Shore Power:

*Existing Shore Power Facility, South Franklin Dock (Princess Cruises):* The existing shore power facility at the South Franklin Dock was placed in operation in 2001 for Princess Cruises. The facility is configured with a substation on the mountainside above the dock, adjacent to the two 69 KV transmission lines routed from the Thane Substation to distribution substations in downtown Juneau. A transformer at this substation provides either 11.2 KV or 6.6 KV power to the shore power stations dependent on the vessel requirements. The power is transmitted through underground cables to a switch at the dock where the cables become large, flexible mining type cables laid in cable trays up and onto the festooning system where the cables are suspended to the ship. The system is capable of supporting a 16.25 MVA\(^1\) load.

The energy consumption for each ship visit has been recorded since the beginning of operations on 10 July 2001. The energy consumed varies from year-to-year dependent primarily on the amount of energy available from AEL&P. AEL&P provides this energy to Princess Cruises on a “non-firm” rate\(^2\). The energy consumed is graphically illustrated over the past ten year period – see Attachment A. The average consumption over the past nine years\(^3\) was 4,107 MWh\(^4\), while last year (2010) 4,266 MWh was consumed.

Last year, AEL&P began recording the load demand at the South Franklin Dock. Six different vessels visited Juneau and demanded peak loads varying from 7.24 MW (Sea Princess) to 10.6 MW (Diamond Princess). Most of the loads were between 8 and 10 MW – see Attachment B.

The vessels’ connection to shore power requires cooperative coordination between the AEL&P staff and the vessel crew. This involves synchronizing the generators on the ships to the utility frequency and voltage before closing the switch allowing connection, and then removing operation of the vessel's generators. Vessel departure involves a reverse procedure. The connection of the vessel is monitored with protective relays and interlocks which open the vessel's connection with any problematic conditions.

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\(^1\) MVA = Mega Volt-Amperes, a measure of apparent power.

\(^2\) AEL&P utilizes this rate structure allowing them to provide excess energy to specific customers when it is available. These customers utilize this energy in lieu of producing electricity with their own generators. With this rate structure, AEL&P is not required to maintain additional standby generators supporting “firm” capacity as stipulated by the regulatory commission.

\(^3\) The first year (2001) was not a full year, thus the consumption for that year was not included in the average.

\(^4\) MWh = Mega Watt hours, a measure of real energy.
**Future Shore Power Facilities, Downtown Docks:** AEL&P officials state that they currently lack capacity to support additional “non-firm” shore power facilities. When the second phase of the Dorothy Lake facility is constructed, their capacity will be improved with likely allowance for additional shore power facilities.

When implemented, the shore power facilities should be constructed at both docks. As illustrated in the site drawings, the ships will be moored stern-to-stern. From recent meetings with the cruise ship agencies, it was learned that the vessels are configured with their shore tie connections near their sterns, on one side or the other, but not on both sides.

The new shore tie facilities will involve the construction of a new substation on the mountainside, south of Gastineau Avenue. Again, this substation will be close to the 69KV transmission lines, located on land owned by an AEL&P sister company. It is probable that it will utilize two transformers, allowing selection of either 6.6KV or 11.2KV power to the each dock. The feeders from the substation will be parallel to the shoreline where they will separate direction to the individual docks.

The feeders from the dock will traverse down the transfer bridges to the floating docks. The cables will pass within the docks to the ends to the most strategic location for connecting to the vessels. The cables will terminate on a festooning type of structure allowing the cables with connectors to be suspended and swung out to the vessel.
The feeders on shore will utilize single conductors with 15KV rated insulation. These conductors typically utilize large strands with little flexibility. Before crossing from the stationary dock to the floating docks, the conductors will probably have to change to a finely-stranded type with much greater flexibility. And these cables will probably be a mine type cable encompassing the conductors for all three phases. The transition from one conductor type to the other will occur at a control switch or a pedestal type junction. This detail will be better studied during design.

When energy becomes available, the first phase of the facility to be constructed may be adequate to just power one shore tie. In this case, the system will be configured with a single transformer at the substation and a single feeder\(^5\) to a switch at the shore. The switch will be configured to select the dock to be powered as well as provide synchronizing control.

When it is determined that an adequate supply of energy is available to serve to shore ties simultaneously, the second transformer will be installed in the substation with a second feeder similar to the first installed to the switch at the shore. The switch bank will be reconfigured such that each switch individually controls synchronization to the associated dock. The cables from the switches to the festoons and connectors on the floating docks will remain the same.

