6. Energy/Renewable Energy

The major population centers in Southeast Alaska have been well served for decades with renewable hydroelectric power. The cost of power in these communities is among the lowest in all of Alaska. These communities want to ensure new renewable energy projects are developed so their energy supply remains abundant and at the lowest attainable price. These communities include Ketchikan, Wrangell, Petersburg, Sitka and Juneau.

Other communities in Southeast Alaska are served with hydroelectric facilities but their electric rates are higher than those in the major southeast communities. Ratepayers in those communities would like lower cost power and they want continued development of new hydroelectric generation (or other renewable alternative projects) so their energy supplies remain abundant and at lowest attainable cost.

The more remote and isolated rural communities in Southeast Alaska, do not have access to renewable energy, and rely on diesel generation to meet their energy needs. Typically electricity costs are high, in part due to the costs of the diesel fuel for power generation. While residential electricity costs are partially offset by the Power Cost Equalization program, commercial and industrial users face very high rates. Most of these rural communities in southeast Alaska are not able to support significant economic development because of this.

With the exception of the Prince of Wales Island, Southeast Alaska Power Agency (SEAPA) and Upper Lynn Canal transmission networks, Southeast Alaska is not interconnected with transmission lines. Southeast Alaska has a rugged and remote topography, and because of this construction costs for transmission infrastructure can be very high. This has hampered build-out of an interconnected electrical transmission system in Southeast Alaska.

With its geography of mountainous terrain, numerous hydroelectric power water resources, relatively warm climate and abundant precipitation, consideration of renewable resources must be a key part of energy planning for Southeast Alaska. The area also has known sources of tidal energy, evidence of surface geothermal energy release and locations where the wind is known to blow in frequency and speed to make power generation with wind turbines possible. The vast forested areas of southeast could provide for various types of biomass energy solutions.

The United States Forest Service, custodian of over 90% of Southeast Alaska lands owned by the Federal Government, has a Tongass Land Management Plan, which defines southeast Alaska land corridors where roads and utilities may be routed. There are existing energy projects underway to construct new generation facilities and electrical interties, many of which are thought to be routed in and through these corridors.

Electrical Rates

Southeast Alaska's hydropower resource is one of the region's great strengths. Communities on hydroelectric power, particularly those connected via transmission lines that provide redundancy and back-up, have some of the least expensive electricity rates in the State. This resource is clean, "green," and essentially unlimited in our rainforest climate.

In December of 2010, Sheinberg Associates conducted a small commercial electricity survey based on a monthly use of 1,500 kWh across Southeast Alaska. According to the findings, 18 communities in the region use hydroelectricity. In diesel dependent communities, high power rates are a major challenge for commercial users. The average small commercial rate for 1,500 kWh for diesel in the region is $622 per month, or 213 percent more on average than commercial users in communities with hydroelectric power. The full results of the Southeast Alaska small commercial energy survey is below:

Small Commercial Rate for 1,500 kWh/month by Southeast Alaska Community, November 2010

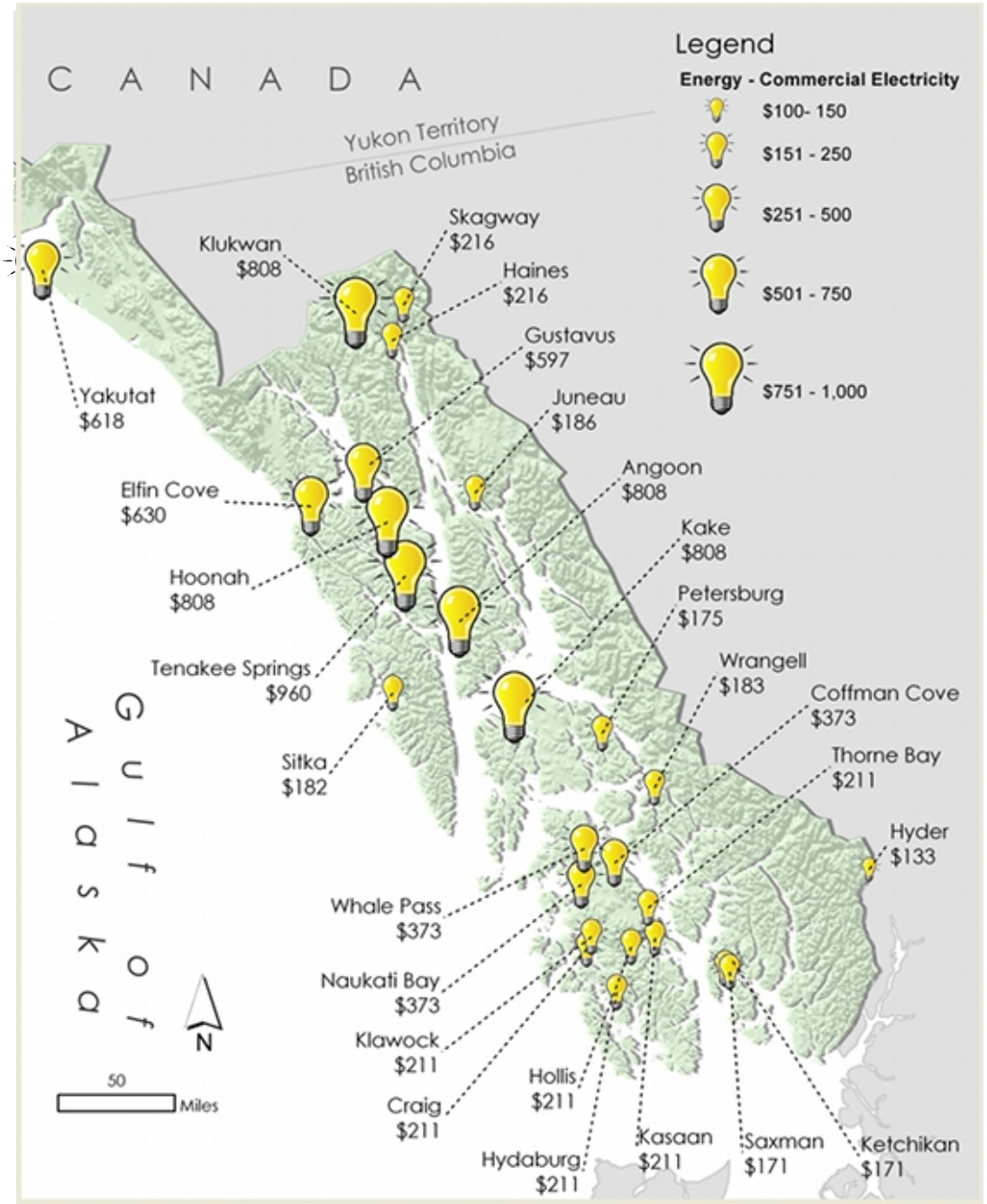
Community	Electrical Utility	Fuel Source	Rate 1	Rate 2**	Monthly Fee	Total	**Notes for Rate 2*
Angoon	Inside Passage Electrical Cooperative (IPEC)	Diesel	$0.5680	$0.5090	$15.00	**$808**	Rate 2 is for above 500 kWh
Coffman Cove	Alaska Power & Telephone Company (AP&T)	Diesel	$0.2399		$12.93	**$373**	
Craig	AP&T	Hydro	$0.1320		$12.93	**$211**	
Edna Bay	Individual power supply						
Elfin Cove	Elfin Cove Electrical Utility	Diesel	$0.4200			**$630**	Includes $0.1066/kWh fuel surcharge.
Game Creek	Individual power supply						
Gustavus	Gustavus Electric Company	Hydro	$0.3899		$12.31	**$597**	
Haines	AP&T	Hydro	$0.1355		$12.93	**$216**	
Hollis	AP&T	Hydro	$0.1320		$12.93	**$211**	
Hoonah	IPEC	Diesel	$0.5680	$0.5090	$15.00	**$808**	Rate 2 is for above 500 kWh
Hydaburg	AP&T	Hydro	$0.1320		$12.93	**$211**	
Hyder	BC Hydro	Hydro	$0.0816		$5.15	**$133**	4% rider rate included. Demand; under 35 kW free, over that $4.18 per kW.
Juneau	Alaska Light and Power Company	Hydro	$0.1120		$18.80	**$187**	Power supplied by facilities at Snettisham and Dorothy Lake
Kake	IPEC	Diesel	$0.5680	$0.5090	$15.00	**$808**	Rate 2 is for above 500 kWh
Kasaan	AP&T	Hydro	$0.1320		$12.93	**$211**	
Ketchikan	Ketchikan Public Utilities	Hydro	$0.0897		$36.00	**$171**	No monthly fee in winter. Demand charge per kW of max demand per month: $2.91 in excess of 25 kW.
Ketchikan	Ketchikan Public	Hydro	$0.0897		$36.00	**$171**	No monthly fee in winter. Demand charge per kW of

