Request IR-1:

The Labrador Island Link (LIL) Transmission milestone "Ready for Power Transmission (Low Load Testing Complete Pole 1)" was listed as 1-Dec-18 in the June 2017 forecast, as 21-Jan-19 in the December 2018 Muskrat Falls Quarterly Project Update (p. 52), and as 15-Jun-19 in the March 2019 Muskrat Falls Quarterly Project Update (p. 50).

(a) Does NSPML know why this milestone was delayed almost five months between December 2018 and March 2019?

(b) Does NSPML know whether this milestone has been achieved? If not,

i. Does NSPML know why the milestone has not has been achieved?

ii. Has a new target date been set?

Response IR-1:

(a) Yes, we understand Nalcor's supplier, GE, was unable to advance the Protection and Controls (P&C) software for the HVdc system to a satisfactory performance level due to technical issues that were identified during testing.

(b) We understand Nalcor accomplished completion of this milestone on June 4, 2019 after an update of the P&C software (17c) was loaded in May and tested in June.

i. As noted in (b) above, this milestone has been achieved.

ii. As noted in (b) above, this milestone has been achieved.

Request IR-2:

Since February 5, 2019 power transfer levels have fluctuated at restricted rates between 45–100 Megawatts due to an issue with P&C software. On May 1, 2019 an updated version of P&C software (17 c) was installed and commissioned over a four-work period. As planned, the LITL was taken out of service in June to progress bipole completion." (March 2019 Muskrat Falls Quarterly Project Update, p. 26)

(c) Has Nalcor represented to NSPML that the updated software was operating properly and had resolved the problems with the previous version, prior to the June shutdown of the LIL?

(d) What was the maximum power transfer level of the LIL in May?

(e) Has the LIL returned to service since the June outage?

(f) Does NSPML believe that the software problems have been resolved?

Response IR-2:

(c) Nalcor indicated to NSPML that the software supplier was facing challenges; however, Nalcor also informed NSPML that contingency plans were being developed to allow the system to operate at less than full load, with bipole commissioning and operations starting later this year. NSPML also understands that certain system modes will be made available once further development and testing is completed between this year's software upgrade and spring 2020.

(d) The maximum power transfer level of the Labrador-Island Link (LIL) in May 2019 was 140 MW.

(e) A planned outage of the LIL continues this summer. The LIL is expected to be re-energized in the coming months in accordance with Nalcor's plan to commission the asset later this Fall.

(f) NSPML understands that Nalcor and its contractor continue to make progress addressing this matter. The system has been turned over to the contractor and all ongoing work is concentrating on bipole commissioning. NSPML further understands that Nalcor and its contractor have hired two independent third parties to monitor progress.

Request IR-3:

The following language has appeared in the press concerning the HVDC software developed by GE Grid Solutions:

The witnesses were asked about other GE Grid Solutions projects worldwide, and shown slides from Nalcor Energy, commenting on operational concerns and commissioning delays noted there. Projects referenced included the SydVästlänken (or South West Link) in Sweden. Nalcor Energy noted it is four years behind schedule. As stated in a column by Russell Wangersky in The Telegram in December 2018, work for the project in Sweden was being done in Stafford, U.K. — the same site where control systems for the Labrador-Island Link were produced. ("Transmission line will be ready for first power, contractor tells Muskrat Falls Inquiry," Ashley Fitzpatrick, *The Western Star*, May 03, 2019, https://www.thewesternstar.com/news/local/transmission-line-will-be-ready-for-first-power-contractor-tells-muskrat-falls-inquiry-308312/)

[T]he SydVastlanken (or South West Link) is a high voltage direct current (HVDC) power line system…. It was a turnkey project, including valve modules, transformers and "control systems from the HVDC excellence centre in Stafford, U.K.," according to the successful bidder, General Electric Grid Solutions. GE Grid Solutions is also the successful bidder on the Labrador Island Link….

The SydVastlanken was supposed to have been brought online in 2015. Now, the Swedish utility, Svenska Kraftnat, is hoping the line may come into full service by March 2019 — four years late.

Here's part of an email from Svenska Kraftnat communications officer Joel Nylin.

"(It) occurs as our problems are similar with yours. GE Grid haven't been able to deliver the technical solutions in converter stations. All other parts of the project such as the physical elements have been finished according to plan. The four-year delay of the HVDC-link are due to that GE Grid haven't been able to make the system function in a stable and satisfying way," Nylin writes.

