



October 20, 2019

Cedar LNG Project

Impact Assessment Agency Canada

410-701 West Georgia Street

Vancouver, British Columbia V7Y 1C6

Submitted via web to: <https://www.canada.ca/en/impact-assessment-agency/news/2019/09/cedar-lng-project--public-comments-invited.html> . Original signed hardcopy hand-delivered.

Dear Sir/Madam,

**Re: Requirement for a Federal (IAAC) review of Cedar LNG**

On behalf of the My Sea to Sky (MS2S), a non-governmental organization in Howe Sound, BC, I am writing to support the requirement that the Cedar LNG project undergo both a Federal/ IAAC and a BC/ BIAAC environmental review and that any request by the BC Government for a substituted assessment be denied. Our reasons include:

- **Current regulations require both; the Proponent expects both:** Under current assessment legislation, this project meets the criteria for assessment by both IAAC and its provincial counterpart, the BC Environmental Assessment Authority. As the IAAC legislation is new, we think it unwise to miss this opportunity to test its validity and public acceptance.

We note that the proponent acknowledges that the project qualifies for a IAAC assessment. On P. 1 of the project description, the Proponent notes that: *“It is expected that the Project will require an environmental assessment (“EA”) under both the British Columbia Environmental Assessment Act (BIAAC) and the federal Impact Assessment Act (IAA) as the Project”*.

- **Marine impacts are a Federal- not Provincial- responsibility:** The Cedar LNG project description shows, at full buildout, one floating liquefaction and storage barge moored near the shore of the North end of Douglas Channel, between the Bish Cove (Kitimat LNG) and Kitimat (LNG Canada) project sites. According to the project description (P.4): *“Construction activities will include site preparation, as well as the construction and installation of Project components. Construction activities will be refined as design progresses, but are currently anticipated to consist of the following: Potential localized removal and disposal of marine sediments to accommodate marine terminals and the nearshore LNG production unit ..... “*. As Provincial Governments have no constitutional authority over marine areas below tidewater, and this authority cannot be assigned, a Federal assessment of the impacts on marine areas and marine life and habitat, is therefore required.

The project will impact marine life, both in the Douglas Channel and on the West Coast of BC. This includes near-shore noise and water quality effects on cetaceans and local herring-spawn and salmonid spawning areas, along with effects of noise and tanker traffic on endangered Northern Resident and Transient orca populations. This is acknowledged in the project description (P.66) as: *“Douglas Channel is highly productive, supporting many species of marine fish and invertebrates. Upwellings of nutrient-rich waters from the Juan de Fuca Plate and subsequent mixing with less*

*saline and warmer surface waters support a diversity of marine life, from microscopic primary producers (i.e., phytoplankton) through apex predators such as killer whales (Orcinus orca)”.*

LNG is classified as a Hazardous and Noxious substance (HNS) whose floating storage and ocean transport is regulated under the (Federal) Canada Shipping Act and Dangerous Goods Act. BC’s Oil & Gas Commission has no jurisdiction (or expertise) in these areas. Indeed, the Commission’s regulatory independence has recently attracted severe criticism for its repeated failure to regulate the construction of large dams supporting gas fracking operations in N.E. BC. As there is not now, nor has there ever been, an active LNG export facility on BC’s coast, the Commission’s (and EAO’s) expertise in this area is demonstrably inadequate. The conflict of interest in having the BC Government’s Deputy Minister of Energy, Mines and Petroleum Resources also be the current Chair of BCOGC, is further reason to require a separate Federal assessment lest public trust in BC’s much-maligned EA process be further eroded.

The Provincial Government lacks both the expertise and the authority to assess marine impacts. Section 5 of IAAC 2012 is specific to the need for IAAC to assess marine effects. Its dependence on “professional reliance” is what has hugely diminished public trust in the independence and quality of BC’s EA process.

