

MEMORANDUM

TO: Alaska Energy Authority Board

THRU: Curtis. W. Thayer, Executive Director

FROM: Conner Erickson, AEA Planning Manager

DATE: October 12, 2022

RE: Sweetheart Lake Hydroelectric Plant Construction

On August 17, 2022 Juneau Hydropower, Inc. (“JHI”) signed a joint-development agreement with Tokyo-based hydroelectric developer Electric Power Development Company, Ltd. (d.b.a. J-POWER) to construct the Sweetheart Lake Hydroelectric Development Project (“Project”). The project is being financed through the U.S. Department of Energy, with JHI and J-POWER providing the equity portion¹.

Project Overview

The Project, which has been ongoing since 2009 per JHI, is designed as a hydroelectric facility to be constructed on Sweetheart Creek, at the southern outlet of Sweetheart Lake. Rated at 19.8 Megawatts (“MW”), it is anticipated to generate an annual average of 116,000 Megawatt-hours (“MWh”). The project is estimated to cost approximately \$200 million² and is comprised of hydroelectric power plant, 40+ miles transmission lines and a district heating system in Juneau³. The joint-developers of the project state construction will begin next year and will last 2-3 years, with commissioning projected sometime after 2025. The Project will utilize a roadless alternative construction design, as stated by JHI, due to the Project being located within the bounds of the Tongass National Forest, utilizing a larger 15’ by 15’ tunnel for water conveyance from the lake to the powerhouse, which will allow for material and equipment to be moved to and from the site, without the construction of a traditional access road⁴.

J-POWER, JHI’s equity partner in the Project, is a major Japanese hydroelectric company which builds, owns and operates generation and transmission facilities across Japan, Australia, China, the Philippines, and the U.S. As per representatives of J-POWER, the company owns and operates 61 hydroelectric facilities, in addition to over 1,500 miles of transmission lines across Japan.

¹ Juneau Empire, Sep. 15, 2022, <https://www.juneauempire.com/news/juneau-hydropower-announces-sweetheart-deal/>

² KTOO Public Media, Sep. 16, 2022, <https://www.ktoo.org/2022/09/16/juneau-hydropower-sweetheart-lake/>

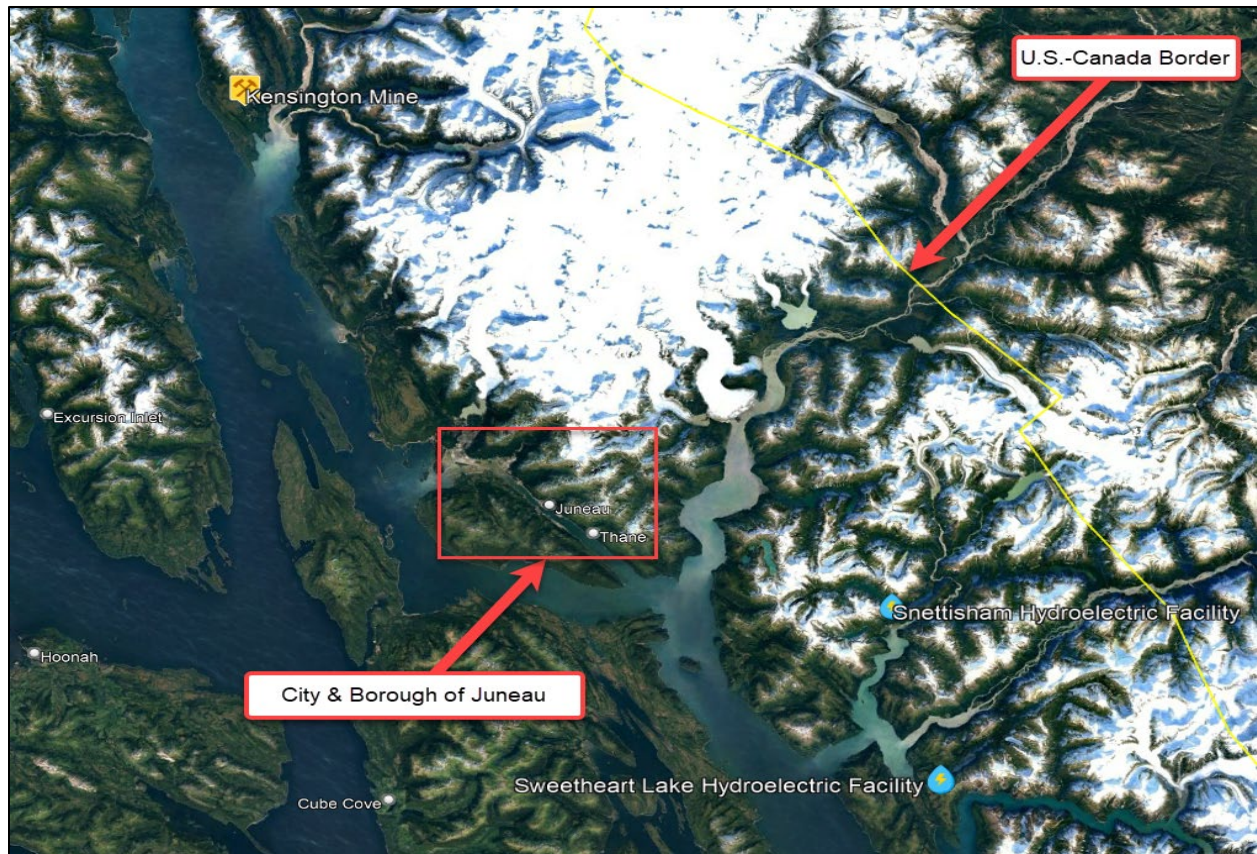
³ Clarion Energy – Hydro Review, Aug. 17, 2022, <https://www.hydroreview.com/hydro-industry-news/j-power-signs-agreement-to-develop-sweetheart-lake-hydro-in-alaska/#gref>