"There isn't a specific issue delaying the commission but a number of faults and deviations that are being handling in order to get all parts of the functions to work and communicate as intended. For instance, there have been numerous deviations in the control and protections systems.

"The problems have variated all from quality flaws to need for developing new software solutions. The remaining work consists of testing, handling deviances and implementing solutions. There is continuous progress in the work and even though the link has been postponed several times, we are still optimistic that General Electric (GE) Grid will be able to finish the job." ("A tale of software and power lines," Russell Wangersky, The Western Star, December 8, 2018, https://www.thewesternstar.com/opinion/columnists/russell-wangersky-a-tale-of-software-and-power-lines-265591/)

(g) Does NSPML believe that these accounts are substantially correct?

(h) If NSPML has the "slides from Nalcor Energy" referenced in the Fitzpatrick article, please provide them.

(i) Does NSPML have any basis for believing that the software problems on the LIL will not be as persistent as those reported for SydVastlanken?

Response IR-3:

(g) NSPML has no reason to disagree with the account presented.

(h) NSPML is aware that this presentation is publicly available at the following link: https://www.muskratfallsinquiry.ca/files/P-03019.pdf. For ease of reference, please refer to Attachment 1 for a copy of the presentation.

(j) Laszlo von Lazar, a senior executive at GE, testified at the Muskrat Falls Inquiry that the issues on the South West Link are distinguishable from those on the Lower Churchill Project because the SouthWest Link used VSC technology, which was a new design to General Electric (GE) at the time, whereas the Lower Churchill Project uses LCC technology, a proven technology with which GE has prior experience. As well, Mr. von Lazar testified that the customer on the SouthWest Link had harmonic issues on its grid and cable issues that have contributed to its delays.
[ref: https://www.muskratfallsinquiry.ca/files/2019-05-03.pdf – testimony from May 3, 2019, p. 25]. Aside from this publicly available evidence, NSPML does not have any information regarding the SouthWest Link software issues.

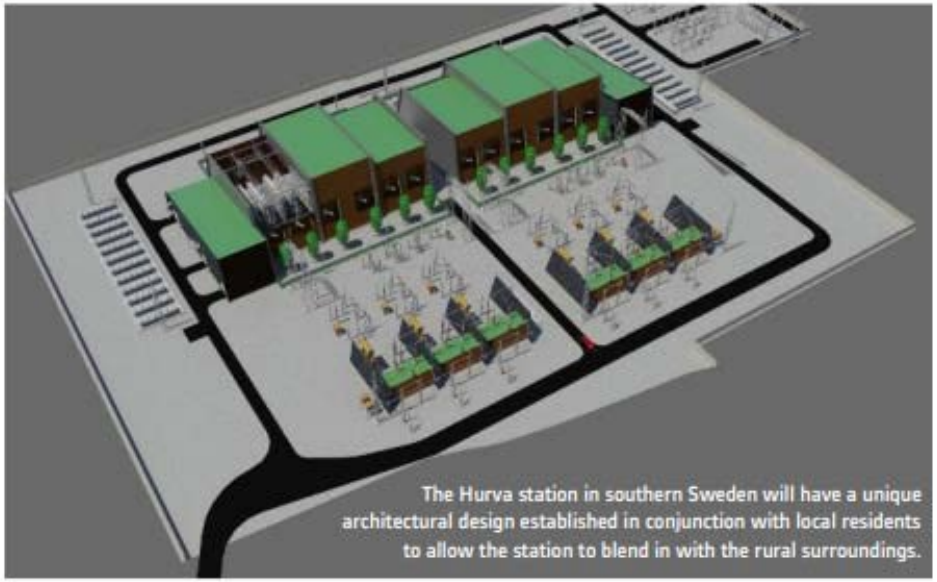
Transmission Link Project

GE Global Performance

Boundless Energy

nalcor energy
LOWER CHURCHILL PROJECT

CIMFP Exhibit P-03019



Country:	Sweden
Project:	South West Link
Scope:	2 x 720 MW HVDC interconnection between central and southern Sweden
Ratings:	±300 kV, 1440 MW
Transmission means:	Underground DC cable and overhead line interconnection
Scheduled delivery:	December 2014


SydVästlänken

Justering av tidplanen

29 juni, 2015

Justeringen gäller drifttagningen av den ena av SydVästlänkens två likströmsförbindelser.