Community	Electrical Utility	Fuel Source	Rate 1	Rate 2**	Monthly Fee	Total	**Notes for Rate 2*
Gateway Borough	Utilities						max demand per month: $2.91 in excess of 25 kW.
Klawock	AP&T	Hydro	$0.1320		$12.93	**$211**	
Klukwan	IPEC	Diesel	$0.5680	$0.5090	$15.00	**$808**	Rate 2 is for above 500 kWh
Kupreanof	Individual power						
Metlakatla	Metlakatla Power & Light	Hydro	$0.0900			**$135**	
Naukati Bay	AP&T	Diesel	$0.2399		$12.93	**$373**	
Pelican	Pelican Utility Company	Hydro & Diesel				**NA**	Not able to contact.
Petersburg	Petersburg Municipal Light & Power	Hydro	$0.1110		$9.00	**$176**	Demand charge only for large commercial.
Point Baker	Individual power supply						
Port Alexander	Individual power supply						
Port Protection	Individual power supply						
Saxman	Ketchikan Public Utilities	Hydro	$0.0897		$36.00	**$171**	No monthly fee in winter. Demand charge per kW of max demand per month: $2.91 in excess of 25 kW.
Sitka	Sitka Electrical Department	Hydro	$0.1417	$0.0903	$21.25	**$182**	Rate two is from 501 to 10,000 kWh. Demand, up to 25 kW no charge, over that $3.90 per kW for max demand.
Skagway	AP&T	Hydro	$0.1355		$12.93	**$216**	
Tenakee Springs	City of Tenakee Springs	Diesel	$0.6400			**$960**	
Thorne Bay	AP&T	Hydro	$0.1320		$12.93	**$211**	
Whale Pass	AP&T	Diesel	$0.2399		$12.93	**$373**	
Wrangell	Wrangell Municipal Light and Power	Hydro	$0.1160		$9.00	**$183**	Negotiates rates for Industrial
Yakutat	Yakutat Power	Diesel	$0.2670	$0.2420		**$682**	Rate 2 is for between 1000 kWh and 1500 kWh. Fuel surcharge changes monthly with price of fuel; as of December 2010, $0.1960/ kWh.

Sources: Inside Passage Electric Cooperative. www.myipec.org and personal; communication; Alaska Power Company; Schedule of General Rules, Regulations and Rates, 2010 ; Personal Communication: Jane Button, Elfin Cove; Gustavus Electrical Company, Inc. www.gustavuselectric.com and personal communication; City of Ketchikan, Municipal Code, Chapter 11, Section 8, Electrical Rates; BC Hydro www.bchydro.com/youraccount/content/electricity_rates.jsp; Petersburg Municipal Power & Light Company; Alaska Electrical Light & Power Company www.aelp.com/rates; DCCED www.commerce.state.ak.us/dca; Personal Communication, Anna Holmes, City of Ketchikan, Municipal Code, Chapter 11, Section 8, Electrical Rates; Sitka Municipal Code, Chapter 15, Electrical Rates; City and Borough of Yakutat; Yakutat Power Website. www.yakutatak.govoffice2.com City and Borough of Wrangell; www.wrangell.com/government/departments/articles/index.cfm?Department=39;
*All hydro communities have mandated diesel back up.

The following map presents the results of the survey graphically.

