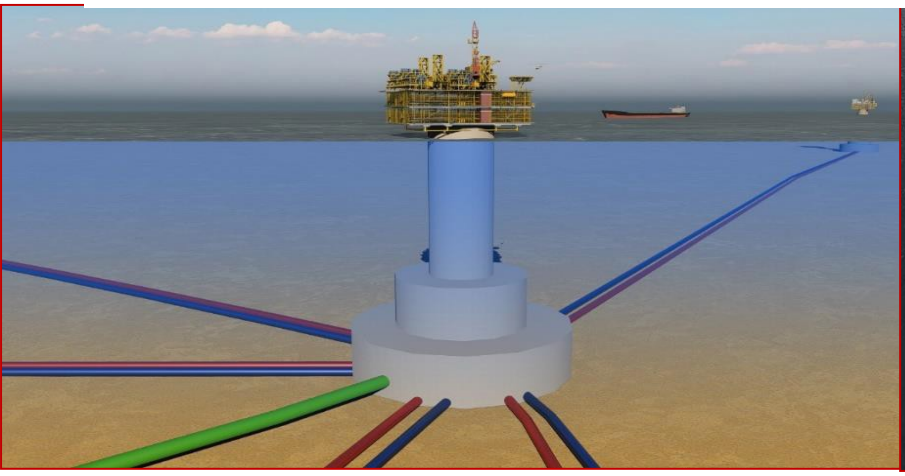
Grassy Point Liquefied Natural Gas (LNG) Facility withOffshore Gas Hub and Subsea Pipeline

Project Registration



October 15, 2021

LNG Newfoundland and Labrador Limited

1 Table of Contents

List of Tables

List of Figures

EXECUTIVE SUMMARY

LNG Newfoundland and Labrador Limited (LNG NL) is a Newfoundland and Labrador owned and operated corporation focused on permitting and developing Liquified Natural Gas (LNG) infrastructure needed to monetize significant stranded natural gas in the Jeanne d'Arc Basin, offshore Newfoundland and Labrador. The proponent is a consortium of NL companies and includes an important indigenous equity partner Miawpukek First Nation through their joint venture with Horizon Maritime Services.

The project consists of three key components including:

- Offshore Gas Hub in the Jeanne d'Arc Basin;
- Natural Gas Pipeline from Jeanne the d'Arc Basin to Placentia Bay, NL; and
- Natural Gas Liquefaction Facility and marine export terminal at Grassy Point, Placentia Bay, NL.

The rationale for developing this project includes supplying the international energy markets with LNG to help reduce or eliminate the use of coal for electrical power generation in Europe and Asia. Natural gas isrecognized as an important transition fuel as countries shift from coal to less carbon intensive fuels such as natural gas, hydrogen, and renewables.

The project looks to build on the earlier 2008 federal and provincial approvals for an LNG transshipment and marine terminal at Grassy Point, Placentia Bay. Feasibility for the project is based on the vast provennatural gas reserves within the Jeanne d'Arc Basin offshore Newfoundland and Labrador. Project innovations to be evaluated as part of the engineering feasibility studies include carbon capture from liquefaction processing and reinjection to offshore reservoirs in the Jeanne d'Arc basin for enhanced oil recovery and general sequestration purposes, and the use of existing hydroelectric energy from NL as the primary source of power generation with potential use of other renewable energy sources.

The regulatory regime is understood, and LNG NL recognizes that LNG production is subject to legislativerequirements under both the federal Impact Assessment Act (2019) and the provincial Environmental Protection Act (2002) including:

- Sections 35, 37, 40, and 52 of the federal Physical Activities Regulations (2019) which require projects with LNG storage, offshore facilities, gas pipelines, and marine terminals to submit anInitial Project Description to the Impact Assessment Agency; and

- Section 32 of the provincial Environmental Assessment Regulations (2003) which designatesNatural Gas production facilities to be registered with the NL Minister of Environment and Climate Change.

This project has significant employment and industrial benefits for the province of Newfoundland and Labrador and Canada. The project will be an important component of an energy transition plan towards the use of lower carbon fuels and will export world's cleanest LNG to contribute to global decarbonization initiatives.

GLOSSARY AND ACRONYMS

berthing dolphins	A berthing dolphin is an isolated structure, remote from the main structure that is designed to resist the large horizontal loads caused by berthing ships
BOG	Boil-off gas
boil-off gas	Gas produced in LNG storage tanks as it warms up in storage either in tanks or in vessels. Modern insulation is used to reduce boil-off gas to a minimum
boil-off gas compressors	Equipment that inhales boil-off gases from the surface of LNG in the storage tanks and exhales it under pressure of 8 kg/cm2 into the distributing system
CCG	Canadian Coast Guard
CEAA /IAA	*Canadian Environmental Assessment Act / Impact Assessment Agency*
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
contingency plan	A set of predetermined actions to be taken in the advent of an accident, malfunction, or unplanned event
Cryogenic	At very low temperature; having or relating to extremely low temperatures
cumulative environmental effect	The environmental effects on the environment, over a certain period of time and distance, resulting from the environmental effects of the Project when combined with those of other past, present and imminent future projects and activities
DFO	Fisheries and Oceans Canada (or Department of Fisheries and Oceans)
EC	Environment Canada
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EPP	Environmental Protection Plan
ERP	Environmental Response Plan
ERS	Emergency Response System
ESD	Emergency Shut-down Device
exclusion zone	Exclusion zones are navigational restrictions on the movement of tankers and support vessels that may be permanently or periodically established in the interest of safe navigation
GPM	Gallons per Minute
HADD	Harmful Alteration, Disruption or Destruction (of fish habitat, as defined by the *Fisheries Act*)
HC/UV/IR detectors	Hydrocarbon/ultraviolet/infra-red detectors
LDAR	Leak Detection and Repair
LFL	Lower Flammability Limit
Liquefaction	Conversion of a solid or a gas into a liquid
Liquefied Natural Gas (LNG)	A liquid composed predominantly of methane, and which may contain minor quantities of ethane, propane, nitrogen, or other components normally found in natural gas, produced by cooling natural gas to -160°C. Usually used as a source of natural gas supply when a gas user has no access to natural gas supplies by pipeline or pipeline supplies are insufficient.

MCTS	Marine Communications and Traffic Services
MMSCFD	Million Standard Cubic Feet per Day (million cubic feet of gas per day measured at standard conditions -14.7 psia and 60 °F)
mooring dolphin	A mooring dolphin is an isolated structure, piled or solid, forming part of a berth but remote from the main structure, often forming a single mooring point - usually a small distance from the main jetty
NEB/ CER	National Energy Board/ Canada Energy Regulator
NLDFFA	Newfoundland and Labrador Department of Fisheries, Forestry and Agriculture
NLDGS	Newfoundland and Labrador Department of Digital, Government and Service
NLDMPA	Newfoundland and Labrador Department of Municipal and Provincial Affairs
NLIET	Newfoundland and Labrador Department of Industry, Energy and Technology
NLDOECC	Newfoundland and Labrador Department of Environment and Climate Change
NLDTCAR	Newfoundland and Labrador Department of Tourism, Culture, Arts and Recreation
NLDTI	Newfoundland and Labrador Department of Transportation and Infrastructure
NRC	Natural Resources Canada
NTL	Newfoundland Transshipment Limited
PAO	Provincial Archaeology Office
PM	Particulate Matter
PSI	Pounds per square inch
RA	Responsible Authority. Defined in CEAA as "…in relation to a Project, means a federal authority that is required pursuant to subsection 11(1) to ensure that an environmental assessment of the Project is conducted"
Recondensers	Equipment that recondenses the boil-off gas when it is mixed with the cold LNG discharged from a low-pressure pump
SBS	Side-by-side
SCV	Submerged Combustion Vaporizers
Seismicity	A characterization of the seismic history at a particular location
STS	Ship-to-ship
TRC	Technical Review Committee
TDG	*Transportation of Dangerous Goods Act*
thermocouple cable	thermocouple cable is electrical cable that is used for remote temperature sensing
TOV	Tow Operated Vehicle
unloading arm	A facility that safely transfers LNG from the LNG ship to the storage tank by connecting to the ship and overland pipelines
UPS	Uninterruptible Power Supply
UV/IR	Ultraviolet/Infrared
Vaporizers	Equipment which converts LNG from its liquid form to natural gas

INTRODUCTION

1.1 Name of Undertaking

Grassy Point Liquefied Natural Gas (LNG) Liquefaction Facility with Offshore Gas Hub and Subsea Pipeline

1.2 Proponent

Table 1: Proponent Details

Proponent	LNG Newfoundland and Labrador Limited [redacted]
President and Chief Executive Officer	Leo Power LNG Newfoundland and Labrador Limited. [redacted]
Principal Contact Persons for Purposes of Environmental Assessment	Majid Abdi VP Engineering and Technology LNG Newfoundland and Labrador Limited. [redacted]
Chairman / Corporate Secretary	Greg Dickie LNG Newfoundland and Labrador Limited. [redacted]
Environmental Advisor	David Robbins [redacted]

The Project will be owned and operated by LNG Newfoundland and Labrador Limited, a Newfoundland and Labrador corporation that is jointly owned by a group of business and industry partners including Pennecon, D. F. Barnes, Baine Johnston Corporation and Miawpukek Horizon Maritime Services.

Miawpukek Horizon Maritime Services is a partnership between Miawpukek First Nation of Conne River, NL and Horizon Maritime Services to form a local marine services company. A corporate project overview is included as Appendix A.

1.3 Project History

This present project is the continuation of a previous LNG project that was registered and subsequently released from further provincial environmental assessment in 2007 (Dept of Environment and Conservation, 2007). In 2007, Newfoundland LNG Ltd. received environmental approval from the NL Minister of Environment and Conservation for an LNG Transshipment Terminal at Grassy Point Placentia Bay. While all conditions of its provincial environmental release were met including the completion of a Risk Assessment, Employment Equity Plan and an Environmental Protection Plan, construction of the project did not commence within the time periods listed in the Term of Decision provision 17 pursuant to the EA Regulations (2003).

The previous LNG Transshipment Terminal was also required to conduct a Comprehensive Study Report (CSR) pursuant to the former Canadian Environmental Assessment Act with both Transport Canada and Fisheries and Oceans identified as Responsible Authorities. A Comprehensive Study Report was completed with a focus on the following valuable ecosystem components (VECs):

- Marine fish and fish habitat
- Commercial fisheries (including aquaculture and fish processing)
- Marine mammals
- Migratory birds
- Species at Risk
- Atmospheric environment (as it relates to human health) and
- Marine transportation and safety.

The CSR was subsequently approved by the federal Minister of the Environment in 2008 for the Grassy Point LNG Transshipment and Storage Terminal (CSR, 2008).

The Grassy Point area and surrounding lands has been the focus of detailed municipal planning exercises over the past fifteen years during which time the whole area was zoned for marine terminal use by the Town of Arnold's Cove.

In November 2019 LNG Newfoundland Limited (LNG NL) acquired from Newfoundland LNG Ltd (i.e., the former proponent) its studies, assets and rights relating to the development of a LNG facility at Grassy Point, Placentia Bay. The biological, socio economic, and engineering studies completed as part of the earlier 2007-2008 LNG project approvals provide relevant important information for the new Grassy Point Liquefied Natural Gas (LNG) Production, Storage and Export Facility.

LNG NL has subsequently modified the design concept and is registering with the NL Minister of Environment and Climate Change a modified LNG project for development.

Table 2: Project Key Components below identifies the high-level similarities and changes between the two projects and further information is included in the Registration.

Table 1: Project Key Components

Key Component	Location	Description and Status
Grassy Point Liquefaction, Storage, and Export Facility	Grassy Point, Placentia Bay	Grassy Point remains as the most suitable site for the marine terminal and LNG facilities. The new site layout will have a smaller footprint as less LNG storage and fewer storage tanks will be required as the new project does not include transshipment. Storage of LNG will be on board FLNG. The Marine Terminal and jetties remain at the same location and are the same size and design. The new facility includes a Floating Liquified Natural Gas (FLNG) vessel and is an export facility.
Gas Hub and upstream natural gas production systems	Jeanne d'Arc Basin, Offshore NL	New Component
Subsea Pipeline	From Offshore Basin to Placentia Bay	New Component

PROJECT OVERVIEW

1.4 Nature of the Undertaking

LNG Newfoundland and Labrador Limited proposes to develop an environmentally responsible Liquefied Natural Gas (LNG) Production, Storage, and Export Facility at Grassy Point site to provide cost effective and carbon neutral LNG to world markets. The "Project" will provide facilities to receive natural gas produced in an offshore central gas hub, transported through a subsea pipeline, received, and metered at Grassy Point site, Placentia Bay. Natural gas will be potentially preprocessed to remove excess liquid hydrocarbons, liquefied, and stored on a Floating Liquefied Natural Gas (FLNG) production vessel. The Grassy Point facility will also include LNG cargo transfer to LNG carriers for export to European markets and beyond. LNG Newfoundland and Labrador Limited will operate the LNG delivery chain, receiving gas from any offshore pipeline and providing liquefaction, storage, and export to world markets. The Project will involve the construction and operation of:

- Jeanne d'Arc Basin Central Gas hub
- Offshore subsea gas pipeline from central gas hub to gas receiving and metering facilities at Grassy Point, Placentia Bay
- Liquefaction facilities on an FLNG vessel
- A wharf comprised of three jetties with berthing capability for LNG tankers up to 265,000 m^3;
- A tugboat basin
- Storage tanks for condensate and LPG liquids; and
- Supporting infrastructure including an access road, office facilities, security fencing, and utilities such as water and power.

1.5 Project Rationale

The purpose of the Project is to provide a means of developing offshore Newfoundland and Labrador natural gas resources estimated to be in the order of 8 trillion cubic feet (TCF) in the Jeanne d'Arc Basin alone. The Government of Newfoundland and Labrador has stated its desire to commercialize offshore natural gas as part of "Advance 2030 – A Plan for Growth in the Newfoundland and Labrador Oil and Gas industry". The construction of an LNG production and export facility at Grassy Point will contribute to the critical mass of energy infrastructure in the province.

LNG is of critical importance to the world energy equation and Newfoundland and Labrador (specifically the proposed Grassy Point LNG Facility) is exceptionally well positioned to play a key role in providing cleaner energy to the world. Furthermore, Grassy Point's proximity to the European LNG market will allow it to become a cost-effective provider of clean LNG produced with renewable hydroelectricity from Newfoundland and Labrador, enhancing the Atlantic basin LNG supply and delivery chain.

The demand for natural gas in the world is increasing mainly due to international agreements to reduce the emission of CO_2 as a result of combustion of carbon intensive fuels, particularly coal. Demand for natural gas is also increasing because of general population growth and increased industrial demand.

Figure 1 shows LNG supply in operation, LNG supply under construction, and the total demand forecast for LNG. A gap is expected to develop between supply and demand starting 2030.

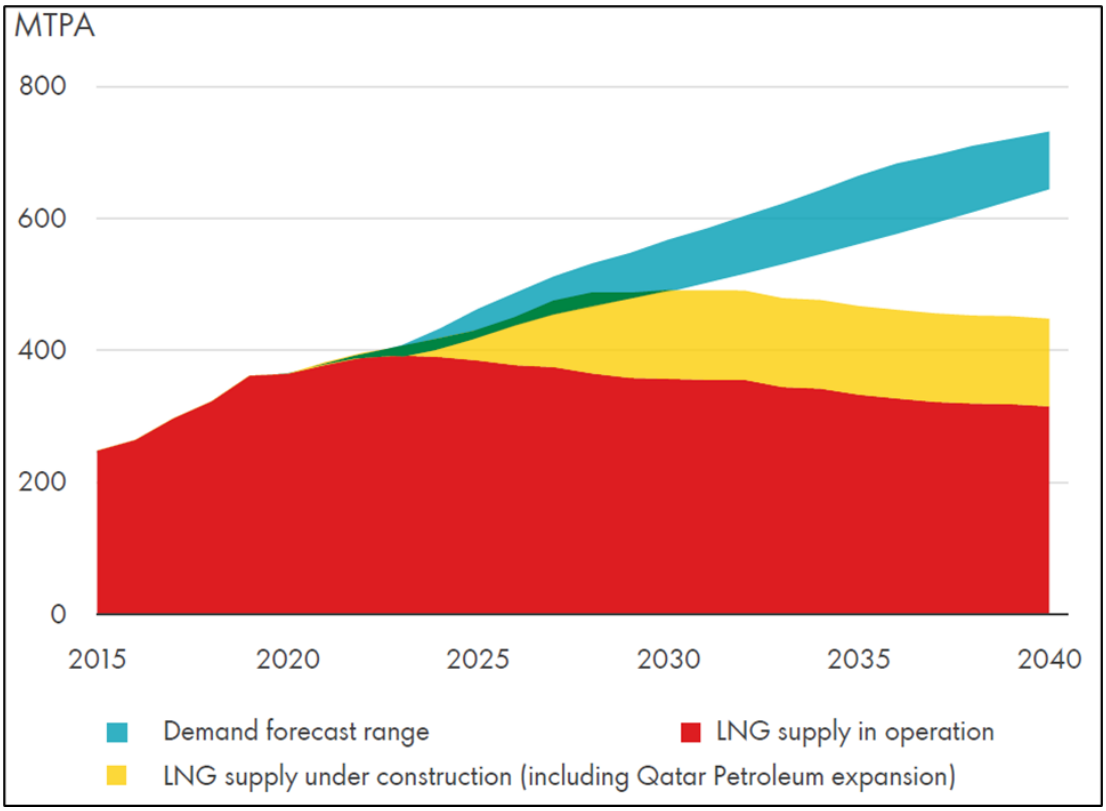


Figure 1: Emerging LNG Supply-Demand Gap (Source: Shell LNG Outlook 2021)

The worldwide demand for LNG has grown steadily since 1970. Figure 2 shows the import of LNG in world markets since 2010. While COVID 19 derailed expected forecasts, LNG demand still grew with trade reaching 360 million tonnes in 2020 based on Shell's LNG Outlook 2021 report with predictions of LNG demand doubling by 2040.

