Agenda – Regular Meeting
Juneau Commission on Sustainability
Wednesday, June 2, 2021
12pm-1pm

https://juneau.zoom.us/j/98993076467

Webinar ID: 989 9307 6467
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+1 346 248 7799 or +1 669 900 6833 or +1 253 215 8782 or +1 312 626 6799 or +1 929 436 2866 or +1 301 715 8592
Webinar ID: 989 9307 6467

I. CALL TO ORDER

II. AGENDA CHANGES

III. APPROVAL OF MINUTES

a. May 5, 2021

IV. PUBLIC PARTICIPATION

V. ACTION/DISSCUSSION ITEMS

a. Integrated Resource Planning background info (Duff)

VI. INFORMATION ITEMS

a. Recap – Sustainability Session – Solid Waste
b. Federal RAISE Grant Update
c. Assembly PWFC June 7th meeting – Solid Waste

VII. COMMISSIONER COMMENTS

VIII. Next meetings

Monthly Work session/Subcommittee	**Wednesday June 16, @ 12PM ZOOM**
Monthly regular meeting	**Wednesday July 7, @ 12PM ZOOM**

VIII. ADJOURNMENT

DRAFT Minutes
Juneau Commission on Sustainability
Wednesday, May 5, 2021
Zoom Conference
12:00 p.m. to 1:00 p.m.

I. CALL TO ORDER

12:01 pm, by Chair Gretchen Keiser. Commissioners present: Gretchen Keiser, Lisa Daugherty, Steve Behnke, Anjuli Grantham, David Teal, Duff Mitchell, Danielle Meeker. CBJ liaison present: Beth McKibben. Assembly liaison present: Alicia Hughes-Skandijs. General public present: Patricia Spence.

II. AGENDA CHANGES

None.

III. APPROVAL OF MINUTES

a. March 3, 2021- Regular meeting

Steve made a motion to approve the minutes.

IV. PUBLIC PARTICIPATION

None.

V. ACTION/DISCUSSION ITEMS

a. Ground Source Heat Pumps/Fire Stations (Katie Koester)

Katie shared that the life cycle analysis was better for heat pumps vs oil broilers. They want to go forward with ground-source heat pumps, which have redundancy and reduced maintenance. There are cost challenges however: They have funding to build for one fire station but want to have a portion of the design and work done for both fire stations at the same time to save on costs. Gretchen asked if CIP funding for the year has been decided and Katie said they are looking to fund the heat pump project by transfering funds from the centennial hall renovation in the amount of approximately $500,000. Steve made a motion for JCOS to support the PW director’s recommendation for ground source heat pumps for the fire stations and to request additional funding, which Anjuli seconded. Beth mentioned that energy savings should be tracked on new systems and to perhaps have it included in the scheduled maintenance of the pumps.

b. Federal RAISE Grant (Steven Benhke)

What is a Juneau Integrated Resource Plan (JIRP), and how does it help Juneau achieve the goals of the Juneau Climate Action Plan and the Juneau Renewable Energy Strategy?

1. What is a Juneau Integrated Resource Plan?

A Juneau Integrated Resource Plan (JIRP) is a commonsense roadmap used by the Juneau community to map out our community energy demand, future load growth, and forecasts. A JIRP integrates our current electrical adoption trajectory: electric vehicles, conversion to electric Air Source Heat Pump (ASHP) heating, electric buses, district heating, dock electrification, AND full mining electrification to displace diesel-electric generation. Innovative and community-oriented utilities traditionally and habitually use Integrated Resource Planning to map out electricity generation and electricity acquisitions over five, 10, or 20 years (or more). Lower 48 utilities, including Avista Utilities in Washington, Idaho, and Oregon, traditionally use integrated resource plans, which many states' utility regulatory authorities require of the electric utilities. IRPs help plan for updated technologies, increases in grid reliability and stability (fewer outages), and integrating third-party renewable to ensure lower-cost power for ratepayers not only for today but also for years into the future.

IRPs examine foreseeable future resources regarding transmission lines, substations, power plants, current and new end users and markets, and responsibility for taking care of the transmission and distribution of electricity. The ultimate purpose is to answer one question: How, as a Juneau community, do we plan to meet future electricity needs? The JIRP outlines the necessary actions to enable the community to ensure the integration of all energy producers to continue providing the Juneau public with electricity.

The IRP also addresses contributing factors that impact electricity supply and delivery, ranging from federal and state government regulations and expectations to the physical assets such as transmission lines and new hydropower to meet customer demand and other drivers.

Juneau's citizens would have the power to voice and influence how Alaska Electric Light & Power generates and delivers power, as well as their plans for the future, through a public process called the "Juneau Integrated Resource Planning."

2. What Juneau IRP essential questions get answered?

The public considers many criteria when creating the Juneau IRP. Common questions include:

- Will the customer base in Juneau grow with air source heat pumps, dock electrification, electric buses and vehicles, and putting area mines on 100% Hydro?
- What is the demand of each of these growing industries and customer bases?
- Do we have enough generation capability now, and what planning and public discussion are required now?

Port of Juneau

Cruise Ship Electrification

Shore Power Connection Study

June 2021

Introduction

In 2001, the world's first cruise ship shore power facility was installed in Juneau. It was installed as a collaborative project with Princess Cruise Lines and AEL&P. This facility has been in operation since then providing electricity to the cruise ships moored at the Franklin Dock from Juneau's renewable resource, hydroelectric generating plants. The result has been a reduction of consumption of fossil fuels powering the onboard generators, and thereby a reduction of unacceptable emissions. This is a reduction to Juneau's carbon footprint.

The electrical system planning for the City & Borough of Juneau (CBJ) cruise ship North & South Berths began in 2010 with a written Concept Design published in February 2011. The narrative included a brief description of proposed electrical shore connection deployment system to be facilitated with the construction of the new berths. The narrative included a brief description of the existing Franklin Dock facility and graphic displays of its energy consumption and power demand.

In 2016 during the construction of the North (Alaska Steamship) and South (Cruise Ship Terminal) Berths, CBJ contracted a team including PND Engineers, Inc. and Haight & Associates, Inc. to conduct a Feasibility Study determining the requirements to implement an electrical shore connection facility for the cruise ships moored to those berths. That study focused primarily on the characteristics of this facility, but also briefly addressed the probable use of the facility by the cruise ships and AEL&P's available capacity.