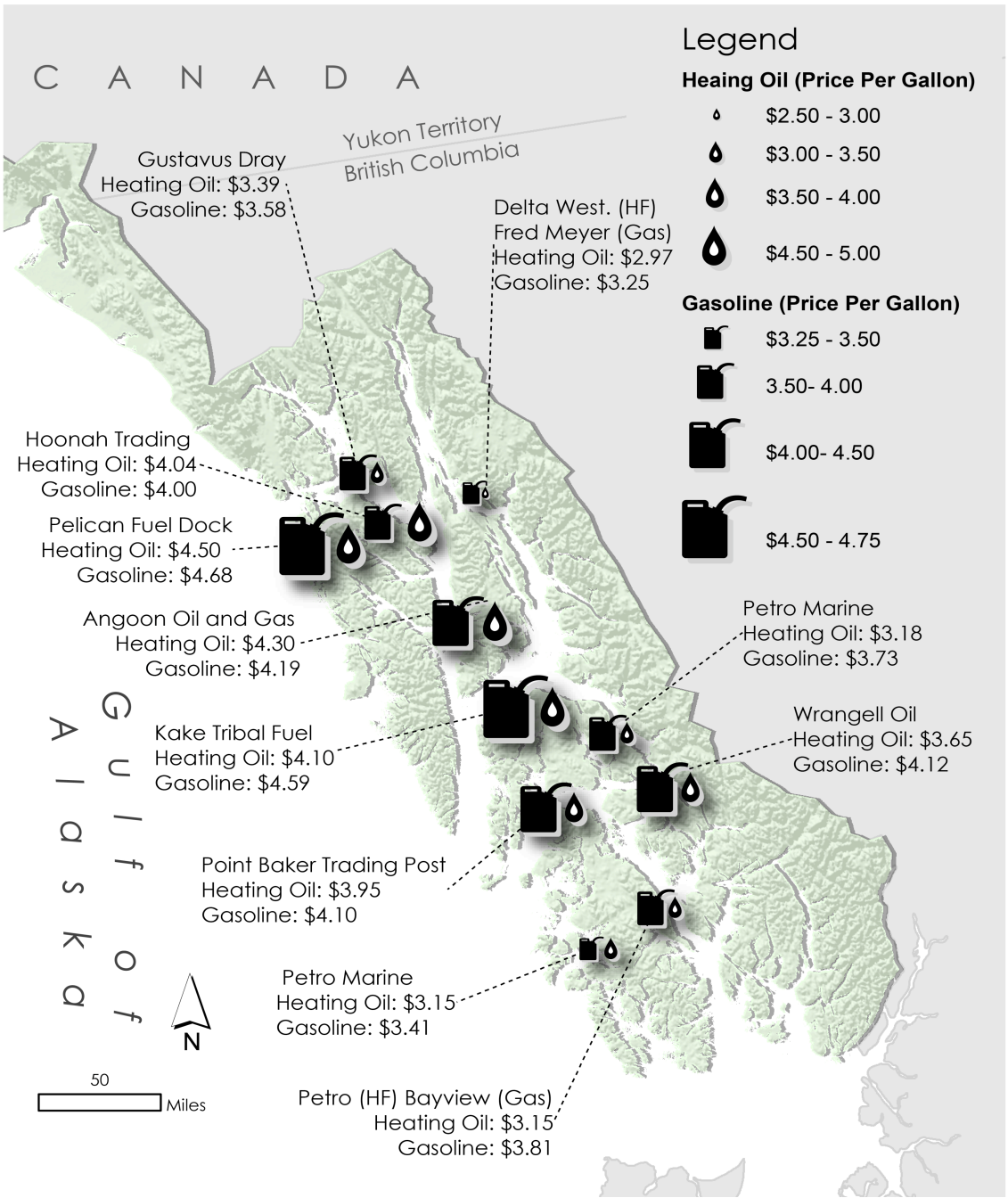
Small Commercial Rate for 1,500 kWh/month by Southeast Alaska Community, November 2010



Source: Inside Passage Electric Cooperative; Alaska Power Company; Personal Communication: Jane Button, Elfin Cove; Gustavus Electrical Company, Inc.; City of Ketchikan, Municipal Code, Chapter 11, Section 8, Electrical Rates; BC Hydro; Petersburg Municipal Power & Light Company; Alaska Electrical Light & Power Company; DCCED; City of Ketchikan; City and Borough of Yakutat; City and Borough of Wrangell.

The following map presents the comparative June 2010 prices for heating fuel and gasoline in Southeast Alaska, according to the Alaska Department of Commerce.

Fuel Prices in Southeast Alaska, June 2010



Source: Current Community Conditions: Fuel Prices Across Alaska - June 2010 Update 2010
http://www.commerce.state.ak.us/dca/StaffDir/GetPubl.cfmRenewable Energy

For many years, the State of Alaska, federal agencies, municipal and Tribal governments, public and private utilities, Southeast Conference, and the private sector have all been paying increased attention and devoting increased resources to the development of renewable energy infrastructure. The growing interest reflects the need to stabilize, and where possible, lower the cost of power and heat by reducing reliance on expensive diesel, stimulate economic growth and job creation, shift from non-renewable sources of power (oil) to renewable sources (hydro, tidal, wave, biomass, geothermal, solar), and reduce carbon and greenhouse gas emissions.

Keenly aware of the impact of high-cost energy, the US Forest Service notes that "The high cost of electrical power impeded economic development in the region, yet the region is rich in hydro power potential." (Economic Analysis of Southeast Alaska: Envisioning a Sustainable Economy with Thriving Communities, May 2010 R10-MB-725)

During the 2010 Alaska Legislative Session the State passed historic energy policy legislation. By enacting SB 220 and HB 306, Alaska energy policy was established in statute. This legislation is the blueprint for future action by the state and citizens to guide the development of renewable energy infrastructure and capacity that will reduce the use of imported diesel as a primary fuel source for electricity, space heating and transportation.

Renewable energy sources in Southeast Alaska include hydro power, biomass, geothermal, current, wave, tidal, wind, solar and more. The following goals and opportunities are linked to renewable energy:

Develop energy infrastructure and capacity to reduce reliance of businesses and communities in Southeast Alaska off of expensive diesel and onto a renewable energy system, thereby stabilizing, and in many communities, lowering the cost of power thus removing a barrier to business development and expansion.

Support the timber industry through the timber sales program, by utilizing utility grade timber and wood waste, thinning wood and slash, and small wood for wood pellet and other biomass heating and energy.

Invest in smaller scale, local energy sources wherever appropriate for commercial and residential space heating needs. Examples might include ground source heat exchange for homes, Juneau's new swimming pool and airport terminal expansion project, as well the Craig wood-chip fired school/pool heating project.

Serve as a research, testing, and product development location for future energy technology advancements, such as wave and tidal energy.

Establish policies, goals and action plans to convert Southeast Alaska's electrical, heating and transportation needs to local, renewable energy sources.

Consideration of the highest and best use of each form of renewable energy available to southeast Alaska, to include the needs of the residential customer, business and industrial needs and the potential for exporting energy from southeast into the Canadian grid and/or a possible connection into the South-central Alaska electrical grid network.

Hydropower

There are currently 25 hydropower facilities in Southeast Alaska generating just over 200 MW of electrical power. Some are very small facilities powering isolated hatcheries; others are linked together through transmission lines that power the region's communities. Nearly three-quarters of Southeast Alaska's total electrical generation of 277 MW comes from hydro power (if non-operating diesel back up capacity to the total, Southeast Alaska could produce 386 MW). Electrical transmission lines connect sub-regional grids in Skagway and Haines, Juneau and the Greens Creek Mine, POW Island communities and Ketchikan, Wrangell and Petersburg to share hydro power.

Hydro power projects currently under construction include a 5 MW project on Reynolds Creek on Prince of Wales Island with several other regional projects proposed or being studied.