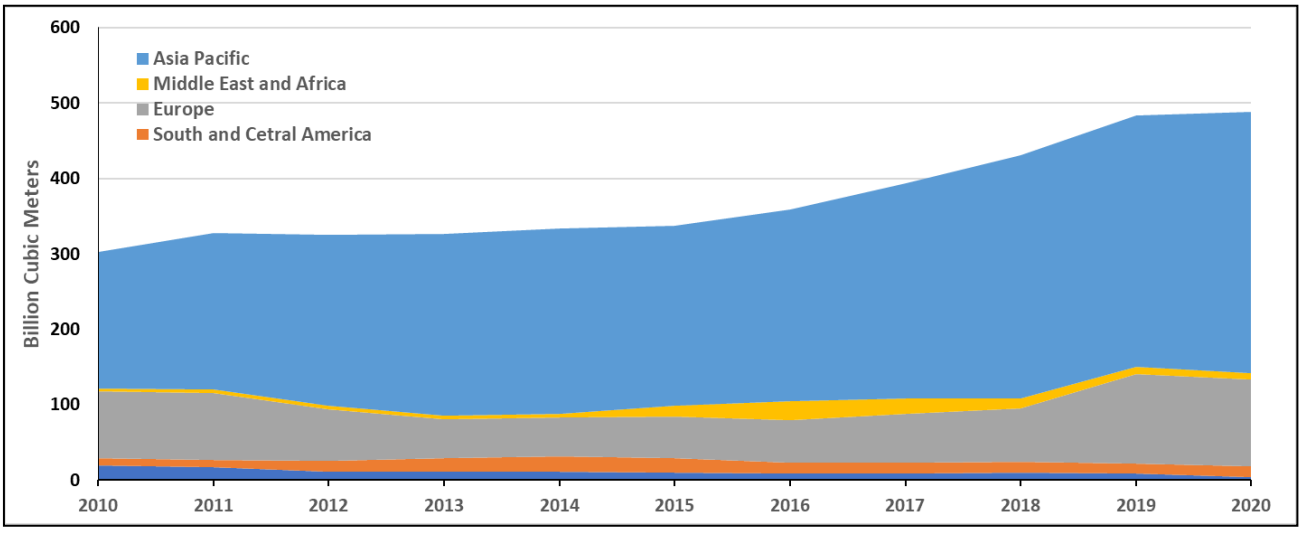


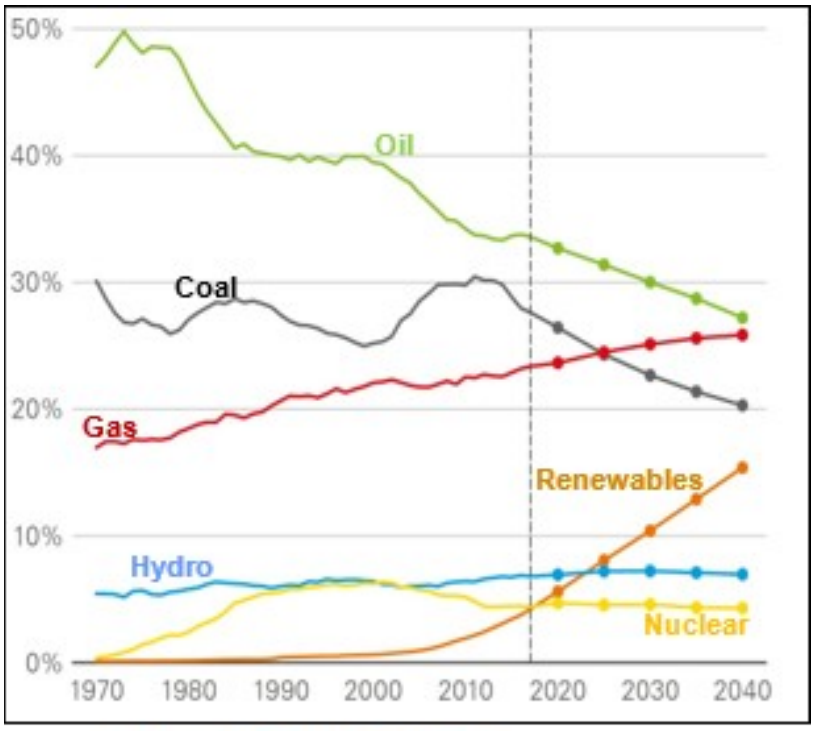
Figure 2: Worldwide Growth in LNG Demand (Source: BP Statistical Review of World Energy 2021 (70th Edition))

1.6 Business Drivers

There are national and international drivers to reduce greenhouse gas emissions and move towards a lower carbon economy. The Pan-Canadian Framework on Clean Growth and Climate Change is a plan developed in consultation with the provinces and Indigenous peoples to meet Canada's reduction targets. This plan promotes projects that reduce greenhouse gas emissions and accelerate the phase out of coal fired plants. Natural Gas, which has approximately half the carbon footprint of coal at the point of combustion and the lowest CO_2 emissions of any fossil fuel, is an important and economic fuel to help certain countries and regions meet their energy needs while reducing greenhouse gas emissions (World Bank 2017).

This project is aligned with the Government of Canada's 2050 Net-Zero Plan Greenhouse Gas Credits & Emissions Targets and has the several important features including:

- **Strategic Supply –** Particularly for Europe and high demand markets such as India, Japan, South Korea and China.
- **Simplicity in Relation to Interprovincial Onshore Pipelines –** NL offshore pipeline to onshore has one provincial and one federal jurisdiction.
- **Gas Reinjection Costs –** Current offshore practices for reinjection to manage associated gas is costly and flaring is restricted.
- **Monetization –** Offshore operators interested in monetizing gas and condensate assets. Encouragement from governments to develop natural gas resources



*Source: BP Energy Outlook, 2020 edition

Figure 3: Global Fuel Consumption over Time

BP Energy Outlook 2020 (Figure 3) predicts natural gas demand will grow in almost every country and region as the result of availability of gas and policy shifts to lower-carbon fuels. Coal-to-gas switching,

especially in China and India, and increased industrial demand for gas in developing economies will drive additional demand.

1.7 LNG Background Information

LNG is simply natural gas (primarily methane) in its super-cooled liquid state. Natural gas is used in homes for cooking and heating, as a transportation fuel, and is also used as fuel for generating electricity. It is an organic fossil fuel found in reservoirs beneath the Earth's surface, often occurring in the same locations as crude oil. When cooled to a temperature of -160°C (or -260°F) at atmospheric pressure, natural gas becomes a clear, colourless, and odourless liquid. The liquefaction (cooling) process reduces natural gas to 1/600th of its original volume, making it possible to transport large amounts of LNG over long distances in specially designed ocean tankers (Figure 4). LNG is non-corrosive, non-toxic, and vaporizes when exposed to air. LNG is not pressurized.

Unlike products that are considered flammable liquids, LNG must first be vaporized, mixed with air, and then be exposed to an ignition source before it will ignite. Natural gas in its liquid form (LNG) cannot ignite. Only the natural gas vapour, which forms when LNG's temperature rises, can be ignited but its flammability depends primarily on its air content. The flammable range lies between 5 and 15 percent in air, by volume. For ignition to occur when LNG vapour contacts a hot surface, the temperature of that surface must exceed 540°C.

When LNG is confined within a tank, ignition of the natural gas vapours cannot occur due to the lack of oxygen. If LNG leaks out and begins evaporating in an open area, the natural gas vapours are often quickly dispersed by wind, making ignition unlikely. If ignition of the natural gas vapours occurs, the gas does not burn rapidly like gasoline, but forms a slow burning flame that burns back to the source of the natural gas vapour, until the fire is extinguished, or the fuel is exhausted. LNG storage facilities are equipped with gas detectors capable of early detection of leaks.

After natural gas is extracted from reservoirs, it is transported by pipelines to liquefaction plants where it is liquefied (cooled) and stored. The LNG is stored in double-walled tanks at atmospheric pressure. The space between the walls in the tanks is filled with insulation to keep the LNG cool. These plants are built in association with marine shipping terminals so that the LNG can be loaded into specially designed and insulated double-hull tankers (Figure 4).

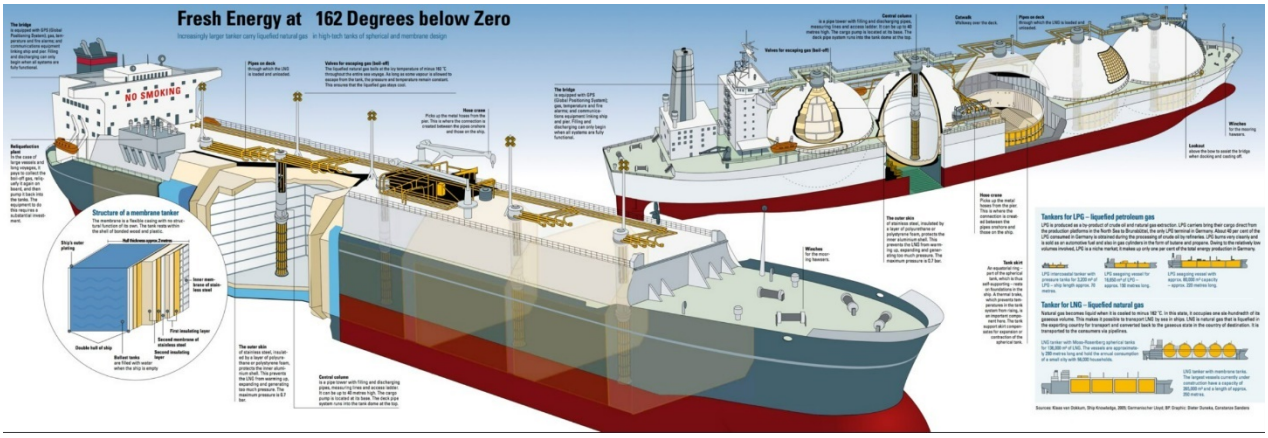


Figure 4: Typical Ship Hull Wall and General Construction of Conventional LNG Tankers (Source: Resource Work and 2020 Ship Knowledge, 10th Edition, by Klaas Van Dokkum, May 1, 2020)

1.8 Key Components and Location

1.8.1 Offshore Gas Hub

The NL offshore oil industry comprises four production projects all located in the Jeanne d'Arc Basin approximately 350km east of St. John's.

The Hibernia Project operated by ExxonMobil Canada was developed in 1997 and produces oil from the Hibernia Gravity Base Structure (GBS) and Topsides. Its two principal reservoirs; the Hibernia and Ben Nevis-Avalon reservoirs have proven estimated gas resources of 66.3 x 10^9 m^3 or 2,353 billion standard cubic (Bscf) (C-NLOPB).

The Terra Nova Project operated by Suncor and developed in 2002 comprises one reservoir the Jeanne d'Arc. It produces from the Terra Nova Floating and Production and Storage and Off-loading Vessel (FPSO) and has natural gas resources of approximately 1.8 x 10^9 m^3 (64 Bscf) (C-NLOPB).

The White Rose Project operated by Husky Oil (Cenovus) and developed in 2004 has one principal reservoir: the Ben Nevis-Avalon reservoir. It produces from the SeaRose FPSO and has natural gas resources of approximately 94.4 x 10^9 m^3 (3,333 Bscf) in White Rose and North Amethyst fields (C-NLOPB).

The Hebron Field operated by ExxonMobil Canada and developed in 2017 has three principal reservoirs: the Ben Nevis, Hibernia and Jeanne d'Arc formations. This project produces from the Hebron Gravity Base Structure and Topsides and has estimated natural gas resources of 12.7 x 10^9 m^3 (451 Bscf) natural gas (C-NLOPB).

The total natural gas resources in the Jeanne d'Arc Basin is estimated at 235.7 x 10^9 m^3 or 8,344 billion standard cubic feet (8.334 TCF) (C-NLOPB).

The LNG NL project will include the construction and development of Central Gas Hub connecting the existing offshore production platforms in the Jeanne d' Arc Basin (Figure 5 Gas Hub Location). The Gas Hub will consist of a platform, such as a GBS, and subsea infrastructure connecting the existing producing facilities to the proposed gas facility.

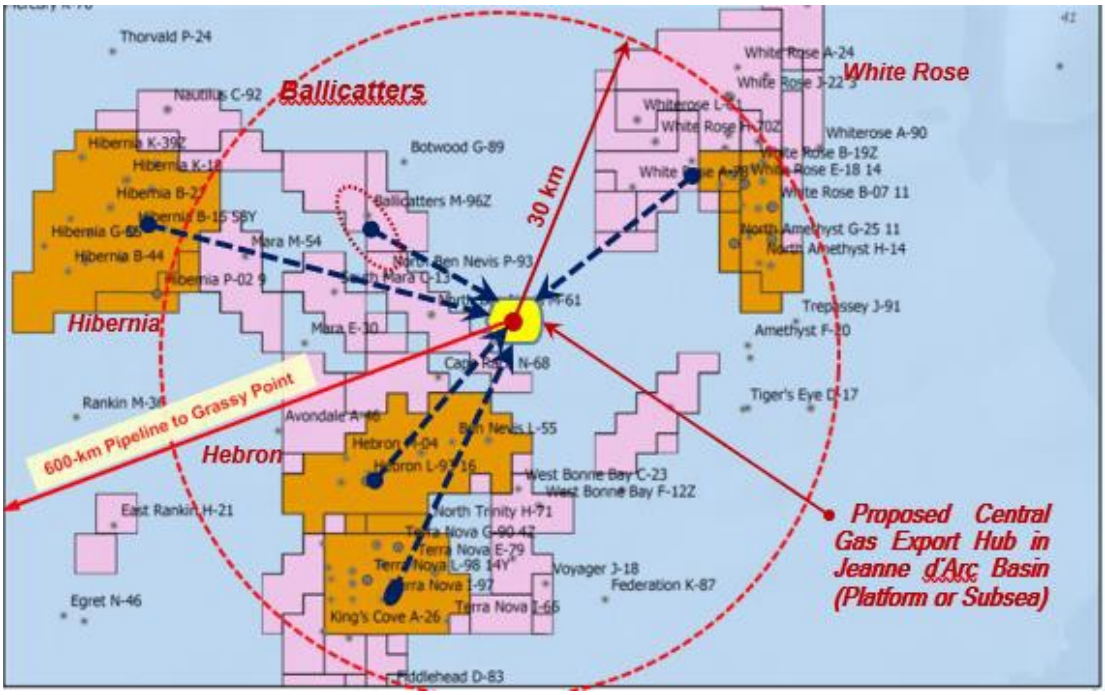


Figure 5: Jeanne d'Arc Basin with four producing fields CNLOPB REF

The key features of the Offshore Gas Hub include:

- Development wells drilled from existing or new subsea drill centres or fixed structure platforms and a combination of new and recompleted wells.
- A subsea network in the development area involving drill centres each tied back via dual pipelines to a new production gas hub proposed to be a Gravity Base Structure (GBS) to be confirmed by future engineering investigations.
- Single multi-phase production pipelines transferring reservoir fluids from the fixed platforms/subsea drill centres to the central gas production hub.
- The key flow assurance threat is hydrate formation in the wet gas systems. This will be managed via insulated pipelines with the ability to depressurise the lines and inject hydrate inhibitors (e.g., mono ethylene glycol / MEG solution) to manage the hydrate risk. For longer tie-backs in the future, the system may operate colder and the most robust mitigation method is via continuous injection of MEG, which will be regenerated at the central gas hub for supply via a closed-loop subsea system.
- Fluids separation and dehydration/compression will be placed on the central gas hub to achieve the required gas export pipeline specifications and stabilisation of condensate for storage at the GBS and infrequent tanker offload.
- Central gas hub topsides processing capacity of at least 650 MMscfd of raw gas from the offshore fields.
- Key topsides processing and utility systems to be spared to maximise the gas export availability. Artistic view of the central hub topsides and gravity base substructure are shown in Figures 6.

