Request IR-1:

With respect to page 33, Line 13 of the Application which states that "The expected service life of the Maritime Link facilities is 50 years", please supply details of the calculations that have been, or are to be, performed to substantiate the predicted 50 year life of the HVDC submarine cable system?

Response IR-1:

Calculations of the predicted life are based on the prequalification testing as per CIGRE TB 496 and Type testing in accordance with Electra No. 189 and Electra no. 218 articles, as well as demonstrated reliability through proven designs with service of greater than 10 years for MI and 5 years for XLPE with no failures of cables or accessories. The proponents have been requested to provide erosion and corrosion calculations for the design life of 50 years.

Request IR-2:

With respect to page 41, Line 21 of the Application which states that "NSPML is currently finalizing the Basis of Design at DG2 which could include changes to the preliminary design for the mix of overhead and underground" please advise:

(a) With which specifications (e.g. Publications by CIGRE or IEC, etc.) will any underground systems be required to comply?

(b) Whether NSPML have placed any other restriction on the type of cable which may be offered, for example the radial waterblocking method (e.g. extruded lead sheaths or aluminum foil laminate)?

(c) If any transitions from overhead to underground will be housed in buildings of the type described in page 61, line 8 of the Application?

(d) Whether NSPML have placed any restriction on the installation configuration of any such cables (e.g. maximum spacing between bipole cables to limit external magnetic fields or minimum spacing to facilitate excavation and repair of one cable)?

Response IR-2:

(a) The underground system will be required to meet industry standards and a list of relevant standards has been provided in the RFP. The underground systems shall be of a design which meets the technical performance specification. The following is list of relevant standards/specifications to which the proponent must adhere if applicable in the proposed design:

- AEIC CS4 Specifications for Impregnated Paper Insulated Low and Medium Pressure Self-contained Liquid Filled Cable
- ASTM B749 Standard Specifications for Lead and Lead Alloy
- ASTM D202 Sampling and Testing Untreated Papers for Electrical Insulation
- ASTM B3 Standard Specification for Soft or Annealed Copper Wire
- ASTM B230 Standard Specification for Aluminum 1350 H19 Wire for Electrical Purposes
- ASTM B233 Standard Specification for Aluminum 1350 Drawing Stock for Electrical Purposes
- ASTM B400 Standard Specification for Compact Round Concentric Lay Stranded Aluminum Conductors
- ASTM B496 Standard Specification for Compact Round Concentric Lay Stranded Copper Conductors
- BS EN 50307 Lead and Lead Alloys
- CEC Canadian Electrical Code
- Electra 28 The Design of Specially Bonded Cable Systems
- Electra 141 Guidelines for tests on high voltage cables with extruded insulation and laminated protective coverings
- Electra 189 Recommendations for tests of power transmission DC cables for a rated voltage up to 800 kV
- Electra 218 Addendum to: Recommendations for tests of power transmission DC cables for a rated voltage up to 800 kV
- CIGRE TB 86 Overvoltages on HVDC Cables
- CIGRE TB 189 Insulation Co-ordination for HV AC Underground Cable System
- CIGRE TB 194 Construction, Laying and Installation Techniques for Extruded and Self-contained Fluid Filled Cable Systems
- CIGRE TB 219 Recommendations for testing DC extruded cable systems for power transmission at a rated voltage up to 250 kV
- CIGRE TB 268 Transient Voltages Affecting Long Cables
- DnV-RP-B401 Cathodic Protection Design

