	$120,000

4.3 Southeast Sub-Region

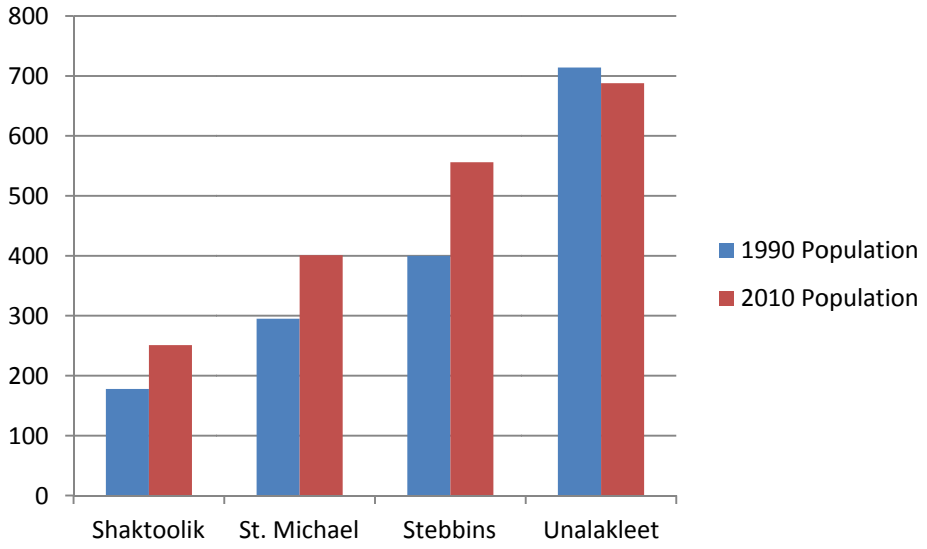
The Southeast Sub-Region includes the communities of Shaktoolik, Stebbins, Saint Michael and Unalakleet. These coastal communities are located along Norton Sound and range from 120 to 148 miles from Nome.

Figure 5: Southeast Sub-Region

4.3.1 Demographics

Total population for the Southeast sub-region was 1,896. Shaktoolik (population 251), Stebbins (population 556), Saint Michael (population 401) and Unalakleet (population 688) experienced an average annual growth rate over the past 20 years of less than 1% percent.

Exhibit 8: South East Sub-Region 20 year Population Change



4.3.2 Economy

The unemployment rate was 35 percent and about 37 percent of the residents were below the poverty rate. The economy of Saint Michael relies on subsistence harvests supplemented by part-time wage earning. Local governments provide some jobs. There are 7 residents who have commercial fishing permits. Shaktoolik residents also rely on subsistence harvests with 37 residents holding commercial fishing permits. Both commercial fishing for herring and herring roe and subsistence activities make up major parts of Unalakleet' s economy with 96 people holding commercial fishing permits. There is a fish processing plant in the community. Tourism is on the rise and there are several jobs in local government. The Bering Strait School District has its headquarters in Unalakleet.

4.3.3 Infrastructure

There are 519 occupied housing units in this sub-region according to the 2010 census information. Table 14 shows the mix of sewer and water systems present in this sub-region. Stebbins is expected to get a piped water and sewer system in conjunction with a new power plant in the near future. Unalakleet Valley Electric operates the electrical system in Unalakleet and the other communities are covered by AVEC service. There are clinics in each community. The schools are operated by the Bering Strait School District. There are city buildings, tribal buildings and post offices as well as stores and churches. The only ADEC permitted landfill is in Unalakleet. All communities have state-owned and operated airports.

Table 14: Southeast Sub-Region Sewer and Water Systems

Community	Water System	Water Pipe	Sewer System	Sewer Pipe
Saint Michael	Circulating	Above	Vacuum	Above
Shaktoolik	Circulating	Buried	Gravity	Buried
Stebbins	Wash	None	Honey Bucket	None
Unalakleet	Circulating	Buried	Gravity	Buried

4.3.4 Energy Issues

All the communities in the Southeast sub-region would benefit from and have identified a need for energy efficient homes, either new or upgraded.

Three of these five community schools have had energy audits by AHFC which should be used in upgrading the schools appropriately. Additional energy audits were completed for three buildings in Shaktoolik: water treatment plant, health clinic and tribal office. A comprehensive list of audits and action items identified in these audits could help shape future auditing and capital investment planning. This analysis should also include waste heat recovery systems and capital improvements.

Table 15: Southeast Sub-Region Quick Facts

Southeast Sub-Region Quick Facts Saint Michael, Shaktoolik, Stebbins, Unalakleet	
Population (U.S. Census, 2010)	1,896
Utility	AVEC Unalakleet Valley Electric Cooperative
Total Electricity Production, mWh (AEA, 2010)	8,412
Diesel Fuel Consumed to Produce Electricity, per year (AEA, 2010)	538,592
Annual Heating Oil Consumption, gallons (AEA, 2010)	628,754
Average Household Electricity PCE Rate per kWh up to 500,000 kWh, after that customers pay full rate (based on avg. residential customer) (AVEC, 2012)	$0.2130
Average Commercial Electricity Rate (AVEC, 2012)	$0.54
Annual Transportation Fuel Use, gallons (AEA, 2010)	216,171
2012 Average Diesel Fuel Price (Kawerak, 2012)	$6.15

4.3.5 Community Plans

Saint Michael's Hazard Plan is almost complete. The Shaktoolik Hazard Plan was complete in 2009 and Stebbins is in progress. The Unalakleet Hazard Plan was done in 2008.

Each community has a Local Economic Development Plan sponsored by the Bering Strait Development Council. Saint Michael has a recent plan (2011-2015) which highlights the need to provide energy efficient homes to residents. This Plan references a Strategic Energy Plan, December 2010. The consultant provided baseline energy audits of public buildings such as the Tribal Administration Building, the School, the washeteria and the City Hall. The Shaktoolik Local Economic Development Plan (2006-2011) places an evacuation route high on their local priority listing. The Stebbins Plan (2005-2010) discusses how new housing would benefit the community. The community of Unalakleet has erosion problems. Unalakleet would like waste heat connections in public buildings, as well as wind turbines for electric generation along with other alternative energy modes. They place weatherization of private homes high among their priorities.

4.3.6 Energy Improvement Opportunities/Alternatives

Table 16 shows the energy opportunities that exist in the Northern sub-region.

Table 16: Energy Improvement Opportunities/Alternatives

Energy Opportunity	Potential
Existing Generation	Medium potential; a new fuel tank was placed in Saint Michael in 2011 a power plant project was completed in Koyuk recently, including a new tank farm; wind generation could be expanded in Shaktoolik.
Interties	Medium potential; An intertie between Saint Michael and Stebbins in underway, additional interties may be prohibitive due to distances and multiple energy providers
Wind	High potential; Stebbins has Class 6 winds and an ongoing wind study set to be complete June 30, 2014; Saint Michael has an on-going wind power study; AEA and AVEC constructed a 2-turbine system in Shaktoolik; and AEA and Unalakleet Valley Electric Cooperative constructed a 6-turbine system with battery storage in 1998 (system under assessment for upgrade)
Energy Efficiency program	High potential; RurAL CAP completed home weatherization projects completed in St. Michael and Stebbins but Shaktoolik and Unalakleet are not done. Energy education projects needed.
Heat Recovery	High potential; the Community of Unalakleet particularly wants some waste heat connectivity; the AEA has a project in Stebbins on their Round 6 funding program for a heat recovery project which is ranked number 9
Hydroelectric	Low potential; relatively little topographic relief in this sub-region
Solar	Low potential; Annual Average solar insolation less than 3.5kWh/m²/day.
Biomass	Low potential; biomass opportunities are very limited to nonexistent
Hydrokinetic	Low to medium potential; tidal action in these communities is light but there is a potential resource near St. Michael.
Geothermal	Low potential; geothermal resources are not known in the area.
Gas	Low potential; gas opportunities are limited in the Norton Sound or are undiscovered.

Energy Opportunity	Potential
Coal	Low potential; coal resources are not known in this area.

4.3.7 Priority Energy Actions

Representatives from the sub-region provided the following information in the first stakeholder advisory meeting.