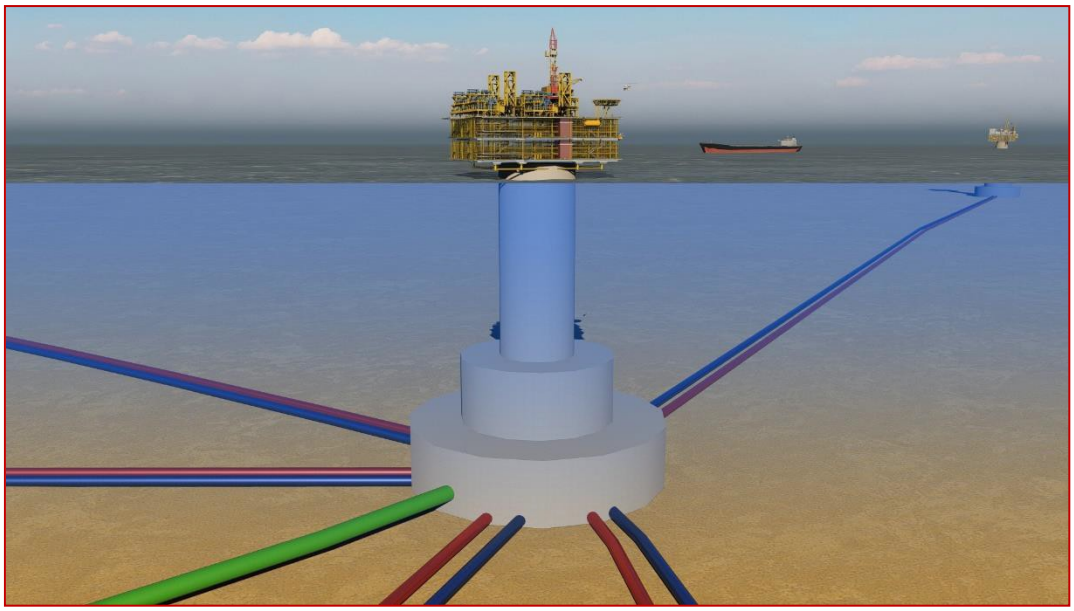


Figure 6: Typical Gas Hub Facility

1.8.2 Natural Gas Pipeline from Jeanne d'Arc Basin to Placentia Bay, NL

LNG NL is proposing a ~600 km offshore subsea pipeline from Jeanne d' Arc Basin Offshore Gas Hub to Grassy Point, Placentia Bay FLNG Liquefaction processing plant (Figure 7 Pipeline route).

The key features of the pipeline would include:

- An estimated 28-inch OD single phase gas export pipeline, sized for the transport of 650 MMscfd. The feasibility of sending captured carbon dioxide from the LNG facility back offshore for EOR and/or sequestration via an additional but smaller pipeline will be investigated in future engineering studies.
- An offshore tie-in spool will connect the pipeline to the central gas hub, and the pipeline will use a 'Southern' route (shown in Figure 7) to Newfoundland, to a landfall at Grassy Point, Placentia Bay close to the existing Come-by-Chance refinery and transshipment terminal.
- The pipeline(s) will be trenched to a suitable depth to mitigate risk of iceberg scouring. The trenching equipment will be selected based on the soil property and the required trenching depth. Discussions have been held with the Centre for Cold Ocean Resources Engineering (C-CORE) and their expertise will be used to mitigate the threat of iceberg risk.
- The gas export pipeline will be laid using a conventional S-lay barge over 2 seasons.

A high-level screening assessment was completed on the three proposed routes and encompassed engineering influences such as flow assurance, burial and trenching requirements and preliminary cost estimates. Biological, physical and socio-economic criteria were also evaluated along each route including minimizing the risk of iceberg damage, bathymetry features, and environmental impacts, including avoiding subsea infrastructure and minimizing disturbance of offshore benthic habitat, special areas and areas with commercial fishing. From these evaluations and at this early stage, it was determined that the Southern route was the optimal route, as it minimized the onshore component of the pipeline and required the least extension of existing trenching technology. It also avoids environmentally sensitive areas, areas with high iceberg grounding rates, and areas with known fishing activity.

Key criteria to support pipeline engineering feasibility route selection include:

- Bathymetry
- Iceberg scour depth and potential
- Commercial fisheries
- Fish and Fish Habitat
- Sensitive or Special Areas of Concern
- Human Environment Considerations
- Existing Physical Infrastructure

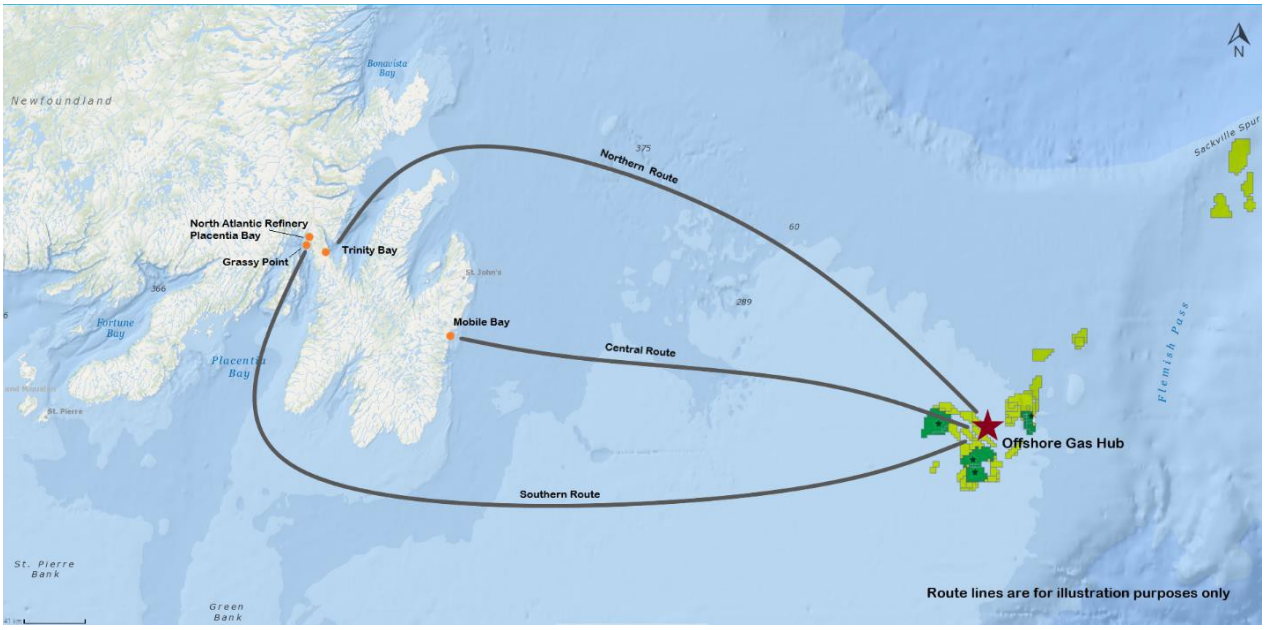


Figure 7: LNG NL Pipeline Route Options

1.8.3 Natural Gas Liquefaction Facility and Marine Export Terminal at Grassy Point, NL

The pipeline will terminate at a marine terminal to be located in Grassy Point, Placentia Bay. This site was previously identified as a potential LNG terminal site and received environmental approval from both the federal and provincial governments.

1.8.3.1 Site Location

The Grassy Point land area is bounded by the waters of Placentia Bay to the west and Arnold's Cove to the east; the approximate location is 47°45.5' N, 54°01.5' W. Grassy Point is approximately 2,500 m west of the Public Wharf in Arnold's Cove. The site is not currently accessible by road. The nearest road is Whiffen Head road, leading to NTL. The marine approaches to Grassy Point are reasonably sheltered from both winds and waves from all directions, except from the south and southwest.

Placentia Bay is a large and deep bay and is ideally located because it is less than 10-12 days sail from European main destinations. Multiple customers at these destinations that are developing LNG receiving infrastructure have indicated a need for the proposed LNG terminal facility. The Grassy Point site provides:

- an area free of ice under normal winter conditions
- sufficient water depth to permit safe transport to and from the location by the largest tankers

- an area with harbour potential, generally sheltered from the effects of the prevailing weather conditions
- experienced Pilotage Authority in transshipment and movement of petroleum products
- an area accessible from an existing road system without major road construction;
- marine access (relative ease of navigating an LNG tanker to the tentative jetty location)
- harbour potential (shelter, availability of a suitable turning basin immediately adjacent to the jetty)
- land access
- land area
- proximity to electrical power grid, and
- land elevation (approximately 30 to 40 m above sea level on western shore of Grassy Point).

Based on these characteristics and subsequent business-development assessments, LNG Newfoundland and Labrador Limited has determined that Grassy Point, Placentia Bay is the preferred site. There are considerable advantages to being close to, but independent from the two existing and similar marine operations (i.e., Newfoundland Transshipment Limited (NTL) and North Atlantic Refining Limited). Their proximity to Grassy Point will allow possible synergies in the areas of bunkering, emergency response, tugs and markets.

An artistic rendering of The Grassy Point location showing the FLNG, jetty and berthing systems and land base is shown in Figure 8 and Figure 9. The site includes pipeline shoring, gas receiving and metering, as well as slug receiving and potential preprocessing of gas to remove excess hydrocarbons (condensate and LPG) and storage tanks for condensate and LPG. It should be noted that the lay out and the type of potential gas pre-processing, the capacity, and quantity of LPG and condensate tanks shown in the graphics are subject to further engineering investigations. The footprint for the required land-based facility is anticipated to be smaller than the original permitted LNG Transshipment facility in 2008.

The Grassy Point LNG facility will require use or access to Bordeaux Island. For safety and security reasons, the Project facility and surrounds will be restricted access only.

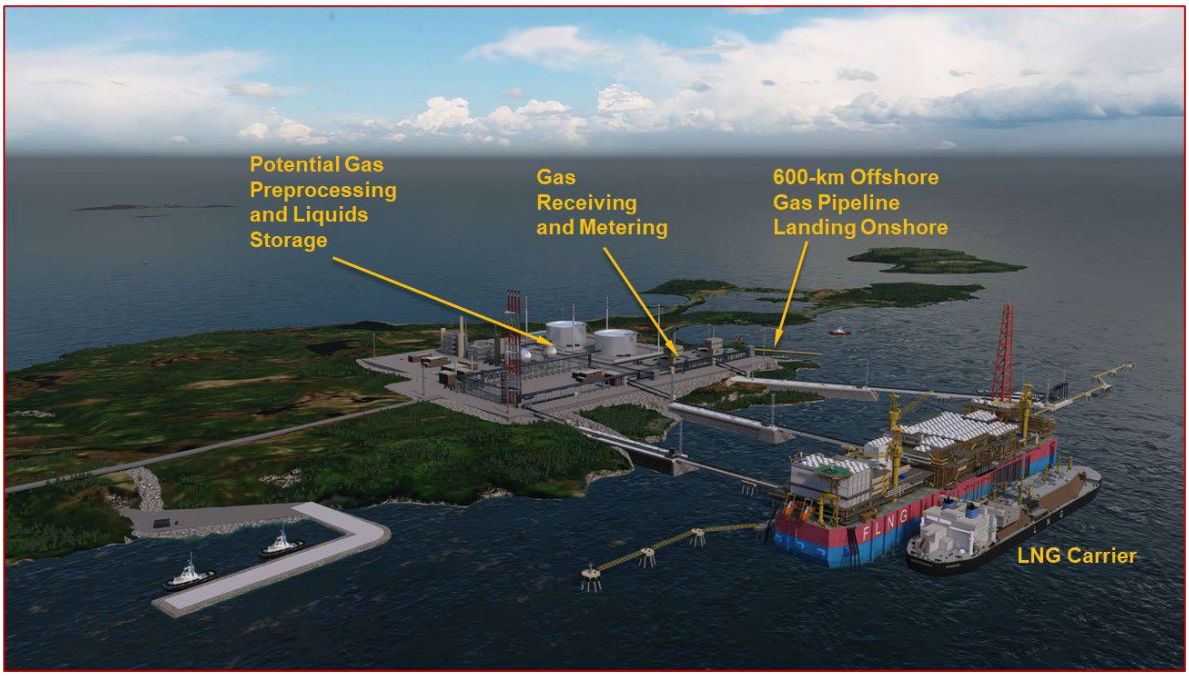


Figure 8: Artistic rendering of LNG production and export facilities at The Grassy Point location

Figure 9: Artistic rendering of LNG production and export facilities at The Grassy Point location

1.8.3.2 Marine Terminal and Jetties

The marine terminal will consist of a series of berths. Each berth will be capable of berthing 265,000 m^3 and 140,000 m^3 LNG or FLNG vessels. The construction of the berths will be phased in over the duration of the Project, but the first two berths may be constructed in close sequence to meet project requirements.

Each berth will be similar in construction and will consist of a service platform, mooring dolphins, berthing dolphins, access trestle connecting the loading platform to shore and walkways connecting the mooring and berthing dolphins (Figure 10). The service platform will be equipped with fixed loading arms to facilitate loading and unloading of LNG. The on-water footprint of the marine structures will encompass a water lot boundary running southwest approximately 2,250 m from the eastern boundary of the existing NTL water lot boundary. The boundary will then turn southeast and extend approximately 700 m terminating at the southernmost point of land at Adams Head.

The berthing structures will be located in approximately 15 m of water such that there is sufficient draught, thereby eliminating the requirement for dredging. In-water blasting is not required.
A conceptual berth occupancy estimate is based on the following data: LNG:

- 145,000 m^3 LNG Carrier (LNGC);
- 12,000 m^3/hr loading rate;
- 4.0 MTPA (9,600,000 m^3pa) Base Case,
- 24-hour vessel turnaround, including berthing, loading, draught surveys and unberthing.
- Condensates:
- 40,000 tonnes (deadweight) tankers (average);
- 3,000 tph loading rate;
- 1.5 MTPA Base Case,
- 24-hour vessel turnaround, including berthing, loading, draught surveys and unberthing.

In the Base Case, there will be an LNGC at the terminal every 5 to 6 days and a condensate tanker every 10 days. This is approximately a 30% berth occupancy. At the current level of project development, the berth occupancy for a single berth terminal should be below 50%.

Figure 3.3 Dock plan and section of propsed berths

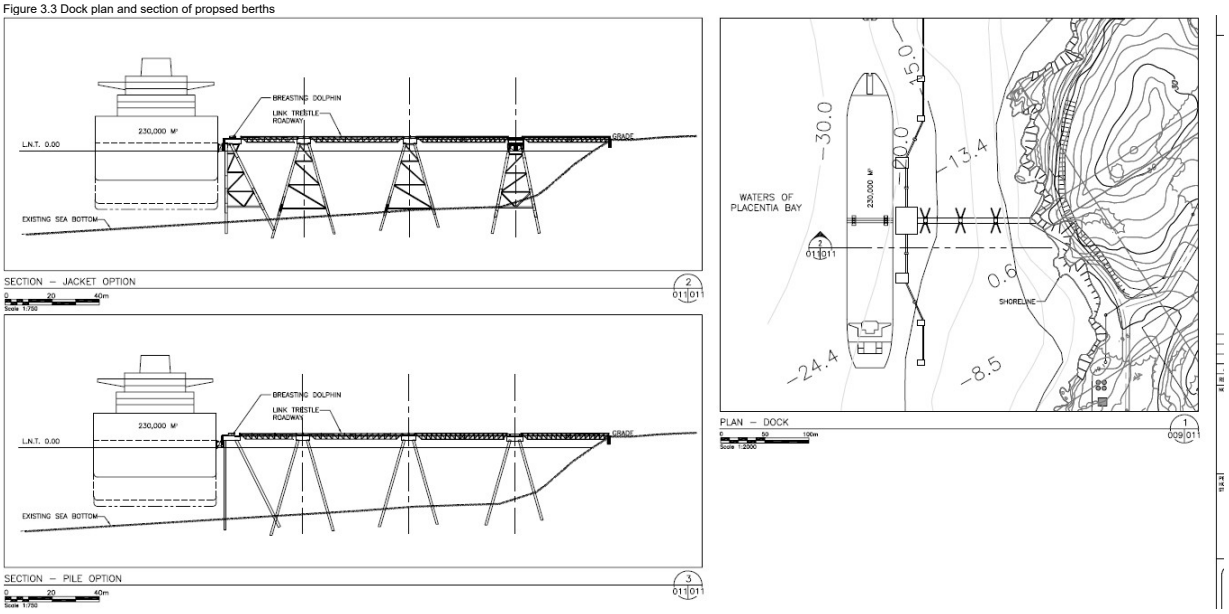


Figure 10: Conceptual Design - Berths and Piers

The berths will include facilities for the production of LNG and unloading of LNG cargo from FLNG vessel. The piers will have safety design features including quick disconnect loading arms and catch basins.

Each berth will be constructed with the following structures and features:

- service platform approximately 30 m x 30 m;
- two berthing dolphins approximately 9 m x 12 m;
- four mooring dolphins approximately 6 m x 8 m;
- steel truss catwalks connecting the dolphin structures;
- access trestle capable of carrying vehicle traffic and LNG pipe racks;
- quick release mooring hooks;
- spill containment equipment;
- fire fighting equipment and fire monitors; and
- electrical supply and lighting.
- Each berth will have four mooring dolphins; two on either side (Figure 10). The mooring dolphins are designed to withstand forces created by wind, waves and currents on the LNG tankers. These will accommodate:
- triple quick release hook assemblies with powered capstans; and
- handrail and bull rails.