- IEC 60071 Insulation Coordination
- IEC 60060 High-Voltage Test Techniques
- IEC 60141 Tests on oil-filled and gas pressure cables and their accessories
- IEC 60183 Guide to the Selection of High Voltage Cables
- IEC 60228 Conductors of Insulated Cables
- IEC 60229 Electric Cables – Tests on extruded oversheaths with a special protective function
- IEC 60230 Impulse tests on cables and their accessories
- IEC 60287 Electric Cables – Calculation of the current rating
- IEC 60332 Tests on electric and optical fiber cables under fire conditions
- IEC 60811 Common test methods for insulating and sheathing materials of electric cables
- IEC 60853 Calculation of the Cyclic and Emergency Current Rating of Cables
- IEC 60885 Electrical Test Methods for Electric Cables
- IEC 60949 Calculation of thermally permissible short-circuit currents, taking into account non-adiabatic heating effect
- IEC 61443 Short-circuit temperature limits of electric cables with rated voltages above 30 kV (U_m = 36 kV)
- IEC 62067 Power cables with extruded insulation and their accessories for rated voltages above 150 kV (U_m = 170 kV) up to 500 kV (U_m = 550 kV) – Test methods and requirements
- IEEE 400 Guide for Field Testing and Evaluation of the Insulation of Shielded Power Cable Systems
- IEEE 404 Standard for Extruded and Laminated Dielectric Shielded Cable Joints Rates 2500 V to 500 000 V.

(b) Yes, for MI, the conductor must be a highly compacted design and for XLPE the conductor requires water blocking. Either design requires a lead metallic sheath with XLPE requiring water blocking under the sheath. Outside the metallic sheath, an

anti-corrosion insulating over-sheath must be extruded over the cable, providing an overall "jacket" for the cable.

(c) Yes, the transition from overhead to underground will be in the building.

(d) No, cable proponents must provide a design which meets the technical specification and installation will be evaluated to consider all such implications, including ease of installation, protection from damage during install, cable bend radius, cooling/heat dissipation, anchoring techniques, jointing, etc.

Request IR-3:

With respect to page 44, Line 13 of the Application which states that "proponents have the option to supply proposals for either Ml or XLPE insulated cables", and page 44, Line 18 of the Application which states that "project cost estimates are based on the assumption that Ml cables will be used for the project", please advise whether NSPML have required proponents to include a proposal for Ml cables in their offers?

Response IR-3:

Proponents were asked to provide both MI and XLPE pricing options, proposals were received that included offers for one or both cable types. We are still evaluating the proposals.

Request IR-4:

With respect to page 47, Line 7 of the Application which states that "During monopolar operation, full load current of 1,250 A may flow through the return path, it must maintain that power level even during planned or unplanned outages on either of the poles"; it is inferred that both bipole cables must be capable of carrying full load current of 1 ,250 A in the event of planned or unplanned outages on the other cable. Can NSPML please advise whether they have required prospective cable supply contractors to ensure that their designs will allow one cable to remain on full load of 1 ,250 A during repairs to the other cable?

Response IR-4:

NSPML has required cable supply proponents to ensure that their designs will allow one cable to remain on full load of 1, 250 A during repairs to the other cable.

Request IR-5:

With respect to page 47, line 7 of the Application which states that "During monopolar operation, full load current of 1, 250 A may flow through the return path, it must maintain that power level even during planned or unplanned outages on either of the poles", please advise:

(a) What maintenance periods NSPML envisage for planned outages?

(b) What repair times NSPML envisage for unplanned outages?

(c) What length of time NSPML envisage for changing between bipolar and monopolar operation?

(d) What is the envisaged availability of the Maritime link as a bipolar system?

(e) What is the envisaged availability of the Maritime link as a monopolar system?

(f) How have the availabilities been calculated?

Response IR-5:

The power level which will be required during mono-pole operation will be dependent on the actual MW transfer at any given time. Higher current is required for higher transfer levels and current decreases as transfer levels reduce. The 1250 amp is required when transfer levels are maintained at 250 MW on one pole.

Please refer to MPA IR-8 and MPA IR-5.

(a) Planned maintenance will be based upon supplier recommendations and Good Utility Practice. The outages will include an anticipated bi-annual (2 year cycle) for converter maintenance, routine maintenance will be completed without outage requirements. The converter stations are designed to achieve operational reliability levels consistent with this maintenance cycle and will be validated during the procurement process. Predictive and preventative maintenance which can be completed in a planned or scheduled manner will be an operating objective, such as monitoring equipment operating temperatures to time repairs or intervention with scheduled outages. The outage duration for planned maintenance, outside overhauls, will be the equivalent of approximately 3-5 days per year. During planned maintenance, it is likely that the second cable would be available to be used as the return path, reducing the operating time of the grounding system. Overhauls could be every 2-3 years.

