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CBJ Dock Electrification Fact Sheet

Juneau Commission on Sustainability, January 2, 2019

SO₂, NO_x and particulates emissions from cruise ships are threats to human health.

Air pollution from international shipping accounts for approximately [50,000 premature deaths](#) per year in Europe, at an annual cost to society of more than US\$ 66 billion according to recent studies. Through chemical reactions in the air, SO₂ and NO_x are converted into fine particles - sulphate and nitrate aerosols. In addition to the particulates directly emitted by ships, these secondary particles increase the health impacts of shipping pollution. Tiny airborne particles are linked to premature deaths. The particles get into the lungs and are small enough to pass through tissues and enter the blood. They can then trigger inflammations which eventually cause heart and lung failures. Ship emissions may also contain carcinogenic particles.

Implementing the sulphur standards for shipping fuels that the International Maritime Organization (IMO) adopted in 2008 is expected to save 26,000 lives a year in the European Union as of 2020. <https://www.transportenvironment.org/what-we-do/shipping/air-pollution-ships>

According to the US EPA, emissions from vessels running auxiliary diesel engines at berth can be significant contributors to air pollution. As port traffic grows in certain areas, air pollution may also increase. Exposure to air pollution associated with emissions from ocean going vessels and other diesel engines at ports (including particulate matter, nitrogen oxides, ozone, and air toxics) can contribute to significant health problems—including premature mortality, increased hospital admissions for heart and lung disease, increased cancer risk, and increased respiratory symptoms – especially for children, the elderly, outdoor workers, and other sensitive populations. <https://www.epa.gov/ports-initiative/shore-power-technology-assessment-us-ports>

Particle pollution is a mixture of microscopic solids and liquid droplets suspended in air. This pollution, also known as particulate matter, is made up of a several components including acids (such as nitrates and sulfates), organic chemicals, metals, soil, or dust particles and allergens.

People with heart or lung disease, older adults, and children are considered at greater risk from particles than other people especially when they are physically active. People with heart or lung diseases-such as coronary artery disease, congestive heart failure, and asthma or chronic obstructive pulmonary disease (COPD) are at increased risk.

<https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1001EX6.txt>

Juneau is one of the most visited port in Alaska and is expected to receive 584 port visitations in 2019. It now ranks as a top port worldwide for summer cruise vessel ship visitations. While many scientific emission study assessments were conducted at other ports, the emission impact would be similar for a similarly sized port. With our short cruise season, and with up to five vessels docked at the same time, people in our compact downtown port area may experience more pronounced seasonal health concerns.

“Nothing compares to the benefits of zero emissions by connecting the vessel to shore power and shutting down the vessel’s engines while the ship is at the dock,” says Peter McGraw, spokesman for the Port of Seattle.

<https://shipandbunker.com/news/am/688808-public-push-for-shore-power-as-seattle-makes-way-for-bigger-vessels>

Current regulation of cruise ship emissions.

Since 2015, vessels have been required to use fuel containing less than 0.1% sulfur or an approved equivalent method, which includes Exhaust Gas Cleaning systems, or scrubbers. Exhaust Gas Cleaning Systems are pollution control systems designed to remove pollutants from exhaust. Primarily, these systems are designed to extract sulfur oxides (SO_x) from the exhaust. Industry claims that the scrubber technology may also reduce NO_x and particulates in the cruise ship exhaust, but reports of independent air quality monitoring of cruise ship exhaust are not readily available. The scrubber systems are either “open loop” with wash water discharge into seawater or “closed loop” with wash water stored for later land disposal or a “hybrid system” which can dispose of wash water at sea or store it for later land disposal.

It is important to note that cruise ships do not require air quality permits, in contrast to stationary sources, such as Greens Creek mine diesel generators, which are regulated.

All ships visiting Alaska must comply with state opacity levels; opacity has been monitored since the 1970s. Enforcement actions in Juneau for opacity noncompliance reached 49 in 2012-2014; 0 between 2015-2016; 2 in 2017; and at least 9 in 2018. <http://dec.alaska.gov/water/cruise-ships/egcs/> Locally, the CBJ does not regulate cruise ship emissions.

There are also national ambient air quality standards for the protection of human health. In 2000, an ambient air quality study was conducted in Juneau, and no exceedance of standards were found. The Alaska Department of Environmental Conservation is planning on conducting an ambient air quality study in Juneau in 2019.

In 2020, the International Maritime Organization (IMO) will introduce even further MARPOL low-sulfur fuel restrictions and violations could result in criminal citations to Captains and Vessel Owners. Under new international regulations organized by the IMO, only fuel with 0.50 percent sulfur will be permitted for ships as of 2020. Alaska is in a North American Emission Control Area (ECA) that has a more restrict standard of 0.1 percent sulfur.