- **Indigenous rights are a Federal responsibility:** Under Section 35 of the Canadian constitution, the Federal Government is responsible for upholding indigenous rights and title and for consultations with affected First Nations. This responsibility is especially vital in this case, as all coastal areas of BC are unceded Coast Salish territory. The proponent acknowledges this in the project description (P. 4) *“The Cedar LNG Team understands that the Project has the potential to affect the rights and interests of neighbouring Indigenous groups and is committed to engaging early and in a meaningful and respectful manner to develop the Project in a way that minimizes potential environmental, cultural, and socio- economic effects and provides long-term benefits for current and future generations”.* This responsibility cannot be assigned, either to the Proponent or to Provincial authorities. As has been the case for other large resource projects in BC, indigenous rights & title are a crucially-important and sensitive issue in environmental assessments.
- **The GHG emissions effects of this project are of national significance:** P. 6 of the Cedar project description states: *“If the full amount of power required by the Project is available from the provincial grid, the Project is expected to produce approximately 168,000 tonnes of CO<sub>2</sub> equivalent (CO<sub>2</sub>e) per year. If Cedar is required to self-generate 100% of its power, the Project is expected to produce approximately 840,000 tonnes of CO<sub>2</sub>e per year”.*

This suggests that the GHG emissions intensity (tonnes CO<sub>2</sub>e emitted per tonne of LNG produced) of this plant would be far below industry norms (i.e. in the range of 21% v. industry-standard intensity measures of 27%-30%<sup>1</sup> for gas-powered liquefaction; roughly 4% if grid-powered v. at least 17% predicted. Grid-powered Woodfibre LNG is suggesting at least 7% direct-emissions intensity). How Cedar’s exceptional level would be achieved in either power option is not explained and is, frankly, highly improbable. The project description also lacks any estimate of the upstream emissions

<sup>1</sup> Delphi Group, LNG Emissions Benchmarking Report to BC Climate Secretariat, April, 2013;  
[https://www2.gov.bc.ca/assets/gov/environment/climate-change/ind/lng/lng\\_emissions\\_benchmarking\\_-\\_march\\_2013.pdf](https://www2.gov.bc.ca/assets/gov/environment/climate-change/ind/lng/lng_emissions_benchmarking_-_march_2013.pdf)

resulting from fracking, venting and flaring and fugitive emissions from pipeline transmission of the gas generated to supply this project.

Both BC and Canada have committed to large reductions in GHG emissions to meet its provincial and international obligations, so the addition of this plant's emissions to the GHG tally is indeed a matter of national importance. Current measurement indicate that GHG levels are rising- not falling – and that both Governments are failing to make progress on meeting those commitments<sup>2</sup>. The air quality and ocean acidification of the Douglas Channel are also of intense local concern<sup>3</sup>. In respect of the greenhouse gases and climate effects of this project, this statement of emissions effects understates the damaging effects of wildfires, tornadoes, floods and pestilences that are the consequences of climate changes induced by anthropogenic emissions, such as from this project. As the recent IPCC report warns, Governments worldwide have little less than a decade to transition away from fossil fuel dependencies. It is inconceivable that this project is in any way consistent with heeding that warning, living up to Canada's COP-21 Paris commitments, or with meeting either Federal or Provincial ("CleanBC") emissions targets.

- **Regulations are not “world-class”:** Currently, Canada has no LNG export plants - let alone regulations specific to this novel “at Shore LNG” configuration proposed for Cedar LNG. Its regulations for LNG plants, storage and tanker safety fall well behind those of countries - the United States, Australia, Algeria, Qatar- with longer, and sometimes bitter, experience in the regulation of LNG plants and tanker traffic. For example – one of the first steps in the (FERC/DHS) U.S. Environmental Assessment process is a “Waterway Suitability Assessment”, which examines the safety and vulnerability assessment of the proposed site and the tanker route to open ocean. The Canadian process lacks anything similar. It is significant that the Douglas Channel is not controlled by a federal Port Authority, has limited navigational aids and communications facilities, and is exposed both to tsunami risks and the fiercest weather the North Pacific can muster. SIGTTO- the Society of International Gas Tanker and Terminal Operators which counts most LNG proponents as members – strongly recommends that LNG facilities not be located in long, narrow inlets with significant other marine traffic. The Douglas Channel and Principe Sound are such inlets.

Provincially and Federally, these regulations are currently in a state of flux. In BC, the EA process is undergoing changes, particularly in regard to the increased role of First Nations, the professional reliance model, and the independence of the BC Environmental Assessment Office (BCEAO). These changes are the result of deep public distrust in BC's current scandal-tainted EA process. An update to antiquated Federal TERMPOL process – likely to be particularly important in this case - is currently in progress, not least because it is a voluntary process and its recommendations are non-binding on project proponents. Also, federal regulation of the maximum levels of fugitive emissions allowed from the fracking industry have recently been changed.