In 2020, CBJ Docks & Harbors contracted a team to further evaluate implementing an electrical shore connection system. This study delves further into the characteristics of the facilities for both berths with a Preliminary Design. Additionally, the cruise ship configurations and power/energy requirements are better illustrated; AEL&P's capability and capacities are identified, the effective costs and rates are analyzed, and the reduction to emissions are determined. The team includes:

- Carl Uchytil, PE, CBJ Port Director,
- Erich Schaal, PE, CBJ Port Engineer,
- Ben Haight, PE, HAI, Principal Electrical Engineer,
- Dick Somerville, PE, PND, Principal Civil Engineer,
- Brandon Ivanowicz, PE, PND, Staff Civil Engineer,
- Jim Rehfeldt, PE, AEE, Principal Mechanical Engineer,
- Jim Calvin, McKinley Research Group, LLC,
- Nick Syzmoniak, McKinley Research Group, LLC,
- Dan Lesh, McKinley Research Group, LLC, and
- Susan Bell, McKinley Research Group, LLC.

Ship Name	Onshore Power Fitted with Connection (Yes/No)	Side of Ship (Port or Starboard)	Distance from Stern (meters)
Norwegian Epic	YES - needs to be commissioned	Starboard deck 4,	74
Norwegian Joy	YES	Starboard deck 4	59
Norwegian Bliss	YES	Starboard deck 4	59
Norwegian Encore	YES - needs to be commissioned	Starboard deck 4	59
Norwegian Star	Yes	Starboard deck 4	63
Norwegian Jewel	YES	Starboard deck 4	64
OCI Regatta	NO - completion by end of 2021	Portside deck 3	21
RSSC Mariner	NO - completion by end of 2021	Starboard deck 4	55
RSSC Splendor	YES - needs to be commissioned	Starboard deck 4	82
OCI Insignia	NO - completion by end of 2021	Portside deck 3	21

Ship - HAL	Ships Class	Fitted out with shore connection	Port side	Starboard
Veendam	S-class	Yes		Yes
Rotterdam	R-Class	Yes		Yes
Amsterdam	R-Class	Yes		Yes
Zuiderdam	Vista Class	Yes	Yes	
Oosterdam	Vista Class	Yes		Yes
Westerdam	Vista Class	Yes		Yes
Noordam	Vista Class	Yes		Yes
Eurodam	Signature Class	Yes		Yes
Nieuw Amsterdam	Signature Class	Yes		Yes
Koningsdam	Pinnacle Class	Need Commisioning April/May 2020	Yes	Yes
Nieuw Statendam	Pinnacle Class	Yes	Yes	Yes
Volendam	R-Class	Install during 2020 approved		
Zaandam	R-Class	Install during 2020 approved		
Maasdam	S-class	No		

Ship - SBN	Ships Class	Fitted out with shore connection	Port side	Starboard
Odyssey		No		
Sojourn		No		
Quest		No		
Encore		No		
Ovation		No		

Voltage	Freq	Power on shore	Power max	Distance from stern	Height of door at WL
6.6 KV	60 Hz	5 MW	7 MW	56.13 Meter	3600 mm
6.6 KV	60 Hz	6 MW	8 MW	62.1 Meter	3600 mm
11 KV	60 Hz	6 MW	8 MW	62.1 Meter	3600 mm
11 KV	60 Hz	7 MW	9 MW	59 Meter	3400 mm
11 KV	60 Hz	7 MW	9 MW	52.5 Meter	3400 mm
11 KV	60 Hz	7 MW	9 MW	52.5 Meter	3400 mm
11 KV	60 Hz	7 MW	9 MW	52.5 Meter	3400 mm
11 KV	60 Hz	7 MW	9 MW	51.79 Meter	3400 mm
11 KV	60 Hz	7 MW	9 MW	51.79 Meter	3400 mm
11 KV	60 Hz	6 MW	8 MW	56.67 Meter	3500 mm
11 KV	60 Hz	6 MW	8 MW	56.67 Meter	3500 mm
6.6 KV	60 Hz	6 MW	8 MW	62.1 Meter	3600 mm
6.6 KV	60 Hz	6 MW	8 MW	62.1 Meter	3600 mm
6.6 KV	60 Hz	5 MW			

Voltage	Freq	Power	Power max	Distance from stern	Height of door at WL
6.6 KV	60 Hz	5 MW			
6.6 KV	60 Hz	5 MW			
6.6 KV	60 Hz	5 MW			
6.6 KV	60 Hz	5 MW			
6.6 KV	60 Hz	5 MW			

Door size	Distance Shore panel to Hull
1220 x 1220 mm	2200 mm
1220 x 1220 mm	2200 mm
1220 x 1220 mm	2200 mm
1220 x 1220 mm	2200 mm
1220 x 1220 mm	2200 mm
1220 x 1220 mm	2200 mm
1220 x 1220 mm	2200 mm
1220 x 1220 mm	2200 mm
1220 x 1220 mm	2200 mm
1220 x 1220 mm	approx 3000mm
1220 x 1220 mm	approx 3000mm
1220 x 1220 mm	2200 mm
1220 x 1220 mm	2200 mm

Door size	Distance Shore panel to Hull

Distance above Waterline	**Voltage (KV)**
4 meters	11kV
3.5 meters	11kV
3.5 meters	11kV
3.5 meters	11kV
3.5 meters	11kV
3.5 meters	11kV
1.75 meters	6,6kV
4.5 meters	6.6 kV
2.2 meters	6,6 kV
1.75 meters	6.6kV

	Water
Peak Load in Port (MW)	**Side of Ship (Port or Starboard)**
(9- 10MW)Depends of season - number of AC in service	Port and Stbd
(9- 10MW)Depends of season - number of AC in service	Port and Stbd
(9- 10MW)Depends of season - number of AC in service	Port and Stbd
(9- 10MW)Depends of season - number of AC in service	Port and Stbd
10 MW	Port and Stbd
6 to 7 depending on number of running HVAC	Port and Stbd
4,8 MW	Port and Stbd
4.9 MW	Port and Stbd
3,7 MW	Port and Stbd
4.8 MW	Port and Stbd

	Waste Water	
Distance from Stern (meters)	**Side of Ship (Port or Starboard)**	**Distance from Stern (meters)**
147	Port & Starboard	134
151	Port & Starboard	120
151	Port & Starboard	120
151	Port & Starboard	120
69	Port & Starboard	66.3
60	Port & Starboard	60
95	Port & Starboard	95M
167	Port & Starboard	110M
106,9 PS 95,9 STBD	Port & Starboard	106,9 PS 95,9 STBD
95 M	Port & Starboard	95M

Objective: The primary objective for the community is to reduce gas emissions from cruise ships in the Port of Juneau. The objective of this study is to:

- Understand and identify the energy needs to support shore power deployment to the cruise ships.
- Understand and identify the community's capacity to provide for those energy requirements.
- Determine and portray a technical direction to install a shore power deployment system with Preliminary Design drawings.
- Determine the costs to implement a shore power deployment system to CBJ docks.
- Determine and portray the economics of implementing a shore power deployment system.
- Determine and portray the effect of increasing shore power deployment to the cruise ships on the reduction of gas emissions in the Port of Juneau.