<https://www.platts.com/IM.Platts.Content/InsightAnalysis/IndustrySolutionPapers/SR-tackling-2020-imo-impact-shipowners-tighter-sulfur-limits.pdf>

There are ongoing industry trends in heavy visited ports toward reducing emissions through lower sulfur fuels and using shore power. Working to find solutions as well as regulatory enforcement of pollution and emission regulations is not limited to one geographical area. On November 26, 2018, the Port of Marseille, France criminally prosecuted a ship captain and owner for emissions violations of the 1.50 % sulfur limit for a vessel outfitted with scrubber technology.

<https://www.telegraph.co.uk/news/2018/11/26/french-court-fines-po-american-cruise-ship-captain-breaching/>

Based on a 2016 air quality survey of three Norwegian fjords with heavy cruise ship traffic, the Norwegian Maritime Authority recommended that only low-sulfur fuel be used in the fjords, regardless of whether ship have scrubbers. Also, the Authority recommended that the discharge of “open loop” scrubbers’ wash water be prohibited.

<https://www.sdir.no/en/shipping/vessels/environment/prevention-of-pollution-from-ships/report-regarding-pollution-from-shipping-in-world-heritage-fjords/>

Worldwide, these open loop scrubbers’ discharges are banned in Belgium, California, Connecticut, Dublin, Massachusetts, Germany’s Rhine River, and China’s inland waters, and Singapore will ban them in 1/1/2020.

<http://www.nepia.com/insights/industry-news/no-scrubs-more-ports-declare-ban-on-egcs-discharges/>

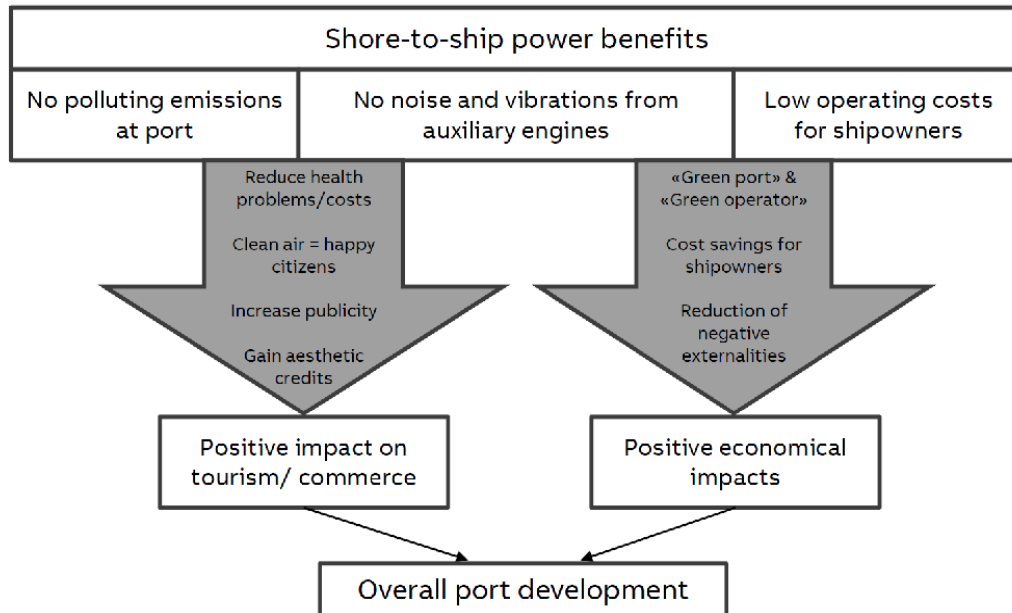
The ADEC’s *Commercial Passenger Vessel Environmental Compliance 2017 Seasonal Report* noted observations of oily sheens, foam, discoloration and solids of unknown sources in open loop scrubber wash water discharge, mostly observed while ships were docked. According to the ADEC report, the wash water is acidic and some ships reported non-compliance with ADEC/EPA standards that have pH limitations in 2016 and 2017.

Many of the cruise line companies visiting Alaska have made significant investments in burning ultra low sulfur diesel while in ports as well as ensuring that their vessels are electrification ready for use in ports that have installed electricity at their docks, piers and terminals to proactively comply with current and future regulations.