- **Unknown impacts on local gas prices:** Currently, regulated gas retailer FortisBC employs 2,300 people supplying natural gas (and some electricity) to 1.1 million customers across 135 communities in British Columbia. The gas is sourced from the same Western Canadian Sedimentary Basin as would the Cedar facility, so export and local demands would compete for certainty of supply.

<sup>2</sup> <http://climatechangeconnection.org/emissions/ghg-emissions-canada/canada-ghg-by-province/>

<sup>3</sup> <https://www.cbc.ca/news/canada/british-columbia/bad-air-from-rio-tinto-aluminum-smelter-forcing-her-to-move-kitimat-resident-says-1.3732516>

This raises concerns for FortisBC, for many of its customers and for the local regulator (BC Utilities Commission). In its Nov. 16, 2012 letter to the NEB (re the LNG Canada export license application), FortisBC summarized its supply concerns as follows: *“FortisBC does remain concerned with the potential for negative price impacts and increased transportation costs that could arise if the development of LNG export related infrastructure is completed in a way that reduces the supply availability, or liquidity, at Station 2, or results in redundant pipeline capacity. FortisBC recognizes that North American natural gas markets are interconnected and that the Company’s customers generally pay commodity prices that are linked to North American prices, with the benchmark being the Henry Hub market price. In fact, the majority of FortisBC’s BC supply agreements are currently indexed to AECO prices, which in turn are linked to Henry Hub. However, there is currently considerable uncertainty how the proposed LNG export projects will impact the regional pricing of natural gas and the utilization of existing pipeline infrastructure in BC, which could reduce liquidity and give rise to price disconnects at BC market hubs on which FortisBC is dependant to access the gas supplies required by its customers. FortisBC will be monitoring future facility applications associated with these projects and, where appropriate, actively participating in any review process to ensure its customers’ interests are protected”. . . . . “FortisBC also believes that any future LNG export applications should include an assessment of how their LNG exports could impact regional pricing and regional pipeline flows.”.*

In the regrettable absence of any agreed pan-Canadian Energy Strategy, such supplier, consumer (and voter) concerns are valid in this case also. It is not unlikely that BC might mirror recent Australian experience, where the development of an LNG export industry triggered a gas scarcity, a tripling of local gas prices, a “lock the gate” farmer revolt against fracking, and, in a spiral into economic absurdity, proposals to build two LNG import plants on the east Coast of Australia.

Aside from the above reasons to require a Federal (IAAC) review, there are several questions about this project which the current project description fails to address, including:

1. **How will the liquefaction process be cooled?:** All (3) known FLNG (FSPO) vessels are designed to use sea-water to carry away the heat extracted from the liquefying gas. These are significant – Shell’s “Prelude” FSPO will intake and flush out 51 million litres (51,000 tonnes-20 Olympic-size swimming pools) of sea-water and its associated sea-life every hour in its 3.5 Mt/y operation. To keep the expensive titanium-steel piping in the plant free of crustaceans and other marine growth, the water is treated upon intake, usually with fluorides, which are flushed, hot and untreated, back into the ocean. Far offshore, this is far less destructive of sea-life as would such a practice in a near-shore installation. Consequently, California, New York and some parts of Europe have banned this form of once-through sea-water cooling for its near-shore power plants – see attached article and research references comparing closed-loop and once-through forms of cooling. In Howe Sound, the local Squamish Nation forced Woodfibre LNG to change its cooling method to air-cooling<sup>4</sup>, despite the higher noisiness and power requirements of the latter. Appendix A at the end of this comment outlines the research on this topic.
2. **Where’s the pipeline piece?:** The current proposal omits from its scope the pipeline required to feed gas to the Cedar plant. Without it, the project is impossible, as there is no local supply of gas. The Project Description describes the pipeline thus: *“Subject to the negotiation of certain agreements, Cedar intends to receive feed gas from the Coastal GasLink pipeline at a meter station within the vicinity of Kitimat. Natural gas will be delivered to the Cedar LNG Project Area*

<sup>4</sup> <https://www.squamishchief.com/news/local-news/sea-cooling-system-out-air-cooling-system-in-1.2371049>

by a 20-inch diameter, approximately 8 km long pipeline". As the pipeline is a necessary and intrinsic part of the project, and, along with possible grid power infrastructure, contributes to the project's cumulative environmental impacts, it should be included in a single, comprehensive assessment rather than in this fragmented, piecemeal approach. That the pipeline component has been supplied by an unrelated entity is entirely irrelevant to the environmental assessment of the project.