(b) VSC converter technology has a high reliability, with design considerations included to achieve uninterrupted operation between bi-annual planned maintenance periods. Unplanned outages on traditional overhead infrastructure is minimal for transmission systems of this design and both utilities have extensive experience operating and maintaining lines in the same territory. The duration of unplanned outages for subsea cables can vary depending upon the location and timing of the failure. Outages in the deep water areas require more specialized equipment to be available to carry out the repair, while in more shallow waters a greater number of vessels could be considered. The timing of the failure can lead to delays based on either the availability of suitable vessels and/or weather conditions which would allow the repairs to be carried out safely. The repair times could be in the range of 2-8 months depending upon the location and the time of year.

(c) NSPML has not finalized design of the switching, however, the length of time expected could range from less than one hour to several hours depending on final design criteria to change between bipolar and monopolar operation.

(d–f) The availability target for the Maritime Link is presently 95-97 percent and will be validated during final design and review of supplier performance characteristics. The Maritime Link will be planned to operate in bipolar mode at all times. The operating criteria will be finalized during the converter design with an expectation of bi-polar mode on a continuous basis and capability to operate in mono-polar similarly if required. The availability is based upon experienced reliability levels of typical overhead high voltage transmission systems, converter availability, no projected major cable failures and includes all routine substation and converter maintenance which requires unavailability of the plant being performed during bi-annual planned shutdowns for all components in the pole.

Request IR-6:

With respect to page 52 line 16 of the Application which states that "In deep waters (at least 15 meters), a combination of cable spacing on the ocean floor, hydro-jet installation techniques to plow the cables into the sea floor, and stone berms or concrete mattresses to protect cables over ocean-bottom rock outcroppings can adequately address the risks" and 62, Line 8 of the Application which states that "In shallow waters such as the near-shore approaches to the cable landings, where the exposure is greatest, the cables will be installed using horizontal directional drilling techniques until the water depth reaches a level (at least 12 meters) that affords some protection", please advise how the cable is to be protected between 12 and 15 meters depth?

Response IR-6:

The cable will be protected from the exit of the HDD onwards using the same means noted. The difference in elevations was not intended to indicate the cable would be unprotected in that region.

Request IR-7:

With respect to page 52 line 16 of the Application which states that "In deep waters (at least 15 meters), a combination of cable spacing on the ocean floor" and 55 line 21 of the Application which states that "the cable supplier to adopt a final route and cable spacing strategy that minimizes the risk of cable damage", please advise if NSPML has compared the cost of laying the cables spaced on the ocean floor with those of laying both bipole cables in a bundle? If NSPML has made such a cost comparison, has NSPML included the cost of repairs, including the costs of any lost transmission capacity during repairs, in their cost comparison?

Response IR-7:

NSPML has compared the cost of laying cables spaced on the ocean floor with costs of laying both bipole cables in a bundle. The cost of repairs, including the costs of any lost transmission capacity during repairs will be included if the bundled installation is recommended as a result of the evaluation.

Request IR-8:

With respect to page 52 line 17 of the Application which infers that the cables may be spaced apart on the ocean floor, please advise if NSPML has considered the effect of the cable spacing on the magnetic fields which will be produced by DC cables and have NSPML provided details of the magnetic fields which will be produced by the cables, including harmonics, during both bipolar or monopolar operation to all appropriate authorities?

Response IR-8:

A complete Environmental Assessment has been filed with the appropriate regulatory authorities in Nova Scotia, Newfoundland and Labrador and with the Canadian Environmental Assessment Agency. The report describes magnetic fields associated with 200kV HVdc cables spaced at up to 200 meters (S.2.7.3, S.7). There are no anticipated harmonics with DC current. The converter rectifier removes the harmonics from the incoming sinusoidal AC current and the outgoing DC is linear and harmonic free.