History/Background

Electrical Generation in Juneau:

The Juneau Goldbelt mining industry pioneered the early development of hydropower in Juneau. Their developments provided low cost, renewable energy to support mining and mills to extract gold from low grade ore bearing rock. The early hydroelectric facilities included Annex Creek, Salmon Creek, and Gold Creek Power Plants. These plants have been upgraded over time and are still in operation today.

Hydropower development has continued since the days of hardrock mining in Juneau with construction of the Snettisham Plant with taps into Long and Crater Lakes and the construction of the first phase of Dorothy Lake. These two plants presently provide a bulk of the electrical energy consumed by Juneau customers.

With AEL&P's five hydroelectric powerplants, Juneau is blessed with a significant renewable energy resource.

Cruise Ship Electrification:

The shore power connection facility was constructed and placed into operation on the Franklin Dock in the Port of Juneau in 2001 as noted above. It has a capacity to support a cruise ship load of over 16 MVA. This facility remains in operation today and is used primarily by Princess Cruise Line ships. The facility includes the following primary features:

- Substation: The substation owned by the utility, AEL&P is located on the mountainside above the Franklin Dock. It is powered from one of the 69 KV transmission lines routed from the Thane Substation into Juneau. The substation includes 69 KV switches, a stepdown transformer with 12.5 KV, 11.2 KV, and 6.6 KV output capability. The 12.5 KV feeder originally powered an electric steam boiler designated to support the cruise ship heating system. The 11.2 KV and 6.6 KV outputs are selected by switches and routed through a single feeder to the cruise ship. The voltage is selected based on the ship's rated connection.

- Cruise Ship Feeder: The cruise ship feeder is composed of three sets of conduit, each with three 15 KV cables from the substation to a switch located on the Franklin Dock. The conduits are buried to the dock and mounted to the side of the dock to the switch. From the switch, four 15 KV Type G/GC cables are routed across the deck and onto an overhead structure with a festooning system. The Type G/GC cables are a highly flexible, industrial type suitable for this installation.
- Festooning System: The festooning system is an overhead structure with a trolley like system supporting and suspending the cables. The system allows the cables to adjust a short horizontal distance along the side of the ship as well as vertically to the shore power connection port. The cables are raised and lowered as the tides change.

Cruise Ships

Information has been acquired from the cruise ship industry to determine the characteristics of the ships, their typically scheduled visits to Juneau, and their probable demand for electrical energy. This information is being further used to develop Preliminary Design Drawings for the Shore Power Connection Facility, to analyze the impact to AEL&P, and to evaluate possible electrical rates. Data was not provided for all cruise lines or ships. The data acquired for most of the ships adequately allows preliminary design and analysis.

Shore Power Connectivity

The characteristics of many of the cruise ships that currently visit Juneau are tabulated in a form, Appendix A. These characteristics include the length of the vessels, the position of the electrical connection port with reference to their distance from the stern, the side(s) of the ship where the connection port is located, their maximum electrical demand, and their connection voltage.

Ship Configurations:

The present shore power connection facility at the Franklin Dock is configured to support the Princess Cruise Line ships. Their ships are configured with the connection port on the Port side of the ship. The location of the port varies in distance from the stern. The length of the ships and their positioning at the dock allows them to connect most of the time.

The cruise ships that will typically moor to the CBJ (Alaska Steamship and Cruise Terminal) docks have varying connection port locations. Most of them are located on the Starboard side while a select few are located on the port side. A few have connection ports on both sides of the ship.

The North Berth (Alaska Steamship) includes a floating dock measuring 400 feet in length, designed for the larger cruise ships. The ships typically moor with their Starboard side facing the dock. This minimizes water turbulence to the Merchants Wharf and floatplane dock when the ships arrive and depart.

The South Berth (Cruise Terminal) has a smaller floating dock measuring 300 feet in length. This provides less frontage to the side of the ships limiting their ability to adjust their positioning for gangway placement and water & sewer line connections. The larger ships typically moor with their Port side facing the dock easing their approach and departures to the dock. It is possible the smaller ships can moor with their Starboard side to the dock.

Voltages:

As previously noted, the Princess Cruise Line ships are powered at either 6.6 KV (6,600 volts) or 11.2 KV (11,200 volts). The power is stepped down to their “user” voltages with transformers on board the ships. The ships for the other cruise lines are configured similarly at the same voltages.

The feeders to the ships will be configured similarly to those installed at the Franklin Dock for the Princess Cruise Line ships. A single feeder will be able to supply either 6.6 KV or 11.2 KV power to the ship. The feeder will be configured with several sets of multiconductor cables connected in parallel. The multiconductor cables will be limited in size to maximize their needed flexibility for ease of handling and tidal changes.

Power Demand:

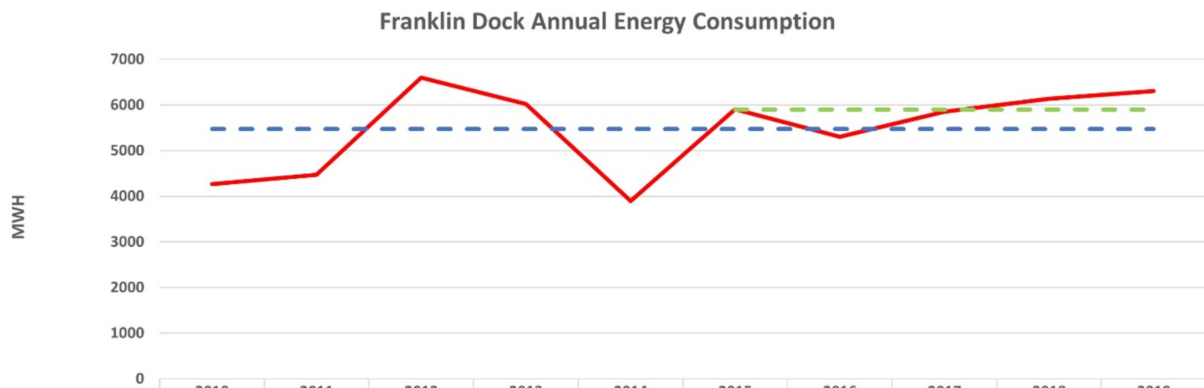
The Princess Cruise Line ships are designed to support loads of 8 to 10 MW (1 MW = 1,000,000 watts). With some exception, most of the ships for the other cruise lines are designed for peak loads via their shore connections of 4 to 7 MW. The exceptions are peak loads of 9 MW.

