



# Akutan Geothermal Development Project

## Geothermal Energy Demand & Stakeholder Assessment

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## Introduction

Alaska is rich in natural resources: oil and gas, mineral deposits, abundant fisheries and an entrepreneurial and independent people. Renewable energy is a resource that has, until recently, gone relatively unexploited despite the tremendous potential it represents for the state.

*“With some of the best renewable energy resources in the country, Alaska has an opportunity to be a leader in their development and bring new revenue streams into the state’s economy.” – Renewable Energy Atlas of Alaska<sup>1</sup>*

There is substantial and growing interest in developing renewable resources at both the national and the state level. Access to affordable energy is a key component in sustaining communities. Inexpensive and stable energy prices can act as a catalyst for economic development; likewise, unstable and unaffordable energy can have a crippling effect.

In summer of 2008 (June-August) the price of Alaska North Slope (ANS) West Coast oil averaged \$128.50 per barrel<sup>2</sup>. Subsequently, the impacts of high energy costs were felt in all parts of the state, bringing an increased awareness of the vulnerability that many communities face when relying solely on diesel to meet their energy needs. In numerous rural places, prolonged high prices mean that households will be forced to make decisions about basic needs, choosing between home energy and other basic necessities.

Even when oil prices are not soaring, fluctuating energy prices impact a community’s ability to plan for the future. The State of Alaska has made it policy to promote both renewable energy development<sup>3</sup> and rural sustainability. These ideas go hand in hand; energy price stability is essential to creating sustainability of rural Alaska communities.

The City of Akutan, Alaska (Akutan, City) is part of the Aleutians East Borough (AEB, Borough) and lies 766 air miles southwest of Anchorage. The community is not connected by road and does not have an airport; Akutan is only accessible via seaplane or boat. The nearest community is Unalaska/Dutch Harbor, approximately 40 miles to the south. Akutan has a full-time residential population of around 75-80 people, with a total population (including processor workers) of approximately 796 in 2008<sup>4</sup>. Akutan is home to Trident Seafoods Inc. (Trident), the largest fish processing plant in North America with as many as 700 to 800 employees working and living at the plant 250 days per year.

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<sup>1</sup> Published by the Renewable Energy Alaska Project (REAP) May 2009.

<sup>2</sup> Summer 2008 Alaska North Slope (ANS) West Coast crude saw a low of \$112.17 and a high of \$144.59 per barrel.

<sup>3</sup> HB 152 established an Alaska Renewable Energy Grant Fund.

<sup>4</sup> Department of Commerce, Community and Economic Development certified population (DCCED), 2008.

The vision of developing geothermal energy in Akutan goes beyond building a utility that will provide energy to the town and processor; it is an economic development engine that could remove barriers to business development and create opportunities that do not currently exist.

The community of Akutan is well positioned to explore and develop its geothermal resource. It is well established that there is a significant geothermal resource near the community of Akutan. Survey work done decades ago documents the geothermal resource at Hot Springs Bay Valley (HSBV) on Akutan Island. The objective of this report is to add to that knowledge set through analysis of energy demand markets on Akutan Island and articulating stakeholder sentiment. This report is not intended to be an assessment of the viability of the project, but rather to present the current and future potential energy demand markets.

## Key Findings

This report explores energy demand on Akutan Island and perceptions about the geothermal energy project held by stakeholders in the community, business interests, government, and neighboring entities. There is substantial energy demand on the island; the City and Trident together currently use more than 4.6 million gallons of fuel every year to meet their electric and heat energy needs. The large majority of this demand is generated by the Trident Seafoods processing plant.

### *Electric*

- Trident uses approximately 36.2 million kWh of electricity produced at an estimated cost of \$0.21 per kWh.
- The City of Akutan uses approximately 560,000 kWh annually produced at a cost of \$0.32 per kWh.

### *Heat*

- Trident burns in excess of two million gallons of fuel each year, at an estimated current cost of \$3.05 per gallon, to meet its heat energy needs.
- The City of Akutan burns around 37,500 gallons of fuel each year, at an estimated current cost of \$4.20 per gallon, to meet its heat energy needs.

Based on the estimated cost of current electric energy production, a geothermal project would be viable if it can produce energy for less than \$0.21 per kWh, the estimated cost of electric energy generation at Trident. If a project can deliver reliable energy for a cost that is less than what Trident currently pays, it is anticipated that the processor would purchase it. At \$0.21 per kWh, the estimated cost of electricity is \$0.11 less than City costs per kWh.

The value of energy currently used on Akutan Island has a mid range estimated value of more than \$14 million annually. Current energy markets for both electric and heat energy relying on diesel energy create more than 51,000 tons of carbon emissions annually. In addition to current energy demand, there are planned and potential projects that will substantially increase the energy demand load.

- The planned small boat harbor will add a demand load equivalent to more than 82,000 gallons of fuel.
- The airport project includes a hovercraft maintenance shed facility based on Akutan Island. The maintenance shed will have an estimated energy demand equivalent to 1,760 gallons of fuel for both electricity and heat needs.
- If Trident moves forward with plans to add cold storage capacity at or next to the processing plant, the estimated increase in demand load is equivalent to between 200,000 to 300,000 gallons of fuel.
- Other potential projects that are favored by local residents of Akutan could create an additional demand load equivalent to roughly 36,398 gallons of fuel.

Distributing electricity generated from a geothermal resource is widely practiced throughout the world. The United States had more than 3,000 megawatts of geothermal installed capacity as of

September 2009<sup>5</sup>. Heat energy needs can also be met by geothermal energy through either district heat or electric heat applications, or some combination of the two, depending on the location and design specifications of the project. Geothermal hot water can also be utilized for cold storage, a direct use that is gaining in popularity where it is feasible due to the dramatic costs associated with cold storage.

The vision of developing geothermal in Akutan goes beyond providing a cleaner, more price stable energy source. It also creates the cornerstone for an economic development engine, giving rise to opportunities that do not currently exist at the local and regional level. The City, Tribe, and community are eager to explore the opportunities created by low cost energy. The community has the funds and the infrastructure necessary to support entrepreneurial efforts, including local food production and tourism operations, among others.

Land use issues related to development of the resource do not present a significant barrier as all parties are in agreement that geothermal energy would have a positive impact on the community.

- Akutan Corporation owns most of the land that would be impacted and is a strong advocate of the project. In March 2009, the Akutan Corporation executed a Surface Use and Exploration Agreement with the City.
- The Aleut Corporation (TAC) owns subsurface rights on the Island and has expressed a desire to see those resources explored and developed for the benefit of both the community and Aleut Corporation shareholders. In June 2009, TAC executed a Subsurface Resources Exploration Agreement with the City.

Akutan has significant geothermal energy potential. The political climate at a national and state level is ripe for exploring this asset. At the local level, the City government is enthused and preparing the way for maximizing the benefits of natural resource development. Geothermal technology has been tested around the world, including in the state of Alaska. There is little question that a geothermal resource exists, but in order to determine if that resource can be economically developed at this time, further information about the size and specifics of the resource is needed.