Table 17: Southeast Sub-Region Priority Energy Actions

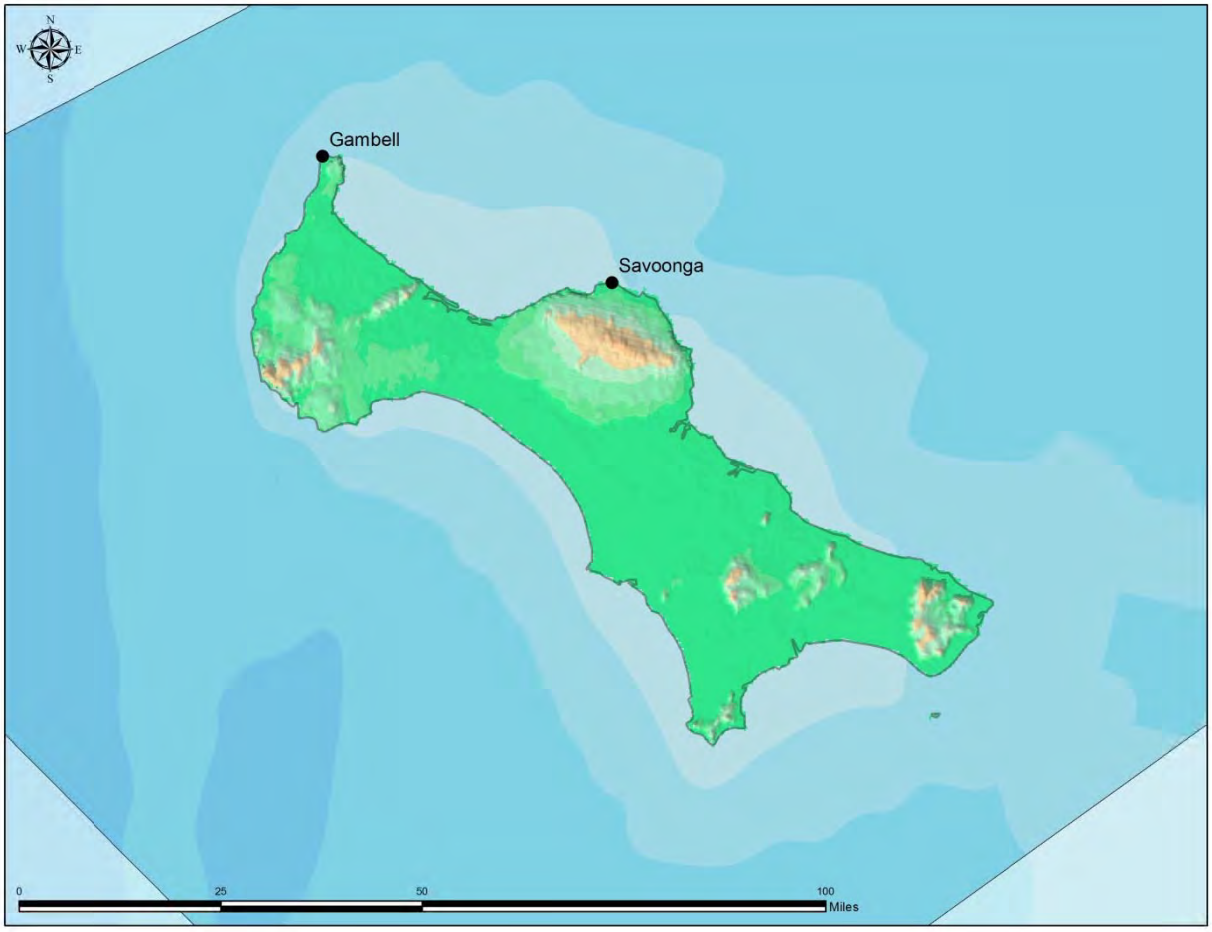
Immediate Actions 1 year		***Project***	***Estimated Costs***
	Shaktoolik	Complete surplus Wind Energy Recovery study for Water System Heat	$250,000
		Housing - Electrical inspection and upgrades, possibly new meters	
		Apply for Forest Stewardship and Harvest Plan	$5,000
	St. Michael	Complete Renewable Energy Reconnaissance	
		Analyze water and sewer system deficiencies	
		Complete wind farm final design/construction	
		Seek funding for site of wind turbine location	
		Incorporate additional wind turbines into Stebbins and St. Michael design with heat recovery	
		Partner with UAF to study ocean currents for potential hydrokinetic energy	
	Stebbins	Construct new Power Plant	$3.5 M
		Complete Diesel Engine Heat Recovery system	$1.3 M
		Complete wind farm final design/construction	
	Unalakleet	Technical Assistance for Power Plant personnel	$10,000
		Diesel Engine Heat Recovery system	$1.28 M
		Apply for Forest Stewardship and Harvest Plan	$50,000
		Insure maintenance and operation of wind turbines	
Near Term Actions 1-5 years	St. Michael	Install additional wind turbines	
		Technical Assistance for Power Plant personnel	$10,000
		Install waste oil burner at IRA building	
	Stebbins	Install back up power plant	
		Install heat recovery for wind turbines to reduce water and sewer costs	
	Unalakleet	Develop Biomass Resource based on Forest plans	

4.4 Saint Lawrence Island Sub-Region

The Saint Lawrence Island Sub-Region contains two communities - Gambell and Savoonga. Gambell is located on the northwest cape of Saint Lawrence Island, 200 miles southwest of Nome, in the Bering Sea and 36 miles from the Chukotka Peninsula, Siberia. Savoonga is located on the northern coast of Saint Lawrence Island in the Bering Sea, 164 miles west of Nome and 39 miles southeast of Gambell.

When the Alaska Native Claims Settlement Act (ANCSA) was passed in 1971, Gambell and Savoonga decided not to participate and instead opted for title to the 1.36 million acres of land in the former Island Reserve.

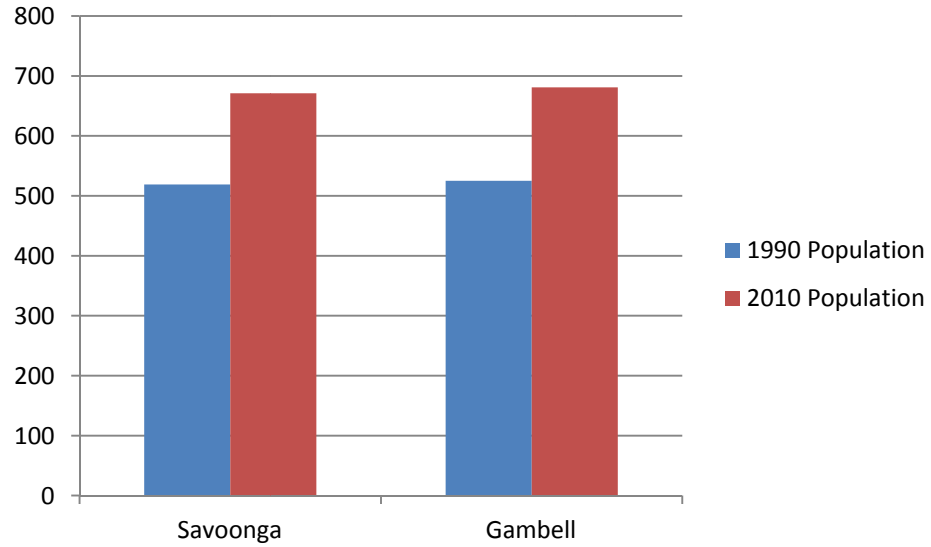
Figure 6: Saint Lawrence Island Sub-Region



4.4.1 Demographics

Gambell (population 681) and Savoonga (population 671) experienced an average of about 1.3% annual population growth in the past 20 years.

Exhibit 9: Saint Lawrence Island Sub-Region 20 year Population Change



4.4.2 Economy

The economy in Gambell and Savoonga is largely based upon subsistence harvests from the sea that include seal, walrus, fish, and bowhead and gray whales. Supplemented income by part-time wage earnings is available through the city, school, clinic, and store. The unemployment rate averages 40%; and 45% of residents live below the poverty level.

4.4.3 Infrastructure

Gambell has 164 occupied houses and Savoonga has 166. Many multigenerational extended families live in one home making overcrowding common. Each community has a school operated by the Bering Strait School District, a health clinic, a post office and city and tribal government buildings.

There is an above ground circulating water system and a gravity, buried sewer system in each community although some homes in the older parts of town are not connected to the piped system. Residents in these homes haul water from the washeteria and dump their honey-buckets at the landfill. There is a Class 3, non-permitted landfill in each community.

AVEC supplies electricity in both communities. In Gambell, there is a diesel powered generator that has a Kilowatt capacity of 1,526 kW and three 300kW wind turbines. In Gambell, the wind turbines produce an estimated 25% of the

energy. The average community load is 179 kW with an estimated peak load of 398 kW. Savoonga also has a diesel generator and has two 200kW wind turbines producing an estimated 25% of the energy. In Savoonga the average community load is 195 kW with an estimated peak load of 434 kW.

The larger fuel tanks in each community are owned by several entities including the Bering Strait School District, AVEC, the Native Store and the City.

ANTHC conducted energy audits in the tribally owned buildings, clinics, and water treatment plants in Gambell and Savoonga. They also installed energy monitors in homes in both communities.

4.4.4 Energy Issues

Like much of the Bering Strait region, this sub-region faces many energy challenges. The isolation of the island makes the cost of energy one of the highest in the region, the state and in the nation. In the last five years the percent of income dedicated to heating and electricity continued to consume a large part of the total family income. There is a need for energy improvements to help stabilize the cost of energy in the area. ANTHC has submitted an AEA round 6 Renewable Energy Fund application for a Savoonga Heat Recovery project. The project was listed within the first $25 million worth of projects.

Other issues cited by residents include the lack of energy efficient housing, home energy audits and energy efficiency education. They also have indicated they lack grant writers to assist in the submission and management of energy grants. AVEC has indicated a need for heat recovery systems, wind turbine improvements and the need for operator training.

Table 18 summarizes energy facts in the Saint Lawrence sub-region.

Table 18: Saint Lawrence Island Sub-Region Quick Facts

Saint Lawrence Island Sub-Region Quick Facts Gambell, Savoonga	
Population (U.S. Census, 2010)	1,352
Utility	AVEC
Total Electricity Production, MWh (AEA, 2010)	3,997
Diesel Fuel Consumed to Produce Electricity, per year (AEA, 2010)	267,471
Annual Heating Oil Consumption, gallons (AEA, 2010)	365,155
Average Household Electricity PCE Rate per kWh up to 500,000 kWh, after that customers pay full rate (based on avg. residential customer) (AVEC, 2012)	$0.21
Average Commercial Electricity Rate, per kWh (AVEC, 2012)	$0.54
Annual Transportation Fuel Use, gallons (AEA, 2010)	122,450
2012 Average Diesel Fuel Price (Kawerak, 2012)	$7.00

4.4.5 Community Plans

Both Gambell and Savoonga have completed Local Economic Development plans and Hazard Mitigation Plans. Both communities are included in the Alaska Department of Transportation's Northwest Alaska Transportation Plan. Gambell has Housing and Renewable Energy listed as their top priority in their Local Economic Development Plan (2012-2017).

4.4.6 Energy Improvement Opportunities/Alternatives

Table 19 shows the energy opportunities that exist in the Saint Lawrence Island Sub-Region

Table 19: Saint Lawrence Island Sub-Region Energy Opportunities

Energy Opportunity	Potential
Existing Generation	Medium potential; power plant projects were completed in Gambell in 2009 and in Savoonga in 2008.
Interties	Low potential; a low cost benefit ratio makes an intertie impractical.
Wind	High potential; Outstanding to superb energy resource, five wind turbines are in operation and continued improvements and operation could yield additional energy cost savings.
Energy Efficiency program	High potential; home weatherization projects and energy efficiency education is needed. Commercial building audits completed in Savoonga include the Savoonga Water Treatment plant, old and new clinic and tribal office. Audits in Gambell include the John Apangalook School, water treatment plan and Tribal office.
Heat Recovery	High potential; there are heat recovery systems in place but improvements are needed. Currently, both communities have projects to convert wind to heat.
Hydroelectric	Low potential; with little suitable terrain in the area, there are few hydropower opportunities.
Solar	Low potential; Annual Average solar insolation less than 4kWh/m²/day.
Biomass	Low potential; biomass resources are primarily limited to driftwood.
Hydrokinetic	Unknown potential; the area experiences some tidal action, but energy generation is unknown.
Geothermal	Low potential; geothermal resources are not known in the area.
Gas	Low potential; gas opportunities undiscovered.
Coal	Low potential; coal resources are located in this area but not in sufficient quantities to significantly replace other forms of energy.

