



## ENVIRONMENT IN THE COURTROOM II

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# LNG-Fuelled Vessels— Environmentally Friendly Ships for the Arctic

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## Introduction

This chapter was written for the October 2016 Canadian Institute of Resources Law Symposium and reflected the perspective and context at that time. A postscript has been added to provide updates on the current state of affairs in relation to the use of liquefied natural gas (LNG) as fuel for vessels. It has been prepared following the same structure and using the same subheadings as the original paper for ease of reference. In addition, the information reflected in this postscript does not reflect the impact that the current global COVID-19 pandemic has had and will continue to have on the supply and pricing of LNG or the marine trade.

## Background: What Is LNG and Why Are We Talking about It Now?

### **AIR POLLUTION RESTRICTIONS: INTERNATIONAL CONVENTION FOR THE PREVENTION OF POLLUTION FROM SHIPS, EMISSION CONTROL AREAS, AND THE EUROPEAN UNION**

IMO 2020 (International Maritime Organization 2020) is the term used to describe the next step of the implementation of the regulations to Annex VI of the *International Convention for the Prevention of Pollution from Ships (MARPOL)*, which, as of January 1, 2020, includes reducing the global sulphur content in fuel to 0.5 percent.<sup>3</sup>

To achieve this objective, ships will be required to use fuel oils with sulphur content of less than 0.5 percent mass by mass, compliant exhaust gas cleaning systems (EGCS or scrubbers),<sup>4</sup> or non-fuel oil alternatives such as LNG. Carriage of non-compliant fuel oil for combustion purposes for propulsion onboard a ship (unless fitted with scrubbers) is also prohibited.<sup>5</sup>

Since January 1, 2015, the sulphur limit for fuel oil used by ships operating in emission control areas (ECAs) designated by the IMO for the control of sulphur oxides has been 0.10 percent mass by mass. The IMO 2020 does not affect these ECAs.

There are now four designated ECAs in effect globally:

1. Baltic Sea area;
2. North Sea area;
3. the North American ECA running along the eastern and western coasts of Canada, the United States (including southeast Alaska and the main Hawaiian Islands), and France (for Saint-Pierre and Miquelon) and extends some 200 nautical miles from the coastline, but below 60 degrees north latitude;<sup>6</sup> and
4. the United States Caribbean Sea ECA, covering certain waters adjacent to the coasts of Puerto Rico and the US Virgin Islands.<sup>7</sup>

## **LNG INVESTMENT**

Currently, a regasification terminal in Saint John, New Brunswick, operated by Canaport LNG, is the only such terminal in Canada;<sup>8</sup> however, several LNG export facilities have been proposed: thirteen in British Columbia, two in Quebec, and three in Nova Scotia, while long-term export licences have been issued to twenty-four LNG projects since 2011.<sup>9</sup>

Investment in LNG facilities has increased with demand. Total investment in LNG, according to the International Energy Agency (IEA), reached \$50 billion in 2019, primarily in the United States and Canada.<sup>10</sup> Moreover, according to the predictions of McKinsey & Company, expansion in the gas and LNG markets will continue, with LNG demand expected to increase 3.6 percent per year to 2035.<sup>11</sup>

## LEGAL FRAMEWORK

To ensure compliance with the new measures, the IMO's Marine Environment Protection Committee (MEPC) released the "2019 Guidelines for Consistent Implementation of the 0.5 percent Sulphur Limit under MARPOL Annex VI"<sup>12</sup> (Guidelines) to provide guidance to state parties, as the enforcement, compliance, and monitoring of the IMO 2020 sulphur limit is the responsibility of the state parties (including both flag states and port states) that have ratified *MARPOL* and acceded to Annex VI.

These Guidelines were adopted for port state control under *MARPOL* Annex VI, chapter 3, providing updated enforcement guidance for provisions including Regulation 13, "nitrogen oxides" and Regulation 14, "sulphur oxides and particulate matter." Port states should take appropriate measures to ensure compliance, such as conducting initial inspections based on documents and other possible materials, including remote sensing and portable devices. Given "clear grounds" to conduct a more detailed inspection, the port state may conduct sample analysis and other detailed inspections to verify compliance to the regulation, as appropriate. If the ship is non-compliant with the IMO 2020, the port state may prevent it from sailing until it takes measures to achieve compliance and should report a non-compliant ship to the flag state. In case of fuel oil non-availability, the ship must notify the port or flag state. This notification is commonly referred to as a Fuel Oil Non-Availability Report (FONAR).