Table 1 on the following page gives the estimated avoidable fuel in gallons and the value of that fuel for current, planned, and potential energy consumption on Akutan Island. Avoidable fuel represents the fuel used to meet current energy demand and the estimated fuel that would become necessary to meet future energy demand. Low, mid, and high range estimated per unit fuel costs vary depending on the buyer and the fuel end-use with a base price of:

- \$65 per barrel crude oil prices for low cost estimates
- \$94 per barrel crude oil prices for mid cost estimates
- \$120 per barrel crude oil prices for high cost estimates

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<sup>5</sup> U.S. Geothermal Power Production and Development Update, September 2009, Geothermal Energy Association.

Table 1 Estimated Energy Demand Markets in Akutan

	Gallons per year	Total cost Low estimate	Total cost Mid estimate	Total cost High estimate
<b>Current energy demand</b>				
Akutan Electric	43,077	\$123,631	\$155,079	\$182,216
Trident Electric	2,495,172	\$5,788,799	\$7,610,373	\$9,182,233
Akutan Heat	37,500	\$130,125	\$157,500	\$181,125
Trident Heat	2,063,064	\$4,786,309	\$6,292,345	\$7,592,076
<i>Total Current</i>	<i>4,638,813</i>	<i>\$10,828,864</i>	<i>\$14,215,297</i>	<i>\$17,137,649</i>
	Gallons per year	Total cost Low estimate	Total cost Mid estimate	Total cost High estimate
<b>Planned energy demand</b>				
Harbor Electric <sup>6</sup>	79,377	\$227,812	\$285,760	\$335,764
Harbor Heat	2,810	\$9,751	\$11,802	\$13,573
Hovercraft Electric	730	\$2,096	\$2,629	\$3,089
Hovercraft Heat	1,030	\$3,574	\$4,326	\$4,975
<i>Total planned</i>	<i>83,947</i>	<i>\$243,233</i>	<i>\$304,517</i>	<i>\$357,401</i>
	Gallons per year	Total cost Low estimate	Total cost Mid estimate	Total cost High estimate
<b>Potential energy demand</b>				
Cold Storage <sup>7</sup>	278,308	\$645,674	\$848,849	\$1,024,172
Greenhouse Electric	23,231	\$66,673	\$83,633	\$98,267
Greenhouse Heat	8,749	\$30,359	\$36,746	\$42,258
Tourism Electric	1,418	\$4,070	\$5,105	\$5,998
Tourism Heat	3,000	\$10,410	\$12,600	\$14,490
<i>Total Potential</i>	<i>314,706</i>	<i>\$757,186</i>	<i>\$986,933</i>	<i>\$1,185,185</i>
<b>Total current, planned &amp; potential</b>	<b>5,037,466</b>	<b>\$11,829,283</b>	<b>\$15,506,747</b>	<b>\$18,680,236</b>

<sup>6</sup> Harbor estimates are based on the mid-range use estimates of 60 percent average capacity.

<sup>7</sup> Estimates are based on a 20 percent increase in cold storage capacity.

## Overview of the project

The City of Akutan, through RMA Consulting Group, contracted with Information Insights and Mark Foster & Associates to conduct a preliminary energy demand and stakeholder assessment related to developing geothermal resources on Akutan Island. The purpose of this project is to provide an assessment of stakeholder interest, the current energy markets for the City and Trident, and the potential increase in energy demand load that will result from the planned infrastructure projects, as well as new projects that become viable with the availability of less expensive and stable-priced energy. This energy demand/stakeholder assessment is intended to provide a picture of current and future demand for energy and a summary of stakeholder input.

The project team conducted a series of stakeholder and key informant interviews during fall 2009 and travelled to Akutan in late September for a public meeting to discuss the project and collect input from the community. The meeting was advertised locally and was open to the public. Project staff also interviewed key individuals on site in Unalaska/Dutch Harbor. The team reviewed available literature and studies related to the resource and conducted a review of similar projects.

Geothermal energy from Hot Springs Bay Valley (HSBV) on Akutan Island has an estimated capacity that exceeds the energy needs of both the City of Akutan and the Trident Seafoods processing plant. This clean, renewable energy could displace close to a total of 4.6 million gallons of fuel (total current use): 2.5 million gallons of fuel currently used in electric energy generation and a substantial portion of the 2.1 million gallons burned for space heat and industrial energy. The relative attractiveness of all renewable energy projects depends heavily on the price of alternative energy sources. In the City of Akutan, energy needs are being met by burning diesel. There is a hydro generation system currently offline, but under repair. Trident, the primary energy user on the island, burns diesel fuel, and to an unknown extent fish oil, to meet its energy needs.

A variety of geo-scientific surveys were conducted in Akutan in summer 2009 in order to better pinpoint the location and characteristics of the geothermal resource. The team conducted an Audio Magneto-Telluric survey in the Akutan geothermal area in order to identify conductive zones at depth which might be representative of the clay cap overlying a geothermal reservoir, amongst other features that will illuminate the subsurface flow regime feeding Akutan hot springs. Analysis of the data collected is not yet finalized, but will provide necessary information for resource evaluation and definition, and will guide exploratory drilling efforts that are planned for summer 2010.

Exploratory drilling will provide concrete resource parameters that will facilitate the development of a realistic cost estimate for the project. These parameters include:

- Geothermal fluid temperature
- Geothermal fluid flow rate (reservoir pressure)
- Geothermal fluid composition
- Cooling temperature (air or cold water sink)
- Extractable volume of fluid (pump capacity)
- Efficiency of energy conversion
- Size of power system / system technology
- Location of geothermal wells
- Size and configuration of gathering system

Phase II of the assessment of geothermal energy market potential in Akutan will include cost estimates associated with supplying geothermal energy to the energy markets identified in this report. Project economics and a determination of viability will be based on information gathered through exploratory drilling. It is not possible at this time to engage in a detailed analysis of the economic and financial feasibility of geothermal development at Akutan because not enough is known about the resource.

This assessment estimates:

- Current energy demand for the City of Akutan and the Trident processing plant.
- Energy demand impacts associated with planned infrastructure projects.
- Energy demand created by potential business development projects that become feasible if low cost and stable-priced energy is available.

## Overview of the local and regional economy

Akutan, Alaska is a 2<sup>nd</sup> Class City incorporated in 1979. However, the history of Akutan, its people, subsistence economy, and trade activities goes back for thousands of years.

Current day Akutan is a community of roughly 75 year-round residents. The City is economically tied to Trident Seafoods Inc., a substantial fish processor in Alaska. Including the group quarters at Trident, the 2008 estimated population of Akutan was 796 people.

As a 2<sup>nd</sup> Class City, Akutan has the authority to levy taxes. The City has no sales or property taxes, relying on a one percent fish tax paid by the processor to support local government functions. The Aleutians East Borough levies an additional borough-wide two percent fish tax. Although few residents are employed directly by the processing plant, as the only tax payer in the City, Trident is indirectly responsible for job creation in every sector.