Each berth will have two berthing dolphins which are designed to absorb the berthing forces of the LNG tankers. The berthing dolphins will be equipped with energy absorbing fenders.

1.8.3.3 Storage Tanks

Considering the safety, risk, environmental, and spacing criteria, it is recommended that only Full Containment type tanks or equivalent within the hull of FLNG vessel are selected for this proposed facility. For the base case up to 250,000 m^3 storage capacity will be required to 145,000m^3 LNG carriers (LNGC) and providing a 3-day buffer for periods when loading cannot take place (i.e. storms, etc.).

1.8.3.4 Tug Basin

The tug basin will require a minimum of 7 m water depth and be capable of berthing two to three tugs. Dredging may be required for the tug basin, but the material will be disposed of on land. The material used to construct the tug basin will be washed rock from a nearby quarry. The particular size of each material is as follows:

- shoreline granular fill: 1 to 250 kg;
- rock sub-mattress: 1 to 250 kg;
- rock mattress: 20 to 75 mm;
- filter stone: 100 to 1200 kg;
- scour Protection: 500 to 2,000 kg;
- armour stone: 2 to 6 t.

The preliminary footprint of the infill area for the tug basin will be approximately 23,000 m2. However, with detailed engineering, the footprint may change by as much as 50 percent. In any case, about 33 percent of the footprint of the tug basin infrastructure will be replaced by the vertical boulder habitat created by armour stone and fill material below mean low tide. The detail for the tug basin construction is illustrated in Figure 11.

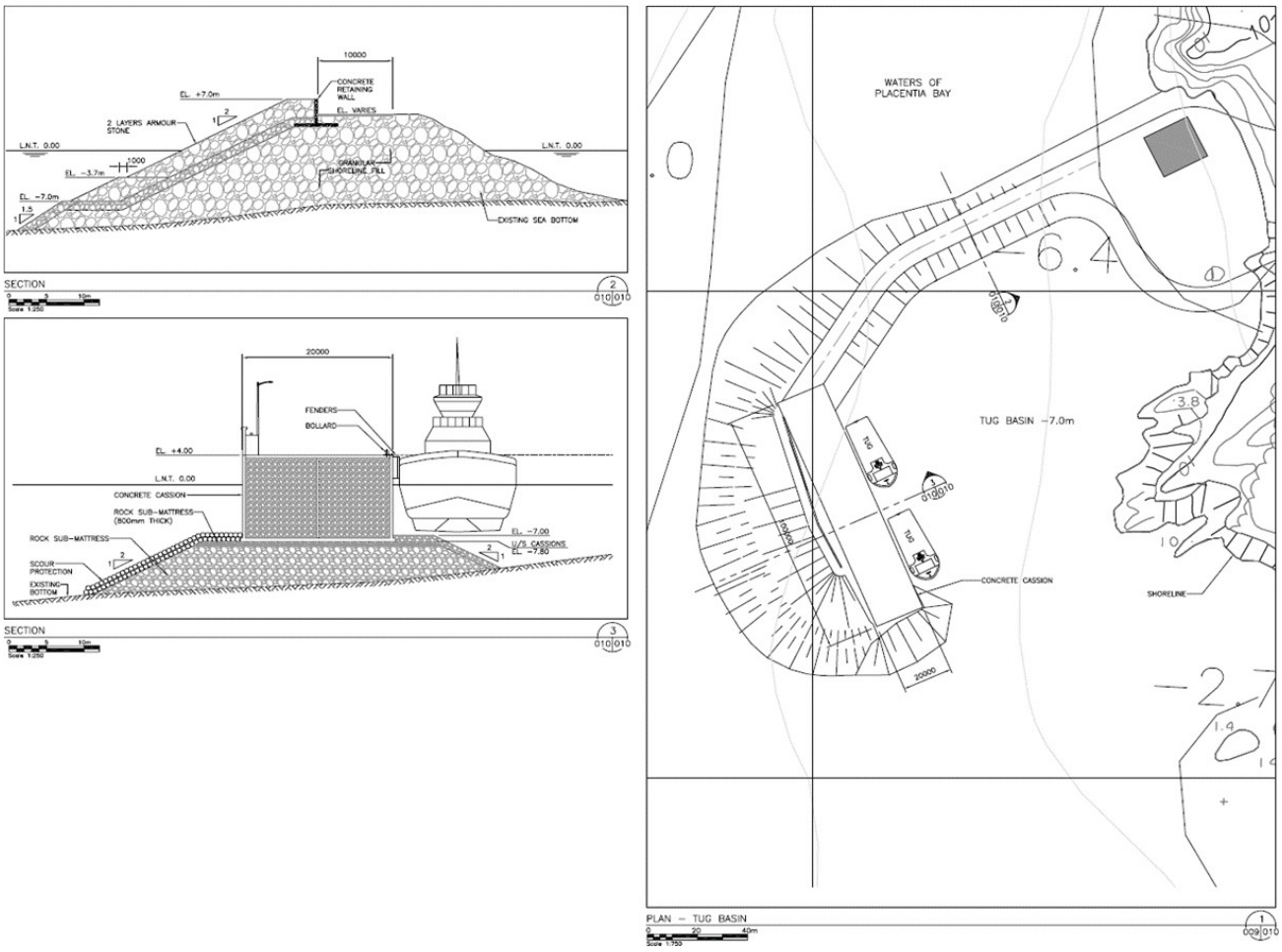


Figure 11: Tug basin plan and section of proposed project

1.8.3.5 Site Development and Environmental Protection Planning

The site is partially tree covered and is covered by shallow overburden. Trees will be cut, merchantable timber salvaged, and the slash mulched. Site grading will require removal of the overburden by bulldozer and excavator. This material will be loaded in trucks and removed to the overburden stockpile sites. The stockpiles will be trimmed and leveled as required. The stockpile will be reclaimed and redeposited over developed areas in the future, as required.

Site development requires the excavation of rock, which will be deposited in fill areas to complete any site grading. This work will involve drilling and blasting using pneumatic or hydraulic rock drills as per conventional rock excavation techniques. The explosives to be used will be stored in an approved, secure magazine. Licensed blasters under direct supervision of a professional engineer will undertake blasting. The following measures will be implemented to minimize the impact of the use of explosives and blasting:

- explosives will be used in a manner that will minimize damage or defacement of landscape features, trees and other surrounding objects by controlling through the best methods possible (including time-delay blast cycles) the scatter of blasted material beyond the limits of activity;
- blasting patterns and procedures, which minimize shock or instantaneous peak noise levels, will be used;

- blasting will not occur in the vicinity of fuel storage facilities; and
- blasting in or near a water body will be undertaken following existing guidelines and only after appropriate regulatory approval has been obtained.

An access road for equipment, materials and general access will be constructed overland, for approximately 1.5-2.0 km. The road will be a minimum width of 6 m with 1 m shoulders but remain on public or LNG NL owned land. Access will become secure and restricted at the Grassy Point LNG gatehouse. Perimeter fencing will be 2.4 m high galvanized chain link topped with 3 strands of barbed wire.

Effluent

Storm water management during construction will include control facilities such as runoff control ponds and site drainage ditches. Site run-off water will be directed to vegetated areas within the site, which will filter suspended solids. All water releases will meet the regulatory requirements of the *Fisheries Act* and the Newfoundland and Labrador *Environmental Control (Water and Sewage) Regulations*, as well as Provincial and Federal permits. Quarry sites for aggregate will be planned and operated to minimize impacts to water quality and the surrounding terrain. The extraction of materials will be planned to facilitate rehabilitation and avoid erosion. All fuel handling and storage will comply with the *Certificate of Approval for Storage and Handling of Gasoline and Associated Products*. All waste oil generated at the construction site will be disposed of by a licensed disposal agent. Spills kits will be maintained near fuelling facilities.

Waste Management and Recyclables

Solid wastes generated during construction of the Project include scrap metals, scrap lumber and general debris. Waste generated on site will be collected, stored and disposed of at approved facilities for such materials, according to the applicable regulations of NL. An emphasis will be placed on opportunities for reduction, reuse and recycling of waste materials. Combustible waste generated during construction and/or operation will be collected and stored in covered containers. All waste will be disposed in an approved manner.

Hazardous waste (limited to used oil and oil filters) will be collected and disposed of off-site in an approved manner. All areas where spillage may occur will have drip pans and collection sumps installed. Gasoline will be stored in approved containers. Waste diesel fuel, transmission oils, hydraulic oils and motor oil will be stored for off-site disposal by a licensed disposal company. Spent oil filters will be drained, stored in drums and sent to an off-site licensed disposal facility.

Septic Wastes

During construction, sanitary wastes will be handled by portable restrooms. These are self-contained units and will not require additional water. The portable restrooms located at the site will conform with the *Canada Occupational Health and Safety Regulations* (SOR/86-304). Waste will be disposed of by a licensed contractor.

Air Emissions

Air emissions will be limited to vehicle and equipment emissions and dust. All equipment will have the appropriate emission-control features. Emissions will also be generated from burning of unmerchantable timber, slashings and brush on site. The construction vehicles and equipment that may be required on site include:

- bulldozer;

- back-hoe crawler;
- dump truck;
- scrapper-pan;
- grader;
- rubber tire back-hoe;
- back-hoe front-end loader rubber;
- roller-compactor;
- asphalt pavers; and
- pick-up civil (job-site use).

The use of construction equipment and other heavy machinery during construction has the potential to create dust. Dust will also be generated through routine construction activities and materials handling. Dust control measures (i.e., water application) will be applied as required for vehicle traffic on the access road and other site areas during construction as required. Stream crossings for the site access road will be constructed of galvanized corrugated metal pipe (CMP). The CMP diameter will be selected based on the stream flows. The length of culvert will be dictated by the topography of the stream crossing. Typically, the culvert will be a minimum of 10 m in length to account for road width (6 m), shoulder (1 m) and slope of fill material.

Noise

The potential sources of noise during construction are vehicle traffic at site and on the access road, onsite equipment, and other construction activities, including blasting, that may be required to achieve grade requirements. Typical noise levels for construction equipment include:

- Earth Moving heavy equipment - 70 to 100 dB
- Materials Handling equipment for concrete and asphalt placement - 80 to 90 dB
- Stationary equipment such as generators and compressors - 70 to 90 dB
- Impact Equipment including jack hammers and pile drivers - 80 to 105 dB

Water Requirements

Potable water requirements during construction will be trucked to site or obtained from a bottled source. The batch plant for concrete production is planned to be an existing offsite operation. A water source for the hydrostatic testing of the tanks is currently being evaluated. Hydrostatic testing may be conducted using seawater, followed by a chemical rinse; a desalination plant, or a nearby surface freshwater supply may be required. All options are currently being evaluated

Potential Resource Conflicts during Construction

Current resource use of the Grassy Point area is likely restricted to small game hunting (otter trapping and duck hunting), fishing, berry harvesting and domestic wood cutting. Commercial fishing will be restricted near Grassy Point during construction of the marine facilities.

LNG Newfoundland and Labrador Limited is committed to the development and implementation of comprehensive Environmental Protection Plans (EPP) to help ensure a high level of environmental protection throughout its work areas and activities associated with the construction and development of the Grassy Point Liquefied Natural Gas (LNG) Facility, Offshore Gas Hub and Subsea Pipeline. An EPP is a working document for use in the field for Project personnel and contractors, as well as at the corporate level, for ensuring commitments made in policy statements are implemented and monitored. EPPs provide a quick reference for Project personnel and regulators to monitor compliance and to make suggestions for improvements.

In 2008 an Environmental Protection Plan was prepared in support of the formerly approved LNG transshipment terminal at Grassy Point (Jacques Whitford, 2008a). The EPP provides the general protection procedures for the routine activities associated with construction and commissioning activities anticipated for the Project and identifies applicable permits, authorizations and approvals, as well as key site-specific conditions of approvals, as appropriate.

The specific purposes of the EPP are to:

- ensure that commitments to reduce environmental effects are met; -
- document environmental concerns and appropriate protection measures;
- provide concise and clear instructions to Project personnel regarding procedures for protecting the environment and minimizing environmental effects;
- provide a reference document for Project personnel when planning and/or conducting specific activities and working in specific areas;
- provide a training aid during implementation efforts;
- communicate changes in the program through the revision process;
- provide a reference to applicable legislative requirements and guidelines; and
- provide direction for developing contingency plans for accidental events.

LNG Newfoundland and Labrador Ltd. Is committed to revising and submitting updates of the 2008 EPP to the applicable government authorities for review as part of the environmental approval process.

1.8.3.6 LNG Plant Operation

The Grassy Point site will be an industrial facility that produces LNG from natural gas and prepares it for marine export. The main processing facilities include:

- Gas receiving and metering
- Gas separation to remove condensate and LPG
- Liquefaction
- LNG and condensate storage
- LNG and condensate loading and export

The LNG processing facilities are designed to operate continuously for extended periods of time between planned turnarounds. To ensure the uninterrupted production of LNG for export it is most important during normal plant operations that the process is constantly monitored and surveyed by the duty shift operating personnel.

Although the most widely utilised liquefaction technology for base load LNG plants is the Propane Pre-cooled Mixed Refrigerant (C3MR), the selected concept for FLNG systems seems to be Single Mixed Refrigerant (SMR). The SMR system provides the most flexibility in terms of execution strategy and is the most common choice by FLNG clients for this capacity of LNG plant, hence it is assumed as the basis (this phase only) for cost estimates. At this level of definition any differences in cost between the four liquefaction technologies above will not have any appreciable effect on the overall project cost estimate. The Base Case capacity of 4.0 mtpa proposed for LNG Newfoundland and Labrador Limited would be close to the maximum possible for a single LNG train of SMR or Single Mixed Refrigerant.

It is recommended that a driver selection study is undertaken in the next phase considering gas turbine and electric drivers. As gas turbine drivers are assumed for the refrigerant compressor drivers, the power plant only supplies power for the helper motors and not the full compressor power. This therefore makes the power plant duty significantly lower than if electric motor drives are selected for the refrigerant

compressors. Gas turbines are the most selected drivers in recently constructed LNG plants and may be used for the Project. In that case, a carbon capture technology will be used to capture the CO_2 and transport it offshore for injection to offshore reservoirs through a parallel smaller pipeline to proposed subsea gas pipeline for enhance oil recovery (EOR) or general sequestration purposes. Alternatively, the refrigeration compressor could be powered by hydroelectricity from the NL power grid. The aspects of driver power selection will be detailed in future engineering investigations.

The operations at the terminal are based on allocating plant personnel to the marine terminal for the duration of ship loading. The assumption is made that the terminal supervisor is the only labour that is dedicated to the marine operations. The supervisor will monitor radio for ship calls that provide notice of arrival, coordinate plant personnel for line handling and loading operations, and coordination with the tug operators. The supervisor is the primary terminal contact with the harbour master. As an overall average, it is assumed that operators will consist of one equivalent fulltime operator and two equivalent full-time linespersons. There is no specific allowance carried to boom the vessels at the berth. It is assumed that booming will be carried out only in the event of a spill. Should operations management deem that booming is mandatory for, e.g., condensate vessels, additional plant resources will be required to assist with deployment.

Potential Sources of Pollution during Operation

The Project is an LNG production, storage, offloading and export facility. There will be no substantive processing or regasification of LNG; hence, there will be no significant generation of hydrocarbon by-products, emissions, or effluents. Minor emissions from routine operations of the proposed LNG facility are associated with boil-off control systems. The level of land-based vehicle traffic during operation is anticipated to be negligible and will not result in substantive emissions. The only potential release of LNG would be in the improbable event of an accident, malfunction or unplanned event (including operational upset).

Effluent

Liquid wastes generated at the facility will include oily wastewater, residual CO_2 removal solvents, and sanitary wastewater. Wastewater that has the potential for oil contamination, including building floor drains and equipment drains, will be collected in sumps located throughout the process area. This system will be designed so that separated oily waste can be collected, removed and disposed off-site at an approved facility. Separated wastewater or waste solvents will be collected on as-needed basis by a vacuum truck. Control of stormwater and snowmelt within the LNG tank containment system will be controlled by directing the water from the containment structure into a stormwater retention pond. The purpose of this pond is to control the volume of run-off during peak storm and snowmelt periods. This will prevent washouts and control sedimentation run-off and maintain the quality of discharge water entering the marine environment. The pond will consist of a perimeter till berm, inlet and outlet. A stabilized inlet will prevent erosion at the pond entrance. The outlet will consist of an overflow weir with an emergency spillway to control storm levels. The outlet channel will be lined to prevent erosion downgradient of the outlet. Water from the storm water retention pond will be discharged to the sea in compliance with provincial and federal requirements. No deleterious substances will be discharged. Seawater may be used for cooling in the liquefaction system. The seawater will be returned to the marine environment at a slight difference in ambient temperature.

Solid Waste

Solid wastes including desiccants and other solid wastes will be collected and disposal in an approved manner. Combustible waste generated during construction and/or operation will be collected and stored in covered containers. An emphasis will be placed on opportunities for reduction, reuse and recycling of waste materials.

