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Final Report

Comprehensive Renewable Energy Feasibility Study for Sealaska Corporation

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Executive Summary

Comprehensive Renewable Energy Feasibility Study for Sealaska Corporation

Purpose

The purpose of this project was to conduct a comprehensive feasibility study to determine the potential sustainability of wind and/or small hydroelectric power plants on Southeast Alaska native village lands. The long-term objective is to supply all or a portion of the villages' electricity from local, renewable energy sources in order to reduce costs, provide local employment, and reduce power outages. An additional objective was for the villages to gain an understanding of the requirements, costs, and benefits of developing and operating wind or small hydroelectric power plants.

Background

Sealaska Corporation was formed as the Regional Native Corporation for Southeast Alaska under the Alaska Native Claims Settlement Act (ANCSA), passed by Congress in 1971. It includes 12 village/urban corporations in Southeast Alaska and represents over 17,000 shareholders, approximately half of whom live in Southeast Alaska. Most villages are isolated from any central electric transmission and use diesel-electric systems for power generation. For diesel powered plants, the cost of electricity is $0.30 – 0.35¢ per kWh, after deducting subsidies from the State of Alaska. This makes the villages prime candidates for deploying renewable energy sources.

Scope of work for this project

Wind energy: Prescreening of potential sites; field surveys by a wildlife biologist, meteorologist, and wind power development specialist to select best potential sites; installation of anemometry, and analysis of wind data to determine if the wind is sufficient for economic viability of a wind power station. If one or more sites were identified that appeared to be economically viable, a business plan would be prepared.

Small hydro: Analysis of past and current studies of the potential small hydro sites to determine if changing conditions, such as technology improvements or materials cost changes, indicate that one or more projects may now be economic. Includes preliminary analyses of environmental, permitting, and economic considerations.

Project Team

The project team consisted of very experienced personnel in their respective areas of expertise. This report is based on their collective work and reports. The team members are:

Project Coordinator: Sealaska Corporation, Michele Metz, Assistant Lands Manager
Technical Coordinator and Wind Energy Consultant: Springtyme Company L.L.C., Bob Lynette

Wildlife: Northwest Wildlife Consultants, Inc., Karen Kronner
Meteorologist: John Wade Wind Consultants, John Wade
Anemometry Installation: Met Tower Services, Mike Sailor, Chris Sailor, Jeff Baker
Micro/Small Hydroelectric Power: Alaska Power & Telephone, Larry Coupe
U.S. Department of Energy: Larry Flowers (DOE Monitor)

Project Work

Wind Energy

Database - A database was assembled for all of the candidate sites in Southeast Alaska, including location, demographics, electricity supply and demand, existing and planned transmission interties with central generation, topographical maps, macro wind data, and contact personnel.

Pre-field work analyses – Twenty-three sites were analyzed to eliminate sites that were not likely candidates. Criteria used were: (1) macro wind data from weather stations and airports, (2) probability of viable winds based on topography, (3) schedule for bringing intertie to candidate sites, and (4) wildlife information that might preclude deploying wind turbines. Additionally, communications with the Alaska State Energy Office and tribal members at the villages were conducted to ensure that all parties were working together and to gather anecdotal information. Five villages were selected for site visits.

Meetings with cognizant personnel and field analyses – Field trips were conducted at the five candidate villages that were deemed most likely to have viable wind resources. Meetings were held with local village and utility leaders and the requirements, costs, and benefits of having local renewable energy facilities were discussed. The potential sites were looked over and GPS readings were taken. Two sites were selected based on their needs and the probability of having viable wind resources – Hoonah and Yakutat.

Hoonah: No wind resource data was available at Hoonah, but its location – with a 1,410 ft. ridge above the village made for an attractive site. Additionally, AT&T Wireless owns a 100 ft. Rohn tower on the ridge that provided an inexpensive way of installing anemometry at the site. The anemometry was installed in March 2005, and the first data successfully retrieved in September 2005. A report was prepared by meteorologist John Wade that contains the details of the measured wind resources and preliminary energy production projections. (Attachment A to this report.)

Yakutat: There was one existing anemometer tower that was not well sited and for which only scattered, unreliable data was available. Two additional sites were identified and instrumented with 30-meter NRG towers and anemometry. Additionally, the original site was retrofitted with modern NRG anemometry. Yakutat Power, the local utility, provided help with personnel and equipment. Data was also collated from an analog wind speed instrument used by the local airport. Data was collected for more than 12 months from the three NRG stations. An off-site reference station was identified and used to project long-term wind resource characteristics at the two stations. A report was prepared by meteorologist John Wade that contains the details of the measured wind resources and energy production projections. (Attachment B to this report.) A

preliminary financial analysis of a hypothetical wind power station was prepared and used to gauge the economic viability of installation of a multi-megawatt wind power station.

Small Hydroelectric

The study focused on the communities associated with Sealaska Corporation that use diesel-electric for electricity and have a potential for hydroelectric power generation[1]. Most of them have had at least an assessment of hydroelectric potential, and a few have had feasibility studies of potential hydroelectric projects. The communities, their existing utilities, and identified potential hydroelectric projects are shown in the following table.