Akutan is part of the Aleutians East Borough, a 2<sup>nd</sup> Class Borough with an estimated population of 2,795. Including Akutan, the Borough has five incorporated cities: three 2<sup>nd</sup> Class Cities and two 1<sup>st</sup> Class Cities. The Borough does not levy property or sales taxes, but in 2008 collected \$4.2 million in fish tax and reported per capita revenue of \$1,514. The Alaska State Assessor's Office reports that the full value determination (FVD) of the Aleutians East Borough in 2008 was \$128.1 million, or \$45,847 per capita. The City of Akutan's FVD for the same period was \$18.9 million, or \$22,051 per capita. However, it is important to note that the per capita FVD of Akutan is calculated from a population figure of 859<sup>8</sup>, not the 75-80 full time residents.

Akutan's economy has been primarily cash-based since its days as a whaling station. As in neighboring communities, commercial fish processing is the mainstay of Akutan's economy. The remainder of the economy includes private sector, school district, and local, state and federal government employment. Subsistence foods include seal, salmon, herring, halibut, clams, wild cattle, and game birds.

Akutan residents participate in commercial fisheries in a number of ways, including:

- harvesting, with locally owned skiffs and small vessels,
- participating in the community development quota (CDQ) program,
- providing limited support services to the fishers and vessels in the community, and
- working on the Seattle-based fishing boats as crew members.

The Akutan Corporation, the City, and the Tribe are the key local drivers of the economy. Residents of Akutan currently hold business licenses for eight distinct businesses. Though commercial fisheries play an important role in the economy of Akutan, most full-time employment for Akutan residents comes from the City of Akutan, Akutan Corporation, Akutan Traditional Council, Eastern Aleutian Tribes, and Aleutian East Borough School District.

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<sup>8</sup> The Alaska Taxable population figures differ from the DCCED certified figures because they are based on Alaska Department of Labor and Workforce Development estimates. Due to data availability at different points in time, the Alaska Taxable population figures lag the DCCED certified figures.

Additionally, short-term employment is intermittently generated through community infrastructure improvement projects, usually in the form of construction-related employment.

### Unemployment and seasonality of employment

During the 2000 Census, 97 residents reported being employed and 505 residents reported being unemployed. The unemployment rate at that time was 83.9 percent. By comparison, the 1990 Census reflected an unemployment rate of 0.4 percent. Though it may be numerically correct, the 2000 Census does not present an accurate picture of unemployment in Akutan. The community of Akutan consists of fewer than 100 persons, and not all of them are adults in the labor pool. Thus, the vast majority of persons counted as unemployed were likely idled, itinerant seafood processing workers, not unemployed Akutan residents. Under normal operating conditions, there are no idle seafood processing workers in Akutan. Work crews are flown between their home cities and Akutan, depending on workforce needs. While in Akutan, nonresident workers are provided room and board by their employer. It is uneconomical for the processor to have idle employees on site unless the plant's downtime is anticipated to be short. Akutan resident employment is for the most part year-round employment except for seasonal fishing and construction employment. In contrast, Trident Seafoods employment, while year round for many employees, is dictated by fishery seasons and correlating processing needs.

The following information from the City's 2005 Community Plan has not changed. 2010 Census information will provide current information in the near future.

According to Census data from 2000, the median household income in Akutan was \$33,750. This median income estimate is most representative of the Akutan resident population. In contrast, the Census data from 2000 also reports the Akutan per capita income was \$12,258. This data is reflective of resident and non-resident incomes considered in aggregate and does not accurately represent income levels for the permanent population.

Akutan faces barriers and challenges that are typical to rural Alaska. The City's Community Plan cites several barriers to economic development. One of the most significant is Akutan's distance from any substantial commercial market. While Akutan is relatively close to the hub community of Unalaska, poor weather and other transportation issues have hindered Akutan's ability to develop projects that require reliable transport to or from outside markets. However, this barrier will likely be ameliorated by the currently planned airport project.

Other typical barriers to development include lack of access to:

- capital, competitive financing and public investors,
- education and job-specific training, and
- adequate infrastructure, including affordable energy.

With a predominantly cash-based economy, Akutan will continue to rely on fisheries as an important driver of the local economy. Other potential options for maintaining and expanding the local economic base include the geothermal development project currently being explored and potential development of non-resident "visitor" services. Retention of dollars within the

community can be maximized through local hire and additional training of local residents to take advantage of opportunities as they arise.

On a regional level, the economic drivers are more diverse than in the local economy. In an effort to begin to diversify the economy, Aleutians East Borough Mayor Stanley Mack signed a formal agreement with the State of Alaska, the Bristol Bay Borough, and the Lake and Peninsula Borough to support onshore oil and gas development around the Alaska Peninsula. The agreement acted as a catalyst to the first Alaska Peninsula oil and gas lease sale in 22 years, held in October 2009. Western Alaska is at the forefront of global climate change and subsequently affected shipping routes and fish migration. These factors present both challenges and opportunities. Communities, businesses, and government have started to look at these opportunities and are developing strategies to maximize their potential.

## Current energy demand

On the island of Akutan there are two distinct energy users and energy producers – the City of Akutan and the Trident Seafoods processing plant. These two entities exist in close proximity to one another but have completely separate energy generation systems. Trident operates as an industrial enclave, producing all of the energy it needs for its operations. The City has a local utility that serves local residents and businesses (with the exception of Trident).

### Electricity:

The City of Akutan burns an estimated 43,077 gallons of diesel per year generating electricity. At a cost of \$3.60 per gallon, generation costs total more than \$155,000 per year. The local utility generates electricity at a rate of \$0.32 per kWh. The cost paid by residential users is offset by Power Cost Equalization (PCE) funds and a City subsidy. The majority of potential savings from less expensive geothermal energy would be enjoyed by the State of Alaska through a reduction in the PCE subsidy, the City, and local businesses that are not eligible for PCE.

The Trident Seafoods processing plant uses considerably more electricity than the City, burning an estimated 2.5 million gallons per year to meet the plant’s electric energy needs. Total estimated cost for fuel associated with Trident’s electricity generation is roughly \$7.6 million per year. At \$3.05 per gallon of fuel, the authors estimate Trident is effectively paying \$0.21 per kWh for electricity.

Table 2 Current Markets - Electricity Generation

	Gallons per year	\$/kWh (estimated for Trident)	Estimated total costs
Trident Plant (Electric)	2,495,172	\$0.21	\$7,610,373
Akutan (Electric)	43,077	\$0.32	\$155,079
<b>Total</b>	<b>2,538,249</b>		<b>\$7,765,452</b>

- \* Akutan electric energy use is based on FY08 PCE report for Akutan and assumes an average 13 kWh/gallon.
- \* Trident energy use is based on personal communications with Trident personnel.

Table 2 above uses mid-range current estimated fuel prices. Cost estimates are always a snapshot as the price of fuel is a moving target. The last few years have seen wild variation in fuel prices in relatively short periods of time. The cost of fuel used in the table above are based on Energy Information Authority (EIA) 2009 reference case with cost increments associated with refining, barging from Seattle to Akutan, and projected carbon tax going into the future. This model produces fuel prices of between \$3.05 and \$3.60 for electric generation, depending on the buyer. Most economists agree that it is highly unlikely the price of fossil fuels will decline substantially or for sustained periods in the foreseeable future. Demand for oil continues to rise as the world supply of relatively cheap and accessible oil continues to decline. Ironically, the economic recession has created something of a reprieve for small fuel buyers in Alaska and around the country. After dropping from a high of \$140 in July 2008 to a low of \$31.41 in December 2008, prices are thought to be more accurately priced now at around \$75 per barrel.

