Q&A
West Coast
Marine LNG Project

Q: What is the West Coast Marine LNG Supply Chain Project?

The West Coast Marine LNG Supply Chain Project is a multi-stakeholder project focused on developing an in-depth understanding of the barriers to the use of liquefied natural gas (LNG) as a marine fuel on the West Coast of Canada. The project will make recommendations regarding how to overcome these barriers, ensure safety in all aspects of operations, and maximize the benefits to Canada of LNG use in the marine sector.

Q: What are the upcoming emissions regulations that will affect Canada's marine sector?

In partnership with the United States and France, Canada has designated its territorial waters as an Emission Control Area (ECA). The ECA applies to all North American coastal waters, spanning 200 nautical miles seaward from the coast, excluding Arctic waters north of 60 degrees latitude. Canada implements International Maritime Organization (IMO) measures under the Canada Shipping Act and ECAs are an IMO measure to reduce pollution from ships. The North American ECA limits the sulphur content of marine fuel to 1% with a reduction to 0.1% in sulphur in 2015.

Q: Why focus on natural gas as a marine fuel?

Natural gas holds great promise as a marine fuel in Canada. Its affordability, abundance, and significantly lower emissions in marine applications offer the potential for economic and environmental benefits. Natural gas emits no sulphur in the form of SOx and can reduce emissions of NOx and particulate matter by up to 80%-90%. Greenhouse gas emissions can also be reduced by up to 25% compared with conventional marine fuels. Canada has more than 100 years supply of natural gas based on current demand and production levels.

Q: What are the other compliance options available to vessel owners?

To comply with the new, upcoming emissions regulations, there are three main options available to vessel owners:

1. Install exhaust aftertreatment technologies including scrubbers, exhaust gas recirculation systems, and selective catalytic reduction technologies.
2. Switch to distillate fuel with 0.1% sulphur content. By comparison, many large vessels currently operate on heavy fuel oil with up to 3.5% sulphur content.
3. Switch to LNG as an alternative fuel which involves changes to the engine and vessel fuel storage systems as well as requiring new fuel supply infrastructure.

In addition to providing a compliance option for the Emission Control Area regulations, the use of LNG also supports national emission reductions that could contribute to Canada's greenhouse gas targets and that are aligned with the Government of Canada's Clean Air Regulatory Agenda, a larger initiative that encompasses the marine sector.

Finally, LNG use can also assist vessel owners whose ships will be affected by the new IMO Energy Efficiency Design Index (EEDI) which takes effect starting in January 2013. EEDI compliance requires progressive reductions in energy consumption and associated greenhouse emissions of up to 10-30% from certain types of vessels; LNG is given credit for its lower GHG emissions.

Q: Why is the project focused on the West Coast of Canada?

The West Coast has both a ready source of natural gas in British Columbia as well as LNG supply options including two existing utility LNG production facilities and proposed LNG export terminals in Kitimat. Port Metro Vancouver is Canada's largest and busiest port as well as being Canada's Gateway to the Asia-Pacific market. Offering LNG bunkering could enhance Canada's competitive position as a preferred trade destination for shippers and operators adopting low carbon or "green" shipping practices.

Q: Who are the project participants?

The project is under the overall direction of the Canadian Natural Gas Vehicle Alliance (CNGVA). STX Marine Canada acts as the lead consultant for the project. There are 17 participating organizations from the private and public sectors as well as from academia. The project's participants are:

- American Bureau of Shipping
- BC Ferries
- BC Institute of Technology
- BC Ministry of Transportation – Pacific Gateway
- Canadian Natural Gas Initiative
- CSA Group
- Encana
- FortisBC
- Government of Canada
  (Transport Canada, Environment Canada, Natural Resources Canada)
- Lloyd's Register
- Port Metro Vancouver
- Rolls-Royce
- Seaspan
- Shell
- Teekay
- Wärtsilä
- Westport Innovations

Q: Is LNG a new fuel for ships?

LNG is not a new fuel in the marine sector. LNG has been safely used as a fuel for gas carriers that deliver LNG along international trade routes for more than 40 years. What is new is the use of LNG as a marine fuel for other types of ships including passenger ferries, container ships, and offshore supply

vessels, etc. This leads to a need for innovative approaches to vessel design, engine technologies, and operational practices.

Q: Is LNG a safe fuel?