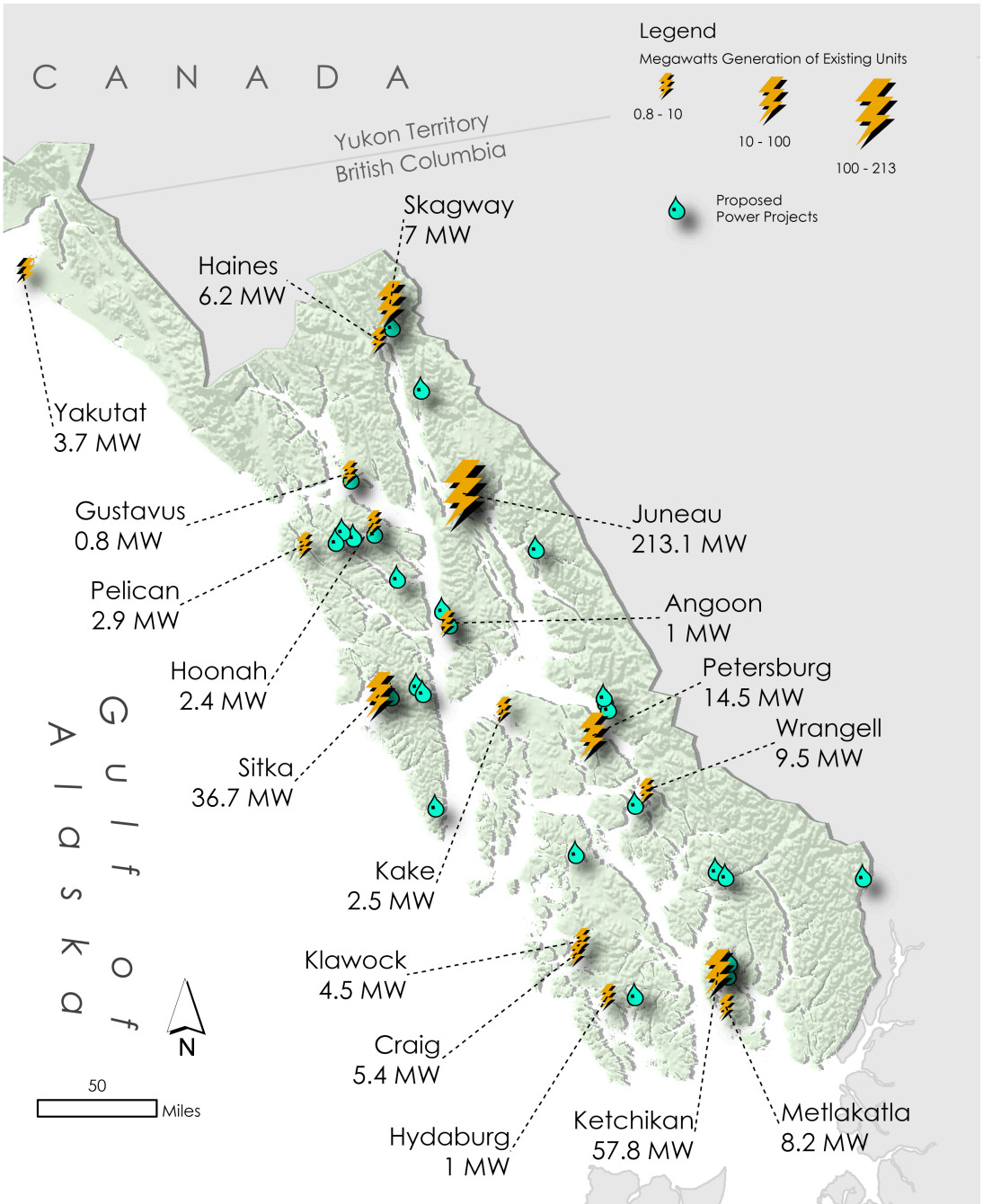
Hydroelectric Power Facilities in Southeast Alaska

Community/Area Served	Facility	MW	Note
Wrangell-Petersburg-Ketchikan	Swan Lake	22.4	
Wrangell-Petersburg-Ketchikan	Tyee	20.0	
Wrangell-Petersburg-Ketchikan	Burnett River Hatchery	0.08	run of river
Skagway-Haines	Dewey Lakes	0.9	run of river
Skagway-Haines	Goat Lake	4.0	
Skagway-Haines	Kasidaya Creek (Otter Lake)	3.0	
Sitka	Blue Lake	2.0	
Sitka	Green Lake	18.6	
E Baranof Is	Hidden Falls Hatchery		
S. Baranof Is (Armstrong Keta)	Jetty Lake, Betty Lake	0.2	
Prince of Wales/Klawock	South Fork Black Bear	2.0	run of river
Prince of Wales/Klawock	Black Bear Lake	4.5	
Petersburg	Crystal Lake	2.0	
Pelican	Pelican Dam	0.7	
Metlakatka	Chester Lake	1.0	
Metlakatka	Purple Lake	3.9	
Ketchikan	Beaver Falls	5.4	
Ketchikan	Ketchikan Lakes	4.2	
Ketchikan	Silvis Lake	2.1	
Juneau	Annex Creek	3.6	
Juneau	Gold Creek	1.6	run of river
Juneau	Salmon Creek	6.7	
Juneau	Snettisham	78.0	
Juneau	Lake Dorothy	14.3	
Gustavus	Falls Creek	0.8	
Total Current Capacity		201.9	
Planned/Under Development			
Angoon	Thayer Lake	1	design stage, run of river
Sitka	Blue Lake Hydro Expansion		Final Design
Sitka	Takatz Lake Hydro	28	Feasibility
Skagway-Haines	Connelly Lake	10.0	design stage
Prince of Wales	Reynolds Creek	5.0	Construction 2010
Hoonah	Gartina & Water Supply Creek	.6	design/permitting
Metlakatla	Triangle lake Hydro	3.0	proposed
Ketchikan-Saxman	Whitman Lake	4.6	construction ready
Wrangell-Petersburg-Ketchikan-Kake	Ruth Lake		Preliminary FERC license review
	Scenery Lake		
	Cascade Creek		

Sources: Renewable Energy Alaska Project www.alaskarenewableenergy.org; Tongass National Forest Energy Facilities, Feb 2010

The following map presents the megawatt generation of all existing units in Southeast Alaska, along with showing the location of proposed power projects.

Southeast Alaska Megawatt Generation of Existing Units 2010 and Proposed Power Projects



Sources: US Forest Service, US Energy Information Administration http://www.eia.doe.gov/cneaf/electricity/page/capacity/capacity.html, AEL&P, Southeast Conference, and the Nature Conservancy.

Biomass

Biomass energy is one of several near-term and long-term opportunities in Southeast Alaska. It could help moderate the cost of home and commercial heating, create uses for waste products, and bring an additional revenue source to mills. The primary focus is on developing wood-fired systems that displace fuel oil for heating public facilities. The above graphic shows the cost of heating oil in Southeast Alaska. The high cost is a reflection of the fact that all heating oil must be barged to the region, which is why alternative sources of fuel are of such great interest.

Several studies have examined how Southeast Alaska sources of biomass such as wood chips, hog fuel, thinning slash, and small trees could be used to manufacture products such as medium density fibreboard and to generate heat and electricity.

A February 2009 Beck Group study analyzed the economics of a variety of young growth and transition related possibilities on Prince of Wales Island. The study found that the least to most costly wood residues for producing energy are 1) wood residues from lumber manufacturing; 2) improved timber harvest log utilization; and 3) silviculture treatments such as pre-commercial and commercial thinning.

Those studying wood pellet opportunities in the Tongass suggest that at least a 10,000 ton/year demand is needed to sustain a local wood pellet plant. Sealaska Corporation in downtown Juneau just installed a wood pellet boiler, which will use about 250 tons/year to heat its four-story office. With current boilers in Sitka, Ketchikan and Juneau nearing the end of their design life, the US Coast Guard is seriously considering converting them to wood pellets. The federal government recently announced plans to convert the Ketchikan facility to a wood pellet heat system. Actions like these must continue to occur in order to build demand to the level that could sustain a local wood pellet plant for biomass to succeed. As this report goes to print, a consortium of individuals and businesses on Prince of Wales Island is actively looking at creating a wood pellet plant.