The Energy Information Authority makes the disclaimer about predicting fuel prices that “EIA’s crude oil price forecast reflects all available data and our expert judgment, nonetheless there is a substantial likelihood that prices will diverge significantly from the forecast.”<sup>9</sup>

Given the level of price volatility, low, mid, and high range estimates of total cost are provided in Table 3 below, and again for heat energy in the section that follows.

**Table 3 Current Electric Markets - Estimated Value**

	Gallons	Total cost Low estimate	Total cost Mid estimate	Total cost High estimate
Trident (electric)	2,495,172	\$5,788,799	\$7,610,373	\$9,182,233
Akutan (electric)	43,077	\$123,631	\$155,079	\$182,216
<b>Total (electric)</b>	<b>2,538,249</b>	<b>\$5,912,430</b>	<b>\$7,765,452</b>	<b>\$9,364,449</b>

- \* Low estimates are based on \$65 per barrel crude oil prices.
- \* Mid estimates are based on \$94 per barrel crude oil prices.
- \* High estimates are based on \$120 per barrel crude oil prices.

### Heat

Space heating is the other significant piece of the current use energy equation in Akutan. The City of Akutan uses around 37,500 gallons of fuel for space heat per year. At a mid level estimated cost of \$4.20 per gallon, the average household pays a little over \$3,000 per year to heat a home – more than three times the national average. The community as a whole spends approximately \$157, 000 per year on space heating at current rates.

The Trident plant consumes 2.1 million gallons of fuel per year for heat energy at an estimated cost of \$6.3 million. Much of Trident’s heat energy is used for industrial processes, not for space heat. Fuel use is based on personal communication with Trident personnel. Cost estimates were produced through review of Trident’s energy production inventory and independent analysis.

Table 4 below shows the potential avoided fuel associated with heat energy use for both the City of Akutan and the Trident processing plant.

**Table 4 Current Heat Market**

	Gallons per year	Cost per gallon	Estimated total costs
Trident Plant (Heat)	2,063,064	\$3.05	\$6,292,426
Akutan (Heat)	37,500	\$4.20	\$157,501
<b>Total</b>	<b>2,100,564</b>		<b>\$6,449,927</b>

<sup>9</sup> <http://www.eia.doe.gov/>

Table 5 gives the estimated value of heat energy consumed in Akutan at low, mid and high estimated fuel prices.

**Table 5 Current Heat Market - Estimated Value**

	Gallons per year	Total cost Low estimate	Total cost Mid estimate	Total cost High estimate
Trident Plant (Heat)	2,063,064	\$4,786,308	\$6,292,426	\$7,592,076
Akutan (Heat)	37,500	\$130,125	\$157,501	\$181,125
<b>Total</b>	<b>2,100,564</b>	<b>\$4,916,433</b>	<b>\$6,449,927</b>	<b>\$7,773,201</b>

There are two methods by which heat energy could potentially be provided by the geothermal resource – electric heating and district heating.

### Electric heating

Electric heating systems have generally been considered less efficient than other heat energy sources in Alaska. However, with inexpensive energy they can provide an attractive alternative. Electric heating systems require little maintenance and attention by the user, and the residential system changeover costs are modest. It is assumed that Trident would not immediately replace industrial equipment currently fueled by diesel with electric units. Depending on the cost of replacement and the age of the equipment, the processor could plan to transition to electric equipment as it becomes economical.

**Table 6 Current Heat and Electric Market**

	Trident: electric demand / year	Trident: heat demand / year	Akutan: electric demand / year	Akutan: heat demand / year
MMBTU	123,482	268,198	1,911	4,875
kWh	36,180,000	78,581,401	560,000	1,428,362

Table 6 above shows total electric and heat demand for both Trident and the City of Akutan in BTUs and kWhs. We can conservatively estimate that electric energy could replace 25 percent of heat needs at the Trident plant, creating a potential 19.6 million (25% of total) kWh in new electric demand. A simple break-even analysis reveals \$/kWh price points for electricity of \$0.08 for Trident and \$0.11 for the City of Akutan. At these price points, electric heat becomes price competitive at current estimated fuel prices.

Because Trident and the City have significantly different unit costs associated with energy generation, it is worth noting that utilities regularly charge varying rates for different customers and/or different end-uses. The geothermal developer in Akutan could charge a rate for heat energy that is just above the incremental cost of that unit. Higher cost units of energy would be sold at a higher cost – because current electric demand represents the demand that is more consistent year- round, the first units of production would be sold for electric use. The result of this rate structure is that the production costs for each unit of energy has a buyer, and the buyer receives energy at a price that is less than what they currently pay. The non-monetary benefit of

incentivizing the use of a renewable resource for heat energy is reduction in greenhouse gas emissions and price stabilization.

### District heating

Geothermal district heat is successfully used in the United States and around the world. Many Alaskans are familiar with geothermal development in Iceland where a significant percentage of the population enjoys low-cost heat provided by geothermal resources. In Alaska, Chena Hot Springs Resort has substantially lowered their cost of space heating through the utilization of district heat.

District heat has several notable advantages. District heat systems typically use conventional piping equipment that is readily available. The system utilizes the resource directly (i.e., “direct use”) so there is no conversion cost and little energy loss, and district heat can use low temperature as well as high temperature geothermal resources. The cost to convert buildings to a district heat system can be a barrier for individual residences, but once the system is in place the level of service is extremely reliable.

Estimating costs for district heating depends on a variety of factors, but most heavily on the distance of the resource to the space(s) to be heated. District heating is most viable if the resource is close to a densely packed group of users. The value of the current heat energy markets in Akutan is nearly \$6.5 million at current estimated fuel prices. The City of Akutan has space heat needs valued at roughly \$160,000, and Trident has heat energy needs totaling nearly \$6.3 million. For a district heating system to be economically viable, the cost of construction of the needed infrastructure would likely need to fall within a financing schema based on current avoidable costs.

### *Total estimated value of the current energy market in Akutan*

The tables that follow estimate the total value of energy used on Akutan Island in 2012 and the net present value of energy consumed between 2012 and 2030. Total net present value (NPV) of energy in Akutan is more than \$200 million, with just over half of that value consumed in electric energy.

**Table 7 Annual Value of Energy Consumed in Akutan**

	Total \$/year	Electric (\$/yr)	Heat (\$/yr)
Akutan	\$312,580	\$155,079	\$157,501
Trident	\$13,902,798	\$7,610,373	\$6,292,426
<b>Total</b>	<b>\$14,215,379</b>	<b>\$7,765,452</b>	<b>\$6,449,927</b>

Table 8 Net Present Value Akutan Energy Market

	Total \$	Electric (\$)	Heat (\$)
Akutan	\$4,520,312	\$2,263,948	\$2,256,364
Trident	\$207,749,254	\$113,721,659	\$94,027,595
<b>Total</b>	<b>\$212,269,566</b>	<b>\$115,985,608</b>	<b>\$96,283,959</b>

Note: assumes a 5% discount rate

Estimates of the value of the local energy market assume a modest increase in the price of diesel as well as a future and increasing cost associated with carbon emissions. The authors assume no population growth or contraction in the community, as making population trend assumptions for a community of fewer than 100 people is extremely unreliable. Likewise, we assume a steady rate of activity at the Trident plant.