Septic Wastes

The sanitary system at the facility will be self-contained and serviced by a local company or developed with the installation of a packaged closed system. Alternatively, connection to the local municipal system may be appropriate and will be investigated.

Air Emissions

The Boil Off Gas (BOG) generated during operation, storage and offloading of LNG will be re-liquefied and returned to the tanks. Natural gas will not be emitted under normal operations. The carbon dioxide separated from natural gas or produced as a result of shaft power generation by gas turbines will be captured and potentially transported offshore for reinjection. The only infrastructure related to the BOG systems that could potentially result in air emissions would be the auxiliary generators.

Chlorofluorocarbons (CFCs) will not be used at the facility. LNG vessels are natural gas-fired, thus making them among the lowest emitting transport vessels at sea. Diesel is used for back-up and vessels may use standard IMO 2020 approved fuel while approaching, offloading and leaving the terminal. Conventional air contaminants and greenhouse gases will be limited to those from marine vessels during approach, tugboats and vehicles. Vehicles and equipment will have appropriate emission control features.

Noise

Noise will result during operation of floating liquefaction system and operations of pumps and machinery. Also, there is potential for noise from vehicle traffic to and from the site, on-site from process equipment such as pumps and compressors, and from marine vessels maneuvering in the harbour as well as from unloading activities. The use of enclosures for process equipment will minimize sound pressure levels from the process area. Vehicles and marine vessels will be equipped with appropriate mufflers to minimize noise. The systems will be designed to comply with standards for noise prevention according to “Levels of Sound - Canada Occupational Health and Safety Regulations, Part VII - IPG-074” and other international accepted regulations.

Potential Resource Conflicts during Operation

For safety and security reasons, the Project facility will be restricted access only. The security of the site will be in accordance with the ISPS and other international codes for port and terminal safety. These codes prohibit public access and require fencing. Exclusion zones around LNG carriers while in transit and at berth will likely be required. The extent of any exclusion zone will be determined by Transport Canada.

1.8.3.7 Operations Risk Assessment

A risk assessment was completed in 2007 as part of the engineering studies in support of the formerly approved LNG transshipment (ICF, 2007). At that time, Newfoundland LNG Ltd. undertook a study of the

related risks associated with the operation of the proposed Grassy Point LNG transshipment terminal. The structure of this study was siting criteria enumerated in CSA Z-276-2007 "Liquefied Natural Gas (LNG) - Production, Storage and Handling" and the associated LNG shipping. The risk assessment methodology of CSA Z-276 - 2007 incorporates the maximum credible LNG release scenarios and the hazard models to determine the severity and distances of the resulting hazards. This methodology combines the likelihood and consequences in the traditional manner. It also provides a standard of acceptable risk level as represented by the hazard levels that are acceptable for siting.

Factors affecting risk and safety addressed included:

- Likelihood of the event occurring
- Behavior of LNG should a release occur during the event
- The potential zone of influence and severity of hazard
- Potential hazards to the public outside the facility
- Potential damage on adjacent property
- Physical effects on the environment
- Ship to Ship Transfer
- Effects on the Community and Future Development

This risk assessment, based on the risk-based "Siting Study for the Grassy Point LNG Transshipment and Storage Terminal" performed by Quest Consultants, Inc. in November 2007 confirms that the proposed facility design at the selected Grassy Point site meets all of the safety requirements for LNG siting specified by CSA Z-276-2007.

LNG Newfoundland and Labrador Limited is committed to updating and building on these previous reports to provide further insight into the potential causes and consequences of the various hazard scenarios associated with the current proposed LNG facility.

1.8.3.8 Employment and Equity

LNG Newfoundland and Labrador Limited is committed to being a fair and equal opportunity employer. In 2007 an Employment Equity Plan was prepared in support of the formerly approved LNG transshipment terminal (Newfoundland LNG Ltd, 2007). This document and will form the basis of the revised employment and equity plan to be completed for the new Grassy Point LNG Facility.

The Employment Equity Plan (2007) covers the construction, operations and decommissioning phases of the former project and was prepared in response to a condition for the release of the Project from provincial assessment. The Plan is in three main sections. The first describes the Project and the occupations required for the construction and operations phases. This is followed by a description of the employment equity planning process, including: the responsibilities of the proponent and its main contractors; the process for identifying and implementing equity targets and initiatives, including the initial targets; and the process whereby the implementation of those initiatives, and success in achieving these targets, are monitored and reported. The last section of the Plan identifies and describes possible initiatives that the proponent and its contractors can use to achieve employment equity for women.

The Grassy Point LNG Facility will provide significant employment opportunities during both construction and operations phases. The Employment and Equity Plan (2007) had estimated that the former project would provide a total construction trade and engineering labour requirement of 2830 person-years. It is estimated that 1,300-1,500 direct jobs at peak construction and 350-400 permanent direct jobs during

operations of all offshore and onshore projects will be created. LNG Newfoundland and Labrador Limited will be updating these estimates and the Employment and Equity Plan for the proposed Grassy Point LNG Facility.

1.9 Project Schedule

Planning for the Project began in 2020 and will continue with formal environmental assessment planning in 2021 (Figure 12). Further public engagement and studies will occur in 2021 followed by submittal of an Initial Project Description. Pre-Front End Engineering Design (Pre FEED) studies will continue throughout 2021 and 2022 followed by FEED studies in 2024 to 2025. The goal is to have first LNG produced for export by 2030.

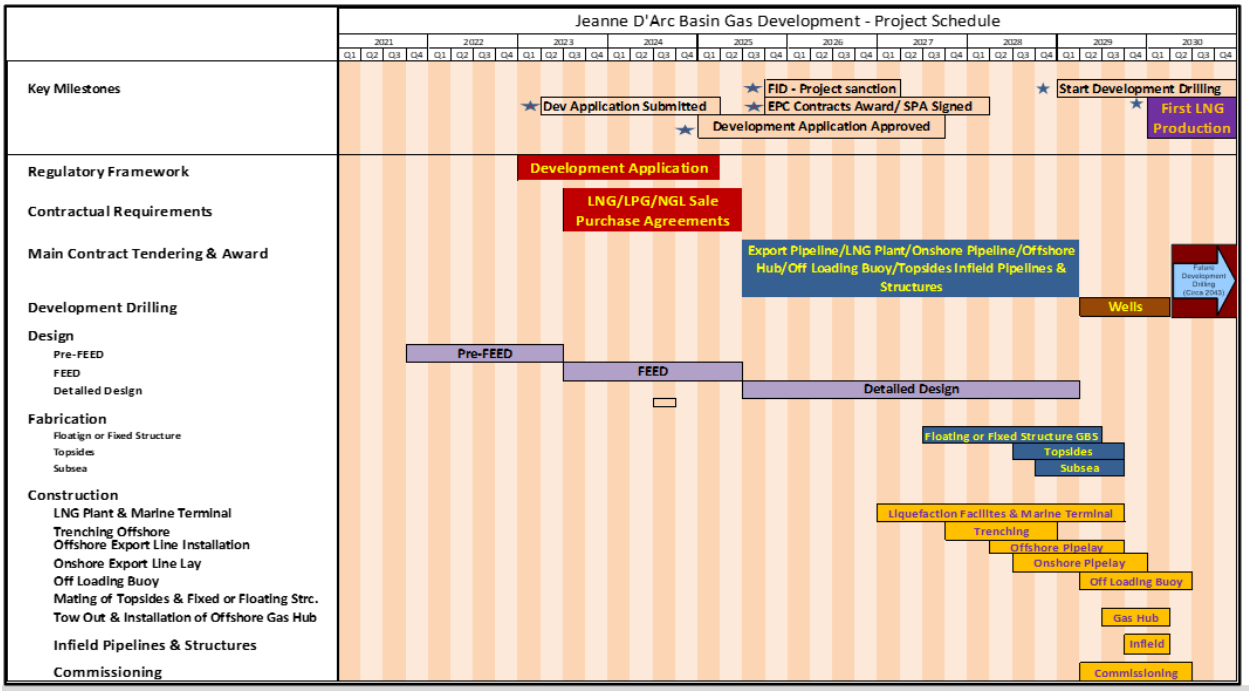


Figure 12: Project Schedule

ENVIRONMENTAL SETTING AND POTENTIAL EFFECTS

1.10 Regulatory Setting

The Grassy Point Liquefied Natural Gas (LNG) Liquefaction, Storage and Export Facility with Offshore Gas Hub and Subsea Pipeline will be subject to both federal and provincial environmental assessments. The federal legislative requirements under the Impact Assessment Act (2019) and associated Physical Activities Regulations (2019) include the following sections that may pertain to the Project:

- 35 - The construction, installation, and operation of a new offshore floating or fixed platform, vessel or artificial island used for the production of oil or gas.
- 37 - The construction, operation, decommissioning and abandonment of one of the following:
- (d) a new facility for the liquefaction, storage or regasification of liquefied natural gas, with a liquefied natural gas processing capacity of 3 000 t/day or more or a liquefied natural gas storage capacity of 136 000 m3 or more;
- (f) a new natural gas liquids storage facility with a storage capacity of 100 000 m3 or more.
- 40 - The construction, operation, decommissioning and abandonment of a new offshore oil and gas pipeline, other than a flowline as defined in subsection 2(1) of the Canada Oil and Gas Installations Regulations.
- 52 The construction, operation, decommissioning and abandonment of a new marine terminal designed to handle ships larger than 25 000 DWT

Section 32 of NL Environmental Protection Act (2002) and associated Environmental Assessment Regulations (2003) designates Natural Gas production facilities to be registered with the NL Minister of Environment and Climate Change.

The Project Area itself has been the focus of detailed municipal planning exercises over the past fifteen years during which time the whole area was zoned for marine terminal use. The area from Whiffen Head to Adams Head, which includes the proposed LNG terminal site, was zoned as Rural Use by the Town of Arnold's Cove in the Arnold's Cove Municipal Plan and Development Regulations in 1991 and revised in 1992. The area zoning was amended in 1996 to accommodate land use for a marine terminal. The amendment included Hazardous Industry as a Discretionary Use in anticipation of then proposed Newfoundland Transshipment Terminal at Whiffen Head. Examples of Hazardous Industry given in the Development Regulations include "bulk storage of hazardous liquid and substances". The public was required to be notified and consulted on all amendments to the municipal plan under Provincial legislation. The public was further involved in the review process associated with both the Newfoundland Transshipment Terminal and the previous LNG Transshipment Terminal proposal that were both subject to separate Comprehensive Studies and associated public consultation under the *Canadian Environmental Assessment Act*.

The Town of Arnold's Cove prepared a land use planning map in 1993. This clearly illustrates that Grassy Point was contemplated for use as a marine terminal. The Town boundaries are specified as at the high water mark, however Sec 2 (2) of the *Municipalities Act* specifies that:

- All docks, quays, wharves and structures touching the boundaries of a municipality and all ships attached either permanently or temporarily to a dock, quay, wharf, ship or structure shall be considered to be with and to be part of the municipality.

The proposed LNG production facilities are located on lands that are designated for such use in a land-use

plan that has been the subject of public consultation.

1.11 Preliminary Environmental Interactions

1.11.1 Natural Gas Liquefaction Facility and Marine Export Terminal at Grassy Point, NL

The environmental interactions resulting from the Grassy Point terminal and floating liquefaction facility as proposed in this Registration document are considered preliminary and are based primarily on the results of previously completed studies. The original Registration document (Newfoundland LNG, 2006) and Comprehensive Study Report (Jacques Whitford, 2008) for the Grassy Point LNG Transshipment Terminal focused on several Valued Ecosystem Components (VECs) that would be affected by the project including:

- Marine fish and fish habitat – Both marine and freshwater fish habitat baseline studies were completed in 2007 (Jacques Whitford, 2007a and b). Marine and fish habitat in the vicinity of the tug basin and jetties was identified as being impacted by construction including infilling and dredging activities. During operations potential effects identified were noise from vessels, and water discharge including surface discharge and cooling water discharge.
- Commercial Fisheries (including aquaculture and fish processing) – The potential interaction with fishers in the vicinity of Grassy Point during construction of the tug basin and jetties was identified as a concern. Mitigations including creating a safety zone and coordinating the timing of construction activities. A commitment was made to ensure that no economic effect on Fishers would occur from terminal construction and operations. The potential interaction with aquaculture facilities was identified from any construction related debris escaping from the

project area.

- Marine Mammals – Noise during marine construction was identified as a temporary concern for marine mammals in the vicinity of the project. During operations vessel noise and the potential for collisions were identified interactions of concern. The low levels of marine mammals in the vicinity of the facility and the intermittent nature of vessel traffic patterns were mitigating factors reducing the overall effect on marine mammals.
- Migratory Birds – Noise, increases in traffic and land-based habitat loss were identified as project construction interactions with migratory avifauna. The terrestrial avifauna habitat was identified as being low quality and the predicted residual effects were deemed not significant for migratory birds. During facility operations the primary interactions were identified from vessel traffic, noise, and human presence. The residual effects from operations were deemed not significant for migratory birds.
- Species at Risk – The earlier studies from 2006-2008 identified sea turtles as the only Species at Risk that may occur within the LNG facility project area. Mitigations to avoid disturbance during marine construction include monitoring to identify and avoid sea turtle and marine mammal presence/absence before initiating construction activities.
- Atmospheric environment (as it relates to human health) – Air emissions during construction were deemed to be low and to represent a low contribution of overall local total air emissions.
- Marine transportation and safety – Vessel traffic planning will occur to ensure that construction activities and vessel movement during operations do not represent an unacceptable risk to navigation.

The re-designed facility will recognize these same potential interactions as listed above and also additional environmental effects associated with LNG production, pipeline reception, gas metering and condensate storage. Table 3 below includes a preliminary overview of the project and environment interactions.

Table 2: Preliminary Project Environmental Interactions, Natural Gas Liquefaction Facility and Marine Export Terminal

Project Component	Project Stage	Activities	Environmental Interaction
Grassy Point Facility	Construction	Marine Dredging Pile Installation Blasting Rock Placement Seawater Intake Sewer Outfalls	Fish and Fish Habitat - Project will have a direct effect on benthic habitat within the footprint of the tug basin and jetties. Proponent will build on existing fisheries studies and continues the commitment to achieve Not Net Loss of Fish and Fish Habitat pursuant to Fisheries Act. Avifauna – Land Based activities will displace any avifauna within the project footprint. Noise from marine construction may temporarily disrupt avifauna in the vicinity of the terminal. Marine Mammals – Vessel movement and marine construction has the potential to disrupt marine mammal movement. Commercial Fishers – The potential interaction with fishers in the vicinity of Grassy Point during construction of the tug basin and jetties remains a concern. The potential interaction with aquaculture facilities resulting from any construction related debris escaping from the project area remains an interaction. Atmospheric – Emissions from construction activities associated with heavy equipment will and is anticipated to be a minor effect. Historic Resources – The proponent will build on the results of the stage 1 historic resources assessment completed previously. Human Environment & Health – The operation of a liquefaction facility has the potential to interact with workers health and nearby communities. Species at Risk – No land-based SAR were identified in previous terrestrial studies. These studies are to be reviewed and updated. Socio Economic – The Equity plan is to be reviewed and updated.
		Land Based Site clearing Land development Road construction Site utility development Storage tank development	

Project Component	Project Stage	Activities	Environmental Interaction
	Operation	Vessel Movement Natural Gas Metering and Treatment LNG Production Emergency Energy Generation LNG and Condensate Storage Condensate Offloading and Export LNG Offloading and Export	Fish and Fish Habitat – Effluent and surface runoff may affect water quality in the vicinity of the terminal. Avifauna – Vessel traffic, noise and lighting has the potential to disrupt avifauna within the project vicinity. Commercial Fishers – Vessel movement has the potential to disrupt fishers within the vicinity of the project. Atmosphere - During operations it is planned that the primary power source for the site will be electricity provided by NL Power from hydroelectric sources and possible local renewable energy suppliers. It will be possible during emergency events to use natural gas for electricity generation which will represent a temporary source of air emissions. It is also proposed to investigate the feasibility of capturing carbon from the liquefaction process and piping it back offshore for re-injection. Human Environment & Health – Continued and fugitive emissions have the potential to affect worker health and nearby communities. Socio Economic – Equity plan monitoring, and modification as required.
	Decommissioning	Site Decommissioning Waste Disposal	Fish and Fish Habitat, Atmosphere and Avifauna Sedimentation, liquid discharge, and fugitive emissions have the potential to effect biota in the vicinity of the project.

1.11.2 Natural Gas Pipeline from Jeanne d'Arc Basin to Placentia Bay, NL

The engineering design and route / corridor selection of the pipeline location will be key factor for minimizing the potential negative effects from construction and operation of the pipeline. By avoiding biologically sensitive areas and areas of known fishing activities during pipeline route selection certain environmental effects may be reduced and/or eliminated during project planning. Further environmental effects and risk can be reduced or mitigated through engineering design including the incorporation of trenching, pipeline cover, and innovative pipeline construction technologies.