The EA Report can be found here:
http://www.emeranl.com/en/home/environment/environmentalreviewprocess.aspx

Request IR-9:

With respect to page 53, Line 7 of the Application which states that "NSPML has included the use of horizontal directional drilling" and page 62, line 19, of the application which states that "the design-build contractor will size the core conductor to achieve the targeted power transfer capacity" please advise if a survey of the thermal properties of the overlying rocks and soils has been conducted and provided to the design-build contractors to enable them to perform ampacity calculations and hence offer a suitable cable design?

Response IR-9:

Thermal resistivity values of the overlying rocks and soils were given for the soils expected to be encountered at both HDD sites. Proposals have been received and evaluated for a geotechnical program that will take samples onshore and in the near-shore area this year. This information will be used as input to finalize the cable design as well as the design for the Horizontal Direction Drill Design.

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Request IR-10:

With respect to page 53, Line 7 of the Application which states that "NSPML has included the use of horizontal directional drilling", please advise:

(a) What is the length of the horizontal directional drilling at each end of the route?

(b) Are prospective cable supply contractors required to submit pulling tension calculations and details of their experience of similar cable pulls?

(c) If prospective cable supply contractors are permitted to propose different types of cables for the directionally drilled part of the route and the deep water part of the route?

(d) If a different type of cable is to be used, is the proposed design of transition joint between the two types of cable required to have proven service experience for the voltage, electrical stresses and conductor size range of the Maritime Link Cable?

(e) With which specifications (e.g. Publications by Cigre or IEC, etc.) will any transition joints be required to comply?

(f) If NSPML have required that each of the two bipole cables be installed in a separate horizontal directional drill?

(g) If NSPML have formulated a repair strategy for cable failure within the horizontal directional drill?

Response IR-10:

(a) The length of the HDD on the Nova Scotia side is approximately 1000m, and on the Newfoundland side, approximately 430 m.

(b) Yes.

(c) No, the same type of cable will be used in the HDD and on the seafloor.

(d) N/A

(e) N/A

(f) Each cable will be pulled in a separate HDD at each of the land fall points.

(g) The HDD is only filled with water. If failure occurs in the HDD portion, the cable will be disconnected at the anchoring site, pulled offshore, repaired, and then pulled back in the HDD up to the anchoring site. Based on the proposals from different cable suppliers, water should be sufficient (bentonite is no longer required). Some of them require a seal at the HDD exit, others don't. The final plan will be developed with the selected supplier.

Request IR-11:

With respect to page 55 line 8 of the Application which describes the factors that have guided route selection and page 62 line 5 of the Application which states that "The cable supply contractor will be broadly responsible for decisions about cable installation techniques in deep water", please advise what precautions against damage from fishing activities the cable supply contractor will be required to take during both the installation and the operation of the submarine cables?

Response IR-11:

During cable installation, a notice to mariners will be published to advise of the activities of the cable lay vessel. A fishery liaison committee will be established in advance of the installation season to advise the fishermen of the location and activity of the cable lay vessel. The cable lay vessel will use guard vessels if required. After cable installation, the cable will be buried to protect it from fishing activities. A cable burial analysis is being developed by Intecsea, and will include fishing activities as a criteria for protection. Post-installation the location of cables will be identified on marine navigation charts.

Request IR-12:

With respect to page 55 line 8 of the Application which describes the factors that have guided route selection and page 62 line 5 of the Application which states that "The cable supply contractor will be broadly responsible for decisions about cable installation techniques in deep water", please advise what precautions against damage from ships anchors the cable supply contractor will be required to take during both the installation and the operation of the submarine cables?

Response IR-12:

During cable installation, a notice to mariners will be published to advice of the activities of the cable lay vessel. The cable lay vessel will use guard vessels if required. After cable installation, the cable will be buried to protect it from dragged anchors. A cable burial analysis is being developed by Intecsea, and will include dragged anchor as criteria for protection. Marine navigation charts will be updated to identify cable location.

Request IR-13:

With respect to page 55 line 8 of the Application which describes the factors that have guided route selection, please advise if any submarine cable suspensions would be permitted, and if so have vortex induced vibration studies been performed or required from prospective cable supply contractors?