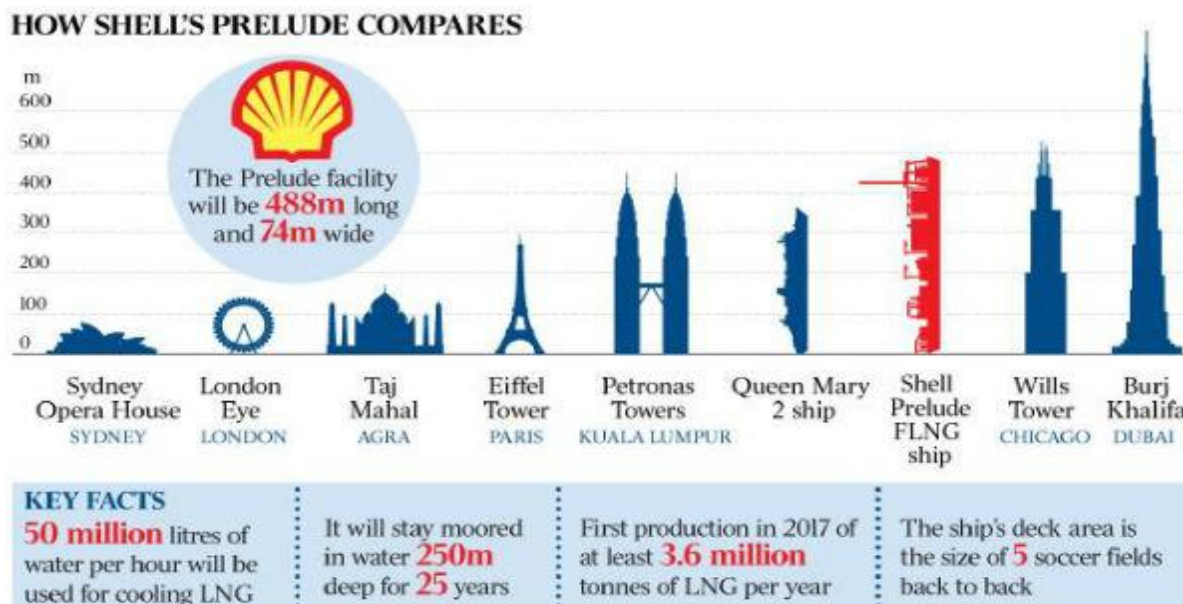
3. **Where's the BC Hydro line piece?:** The current proposal omits details of the impact of adding a high-voltage electricity supply from the sub-station to the Cedar plant. The proposal states that it will require a 200MW service from BC Hydro (if available). As high-voltage lines require 32-64m. clear-cut setbacks from large pylons, the visual, vegetation and wildlife habitat impacts should be included in the assessment. Also, the effects of this large increase in electrical demand in the Kitimat area – already taxed by the RTZ, LNG Canada and Kitimat LNG proposals - should be known prior to any approvals of this project.
4. **Where will the liquefied gas to be stored?:** The proposal implies – but does not specify - that the FLNG vessel will also store approximately 108,000 tonnes of LNG. The wisdom of locating this amount of LNG in the water close to the shipping route of LNG tankers to/from LNG Canada and freighters to/from RTZ can be questioned. In Japan, regulations for LNG terminals require storage tanks to be sunk to ground-level – this to minimize spill dispersion in seismic events. The now-dated TERMPOL assessment of shipping safety in Douglas Channel should be revisited, given the greatly increased shipping traffic now anticipated.
5. **What are the upstream impacts (fracking, fugitive emissions, water use/contamination etc.)?:** The project description is largely silent on the sources of its feed gas, which will necessarily require a large increase in fracking operations in N.E. BC. The adverse environmental impacts of fracking (earthquakes, forest destruction, use and contamination of ground water and water tables, health and social impacts on residents, infringement on First Nations hunting and fishing rights, effects on wildlife, especially caribou, to name but a few) are well known. Less well known and largely-unmeasured also are the fugitive emissions from cracked well-casings, poorly-completed well bores and pipeline compressor stations, all of which are significant unrecognized point sources of climate-warming methane emissions.
6. **What is the source of electrical power for this project?:** The project description suggests that the enormous (200MW) amounts of electrical power required for the liquefaction and storage of Cedar LNG may be supplied from BC Hydro's grid. The alternative – of using gas-powered turbines at the plant site, is also put forward as the more likely possibility. This is quite disingenuous, as there is no large-scale grid-powered LNG facility operating anywhere in the world, and, in any case, BC Hydro does not have anywhere near that level of hydro power available or developable in the Kitimat area. The matter of power source is important, not just for the plant's projected GHG emissions, but also for the environmental impacts of the proposed facility.
7. **What are the local, regional and national benefits of this project?:** The project description fails to establish what the "benefits would be. It states that: *"the project will also contribute to economic reconciliation in British Columbia by recognizing and implementing Haisla Nation's authority over economic development on Haisla Nation-owned lands. It is also in keeping with Article 32 of the United Nations Declaration on the Rights of Indigenous Peoples. Income generated by the Project will be invested by Cedar in the Haisla community and will provide jobs and contracting opportunities for Haisla Nation members, member of other local Indigenous*