During future engineering feasibility studies a detailed constraint mapping will be completed showing various biological and physical constraints to

be considered during corridor selection and options within the preferred southern route.

Preliminary environmental and project interactions associated with a natural gas pipeline from the Jeanne d'Arc Basin to Placentia Bay are listed in Table 4.

Table 3: Preliminary Environmental Interactions - Natural Gas Pipeline

Project Component	Project Stage	Activities	Environmental Interaction
Pipeline from Jeanne d'Arc Basin to Grassy Point, Placentia Bay	Construction	Dredging and Trenching Pipe Placement Blasting Rock Placement	Fish and Fish Habitat – Pipeline construction will have a direct effect on benthic habitat within the footprint of the pipeline. Trenching and placement of materials has the potential to affect benthic fish, plants and coral habitat Avifauna – Vessel use during pipeline placement may cause temporary disruption of avifauna within the vicinity of the vessel. Marine Mammals – Vessel movement and marine construction has the potential to temporarily disrupt marine mammal activities. There is the potential for collisions during trenching, and rock placement. Commercial Fishers – There is potential interaction with fishers in the vicinity the pipeline during construction. Atmospheric – Emissions from construction activities associated with vessel use is anticipated to be a minor effect. Historic Resources – There is the potential for the pipeline route to interact with known marine wrecks

	Operation	Maintenance Activities Leakage Accidental Spill Events/ Malfunctions	Operational effects relate to leakage and accidental effects associated with pipeline ruptures and release of natural gas. Natural gas releases in the marine environment have the potential to create toxic conditions that may affect fish health or mortality depending on the concentrations. Factors determining the severity of the effects include the length of time and volume of natural gas emitted, proximity to and species of fish present as effects may vary by species, and oceanographic conditions. While the pipeline will be located in the seabed, accidental rupture events have the potential to affect water quality throughout the water column thus interacting with other biota not just benthic species such as avifauna, plankton and marine mammals. Commercial Fishers – The pipeline will have the potential to affect fishing activity within the vicinity of the project. Atmosphere – During typical operations there will be little interaction with the atmospheric environment. Human Environment & Health – Interactions with people and human health effects are associated with accidental events
	Decommissioning	Site Decommissioning Waste Disposal	Fish and Fish Habitat, Atmosphere and Avifauna Sedimentation, liquid discharge, and fugitive emissions have the potential to effect biota in the vicinity of the decommissioning construction activities.

1.11.3 Offshore Gas Hub

The offshore gas hub will be comprised of a gravity base structure and associated subsea pipelines and infrastructure connecting the various existing producing fields back to the gas hub. Environmental Effects associated with the construction of the gas hub would be similar to other gravity base platforms already in place offshore NL and are well understood. These effects would relate to the potential for sedimentation related to seabed preparation and platform placement and any liquid wastes, effluent, and surface run off associated with construction vessels usage.

During operations, the Gas Hub will be handling and treating natural gas prior to piping it onshore. Potential environmental effects are associated with power generation, surface runoff, effluent, leaks, and fugitive emissions. The preliminary environment and project interactions associated with the construction and operation of the Offshore Gas Hub are listed in the following table.

Table 4: Preliminary Environmental Interactions – Offshore Gas Hub

Project Component	Project Stage	Activities	Environmental Interaction
Offshore Gas Hub, Jeanne d'Arc Basin	Construction	Seabed preparation Site excavation Rock Placement	Fish and Fish Habitat - Project will have a direct effect on benthic habitat within the footprint of the gravity base structure and subsea infrastructure. Avifauna – Noise from marine construction may temporarily disrupt avifauna in the vicinity of the platform. Marine Mammals – Vessel movement and marine construction has the potential to disrupt marine mammal movement. Commercial Fishers – Vessel routing and movement may interact with fishers in the vicinity project area. Atmospheric – Emissions from construction activities associated with vessels is anticipated to be a minor effect.
	Operation	Drilling Fluid separation Dehydration Compression	Fish and Fish Habitat – Effluent and surface runoff may affect water and sediment quality and biota in the vicinity of the platform. Avifauna – Vessel traffic, noise and lighting has the potential to disrupt avifauna within the project vicinity.

		Condensate Storage CO_2 reinjection	Commercial Fishers – Support vessel movement has the potential to disrupt fishers within the vicinity of the project. Atmosphere - During operations thermal power using natural gas will be used for electricity generation which will represent a source of GHG emissions. Human Environment & Health – Fugitive emissions have the potential to affect worker health Socio Economic – The development and implementation of an Equity plan has the potential to have a positive effect on employment.
	Decommissioning	Site Decommissioning Waste Disposal	Fish and Fish Habitat, Atmosphere and Avifauna Sedimentation, liquid discharge and fugitive emissions have the potential to effect biota in the vicinity of the project.

1.12 Stakeholder and Indigenous Concerns

Numerous public information sessions were held as well as discussions with representatives from various nearby communities as part of the environmental assessment of the formerly approved LNG facility at Grassy Point, Placentia Bay. The results of these meetings are presented in the Comprehensive Study Report (2007). LNG Newfoundland and Labrador Limited is committed to further public consultation and will be developing and implementing an engagement strategy.

For this Project, numerous discussions have taken place with representatives of the Miawpukek First Nation of Conne River who hold fisheries licenses within Placentia Bay. Miawpukek First Nation through their joint venture with Horizon Maritime Services is an equity partner in this project and will be participating in all aspects of the project.

1.13 List of Permits

The permits and approvals that may be required for the Project are listed below in Table 6.

Table 6 List of potential applicable permits.

Permit, Authorization, Approval	**Agency**
Release under the IAA	Various Federal Departments
Authorizations Concerning Fish and Fish Habitat Protection	DFO
Permit for Construction within Navigable Waters	Transport Canada
Application for a Water Lease	Transport Canada
Notification to Handle or Transport Dangerous Goods	Transport Canada
Transportation of Dangerous Goods	Transport Canada
Approval for Vessel Admission	Canada Customs and National Revenue
Radio Station License	Industry Canada Communications
Application to Import Natural Gas/LNG	Canadian Energy Regulator
Release under the NL *EPA*	NLDOECC – Environmental Assessment Division
Certificate of Approval for any Industrial Processing Facility	NLDOECC – Pollution Prevention Division
Certificate of Environmental Approval for any Alteration to a Body of Water	NLDOECC – Water Resources Division
Application for Water Use License	NLDOECC - Water Resources Division
Shoreline Reservation	NLDOECC – Lands Division

Letter of Advice of New Construction Project or Industrial Enterprise	Newfoundland and Labrador Department of Government Services (NLDGS) - Occupational Health and Safety Services
Application for Water and Sewage Works	NLDOECC – Water Resources Division
Permit for Access off any Highway	Newfoundland and Labrador Department of Municipal and Provincial Affairs (NLDMPA)
Authorization to Handle or Transport Dangerous Goods	Newfoundland and Labrador Department of Transportation and Infrastructure (NLDTI) - Transportation Regulation Enforcement
Borrow and Quarry Permit	NLDIET – Industry, Energy and Technology
Authorization to Control Nuisance Animals	NLDFFA – Fisheries, Forestry and Agriculture
Permit to Burn	NLDFFA - Forest Resources Division
Commercial Cutting Permit	NLDFFA - Forest Resources Division
Operating Permit/Fire Season	NLDFFA - Forest Resources Division
Certificate of Approval for Storage and Handling of Gasoline and Associated Products	NLDOECC
Review of Building/Fire/Life Safety	NLDJPS - Office of the Fire Commissioner
Permit for Flammable and Combustible Liquid Storage and dispensing and for Bulk Storage	NLDJPS - Office of the Fire Commissioner
Building Accessibility	NLDGS - Occupational Health and Safety Division
Permit for Archaeological Investigations	NLDTCAR - PAO
Approval for Waste Disposal	Arnold’s Cove Town Council

List of References

- BP. 2021. Statistical Review of World Energy 2021. 68pp., www.bp.com
- BP. 2020. Energy Outlook: 2020edition. 81 pp. www.bp.com
- Canning and Pitt Associates. 2005. Placentia Bay Project Benefits Study: Marine Institute Canadian Centre for Marine Communications
- Dokkum, Klass Van. 2020. 2020 Ship Knowledge, 10th Edition, Dokmar. 341 pp.
- Government of Newfoundland and Labrador. 2007. Environmental Assessment Bulletin 2007-1-19. Department of Environment and Conservation, Environmental Assessment Division. 2pp
- Jacques Whitford. 2007a. Freshwater Fish and Fish Habitat Survey at Grassy Point. A report submitted to Fisheries and Ocean Canada on behalf of Newfoundland LNG Ltd. 22 pp + app.
- Jacques Whitford. 2007b. Marine Fish and Fish Habitat in the Grassy Point Area of Placentia Bay. A report submitted to Fisheries and Ocean Canada on behalf of Newfoundland LNG Ltd. 37 pp +app.
- Jacques Whitford. 2007c. Stage 1 Historical Resources Assessment Grassy Point, Placentia Bay. A report submitted to Newfoundland and Labrador Provincial Archaeology Office on behalf of Newfoundland LNG Ltd. 14 pp.
- Jacques Whitford. 2008b. Grassy Point Liquefied Natural Gas Transshipment and Storage Terminal Comprehensive Study Report. A report submitted to Transport Canada and Fisheries and Oceans pursuant to the Canadian Environmental Assessment Act CEAR Reference Number: 07-03-26546 on behalf of Newfoundland LNG Ltd. 528pp.
- Jacques Whitford. 2008a. Environmental Protection Plan for Project Construction and Commissioning of the Grassy Point LNG Transshipment and Storage Terminal. A report prepared for NEWFOUNDLAND LNG LTD. And submitted to NL Minister of Environment and Conservation pursuant to the Environmental Protection Act. 63pp.
- ICF International. 2007. Risk Assessment Grassy Pont LNG. A report submitted to NL Minister of Environment and Conservation pursuant to the Environmental Protection Act. 74pp.
- Newfoundland LNG Ltd. 2007. Grassy Point Employment and Equity Plan. A report submitted to NL Minister of Environment and Conservation pursuant to the Environmental Protection Act. 31pp.
- Quest Consultants Inc. 2007. Siting Study for the Grassy Point LNG Transshipment and Storage Terminal. A Report submitted to NL Minister of Environment and Conservation pursuant to the Environmental Protection Act. 14 pp.
- Shell Energy. 2021 Shell LNG Outlook 2021. www.shell.com/energy-and-innovation/natural-gas
- The World Bank. 2017. Understanding Poverty Brief Q&A: The World Bank Group and Upstream Oil and Gas. www.worldbank.org/en/topic/climatechange

APPENDIX A: Corporate Project Overview

Slide 1

Slide 2

About Us

Newfoundland LNG Ltd. ("Newfoundland LNG") is a Newfoundland and Labrador owned and operated corporation focused on permitting and developing LNG infrastructure needed to monetize significant stranded natural gas in the Jeanne d'Arc Basin, offshore Newfoundland and Labrador.

Project requires a centralized offshore gas hub, a pipeline, and natural gas liquefaction facilities and export terminal at Grassy Point, Placentia Bay, NL.

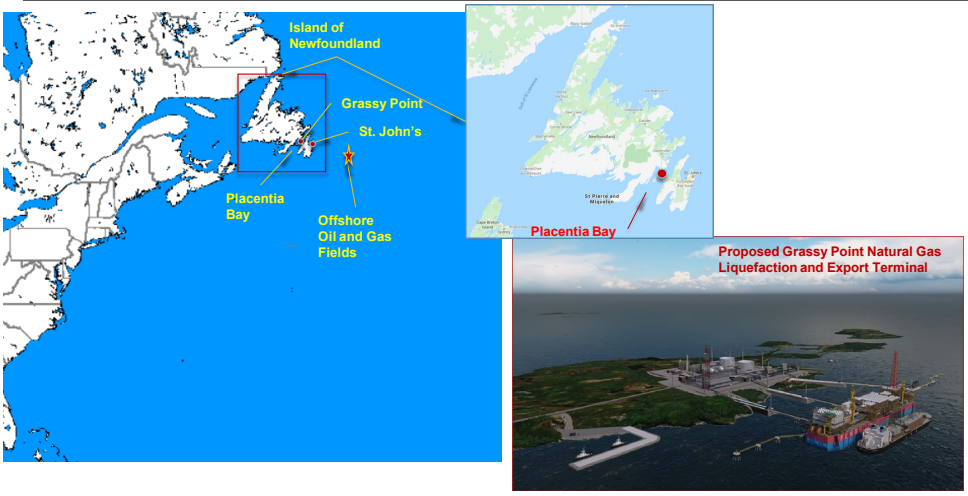
Slide 3

Our partnership

Privileged and Confidential

Slide 4

Proposed Gas Liquefaction Facilities & Export Terminal
Grassy Point, Placentia Bay, NL



Slide 5

About Us - The Team

Leo Power, MBA, Master of Oil & Gas Studies, ICD.D, CEO, President, and Director of LNG NL.

Majid A. Abdi, Ph.D., P.Eng., VP Engineering and Technology, LNG NL.

Kevin Aylward, B. Comm., Chief Operating Officer, LNG NL.

Chief Mi'sel Joe, VP Community and Government Relations, LNG NL, and Chief of Miawpukek First Nation

Greg Dickie, LL.B., QC, Chair of Board of Directors and Corporate Secretary, LNG NL, and President of Baine Johnston Corp.

Don Anthony, CPA, VP Finance and Director, LNG NL

Chris Collingwood, Chairman & CEO Baine Johnston Corp. and Director of LNG NL

Shayne McDonald, LL.B., QC, MBA, Miawpukek First Nation, Director of Miawpukek Horizon Maritime Services (MHMS)

Sean Leet, MBA, CEO, Horizon Maritime Group of Companies, Director of MHMS

Jason Fudge, President, DF Barnes wholly owned by JV Driver and Director of LNG NL

David Mitchell, M.Eng., P.Eng., MBA, ICD.D, LL.M., CEO, Pennecon and Director of LNG NL

Slide 6

About Newfoundland LNG

- Indigenous partnership – Miawpukek Horizon Maritime Services
- Oil & gas engineering and project management
- Oil & gas procurement and construction management
- Real estate and property management
- Legal and contract negotiations
- Permitting and regulatory liaison – deep local knowledge
- Former Newfoundland and Labrador Environment Minister
- Accounting and finance

Slide 7

Project Overview

- **8.0 TCF** of Natural Gas in Jeanne d'Arc Basin awaiting monetization
- **5.0 TCF** required for 25-year project at 4 MTPA/600 MMSCFD
- **432-acre** site at Grassy Point, Placentia Bay, NL
- **US$ 10 B CAPEX** to construct three major projects:
  1. US$ 4.5 B Central Gas Hub Connecting Offshore Production Platforms
  2. US$ 3.0 B 600 km Pipeline to Grassy Point
  3. US$ 2.5 B Floating Liquified Natural Gas (FLNG) Vessel Moored at Grassy Point Export Terminal
- Potential use of up to 180 MW Muskrat Falls hydropower
- Strong indigenous participation from Miawpukek First Nation
- Closest North American export point to European markets
- NL offshore gas sourced **from non-fracking production**

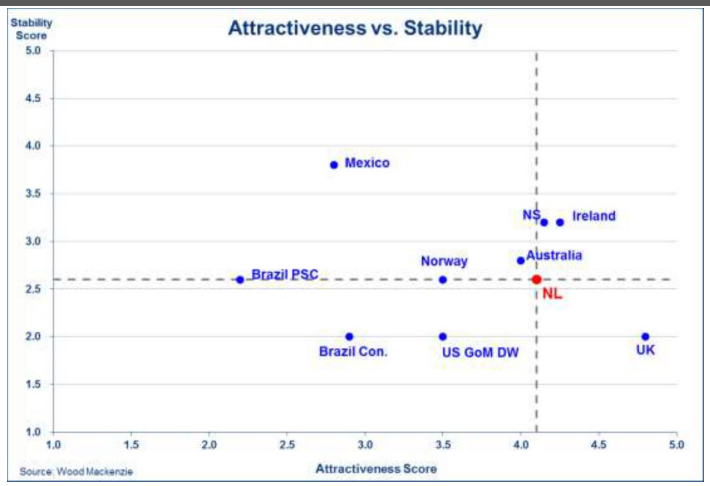
Slide 8

Business Drivers

- **Greenhouse Gas Credits & Emissions Targets** - International push to replace coal and marine bunker fuel with cleaner alternatives and aligned with Government of Canada 2050 Net-Zero Plan
- **Strategic Supply** – Particularly for Europe and high demand markets such as India, Japan, South Korea and China.
- **Simplicity in Relation to Interprovincial Onshore Pipelines** – NL offshore pipeline to onshore has one provincial and one federal jurisdiction.
- **Gas Reinjection Costs** – Current offshore practices for reinjection to manage associated gas is costly and flaring is restricted.
- **Monetization** – Offshore operators interested in monetizing gas and condensate assets. Encouragement from governments to develop natural gas resources.