The economic and environmental benefits of shore power

Shore-to-ship power

Economical and environmental benefits



According to ABB, a large electrical component manufacturer, and confirmed with other studies, a cruise line vessel emits more NO_x in an 8-hour port visit than 10,000 vehicles. Juneau regularly has three and sometimes four vessels not electrified with shore power during a summer day. This is equivalent to emitting the same amount of pollution as 30,000 to 40,000 vehicles circling our downtown. The impact on Juneau not providing shore power to help reduce these GHG, particulates SO₂ and NO_x emissions in port is unhealthy, unsafe and not sustainable for the long-term health of Juneau residents, workers or the travel industry.

<https://search-ext.abb.com/library/Download.aspx?DocumentID=9AKK10103A1196&LanguageCode=en&DocumentPartId=&Action=Launch>

Juneau policies support dock electrification.

Juneau's Comprehensive Plan, Climate Action Plan, Juneau Renewable Energy Strategy and even the Juneau Docks and Harbors Bond brochure all tout CBJ dock electrification as both a solution to air quality concerns and as a part of reducing the city's carbon footprint. Additional dock electrification has been discussed in Juneau for more than a decade as a partial solution to decrease downtown emissions and health concerns during the cruise passenger season.

Ships coming to Juneau are electrification ready.

According to the Ports of Seattle and Vancouver 11 of 14 Holland America Line vessels are electrification ready. All Holland America vessels are starboard (right side of the ship) connections except for the Zuiderdam which is Port (left side of the ship) electrically arranged to connect to shore power.

Most of the vessels arriving in Juneau are electrification ready and are equipped with a starboard connection system. The entire Princess fleet will be shore power equipped by the end of 2019. All the Princess vessels are shore power equipped with access on the port side of the vessels. Juneau is lacking a Starboard shore power berth to service vessels with Starboard shore power configurations that regularly connect and use shore power in Seattle and Vancouver.

The wise cruise line operators are responsibly investing in on-board systems to enable shore side power connections to help meet current and future air quality regulations and to provide health and safety benefits for their guests/customers, on ship workers, and dockside workers and the public.

Many ports in North America offer shore power.

In 2018, there are ten North American Ports where the cruise industry regularly connects shore power while at berth. European ports are expanding shore power capability. Many ports require shore power connection and low sulfur fuel burning while berthed. Virtually, all new ports are employing Smart Port Grid Integration that enables fast and efficient electrical connections which lowers costs. Both Seattle and Vancouver provide shore side power for vessels operating in the Alaska cruise market. The average cost of electrifying one berth can vary but in North America ranges from \$6-8 million dollars and electrification is typically paid for by the industry and the community, along with port monies and fees. Tried and proven connection infrastructure design with experienced engineering for specialized dock electrification appears to play a role in keeping costs low.

There are two recent examples. The Port of Halifax recently electrified 3 terminals for \$10 million CDN while the Port of Montreal electrified their cruise terminals and three container berths for \$11 million CDN in 2017 using experienced and specialized firms adept at dock electrification.

https://www.marinelog.com/index.php?option=com_k2&view=item&id=8167:cruise-ships-calling-halifax-can-now-plug-in-to-shoreside-power&Itemid=227

<https://worldmaritimeneeds.com/archives/227279/port-of-montreal-can-now-power-cruise-ships-with-electricity/>

Cruise ship electricity needs and Juneau supplies.

Cruise vessels vary in size and their size dictates how many passengers they can accommodate and therefore the power that they require for hoteling operations while at berth. Smaller cruise vessels that typically dock at the Northern 16B CBJ berth requires substantially lower power than some of the Post Panamax ships. Depending on vessel size the power requirements can range from 5-10 Megawatts (MW) or 7 to 11 MW or more depending on cruise line.

<https://www.forbes.com/sites/williampentland/2010/12/18/plug-in-power-set-for-massive-growth-at-major-ports/#5016d2a65752>

<https://www.danskehavne.dk/wp-content/uploads/2015/12/GP-CMP-Shoreside-Report.pdf>

AEL&P recently cut off Greens Creek from hydropower and has announced it is out of power for interruptible accounts, raising the question of where additional electricity supplies will come from.

Juneau Hydropower, Inc., a local company, has a FERC license to build the 19.8 MW Sweetheart Lake Hydroelectric Facility. It has committed its power to supply the Coeur Alaska Kensington Mine which would could take up to one-half of the power. The balance of power has been offered to AEL&P to firm up Juneau's existing firm and interruptible customers from low reservoir outages, but would also provide power for future Juneau electrical growth to include the power requirements for one additional cruise vessel berth for the Juneau port.