Response IR-13:

Cable suppliers will identify the maximum allowable free span based on the final cable design and vortex induced vibration studies will be performed. Seafloor preleveling or cable routing to avoid final design will be included and monitored in the installation requirements and execution.

Request IR-14:

With respect to page 55 line 17 of the Application which states that, "Planning also included studies of ... silt migration" and page 62, line 19, of the application which states that "the design-build contractor will size the core conductor to achieve the targeted power transfer capacity" please advise what maximum depth of silt accretion prospective design-build contractor are required to use in their ampacity studies for their cable system designs?

Response IR-14:

A sediment movement study has been performed and the relevant report was issued to the proponents for use. The maximum sand wave amplitude is about two meters and one meter additional burial (0.5 of amplitude) is to be considered in the area where there is risk of sediment movement.

Request IR-15:

With respect to page 55 line 20 of the Application which states that "NSPML has defined the route as a 2000-meter-wide study corridor", please advise if NSPML has received all the necessary authorizations to install and operate the DC cable system in this study corridor?

Response IR-15:

The 2000-meter wide study corridor was selected to facilitate the Environmental Assessment process and routing of the cable will occur within this corridor. The EA process is progressing satisfactorily and is expected to be completed in Q2-2013. This process identifies all authorizations/permits required for installation and operation of the DC cable system, and these will be received prior to cable installation activities.

Request IR-16:

With respect to page 56 line 2 of the Application which states that the "estimated subsea route length is 170 km", please advise:

(a) If NSPML have restricted the number of installation campaigns and number of in-line cable joints permitted during the installation?

(b) If NSPML have placed such restrictions, what are they?

(c) With which specifications (e.g. Publications by Cigre or IEC, etc.) will any in-line cable joints be required to comply?

(d) If NSPML have required prospective cable supply contractors to provide details of service experience for such joints which includes the water depth, the voltage, the electrical stresses and the conductor size range of the cable for the Maritime Link?

(e) If multiple installation campaigns are to be used during the installation, will NSPML require any testing of installed lengths prior to joining and installation of further lengths?

Response IR-16:

(a) NSPML has provided a schedule and anticipated installation campaign window for suppliers to consider, while we did not specify the number of campaigns, the effect will be assessed in the evaluation process if it adds cost, risk or schedule delays. NSPML will endeavour to minimize the number of field joints and assess the location of joints in the lay to avoid obstacles such as deeper portions of the placement. The number of installation campaigns and subsea joints will depend on the size of the turntable (weight of cable per campaign) on the cable lay vessel of the successful bidder.

(b) N/A.

(c) The in-line cable joints will be required to comply with CIGRE TB 496 for XLPE cables or Electra No. 189 and Electra No. 218 articles for MI cables.

(d) Yes, examples of similar systems installed have been requested from suppliers. NSPML has also been monitoring the industry projects, talking to proponents and completing site visits where possible.

(e) No, testing will be performed on the full length of the cable once laid offshore. The cable segments will be tested in the factory, and then an HV test will be performed on the full length after manufacturing. A test will be performed on cable after load out (TDR measurement). During offshore campaign, and depending on how many joints we have, no tests will be performed on segments laid subsea.

Request IR-17:

With respect to page 56 line 2 of the Application which states that the "estimated subsea route length is 170 km", please advise:

(a) If NSPML have restricted the number of extrusion campaigns for XLPE cables and the number of factory joints permitted during manufacture?

(b) If NSPML have placed such restrictions, what are they?

(c) With which specifications (e.g. Publications by Cigre or IEC, etc.) will any factory joints be required to comply?

(d) If NSPML have required prospective cable supply contractors to provide details of service experience for such joints which includes the voltage, the electrical stresses and the conductor size range of the cable for the Maritime Link?

Response IR-17:

(a) No, NSPML is aware of the limitation of extrusion campaigns and will review proposals based on that knowledge.

(b) See (a).

(c) The factory joints will be required to comply with CIGRE TB 496 for XLPE cables or Electra No. 189 and Electra No. 218 articles for MI cables.