Like most forestry related investments contemplated as part of a transition in Tongass management, a guaranteed wood supply (between sawmill residue at known tons/year, scheduled timber sales, and scheduled thinning areas) must be assured in order to assume the risk of investment and obtain financing. The wood supply has been so unpredictable in the Tongass that the need for guaranteed wood supply (not a contract, but a guaranteed supply) is underscored by all involved.

Saah and Ganz (2009) showed that compared to importing and using heating oil, production and use of local biomass within the region is carbon positive. The Tongass Futures Roundtable, a group representing diverse interests that is dedicated to consensus building around sustainable communities in Southeast

Alaska, established by consensus on May 8, 2008 (and revised on February 27, 2009) the following goals for biomass projects:

- Improve regional energy self-reliance.
- Improve community viability and prosperity.
- Increase resiliency and competitiveness of regional sawmills.
- Reduce energy costs and carbon footprint.
- Create jobs and stimulate secondary manufacturing of wood products.
- Make forest restoration more economically viable.
- Reduce volume of municipal and forest waste/turn into a resource.
- Scale industry to regional energy needs.
- Scale industry to regional municipal, commercial, and forest byproduct waste streams.
- Does not create unsustainable exploitation of forest ecosystems or open remote and pristine areas exclusively for biomass feedstock production, although use of feed stock as part of wildlife and fisheries habitat is encouraged.

Geothermal

Alaska's geologic and tectonic history has produced substantial geothermal resources throughout the state. Southeast Hot Springs is one of three recognized geothermal regions in Alaska, and includes, from south to north, the Bell Island area north of Ketchikan; Goddard, Edgecumbe and Baranof hot springs around Sitka; and Tenakee hot springs near Tenakee.

Several new buildings in the Juneau area use ground source heat exchange, which requires modest temperature differentials, to supply all or part of the buildings' heat. Geothermal heat pumps are used, functioning like air-source heat pumps but using the heat of the ground (instead of the air) as the heat source. Geothermal heat pumps require no combustion and are more efficient than air-source heat pumps (i.e., they can produce more heat using less electricity). However, they are much more costly to install. Geothermal systems are used in the new Juneau airport terminal building and the new Juneau community swimming pool, the AEL&P office building and warehouse, and in individual homes throughout southeast.

Current-Tidal-Wave

Ocean energy is divided into in-stream tidal and wave energy. All ocean technologies are in the pre-commercial stages, with European manufacturers and research institutes (particularly in the United Kingdom) leading the way.

In-stream tidal energy technology consists of many designs, but all convert the kinetic energy of flowing water into electricity, most using some type of turbine. Turbine designs range from underwater wind-style turbines to vertical- or horizontal-axis cross-flow turbines. Since in-stream tidal energy derives power from the tides, the power production is a highly predictable, if not constant, power source.

Wave energy conversion (WEC) devices are also in the pre-commercial stage. As an emerging technology, a wide array of designs aims to convert wave energy into electricity. Many potential designs are being tested around the world, ranging from heave devices like the Pelamis to oscillating water columns and single buoys riding the waves in the open ocean. While not as consistent as the tides, the amount of potential wave energy is frequently predictable days in advance.

River in-stream energy conversion (RISEC) devices work in a similar manner to tidal devices, but generally on a smaller scale. In the summer of 2008, the village of Ruby—located on the Yukon River, 50 air miles east of Galena—deployed and tested the first river hydrokinetic device in Alaska, a 5 kW New Energy Encurrent turbine.

EPRI Ocean Energy and Polagye of the University of Washington completed an assessment of the in-stream tidal energy resources in Southeast Alaska for the Alaska Energy Authority. They identified Cross Sound and Icy Strait as showing a massive energy potential, more than enough to meet the region's energy needs. In addition, high quality (strong power density), small (low average annual power) sites such as Angoon (Kootznahoo Inlet), Hoonah and Elfin Cove (Cross Sound) could provide power for remote locations.

In Southeast Alaska, Sealaska Corporation has been actively investigating the feasibility of sources and projects that could utilize tidal and current energy.

Wind

As a renewable resource, wind is classified according to wind power classes, which are based on typical wind speeds. These classes range from Class 1 (the lowest) to Class 7 (the highest). In general, at 50 meters, wind power Class 4 or higher can be useful for generating wind power with large turbines. Class 4 and above are considered good resources. Particular locations in the Class 3 areas could have higher wind power class values at 80 meters than shown on the 50-meter map because of possible high wind shear. Given the advances in technology, a number of locations in the Class 3 areas may suitable for utility-scale wind development.

There are indications that the southeast Alaska Panhandle has wind resources consistent with utility-scale production. The greatest potential wind resources are found on the ridge crests throughout the region and on the interior marine passageways. Other wind resource areas are located in the Gulf of Alaska along the west coast of the southeast Alaska Panhandle. However, many of these locations are not near population centers or an electrical grid system and the technology has not proven to be an economical alternative to the plentiful hydroelectric resource throughout the region. Wind resources merit more study to see if wind can be a reliable supplemental energy resource in the region's renewable energy portfolios.

Solar

All of the Forest Service Tongass summer camp barges are now running on solar energy. These barges are used to house field crews. In 2009, the Forest Service completed the energy conversion of the last of four camp barg-es, the Chickamin, and also upgraded the first solar power system installed on the Steelhead camp barge in 2004. These solar-power systems have cut power costs by up to 50%, fuel consumption by 75%, and significantly reduced the risk of spills.

Individual homeowners in Southeast Alaska are using solar panels to reduce the high cost of power. In 2010 a demonstration home in Angoon received a $100,000 retrofit to test energy-efficient technology, thanks to a collaborative project between the Southeast Alaska Conservation Council, Tlingit and Haida Central Council, and the Tlingit-Haida Regional Housing Authority. Solar panels were installed as part of a collaborative renewable energy and energy efficiency demonstration project that grew out of a desire to help the community explore renewable energy and other options that can have an impact in the short to medium term. Another private home in Gustavus is using solar panels for its electricity and during times of the year returns energy back to the local electrical grid.

Summary

Renewable hydro power already supplies just over half of Southeast Alaska's electricity. It continues to be the most cost-effective resource to develop for the electrical needs of the region. Communities and businesses that are instead dependent on diesel are paying significantly more for their electricity. Also, all who are using oil for space heat are forced to pay the high and fluctuating price of oil that must be barged to the region.

While Southeast Alaska is rich in renewable energy resources, not much beyond hydro is developed on more than a very small-scale, individual basis. There is momentum and attention now to biomass on Price of Wales Island that seems promising. Individual businesses, home and building owners, and communities are trying to move renewable energy projects in the region forward. While building owners can move forward with small-scale investments, some cite a need to coordinate several fragmented efforts and investigations around this subject in the region.