<https://www.juneauempire.com/news/chamber-luncheon-focuses-on-sweetheart-lake-dam/>

Regardless of who provides the additional electricity, the community will need more hydroelectricity to meet the CBJ's goals of shifting heating loads to electricity. Providing for increased summer electricity sales will complement these increased winter loads while furthering Juneau community climate and energy goals.

EPA Report 2017: Shore Power Technology Assessment at U.S. Ports

Shore power can significantly reduce diesel emissions from ships at dock. {However, in Juneau, with hydropower based electricity, shore power completely eliminates diesel emissions from a connected ships at an electrified berth}.

Under the right circumstances when a vessel is connected to shore power, overall pollutant emissions can be reduced by up to 98% when utilizing power from the regional electricity grid, (depending on the mix of energy sources).

- The potential emission reduction benefits may be estimated for a particular vessel at berth when connected to shore power. Factors such as the amount of time connected, power consumption rate, energy costs and total time at berth are described in the EPA assessment and affect the overall effectiveness of shore power. Because these factors must be evaluated for each situation, total emission reductions may vary.

- The assessment suggests that shore power may be most effective when applied at terminals and ports with a high percentage of frequently returning vessels, typically cruise ships and container ships.

<https://www.epa.gov/ports-initiative/shore-power-technology-assessment-us-ports#findings>

Juneau meets both optimum circumstances because our power is hydropower and we have a high percentage of frequently returning cruise vessels. Not providing shore power to reduce the cruise vessel emissions in port is unwise and overdue. With expected increased port visitations in Juneau, the air quality problem will only get worse unless action is taken now.

Cruise Industry support for shore power electrification.

Disney, Holland America and Princess Cruises all support shore electrification based on their public statements and awards that they have received in Vancouver and Seattle for electrifying their vessels that serve the Alaska market.

Disney consistently receives an A grade for environmental transparency and compliance.

<https://foe.org/news/2016-06-disney-cruise-line-regains-a-grade-for-pollution-transparency/>

Holland America has aggressively upgraded its vessels for shore side power. October 23, 2018- Orlando Ashford, President, Holland America Line. **“Our ships call at the world’s most beautiful destinations, which is one reason we prioritize environmental responsibility. These ships can now achieve very low emissions while in ports where shore power is available.”**

<https://new.abb.com/news/detail/9079/abb-plugs-holland-america-line-into-low-emission-shore-power-worldwide>

Princess Cruise Line has pioneered shore power in Juneau that has led to other cruise lines adopting this environmentally proactive responsibility.

https://www.princess.com/news/backgrounders_and_fact_sheets/factsheet/Princess-Ships-Clear-the-Air-with-Shore-Power-Connections.html

Both Holland and Princess have received Green Awards for their shore power support at reducing emissions in Seattle and Vancouver and have been publicly supportive of shore power applications in the Northwest as well as in other ports of the US.

Dan Blanchard, of the small cruise line Uncruise, reports that the company has electrified their ships.

Past Juneau dock electrification efforts.

Juneau was the first port in the U.S. to initiate shore power for Princess Cruises in 2009 for Port (left) side connection at the Franklin Dock. Over time, the Marine Passenger Head tax funds reimbursed the cost of the Franklin Dock substation and dock infrastructure. Princess Cruises has connected to shore power every season since and has been a leading brand to use shore power. Its sister company, Holland America, has also outfitted 80% of its vessels for shore power and connects in Seattle and other ports, but cannot use shore power in Juneau as it requires a Starboard connection.

In 2016, the CBJ Dock and Harbors developed and published a dock feasibility study that was contracted to PND Engineers, Inc. This report is available at the CBJ Harbors but is currently not available as an online document with CBJ or with PND Engineers. The report's conclusions suggest:

"It is intended only to illustrate features of a possible configuration that will meet the objectives. As additionally identified, there are other options available which may be considered. The design process should more carefully evaluate the presented configuration along with the options presented and any other options yet to be determined."

"The facility described includes connection to the AEL&P transmission lines on Gastineau Avenue, a substation with feeder protection and voltage transformers, switchgear, and feeders to the ship portal. The configuration of the facility is based on application of submarine cables to a floating dock supporting a cable deployment system."

"\$12.9 million should be budgeted for the construction, engineering, and administration to install a facility for the South Berth. An additional \$12.9 million should be budgeted to complete the same for the North Berth."