In addition, on January 1, 2017, the IMO's *International Code for Ships Operating in Polar Waters* (Polar Code)<sup>13</sup> came into effect, which includes amendments to *MARPOL* to add stricter discharge requirements, including prohibitions on discharges of oil and noxious liquid substances in Arctic waters. The Polar Code prompted the adoption, in Canada, of the *Arctic Shipping Safety and Pollution Prevention Regulations*.<sup>14</sup> The Polar Code and Canada's new regulations include a variety of safety and pollution prevention measures, including those related to vessel design and equipment, vessel operations, and crew training. Drawing from decades of experience as an Arctic regulator, Canada played a key leadership role in developing the Polar Code at the IMO.<sup>15</sup>

Furthermore, the use and carriage of heavy fuel oil (HFO) is banned in Antarctic waters under *MARPOL*, and the IMO Polar Code recommends that states follow the same practice in the Arctic.<sup>16</sup> The IMO has agreed on a draft

regulation that would phase out the use and carriage of HFO in the Arctic. The draft regulation, which moved forward for consideration by the MEPC in October 2020 (MEPC 76), allows for the continued use of HFO until July 1, 2024.<sup>17</sup>

Moreover, Transport Canada has issued a policy, “Requirements for Vessels Using Natural Gas as Fuel,” which came into force on July 28, 2017, addressing the need to clarify and provide guidance on the requirements involved in designing and constructing natural gas-fuelled vessels, 24 m in length or longer, under the Canadian flag. This policy establishes how the *International Code of Safety for Ships Using Gases or Other Low Flashpoint Fuels*<sup>18</sup> (IGF Code), which is a sub-instrument of the *International Convention for the Safety of Life at Sea*<sup>19</sup> (SOLAS), will be applied to vessels under the Canadian flag.<sup>20</sup>

A permit from the Canada Energy Regulator (CER) is required to export LNG from Canada.<sup>21</sup> Bill C-69 replaced the National Energy Board (NEB) with the CER and implemented the new *Impact Assessment Act (IAA)*,<sup>22</sup> replacing the *Canadian Environmental Assessment Act, 2012 (CEAA 2012)*. Regulations such as the *Designated Classes of Projects Order*<sup>23</sup> and the *Physical Activities Regulations*,<sup>24</sup> which identify projects that will require federal review under IAA, and the *Information and Management of Time Regulations*,<sup>25</sup> which identifies information to be submitted and criteria for setting, managing, and suspending time limits along, with Bill C-68 and Bill C-69, came into force on August 28, 2019.<sup>26</sup>

## **Advantages and Challenges for Using LNG as Vessel Fuel**

There are varying reports on the advantages of using LNG as a marine fuel. Despite the clear advantages in most aspects, such use is not without its challenges.

The life cycle greenhouse gas (GHG) emissions of LNG are estimated to be 6 to 10 percent less than emissions from HFO, which is currently the most commonly used shipping fuel.<sup>27</sup> However, some environmentalists have raised concerns in relation to “methane slips,” the release of natural gas (methane) inadvertently into the atmosphere through leaks, which has up to twenty-five times the climate warming effect of carbon dioxide. For example, the International Council on Clean Transportation reported that LNG use

as fuel would emit between 70 and 82 percent more GHG emissions over the short-term compared to clean distillate fuels, mainly due to methane slips.<sup>28</sup>

Despite the challenges, there is an increasing availability of natural gas sources and a significant number of first-movers initiatives with a growing number of ships adopting LNG as fuel.<sup>29</sup> In addition, efficient engines, careful LNG transfer procedures, and proper education and training can significantly reduce the amount of methane slip that occurs during ship refuelling and operating, increasing the benefit of using LNG as a marine fuel.

## SHIP DESIGN

LNG as a marine fuel is currently being used in certain vessels, usually in LNG carriers, which use natural boil-off of LNG to supply their engines. However, this approach has started to spread over other types of vessels, such as ferries, containerships, tankers, and offshore vessels, and the number of shipping companies ordering new buildings with LNG as a marine fuel is increasing.<sup>30</sup>

## BUNKERING FACILITIES

In 2017, according to the company DNV, sixty locations in Singapore, the Middle East, Europe, and the Caribbean were capable of supplying LNG. As of 2019, according to the industry-coalition organization SEA-LNG, ninety-three ports were able to deliver LNG. An additional fifty-four ports were known to be in the process of preparing facilities to deliver LNG. LNG can also be transferred ship to ship; by February 2020, twelve bunkering vessels were available to deliver LNG, up from six in 2019, and an additional twenty-seven had either been ordered or commissioned.<sup>31</sup>