Planned and potential projects will increase the energy demand load in Akutan and raise the value of the energy market. There is no load growth estimated outside the parameters of the planned and potential projects. Projections of population are not reliable in such a small community and the fishing industry has too many unknown and uncontrollable variables to make a reasonable prediction of future levels of production. Planned and potential projects that impact energy demand are described in the sections that follow.

## Planned projects and energy demand

Akutan is primarily dependent on sea transportation for access to import and export of goods. The two planned capital projects in Akutan - construction of an Airport and a public small boat harbor - both help create community sustainability through increased access to goods and services. Ease of access also removes a significant barrier for individuals interested in marketing tourism opportunities on the island, exploring niche seafood markets, and for residents who need to travel out of the community for work and/or pleasure.

These projects will create long-term employment opportunities for residents, an essential component in creating community sustainability. The airport and harbor projects combined represent more than \$100 million investment in the community. The projects are being constructed by separate entities, and an assessment of their combined impact on the City has not been studied at this point. It is therefore premature to assign any kind of multiplier effect analysis, labor, or population impacts. However, with infrastructure investments of this magnitude, economic activity will increase throughout the construction periods at minimum, and activity should be monitored in order to quantify impacts on Akutan in the long term.

The harbor project will have significant impact on the energy demand load in Akutan, while the Airport's location on Akun Island necessitates a separate energy generation system.

### *Airport*

The construction of an airport on Akun Island is an important project for the City of Akutan, though not one that will increase energy consumption dramatically. Limited outdoor lighting and a snow removal equipment building will be erected and powered to support airport activity, but they will be located on Akun Island and energy generation will occur on site. The airport location makes it difficult to imagine a feasible intertie for such a small load to a geothermal project on Akutan Island. Akun Island is located seven miles across the water from the community of Akutan. Even if it were economically feasible, running power lines under water presents problems because of the large fishing vessels that come into the area and anchor to offload fish at the Trident plant.

The Environmental Assessment (EA) for the proposed airport notes that energy would be provided by an on-site diesel generator and estimates total consumption at 2,000 gallons per year. Direct energy demand in the community of Akutan is limited to the hovercraft maintenance shed. Energy consumption for the maintenance shed is estimated using PCE data for community buildings in Akutan. Electric demand is estimated at 9,494 kWh per year, and heat energy demand is estimated at 1,030 gallons per year.

The Airport EA also notes potential project benefit for small business ventures, including export of local goods to market. Along with seafood goods, the airport could provide a transportation option for a greenhouse food production venture, if the developer intended to sell fresh produce to other communities on the Aleutian chain.

The most significant impact of the airport on the community of Akutan is increasing the ease and safety of access. Increasing the reliability of flights in and out of the community will make Akutan a more attractive place to live, potentially staving off outmigration, and removing a significant barrier to small business development and community economic development.

### *Harbor Development*

Akutan will soon be home to a public small boat harbor. Development of the harbor will provide a naturally sheltered area, shore power, and services for up to 58 vessels primarily 60 feet in length or smaller. The public small boat harbor project is being managed by the Aleutians East Borough working with the Army Corp of Engineers. The project has moved through assessment and design phases and has gone out to bid for construction in 2010. There is some regional competition for small boats at harbors along the Aleutians, but Akutan's proximity to rich fishing grounds, the local on-shore processor, as well as proximity to Unalaska/Dutch Harbor, gives it a competitive advantage.

The public small boat harbor operating at Unalaska/Dutch Harbor can accommodate 71 boats up to 60 feet and often has a waitlist and conditions of overcrowding. Between 1998 and 2003, the public small boat harbor operated at 78 to 98 percent capacity.<sup>10</sup> There are additional small boat slips available at private docks in Unalaska/Dutch Harbor, but there remains a persistent condition of overcrowding at the public small boat harbor. In addition to offering an alternative to the small boat harbor at Unalaska/Dutch Harbor, Akutan's harbor will offer residents, who are involved in or interested in becoming involved in commercial fishing, a local place to keep their boats. There is currently only a handful of commercial fishing licenses held by residents of Akutan. Creating opportunities for residents to work locally can keep people in their community of choice and potentially attract new residents. In combination with the airport, the harbor might also provide better access to boats when flights are suspended into Unalaska/Dutch Harbor.

The energy demand load associated with the planned harbor development includes shore power for vessels, laundry/shower facilities, garage/maintenance shed, and harbormaster residence and office.

Table 9 on the following page estimates shore power energy demand load associated with the harbor at 20, 40, and 60 percent capacity. Estimates assume boats are using 30 amps and receiving 110 volt service. The estimate of gallons used to generate electricity assumes 13 gallons per kWh.

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<sup>10</sup> Technical Memorandum: Port and Harbor Ten-Year Development Plan, April 2004, Northern Economics.

Table 9 Small Boat Harbor Energy Demand – Shore Power

	20% capacity	40% capacity	60% capacity
Boats	23.2	34.8	46.4
kWh per day	1,837	2,756	3,675
kWh per year	670,666	1,005,998	1,341,331
Gallons needed to generate electricity	51,590	77,384	103,179

Table 10 estimates energy demand, other than shore power, associated with the operation of a small boat harbor.

Table 10 Boat Harbor Energy Demand - Other Land Based Services

Other services	Estimated annual electric demand – kWh	Estimated annual heat demand - gallons
Laundry/Shower/Bathrooms	9,494	1,030
Harbormaster Home/Office	6,913	750
Garage/Maintenance Shed	9,494	1,030
<b>Total</b>	<b>25,902</b>	<b>2,810</b>

The total energy demand created by the small boat harbor in Akutan is estimated to be 1,031,900 kWh of electricity and 2,810 gallons of heating fuel. If diesel is used to generate all of this energy, more than 82,000 gallons of fuel will be needed: 79,377 gallons for electric energy generation and 2,810 gallons for heat energy.

## Potential projects and energy demand

The increase in demand for energy created by the potential projects outlined below – greenhouses, tourism, and increased cold storage capacity – is large relative to current demand for the City alone. Greenhouse and tourism operations would be efforts of a local entity or entrepreneur, and would together generate demand for the equivalent of an additional 36,397 gallons of diesel (nearly half what the City currently uses) for space heat and electricity, with most of the energy used in the greenhouse operation. The third project, cold storage, has a much greater estimated energy demand load that is roughly equivalent to 278,300 gallons of fuel, and is most likely to be developed by Trident to serve the needs of the processing plant.

The desire expressed by stakeholders and community members to engage in the activities outlined in the following section is rooted in the clear financial, social, and cultural benefits of local economic development and job creation opportunities. It is important to note that creating even one good job in a remote community with limited employment opportunities can have an impact on the community. Tourism and greenhouse farming have the potential to create a handful of job opportunities for local residents and will help sustain the local economy. Increasing cold storage capacity will allow Trident to process and store more fish, increasing the tax base for both the City and the Aleutians East Borough.