⁴ JHI, <https://juneauhydro.com/sweetheart-lake/design-and-development-philosophy/>

Project Location

The Project is to be constructed on the east shore of Gilbert Bay, about 33 miles southeast of Juneau, Alaska. The existing 78.2 MW Snettisham hydroelectric facility lies approximately straight-line 15 miles north of the Project site. Kensington Mine, an active Coeur Mining-owned gold mine operation is the Project's primary energy customer, and is located about 44 straight-line miles north of downtown Juneau, as illustrated in Figure 1 below.

Figure 1 – Project Area Map



Project Revenue Sources

The Project, is slated to increase the electrical generation capacity of the Juneau area by 20-25 percent⁵. The Project will require interconnection with the existing Alaska Industrial Development and Export Authority ("AIDEA") - owned Snettisham transmission line, via a new 8.6 mile line north from the Project site, in addition to a new 31-mile transmission line extension north from Alaska Electric Light & Power's ("AEL&P") existing transmission infrastructure in order to deliver power to the Project's primary power purchaser, Kensington Mine, a Coeur Mining operation⁶. Alaska Electric Light & Power ("AEL&P"), the RCA-regulated utility serving the City and Borough of Juneau, operates and maintains the Snettisham generation and transmission assets on behalf of AIDEA, through an existing O&M agreement. The Snettisham line is an existing 44 mile long high-voltage overland and undersea transmission line providing interconnection from the Snettisham hydroelectric plant to AEL&P's Juneau transmission lines.

⁵ See footnote #1

⁶ See footnote #2

Currently, the Snettisham hydroelectric plant provides the majority (65%) of the power requirements for AEL&P⁷.

Additionally, interconnection with AEL&P's grid would provide the potential for the project to wholesale power to AEL&P under a negotiated and Regulatory Commission of Alaska-approved Power Purchase Agreement ("PPA"), providing potential future power-sales revenue to the Project. Future additional power requirements for the Juneau City & Borough, as would be provided via AEL&P, include additional cruise-ship dock electrification, electric vehicle charging infrastructure, and JHI's high-temperature seawater heat pump district heating system, the development of which is being pursued by JHI's subsidiary, Juneau District Heating⁸.