group, and local community members”. The Regional, Provincial and National benefits of the project are not stated. In the currently-gutted Asian LNG marketplace, LNG spot prices are below the likely cost of production, making any forecasting of these benefits extremely difficult.

However, its ultimate investor-shareholders may not be local (the equity participation of the Haisla First Nation is unspecified, but will hopefully be above 50%). The project description states that “It is possible that Cedar will pursue the Project through a limited partnership in which Cedar or its affiliate serves as the general partner and Haisla Nation maintains a majority ownership interest”). The taxation, employment and social benefits are vaguely outlined and it is highly likely that most of the FLNG technology and professional services will be purchased abroad, limiting local benefits. The proponent promises a local in-operation work force. P.18 states that “During operations, the Project will directly employ an estimated 70 to 100 people in ongoing full-time roles”. That is a paltry job-count benefit for an investment of at least \$5 Billion. The availability and housing of skilled workers will be major issues, especially given competition from other local LNG project(s).

- 8. **Where will the offloading LNG tankers (and tugs) be bunkered:** LNG tankers burn up to 200 tonnes of IFO380 fuel for each day’s sailing to and from Asia – typically a 10-14-day trip one-way. Tugs typically burn diesel. While most LNG tankers use their boil-off gas (BOG) to augment this fuel, none can avoid using bunker fuel for the majority of propulsion and electrical power needs. Our reading of the project description shows no recognition of this need, which will expose Douglas Channel to increased marine traffic and oil-spill risk.
- 9. **FLNG is a novel technology- where will the expertise come from?:** The Cedar LNG proposal is for a floating liquefaction and storage facility capable of producing and shipping 3-4 million tonnes of LNG annually. We know of only two FSPO’s (floating storage, production/liquefaction and offloading) vessels currently in operation in the world. The “Prelude” floating LNG facility, currently starting production 120km. offshore Western Australia, is 488m. long and 44m.wide.

Prelude has a production capacity of 5.3 million tonnes a year (Mt/y) of liquids and condensate, including **3.6Mt/y of LNG**, 1.3Mt/y of condensate and 400,000t/y of liquefied petroleum gas.



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That is much the same as Cedar LNG’s proposed annual 3-4 Mt/y production. Prelude’s infrastructure includes six LNG storage tanks with a **total capacity of 220,000m<sup>3</sup>**. Source is: <https://www.offshore-technology.com/projects/shell-project/> .

**Prelude** FLNG was approved for funding by **Shell** in 2011 and went into production last year. Analyst estimates in 2013 for the **cost** of the Prelude vessel were between US\$10.8 to \$12.6 billion. **Shell** estimated in 2014 that the project would **cost** up to US\$3.5 billion per million tons of production capacity. Petronas’ smaller (365m. long, 1.2Mt/y of LNG production) FSPO “Satu” is in operation offshore Sarawak.