The State of Alaska is embarking on an Integrated Resource Plan that will investigate many of these issues. Combining resources and planning efforts will bring a focused resolution and action plan forward for businesses and community use that should detail the generation and transmission projects most needed in southeast Alaska.

Community by Community Review

The Southeast Conference (SEC) works closely with the Alaska Energy Authority (AEA) on energy planning for the region. As part of the State's energy planning for 2010, SEC contacted Southeast communities and regional utilities to identify current and future energy plans. Information gathered as part of that effort is now summarized by community.

Metlakatla

Metlakatla (population 1,400) is located on the Annette Islands Reserve approximately 15 miles from Ketchikan, Alaska. The local utility's power generation consists of four hydro generators, one diesel generator and one battery energy storage system. The combined hydros at Chester Lake and Purple Lake generate surplus power that could be dispatched to Ketchikan or to Kake via the Southeast Alaska Power Agency (SEAPA) intertie system if extended to Metlakatla.

The community has identified two projects for development. The Metlakatla-Ketchikan Intertie will be a 34.5 kV transmission line that will connect the electric systems of the two municipalities. The intertie will include 16 miles of overhead line and one mile of submarine cable terminating at Ketchikan's Mountain Point substation. This project is partially funded by AEA and Denali Commission grant funds.

The second proposed resource development project is the Triangle Lake hydro facility. This resource is located along the proposed intertie route and would consist of a single-turbine generating unit with a capacity of 4.0 MW (17,324 MWh annually), with project costs estimated at $17.7 million (per 2000 R.W. Beck Study for KPU).

Ketchikan

Ketchikan Public Utilities (KPU) owns Ketchikan Lakes Hydro, Beaver Falls Hydro, and Silvis Hydro. Total local hydro capacity is 13 MW. KPU's Bailey Plant has four peaking/standby diesel units (24 MW) and there are two standby units at the North Point Higgins substation capable of generating 3.2 MW. SEAPA can supply up to 24 MW of power from Swan Lake and Tyee via intertie. Local energy demand continues to grow, which will result in diesel power dependence in the foreseeable future unless more hydro is developed soon.

The preferred resource development project for immediate construction by the City of Ketchikan is the Whitman Lake Hydro project, located approximately four miles from town with an estimated generating capacity of 4.6 MW (16,000,000 kWh annually). This project will operate in conjunction with the Whitman Lake Hatchery and will provide the hatchery with much needed improvements. Pipelines will lead to a new

powerhouse containing two hydro generating units. Unit 1 will generate power with water that would otherwise be spilled; Unit 2 will generate power from water delivered to the hatchery located next to the proposed hydro project. Projected costs (per KPU) are $19,050,000 with a legislative funding request for $15,680,000. The Whitman Lake Project is licensed and construction-ready and is needed to meet Ketchikan's real and imminent energy needs.

The Coast Guard is strongly considering installation of a wood pellet boiler at its Ketchikan Station and the federal government recently announced plans to convert their facility in Ketchikan to a wood pellet heating system.

Other Resources Near Ketchikan

Five miles northeast of Ketchikan is the proposed 9.6 MW Mahoney Lake Hydroelectric project. This joint venture (Cape Fox, Alaska Power & Telephone, City of Saxman) proposes the installation of a tap into Upper Mahoney Lake, a 1,700-foot-long upper tunnel, a value house, a buried bypass pipe, a 1,370-foot-long vertical shaft, an 8-foot-diameter, 3,350-foot-long lower tunnel, a semi-underground powerhouse, a 200-foot-long tailrace channel, 1.5 miles of buried transmission line and 3.1 miles of overhead transmission line, a switchyard, and 2.6 miles of new access road.

Other resources in the area include Connell Lake (2.0 MW), Lake Shelokum (AP&T, 7 MW) and Lake 3160 (AP&T, 4.9 MW). AP&T has expressed a concern about "stranded" resources in the area without open access to transmission corridors. Biomass resources are abundant and are looked to as potential space heating solutions.

Prince of Wales Island

AP&T has developed an extensive intertie network throughout Prince of Wales Island, connecting most of the communities to its hydroelectric facilities at Black Bear Lake (4.5 MW, 1995) and South Fork Hydro (2 MW, 2006). Construction is underway on a 48-mile transmission line extension to Naukati Bay and Coffman Cove. After completion, all POW communities (except Whale Pass) will be interconnected through the hydroelectric grid.

Hydro resources are being developed at Reynolds Creek near Hydaburg and Neck Lake in Whale Pass. Reynolds Creek is a 5 MW facility that is jointly owned and operated by AP&T and the Haida Corporation. The proposed 0.3 MW Neck Lake facility is intended to displace 100% of the diesel-generated power for Whale Pass and will be owned and operated by AP&T.

Prince of Wales Island is in a unique situation with its abundant timber resources and operating mills. Discussions with the Prince of Wales Community Advisory Council (POWCAC) showed strong support from the communities for further development of biomass energy resources. The City of Craig has successfully implemented a district heating system with the wood waste products from the local sawmill. The communities have also been in discussion with the US Forest Service about timber harvest levels that could support expanded development of energy related ventures.

Southeast Alaska Power Agency

The three member utilities of the Southeast Alaska Power Agency (SEAPA) own and operate the Tyee Lake hydro facility near Wrangell and the Swan Lake hydro facility near Ketchikan. The 57-mile Swan-Tyee Intertie is now operational and interconnects the Swan Lake and Tyee Lake hydroelectric projects. As a result, all of the member utilities (Ketchikan, Wrangell and Petersburg) are interconnected for the first time and the hydroelectric projects are more efficiently operated. Existing surplus power from the Tyee Lake project will be used to displace diesel generation in Ketchikan.

Multiple resources throughout the SEAPA network region include Thoms, Sunrise and Anita Lakes (7.5 MW, 4 MW and 8 MW respectively) near Wrangell, and the Thomas Bay hydro projects north of Petersburg (80 MW Cascade Creek, 40 MW Scenery Creek and 20 MW Ruth Lake). Bell Island also has geothermal potential.

Hyder

AP&T is proposing the development of a 75 MW hydro at Soule River near Hyder. This 1,000-foot-long, 160-foot-high dam would create a reservoir of approximately 950 acres, with water flowing down a 2.08-mile pipe (penstock) to spin two generators in a tidewater-level powerhouse. The facility would produce an annual average of 270 gigawatt hours of electricity that would travel about 11 miles via underwater cable and overhead power line to connect with the British Columbia Transmission Corporation's transmission system at Stewart, British Columbia. Projected costs are estimated at $200 million (per AP&T).

Inside Passage Electrical Cooperative (IPEC)

IPEC has actively pursued reduced and stably priced electric rates on behalf of its member owners for many years. The high and volatile price of diesel has both hurt and helped in their quest—hurt because rates necessarily climb to cover increasing costs of fuel, and helped because they now have available a State grant program dedicated to assist with the mission to become diesel independent. An activity update for each of IPEC's communities follows.