Project History

The Project began in 2009 and has been progressing steadily in its licensing and financing process. In the second half of 2009, Federal Energy Regulatory Commission ("FERC") issued a preliminary permit to begin the necessary studies required for a full FERC license. In May 2014, JHI submitted its Final License Application and related Preliminary Draft Environmental Assessment for the Project. In October 2015, FERC approved the draft Environmental Impact Statement ("EIS") for agency and public comment. In May 2016, FERC issued its final EIS for agency and public comment. In September 2016, FERC issued the Final License (FERC project no. 13563-003) for the Project⁹. In an effort to assist JHI in its interconnection with the AIDEA-owned Snettisham transmission lines, AIDEA and JHI have entered into a Memorandum of Understanding (MOU) to study such interconnection requirements. Discussions between JHI and AEL&P concerning the interconnection with AEL&P's transmission infrastructure across the City and Borough of Juneau north to the Kensington mine site are still ongoing.

Project Cost

Table 1 and Table 2, as found in Appendix A, are provided to give a high-level cost comparison of Alaska power plant development since 2009. Table 1 provides a nominal cost comparison, whereas Table 2 provides an inflation-adjusted, real-cost comparison. At an estimated cost of \$200 million, the Project cost, in comparison with other power generation projects throughout Alaska over the last decade or so, is on the higher end of the range.

As indicated in Table 1, projects of similar MW capacities range from \$1.3 million to \$12.3 million per MW of capacity. On a energy generation basis, Sweetheart Lake falls within the lower half of the range of those plants surveyed at a cost of \$1,724 per MWh. The significant amount of new transmission line construction (40+ miles), along with the remote location of the site, and current inflationary pressures impacting the prevailing cost of raw materials, labor, and management are assumed to be the major contributing factors to the high cost of the project.

It is important to note that not all power plants are created equal. Many items need to be considered when assessing the cost of a plant, which are not addressed in this memo. Some

⁷ AIDEA, 2020Q2 Snettisham Status Update, http://www.aidea.org/Portals/0/PDF%20Files/PFS_Snettisham.pdf

⁸ Juneau Hydropower, Inc., <https://juneauhydro.com/sweetheart-lake/juneaus-community-values-in-action/>

⁹ Juneau Hydropower, Inc., <https://juneauhydro.com/sweetheart-lake/>

critical items to consider are the plant type/application (i.e. peaking, baseload, reserve, etc...), technology (i.e. gas turbine, wind, solar, hydro, or other), project financing arrangement (i.e. private equity, grant funded, bond financing, conventional loans, or other sources), power dispatchability (e.g. intermittence vs. load-following), site location (i.e. remote, or urban), and others. The information provided in Table 1 and Table 2 of Appendix A are only for purposes of high-level comparison only.

Attachments

Appendix A – Power Plant Cost Comparison Tables

Appendix A – Power Plant Cost Comparison Tables

Table 1: Nominal Cost (Year of Construction)