A third, Petronas’ **PELNG2**, will be moored at the Rotan gas field in deepwater Block H, 120km. offshore Sabah, Malaysia, and will have a capacity to annually produce 1.5 million tonnes of LNG. We know of no FPSOs in operation anywhere in North America. Both existing FPSO’s use once-through seawater cooling to disperse the energy produced in the liquefaction process Prelude uses **50 million litres of seawater every hour – 20 Olympic-sized swimming pools** -in its liquefaction process, and discharges these – warm and chlorinated - into the ocean). Both operational FSPOs have at least one permanently-lit flare, mainly to burn off unwanted gases in the pipelined supply.

The proponent has no experience with designing, constructing and operating an LNG plant. There is little/no FLNG construction experience in BC’s labour force. We know of no North American LNG engineering firms with experience with the design and operation of floating LNG platforms. Neither do the BC EAO , the BC Oil & Gas Commission or Transport Canada. The prior FLNG proposal in BC – Steelhead LNG – recently **shelved**s its effort when its investors pulled out. This pioneering LNG proposal is indeed facing long odds on its success.

It is our firm view that the Cedar LNG project must undergo both Federal/ IAAC and BC/ BIAAC environmental reviews and that any request by the BC Government for a substituted assessment should be denied. We request confirmation of receipt of this letter, and its prompt publication in the comments section for this project.

**Eoin Finn B.Sc., Ph.D., MBA**



**Research Director, My Sea to Sky, Vancouver, BC.**

cc. Tracey Saxby, MS2S Executive Director  
MS2S Board of Directors

<sup>5</sup> <https://www.straight.com/news/1202346/steelhead-lng-halts-work-kwispaa-plant-according-huu-ay-aht-first-nations>

**Appendix A: LNG 101 - Salmon and Hot, Chlorinated Seawater don't Mix**

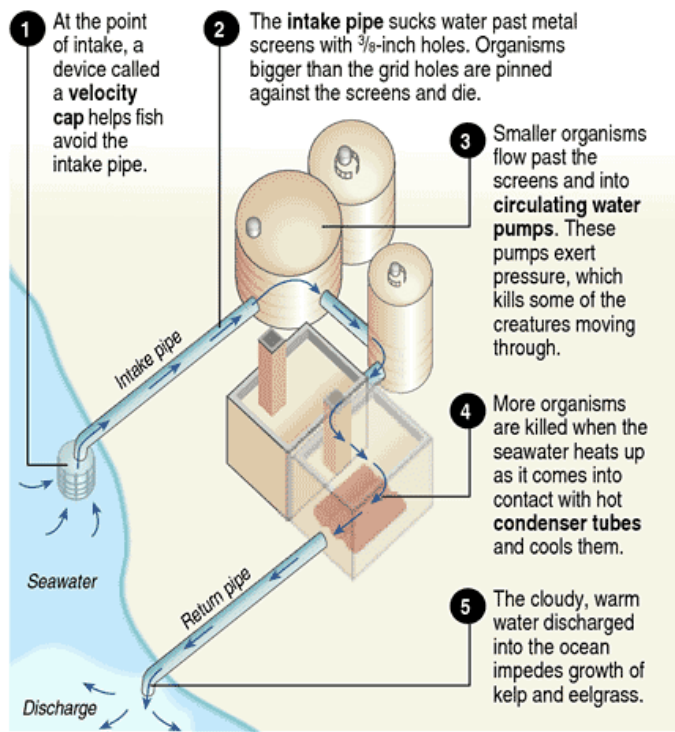
**(Author: Eoin Finn B.Sc., Ph.D., MBA, 2015, unpublished)**

For all of us and for the First Nations in particular - is there anything in BC more sacred and iconic than salmon? The wild kind, that is. Nature's amazing bounty - salmon is one of the planet's [four great food fish species](#) that have sustained humans in coastal and riverine communities for millennia.

That is why the development of LNG plants on our coastline should be a major concern to everyone in BC. If these developments follow easier and cheaper design options of using seawater to cool the liquefaction<sup>6</sup> process, millions of juvenile salmon will be affected. Juvenile salmon will need to run yet another man-made gauntlet as they progress on their incredible seagoing life-cycle. The invisible culprit will be elevated ocean water temperatures caused by the release of massive amounts of unnaturally warm, chlorinated, virtually dead seawater back into the marine environment.