Slide 9

Business Drivers
NL Fiscal Attractiveness and Stability

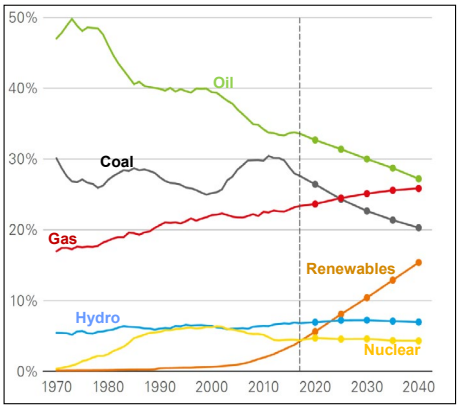


Source: Wood Mackenzie Newfoundland & Labrador Competitiveness in Oil & Gas Investment, Feb 2018

Slide 10

Business Drivers
Riding the Transition to Lower Carbon Fuels

- Carbon emissions in the NL offshore are estimated to be **30 percent below the global average** at extraction (12 kg CO_2/bbl vs. 18 kg CO_2/bbl)
- Natural gas has the least carbon content of all hydrocarbons. LNG exports will improve Canada's contribution to lower global carbon emissions
- Shares of primary energy are shifting to higher use of natural gas and renewables*
- BP Energy Outlook 2020 predicts natural gas demand will grow in almost every country and region* as the result of availability of gas and policy shifts to lower-carbon fuels
- Coal-to-gas switching, especially in China and India, and increased industrial demand for gas in developing economies will drive additional demand



***Source:** BP Energy Outlook, 2020 edition

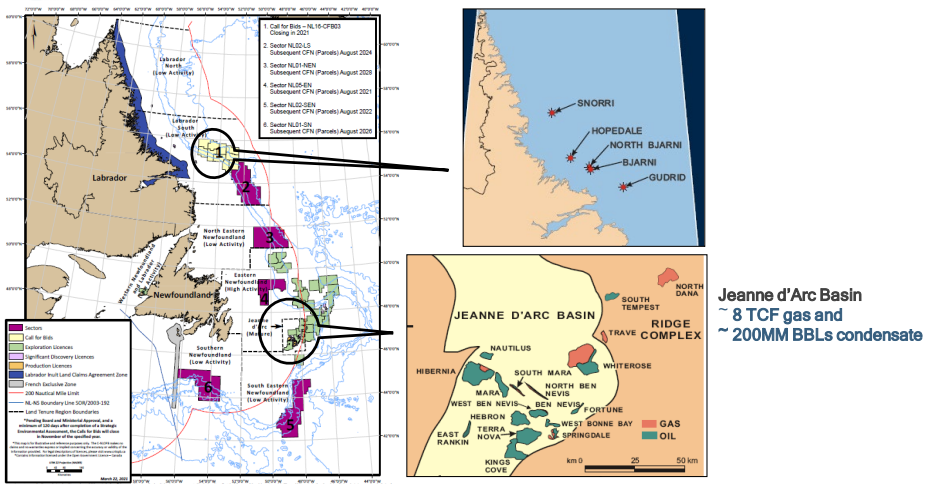
Slide 11

EASTERN CANADA - Newfoundland and Labrador
Discovered Oil and Natural Gas Resources

- First oil production 1997
- ~2 billion BBLs produced from four fields to date
- Newfoundland and Labrador's offshore has 3.9 billion barrels of discovered oil reserves/resources[1]
- 12 TCF of discovered gas and 340 MMBLs of condensate
  - **~ 8 TCF - Jeanne d'Arc Basin**
  - **~ 4 TCF - Labrador Shelf**
- None of the gas or condensate has been produced yet
- *Advance 2030* outlines Newfoundland and Labrador's natural gas development strategy

[1] **Source:** Government of Newfoundland and Labrador Advance 2030 Strategy

Slide 12

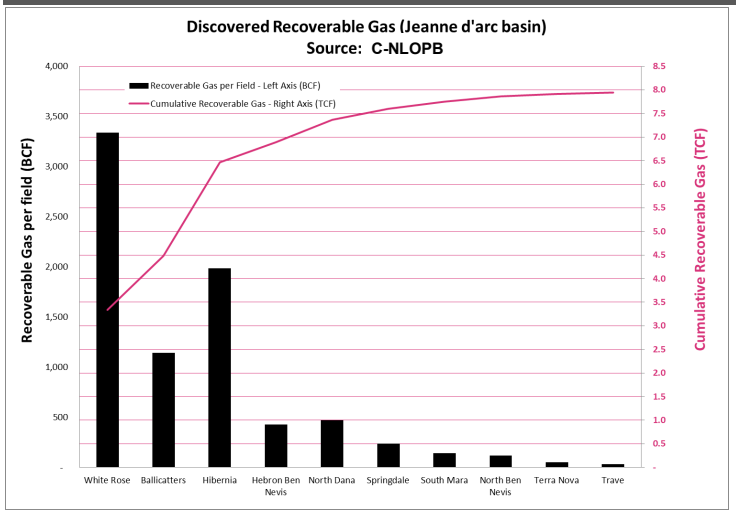


Jeanne d'Arc Basin
~ 8 TCF gas and
~ 200MM BBLs condensate

https://www.cnlopb.ca

Slide 13

Discovered Recoverable Gas
Jeanne d'Arc Basin ~ 8 TCF gas and ~ 200mm BBLs condensate

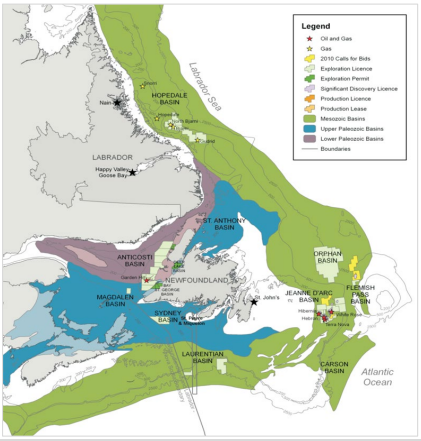


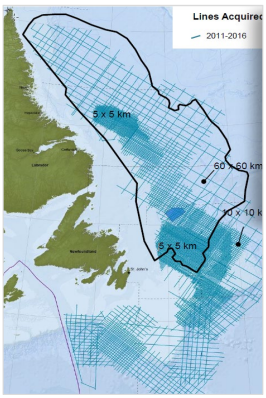
Slide 14

EASTERN CANADA - Newfoundland and Labrador
Oil and Natural Gas Resources and Potential

Combined Resource Potential (considering only 9% of prospective area)

- 63.6 billion BBLs of Oil and 224.2 TCF Natural Gas*





Source: Nalcor Oil and Gas
https://nalcorenergy.com/nalcor-operations/oil-and-gas/

*Source: Nalcor Energy September 29, 2020 press release

Slide 15

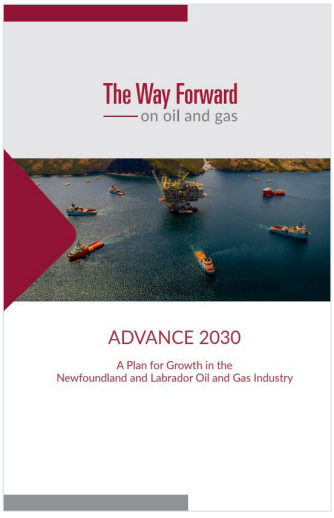
A Stable Long-Term Supply with Expansion Upside

Newfoundland Offshore Area is 1.5 times the size of the US Gulf of Mexico

Source: Nalcor Energy Presentation – Jim Keating - September 2017

Slide 16

Government of NL - Advance 2030 Strategy



VISION STATEMENT

Newfoundland and Labrador is an internationally preferred location for oil and gas exploration and development driven by an innovative, sustainable, local industry that is globally competitive, environmentally responsible, and maximizes benefits to the people of the province.

Source: Government of Newfoundland and Labrador

Slide 17

Government of NL - Advance 2030 Schedule Milestones

FOCUS AREAS

A concerted effort is necessary to improve industry performance and accelerate the pace of oil and gas development for the benefit of all stakeholders. The council has identified a number of focus areas for collaboration and proposed timelines for action.

Immediate (within 24 months)

- Drive Exploration
- Modernize the Governance Structure
- Ensure Global Competitiveness
- Enhance Local Supply Chain
- Accelerate Development
- Support Innovation
- Increase Industry Promotion
- Workforce of Tomorrow

Mid-Term (2022)

- Develop Basin-Specific Plans
- Expand Integrated Operations
- Develop a Natural Gas Development Plan
- Supply and Service Diversification

Long-Term (2030)

- Commercial Natural Gas Production
- Sustained Energy Production
- Exploitation of Value Added Opportunities
- Supply and Service Industry Growth
- World-Class Energy Cluster

Source: Government of Newfoundland and Labrador

Slide 18

NL Work Force Productivity

Quotes/comments from Sandy Nairn, VP, Husky Energy, commenting on the White Rose Extension Project (WREP) in Argentia:

- ❑ The NL workforce is highly trained, productive and delivering high quality work on the WREP. Further, the safety statistics are marvelous.
- ❑ The NL workforce is the best he has ever came across. Our workers are doing it right.
- ❑ NL has everything it needs to service the oil & gas industry.

Ref: APEC Economic Update, June 2019, published in Building Trades of NL June 2020,

Slide 19

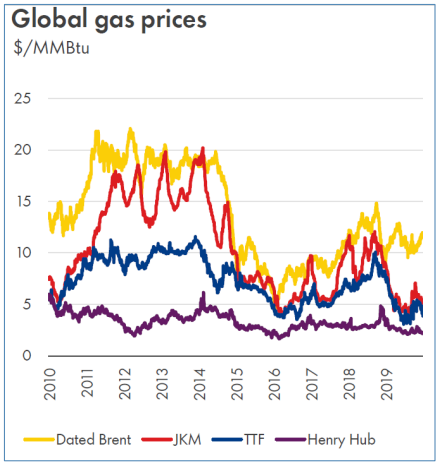
Support from Government of Canada

- ✓ Quotes/comments from Prime Minister of Canada, Justin Trudeau‡:
  - ❑ *Providing Asia with natural gas will help many countries kick their coal habit, and shows Canada's commitment to combatting the problem of climate change by driving down emissions worldwide.*
  - ❑ *PM announced $275 million in federal support (for two LNG projects in Kitimat, BC), and pledged that once built, the project will have the lowest carbon intensity of any large-scale LNG facility in the world*
- ✓ Quotes from Minister of Natural Resource, Seamus O'Regan*:
  - ❑ *Canadian LNG is the best choice for global energy investors looking for sustainable and competitive natural gas production*
  - ❑ *The best path to a healthy, low-emission economy includes Canada making natural gas a greener product that can be sold overseas to replace coal as a source of electricity*
  - ❑ *Our natural resource wealth is the envy of the world and we use that wealth to get to net-zero by 2050*
- ✓ Canada's Leader of the Official Opposition Erin O'Toole has endorsed a plan to sell Canadian LNG to overseas markets

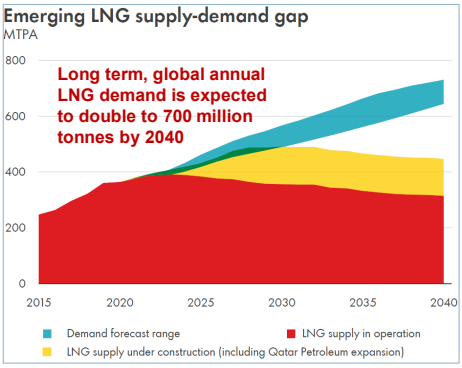
‡ Ref: Press conference announcing the signing of a Declaration of Final Investment Decision for a LNG project in Kitimat, Vancouver Sun, Oct 02, 2018
* Ref: Opening Speech at virtual Gastech 2020 conference

Slide 20

Natural Gas Preliminary Market Assessment
LNG Supply and Demand and Price Stability



Source: Royal Dutch Shell LNG Outlook 2020

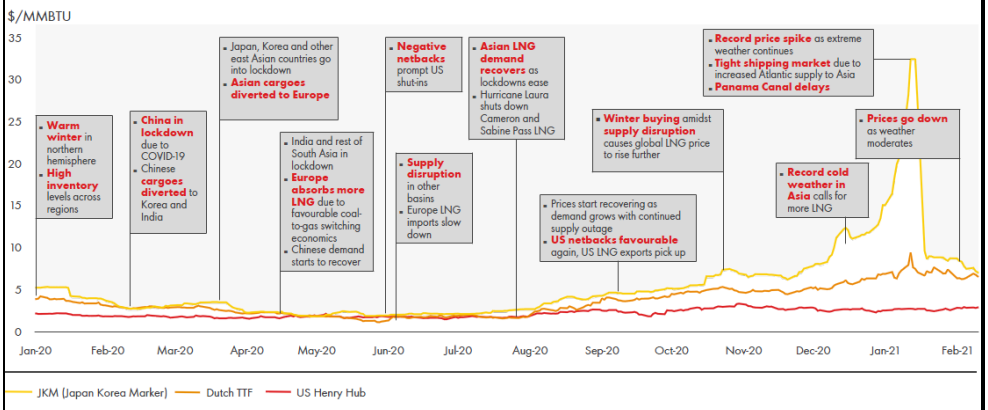


Source: Royal Dutch Shell LNG Outlook 2021

- Global demand for LNG increased to 360 million tonnes in 2020
- Demand for LNG as a marine fuel could reach over 30 million tonnes per year by 2040

Slide 21

Natural Gas Preliminary Market Assessment
LNG Supply and Demand and Price Stability



Source: Royal Dutch Shell LNG Outlook 2021

Slide 22

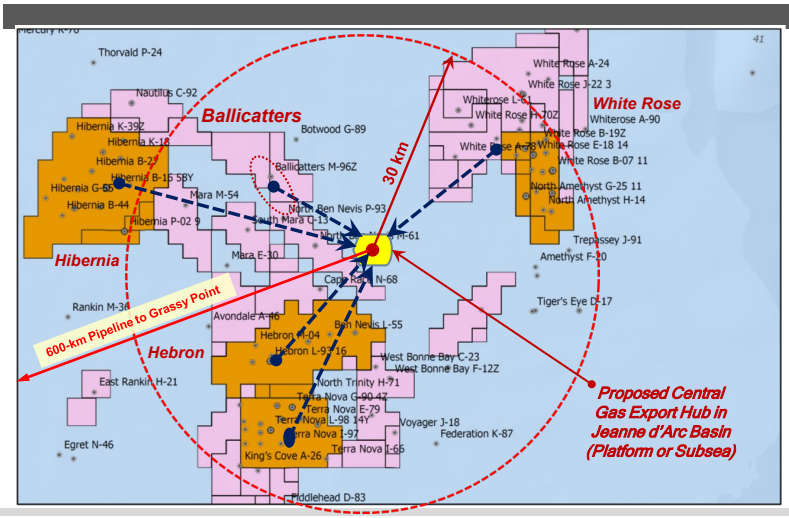
Natural Gas Preliminary Market Assessment
Export to Europe and Markets such as India, Japan, South Korea & China

- On Feb 12, 2020, the EU Parliament voted substantially in favour of funding to support development of 151 energy infrastructure projects, including 4 LNG import terminals in Ireland, Greece, Croatia, Poland[1]
- Merkel Looks to LNG to Cut Germany's dependence on Russian Gas[2]
- A strategic partnership has been announced between GNL Québec, Buss Group, and shareholders of Hanseatic Energy hub to develop a low-carbon supply chain for liquefied natural gas (LNG) from Canada to Germany, the aim of the partnership is to meet Germany's growing demand for gas imports as a consequence of the coal phase-out and the increase in focus on the reduction of carbon footprint of the supply chains[4]
- Pieridae Energy's LNG project in Goldboro, NS has a conditional US$4.5 B loan guarantee (including US$1.5 B for upstream) from German Government's UFK program[3], and a 20-year offtake agreement with German utility company Uniper
- European countries' desire for independence from the dominance of Russian natural gas and from shale based natural gas which requires fracking, Europe's domestic natural gas production is declining
- Significant market to convert coal fired power plants given the fact natural gas emits 50-60% less CO_2 in an efficient natural gas power plant compared with emissions from a typical new coal plant

References:
1. Financing the green transition: The European Green Deal Investment Plan and Just Transition Mechanism, European Commission Website
2. Bloomberg website: March 19, 2018
3. Pieridae Energy
4. Low-carbon supply chain for LNG from Canada to Germany announced, Gas World, By Anthony Wright, 4 June 2021

Slide 23

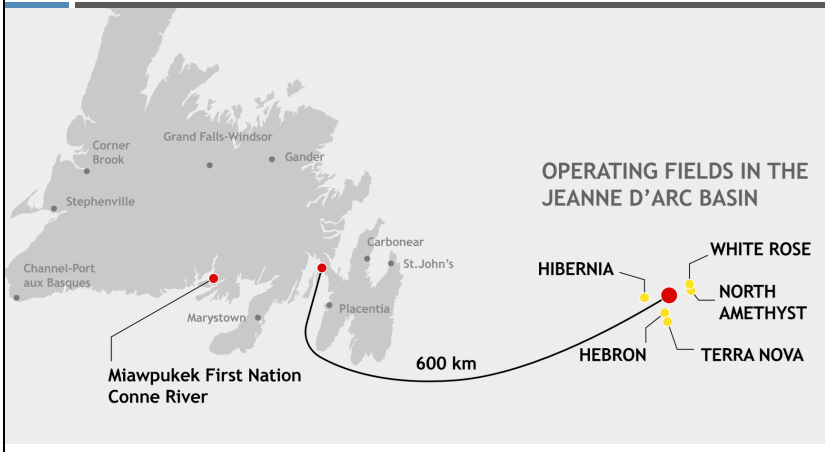
Jeanne d'Arc Basin
Producing Fields Are Within 30 km of Proposed Gas Hub