4.4.7 Priority Energy Actions

Representatives from the sub-region provided the following information in the first stakeholder advisory meeting.

Table 20: Saint Lawrence Island Priority Energy Actions

Immediate Actions 1 yeas		***Project***	***Estimated Costs***
	Gambell	Technical Assistance for Power Plant personnel	$10,000
		Training for certified wind turbine technician	$10,000
		Heat Recovery – wind energy used for heating water	
		Complete design for additional wind turbines	
	Savoonga	Technical Assistance for Power Plant personnel	$10,000
		Heat Recovery – wind energy used for heating water	$420,000
		Coordinate with AVEC to design for additional wind turbines	
Near Term Actions 1-5 Years	Gambell	Wind energy for residential heat	
		Construct additional turbines	
	Savoonga	Wind energy for residential heat	
		Construct additional turbines	

4.5 Nome Sub-Region

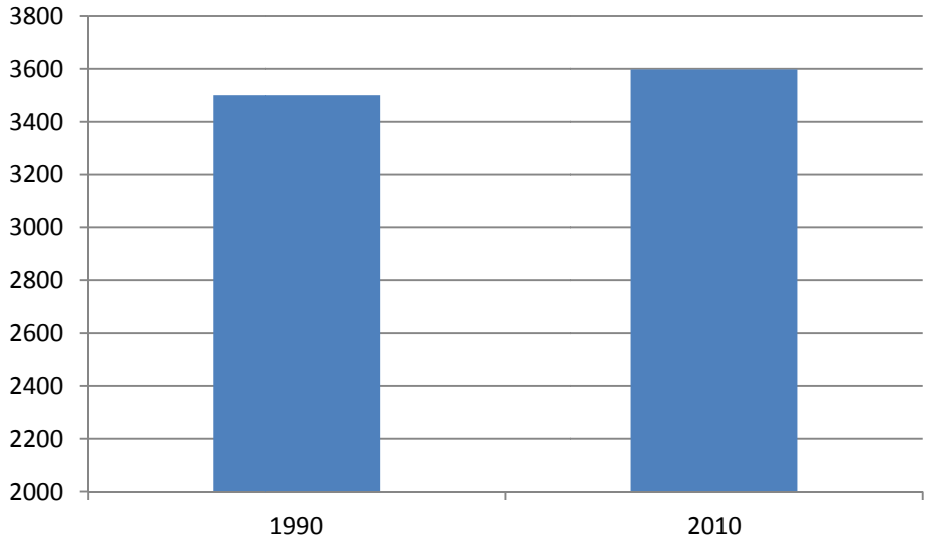
The Nome Sub Region consists of Council, King Island Native Community, Nome Eskimo Community, and Solomon. The Native Village of Mary's Igloo is also located within this sub-region. Mary's Igloo members reside primarily in Teller and their lands are located near Pilgrim Hot Springs. King Island tribal members live in Nome. Solomon and Council are primarily seasonal communities whose citizenry reside in Nome or elsewhere most of the year.

Figure 7: Nome Sub-Region

4.5.1 Demographics

Population data for Tribal members in Council, King Island, Solomon and Mary's Igloo are unavailable as members live in other communities. Nome (population 3,598) experienced an average population growth of about 1% over the past 20 years.

Exhibit 10: Nome 20 Year Population Change



4.5.2 Economy

Nome is the regional hub for the Bering Strait region and government services provide the majority of employment opportunities. 39 residents hold commercial fishing permits and tourism, gold mining, retail, transportation, medical and other businesses provide year round income. Residents in Nome participate in subsistence activities but rely less on subsistence activity than village residents. The unemployment rate averages 24% while 6% of the residents in the sub-region live below the poverty level.

4.5.3 Infrastructure

There are 1,216 occupied homes in Nome. Infrastructure in Nome, as the regional center for service, supply and transportation in the Bering Strait region, is more complex than the region's village infrastructure. There are many retail services as well as government structures and offices. Nome city streets are a mixture of paved and gravel roads laid out on a grid system with alleyways. Stops signs and other traffic control devices set this community apart. Restaurants, hotels and shops line the main Nome streets such as Front Street and there is a Web Cam supported by the Nome Convention and Visitors Bureau.

Nome remains dependent on diesel generation for most of its energy. Although some local residents and businesses have installed solar panels or solar tubes which help to offset some diesel fuel, residents still rely heavily on diesel for residential and commercial space and water heating. In 2010, the BSNC and Sitnasuak Native Corporation completed the Banner Wind Project which offset nearly 200,000 gallons of diesel fuel per year for the City of Nome. The Alaska Energy Authority and Nome Joint Utility Systems (NJUS) installed a two-mile intertie to connect the turbines with the existing electrical grid in Nome. They expect to improve the wind farm by constructing a $4.4 million expansion. The expansion will consist of 2 EWT 900 kW turbines that create 1.8 MW of energy. This increased total wind power for

Nome to approximately 2.97MW. NJUS has a power purchase agreement with Sitnasuak and BSNC, to purchase 1 million kWh a year.

Nome buys and stores most of the 2 million gallons of diesel they use annually in bulk fuel tanks. The fuel is purchased in bulk through the Alaska Fuel Group which includes other regional hubs such as Kotzebue, Dillingham, and others. The yearly price of the fuel purchase is based on a 3 day average in July. Nome replaced their diesel power plant generators in 2007. It is 3 kWh per gallon more efficient. NJUS recently switched to LED lights in the power plant and throughout the city, paying for the costs of the lights in energy saving in one year. NJUS helps other Bering Strait communities with parts and technical assistance. Recently they provided critical equipment to Teller.

Other facilities in Nome include water treated at the Snake River Power Plant. It is piped to residences but a water truck is also available for delivery. Sewage is piped away from homes and there is local refuse collection. The City also operates the library, a swimming pool, the Port, a museum and recreational and civic centers. The Norton Sound Health Corporation operates the Norton Sound Regional Hospital in Nome. It opened in January 2013 and is a state-of-the-art facility.

Nome is primarily accessed by jet air service and is a hub for smaller air taxi operators that serve the region. The transportation system in the Nome area is mostly owned and maintained by the State of Alaska. There is a small system of state owned and maintained gravel Highway roads connecting the communities of Teller and Council with Nome and a third road (Taylor Highway or Kougarok Road) that provides access to Pilgrim Hot Springs and the Kougarok River. These roads are only maintained seasonally.

4.5.4 Energy Issues

Fuel costs are high in part because of the limited window when fuel is available. In the fall of 2011, a fuel barge with more than 1 million gallons did not arrive as expected. Without the fall shipment, Nome would have run out of fuel in the spring. A 370-foot tanker brought fuel and averted the crisis. It began its journey from Russia in mid-December, picking up diesel fuel in South Korea before heading to Dutch Harbor, Alaska, where it took on unleaded gasoline. It arrived in January. Hauling equipment and supplies available to transport fuel are also limited.

Pilgrim Hot Spring, located about 60 road miles north of Nome has a geothermal source that is currently under investigation. The Alaska Center for Energy and Power (ACEP), in collaboration with the Geophysical Institute, is conducting tests which they hope will be able to assess the feasibility of developing this site to benefit the region and its residents. The project includes a comprehensive economic analysis of a variety of potential options for developing the springs. Options include a large scale power generation project to support the region as well as direct use, such as a greenhouse to supply fresh produce to the region. Partners in the project include Unaatuq LLC, the property owner, Mary's Igloo Native Corporation (MINC) and the Bering Straits Native Corporation (BSNC).

The new hospital in Nome is reported to be consuming 3,500 gallons of heating fuel per week in the winter.

Table 21: Nome Sub-Region Quick Facts

Nome Sub-Region Quick Facts	
Population (U.S. Census, 2010)	3,598
Total Electricity Production, mWh (AEA, 2010)	34,427
Diesel Fuel Consumed to Produce Electricity, per year (AEA, 2010)	2,109,802
Annual Heating Oil Consumption, gallons (AEA, 2010)	1,768,241
Average Household Electricity PCE Rate per kWh up to 500,000 kWh, after that customers pay full rate (based on avg. residential customer) (AVEC, 2012)	$0.1919
Average Commercial Electricity Rate (NJUS, 2013)	$0.36
Annual Transportation Fuel Use, gallons (AEA, 2010)	607,938
Transportation Fuel Cost Medium Projection for 2014, per gallon (ISER, 2012):	$3.44

4.5.5 Community Plans

There are a number of plans for Nome and the Nome Area. The Nome Comprehensive Plan was produced in two phases: Phase 1 was background and came out in 2003; Phase II was land use and was issued in 2005. An update was begun in 2010.

The Nome Region Energy Assessment was completed in March 2008. Participating agencies included AEA, the City of Nome, and the National Energy Technology Laboratory. Several alternatives to diesel generators analyzed in the assessment included; importing coal by barge to Nome from Usibelli Mine near Healy, Alaska or from British Columbia; wind turbines; building a power transmission line to Pilgrim Hot Springs and capturing the geothermal power; and developing the natural gas in Norton sound. Also considered were hydrokinetic energy, hydroelectric dams, and coalbed natural gas but these options were deemed unfeasible at this time. Developing wind energy was considered the best option.

4.5.6 Energy Improvement Opportunities/Alternatives

Table 22 shows the energy opportunities that exist in the Nome Sub-Region

Table 22: Energy Improvement Opportunities/Alternatives

Energy Opportunity	Potential
Existing Generation	Medium potential, on-going improvements are needed. Fuel purchasing savings could reduce energy costs.
Interties	Low to medium potential; depending on feasibility of Pilgrim Hot Spring geothermal potential
Wind	High potential; Turbine improvements will continue to allow for increases in wind energy production in Nome.
Energy Efficiency program	High potential; home weatherization and energy education projects are underway. Commercial building audits are needed.
Heat Recovery	High potential; heat recovery systems are needed.
Hydroelectric	Low potential; the terrain is not suited to hydroelectric power generation.
Solar	Low potential; Annual Average solar insolation less than 3.5kWh/m²/day. Good for households but not district wide source at this time.
Biomass	Fair potential; There are some sources of woody biomass but not in significant quantities nearby.
Hydrokinetic	Low potential; hydrokinetic power generation opportunities are low due to limited wave action.
Geothermal	High potential; Pilgrim Hot Springs could prove to be sufficient for energy production.
Gas	Low potential; gas opportunities have been studied in Norton Sound but found too sparse for economic development.
Coal	Low potential; coal is not locally known

4.5.1 Priority Energy Actions

Representatives from the sub-region provided the following information in the first stakeholder advisory meeting.