**Seawater cooling systems**

California's 21 coastal power plants use almost 17 billion gallons of seawater daily to cool their systems. The process kills a variety of marine creatures and plants. A look at the cooling process:



SOURCES: Southern California Edison; Associated Press illustrations UNION-TRIBUNE

Most of the new LNG plants proposed for BC plan to use seawater cooling systems. It is the easiest and cheapest option. Are we not risking a mismanagement scenario on the Pacific coast akin to the Atlantic cod debacle? Why is BC not adopting and enforcing "world-class practices" in the area of cooling systems? There are good lessons to be learned from other jurisdictions?

**California bans once-through seawater cooling for power plants.**

Up until 2010, [the 19 power generation plants along California's coastline](#) pulled in nearly 17 billion gallons of seawater each day<sup>7</sup> in a practice called "once-through" cooling. This is where ocean water is used as a kind of radiator fluid to help cool the gas-turbine and nuclear power plants generating 40% of California's electricity.

But this "once-through" cooling practice killed billions of fish eggs, larvae and other marine life. 80 square miles of California's coastal habitat were affected daily. The [Ocean Unit of the California Water Resources Control Boards](#) estimated that once-through cooling systems used in their coastal power plants kill [2.6 million fish](#), [19 billion fish larvae](#), and [57 seals, sea lions and sea turtles](#) every year. Such depletion of the ocean food chain has continued for decades.

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In once-through systems, living creatures are sucked into the intakes, gassed with chlorine and barbecued in the cooling towers. Their corpses are then expelled back into the ocean to decay and deplete life-giving

<sup>6</sup> Converting natural gas (methane) into a liquid (LNG) generates huge amounts of heat and requires cooling.

<sup>7</sup> An average of ~125,000 tonnes of cooling water per hour, comparable to a large water cooled LNG facility.

<sup>8</sup> [https://www.waterboards.ca.gov/publications\\_forms/publications/factsheets/docs/once-through-cooling.pdf](https://www.waterboards.ca.gov/publications_forms/publications/factsheets/docs/once-through-cooling.pdf)



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oxygen in the water column. [Scientists](#), environmentalists, First Nations and fishers agree - using once-through cooling systems is seriously damaging to coastal ecosystem, especially in bays and estuaries, which are critical nursery habitats for fish. [According to the California Energy Commission](#), once-through cooling represents “*the single greatest and unaddressed environmental issue associated with power plant operation in the state*”.

### **Seawater cooling systems harm marine life in three ways.**

First, fish are sucked into intake pipes and pinned against 3/8" mesh screens where they die. Next, smaller marine organisms flowing through the screens are killed by pumps, water pressure, chlorination and heat as they pass through the cooling process. Finally, the power plant then flushes out the heated chlorinated, seawater which is now cloudy from the organic remains of marine organisms.

This mixture typically forms a murky plume that uses up available oxygen in the water column, elevates normal eco-system baseline water temperatures, and inhibits the growth of kelp and eelgrass, both of which are crucial habitats for fish. Although tidal action moves the discharge plume around, it mostly fails to disperse the heated, chlorinated, anoxic plume which does not mix well with ambient seawater (seawater is a notoriously poor mixer – else the Gulf Stream would not survive its trans-Atlantic journey to warm the shores of Western Europe).

[A prominent marine biologist](#) put it like this: “*Seawater is not just water. It is actually a community of living organisms, some of which spend their whole lives in that water. They... produce eggs and larvae that grow up in that water.*”

New cooling regulations were adopted by California's Water Resources Control board in 2010. By 2015, 19 coastal power plants must stop using once-through cooling, and start using modern cooling systems to reduce damage to marine ecosystems. Modern cooling systems cost millions. Alternatives include: a) “dry cooling”, where giant fans blow air to prevent overheating; and b) closed-cycle “wet” systems, where the water used for cooling is recycled and c) large evaporation cooling towers. BC has no such regulations.

At roughly the same time as in California, regulators in New York stepped up and denied a water-quality permit to the Indian Point nuclear power plant that uses cooling water from the Hudson river. This 2,000-megawatt facility was told to [install closed-cycle cooling towers](#). By utilizing air cooling for the refrigerant condensers and other process cooling loads, it is possible to entirely eliminate using water for cooling, with a substantial savings in capital costs.