Plant Name	Technology	Owner/Operator	Commissioning Year	Nameplate Capacity / Size (MW)	Cost (Nominal)	Cost / MW - Nominal	Annual Generation at 100% Capacity Factor (MWh)	Average Annual Generation (MWh)	Cost / Average Generation MWh (\$/MWh - Nominal)	Capacity Factor (%)
Southcentral Power Plant	Gas Turbine	Chugach Electric Association	2013	200.2	\$ 370,206,767	\$ 1,849,185	1,753,752	1,042,049	\$ 355	59%
Ekluhna Generation Station	Gas Turbine	Matanuska Electric Association	2015	171	\$ 339,814,633	\$ 1,987,220	1,497,960	678,552	\$ 501	45%
Plant 2A (George Sullivan)	Gas Turbine	Chugach Electric Association (ML&P)	2016	178	\$ 289,453,752	\$ 1,626,145	1,559,280	622,392	\$ 465	40%
Sweetheart Lake Hydro	Hydroelectric	Juneau Hydropower, Inc. / J-Power	2026	198	\$ 200,000,000	\$ 1,010,101	173,448	116,000	\$ 1,724	67%
Blue Lake Dam Hydro	Hydroelectric	City & Borough of Sitka	2015	15.9	\$ 146,000,000	\$ 9,182,390	139,284	66,251	\$ 2,204	48%
Eva Creek Wind Farm	Wind	Golden Valley Electric Association	2012	24.6	\$ 94,000,000	\$ 3,821,138	215,496	45,644	\$ 2,059	21%
Fire Island Wind - Phase I	Wind	Cook Inlet Region Incorporated	2012	17.6	\$ 90,000,000	\$ 5,113,636	154,176	47,000	\$ 1,915	30%
Soldotna Combustion Turbine	Gas Turbine	Homer Electric Association (HEA/AEEC)	2015	48	\$ 81,177,661	\$ 1,691,201	420,480	31,863	\$ 2,548	8%
Lake Dorothy Hydro	Hydroelectric	Alaska Electric Light & Power	2009	14.3	\$ 68,644,348	\$ 4,800,304	125,268	88,704	\$ 774	71%
Allison Creek	Hydroelectric	Copper Valley Electric Association	2016	6.5	\$ 51,000,000	\$ 7,846,154	56,940	15,000	\$ 3,400	26%
Industrial Blvd	Gas Turbine	Alaska Electric Light & Power	2016	23.49	\$ 24,363,574	\$ 1,037,189	205,772	204	\$ 119,429	0%

Table 2: Real Cost (\$2022)

Plant Name	Technology	Owner/Operator	Commissioning Year	Nameplate Capacity / Size (MW)	Cost (Real)	Cost / MW (\$/MWh)	Annual Generation at 100% Capacity Factor (MWh)	Average Annual Generation (MWh)	Cost / Average Generation MWh (\$/MWh)	Capacity Factor (%)
Southcentral Power Plant	Gas Turbine	Chugach Electric Association	2013	200.2	\$ 504,540,313	\$ 2,520,181	1,753,752	1,042,049	\$ 484	59%
Ekluhna Generation Station	Gas Turbine	Matanuska Electric Association	2015	171	\$ 454,674,616	\$ 2,658,916	1,497,960	678,552	\$ 670	45%
Plant 2A (George Sullivan)	Gas Turbine	Chugach Electric Association (ML&P)	2016	178	\$ 383,228,883	\$ 2,152,971	1,559,280	622,392	\$ 616	40%
Sweetheart Lake Hydro	Hydroelectric	Juneau Hydropower, Inc. / J-Power	2026	19.8	\$ 200,000,000	\$ 10,101,010	173,448	116,000	\$ 1,724	67%
Blue Lake Dam Hydro	Hydroelectric	City & Borough of Sitka	2015	15.9	\$ 195,349,133	\$ 12,286,109	139,284	66,251	\$ 2,949	48%
Eva Creek Wind Farm	Wind	Golden Valley Electric Association	2012	24.6	\$ 130,061,559	\$ 5,287,055	215,496	45,644	\$ 2,849	21%
Fire Island Wind - Phase I	Wind	Cook Inlet Region Incorporated	2012	17.6	\$ 124,527,025	\$ 7,075,399	154,176	47,000	\$ 2,650	30%
Soldotna Combustion Turbine	Gas Turbine	Homer Electric Association (HEA/AEEC)	2015	48	\$ 108,616,340	\$ 2,262,840	420,480	31,863	\$ 3,409	8%
Lake Dorothy Hydro	Hydroelectric	Alaska Electric Light & Power	2009	14.3	\$ 102,949,707	\$ 7,199,280	125,268	88,704	\$ 1,161	71%
Allison Creek	Hydroelectric	Copper Valley Electric Association	2016	6.5	\$ 67,522,611	\$ 10,388,094	56,940	15,000	\$ 4,502	26%
Industrial Blvd	Gas Turbine	Alaska Electric Light & Power	2016	23.49	\$ 32,256,708	\$ 1,373,210	205,772	204	\$ 158,121	0%

Note: Nominal values adjusted per the U.S. Army Corps of Engineers Civil Works Construction Cost System (CWCCS); Feature Code: 07 – Power Plant – Published March 2022