Table 23: Nome Sub-Region Priority Energy Actions

	Project	***Estimated Costs***
Immediate Actions 1 year	Nome Power Plant Upgrades	
	Complete Pilgrim Hot Springs Geothermal Assessment	
	Secure matching funds for next phase of Pilgrim HS geothermal study	$,1,000,000
	Install two wind turbines on Banner Peak	
	Conduct pilot project to study on wood pellets for residential heating	
Near Term Actions 1-5 years	Nome Power Plant Upgrade to accommodate increased wind capacity	$10,000,000
	Pilgrim Hot Springs Geothermal Design	$8,000,000
	Conduct study for capturing wind energy to heat project	
	Move forward with Pilgrim Hot Spring recommendations with land owner support	

5 Implementation Plan

5.1 Prioritized Regional Project list

Regional priority energy actions were identified from the AEA Community Deployment scenarios, stakeholder interviews and input from the public meetings. The priorities were categorized into immediate, (1 year) and near term (1-5 years). Potential sources, opportunities, and constraints for energy project funding opportunities are presented in Appendix D.

Table 24: Regional Priority Energy Actions

Immediate Actions	***Action Type***	***Project***	***Estimated Costs***	***Potential Partners***
1- year	*Data collection*	Collect community wide energy end use data for electricity and space heating		ANTHC, AEA
		Identify water and sewer infrastructure improvements based on known end use data		ANTHC
		Conduct LED street lighting inventory		Utilities
		Complete Energy Audits – home, public and commercial buildings		AEA
	Training and Education	Develop Energy Conservation and End-Use Energy Efficiency Program		Kawerak, AEA, DOE
		Provide energy training to prepare workforce for near term jobs in the energy sector - such as residential; boiler and heating appliance maintenance and repair, certified operator training to maintain and operate wind turbines, etc.		Steering C., ACEP
		Provide energy specific information to grant writers		Kawerak
		Prepare for Village Energy Planning workshops		Kawerak
		Collaborate with higher education institutions to develop school curriculum that focuses on energy		UAF, BSSD, NSD
	Program Development	Promote the full utilization of the heating assistance program		DHHS
		Continue to utilize PCE program		AEA
		Fully utilize bulk fuel purchase program (awaiting input)		NSEDC
		Develop appliance replacement program		EA, DOE, Kawerak
		Secure funding for energy efficient prototype home project		HUD, CCHRC

		Identify resources for potential alternative energy surveys or feasibility studies		AEA
	Collaboration	Collaborate with regulatory agencies to overcome energy project development hurdles		Steering C.,
		Identify effective ways to participate in discussions regarding long term projects that could benefit energy users such as regional deep water port, a natural gas fired power plant in Prudhoe Bay with statewide transmission, etc.		Steering C.,
		Maintain an on-going dialogue with higher education institutions regarding potential pilot energy projects		UAF
Near Term Actions 1-5 years	*Data Collection*	Conduct Alternative Energy Feasibility Studies		AEA
		Conduct region wide high penetration wind study to maximize wind resource		AEA
	Training and Education	Conduct Energy Conservation and End-Use Energy Efficiency Education training		DOE, Kawerak
		Conduct Village Energy Planning workshops		Kawerak
		Implement school curriculum that focuses on energy		BSSD, NSD
	Program Development	Implement cost effective energy efficiency improvements based on energy end use data collected		AEA
		Adopt emerging , proven, next generation energy pilot projects		UAF
		Implement energy audit recommendations		AEA
		Install LED street lighting		Utilities
		Build energy efficient prototype home project		HUD, CCHRC
		Implement sewer and water system energy audit implementation and known end use data		ANTHC
		Implement Energy Conservation and End-Use Energy Efficiency Program		DOE, Kawerak
		Implement recommendations from home and commercial Energy Audits		AEA
		Implement the appliance replacement program		
		Move forward with potential pilot energy projects		Steering C., UAF
		Hire workers trained in energy field to take energy sector jobs		Utilities
	Collaboration	Participate in discussions regarding long term projects that could benefit energy users such as regional deep water port, a natural gas		Steering C.,

Immediate Actions	*Action Type*	*Project*	*Estimated Costs*	*Potential Partners*
1- year	*Data collection*	Collect community wide energy end use data for electricity and space heating		ANTHC, AEA
		Identify water and sewer infrastructure improvements based on known end use data		ANTHC
		Conduct LED street lighting inventory		Utilities
		Complete Energy Audits – home, public and commercial buildings		AEA
	Training and Education	Develop Energy Conservation and End-Use Energy Efficiency Program		Kawerak, AEA, DOE
		Provide energy training to prepare workforce for near term jobs in the energy sector - such as residential; boiler and heating appliance maintenance and repair, certified operator training to maintain and operate wind turbines, etc.		Steering C., ACEP
		Provide energy specific information to grant writers		Kawerak
		Prepare for Village Energy Planning workshops		Kawerak
		Collaborate with higher education institutions to develop school curriculum that focuses on energy		UAF, BSSD, NSD
	Program Development	Promote the full utilization of the heating assistance program		DHHS
		Continue to utilize PCE program		AEA
		Fully utilize bulk fuel purchase program (awaiting input)		NSEDC
		Develop appliance replacement program		EA, DOE, Kawerak
		Secure funding for energy efficient prototype home project		HUD, CCHRC
		Identify resources for potential alternative energy surveys or feasibility studies		AEA
	Collaboration	Collaborate with regulatory agencies to overcome energy project development hurdles		Steering C.,
		Identify effective ways to participate in discussions regarding long term projects that could benefit energy users such as regional deep water port, a natural gas fired power plant in Prudhoe Bay with statewide transmission, etc.		Steering C.,
		Maintain an on-going dialogue with higher education institutions regarding potential pilot energy projects		UAF
		fired power plant in Prudhoe Bay with statewide transmission, etc.		

5.2 Timeline for Implementation

Appendices

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Appendix B: Public Involvement

Bering Strait Region Strategic Energy Plan

Stakeholder Advisory Group Meeting#1 Summary

Location: Nome **Date:** February 26, 2013, 1-7 pm

Re: Meeting#1 Summary **Reporter:** Nicole McCullough

Purpose: The meeting provided a forum to discuss the Bering Strait Region Strategic Energy Plan. The goal of the workshop was to develop a collaborative effort to solve energy issues and reduce energy costs.

Attendees: Bryant Hammond, Walter Rose Kawerak, conducted the meeting along with Jay Hermanson and Nicole McCullough, WHPacific. In addition, there were Tribal or City representatives from each community in the region except Council and Diomede. There were also representatives from the Alaska Energy Authority (AEA), Arctic News, ANTHC, AVEC, Bering Straits Native Corporation, Nome Gold, Nome's Fishermen's Association, Nome and Bering Strait Public School District, City of Nome Chamber of Commerce, Nome Joint Utilities, Norton Sound Economic Development Corporation, Norton Sound Housing Corporation, Sitnasuak Corporation, and Unalakleet Valley Electrical Co-op. A copy of the sign-in sheets is attached.

Meeting Introduction and Background: Melanie Bahnke, President Kawerak opened the meeting with an introduction and thanked everyone for their participation. She talked about the importance of energy and the challenges the communities face. She encouraged everyone to participate and share their ideas and to take what they learned back to their community.

Bryant Hammond, Kawerak provided logistical information and discussed ground rules. NSEDC paid for participants to be flown in from villages. They were introduced along with agency personnel. Walter Rose reviewed the agenda which included an Introduction, Background, Stakeholder Analysis, Sub-Regional Analysis, Timeline of Projects, Community Deployment Scenarios and Case Studies.

Nicole McCullough, WHPacific (consultant assisting Kawerak with producing the energy plan) provided a brief summary of the planning process currently underway and explained that phase I included developing a draft plan and phase II will be to present the draft plan to the communities. Jed Drolet from AEA presented a summary of the energy plans completed, underway or about to start statewide. He explained that AEA is working closely with the energy planning partners and have provided a template. Nicole outlined planning and research efforts completed in the region.

Data Gaps. Jay Hermanson, WHPacific led a discussion about the energy data gaps within the region.

- The Bering Strait School District has a lot of data but no one is really asking for it.
- Others said that they did not know what data was available.
- ANTHC needs accurate fuel data by building.
- Data regarding the effectiveness of the cold climate homes installed in places like Wainwright is lacking.
- Standardized data is needed.

- Residents lack data about solar, biomass, wave energy, etc.
- Data needs to be made more accessible and visible.
- King Island Tribal residents live in Nome but their data should be collected specifically.
- Savoonga and Gamble do not have data on the impact of fuel reduction due to the wind turbines.
- There is a lack of energy audit data.
- Accurate space heating data is unavailable.
- How much is wood burning impacting fuel usage?
- Wales does not know what is going on with potential wind turbines at Tin City.
- Question – What is the status of the Brevig Mission-Teller intertie? Answer – AVEC applied to FEMA for funding to repair the cable that was destroyed during a storm.

What stakeholders want in the Plan. Communities and other stakeholders talked about issues and what they wanted to see in the plan.

Improve Energy Efficiency

- There needs to be energy inventories of all the homes.
- There could be a team that does all the energy audits in one community and then have them move to the next.
- Nome School district changed out their lights to LED lights and saw a 30-50% reduction in their energy costs.
- There are different requirements for different agencies funding energy efficiency projects which make the team energy audit concept problematic in terms of funding and coordinating the effort.
- An appliance replacement program is desired.

Increase Energy Education

- More energy efficiency projects and energy education is needed.
- The plan should contain a strategy for getting energy education to individuals to reduce costs.
- It is important to help Elders with their energy costs.

Expand Energy Coordination

- The plan needs to present good policy, technology and there needs to be collaboration.
- Better communication with the Housing Authority is needed.
- The Local Economic Development Plans should be coordinated with the energy plan.
- There is a need for collaboration on energy within the region.

- AEA wants to let the region lead the planning effort.
- City of White Mountain should attend meetings since they run the utility.
- It is important to build on local knowledge.
- It is important when visitors come to the villages, that they talk to city, tribe and corporation.