Angoon

The Forest Service signed the EIS Record of Decision for the Thayer Creek Hydroelectric Project in May 2009. Kootznoowoo has the rights to develop the project, and IPEC is the certificated and regulated electric provider for Angoon. It is anticipated that IPEC will buy power from Kootznoowoo when the project is built as long as it is cheaper than diesel-generated power. Other resources such as wind, biomass and tide may prove economical to develop in the future.

Hoonah

IPEC moved its decade-long effort to secure funding for the Hoonah-Juneau intertie to a long-range option after the price of submarine cable construction put the project cost at up to $45 million. The immediate focus for lower cost renewable power for Hoonah is primarily the development of two small run-of-the-river hydro projects for Hoonah which would displace up to 50% of Hoonah's diesel-generated electricity (nearly 250,000 gallons of diesel annually).

Other Chichagof Island Resources

Southeast Conference and AEA have been facilitating planning efforts between IPEC and the communities of Chichagof Island for possible integrated corridor development (roads, communications and electric transmission grids) to serve multiple communities. This idea is in its infant stages, but could solve many problems for island residents, including access to healthcare facilities, an airstrip, better and more transportation options, and improved communication services. There is an abundant hydro resource in Pelican that could be dispatched via an intertie to Hoonah. The island also holds vast amounts of biomass resources that could be utilized. While Tenakee Springs is known for its geothermal resources, its focus is now on a potential hydro resource at Indian River to displace 44,400 gallons of diesel used annually for power generation. Elfin Cove has been identified as an ideal location for tidal energy development, as has Port Frederick near Hoonah, where AP&T envisions a possible 400 kW facility can be constructed. These opportunities will be explored further during the Integrated Resource Planning project.

Kake

The Alaska Energy Authority, Southeast Conference, the City of Kake, the City of Petersburg, AKDOT, OVK, SEAPA and IPEC are working together to facilitate, permit and construct a utility corridor (intertie project) between Kake and Petersburg. The intertie would allow IPEC to obtain hydro power through SEAPA. The U.S. Forest Service conducted scoping meetings in both Petersburg and Kake during 2010 and the necessary efforts are being undertaken to obtain permitting for construction of the intertie. Stream surveys and assessments were conducted along the roaded sections of the two proposed corridors this fall and work begun on archaeological and cultural resource inventory for the Alaska State Historic Preservation Officer. Other sensitive plant, Goshawk surveys, etc. will be completed during the 2011 field season. Geotechnical and preliminary design continues as the process to finalize route selection and construction

costs concludes. Funding is secured for the environmental review and final design. Kake seeks construction funds for the intertie so that construction can begin as soon as permitting is completed (est. mid-2012).

Chilkat Valley/Klukwan

Power in Haines is primarily purchased from AP&T and is transmitted via interties from its hydro generation facilities in Skagway. IPEC is working to purchase the 10 Mile Hydro Project (northwest of Haines), and is pursuing options to lower an enormous amount of construction-related debt that directly contributes to the high cost of electrical rates (recently as high as $0.568 kWh).

Sitka

Sitka ranks as the nation's 10th largest seafood port (by value), due in large part to the availability of an abundant source of clean, hydroelectric energy. However, economic growth and stability is threatened by the lack of growth in the development of hydro resources and the exhaustion of the current 124,000 MWh supply generated annually.

Sitka is undertaking a number of efficiency and conservation measures along with generation and distribution upgrades and the implementation of interruptible load programs. Sitka continues these types of initiatives while working to expand the Blue Lake hydro (which will add 34,000 MWh firm service, replacing (2) 3MW turbines with (3) 6 MW turbines and raising the existing dam height an additional 83 feet). Feasibility studies are in progress to develop the 28 MW hydro potential at Takatz Lake. The Blue Lake Expansion Project is in final engineering design, orders for new turbines have been placed, and the final FERC license amendment application was submitted in November 2010. Also nearby are extensive geothermal resources that may be economical to develop in conjunction with Takatz. The IRP will detail how and when these resources should be developed.

Other Sitka Resource Development

The U.S. Coast Guard is moving forward with the installation of a wood pellet boiler to replace old oil-fired boilers to heat its facilities on Japonski Island. The USCG in cooperation with Mt. Edgecumbe High School completed installation of a Skystream 3.7 wind turbine in December 2010 and is the second Renewable Independent Power Producer (RIPP) to be connected to the city's utility grid in 2010.

Juneau

With the completion of the 14.3 MW Lake Dorothy Hydroelectric project, Juneau has over 100 megawatts of installed renewable energy generation capacity at five power plants, including Snettisham, Annex Creek, Salmon Creek, and Gold Creek. A second phase is planned for Lake Dorothy in the future.

Snettisham is the largest hydro project with a maximum peak output of 85 MW and an average annual energy output of 325 million kW hours. This project is located about 28 air miles southeast of downtown Juneau and provides 80-85% of Juneau's electricity. Built by the federal government in 1973 and expanded in 1990, the Snettisham Project was sold to the State of Alaska in 1998. AEL&P operates and maintains the project under the provisions of a long-term power sales agreement with the State.

Two other smaller hydroelectric plants supply power year-round. The Annex Creek and Salmon Creek Power plants are historically tied to the gold mining days, when low-cost power was needed to operate the mills. Built in 1914-16, the two plants were engineering marvels for their day and continue to provide low-cost, reliable power today. Both provide the remaining 6 MW of capacity and add an additional 50 million kW hours of energy production yearly.

President Obama's executive order mandating environmentally friendlier federal buildings has spurred the NOAA Fisheries Auke Bay research facility to install a 30-foot spinning tower (wind-powered electrical generator) that will produce 1.2 kW of electricity. Others have also expressed interest in developing wind and tidal resources, as well as some biofuels. Heat pump systems (either ground-source or using seawater) are also being installed at various facilities in Juneau. Sealaska Corporation installed a wood pellet boiler to heat its downtown corporate headquarters and will use 250-300 tons/year. The Coast Guard is considering installation of a wood pellet boiler at its downtown Juneau station, where a small windmill is also in use.

Gustavus

The recently completed Falls Creek hydro produces 800 kW of electricity for Gustavus. This facility is projected to meet the community's power needs for the foreseeable future. A waste-heat project is being examined to utilize excess water coming through the facility. The utility is pursuing construction-debt relief in order to lower rates to the consumer and is working with the National Park Service to initiate the process to connect the Glacier Bay Lodge to hydro power. This project is expected to take 3-5 years. The additional power load can be easily met by current production capacity and will help lower the rate base to consumers while displacing approx. 70,000 gallons of diesel used by the National Park Service each year.

Yakutat

Yakutak is totally dependent on diesel-generated power but has an active feasibility study underway for a biomass facility. The community is renowned by surfers for its large waves; Outside Magazine rated Yakutat one of the five best surf towns in America and Newsweek wrote an article about "surfing with sea otters." The Yakutat utility is wrapping up a feasibility study for a near-shore wave generator patterned after Scotland's energy farm. The wave generator is made up of connected sections that flex and bend as waves pass. This motion would be used to generate 650 kW of electrical power. Yakutat's hydro resources are located too far from the community to be developed economically.