Map Source: Government of NL
https://www.gov.nl.ca/nr/energy/petroleum/offshore/offmaps/

Slide 24

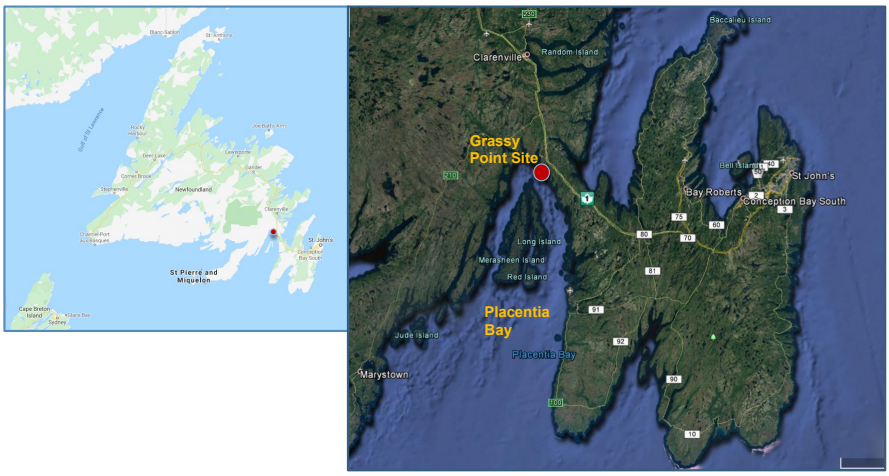
Offshore Pipeline



Map Source: Government of NL
https://www.gov.nl.ca/nr/energy/petroleum/offshore/offmaps/

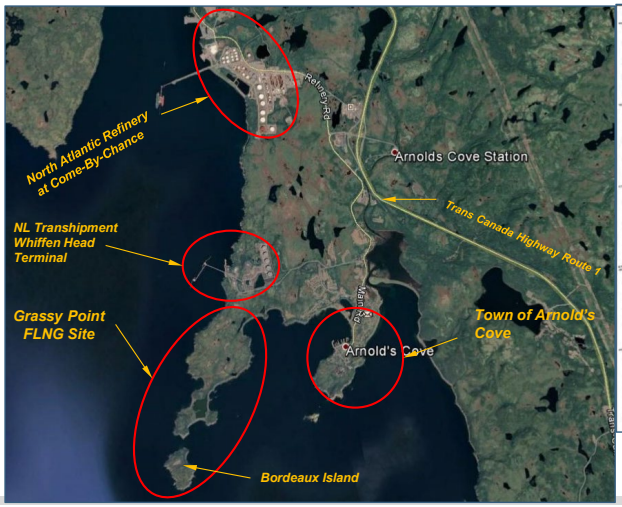
Slide 25

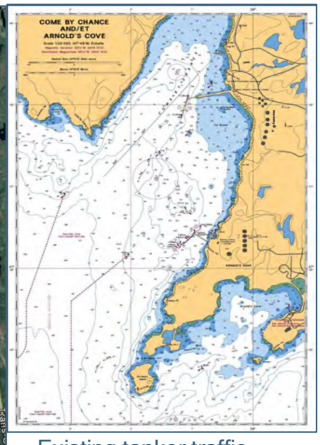
Proposed Floating Liquefied Natural Gas (FLNG) Facility Moored at Grassy Point in Placentia Bay



Slide 26

Proposed FLNG Location
Grassy Point, Placentia Bay





- Existing tanker traffic
- Deep water location

Slide 27

Proposed FLNG Location
Facts About Grassy Point, Placentia Bay

- 135-km via road from St. John's
- 432 acres with Bordeaux Island
- Latitude - 47°45'16.59"N
- Longitude - 54°1'20.82"W
- Previously approved by Canadian Government / CEAA for an LNG importing and reshipment project
- Newfoundland LNG seeking updated approvals for Grassy Point project

Adjacent to major industrial infrastructure:
- NL Transshipment Terminal at Whiffen Head
- North Atlantic Oil Refinery at Come-by-Chance
- Marine Communications and Traffic Services (MCTS) monitors marine traffic in Placentia Bay

Slide 28

Advantages of FLNG Technology

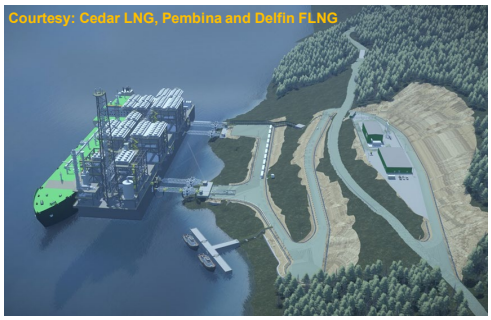
1. Proven technology - efficient and compact
2. 7 FLNG vessels in operation or under construction
3. LNG projects are currently economically challenged necessitating the latest technological and construction advances to reduce CAPEX
4. Optimal CAPEX/OPEX will increase likelihood of Final Investment Decision (FID) for Grassy Point Project
5. The proposed first project at an optimal cost will serve as a catalyst for a massive new industry in NL
6. Shorter timeframe for Engineering, Procurement, and Construction (EPC)
7. Lower cost of construction, installation & commissioning
8. An FLNG project with lower construction cost in an Asian shipyard will still enable massive amounts of work in NL similar to Husky White Rose FPSO project
9. FLNGs are mobile and redeployable

Slide 29

At-shore FLNG Technology

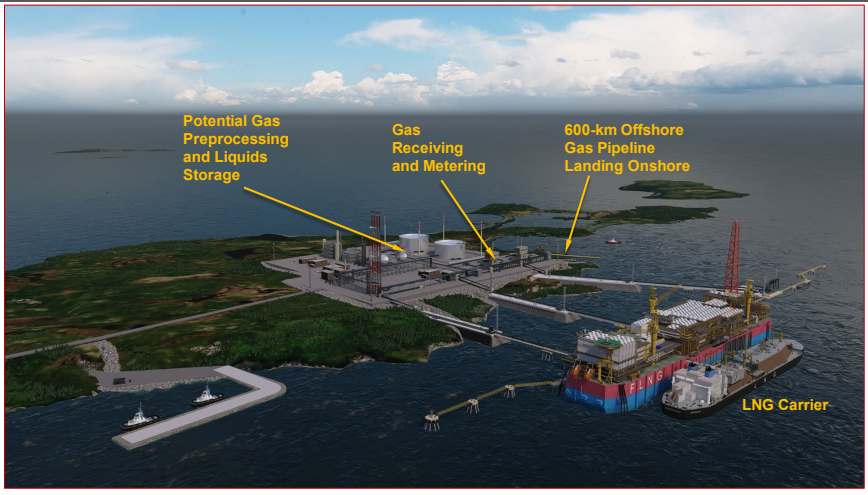
Exmar Tango floating natural gas liquefaction vessel, first at-shore moored FLNG vessel commissioned by YPF in Argentina in 2019

October 30, 2020 Haisla First Nation and Delfin Midstream announced Canada's first FLNG project for Kitimat, BC (Cedar LNG) which will export 3 MTPA of LNG to Asia.



Slide 30

Proposed FLNG Facility



Slide 31

Net Zero Initiatives

- Grassy Point liquefaction facilities will produce 4 MTPA of LNG - total shaft power for refrigeration compressors is estimated at 120-140 MW - the major users of power in liquefaction facilities. Potential additional power demand for other utility systems at ~40 MW
- Replacing conventional gas turbines with electric drivers could save 24-26 MMSCFD[1] (24-26,000 MMBTU/day) of natural gas which increases LNG exports
- Newfoundland LNG could therefore reduce its carbon footprint by 400,000 tonnes/year meeting the most stringent carbon emission standards in the world of about 0.16 tonnes of CO_2/tonne of LNG
- Alternatively Grassy Point facility could take advantage of **McDermott Net Power** technology to effectively capture carbon emission
- Potential to monetize greenhouse gas emission credits for production of zero emission LNG e.g., from countries importing LNG for conversion of coal burning plants or for carbon credit sales to emitters within Canada
- CO_2 can be exported to offshore fields for EOR initiatives through a planned pipeline

[1] Assuming 42% Efficiency for gas turbine

Slide 32

Potential for Future Hydrogen Export

- There is a significant market for hydrogen use in transportation especially in trucks
- Major car manufacturers have plans to make hydrogen electric cars and trucks using fuel cell technology
- Production of hydrogen from natural gas through Steam Methane Reforming (SMR) technology and capture and storage of byproduct CO_2 (Blue Hydrogen) is one of the most efficient methods of hydrogen production
- Hydrogen could be exported to markets in North America and Europe
- Byproduct CO_2 in SMR technology can be exported to offshore fields for EOR initiatives through a planned return pipeline parallel to offshore gas pipeline
- Hydrogen could also be produced using both natural gas and renewables in Newfoundland and Labrador and place NL as an energy hub in the future

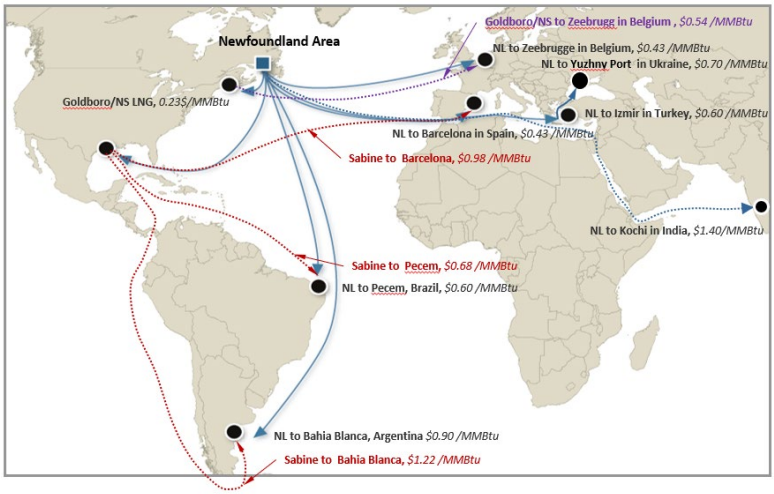
Slide 33

Preliminary Project Economics
Base Case Development

1. Centralized Offshore Natural Gas Hub
2. 600-km Southern Route Pipeline to Grassy Point, NL
3. At-shore Floating Liquefied Natural Gas (FLNG) Facility at Grassy Point Export Terminal

Slide 34

Newfoundland and Labrador LNG Markets
Shipping Cost Estimates



Slide 35

Project Update and Moving Forward

1. Coalition of NL, Canadian, and international interests
2. McDermott International / CB&I as the EPCM partner
3. Engage qualified engineering and technical organizations and regulatory bodies to conduct necessary investigations regarding pipeline risks and standards: e.g., Impact Assessment Agency of Canada, Canadian Energy Regulator (CER), C-NLOPB, Det Norske Veritas (DNV), C-CORE
4. Engaged Husky/Cenovus and ExxonMobil by signing NDAs. Potential sources of gas include:
   - White Rose Project (Husky, Suncor)
   - Ballicatters Discovery (Suncor, Equinor)
   - Hibernia Project (ExxonMobil, Chevron, Suncor, Equinor, Murphy, Canada Hibernia Holding Corp / CHHC)
   - Hebron Project (ExxonMobil, Chevron, Suncor, Equinor, Nalcor)

Slide 36

Project Update and Moving Forward – Cont.

5. Further engage stakeholders: Governments of NL and Canada, Oil and Gas Corporation of NL, NOIA, NEIA, Trades NL, indigenous groups, vendors and manufacturers, local communities, environmental groups
6. Initiate technical studies, natural gas liquefaction facilities, site evaluation and preparation requirements for at-shore FLNG vs. conventional onshore LNG plant (with on site storage or floating storage), offshore central gas hub, pipeline route surveys and confirmation, shore crossing locations, constructability evolution, labour availability

Slide 37

The Newfoundland Offshore Risk Management Strategy

Icebergs - Operators have been successfully managing ice and icebergs in the Jeanne d'Arc Basin since 1997. Placentia Bay is iceberg free. Team members have been involved in ice management for over 15 years. New findings by industry and C-CORE show the risk of icebergs is less than previously understood.

Technology - Pipeline and other technologies required to develop this project are not unique. This pipeline would be shorter and arguably less challenging than some in the North Sea and Baltic. NL reservoir fluids are sulphur free and, therefore, pipeline corrosion is less of a factor.

Permitting & Regulatory Approvals – The Canada Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) is the joint federal and provincial regulator. A mature regulator successfully overseeing major developments.

Stakeholder Relations – The oil refinery and transshipment terminal in Placentia Bay have both successfully addressed stakeholder concerns.

Slide 38

Preliminary Project Timeline

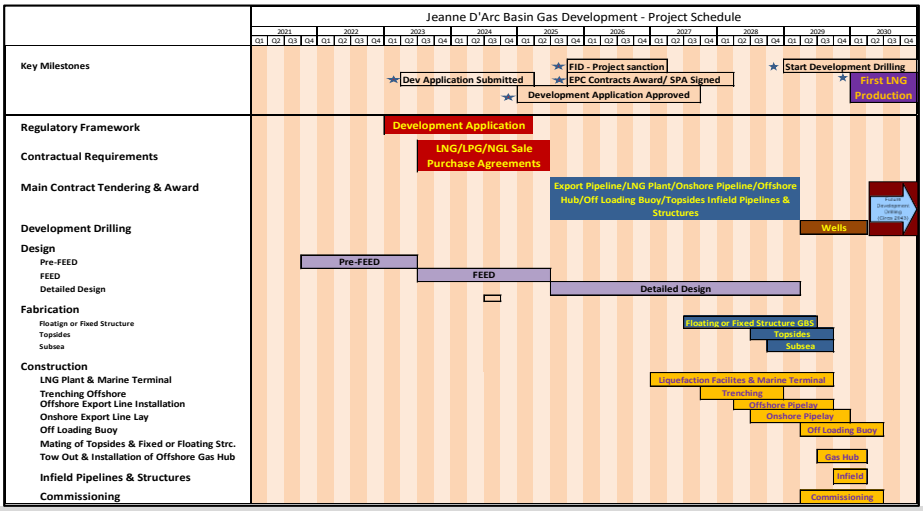
2022	• Predevelopment Activities*
Late 2022	• Gate 1 Review (IDENTIFY)
2023	• Pre-FEED
Late 2024	• Gate 2 Review (SELECT)
2025-2026	• FEED
Mid 2026	• Gate 3 Review - FID
2026-2030	• Execution - EPC
2030	• First LNG

* **Predevelopment Activities include but are not limited to the following:**

- Stakeholder engagement (oil companies, financiers, governments, local communities, trade unions and service providers, fabrication sites, Indigenous Groups, EPC companies)
- Engineering feasibility studies (LNG plant and pipeline constructability, risk analysis, site evaluation, pipeline route evaluation, narrowing down cost estimates)
- Preliminary market evaluation and economics

Slide 39

Preliminary Project Schedule



Slide 40

Project Economics

- Project capital costs expected at $10Billion
- Approx. 1,300-1,500 jobs at peak construction / 400 permanent jobs during operations for the three main projects
- 25-Year Gross Revenue from sale of ~5 TCF of Gas, 100 Million tonnes of LNG, and 150 MMBBL of condensate
- LNG Price in Europe is currently at historic high and around $25/MMBTU

Slide 41

Project Recap - Simple and Stable

Stable long-term gas supply - Massive gas potential in central and northern part of Jeanne d'Arc Basin; existing gas reserves of 8 TCF discovered while drilling for oil - opportunities for direct drilling for gas; operators motivated to monetize gas and condensate

Beneficial to NL and Canada
Three massive industrial projects will create thousands of jobs during construction phase and hundreds of full time direct and indirect jobs during production

1 NL LNG Project Advantages

2 **One federal and one provincial jurisdiction** and supportive federal and provincial governments

3 **European markets are close** and want a more diversified supply of gas from clean sources like offshore NL

4 **Grassy Point previously permitted for an LNG Transhipment terminal.** Local municipality/Placentia Bay supportive of the oil and gas industry

5 **Experienced Project Team** with strong industry and regulatory relationships

6 **Conventional offshore pipeline** construction. Gas fields close to the proposed offshore central gas hub < 30 km

7 **Reducing GHG Emissions through Sustainable LNG and Coal Reduction**

8 **Strong indigenous and Stakeholder engagement – Partnership with major local and international industry**

9

Privileged and Confidential

Slide -41-

Slide 42

Thank You!

Privileged and Confidential

Slide -42-