(d) Yes, we have requested the potential suppliers to give us examples of where they have used similar cable systems, which would include all accessories they plan to use.

Request IR-18:

With respect to page 57 line 9 of the Application which states that the Maritime Link facilities include "underground cables from the overhead-to-underground transition compounds to the cable landing sites", please advise:

(a) With which specifications (e.g. Publications by Cigre or IEC, etc.) will underground systems be required to comply?

(b) Whether NSPML have placed any other restriction on the type of cable which may be offered, for example the radial waterblocking method (e.g. extruded lead sheaths or aluminum foil laminate)?

(c) Whether NSPML have placed any restriction on the installation configuration of any such cables (e.g. maximum spacing between bipole cables to limit external magnetic fields or minimum spacing to facilitate excavation and repair of one cable)?

Response IR-18:

(a) The underground cable will be required to comply with CIGRE TB 496 for XLPE cables or Electra No. 189 and Electra No. 218 articles for MI cables.

(b) Yes, for XLPE the conductor requires water blocking. Either insulation system design requires a lead metallic sheath with XLPE cable requiring water blocking under the sheath. Outside the metallic sheath, an anti-corrosion insulating over-sheath must be extruded over the cable, providing an overall “jacket” for the cable.

(c) No, the proponents must provide a design which meets the technical specification. The installation must be located within the easement provided for the cable route which would be 50m or less in width.

Request IR-19:

With respect to page 59 line 10 of the Application which states that the "Land-sea transition sites at the seashore will connect the underground cables to the submarine cables, and anchor the submarine cables to land", please advise:

(a) With which specifications (e.g. Publications by Cigre or IEC, etc.) will any transition joints be required to comply?

(b) If NSPML have required prospective cable supply contractors to provide details of service experience for transition joints which includes the voltage, electrical stresses and conductor size of the cable for the Maritime Link?

(c) If NSPML have required prospective cable supply contractors to provide verification that the transition joints will perform adequately under the environmental conditions at the joint bay sites (which could include long periods of cold with the cable out of service)?

Response IR-19:

(a) The factory joints will be required to comply with CIGRE TB 496 for XLPE cables or Electra No. 189 and Electra No. 218 articles for MI cables.

(b) Yes, examples of similar systems installed have been requested, NSPML has also visited one site which experienced a transition joint failure.

(c) The proponents are required to meet the environmental operating conditions which have been provided. As per item (b) above NSPML has asked for examples of similar system installed of which some should have similar operating conditions.

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Request IR-20:

With respect to page 61 line 6 of the Application which describes the overhead-tog underground transition compounds, please advise:

(a) With which specifications (e.g. Publications by Cigre or IEC, etc.) will any cable terminations be required to comply?

(b) If NSPML have required prospective cable supply contractors to provide details of service experience for cable terminations which includes the voltage, electrical stresses and conductor size of the cable for the Maritime Link?

(c) If NSPML have required prospective cable supply contractors to provide verification that the cable terminations will perform adequately under the environmental conditions within the buildings at the overhead-to-underground transition compounds?

Response IR-20:

(a) The factory joints will be required to comply with CIGRE TB 496 for XLPE cables or Electra No. 189 and Electra No. 218 articles for MI cables.

(b) Yes, NSPML has asked for examples of similar systems installed and will include the items noted in our final evaluation along with other technical parameters.

(c) The proponents are required to meet the environmental operating conditions which have been provided. As per item (b) above, NSPML has asked for examples of similar system installed of which some should have similar operating conditions.

Request IR-21:

With respect to page 61 line 24 of the Application which states that "An important aspect of submarine cable systems is their exposure to damage from marine vessels, ship anchors, and pack ice, with long delays for repair or replacement of damaged cables", please supply details of the repair strategies, including holding of spares, availability of vessels and personnel, that have been, or are to be, developed to ensure that the HVDC submarine cable system can be returned to service in the event of either third party activities or intrinsic failure?