The amount of water required by a typical large LNG liquefaction plant varies from 70,000 - 270,000 tonnes of cooling water per hour; which is heated up, chlorinated and flushed back to the ocean<sup>10</sup>. An average power plant in California would use ~ 125,000 tonnes of cooling water hourly. Around the world, about 60% of older power and LNG plants (liquefaction and re-gasification facilities) use [once-through seawater cooling](#), with well-recognized [impacts on local fish populations](#). Newer plants use either air cooling or a closed-loop cooling circuit and tower for heat reduction, greatly reducing the volume of seawater used.

You may ask– how does this concern BC, which has no nuclear and only one (now mothballed) oceanside

<sup>9</sup> <http://sccoos.ucsd.edu/docs/OPC-powerplants.pdf>

<sup>10</sup> *This is the same as 28-108 Olympic-size swimming pools of heated chlorinated seawater discharging into the ocean every hour, 24/7 for the entire life of the facility.*

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gas power plant (BCHydro's Burrard Thermal)? The answer: many of BC's 18-plus proposed oceanside LNG plants propose to use huge volumes of seawater to help cool the gas to a liquid state. In their use of cooling systems, LNG plants and power generation plants are quite similar.

### Cooling systems in LNG plants in BC

BC currently has two very small LNG facilities producing LNG for local storage. These are for a practice known as "peak-shaving" where LNG is stored as a back-up reservoir of gas to cover system down times or periods of peak demand. [Neither plant uses water cooling](#). However, most of the ~18 LNG plants currently on the drawing boards for BC's coast will not use cheaper and more destructive once-through seawater cooling.

For example, the "LNG Canada" 24 MTPA<sup>11</sup> plant in Kitimat/Douglas Channel would suck in millions of tonnes of fresh water from the Kitimat River and discharge it, warm and chlorinated, into Kitimat Arm. The WCC (Exxon) plant in Prince Rupert's Tuck Cove may use either air-cooling or seawater-cooling. In contrast, to reduce effects on the marine environment near the mouths of the salmon-rich Skeena and Naas rivers in Prince Rupert, the 20 MTPA Petronas "Northwest LNG" plant was instead proposing [air cooling](#) for the plant. This change came after much pressure from First Nations, commercial fishermen and environmentalists alike.

Regrettably, the controversial 2.4 MTPA (and potentially much larger<sup>12</sup>) Woodfibre LNG plant in Howe Sound plans to spew some 17,000 tonnes (3.8 million gallons) of hot, chlorinated seawater every hour into the Sound. The plant is directly in the path of the [recovering](#) Cheakamus/ Squamish salmon run in Howe Sound. The potential for again destroying this run was of great concern to residents, commercial fishers, tourism operators and the local Squamish First Nation. This discovery could well compromise the recovery of the Sound from the marine dead-zone it became over the last century and from which it is only just recovering. Under pressure from the Squamish Nation, Woodfibre's management recently downgraded their design to use a once-through seawater cooling option.

### Conclusion

As the fine print of the design of these LNG projects continues to unfold, our Federal and Provincial governments do not have a clear and principled commitment to safeguarding marine eco-systems and BC's iconic wild salmon resource. We need more robust regulatory oversight, else these LNG plants will utilize the cheapest option - with "invisible" consequences slipping under the radar. With once-through cooling, we have invisible hot water discharges disrupting our marine ecosystems. While it seems that the shaky economics of LNG development in BC simply won't support world-class design standards, such as the use of closed-loop or air-cooling, we can and must insist on using world-leading – not last-century - practices. In a province that treasures its salmon culture and which regards orcas that feed on them as sacred, this shoddy practice of once-through cooling should not be allowed. The additional cost of closed-cycle water cooling of LNG liquefaction trains is miniscule compared to the long-term damage once-through cooling will do to the marine ecosystem. As the [Sundance Fuels project](#) in Chetwynd proposes, there are alternatives to cooking the environment with waste heat from industrial activity.

<sup>11</sup> MTPA; million tonnes LNG per annum

<sup>12</sup> Woodfibre LNG has potential to be upwards 6 times larger, should the new 24" gas pipeline required to serve Woodfibre ever be completed by Fortis right through to Coquitlam - a very short "missing link".