<u>Energy Profiles:</u>

Historic:

Data illustrating energy consumption at the Franklin Dock has been collected since the electrical connection system was installed in 2001. This is being presented as a point of reference for energy consumption at the CBJ docks. The data used in the analysis for this report was that collected from 2010 through 2019. During the early years of the facility, only some of the ships moored at the dock were fitted for connection, thus the early time period is not representative of present usage. The 10 year time period used is more representative of anticipated energy consumption.

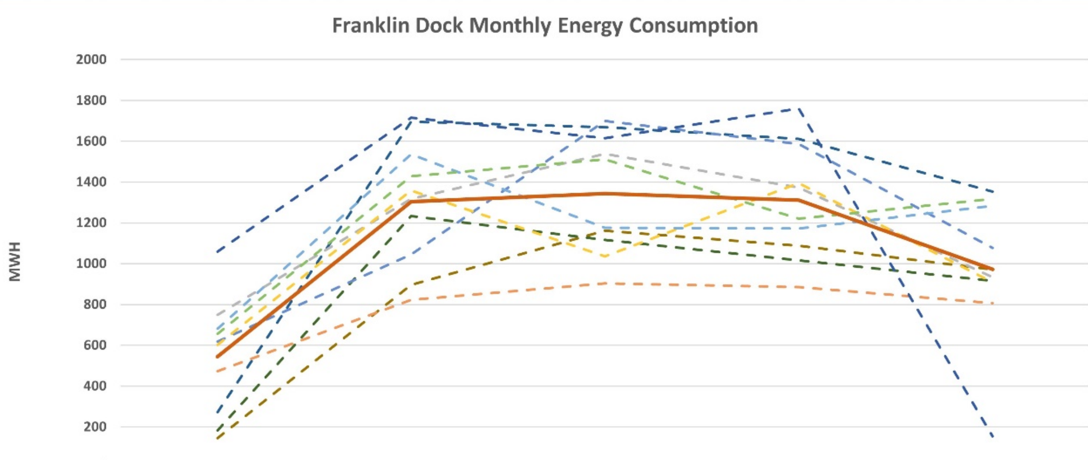
The following annual energy consumption graph and table for the Franklin Dock illustrate total energy consumption for each year of a ten year period. Notably the first two years were relatively low. The dip in 2014 was due to a lack of water in the lakes supporting the hydro facilities. The average noted consumption is 5,476 MWH. Excluding the data from 2010 and 2011, the average is closer to 5,900 MWH per year. Similarly, the five year average is also 5,900 MWH per year.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total	4266	4466	6604	6026	3894	5909	5301	5850	6135	6304
Avg (10 yrs)	5476	5476	5476	5476	5476	5476	5476	5476	5476	5476
Avg (5 yrs)						5900	5900	5900	5900	5900

Year

The monthly energy consumption graph and table for the Franklin Dock are presented here to illustrate the characteristic consumption through the season. As noted, the consumption ramps up from a low in May to a consistent amount for a three month period during mid summer. The average curve indicates 1305 to 1343 MWH monthly energy consumption through that period.



	May	Jun	Jul	Aug	Sep
2010	146	896	1163	1089	972
2011	183	1234	1118	1017	915
2012	272	1696	1669	1612	1354
2013	618	1045	1699	1586	1078
2014	474	823	904	885	807
2015	749	1317	1538	1373	933
2016	603	1358	1036	1394	910
2017	681	1537	1176	1173	1284
2018	655	1429	1512	1221	1318
2019	1060	1715	1615	1761	154
Average	544	1305	1343	1311	972

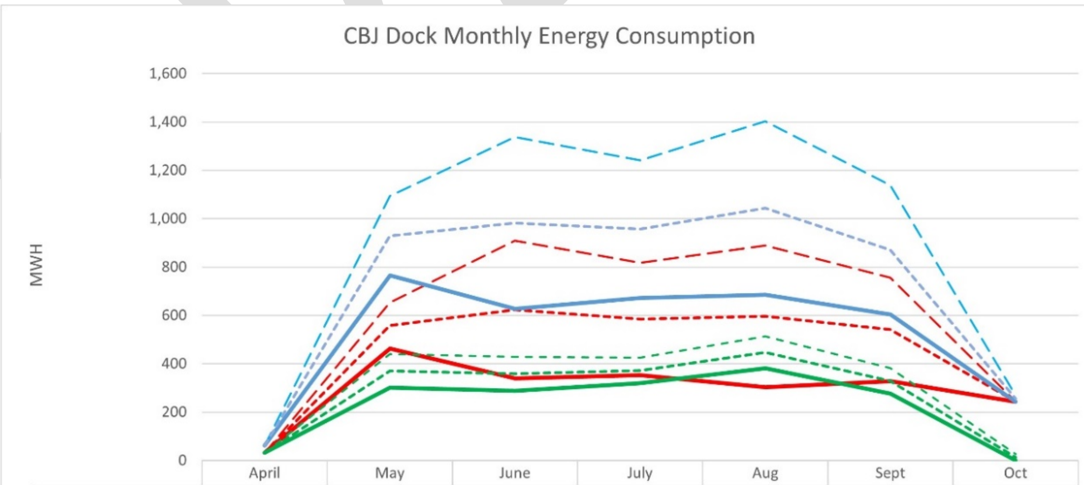
Months

Estimated:

The cruise ship schedule for a typical year is being used to estimate the anticipated energy consumption at the CBJ docks, along with data collected from the cruise ship lines with respect to their maximum connected loads (noted previously). The projected estimates include the following factors:

- The scheduled ship's ability to connect to power.
- The position of the ship's electrical connection port with respect to the dock while moored. Only the ships with the connection ports facing the dock can be connected.
- The time the ship is possibly connected to power while moored to either CBJ dock. The time connected was calculated by subtracting one hour for connect and one hour for disconnection from the total time moored.
- Based on Franklin Dock's annual consumption of 5,900 MWH and estimated time connection of 1,173 hours, their average consumption is 5 MWH per hour. This is approximately 50% of their peak load. The ship operations at the CBJ docks should be similar even though the maximum connection capacity is less than the Princess Cruise Line ships at the Franklin Dock. The ships typically moored to the CBJ docks have a peak load of 4 to 7 MW compared to Princess Cruise Line ships of 9 to 11 MW. Thus, the energy consumption at the CBJ docks was calculated to be 75% of the ships peak load capacity.