Response IR-21:

NSPML will develop a cable inspection and a cable repair program as part of the Long Term Asset management program (LTAMP), which will include retention of spare parts, inspection frequencies for the cable, monitoring and remediation programs based upon the final design and installation program results. The repair program will include spare part requirements, storage requirements, safety and environmental standards, root cause investigation and repair procedures, resource requirements including vessel size and availability and will consider retention of services with suppliers or experienced repair companies. NSPML is aware of proponents on the east coast who maintain a repair barge for shallower depths and will investigate other options prior to the installation campaign.

Spares requested as part of the request for proposals include:

- 5000 m of subsea cable on a turn table
- Subsea jointing kits.

Request IR-22:

With respect to page 62, Line 11 of the Application which states that "The design-build contractor will be responsible for designing and implementing cable protection measures to achieve a targeted return period of up to 1 ,000 years between failures of the cable systems". Please supply details of the calculations that have been, or are to be, performed to substantiate the predicted periods between failures the HVDC submarine cable protection measures?

Response IR-22:

Cable protection study and calculation is being performed by C-Core and Intecsea. An Ice risk analysis was performed by C-Core. Sea ice data from the Canadian Ice Service archives was collected. Upward looking sonar data collected on Makkovik Bank by the Bedford Institute of Oceanography were used to define the pack ice keel distribution and a maximum cut off of 25 m was selected for the analysis. Iceberg frequency in the study area has been evaluated using the PERD (Program of Energy Research and Development) Iceberg Sighting Database which compiles data from a number of sources including the International Ice Patrol, Canadian Ice Service, ship sightings and offshore industry. It was concluded that there is no iceberg risk on the Nova Scotia side of the Cabot Strait, and that the maximum keel draft cut off is 100 m for iceberg scour risk near Newfoundland landfalls. Although viewed as conservative, the ice risk and cable burial depth assessment was modeled using a gouge frequency model developed for use in the Canadian Beaufort Sea. The allowable annual probability of ice contact per metre of cable was calculated using the target reliability of 1/1000; the recommended maximum design gouge depth is 1.7 m due to pack ice from landfall up to 25 m water depth, and 0.4 m for icebergs from 25-100 m water depth on Newfoundland side.

A fishing activity study for the Cabot Straight was performed by Canning & Pitt in order to define the hot fishing areas and gear used based on the species that are harvested. An analysis on this report was performed by Intecsea, and it was recommended based on industry standards that

a 1m cover is required on top of the cable to protect against otter trawls, and 0.25 m to protect against fixed gear fishing.

A "Dragging Anchor Risk Analysis" was performed by C-Core based on vessel traffic analysis of the Cabot Strait, and reported anchor damage to communication cables in the straight. Based on the seabed soil conditions, a cover depth of 1.5 m up to a maximum of 75 m water depth is recommended to protect against dragging anchors.

Intecsea is currently updating the cable burial profile based on the results above. The driving factors for cable protection that will help achieve a return period of 1000 years are a combination of Pack ice sub-gouge zones, Iceberg sub-gouge zones, Dragging anchors zones, trawling zones, fixed gear fishing zones and mega ripples zones.

Request IR-23:

With respect to page 62. Line 16 of the Application which states that "The core conductor of the cables will be either copper or aluminum", has NSPML required that prospective cable supply contractors provide test data and/or service experience to demonstrate the mechanical strength of conductor connectors used in factory joints, in-line cable joints and repair joints?

Response IR-23:

Yes. Prospective cable suppliers must demonstrate that the mechanical strength of conductor connectors used in factory joints, in-line cable joints and repair joints meet or exceed the mechanical strength of the cable.

Request IR-24:

With respect to page 62, Line 17 of the Application which states that "The cable will consist of a core conductor surrounded by electrical insulation, embedded fiber optic communication cable over all or part of the cable length, and overall steel armor for cable protection", has NSPML considered the implications to the power cores of a failure of the fiber cable during manufacture, installation or operation of the cable?