Upper Lynn Canal

The Upper Lynn Canal Power Supply System was formed by AP&T to coordinate electric utility operations currently serving Skagway and Haines. This intertie has been extended up the Haines Highway to connect IPEC's system (Klukwan and Chilkat Valley) to the hydro resources generated from Skagway. If not for the intertie from Skagway, Haines would be almost totally dependent on diesel power. This has prompted the utility to examine hydro resources closer to Haines. The Connelly Lake Hydro Project is under a preliminary permit with the Federal Energy Regulatory Commission to develop and submit a license application. This storage project, which would include a small dam, would have a power plant generating up to 10 MW of power. Located up the Chilkoot River approximately 12 miles southwest of Skagway and 15 miles northeast of Haines, this project is still in the preliminary design stage.

The Haines Borough is also considering possible biomass heating projects (either district heating or single-site projects). The local Chilkoot Indian Association is installing wood pellet heating systems in their new housing complex. There are hopes that biomass heating systems may be able to utilize resources from the 286,000 acre Haines State Forest.

Upper Lynn Canal's energy cornerstone is the Goat Lake Project, a 4.0 MW hydroelectric facility located seven miles north of Skagway. The 204-acre, glacially fed lake has the winter storage necessary to sustain

year-round hydro generation. Goat Lake Hydro became operational in December 1997, and was interconnected with Haines via a 15-mile submarine cable in September 1998. The submarine cable was laid in Taiya Inlet, a fjord with depths up to 1,500 feet. This project allowed diesel-powered generators at both the Skagway and Haines plants to become quiet for the first time in nearly 80 years.

The 943 kW Dewey Lakes Hydro Project is located adjacent to downtown Skagway. This project was built in the early 1900s and has been operated by AP&T since 1957. In 2009, the 3 MW Kasidaya Creek run-of-river hydro project was constructed three miles south of Skagway.

Other projects envisioned in the Municipality of Skagway are the Burro Creek Hydro (feasibility study for a run-of-river system of up to 2 MW) and the West Creek Hydro feasibility study for a 25 MW dam project that could supply power to cruise ships docking in Skagway.

State of Alaska Planning Efforts in Southeast

The Alaska Energy Authority (AEA) is embarking on a Regional Energy Plan for Southeast Alaska for the communities between Yakutat to Metlakatla. The purpose of the plan is to create a document that identifies actions Southeast Alaskans can take so that all southeast residents can enjoy access to affordable, reliable energy for electricity, heating and transportation. This plan is envisioned to be a tool that Southeast Alaskans can use to facilitate future economic development and energy independence.

The goals of this Integrated Resource Plan are:

- To reduce reliance on fossil fuel energy in Southeast Alaska,
- To develop strategies for long run energy security within the region
- To develop strategies for wisely and effectively making use of the region's renewable energy resources
- To develop least cost options for the provision of electricity, space heating and transportation for the long run, to enhance regional economic development

The plan will include an assessment of regional energy concerns and issues, a regional transmission and inter-connection plan, and will address individual community energy needs for electricity, heating, and transportation. The long-range plan will identify a phased plan of generation and transmission capital improvement projects in the Southeast Region of Alaska. The state's contractor is expected to develop this plan based on; public, stakeholder, and advisory committee input; review and analysis of existing data and systems; contractor created financing models; and the technical knowledge and experience the contractor may have in developing resource plans. The success of this planning process will be dependent on the participation of all stakeholders in southeast.

Energy/Renewable Energy Strength/Constraints

Key constraints/obstacles

Electrical Rate Disparities

Small commercial businesses located in diesel dependent Southeast Alaska communities are paying 213 percent more on average than businesses in places where electricity is generated by hydro power. This is due to a number of factors including the economies of scale resulting from a larger population base, investment by the state and federal government in energy infrastructure and access to an integrated electrical grid system.

Even in the smaller, more remote communities, there is significant reduction in the rates that businesses pay in hydro-developed communities in Southeast Alaska. Alaska Power & Telephone Company charges an average of $373 for 1,500 kWh/month, while the diesel-dependent Inside Passage Electrical Cooperative charges an average of $808.

Renewable Energy Projects

Construction of renewable energy systems and transmission lines requires large capital investment. Many barriers must be overcome for sufficient renewable energy to be produced in Southeast Alaska to meet the electrical, space heating and transportation needs of the region. These barriers included:

- Lack of access to energy resources within the federal lands
- Lack of access from energy resources via transmission corridors
- Regulatory uncertainties in a politically charged environment that adds delays, construction cost increases and increased risk into each project.
- Lack of viable timber industry to produce biomass byproducts for energy
- Need for incentives and/or understanding of available technology for electrical, space heating and transportation needs throughout the region
- Lack of cohesive policies and actionable plans at local, state and federal levels
- Cost to convert from one form of energy to another
- Steady fuel supply
- Operations and maintenance issues

The majority of proposed generation and transmission projects in southeast are contained within or cross federal lands. The electrical intertie project that is farthest along—between Petersburg and Kake, could be complicated by the fact that portions of the project are within inventoried roadless lands in the Tongass National Forest.

Key strengths/opportunities

Electrical utilities

Communities on hydroelectric power, particularly those connected via transmission lines that provide redundancy and back-up, have some of the least expensive electricity rates in the State. This resource is clean, "green," and abundant in our rainforest climate.

Renewable energy

Achieve goal to transition businesses and communities in Southeast Alaska off of expensive diesel and onto a renewable energy system, thereby stabilizing and in some cases, lowering the cost of power and removing a barrier to business development and expansion. Completing the Petersburg-Kake and Metlakatla to Ketchikan electrical intertie projects would create many direct jobs through construction, operations, and maintenance as well as indirect jobs through development allowed by lower-cost energy.

Focus on and invest in smaller-scale, local energy sources in appropriate locations. The full build-out of a regional intertie system may never be economically feasible to build. In the meantime, smaller rural communities and businesses cannot afford expensive heating oil and electricity.

Estimates suggest that about $2 of every gallon of heating oil purchased in Southeast Alaska leaves the region because the oil is bought outside and barged in. This equates to $35-$50 million annually exported. If policy makers would establish goals and action plans to transition away from imported fuel and develop renewable energy resources, coupled with technological advancements and demand side management policies, much of this money could be retained within the region, with many direct and multiplier benefits in job creation and economic development initiatives.

It is apparent that most of the research and development for renewable energy innovations in current, tidal and wave energy are happening outside Southeast and most of Alaska. State and federal agencies and the University system could be partnering to encourage research, testing, and product development here for these alternative energy technologies. Southeast Alaska could serve as a research, testing, and product development location for current, wave and tidal energy.

Incentives to increase the number of wood pellet heating systems in Southeast Alaska to generate at least a 10,000 ton/year demand, would sustain a local wood pellet plant. Like most forestry related investments contemplated as part of a transition in Tongass management, some type of guaranteed wood supply also is likely necessary before financing will be available.