In Canada, while the ongoing operation of LNG terminals generally falls under provincial regulation, most LNG terminal proposals require both federal and provincial environmental assessments and permits. A permit is required from Canada's federal energy regulator to export LNG from Canada. In addition, LNG facilities are classified as industrial sites and must meet all federal, provincial, and municipal standards, codes, and safety regulations. The Canadian Standards Association (CSA) has a specific standard for LNG production, storage, and handling.<sup>32</sup> This standard establishes essential requirements for the design, installation, and safe operation of LNG facilities. Furthermore, the *Constitution Act, 1982* establishes several protections regarding the traditional rights of Aboriginal peoples part of which is anchored

on the right to be consulted by government and participate in respect of any energy project that may potentially impact on their lives, environment, and resources.<sup>33</sup>

## TRAINING OF CREW MEMBERS

Amendments to the Standards of Training, Certification, and Watchkeeping (STCW), which came into force in January 2017, introduced training for ships following the *IGF Code*. As such, flag states shall ensure that a certificate of proficiency is issued to seafarers who are qualified under the STCW. There is a provision of equivalency, especially for those who have been onboard LNG or gas carriers.<sup>34</sup>

## LNG-Fuelled Vessels in Operation

The number of vessels fuelled by LNG has steadily increased. According to SEA-LNG, in June 2019, 163 ships were using LNG for fuel, while eight months later that number had grown to 175. The number of LNG-fuelled ships on order has also grown: in June 2019, 155 had been ordered, and by February 2020, that number had increased to 203.<sup>35</sup> According to Gibson Shipbrokers, between January and April 2021, twenty-seven LNG-fuelled vessels had been ordered.<sup>36</sup>

Here are a few new examples of LNG-fuelled vessels in operation:<sup>37</sup>

### Containers

- The *Isla Bella*, owned by TOTE in partnership with General Dynamics NASSCO, is considered the world's first LNG-powered container ship, the first of two Marlin-class containerships, and the largest LNG-powered dry cargo ship.<sup>38</sup>
- According to SEA-LNG, "in February 2019, Hapag-Lloyd announced it would undertake the world's first conversion of a container ship to LNG. The retrofit of the *Sajir* was to take place in 2020 and presents the opportunity for its 16 LNG-ready sister ships to also undergo conversion."
- In September 2019, the *CMA CGM Jacques Saadé*, with a 23,000 twenty-foot equivalent unit capacity, became the largest LNG-fuelled container ship in the world. By 2022, CMA CGM, the container transportation and shipping company, plans to

have eight additional LNG-fuelled containerships of the same capacity, and an additional eleven with a lower capacity.<sup>39</sup>

- The largest LNG dual-fuel combination container/roll-on-roll-off ship ever built in the United States entered the fleet of shipping company Matson Inc. in December 2019.<sup>40</sup>

### Pure Car and Truck Carriers

- The first, trans-Atlantic LNG-fuelled pure-car-and-truck carriers were the *Siem Confucius* and *Siem Aristotle*, operated by Siem Car Carriers, between Europe and China.<sup>41</sup>
- As of September 2019, the world's largest LNG-fuelled pure-car-and-truck carrier had been ordered by the company NYK and would be the first large LNG-fuelled pure-car-and-truck carrier to be built in Japan.<sup>42</sup>

### Tankers

- In December 2019, the oil firm Petronas announced that its the shipping division planned to convert half of its oil tanker fleet (which included sixty vessels) to dual-fuel LNG by 2030.<sup>43</sup>
- The *Creole Spirit*, an LNG tanker built in 2016, with its two-stroke engine technology is termed the world's most efficient LNG ship with the lowest freight cost per unit. In addition to the engine, "the reduction in the number of cylinders requiring overhaul, the reduction in the size of the complex electrical systems and the introduction of a passive partial reliquefaction system contribute towards improving the overall efficiency and reducing cost."<sup>44</sup>

### Cruise & Ferry

- The US cruise ship operator Carnival's 20-deck *Aidanova* became the world's first cruise ship fully fuelled by LNG. Propelled by four dual-fuel engines, it runs on LNG 98 percent of the time, even though it still carries marine gas oil for safety reasons.<sup>45</sup>