Response IR-24:

Yes. The original fiber optic was also being considered for communication purposes but has since been reduced to only Digital Temperature Sensing (DTS), which is not considered a significant risk to the power core as the proposals have the fibre cable installed as part of the armour stranding or installed between the lead sheath and the over all “jacket”. Fiber optic communication options exist with existing unused capacity fiber capacity between NS and NL, which allow NSPML to reduce the requirement for full length fiber.

Request IR-25:

With respect to page 69, Line 1 of the Application which gives details of other projects using VSC technology including details of cables, has NSPML sought and obtained information on the service performance of these, or any other, cable systems from the cable operators?

Response IR-25:

Yes, NSPML has been working with the suppliers of the referenced projects and has visited some of the project sites mentioned to gain first hand experiences from the owners. NSPML has also visited other HVDC projects at various stages of operation, from partial construction to full operation and had open discussion on the performance and reliability with owners. NSPML has established industry contacts on similar projects. NSPML has engaged experienced technical support for both converter and cable technologies, including those directly involved in the specifications and reliability expectations.

Request IR-26:

With respect to page 71, Line 14 of the Application which states that, "For the submarine cable system, NSPML has specified two cable insulation technologies, and has invited proponents to recommend the insulation technology of their choosing, with supporting technical specifications to prove the long-term viability of the proposal", has NSPML given details of the Basic Impulse Level, the maximum short circuit current and duration, the anticipated harmonics, and any short term or emergency load currents for which the cable system must be designed?

Response IR-26:

No, NSPML has not provided the specific design criteria. The successful cable proponent will be required to work with the successful convertor station proponent to establish requirements for a fully integrated system. These requirements would be incorporated in the final cable design. There are no anticipated harmonics with DC current. The converter rectifier removes the harmonics from the incoming sinusoidal AC current and the outgoing DC is linear and harmonic free.

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Request IR-27:

With respect to page 71, Line 14 of the Application which states that, "For the submarine cable system, NSPML has specified two cable insulation technologies, and has invited proponents to recommend the insulation technology of their choosing, with supporting technical specifications to prove the long-term viability of the proposal", has NSPML required proponents to give details of, including applicable test results on, applicable service history of, and proposed tests on, their proposed cable system designs, including:

(a) Conductor size?

(b) Maximum conductor temperature?

(c) Electrical stresses at both the inner and outer surface of the insulation under both hot and cold conditions, with superimposed switching and lightning voltage impulses if applicable?

(d) Cable construction including armoring and embedded fiber optic communication cable?

(e) The temperature difference across the insulation?

(f) The type of Ml insulation (e.g. paper or polypropylene laminated paper) and impregnating compound?

The grades of XLPE insulation and screens (e.g. filled XLPE, unfilled XLPE)?

(g) Degassing requirements for XLPE cable?

Response IR-27:

Yes, NSPML has required each of the proponents to submit completed mechanical, prequalification and type tests for each of the proposed cable system designs. The mechanical tests on the submarine cables are to be completed in accordance with the recommendations outlined in Electra No.171 article. The prequalification and type tests are to be completed in accordance with the recommendations outlined in CIGRE TB 496 for XLPE cables and Electra No. 189 & Electra No. 218 articles for MI cables.

Request IR-28:

With respect to page 76, Line 3 of the Application which gives a breakdown of the NSPML Maritime Link Facilities P50 Cost Estimate, can NSPML please give a more detailed breakdown of the cost estimates, including costs for subsea cable supply and subsea cable installation?

Response IR-28:

NSPML is in active discussions with suppliers. NSPML has been careful to avoid identifying its expectations for the costs of this work so as not to influence negotiations with suppliers. The cost breakdown of the cable includes items such as cable design, manufacture and testing, mobilization, transport and demobilization, preparation for installation, installation, protection, warrantee surveyors, spares and other.

Request IR-29:

With respect to page 76, Line 3 of the Application which gives the marine portion of the NSPML Maritime Link Facilities P50 Cost Estimate to be $M300, has NSPML given consideration to the effects of variations in the price of metals used in the manufacture of cables and currency fluctuations?

Response IR-29:

Yes, NSPML has taken both commodity and foreign exchange matters into consideration in determining its capital cost estimate.