Planning

- All energy options should be in the plan from long-range projects like hot spring development and gas or propane coming from the North Slope to shorter term options like wood pellet stoves.
- The plan should be realistic with near-term and longer projects. Start with the end goal in mind and take steps to get there.

Alternative Energy

- The plan should consider emerging technology, geothermal and wind resources.
- Alternative energy projects need to be realistic and sustainable.
- That plan should embrace appropriate technology.
- There needs to be a way to store waste heat and excess energy.
- A harvest plan is needed so that there is a sustainable source of biomass. There is a funding program to create a Forest Stewardship Plan. If interested contact Walter.
- The plan should recognize that we need more money for research.

Fuel Reduction

- "Now is the time to reduce dependency on diesel and we want to extend a hand to others that want to do the same."
- The plan needs a strategy that will result in a decrease to the amount of diesel needed in our communities.

Other Planning Concerns

- The waste produced by energy projects, PCBs, oil, etc. needs to be addressed.
- Need to have continuity of operations, decrease turnover in energy operators.
- The Norton Sound Economic Development Corporation has a bulk fuel and community energy program that still has funding available for communities but communities nee to apply.
- Home owners need energy education.

Energy Deficiencies

- There is a need to upgrade home electrical systems.
- There is a need to increase stability in power distribution systems (Wales).

- NJUS buys fuel in the summer when it is the most expensive and to reduce costs are thinking of hedging. This could be discussed in plan.
- AVEC will meet with Kotzebue Electric Company soon regarding the Wales Wind Turbines.
- Need safety net for elders.

Walter Rose provided information about the projects that have occurred in the region in the last few years and Carl Remley gave an overview of projects that ANTHC has completed or has on going (presentations attached).

Jay provided background and reviewed the Community Deployment scenario for Brevig Mission. He explained that this is a draft and input is welcome. Nicole then instructed the group to form into sub-regional groups and discuss the energy vision of the 1 year, 5 years and 10+ years and what obstacles there might be in achieving the community energy vision. There were then reports from each group:

Southeast Sub Region

1 year vision – household efficiency upgrades

- Heat recovery from wind turbines
- Water and Sewer energy audits
- BSSD sites and public building energy audits

5 Year Vision

- All homes weatherized
- Wales wind turbines up and running
- Preventative maintenance in public buildings
- Trained workers

10 Year Vision

- All homes energy appliance
- Water and Sewer plant upgrades
- All communities with back-up power
- Lower cost of energy to benefit economic development, such as light industry, cold storage for fish products

What could prevent us from achieving our vision? – Funding, lack of trained work force, lack of grant writer.

South Central Sub-Region – Elim, Golovin, Elim, Koyuk and White Mountain

1 year vision

- Home to home education on how to bring down electrical use and therefore costs, completely turning off TV, computer, coffee maker, etc.

- Training for young people, need to get someone to keep eye on and take care of buildings, expensive to get someone from outside
- Get together from region, sharing grant writers to get funds for area

5 year vision

- Wind Farm
- Obtain information
- WM and Golovin getting our own MET farm
- Place to put in wind turbine
- Manufacture wood pellets, 3 of our 4 villages have lots of wood, do locally instead of purchasing oil to bring down cost of home heating, local employment, work with barges for freight

10 year vision

- Tank Farm, Golovin has good port at Cape Darby good place for tank farm

What could prevent us from achieving our vision?

Funding, grant writers hard to find, villages need to share information like potential funds, city needs to tell IRA, etc. shared by villages.

Northern Sub-Region – Diomede, Shishmaref, Teller, Brevig Mission

1 year vision

- Teller wind generation, clinic heating system repaired, power plant intertie fix, The Energy Detective (TED) installed in homes, LED street lights
- Stebbins – TED gadgets, wind turbine project, AVEC building built, LED lights

5 year vision

- Weatherization more energy efficient housing, new bulk fuel snow fence on ice to address drifting
- Brevig Mission - Use waste heat, WS started, wind turbine, more efficient houses
- Supply water from Teller to Brevig Mission

10 year vision

- Houses that are efficient built in region
- Energy efficient housing, Teller-owned power
- Stebbins – upgrade power system for both Stebbins and Saint Michael and both Sewer and water systems complete

What could prevent us from achieving our vision?

FAA, local Corporations preventing projects, turnover in staff, population sizes preventing successful applications, lack of good grant writer

Nome and Saint Lawrence Island - Nome, Council, Solomon, King Island, Savoonga, Gambell

1 year vision

- Cheap, affordable, energy
- Education on use of energy
- Collect data
- Provide Elder resources
- Find alternative energy resource
- Partner with University for Research and Development

5 year vision

- Collect data
- Work with Regional partners
- Local resource

10 year vision

- Reduce energy consumption
- Continue partnership with region
- Collect data

What could prevent us from achieving our vision?

Funding, lack of unity between entities, people quitting their jobs, not enough funds, dependency on oil from other countries, high cost of developing resources, lots of communities don't want outsiders coming into community

Next, Jay presented information about two case studies – Chaniak Wind Farm and NANA Regional Energy Plan.

Bryant then asked each of the participants what was one thing learned today and what is one thing that they would do in the next two weeks to help advance what was discussed today. A summary of what they said follows:

Communication - Many participants responded that they learned about what others were doing. A lot of communities are trying to save energy. We need to help each other out. Communication with all three entities is important. Several participants said they learned about issues in region. There is a need to ask for help from others. If AEA and ANTHC come to the community they should ask for a meeting with all three entities. AEA and ANTHC can offer technical assistance. Almost everyone said they would be taking this information back to their community and sharing it with the Council and others. Energy is

a local but also a regional, state and national issue. The binders have good information and can be shared with community members. The binders contain information about other communities which is useful for communication. April 29-May 1 there is a Rural Energy conference in Anchorage.

Technology - The Energy Detective (TED) is an important tool to get residents informed and push the message. We would like to collect waste heat from the wind turbines. Some said they learned about Elim's wood pellet projects. The Bering Strait School district will look into LED lights in the next two weeks.

Energy Efficiency - We learned about the importance of weatherization in our rural communities. Some learned about the need for energy education and want to go back to their community and let each household know ways they can save energy. Educating the kids is also important. One person said they learned about installing snow fences to reduce snow berms so that when wind blows you don't have plow road and therefore save money.

Funding – Everyone needs more funding for energy projects. We can take steps to save energy. We will work with Unalakleet for round 7 Renewable Energy funding, Learned about renewable energy projects. NSEDC still has a lot of funding for energy projects. More information about NSEDC's community energy grants is on the web. People are spending a lot on energy. Walter is a good resource and knows about Forest Stewardship Grants that include $50,000 per community. Someone said they would be calling him to discuss.

Work force - We need more training for local energy workforce. There is too much turnover in the work force. Many people said they needed grant writer assistance and someone suggested that a grant writer could be shared by several entities in the region.

Data – Learned there is a lack of data or that some people have data but it is not shared.

Bering Straits Region Strategic Energy Plan
Stakeholder Advisory Group Meeting #1

***Sign In Sheet** February 26, 2013*

Name	Organization	Address/City/Zip	Phone	e-mail
Aaron W Nassuk	NVK	PO Box 124 Kwk 99753	963-2368	igapkka@gmail.com
Richard Schulling	Village of Solomon	P.O. Box 2057 Nome	443-4985	rschulling22@gmail.com
Johnson Eningowuk	Native Village Shishmaref	Box 72009 99772	9076494711	
Nicole McCullough	WHPacific, 301 31st Ave Anch		9073396546	nmccullough@whpacific.com
Andrew Miller	SNC	Box 598	907 443 2332	
Sterling Gallagher	NSEDC	Box 358	443-2477	Sterling@nsedc.com
Barbara Nichols	Chamber	Box 250	434-1833	Director@nomechamber.com
John Handeland	City-NJVS	Box 70	443-6587	johnh@njvs.org
Mitch Eaton	Nome Go2	PO 1718	387-0300	arcticwestern@gmail.com
Theresa Ujack	City of Stebbins	Box 21	934-3561	canisupuszoida@yahoo.com
TIM SMITH	NOME FISHERMENS ASSOC.	Box 396	443-5352	timsmith117@gmail.com

***Sign In Sheet** February 26, 2013*

Name	Organization	Address/City/Zip	Phone	e-mail
Reese Hubita	Unalakleet Valley Elec. Coop	PO Box 1866 Unalakleet AK 99684	907-624-3474 625-1182	uvec@gci.net
Warren Daniels	Native village of Elim	P.O. Box 43 Elim, AK	(907) 8801102	mr_wdaniels150@yahoo.com
Robert Bensin	BSNC	P.O Box 1008	907.443-8111	rbensin@beringstraits.com
Diana Ellanna	BSNC	po Box 1991	907 434 2004	diana_leigh_e@hotmail
Donald Oliver	City of Gambell GPV	Box 27 Gambell, AK	907 737-1059	
Robert Jeffers	Bering Straits Traditional Council	PO 77	642-2311	
Jed Drolet	AEA	813 W. Northern Lights, Anchorage	771-3985	jdrolet@aidea.org
Carl Remley	ANTHC	3900 Am Boassador Dr Suite 301 Anch AK 99508		CREMLEY@ANTHC.ORG
SANDRA MEDEARIS	ARCTIC NEWS	Box 545 Nome	9073041194	nomegolddigger@yahoo.com
Cyril Lyon	NSHC	Box 966 Nome	443-4511	clyon@NSHCoeporg
John Lockwood	IRA	Box 111 St. Michael		

Cost Issues

- Energy costs continue to rise and consume high percentage of household income.
- Funding for Energy Subsidies (Heating assistance, PCE, Bypass mail) will likely be cut. They mask how serious the problem is.
- Homes are often drafty, leading to increased heating costs.

Bering Strait Region

Strategic Energy Plan

Stakeholder Advisory Group Meeting #1

February 26, 2013

Presented By:

Bryant Hammond, Kawerak
Walter Rose, Kawerak
Jay Hermanson, WHPacific
Nicole McCullough, WHPacific

Funded by:

Alaska Energy Authority
Norton Sound Economic Development Corporation

Cost Issues

- Funding for some energy related projects are prioritized country-wide, and many of our systems are low on the priority list.
- Qualified energy raters are few and expensive.
- Winter Construction costs can be twice (or more) as expensive.
- Hard to develop economies of scale due to infrastructure variability and distance between communities.