The CBJ North and South Berth estimated energy consumption graph and table are following. The seasonal traits are similar to those illustrated for the Franklin Dock but with a consistent monthly consumption rate over a five month period.



	April	May	June	July	Aug	Sept	Oct
AS Minimum	32	463	339	353	303	328	243
AS Maximum	32	653	908	818	890	756	243
AS Median	32	558	624	585	596	542	243
CT Minimum	32	302	288	320	382	277	0
CT Maximum	32	441	429	425	513	382	26
CT Median	32	371	359	372	447	329	13
Total Minimum	63	765	627	672	685	605	243
Total Maximum	63	1,093	1,337	1,242	1,403	1,138	270
Total Median	63	929	982	957	1,044	871	257

Month

Three sets of curves are presented with this graph. One set illustrates the estimated usage at the North Berth (Alaska Steamship) dock while a second set illustrates the same for the South Berth (Cruise Terminal) dock. The totals of the two are illustrated with a third set of graphs.

The data illustrated by the “minimum” curves is based strictly on the typical cruise shop schedule. With this illustration, only those ships that have connection capability while appropriately moored at the docks are included. Other ships with connection capability, but not scheduled to be moored to allow connection are excluded. The minimum condition is illustrated with the heavier weighted lines.

The data illustrated by the “maximum” curves is based on the extreme possibility that connectable ships can be shifted with non-connectable ships or ships can be reoriented to expose their connection ports to the dock. This is extreme in that some ships cannot be reoriented or that not all ships can be shifted.

Because it is improbable that the connections are likely to exceed the “minimum” curves by very much, and the possibility that circumstances will not allow all scheduled ships to be connected every time they are in port, the “minimum” curve is most appropriate for the economic analysis.

AEL&P

System Description:

The electrical system supporting Juneau and its surrounding area is composed of a network of power plants, transmission lines, substations, and distribution lines. A map of the locations of the hydro power plants and the main transmission lines into Juneau is included in Appendix B.

The primary source of electrical energy is generated by AEL&P’s hydroelectric power plants. The existing plants include:

Hydroelectric Plant	Peak Capacity (MW)	Typical Annual Energy Production (MWH)
Snettisham (Crater & Long Lakes)	78.2	285,000
Lake Dorothy, Phase I	14.3	75,000
Salmon Creek	5	29,600
Annex Creek	3.6	26,000
Gold Creek	1.6	4,500
Totals	**102.7**	**420,000**

The Alaska Regulatory Commission requires that AEL&P maintain fuel fired standby generators to support Juneau when there is a loss of electrical connection to largest source of power. The largest source is considered to be the combination of Snettisham and Lake Dorothy. They are connected to Juneau via a single transmission line. The standby power plants include those at Lemon Creek, Gold Creek, Industrial Boulevard, and Auke Bay. Their total capacity is 107 MW.

The Snettisham and Lake Dorothy power plants are connected by transmission line to the Thane Substation. This transmission line operates at 138 Kilovolts (KV) with much of it configured with aerial lines supported on towers. A segment of the line is routed along the bottom of the Taku River with oil cooled submarine cable. Annex Creek is also connected to the Thane Substation with a 23 KV transmission line routed from the Annex Creek Power Plant over Powerline Ridge to the Sheep Creek Valley and subsequently the Thane Substation. The Thane Substation converts the voltages from these power plants to 69 KV with two transmission lines routed from there into Juneau proper.

69 KV Line No. 1 is routed to feed power to the Second Street Substation on Gastineau Avenue, the Capital Avenue Substation, and the Lower Salmon Creek Substation. This power line is configured with aerial lines supported by wooden structures. It has a short segment of underground cable routed across the avalanche zone on Thane Road.

69 KV Line No. 2 is routed parallel to Line No. 1 from the Thane Substation to the Lower Salmon Creek Substation with some exceptions in Juneau proper. This line feeds the Franklin Dock Substation and continues to the Lower Salmon Creek Substation.

The substations on either of the 69 KV transmission lines can be switched to the alternate line when required to deenergize one line or to balance their loads. The entire line is configured with aerial conductors supported by wooden structures.

From the Lower Salmon Creek Substation, a single 69 KV transmission line is routed to serve power to the standby power plant and substation at Lemon Creek, the Airport Substation, the Mendenhall Loop Substation, the Lena Loop Substation, standby power plant and substation at Industrial Boulevard, and the power plant and substation at Auke Bay.

12.5 KV power is routed from each of these substations throughout the community using aerial and underground distribution lines.

<u>Capacity:</u>

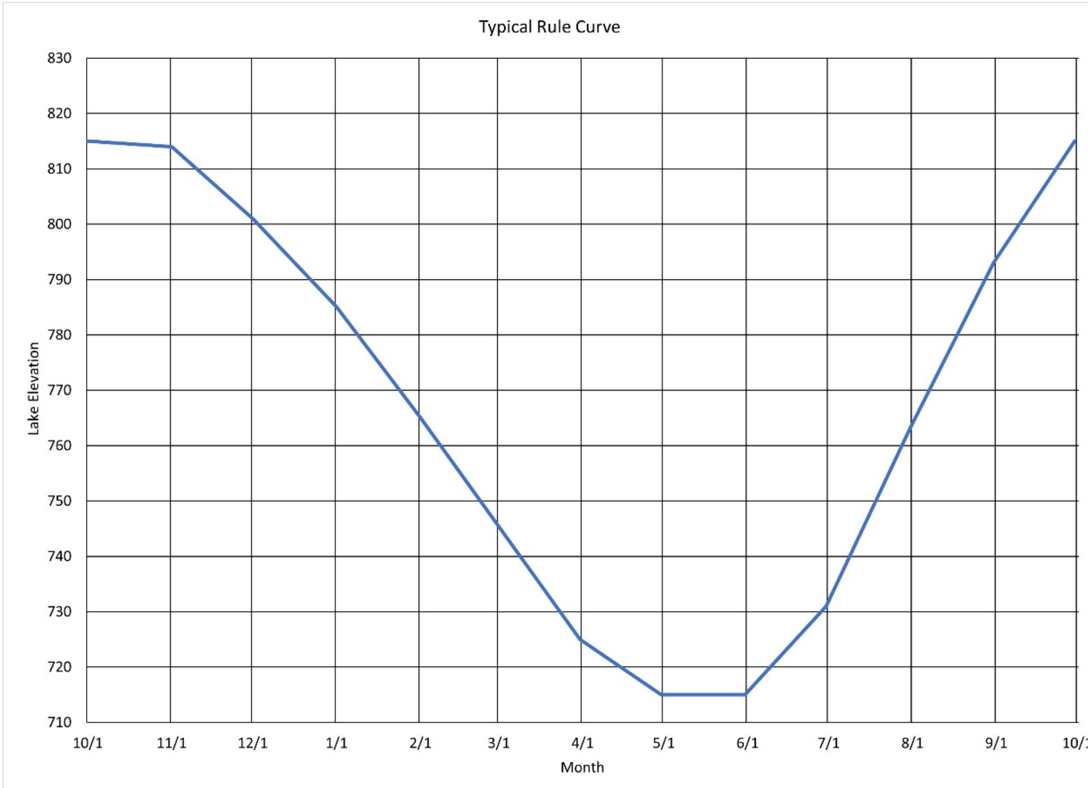
AEL&P's ability to furnish hydroelectric energy to the community is dependent on the capacity of their hydroelectric plant characteristics and their available stored water for production. It is also dependent on the energy consumption by its customers. As previously noted, the bulk of hydroelectric power is produced by the plants whose energy is routed through the Thane Substation. Thus, the capacity of the 138 KV and 69 KV transmission lines is important.