LNG is a safe fuel provided it is handled correctly. Its use as a fuel in the marine sector is growing. LNG is natural gas that has been cooled to its liquid state at -162 degrees Celsius. It is stored in insulated tanks in order to keep it in liquid form. If LNG warms up, it will return to its gas state.

LNG has different properties compared to crude oil-based fuels. These properties are well understood by industry and can be safely managed. LNG is colourless and odourless, so when used as a transportation fuel, methane detectors are needed and other precautions must be taken related to ventilation, electrical systems, and emergency response procedures.

As a liquid, LNG cannot explode or burn. If LNG is spilled, the resulting LNG vapour will warm, become lighter than air and disperse with the prevailing wind. If LNG is released, it converts back to being a gas. Cold gas will cause water vapour in the air to condense which is visible as white cloud or fog. The lighter-than-air property of LNG actually makes it less hazardous than other fuels. As a gas, LNG vapor can only burn if it is released into the air and mixes with the correct proportion of air (5 to 15 percent) and if there is a source of ignition. If there is too little air and not enough oxygen, the LNG vapour will not burn. Similarly, if there is too much air, the LNG vapour will not burn.

Q: Are there other sectors where LNG is already used in Canada?

There is an emerging market for LNG as a fuel for on-road vehicles with 200 LNG heavy highway trucks operating within the provinces of British Columbia, Alberta, Ontario, and Quebec. Canada is also investigating the use of LNG technologies for the rail sector.

Q: What are the barriers to LNG use as a marine fuel in Canada?

Regulatory

Transport Canada does not currently have specific safety regulations for the use of LNG-powered marine vessels. However, an international code (IGF Code for Low Flashpoint Fuels) for such ships is being drafted by the International Maritime Organization (IMO) of which Transport Canada is an active participant. Interim guidelines, also developed by the IMO, have been published, but there are some gap areas that create uncertainty for ship owners on issues such as vessel design, personnel training, and operating procedures.

With LNG being an important option for compliance with upcoming regulations, there is a need to develop a regulatory approach that can facilitate the use of LNG as a marine fuel in Canada while ensuring high levels of safety for new applications of LNG technology.

LNG Bunkering Standard

At present, there is no common global standard for LNG bunkering operations involving fuel transfer from a shore side facility, from a bunkering barge or directly from an LNG tanker truck. The International Organization for Standardization (ISO) has developed a draft Technical Guideline that is expected to be issued in late 2013. Several marine classification societies have also developed LNG bunkering

guidelines. In the absence of a single, agreed upon standard, there is a need to review and make recommendations regarding appropriate LNG bunkering procedures for use in Canada.

Q: Is LNG use cost effective for the marine sector?

There are upfront capital costs associated with converting existing vessels or with building new LNG-powered ships. For example, the cost to convert an existing vessel can be a substantial fraction of the ship's value. In parallel with investment in vessels, there is also a need for investments in new LNG bunkering systems and potentially in new LNG production facilities to meet demand from the marine sector. However, LNG is significantly less expensive than distillate fuel, so for the right type of vessel and infrastructure project, payback can be achieved in a relatively short timeframe

Q: What are the project benefits for industry, other regions of Canada, and for Canadians?

Industry

Addressing barriers to LNG as a marine fuel can help to create the certainty needed for major private sector investments in marine projects in Canada. In addition, as Canada is the world's third largest producer of natural gas, encouraging greater use of natural gas in a new market such as the marine sector can help to stimulate demand for an abundant Canadian resource.

Other Regions of Canada

Much of the information and data gathered through this project can facilitate and support the use of LNG as a marine fuel in areas such as the East Coast and the Great Lakes and the St. Lawrence Seaway.

Canadians

The use of LNG can reduce levels of harmful air pollutants. These reductions support the Government of Canada's Clean Air Regulatory Agenda, a larger initiative that encompasses the marine sector. LNG also offers reductions in greenhouse gas emissions which can help Canada achieve its greenhouse gas reduction targets.

Q: What is the cost of the project?

The project value is estimated at $1,173,000 with project participants providing financial and in-kind contributions. Project participants' financial contributions are matching Government of Canada funding on a 1-to-1 basis with total leveraging of all resources on a 4-to-1 basis.

Q: What is the project timing and when will findings be available for review?

The project began in November 2012 and is expected to be completed in November 2013. The final project report will be publicly available by early 2014. Interim findings may also be released as the project progresses.