Cost Issues

- High energy costs and economic conditions threaten sustainability of Villages.
- Aged infrastructure, deferred maintenance, system expansion without concern for energy use, antiquated technologies, and other conditions contribute to high energy use and delivery costs.
- Energy needs vary notably between communities and system types so must be understood and solutions tailored.

Transportation Issues

- Bulk fuel and heavy equipment transportation into and out of the region is limited to, at most five summer months.
- Transportation time from Anchorage to Nome takes weeks.
- Barge transport, especially for heavier items, is expensive.
- If a village tanks run low before spring fuel must be flown in by air tanker at great expense.

Operational Issues

- Lack of trained operators at the village level.
- Spare parts for energy projects like wind turbines can be difficult to obtain in rural Alaska.
- Funding for properly maintaining systems is inadequate.
- There is a lack of current "best practices" for efficiently operating energy systems in rural Alaska.

Technology Issues

- Due to low bandwidth it is difficult to remotely operate systems.
- Emerging Technology is often sized for large communities and do not translate well to smaller systems.

Regional and Statewide Issues

- The PCE formula does not compliment the Renewable Energy Fund.
- Hard for many Rural Alaskans to pay for Energy Efficiency improvements up front.
- Individuals are not taught ways to conserve energy.
- Waste heat is not being captured to its fullest extent.
- The state funded portion of heating assistance is diminishing.

Regional and Statewide Issues

- Local governments and local project coordinators change and do not always see energy projects through.
- FAA and ADF&G regulations can prevent projects, such as wind turbines, from getting installed.
- Projects can encounter time consuming land access problems, such as Native Allotments.
- Wood pellet stoves are expensive.

Appendix C: Aggregate Community Data

Population			
Community	Population, 2010	Poulation, 2000	Population, 1990
Brevig Mission	388	276	198
Diomede	115	146	178
Elim	330	323	264
Gambell	681	649	525
Golovin	156	144	127
Koyuk	332	297	231
Nome	3,598	3,503	3,500
Saint Michael	401	368	295
Savoonga	671	643	519
Shaktoolik	251	230	178
Shishmaref	563	562	456
Stebbins	556	547	400
Teller	229	268	151
Unalakleet	688	747	714
Wales	145	152	161
White Mountain	190	203	180
Source/link	U.S. Census 2010		

Climate								
Community	Summer low, °F	Summer high, °F	Winter low,°F	Winter high, °F	Rainfall, inches	Snowfall, inches	Heating Degree Days, annual	Cooling Degree Days, annual
Brevig Mission	44	57	-9	8	11.5	50		
Diomede	40	50	-10	6	10	30		
Elim	40	62	-8	8	19	80		
Gambell	34	48	-2	10	15	80		
Golovin	40	60	-1	19	19	40		
Koyuk	46	61	-8	8	19	40		
Nome	44	65	-3	11	18	56	13801	2
Saint Michael	40	60	-4	16	12	38		
Savoonga	40	51	-7	11	10	58		
Shaktoolik	47	62	-4	11	14	43		
Shishmaref	47	54	-12	2	8	33		
Stebbins	40	60	-4	16	12	38		
Teller	44	57	-9	8	11.5	50		
Unalakleet	47	62	-4	11	14	41		
Wales	40	50	-10	6	10	35		
White Mountain	43	80	-7	15	15	60		
Notes/Explanation	Retrieved 2/15/2013 to 3/6/13 from Alaska Depatment of Commerce, Community and Economic Development website						Data from Alaska Climate Research Center	

Economy and Housing							
Community	Employment, % of workforce	Employed Workers	2010 Per Capita Income, $	2010 Median Household Income	2010 Total Housing Units	2010 Occupied Housing	Community Buildings
Brevig Mission	70.37	95	8873	30625	103	93	21
Diomede	100	39	13285	42500	47	38	15
Elim	69.92	86	11080	34583	105	89	21
Gambell	60.64	216	10047	26000	200	164	13
Golovin	71.43	35	12988	31786	64	49	13
Koyuk	67.92	72	9169	23929	99	89	14
Nome	91.94	1893	33502	69522	1503	1216	-
Saint Michael	71.15	111	13348	34821	117	96	14
Savoonga	70.25	163	8245	36250	185	166	18
Shaktoolik	78.38	111	12803	26667	70	64	16
Shishmaref	77.33	225	10439	34286	151	141	21
Stebbins	77.6	142	8938	33462	153	134	16
Teller	82.35	98	11256	36250	86	72	19
Unalakleet	86.71	261	19919	47500	268	225	24
Wales	71.43	35	11835	43125	51	43	12
White Mountain	75.76	50	20756	37813	79	65	13
Notes/Explanation	2013 US Census via DCCED Retrieved 2/15/2013 to 3/6/13 from Alaska Depatment of Commerce, Community and Economic Development website						2012 AEA End Use Study, produced by WHPacific

Water and Sewer System Types				
Community	Water Source	Water System Type	Sewage Collection System	Sewer Pipe Type
Brevig Mission	Well / Groundwater	Circulating	Gravity	Buried
Diomede	N/A	Haul from washeteria	Honey Bucket	Above ground
Elim	Surface water	Circulating	Gravity	Buried
Gambell	Ground water- surface water influence	Circulating	Gravity	Buried
Golovin	Surface water	Circulating	Gravity	Buried
Koyuk	Ground water- surface water influence	Circulating	Gravity	Buried
Nome	Ground water	Circulating	Gravity	Buried
Saint Michael	Surface water	Circulating	Vacuum	Above ground
Savoonga	Ground water	Circulating	Vacuum	Above ground
Shaktoolik	Surface water	Circulating	Gravity	Buried
Shishmaref	Surface water	Haul from source	Honey Bucket	Above ground
Stebbins	Surface water	Haul from washeteria	Honey Bucket	Above ground
Teller	Surface water	Haul from washeteria	Honey Bucket	Above ground
Unalakleet	Ground water- surface water influence	Circulating	Gravity	Buried
Wales	Ground water	Haul from washeteria	Honey Bucket	Above ground
White Mountain	Ground water	Circulating	Gravity	Buried
Notes	Retrieved 2/15/2013 to 3/6/13 from Alaska Depatment of Commerce, Community and Economic Development website	Communication from E. Lohr of ANTHC, 01/24/13		

Community Water and Sewer			
Community	Average Annual Water and Sewer System Electricity Use, kWh	Cost of Electricity Used by Water and Sewer Systems, $	Reported Annual Fuel Use for Sewer and Water Systems, gallons
Brevig Mission	110,897	57,999	4518
Diomede	-	-	-
Elim	52,960	28,757	4568
Gambell	169,392	86,051	5858
Golovin	35,621	20,304	16314
Koyuk	79,081	42,466	16000
Nome	-	-	-
Saint Michael	225,881	108,875	11000
Savoonga	163,987	70,842	7637
Shaktoolik	40,092	21,730	4494
Shishmaref	27,990	15,758	568
Stebbins	46,764	25,206	2438
Teller	-	-	-
Unalakleet	-	-	-
Wales	10,785	6,341	7265
White Mountain	44,553	32,078	4180
Notes	From "ENERGY USE AND COSTS FOR OPERATING SANITATION FACILITIES IN RURAL ALASKA A survey" Produced by Division of Environmental Health and Engineering- Alaska Native Tribal Health Consortium Written By: Daniel Reitz, P.E.,Art Ronimus, P.E., Carl Remley, CEA,CEM Emily Black		

Water and Sewer Service Costs					
Community	Monthly water and sewer bill	Washing clothes	Showers	Drinking water	Honey bucket haul fees
Brevig Mission	$100 per month	$2.50 per load	$2.50 per shower	self haul - free	$20 per mon.
Diomede	unavailable	$5-7 per load	$3 per shower	$1 per 10 gal.	self haul - free
Elim	$70 per month	unavailable	unavailable	self haul – free from IRA	self haul - free
Gambell	$97 per month	$2-4.50 per load	$1 per 10 min.	self haul - free	self haul - free
Golovin	$161 per month	$12 per load	$4 per shower	$.15 per gal. delivered via truck	self haul - free
Koyuk	$71 per month	$4 per load	$1.50 per 15 min.	self haul - free	self haul - free
Nome	$79 per month ($49 per month for seniors)	$6.50 – 8.50 per load - Mark's Soap & Suds	$5 per shower at rec. center	self haul – free at rec. center, $.02 - .05 per gal. delivered –price varies per volume	$10 per bucket, $150 port-a-pot service, $90 port-a-pot if on regular schedule, $250 septic removal up to 950 gal.
Saint Michael	$160 per month	$5 per load	$2 per shower	$.05 per gal.	$20 per mon.
Savoonga	$150 per month	unavailable	unavailable	self haul from a local spring	self haul - free
Shaktoolik	$60 per month	$5-7 per load	$2 per shower	self haul –free from river or neighbors	self haul - free
Shishmaref	unavailable	$7-$10 per load	$3.50 per shower	$1 per 15 gal.	$40 per mon.
Stebbins	unavailable	$2-4 per load	$2 per shower	$.05 per gal.	$8 per mon.
Teller	unavailable	$4-8	$. 25 per 2 min.	self haul - free	$35 per mon.
Unalakleet	$70 per month	unavailable	unavailable	self haul –from neighbors	septic systems
Wales	unavailable	$3 per load	$3 per 15 min.	$. 25 per gal.	$20 per mon.
White Mountain	$105 per month	unavailable	unavailable	self haul from the river	unavailable