With the understanding that excess energy is unavailable for the shore power facilities at this time, it is prudent to only install the required raceways, manholes, and vaults. The raceways constructed in duct banks will be installed from the hillside above South Franklin Street down to the shore line, first crossing beneath the street and then transitioning beneath the new

\(^5\) Four sets of conduits with three conductors.
parking area to the new portion of dock where the old ferry transfer bridge was once located. One or two manholes will be located on the shore side of South Franklin Street to provide access to install new cables. The duct bank will terminate in a vault at the shore with ten ducts stubbed through the retaining wall at the shore. There will be ten, 6 inch diameter raceways in the duct bank for the entire route.

Installing the infrastructure at this time will minimize future disturbances to the new uplands area. Along with the installation of an infrastructure on shore, some raceways, or support structures for raceways will be installed on the transfer bridges and within the floating docks.

Attachment C illustrates the layout of the shore power system. It defines the portion to be installed initially, and the portion, or portions, to be installed in the future.

**Facility Power:**

A power distribution system will be installed for both floating docks to support lighting, capstans, pumps, small vessel shore tie equipment, and miscellaneous equipment. The system will be powered at 480 volts, wye connected three phase.

The system will involve the installation of a feeder from shore to each floating dock. The feeders will terminate in distribution panels constructed for a marine environment with stainless steel enclosures and hardware. Step-down transformers will provide reduced voltage power (208Y/120 volt, three phase) to a second panel for small loads and maintenance receptacles.

The feeder to the dock will be a mining type cable (Type W). The circuits on the floating dock will be single conductors installed in Hot-Dipped Galvanized Steel Conduit. Connections to vibrating or shifting equipment will be flexible cable, either Type W or a type of SO.

All boxes will be cast metal suitable for a marine environment. Cabinets will be stainless steel with drip shields, gaskets, and stainless steel hardware. All support structures and materials will be stainless steel or Hot-Dipped Galvanized Steel.

The system will be metered a single point on shore with separate circuit protection for the feeder to each floating dock.

**Grounding:**

A grounding system will be installed to support both the medium voltage shore power facilities and the low voltage distribution system. It will incorporate bare copper conductors installed in the duct banks, ground rod type electrodes in the manholes and vaults, and insulated conductors beneath the stationary docks.

Grounding conductors will be incorporated into the feeders from the shore meter/load center to the distribution panels on the floating docks. Ground bars will be incorporated into the distribution panels with bonding to the floating docks and equipment. Additionally, sea water ground rod electrodes will be installed and bonded to the same distribution panel ground buses.
The grounding system on the floating docks will be constructed to allow integration to the medium voltage ground grid component of the shore power facility in the future.

**Lighting:**

Luminaires will be installed to illuminate the transfer bridges, gangways, catwalks, dolphins, and the floating docks. The luminaires will all utilize LED type lamps with night-time and motion sensing control. The lighting will only operate during night-time hours. The motion sensors will control the illumination levels from a partial output to full output when human activity is recognized within their sensing area. All luminaires will be manufactured with glare control features.

The luminaires on the transfer bridge will be small fixtures mounted beneath canopies where provided, to protect pedestrians. The illumination of the vehicle lane will be small fixtures mounted to the rails.

The luminaires on the floating dock will be area lights mounted to posts 15 to 20 feet in height, mounted along the shore side of the dock.

The luminaires on the catwalks and dolphins will be small fixtures mounted to the rails, not obstructing movement or line handling.

Navigational lighting will be installed as required.

**Surveillance Cameras:**

Surveillance cameras will be installed to observe problematic activities on the floating docks, catwalks and dolphins, and on the transfer bridges. The cameras will utilize Ethernet technology with wireless communications to a central DVR\(^6\) and monitor.

The cameras will be small and relatively inconspicuous with fixed lenses. Some cameras will also have infrared capability for night time observations. The cameras will be mounted to poles supporting area luminaires.

The DVR may be installed in the Downtown Library with connection to the CBJ network. The DVR may be programmed to collect images at designated intervals from specific cameras, or in video streams during specific times as initiated by camera motion sensing. The DVR will include storage capacity for a minimum of 30 days of images and video. It will have the capability of automatically erasing images and video stored for more than 30 days.

\(^{6}\) DVR = Digital Video Recorder
**Applicable Codes:**
Low Voltage Distribution Facilities – National Electrical Code
Lighting – Illuminating Engineers Society of North America