### *Greenhouses*

Greenhouse technology today is very advanced and has been tested worldwide. In combination with geothermal power, greenhouses are an effective and potentially profitable use of energy. There are many examples of large-scale greenhouse operations in Europe and Russia, and at the state level, Chena Hot Springs Resort (CHSR) and the University of Alaska Fairbanks serve as successful models for the implementation and monetization of greenhouses.

Robert Carroll Dose, at Texas A&M University, believes that hydroponics is the ‘way to go’, as hydroponics technology has been well tested throughout the Lower 48 and Mexico. Successful crops using hydroponics include tomatoes, cucumbers, squash, eggplant, lettuce, and other greens. The estimated cost of building a commercial grade greenhouse is approximately \$100 to \$150 per square foot, not including transportation costs or related support ventures such as storage and packing facilities. At this point, the authors are not able to estimate real operating costs of a greenhouse venture in Akutan because there are too many unknown variables:

- Is it possible to locate the greenhouse very close to the resource?
- What kinds of soluble and water supplements will be needed?
- What are the parameters of local light intensity?
- What is the local market like? Do local people use these products already? How would they fit into the daily diet?
- What is the market potential and logistics for the area? What are the true capital expenditures?
- What are the existing and potential labor components needed?

It is possible, however, to look to the CHSR experience to estimate energy needs. Energy demand assumptions presented from this point forward are based on that experience.

- Electricity: Requirements for a 60' x 70' greenhouse are approximately 62kW, 16 hours per day primarily for lighting. This works out to a little more than **300,000 kWh per year**; nearly \$100,000 at today's electric rates.
- Heating: Between 1971 and 2000 the mean heating degree days (HDD) with a base temperature of 65° F in Dutch Harbor<sup>11</sup> is 8,991 while the mean HDD is 13,980 in Fairbanks.<sup>12</sup> BTUs needed for space heat in Akutan are estimated to be 44.5 percent lower than at Chena Hot Springs Resort. Thus, we can estimate space heat for a greenhouse on Akutan Island at **46.7 million BTU per year**, or approximately equivalent to 8,749 gallons of fuel.

**Table 11 Greenhouse Energy Demand and Cost Estimates**

<b>Diesel fuel scenario</b>			
Annual kWh electric	Annual cost of electricity at 32.3 cents/kWh	Heat fuel gallons/year	Annual cost of fuel at \$3/gallon
302,000	\$97,546	8,749	\$26,246
<b>Geothermal energy scenario</b>			
Annual kWh electric	Annual cost of electricity at 15 cents/kWh <sup>13</sup>	Heat fuel gallons/year	Annual cost of heat at equivalent to \$1.5/gallon <sup>14</sup>
302,000	\$45,300	8,749	\$13,123
<i>Difference</i>	<i>\$52,246</i>		<i>\$13,123</i>
<b>Total savings potential</b>			<b>\$65,369</b>

In addition to providing fresh and local produce, a greenhouse operation would provide jobs for local residents. Sizing of the greenhouse will be a decision of the developer after assessing potential to sell fresh produce up the chain and/or to Trident. Because stakeholders expressed a desire to enter into the greenhouse project as a business venture, the estimates provided are for a greenhouse size that would provide more produce than the community of Akutan could consume.

**Tourism**

Tourism is an important industry in many parts of the state but has yet to take off in earnest in the Aleutians. It is estimated that six percent of Alaska visitors come to the Southwest region of the state. Southwest Alaska visitors are characterized as wealthy, older men who are drawn to

<sup>11</sup> The nearest community to Akutan for which HDD are reported.  
<sup>12</sup> The nearest community to CHSR for which HDD are collected.  
<sup>13</sup> The cost per kWh used to estimate the value of geothermal electricity used in greenhouse operations is based on estimates of the capital cost for Akutan geothermal project development presented in the Geothermal Matrix Memo prepared by Lorie Dilley for the Alaska Energy Authority (2009). These estimates are not accepted by all parties and they are based on limited information. If actual project development costs are higher then savings will decline, if they are lower then savings will increase.  
<sup>14</sup> The dollar value of this space heat is estimated using the \$1.50 per gallon equivalent reported by Chena Hot Springs Resort.

hunting and fishing lodge opportunities in the region. Niche markets that are opportunities for growth in tourism in the region include high-end fishing lodges, birding, eco-tourists, and generally, high margin/low volume tourism that targets upper income travelers who are interested in paying more for a unique experience.

The Aleutian Pribilof Island Community Development Association (APICDA) has commissioned several research projects related to tourism and has built lodges to promote the industry in the region. APICDA research has identified wealthy travelers looking for a unique experience as the target market for the region. Akutan has the benefit of both a hot springs and close proximity to one of the most abundant fisheries in the world. A local entrepreneur could develop a lodge at the hot springs, powered by geothermal energy, with the hot springs and proximity to fishing as the primary attraction.

Outside of transportation, energy demand by the tourism industry is small relative to other industries. A small lodge is estimated to consume four to five times the energy used by a typical residential customer for both heat and electricity.

**Table 12 Small Lodge Estimated Energy Demand**

kWh/year	Gallons/year space heat	Total cost: electric and heat
18,432	3,000	\$18,554

If all energy demands of a small lodge were met through diesel generation, 3,000 gallons would be needed for space heat and an additional 1,418 gallons for electricity generation for a total of 4,418 gallons. Providing for all energy demands of a small lodge using renewable geothermal energy would require approximately 132,701 kWh of electricity. If a combination of geothermal electricity and direct heat were utilized then the kWh requirements would be reduced.

## Cold Storage

Trident has expressed its intent (currently on hold) to build new cold storage to support processing activities. No specific information is available on the size, timing, or location of the project. Estimates for new cold storage facilities are based on academic research of groups of fish processors in the Pacific Northwest and in Asia. These studies report that 50 to as high as 85 percent of all electric use in fish processing plants is associated with freezing and cold storage facilities.<sup>15</sup> The table below estimates increased energy demand based on Trident’s current estimated electric use and gives a range of potential increases in cold storage capacity.

Table 13 Cold Storage Estimated Energy Demand

	15% increase in cold storage capacity	20% increase in cold storage capacity	25% increase in cold storage capacity
Electric demand – kWh	2,713,500	3,618,000	4,522,500
Diesel equivalent - gallons	208,731	278,308	347,885

Cold storage is both extremely energy intensive and absolutely essential to the fish processing industry. Utilizing geothermal power to increase cold storage capacity, either through electric generation or more likely through direct application, avoids the use of hundreds of thousands of gallons of fuel per year, eliminating roughly 3,089 tons<sup>16</sup> of potential carbon emissions.

<sup>15</sup> Nguyen Phuoc Dan, C. V. (2004). *Cleaner Production Potentials in Seafood Processing Industry: A Case Study from Ho Chi Minh City, Vietnam*.

Greg Kelleher, E. K. (2000). *Improving Energy Use and Productivity in West Coast and Alaskan Seafood Processing Plants*.