Generation:

The available energy from a lake tap hydroelectric plant is dependent on the amount of water stored in its reservoir. The amount of water stored is dependent on precipitation, snow storage and runoff to the lake, and the hydraulic energy converted to electricity and delivered to the community.

The amount of energy in an acre-foot of water in the lake is based on the elevation of that so called "acre-foot" of water. At the maximum lake level, the energy content is high whereas at the minimum level, the energy content is much lower.

AEL&P maintains "Rule Curves" for the lakes supporting their hydroelectric plants. The "Rule Curves" are based on historic experience of seasonal precipitation, snow accumulation, and customer loads. Their objective is to maintain lake levels above their "Rule Curve" to ensure adequate capacity to serve the community. A typical "Rule Curve" follows.



Due to the complexity of the calculations, AEL&P does not publish the energy content of the lakes supporting the hydroelectric plants on a seasonal basis. However, they have data that illustrates their typical minimum and maximum annual capacity.

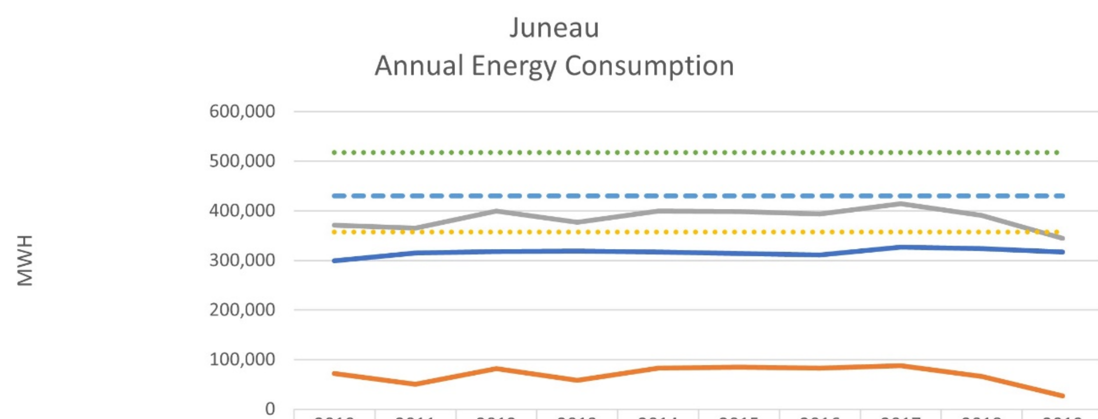
Lake	Firm Capacity (MWH)	Average Capacity (MWH)	Wet Year Capacity (MWH)
Long Lake (Snettisham)	155,000	195,000	230,000
Crater Lake (Snettisham)	90,000	100,000	125,000
Bart Lake (Lake Dorothy Ph I)	63,000	75,000	90,000
Annex Lake (Annex Creek)	22,000	24,000	28,000
Salmon Creek Reservoir	23,000	31,000	38,000
Gold Creek	4,000	5,000	7,000
Total	**357,000**	**430,000**	**518,000**

Data from AEL&P identifies the firm capacity as the minimum available energy, in other words, a dry year. The wet year capacity is the maximum available during a high precipitation year. This will vary seasonally based on the amount of precipitation received as rain versus that from snow runoff. The identified average capacity is typical for most years.

Transmission:

System Energy Consumption:

Using data acquired from AEL&P, Juneau's monthly energy consumption for ten years, 2010 through 2019 was analyzed. The data included the total consumption by firm capacity customers and by non-firm (interruptible) customers. This data was inclusive for all residential, commercial, institutional, and industrial customers connected to AEL&P's system. The data is illustrated with the following graph:

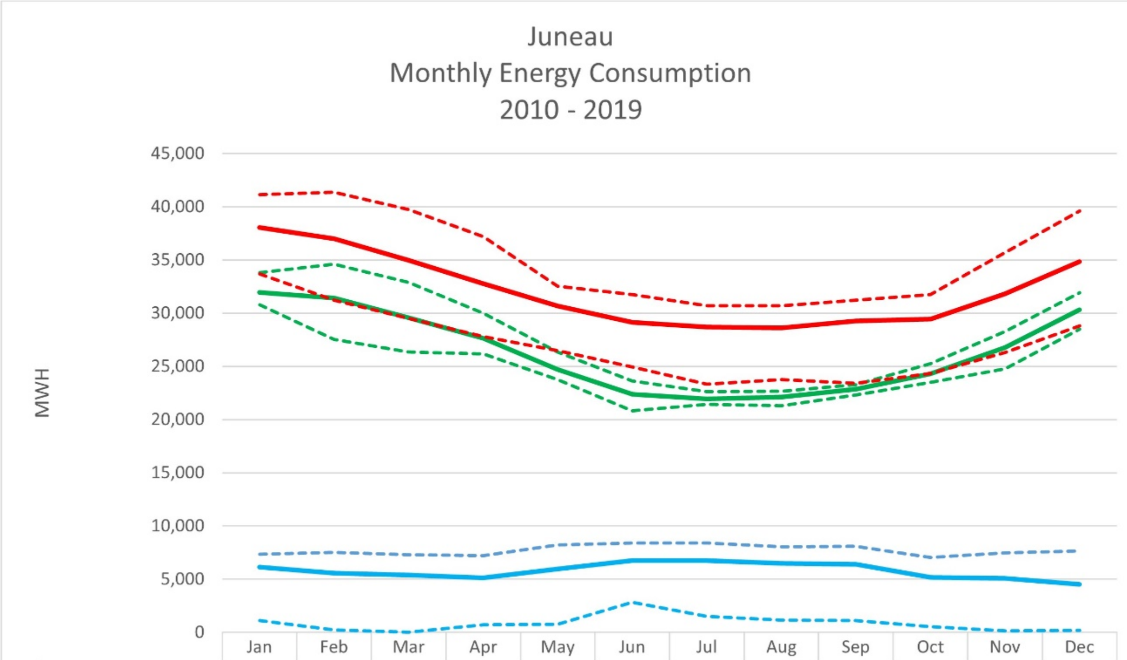


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Firm	298,991	314,927	317,555	318,950	316,625	313,667	310,906	326,464	324,209	317,129
Non Firm (Interruptible)	72,000	50,447	81,590	58,056	82,866	84,781	82,358	87,691	66,397	27,183
Total	370,991	365,374	399,145	377,006	399,491	398,448	393,264	414,155	390,606	344,312
Dry Yr Available	357,000	357,000	357,000	357,000	357,000	357,000	357,000	357,000	357,000	357,000
Typical Yr Available	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000
Wet Yr Available	518,000	518,000	518,000	518,000	518,000	518,000	518,000	518,000	518,000	518,000

Year

The energy consumption for both firm and non-firm customers is totaled presenting the normal energy consumption in Juneau. Also included in the graph above are the "Firm", "Average", and "Wet" year hydroelectric power plant capacities. Notably, the capacity for a dry year remains adequate to support the firm power needs in Juneau, but not all the non-firm power needs. Both the firm and the non-firm needs are supported with some excess capacity during a normal, average year.

Juneau's energy consumption varies with the seasons of the year. Typically the greatest consumption occurs during the winter with the least occurring during the summer. The following graph illustrates the average of consumptions month-by-month over a ten year period. The graph also illustrates the greatest and least for those specific months during the ten year period.

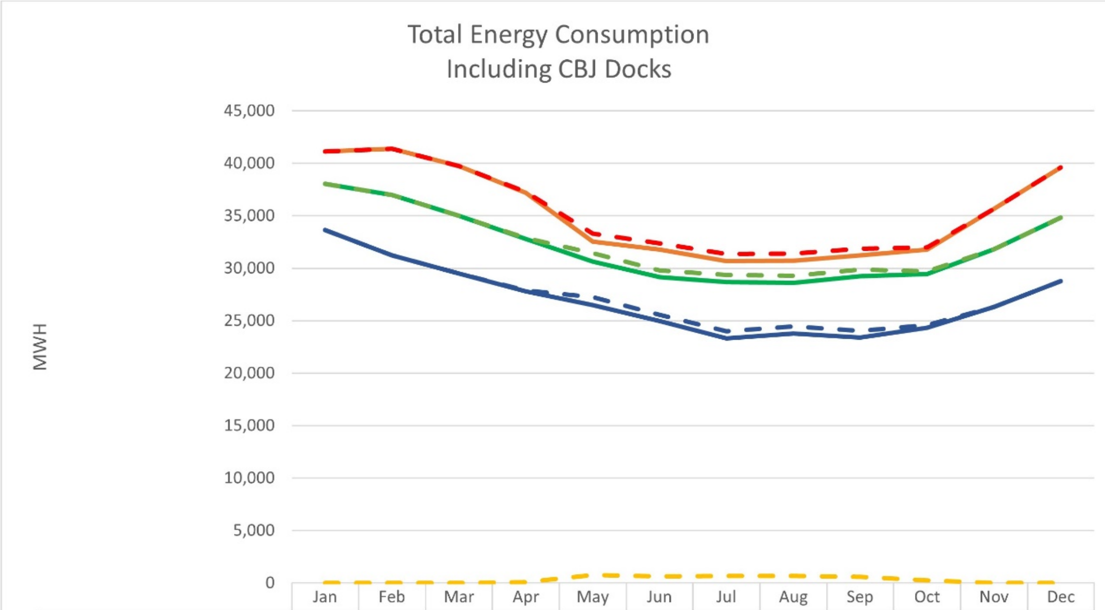


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Firm Avg	31,927	31,413	29,579	27,652	24,713	22,392	21,956	22,108	22,862	24,288	26,743	30,307
Firm Max	33,810	34,620	32,889	29,996	26,345	23,642	22,620	22,671	23,290	25,241	28,281	31,942
Firm Min	30,794	27,544	26,346	26,160	23,778	20,844	21,445	21,297	22,314	23,513	24,786	28,510
Non Firm Avg	6,126	5,565	5,405	5,143	5,943	6,755	6,751	6,502	6,397	5,153	5,066	4,531
Non Firm Max	7,341	7,529	7,290	7,205	8,242	8,382	8,405	8,031	8,107	7,046	7,461	7,646
Non Firm Min	1,115	216	31	711	762	2,810	1,521	1,137	1,102	523	123	181
Total Avg	38,053	36,978	34,984	32,795	30,656	29,147	28,707	28,611	29,259	29,442	31,810	34,839
Total Max	41,151	41,368	39,749	37,201	32,546	31,760	30,688	30,702	31,237	31,760	35,681	39,588
Total Min	33,662	31,225	29,500	27,806	26,481	24,946	23,317	23,761	23,416	24,327	26,322	28,793

Month

A set of curves identifying the AEL&P's seasonal capability to support the community is not available. As previously stated with respect to the Rule Curve, the amount of energy available at various lake elevations is dependent on the hydraulic impression on the hydro-turbine, the amount of runoff into the lake, and the weather conditions at the time. Thus, the hydroelectric capacity at any one time will vary from the identified annually determined capacities. The capacity will generally follow the Rule Curve.