Energy Pricing							
Community	Cost of Residential Electricity, per kWh	Cost of Residential Electricity per kWh, with PCE	Energy Production, MWh	Residential Energy Consumption, kWh	2012 Residential Electricity Rate, after PCE	2012 Commercial Electricity Rate	Cost of Diesel, $/gal (2010)
Brevig Mission	0.5379	0.3232	1,176	5,351	0.2169	0.5789	4.98
Diomede	0.6000	0.4625	437	2,729	0.1375	0.6000	5.23
Elim	0.5867	0.3564	1,159	4,890	0.2179	0.5979	4.95
Gambell	0.5251	0.3116	1,883	4,271	0.2149	0.5376	4.97
Golovin	0.5532	0.3331	756	4,109	0.2883	0.6000	5.39
Koyuk	0.5526	0.3399	1,316	5,599	0.2180	0.5998	4.98
Nome	0.3631	0.1712	34,427	5,419	0.1919	0.3631	4.71
Saint Michael	0.5550	0.3450	1,735	6,076	0.2177	0.5944	4.98
Savoonga	0.4910	0.2851	2,114	5,260	0.2150	0.5409	4.96
Shaktoolik	0.5794	0.3642	904	5,644	0.2167	0.5737	4.92
Shishmaref	0.5895	0.3750	1,594	4,976	0.2182	0.6030	5.09
Stebbins	0.5566	0.3490	1,354	4,302	0.2177	0.5945	4.93
Teller	0.6286	0.4125	838	4,317	0.2202	0.6443	5.54
Unalakleet	0.3932	0.1997	4,419	5,252	0.2000	0.3800	4.92
Wales	0.6423	0.4268	582	4,694	0.2225	0.6895	4.97
White Mountain	0.7200	0.3100	669	3,220	0.3083	0.6200	5.39
Notes/Source	Data from table 2.5c, AEA Power Cost Equalization Data, Calendar Year 2011 (Produced 2012)	Data from table 2.5c, AEA Power Cost Equalization Data, Calendar Year 2011 (Produced 2012)	electricity in mWh Derived from table 2.2a, AEA, 2012	Data from table 2.5b, AEA Power Cost Equalization Data, Calendar Year 2011 (Produced 2012)	Rates from AVEC, Dec 21, 2012. Except for Diomede, Nome, Golovin, White Mountain, and Unalakleet, where local utilities were contacted by phone on 2/08/12. Blank cell indicate information was unavailable at time of data collection.	Rates from AVEC, Dec 21, 2012. Except for Diomede, Nome, Golovin, White Mountain, and Unalakleet, where local utilities were contacted by phone on 2/08/12.Data for Nome and Diomede was taken from table 2.5c, AEA	Alaska Energy Pathway, published by Alaska Energy Authority

Community Energy Use					
Community	Fuel Used for Transportation, gallons/yr	Fuel Used for Electricity Generation, gallons/yr (2011)	Residential Heating Fuel, gallons/year	School Heating Fuel, gallons/yr	School Electricity Consumption, kWh/yr
Brevig Mission	34,113	89,023	99222	21,079	238,946
Diomede	18,314	41,659	53267	11,970	154,399
Elim	34,473	81,625	100266	11,902	164,055
Gambell	62,482	125,869	181733	37,299	288,895
Golovin	19,750	60,975	57444	17,793	21,865
Koyuk	33,754	96,031	98178	23,279	229,933
Nome	607,938	2,109,802	1768241	-	-
Saint Michael	37,704	126,431	109666	36,684	278,280
Savoonga	59,968	141,602	174422	41,551	293,952
Shaktoolik	23,700	70,025	68933	8,515	93,091
Shishmaref	53,504	116,751	155622	21,502	238,081
Stebbins	49,913	108,499	145178	27,671	295,986
Teller	28,272	72,035	83555	19,713	220,449
Unalakleet	104,854	233,637	304977	28,910	289,640
Wales	18,673	47,325	54311	10,910	100,734
White Mountain	24,059	55,074	69978	15,169	142,660
Notes/ Source	Alaska Energy Pathway, published by Alaska Energy Authority, 2010	Data from table 2.3b, AEA Power Cost Equalization Data, Calendar Year 2011 (Published 2012)	Alaska Energy Pathway, published by Alaska Energy Authority, 2010	Averaged values from the years 2009 and 2010. Nome school district not included in dataset. Data provided on REAL forms collected by Alaska Housing Finance Corporation during the research for "A White Paper on Energy Use in	

Community	Subregion	Electrical Energy Produced, MWh
Brevig Mission	Northern	0
Diomede	Northern	0
Elim	Southcentral	0
Gambell	SLI	366
Golovin	Southcentral	0
Koyuk	Southcentral	0
Nome	Nome	955
Saint Michael	Southeast	0
Savoonga	SLI	354
Shaktoolik	Southeast	0
Shishmaref	Northern	0
Stebbins	Southeast	0
Teller	Northern	0
Unalakleet	Southeast	905
Wales	Northern	0
White Mountain	Southcentral	0
Notes/Explanation		Data from table 2.3a, AEA Power Cost Equalization Data, Calendar Year 2011 (Produced 2012)
Source/link		http://www.akenergyauthority.org/

Audits and Studies				
Community	Energy Audits, ANTHC	Heat Recovery Study, ANTHC	Planned ANTHC Activities	Energy Audits, AHFC
Brevig Mission	-	No	-	Brevig Mission K-12 School
Diomede	-	No	-	-
Elim	-	No	-	Elim Aniguiin School
Gambell	-	No	Excess wind to heat	John Apangalook School
Golovin	-	No	-	-
Koyuk	-	No	-	Koyuk-Malamute School
Nome	-	No	-	-
Saint Michael	-	No	-	-
Savoonga	Water Treatment Plant	Yes	Application for heat recovery via AVEC	-
Shaktoolik	Tribal Office, Health Clinic, Water Treatment Plant	No	Excess wind to heat	Shaktoolik School
Shishmaref	-	Yes	Heat recovery	Shishmaref School
Stebbins	-	No	Washeteria upgrade	Stebbins K-12 School (Tukurngailnguq School)
Teller	Health Clinic, Water Treatment Plant	No	-	Teller School
Unalakleet	-	No	-	Unalakleet Elementary School
Wales	-	No	-	-
White Mountain	-	No	-	-
Notes	Audits performed by Alaska Native Tribal Health Authority. Informtion current as of 2/23/2013			Audits performed for Alaska Housing Finance Corporation

AEA Renewable Energy Fund, 1 of 2

Community	Project	Type	Status as of 12/2012	Renewable Energy Funding Budget	Required Local Match	Total Project Budget
Elim	Elim Wind	Wind	Active	$142,500.00	$7,500.00	$150,000.00
Gambell	Surplus Wind to Heat for Water System	Wind	Active	$240,260.00	$0.00	$240,260.00
Koyuk	Koyuk Wind	Wind	Active	$142,500.00	$7,500.00	$150,000.00
Nome	Pilgrim Hot Springs Geothermal Resoure Assessment 1	Geothermal	Active	$613,174.00	$313,093.00	$926,267.00
	Pilgrim Hot Springs Geothermal Resoure Assessment 2	Geothermal	Active	$1,330,467.00	$2,000,000.00	$3,330,467.00
	Nome Banner Peak Wind Farm Transmission	Transmission	Closed	$801,000.00	$89,000.00	$890,000.00
	Newton Peak Wind Farm	Wind	Active	$4,000,000.00	$444,444.00	$4,444,444.00
Shaktoolik	Shaktoolik Wind Construction	Wind	Active	$2,465,664.00	$262,296.00	$2,727,960.00
Shaktoolik	Shaktoolik Excess Wind to Heat	Wind	Active	$240,260.00	$0.00	$240,260.00
Shishmaref	Shishmaref Heat Recovery Project	Heat Recovery	Active	$310,841.00	$0.00	$310,841.00
Stebbins	Stebbins Wind	Wind	Active	$137,750.00	$7,250.00	$145,000.00
Teller	Teller Wind Analysis	Wind	Active	$117,610.00	$6,190.00	$123,800.00
Unalakleet	Unalakleet Wind Farm	Wind	Closed	$4,000,000.00	$164,340.00	$4,164,340.00
Notes	Information from Alaska Renewable Energy Fund Status Report, Rounds I-V Appendix pages 36-48					

AEA Renewable Energy Fund, 2 of 2

Community	Project	Renewable Energy Funding Expenditures	Total State Expenditures	Required Local Match Expenditures	Total Project Cost Expenditures	End Date
Elim	Elim Wind	$2,880.00	$2,880.00	$151.00	$3,031.00	6/30/2014
Gambell	Surplus Wind to Heat for Water System	$0.00	$0.00	$0.00	$0.00	-
Koyuk	Koyuk Wind	$3,917.00	$3,917.00	$206.00	$4,123.00	6/30/2014
Nome	Pilgrim Hot Springs Geothermal	$382,616.36	$382,616.36	$313,093.00	$695,709.36	6/30/2013
	Pilgrim Hot Springs Geothermal	$415,092.37	$415,092.37	$1,406,332.15	$1,821,424.52	
	Nome Banner Peak Wind Farm	$801,000.00	$801,000.00	$122,871.43	$923,871.43	3/31/2012
	Newton Peak Wind	$68,367.00	$68,367.00	$7,596.34	$75,963.34	6/30/2014
Shaktoolik	Shaktoolik Wind Co	$2,465,633.00	$2,465,633.00	$262,263.00	$2,727,896.00	12/31/2012
Shaktoolik	Shaktoolik Excess W	$0.00	$0.00	$0.00	$0.00	
Shishmaref	Shishmaref Heat Recovery Project	$0.00	$0.00	$0.00	$0.00	6/30/2014
Stebbins	Stebbins Wind	$54,737.00	$54,737.00	$2,881.00	$57,618.00	6/30/2014
Teller	Teller Wind Analysis	$70,134.00	$70,134.00	$3,691.00	$73,825.00	12/31/2013
Unalakleet	Unalakleet Wind Fa	$4,000,000.00	$4,000,000.00	$201,492.00	$4,201,492.00	6/1/2012
Notes	Information from Alaska Renewable Energy Fund Status Report, Rounds I-V Appendix pages 36-48					

AEA Renewable Energy Fund Round VI Applications	
Community	AEA 2012 Round VI Applicants
Brevig Mission	Heat Recovery Investigation
Diomede	
Elim	Wind Feasability
Gambell	
Golovin	
Koyuk	
Nome	Pilgrim Hot Springs Geothermal Resource Assessment
Saint Michael	
Savoonga	
Shaktoolik	
Shishmaref	
Stebbins	Wind Feasability
Teller	
Unalakleet	
Wales	
White Mountain	
Notes/Explanation	Applications received for Round VI funding

Rural Power System Upgrade Program			
Community	Completed Projects	In Progress Projects (Phase)	Remaining Projects
Brevig Mission			
Diomede	X		
Elim			
Gambell			
Golovin	X	X (3)	
Koyuk			
Nome			
Saint Michael			
Savoonga			
Shaktoolik			
Shishmaref			
Stebbins			
Teller			
Unalakleet	X		
Wales			
White Mountain			X (Powerhouse)
Notes/Explanation	Information from an AEA stus report published June, 2012		

Appendix D: Energy Project Potential Funding Sources

Funding Opportunities for Energy Projects

The majority of energy funding resources accessed for Alaska projects come from either the State of Alaska or from U.S. Department of Energy. AHFC funds energy efficiency projects for residences, businesses, and buildings owned by municipalities and educational entities, such as the University of Alaska Anchorage. AEA provides energy audit services to commercial and governmental agencies, renewable energy funds, rural power systems upgrades, bulk fuel construction funds and alternative energy and energy efficiency development programs. AEA also provides economic assistance to rural customers where kilowatt hour charges for electricity are three to five times higher than more urban areas of the state.