- BC Ferries, as of 2019, already had two ships running on LNG. As part of its fleet renewal, it plans to build an additional five LNG-fuelled ferries.<sup>46</sup>
- The first cruise ship based in North America to be fuelled by LNG, and also Carnival Cruise Line's largest, the *Mardi Gras*, was set to debut in 2020. At the time of writing, Carnival Cruise Lines planned to deliver a second LNG-fuelled cruise ship to the brand by 2022.<sup>47</sup>
- MSC Cruises' LNG-fuelled *Grandiosa* was launched on November 10, 2019. Capable of accommodating more than 6,000 passengers on its Mediterranean tours, the *Grandiosa* is one of example of a trend toward first-class ships powered by LNG.<sup>48</sup>
- The world's largest LNG-fuelled roll-on/roll-off ferry will be operated by the Australian company, SeaRoad, following completion of construction in Germany.<sup>49</sup>

## Conclusion

Over the next thirty years, the Conference Board of Canada estimates that adding 30 million tons per year of LNG to the export market will also add approximately \$7.4 billion to the national economy and create an average of 65,000 jobs annually.<sup>50</sup> The Norwegian company, DNV, predicts that LNG will dominate ship fuelling by 2050.<sup>51</sup> Beside the potential for economic development, the creation of afore-discussed initiatives and policy instruments, together with conscious practical implementation of the shift to use LNG for vessels, will also foster regulatory efforts for the protection of the Arctic environment.

## NOTES

- 1 Justice Pamel was appointed to the Federal Court on May 2, 2019. He is no longer a partner with the Shipping Group at Borden Ladner Gervais. The authors would like to thank and acknowledge Nigah Awj, an associate lawyer with the Shipping Group of Borden Ladner Gervais in Montreal for her most valuable assistance in updating this paper with the preparation of this postscript.
- 2 Robert C Wilkins is a Retired Advocate and Honorary Life Member of the Canadian Maritime Law Association.
- 3 *MARPOL Annex VI, Regulations for the Prevention of Air Pollution from Ships*, Regulation 14 re sulphur oxide emissions, in force as of May 19, 2005, and Regulation

- 13 on nitrogen oxide emissions (or the associated NOx Technical Code 2008), which entered into force on 1 July 2010; see MEPC 176 (58), adopted in July 2005 and in force October 2008. See also “Prevention of Air Pollution from Ships” (accessed 14 June 2020), online: *International Maritime Organization* <[www.imo.org/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Air-Pollution.aspx](http://www.imo.org/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Air-Pollution.aspx)> [perma.cc/8CSD-V8CR].
- 4 Ships that have been fitted with open-loop scrubbers need to be aware of the risk that they may not be permitted to operate these within the territorial waters of certain port states. Also for a comparative analysis between scrubber technology and LNG, see D Kolich & F Kurtovic, “LNG VS Scrubber Technology in Future Green Ships” (accessed 14 June 2020) at 1–12, online (pdf): *Croatian Scientific Bibliography CROSB* <[bib.irb.hr/datoteka/1032238.Kolich\\_Kurtovic-SMATECH\\_2019.pdf](http://bib.irb.hr/datoteka/1032238.Kolich_Kurtovic-SMATECH_2019.pdf)> [perma.cc/UEX4-HzAF].
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- 15 See “Transport Canada Introduces New Arctic Shipping Safety and Pollution Prevention Regulations” (10 January 2018), online: *Government of Canada* <[www.canada.ca/en/transport-canada/news/2018/01/transport\\_canadaintroducesnewarcticshippingsafetyandpollutionpre.html](http://www.canada.ca/en/transport-canada/news/2018/01/transport_canadaintroducesnewarcticshippingsafetyandpollutionpre.html)> [perma.cc/L2NW-CTDP].
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- 46 LNG as a Marine Fuel, *supra* note 35, at 11.
- 47 See Carnival Corporation & Plc Sustainability “Pioneering Liquefied Natural Gas” (2018), online: *Carnival Corporation & Plc Sustainability* <[carnivalsustainability.com/highlights/pioneering-liquefied-natural-gas/](http://carnivalsustainability.com/highlights/pioneering-liquefied-natural-gas/)> [perma.cc/MM3T-E3RV].
- 48 Frances Marcellin, “Onboard MSC Grandiosa: A Glimpse into the Future of LNG” (18 February 2020), online: *Ship-Technology* <[www.ship-technology.com/features/msc-grandiosa-review/](http://www.ship-technology.com/features/msc-grandiosa-review/)>.
- 49 MI News Network, *supra* note 38.
- 50 LNG Projects, *supra* note 8.
- 51 Fathom World, “LNG to Dominate Fuel Mix in 2050 says DNV GL” (13 September 2019), online: *Fathom World* <[fathom.world/lng-to-dominate-fuel-mix-in-2050-says-dnv-gl/](http://fathom.world/lng-to-dominate-fuel-mix-in-2050-says-dnv-gl/)> [perma.cc/YCF8-BMP7].