<sup>16</sup> Calculations of CO2 emissions based on Environmental Protection Agency methodology. <http://www.epa.gov/oms/climate/420f05001.htm>

## Summary of stakeholder interviews

Information Insights staff conducted extensive stakeholder and key informant interviews. Information was gathered about the proposed geothermal project, industry operations locally and regionally, and perhaps most importantly, perceptions and hopes for the future of the community. Residents of Akutan do not envision the city as the next Dutch Harbor, but they are excited about the prospect of creating sustainability through reduced energy costs and the potential for economic development opportunities that could bear fruit under a low energy cost scenario.

Stakeholders and key informants included:

- Stephen Arbor, Chief Engineer, Trident Seafoods
- Joe Bereskin, Mayor, City of Akutan
- Chris Hladick, City Manager, City of Unalaska
- Ted Meyer, Community Development Coordinator, Aleutians East Borough
- Amanda Kolker, Geologist & Project Manager, Alaska Geothermal
- Joe Kyle, COO/CFO, APICDA
- Dave Lockard, Alaska Energy Authority
- Neal McMahon, Alaska Energy Authority
- Peter Crimp, Alaska Energy Authority
- Tuna Scanlon, City Administrator, City of Akutan
- Eric Waterman, Aleut Corporation
- Zenia Borenin, President, Native Village of Akutan
- Jacob Stepetin, Tribal Administrator, Native Village of Akutan
- Robert Carroll Dose, Texas A&M, Greenhouse Specialist
- John Fulton, Assistant City Manager, City of Unalaska/Dutch Harbor
- Dan Winter, Utility Director, City of Unalaska/ Dutch Harbor
- Town Meeting: Community members, City Council members, Tribal members, City Staff present

The stakeholders and informants interviewed can be divided into three broad categories: State and regional representatives/stakeholders, area experts, and community representatives/stakeholders. Each of these unique stakeholder groups offer different and valuable points of view regarding the feasibility, impact, and opportunity presented by a geothermal energy resource at Akutan. We found that many of the people interviewed expressed overlapping ideas and views. In order to best present the array of thoughts, ideas, and opinions presented, we grouped the feedback received into three broad categories: 1) Geothermal as a part of an energy strategy, 2) Geothermal as a feasible and promising technology, and 3) Geothermal as a catalyst for economic development.

## **1. Geothermal as part of an energy strategy**

Geothermal is a renewable resource that advances the goals and strategies of a national and statewide energy policy of reducing fossil fuels and tempering the effects of climate change. The State of Alaska has an interest in the project as a funder of exploration and as part of its stated policy to encourage renewable resource development in Alaska. Interviews with stakeholders at the government level indicate that although Akutan is one of the primary focus areas for geothermal development in the state, its remote location, small population, and uncertain market are cause for caution as the project moves forward. Nevertheless, the State is supportive of the project as it recognizes the potential of the energy resource.

## **2. Geothermal as a feasible and promising technology**

The success of renewable energy strategies often pivots on the feasibility of the technology applied. Geothermal technology is a well-tested resource used worldwide. Experts in the area of geothermal resources at Akutan were interviewed to confirm information contained in written material about the proposed project and to gain as much detailed information as possible about the potential development. Experts cited successful geothermal projects in Klamath Falls Oregon, Iceland, and Russia. On a local level, experts cited the use of geothermal at Chena Hot Springs Resort, noting however, that this model uses lower temperature water and that the resource at Akutan is likely to be developed using much more conventional technology for higher temperature water. Project geologists verified, through academic research and personal communication, the high value of the geothermal resource at Akutan. Conversations with the City of Unalaska/Dutch Harbor cited similar exploration technology applied in the Makushin project.

Experts interviewed also talked about the importance of maintaining and sustaining the geothermal resource once the project is complete. There is concern about the local capacity to maintain a geothermal energy system. Questions were also raised about an adequate backup for the geothermal system should it be needed.

## **3. Geothermal as a catalyst for economic development**

Akutan has an unusual amount of infrastructure and capacity for a very small remote community, due in large part to the presence of Trident and the one percent raw fish tax that the City collects. The prospect of a reliable and renewable geothermal energy resource is at the center of current discussions on economic development. We talked with a number of experts in industry and economic development in the region, as well as with local entities, the public, and community stakeholders, to assess their perceptions of economic development opportunities in relation to the Akutan geothermal energy resource. The area of economic development overlaps the interests of stakeholders across the board, from state and regional entities to local governments and industry players. A summary is provided of the input received from stakeholders.

The Aleut Corporation (TAC) is a stakeholder in the project as the subsurface rights owner in Hot Springs Bay Valley. The Aleut Corporation is interested in maximizing profits for their shareholders. TAC is interested in the project as a means to that end, and there are shareholders in Akutan who might benefit from geothermal development, but few relative to the universe of TAC shareholders. TAC is open to the idea of being a development partner, if it makes economic sense to do so. TAC has a history of acting as both an owner and as a development partner in projects in the Aleutians, and has indicated a level of interest in working with the State in developing a quarry on Akun Island to support the airport project.

One of the topics that emerged in conversations with City staff and Akutan residents is the convergence of opportunities that is visible when one looks at the planned projects and the potential projects that could be realized with a stable, affordable energy resource. Stakeholders see having geothermal energy as a cornerstone of business development and community sustainability, with a focus towards maintaining their subsistence traditions while maximizing new entrepreneurial possibilities. There is no doubt that stakeholders have ideas for diversifying their economy and way of life, including expanding services and markets within the region, but a great deal depends on the energy resource.

#### *Trident Seafood, Corporation:*

Trident Seafood Corporation has expressed support for the project and has signed a Memorandum of Understanding agreeing to provide non-proprietary information necessary to evaluate the economic feasibility of the project. Trident holds proprietary some information about its operations and energy consumption. Trident has indicated that whenever feasible, it will lend its infrastructure to the project through use of staging areas, equipment, logistics coordination, and potentially transportation support for freight and personnel to and from Akutan, as well as other in-kind services. The potential to cut transportation costs associated with project development is potentially very valuable. The City and Trident have agreed that upon completion of the project feasibility assessment, the two parties will immediately begin work to determine if a power purchase agreement, including price, length, and amount of energy to be purchased, can be negotiated.

In its initial requirements, the State of Alaska indicated that having Trident at the table was optimal, especially since Trident creates the lion's share of energy demand in Akutan. From a State perspective, it is critical that Trident is on board with purchasing the power once it becomes available.

Conversations with community members and leaders indicated that they believe it is in Trident's best interest to be at the table, as the project offers an opportunity to diversify energy consumption practices and lower cost. Trident is perceived to be a part of the community and could benefit from the combined impact of the new harbor, airport, and energy resource.

### *Fishing Industry:*

There is moderate concern over the pollock fishery migrating North as well as concern about the political forces that are lining up to fight the interests of the commercial pollock fishery. Interests include subsistence, sport fishers, and environmentalists who see the pollock fishery as a threat to the king salmon run.

Aleutian Pribilof Island Community Development Association (APICDA) is a non-profit entity whose purpose is to create “stable local economies” in its member communities, of which Akutan is one. APICDA has done very little in the community of Akutan, primarily because there are communities with far fewer resources at their disposal, making them a higher priority. The purpose of the Community Development Quota (CDQs) is to serve very small and very remote communities that have limited resources. That said, APICDA has explored economic development opportunities in the region, and much of what it has learned is applicable to Akutan, as there are many shared variables that impact development.