Following is a graph illustrating the effect of supplying energy for cruise ships connected at the CBJ North and South Berths. This graph includes the anticipated energy requirements for the cruise ships at the CBJ berths, the average, minimum, and maximum energy sales, and the summation of the two. Notably, it's estimated the cruise ships will add a small addition to the overall energy sales by AEL&P.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg Existing Total	38,053	36,978	34,984	32,795	30,656	29,147	28,707	28,611	29,259	29,442	31,810	34,839
Max Existing Total	41,151	41,368	39,749	37,201	32,546	31,760	30,688	30,702	31,237	31,760	35,681	39,588
Min Existing Total	33,662	31,225	29,500	27,806	26,481	24,946	23,317	23,761	23,416	24,327	26,322	28,793
Min CBJ Dock	0	0	0	63	765	627	672	685	605	243	0	0
Min Extg + Min CBJ Dock	33,662	31,225	29,500	27,869	27,246	25,573	23,989	24,446	24,021	24,570	26,322	28,793
Avg Extg + Min CBJ Dock	38,053	36,978	34,984	32,858	31,420	29,774	29,379	29,295	29,864	29,685	31,810	34,839
Max Extg + Min CBJ Dock	41,151	41,368	39,749	37,264	33,311	32,387	31,360	31,387	31,842	32,003	35,681	39,588

Month

Future Development:

The future brings new energy consumers. Some of these customers might require firm power and others might accept interruptible service. AEL&P can respond to the additional customer energy requirements with the development of additional hydroelectric resources as needed.

Energy Consumers:

Major projects that will add loads of varying significance to AEL&P. Know projects are as follows:

- Electric Buses for Capital Transit: CBJ plans to replace several of their fuel powered buses with electric buses over the next few years. Their long term goal is to replace 18 buses. Bus charging stations are being installed at their maintenance station on Bentwood Lane, plus some stations at their transit centers. The total load is unknown at this time, but it is anticipated to be less than 2 MW. This load will be present year around.
- Touring Buses: Planning is proceeding to
- Norwegian Cruise Lines Shore Power
- Willoughby District Heating Plan

Generation:

Possible Future Hydroelectric Plants	Peak Capacity (MW)	Estimated Annual Energy Production (MWH)
Sweetheart Lake	20.4	111,000
Lake Dorothy Ph II	28	80,000
Sheep Creek		
Total		

Shore Power Design

Substation:

Berths:

Construction Costs:

Substation:

Berths:

Economics

Air Quality

Present:

Anticipated Reduction:

Total time in Port: 6,900 hours

Total time connected for power at Franklin Dock: 1,500 hours (22% decrease)

Total anticipated time connected for power at CBJ Docks: 840 hours   (12% decrease)

Conclusion

- What will Juneau do in case of emergency if an avalanche takes out a transmission line, a hydro plant goes down, etc.? Are we stranded again, and who pays?
- What smart grid, optimizations, utility battery storage, and efficiencies used by the utility industry should Juneau prudently plan and integrate?
- What older equipment, controls, and transformers are AELP upgrading or replacing to increase reliability and grid resiliency against current and future brownouts and blackout outages?
- How does integrating small non-utility sources like rooftop solar and backyard wind help Juneau meet its power needs?
- How do privately financed non-utility sources of new hydropower (that cost the utility nothing) integrate, lower electric rates, and displace diesel electrical generation to the benefit of Juneau?

3. Why doesn't Juneau already have an Integrated Resource Plan?

Good Question. Here are some possible answers:

- 36 states - either by state statute or regulation - require utilities to file publicly available IRPs or their equivalent with their State regulatory commission. IRP requirements and scope vary by state, but most commonly, the planning horizon is 20 years, with a detailed implementation plan for the first few years and a required update every two to three years.
- Alaska primarily has municipally owned or cooperative-type utilities. These utilities elect members from the public to oversee and plan for the community. Therefore, Alaska does not have a statute or regulation requiring an IRP because these public-owned or non-profit utilities already do their version of an IRP. There are only four private Investor-Owned Utilities (IOUs) in Alaska: Avista-Alaska Electric Light & Power (AEL&P), Alaska Power &Telephone (AP&T), Tanadgusix (TDX), and Doyon Utilities.
- Nothing precludes an Alaska utility from performing an IRP or working with an Alaskan community to achieve one.

4. How does an IRP help Juneau meet its GHG and Renewable Energy goals?

- How does increasing renewable energy supplies to displace mine and cruise ship diesel-electric generation reduce GHG emissions and help Juneau meet its GHG goals and renewable energy strategies?
- How do longer-term planning increase renewable energy supplies to assist Juneau in its electrification transformation to electric vehicles and electric air source heat pump space heating necessary to successfully meet its GHG goals and renewable energy strategies?

JIRP: Juneau's Path to Prosperity: 80% Renewable - 30% Reduction of GHG

Gretchen and Steve presented a memo about opportunities for dock electrification through a new Biden program. Eric and Steve did a presentation to the Docks and Harbors Board, who voted to seek funding. JCOS offered assistance for putting together the grant application as relates to climate action. Up to $25 million is available with no match required, but it was noted that any match is better than none to bolster a grant application. Anjuli asked about marine passenger head tax, but Eric said a future match does not count--it needs to be money in the bank. Gretchen suggested asking AELP for a portion of the match Duff said the info session about the grant said it required a 20% match unless a community was “impoverished.” He also said the money doesn’t need to be had by the project until the completion date, (possibly September 2027), so head tax money might be an option. Funding spending is 2024-2029, so there is time to plan. The Energy Committee will help Eric on portions of the application to connect the dots on JCAIP, JRES, and sustainability goals, at Eric’s request. Anjui speculated if Norwegian Cruise Line’s $2 million dollar no-strings-attached donation to the city might be available. Duff made a motion for the Energy Committee to work with the Chair to support Docks and Harbors with the grant application, and Steve seconded.

c. Juneau Energy Data (Steve Behnke)

JCOS is asking for funding for a consultant on energy usage. The Energy Committee keeps running into dead ends in trying to obtain information, most recently through a Tier-2 community disclosure of fuel storage. The committee will complete the memo request for funding.

VI. INFORMATION ITEMS

a. There will be a Sustainability Session on May 27 at noon. The topic is h Solid Waste 101 and will be presented by Lori Sowa, CBJ Public Works engineer.

b. Anjuli will Chair the May 19 work session.

c. Beth said the email list to disperse event notices from Tim Felstead’s days is lost. Please send her contacts so she can work on building a new list.

VII. COMMISSIONER COMMENTS

VIII. Next meetings

Monthly Work session/Subcommittee Wednesday May 19. 12PM ZOOM

Monthly regular meeting Wednesday June 2, 12 PM ZOOM

IX. ADJOURNMENT: Duff made a motion to adjourn at 1:00 pm.

Submitted by Lisa Daugherty, Secretary