Sealaska-Affiliated Communities with Hydroelectric Potential

Community	Existing Utility	Potential Hydroelectric Projects
Angoon	Inside Passage Electric Cooperative (IPEC)(1)	Thayer Creek
Hoonah	IPEC	• Gartina Creek • Water Supply Creek
Hydaburg	Alaska Power & Telephone	Reynolds Creek
Kake	IPEC	Cathedral Falls Creek
Klukwan	IPEC	Walker Lake
Yakutat	Yakutat Power	Chicago Harbor

(1) Previously known as Tlingit & Haida Regional Electrical Authority

Findings and Conclusions

Wind Energy

Although there are several known windy spots in Southeast Alaska (e.g., Skagway), we were not able to identify any isolated Alaska Native villages that utilize diesel-electric power generation that have commercially viable wind resources. The two sites that were judged to have the best potential were Yakutat and Hoonah, but as shown below, neither site has commercially viable wind resources.

Hoonah: The average wind resources measured on the 1,417 ft. elevation ridge above the village were very low, with a six-month average of 3.9 mps (8.7 mph) at 60 meters above ground level. The annual average wind speed is estimated at 4 mps (9 mph). Using today's commercial utility-grade wind turbines' performance and costs, yields an annual capacity factor of less than 10%

[1] The complete study is contained in Attachment C to this report.

and a cost of energy of approximately 26¢ per kWh. Hoonah is not a commercially viable site for wind powered energy generation without very substantial grant funding.

Yakutat: The average wind resources measured at three sites were very marginal, with an annual average of 4.0 mps (9 mph) at 60 meters above ground level. The best site had an annual average of 4.2 mps (9.4 mph) at 60 meters. Using today's commercial utility-grade wind turbines' performance and costs yields an annual net capacity factor of approximately 12% and a cost of energy of approximately 19¢ per kWh. Unless grant funds were available, the Yakutat site is not commercially viable for wind power at this time.

The following tables show the necessary grant funding and low-cost financing that would be required to justify wind power projects at Hoonah and Yakutat. A fixed charge rate of 9% represents 5% financing, since 4% of the rate is required to amortize the plant. Conventional financing is represented by a 14% fixed charge rate.

Impact of Low-cost financing and/or Grant Funds Applied to Hoonah

Fixed charge rate	Cost of Energy ($/kWh)					
	No Grant Financing	With Grant (% of total capital cost)				
		10%	20%	30%	40%	50%
9%	0.26	0.23	0.21	0.19	0.17	0.15
10%	0.27	0.25	0.23	0.20	0.18	0.16
11%	0.29	0.27	0.24	0.22	0.19	0.16
12%	0.31	0.28	0.26	0.23	0.20	0.17
13%	0.33	0.30	0.27	0.24	0.21	0.18
14%	0.35	0.32	0.29	0.26	0.22	0.19

Impact of Low-cost financing and/or Grant Funds Applied to Yakutat

Fixed charge rate	Cost of Energy ($/kWh)					
	No Grant Financing	With Grant (% of total capital cost)				
		10%	20%	30%	40%	50%
9%	0.19	0.17	0.16	0.14	0.13	0.11
10%	0.20	0.19	0.17	0.15	0.13	0.12
11%	0.22	0.20	0.18	0.16	0.14	0.12
12%	0.23	0.21	0.19	0.17	0.15	0.13
13%	0.25	0.22	0.20	0.18	0.16	0.14
14%	0.26	0.24	0.21	0.19	0.17	0.14

Small Hydroelectric Power

None of the sites examined are financially viable without substantial grant funding. The following table contains a summary of the feasibility of new hydroelectric projects that could serve the communities.

Community	Project	Construction Cost ($2003)	Economic Feasibility	Environmental Feasibility
Angoon	Thayer Creek (1,000 kW)	$8,700,000	Low	Moderate
Hoonah	Gartina Creek (600 kW) Water Supply Creek (600 kW)	$3,750,000 $3,330,000	Moderate Moderate	Moderate High
Hydaburg	Reynolds Creek (5,000 kW)	$9,400,000	Low	High
Kake	Cathedral Falls Creek (800 kW)	$5,300,000	Moderate	Moderate
Klukwan	Walker Lake (1,900 kW)	$9,400,000	Low	Unknown
Yakutat	Chicago Harbor (1,400 kW)	$9,300,000	Moderate	Unknown

Interconnection to another utility is possible for most of these communities, and may be a viable alternative to either diesel or hydroelectric generation. The possible transmission interconnections to the communities are summarized in the following table.

Interconnection Potential Summary

Community	Interconnection Potential
Angoon	Low
Hoonah	Moderate
Hydaburg	High
Kake	Moderate
Klukwan	High
Yakutat	Very low

Combining the most important factors for the feasibility of new hydro facilities yields the following table.

Community	Project	Economic Feasibility	Environmental Feasibility	Interconnection Potential	Required Grant (% of Cost)
Angoon	Thayer Creek	Low	Moderate	Low	80%
Hoonah	Gartina Creek	Moderate	Moderate	Moderate	45%
	Water Supply Cr.	Moderate	High	Moderate	40%
Hydaburg	Reynolds Creek	Low	High	High	100%
Kake	Cathedral Falls Cr.	Moderate	Moderate	Moderate	55%
Klukwan	Walker Lake	Low	Unknown	High	80%
Yakutat	Chicago Harbor	Moderate	Unknown	Very low	55%

Negative factor
Neutral factor
Positive Factor

Hoonah, Kake, and Yakutat appear to have the best potential for new hydro facilities. However, it should be noted that very little work has been done on the Yakutat site, and further fieldwork may result in changes to the assessment.

This final report was prepared by Springtyme Company L.L.C. (Bob Lynette) and is based on the team's collective field trip reports, meteorological data, analyses, and discussion/meeting notes with team members and others as cited herein.