### *Tourism:*

The idea of using the hot springs as an attraction is not new. Conversations with community members indicate that the springs have been in use throughout Akutan’s history. The potential development of geothermal energy combined with the prospect of the new airport, has created increased talk of tourism. Tourism in the area, however, still faces significant challenges

Chena Hot Springs Resort is able to attract large numbers of Japanese tourists to their resort during the winter months. It seems unlikely that Akutan would be able to attract this subset of hot springs travelers, since the primary attraction outside the hot springs in Chena is the ability to view Northern Lights.

APICDA has explored tourism in the region and shared its market assessments with the project team. For the most part, it appears that tourism in the Aleutians competes with sport fishing opportunities in Homer and other parts of Alaska that have mature industries and well-established support services available for visitors. Interviews indicated that likely Akutan tourists are few, they are well off and well traveled, they are looking for something different/extreme, and they expect high-quality service. In addition, marketing to this group is expensive, and the number of visitors is still relatively small. On the other hand, contacts in Unalaska/Dutch Harbor reported an unusually high number of cruise ships in the region this summer.

### *Akutan and Dutch Harbor:*

Insights on the potential competition between the neighboring communities indicate that there is more interest in a complementary relationship than an adversarial one. Members of the Akutan community expressed that they do not want to become “the next Dutch” and instead want to diversify their opportunities and maintain their community identity. Dutch Harbor contacts indicated that they are keeping a close eye on the developments in Akutan and that they would be interested in collaborating whenever possible in coordinating exploration efforts to better manage costs.

Dutch Harbor is much bigger in every respect, including population, infrastructure and industry development (deep water port). While some expressed the opinion that Akutan could possibly be competition, it was qualified by “but not anytime soon,” since presently Dutch Harbor has support services and fuel. It is unlikely that industry presently at Dutch would relocate to Akutan. There is interest to see how industry will react to the projects at Akutan as they come to fruition.

### *Other Opportunities:*

*Northern Route:* The opening of the Northern Route brings a new element of opportunity to Western Alaska and the Aleutian chain, but it is not clear what those opportunities are. Some interviewees are skeptical of the benefit to Akutan despite the fact that the major thoroughfare for ships going from Seattle to Asia (or vice versa) goes past the vicinity of Akutan. The experience often cited relating to the Northern Route is that of small towns along major highways; however, most people when questioned further recognize that the parallels are not very strong. It is unclear at this point, what a commercial outpost opportunity would look like for Akutan and the region.

*Drilling:* Stakeholders in Akutan and the region see positive impacts from future potential oil drilling in the region, but no specifics were mentioned beyond increased rescue activity.

*Cold Storage:* Additional cold storage in Akutan is an attractive opportunity if cheap geothermal energy is available. Storage would not only support existing Trident operations but could also provide storage of produce if greenhouses are developed. Trident has plans (though they are currently on hold) to develop additional cold storage for its plant operations.

*Green houses:* Informants interviewed believe that a geothermal-powered greenhouse is a feasible opportunity. There is support from the community and the existing technology makes it very probable. However, initial investments could be substantial depending on the specifications of the greenhouse. An expert interviewed believes that the cost of a greenhouse is about \$100 to \$150 per square foot, not including transportation costs. Variables that need to be examined prior to arriving at a business plan include: market data, distribution logistics, cost savings offered by geothermal energy, capital expenditures, labor component, solubles in water, and perhaps most important, distance from geothermal source.

*Cattle:* Potential development ideas include better utilization of cattle currently on the island. There is a herd of roughly 300 head of cattle located on both Akun Island and Akutan Island. The Akutan Corporation is interested in creating a place to slaughter cattle so that the meat can be used for local consumption and potentially for sale to other Aleutian communities.

*Community population:* Stakeholders mentioned that while the population of Akutan has remained stable, there are notable population gaps. Current population models for Alaska do not forecast population at the community level, especially when the base numbers are so low, because of the statistically volatile nature presented by such small numbers. However, some residents believe that geothermal energy and its effect on opportunity would provide an

incentive for residents to come back or not leave in search of jobs. Job creation is key, according to leaders of the community.

*Buildable land:* Stakeholders mentioned the challenges posed by the landscape in Akutan for potential housing to accommodate an increase in population, even if it were temporary. The City sits on a stretch of land with very little room for growth. Residents speculate that any residential growth would either be on Akun Island, or would occur by leveling land at high grades on Akutan Island.

## Next steps: Towards a business plan

This report is a high-level view of the current energy demands of Akutan, Trident Seafoods Inc., and the proposed and potential projects on the contemplated geothermal energy resource. The report provides what the authors have verified and deduced from available information, research, and the stakeholder assessment. There are next steps necessary on all fronts, including drilling, continued exploratory funding, funding beyond the exploration phase, updating of the City's Community Plan to incorporate the current challenges and opportunities, and the development of a business plan.

There are many components and variables for which current information is insufficient to complete a bankable business plan. The State of Alaska has made it its stated policy to support renewable resource development, and to that end it is the appropriate funder of exploration activities which are by their nature extremely uncertain, making them a high risk and unattractive investment for private investors and traditional lenders. It is the intention of the City of Akutan and its partners to develop a project that will be attractive to outside private investors and traditional lenders and will not rely solely on state and other government funds.

The most important next step is clearly defining the resource so that a detailed analysis can be conducted on the cost side of the equation. Once costs are fully understood, the developer will be in a position to negotiate with potential buyers, attract funding, and create a rate structure that best serves the needs of the new utility and the community in which it operates. Given the scope of this report, the authors believe the following should be addressed as part of the business plan or as a preliminary step to inform the business plan.

- Supply side analysis: the current report focuses on looking at the current and foreseeable energy demands on the geothermal resource. The next step is to research the supply side of the equation. While this next step requires more information than is currently available, a plan and strategy for completing the supply side analysis should be designed, including which data sources to be tapped and type of expertise required.
- Workforce analysis: The business plan should look at the workforce/labor demands of the geothermal project on Akutan. What is the necessary training to maximize local hire?
- Infrastructure analysis: The business plan should look at the infrastructure (transportation and communications) needs of the project and how these will be met.
- Housing/accommodation opportunity and need: The business plan should have a component addressing the buildable land issues for permanent opportunities as well as accommodation opportunities for a temporary workforce. Is there a plan in place by the planning commission?
- Funding sources: The business plan should articulate the City's strategy for obtaining funding for the geothermal project completion: private vs. public, examine the City's ability to afford the project given different funding scenarios, examine the feasibility of public debt, and/or taxing or fees. The business plan should address potential partnerships.

- Impact Analysis of planned projects: The business plan should address the known or perceived impacts of the airport and harbor on the community on an economic, workforce and social level. The plan should also look at developing a strategy to measure the projects' impact using a more traditional multiplier model to track the leakage of the cash investments into the project.
- Sustainability of the project: The business plan should contain a plan for the operational sustainability of the geothermal plant, addressing issues such as maintenance, licensed operators, schedule for repair or replacement of components, energy backup, and safety.
- Marketing/Outreach effort: The business plan should contain a plan for educating the community on the benefits and potential challenges of the geothermal project, including costs, safety, and potential usages of the generated power.

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