Private foundations and corporations also provide funds for smaller projects, some of which can be energy improvements, but most of which are capital funds for construction or reconstruction projects.

In the table below, funding sources are listed by type of project and then funding agency. The description of the type of project eligible is included as well as if the funding eligibility is dependent on economic status of the applicant.

Program	Funding Agency	Description of Funding Opportunity	Restrictions for Eligibility	Comments
Direct Aid				
Power Cost Equalization	Alaska Energy Authority	To provide economic assistance to **customers** in rural areas of Alaska where the kilowatt-hour charge for electricity can be three to five times higher than the charge in more urban areas of the state. PCE only pays a portion of approximately 30% of all kWh's sold by the participating utilities.		AEA determines eligibility of community facilities and residential customers and authorizes payment to the electric utility. Commercial customers are not eligible to receive PCE credit. Participating utilities are required to reduce each eligible customer's bill by the amount that the State pays for PCE.
Low Income Home Energy Assistance Program -- LIHEAP	Department of Health and Social Services		Income-based	
Energy Efficiency Improvements				
Alaska Energy Efficiency Revolving Loan Fund Program	Alaska Housing Finance Corporation	Provides financing for permanent energy-efficient improvements to buildings owned by regional educational attendance areas, the University of Alaska, the State or municipalities in the state. Borrowers obtain an Investment Grade Audit as the basis for making cost-effective energy improvements, selecting from the list of energy efficiency measures identified. All of the improvements must be completed within 365 days of loan closing.		

Program	Funding Agency	Description of Funding Opportunity	Restrictions for Eligibility	Comments
Commercial Energy Audit Program	Alaska Energy Authority	Funding for energy efficiency audits for **privately owned commercial buildings** across Alaska. The program provides reimbursements of qualified commercial energy audits for privately owned commercial buildings up to 160,000 square feet. The maximum reimbursement is set by the building size and complexity and ranges from $1,800 for buildings under 2,500 square feet up to $7,000 for buildings from 60,000 to 160,000 square feet.	Owners of commercial buildings	This funding was available in 2011/2012. May not be available in the future.
Industrial Energy Audit Program - Fish Processors	Alaska Energy Authority	AEA has launched an industrial energy audit program to assist the seafood industry to better understand the usage of energy in their plants. This program will help to insure that investment by the seafood industry in energy efficiency is done so effectively. The program has three parts: 1. An energy audit kit, to measure power consumption of equipment and provide data to small and medium sized processors; 2. an energy audit service for larger processors; 3. An energy efficiency section on the MAP website to anonymously publish results of efficiency audits.		
Energy Efficiency Block Grants	AEA/Dept. of Energy	The Alaska Energy Authority is distributing $5,180,490 of American Recovery and Reinvestment Act (ARRA) funding to up to 142 eligible Alaska cities and boroughs (hereinafter called "Cities") in the first half of 2010. Projects must be complete by August 2012. This funding supports energy efficiency and conservation improvements to public buildings and public facilities. There is no matching fund requirement. City allocations range from $10,600 to $227,800 based upon population. To assist small Cities, Alaska Energy Authority is providing an “opt-in technical assistance” option, which will provide Cities technical assistance with energy audits, retrofits, reporting and other aspects of the projects. Reporting requirements include financial reports, narrative reports, jobs created or retained, energy saved and other measures. All ARRA requirements are in effect, including Buy American, Davis-		

Program	Funding Agency	Description of Funding Opportunity	Restrictions for Eligibility	Comments
		Bacon Wages, National Environmental Policy Act, Whistleblower protections, historic preservation and others outlined in the provisions.		
Energy Efficiency Interest Rate Reduction Program	Alaska Housing Finance Corporation			
Alaska Home Energy Rebate Program	Alaska Housing Finance Corporation	Interest rate reductions apply to the first $200,000 of the loan amount. A loan amount exceeding $200,000 receives a blended interest rate rounded up to the next 0.125 percent. The percentage rate reduction depends on whether or not the property has access to natural gas.		
Second Mortgage Program for Energy Conservation	Alaska Housing Finance Corporation	Borrowers may obtain a second mortgage to finance home improvements or purchase a home in conjunction with an assumption of an existing AHFC loan and make repairs if need be.		The maximum loan amount is $30,000. The maximum loan term is 15 years. The interest rate is the Taxable Program or Rural Owner-Occupied, 15-year interest rate plus 0.375.
Village Energy Efficiency Program	Alaska Energy Authority	Upgrades are performed in rural Alaskan community buildings. There are currently three phases of funding with Phase II communities recently completed. Community selection was based on the status of the respective village's Rural Power System Upgrade (RPSU). The community either recently received or is slated to receive a new power system		

Program	Funding Agency	Description of Funding Opportunity	Restrictions for Eligibility	Comments
Weatherization Program	Alaska Housing Finance Corporation	Weatherization programs have been created to award grants to **nonprofit organizations** for the purpose of improving the energy efficiency of low-income homes statewide. These programs also provide for training and technical assistance in the area of housing energy efficiency. Funds for these programs come from the US Dept. of Energy and AHFC		
RurAL CAP Weatherization	RurAL CAP	Rural Alaska Community Action Program, Inc. (RurAL CAP) manages a state program administered by Alaska Housing Finance Corporation that offers **free** weatherization services for low and middle-income residents in western and northern Alaska, the Municipality of Anchorage, and the City and Borough of Juneau. An Anchorage family of four with income up to $87,800 qualifies.	An income-based program	
RurAL CAP Energy Wise	RurAL CAP	The Energy Wise Program engages rural Alaskan communities in behavior change practices resulting in energy efficiency and energy conservation. This tested model uses community-based social marketing to save energy - a multi-step educational approach involving residents in changing home energy consumption behaviors. Locally hired crews are trained to educate community residents and conduct basic energy efficiency upgrades during full-day home visits. Through Energy Wise, rural Alaskans reduce their energy consumption, lower their home heating and electric bills, and save money.	No income restrictions	**Communities** receive the following: 10 locally hired and trained crew member; on site "launch week" by a RurAL CAP staff for hiring and training of local crews; 1 community energy fair to engage community residents and organizations. **Households** receive: Full day home visit from a trained, locally hired crew; household energy consumption and cost assessment conducted with the resident; education on energy cost-saving strategies; an estimated $300 worth of basic, home energy efficiency supplies installed.
Bering Straits Regional Housing Authority	Alaska Housing Finance Corporation	BSRHA is providing energy efficient weatherization assistance to all communities within the Bering Straits Region. The weatherization service is free to individuals and families, who are renting, buying or own their home are apartment. Eligibility for this program requires that the applicant's household annual income not be greater than the median	Income-based program	

Program	Funding Agency	Description of Funding Opportunity	Restrictions for Eligibility	Comments
		income for the region as determined by HUD. BSRHA will provide the weatherization service at no cost to qualified applicants. Additionally, the homes or apartments we work on do not have to be HUD houses.		
Infrastructure Development				
Alternative Energy & Energy Efficiency Development Program	Alaska Energy Authority	AEA's Alternative Energy and Energy Efficiency programs promote: 1.) Use of renewable energy resources and local sources of coal and natural gas alternatives to diesel-based power, heat, and fuel production; 2.)Measures to improve efficiency of energy production and end use.		
Bulk Fuel Construction Program	Alaska Energy Authority/Denali Commission	With substantial contributions from the Denali Commission, the bulk fuel upgrades program provides funding for the design/engineering, business planning and construction management services to build code-compliant bulk fuel tank farms in rural communities. The bulk fuel upgrade retrofit and revision program, with financial support from the Denali Commission, provides funding for repairs to enable affected communities to continue to receive fuel.		
Emerging Energy Technology Fund	Alaska Energy Authority	The Authority may make grants to eligible applicants for demonstration projects of technologies that have a reasonable expectation to be commercially viable within five years and that are designed to: test emerging energy technologies or methods of conserving energy; Improve an existing energy technology; or Deploy an existing technology that has not previously been demonstrated in Alaska.		Eligible applicants: An electric utility holding a certificate of public convenience and necessity under AS 42.05; An independent power producer; A local government, quasi-governmental entity, or other governmental entity, including tribal council or housing authority; a business holding an Alaska business license; or a nonprofit organization.

Program	Funding Agency	Description of Funding Opportunity	Restrictions for Eligibility	Comments
Renewable Energy Fund	Alaska Energy Authority	Solar Water Heat, Photovoltaics, Landfill Gas, Wind, Biomass, Hydroelectric, Geothermal Electric, Fuel Cells, Geothermal Heat Pumps, CHP/Cogeneration, Hydrothermal, Waste Heat, Transmission or Distribution Infrastructure, Anaerobic Digestion, Tidal Energy, Wave Energy, Fuel Cells using Renewable Fuels, Geothermal Direct-Use		
Rural Power Systems Upgrades	Alaska Energy Authority/Denali Commission	Upgrades may include efficiency improvements, powerhouse upgrades or replacements, line assessments, lines to new customers, demand-side improvements and repairs to generation and distribution systems.		
Community Energy Fund	Norton Sound Economic Development Corporation	The Community Energy Fund (CEF) promotes the development of efficient energy systems that are feasible, sustainable and environmentally sound, supporting the goal of reducing the energy costs for households and community facilities. The NSEDC Board of Directors has allocated $1,000,000 to each of its fifteen member communities with the intent of contributing to long-term solutions that decrease the high costs of energy. May be used to assist with, but is not limited to, the installation and construction of community-wide alternative/renewable energy systems (i.e. wind turbines to connect to existing power generation systems) and efficiency upgrades or adjustments to existing power generation and distribution systems.		Eligible applicants are local utility providers, municipal governments, ANCSA Village Corporations or federally recognized tribal governments and must be located in one of NSEDC's member communities.