The report was based on assumptions that all ships would require a Port Connection for non-Princess ships, and that the berths would require unique festoon/connection systems rather than employ tried and proven high voltage systems used elsewhere. Further, the report did not contain any cost/benefit discussion of the health-related issues/costs to the Juneau public or savings to the cruise passenger industry in meeting MARPOL 2020 and future emissions standards. Although there are worldwide and U.S. engineering firms and contractors that specialize in dock and berth electrification, these specialized firms were not consulted at this study's initial level of investigation. However, the report clearly states that it is not intended to differentiate or cost out options but instead the report contained a "possible configuration that will meet objectives. JCOS suggests that the study's electrification configuration costs per berth were higher than has been found in other U.S. ports using modular and lower cost connections.

At the time of the 2016 report, AEL&P was reportedly investigating the use of LNG to reduce port emissions which appears to no longer be an economic or viable option for Juneau. The PND report states:

"AEL&P has not committed to providing energy to another dock. They presently maintain commitments to other non-firm loads with those customers having a higher priority to receive energy first. In the past, they have experienced seasons with inadequate water storage to generate energy for all of their non-firm loads, including the cruise ships. In order to ensure adequate capacity, the construction of additional hydro power generation facilities is required. To gain a reasonable return on investment, they need to see a requirement to support other new customers or customers with increased loads. They currently do not have an adequate demand to support such an investment".

The PND report, published in 2016, did not address the Sweetheart Lake project with its additional 19.8MW of capacity and 116,000 MWh of hydro generation that is in pre-construction phase. It is publicly known to be in negotiations with AIDEA and AEL&P for interconnection arrangements and electrical generation sales of power to AEL&P to supply Juneau additional capacity and generation.

Dock electrification appears to be a legitimate and prudent use of Marine Passenger Fees.

Shore power appears to provide a direct service to cruise vessels, and therefore funding it with Marine Passenger Fees should be consistent with the recent District Court ruling by Judge Holland on December 6, 2018.

The ruling appears to require that MPF fees can only be used for services rendered directly to the vessel itself. Dock electrification provides a service to the vessel itself as well as a valuable service in meeting regulatory certainty and lawful compliance with current and future (2020+) MARPOL emission regulations. Dock electrification also allows a vessel to lower its use of expensive Ultra Low Sulfur diesel fuels by using less expensive local hydropower. The vessels can operate shore side power in the same tried and proven manner that these same exact vessels dock and electrify in other ports on the Alaska cruise itinerary, namely Seattle and Vancouver.

Link to Judge Holland Decision:

<http://s3-us-west-2.amazonaws.com/ktoo/2018/12/Cruise-Lines-International.pdf>

Go Forward- 2019 (FY 2020) Marine Passenger Fee request.

The Juneau Commission on Sustainability is submitting this proposal with this background fact sheet in response to this year's request for proposals to use of Juneau's Marine Passenger Fees (MPFs) for \$3.5 Million in this appropriation cycle.

The JCOS recommends that these fees be used to design and provide shore power for cruise ships at the North Berth of the 16B Dock, as follows:

Request for 2019 (FY 2020): \$3.5M

Evaluate the most economical and reliable alternative to provide the electrical service for the 16B North Berth for Starboard shore to ship electrification. The possible service options are a new substation at Gastineau Avenue served from the AEL&P transmission system or expanding the existing capability of AEL&P's Franklin Dock Substation including high voltage cable to extend electrical wire to the 16B dock to make ready for cruise vessels with starboard (right) side shore power. Produce a bid-ready document for construction of dock infrastructure.

Request for 2019 (FY 2020): \$3.5M

Year 2, 2020 (FY 2021): complete construction to electrify the 16B North Berth to enable electrification for starboard side berthing cruise vessels. Estimated cost \$6 - \$8 million to be determined by detailed engineer design and bid ready documents.

This proposal directly addresses CBJ Assembly's 2019 priority 5c, as well as general commitments to Juneau's sustainability: support for a stable, diverse and equitable economy; protection of air and water quality; and minimizing release of greenhouse gases.

Worldwide, cruise vessels are plugging into shoreside power, either by choice due to the economics or in response to ports requiring electrification to improve local air quality, or both. Most cruise vessels have electrification capability, and the industry is growing worldwide and in Alaska.

Shoreside power will contribute to public support for our Alaska cruise industry and its sustainable benefits to Juneau's economy. It's clear to Juneau residents that our air quality deteriorates during the seasonal cruise season; this is a recurring issue, recently raised during the Blueprint Downtown planning. The primary cause is cruise ship emissions. Juneau residents are concerned because of the well-known human health effects of SO₂, NO_x, and particulates contained in vessel exhausts.

This request that includes the above *CBJ Dock Electrification Fact Sheet* provides background information that supports JCOS's proposal to use Marine Passenger Fees in 2019 (FY 2020) and 2020 (FY 2021) for electrification on our waterfront.