Den första delen planeras att driftsättas i oktober istället för september. Bakgrunden är förseningar hos leverantören Altsom. Drifttagningen av den andra likströmsdelen är fortfarande planerad till den 31 januari 2016.

June 29, 2015
Pole 1 moved from Oct to Nov 2015
Pole 2 moved to Jan 31 2016


SydVästlänken

Ny justering av tidplanen

8 september, 2015

Tidplanen för drifttagningen av de två likströmsförbindelserna har förskjutits ytterligare. Bakgrunden är förseningar hos leverantören Altsom.

Den första delen är beräknad att driftsättas i slutet av december istället för oktober. Drifttagningen av den andra likströmsdelen är planerad till slutet av juni 2016.

Sept 8, 2015
Pole 1 moved to Dec 2015
Pole 2 moved to June 2016


SydVästlänken

Ny tidplan för drifttagningen av likströmsförbindelsen

21 september, 2015

Tidplanen för drifttagningen av den första delen av likströmsförbindelsen har förskjutits två månader. Förbindelsen är beräknad att kunna tas i drift i slutet av februari 2016. Bakgrunden är förseningar hos leverantören Alstom.

Tidplanen för drifttagningen av den andra delen är oförändrad. Den planerar vi fortfarande att kunna ta i drift i slutet av juni 2016.

Nov 21 2015
Pole 1 moved to Feb 2016
Pole 2 still in June 2016


SydVästlänken

Ny tidpunkt för drifttagningen av likströmsförbindelsen

9 februari, 2016

Tidplanen för drifttagningen av den första delen av likströmsförbindelsen har förskjutits ytterligare. Förbindelsen är beräknad att kunna tas i drift i juli 2016.

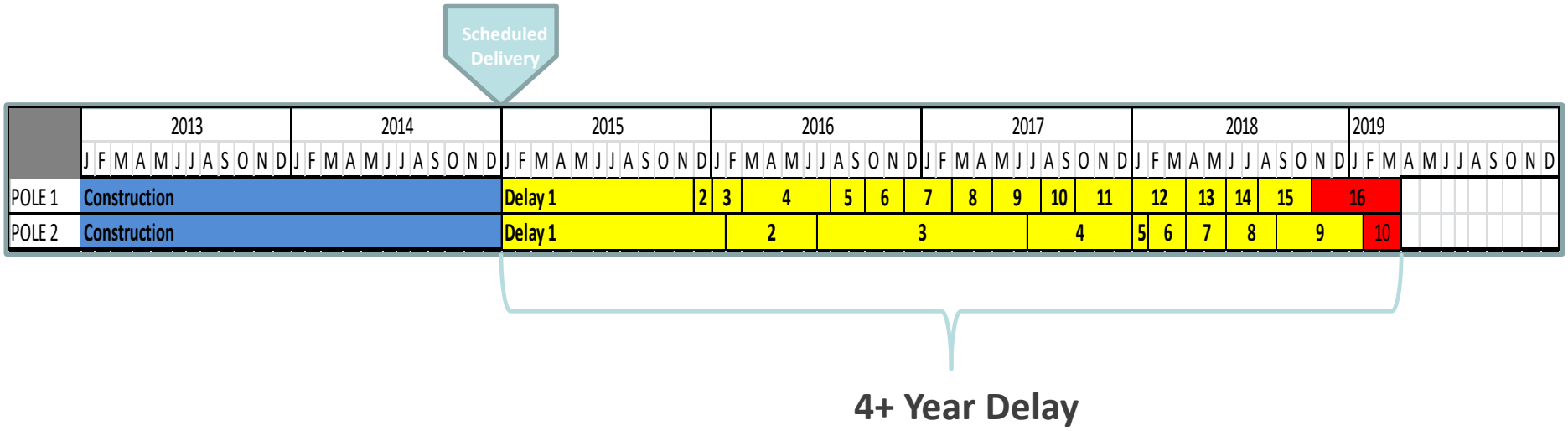
Bakgrunden är förseningar hos leverantören Alstom. Det finns för närvarande ingen tidpunkt för när den andra länken förväntas tas i drift.

Feb 9 2016
Pole 1 moved to July 2016
Pole 2 no date

Trend continues……

CIMFP Exhibit P-03019

South West Link, Sweden

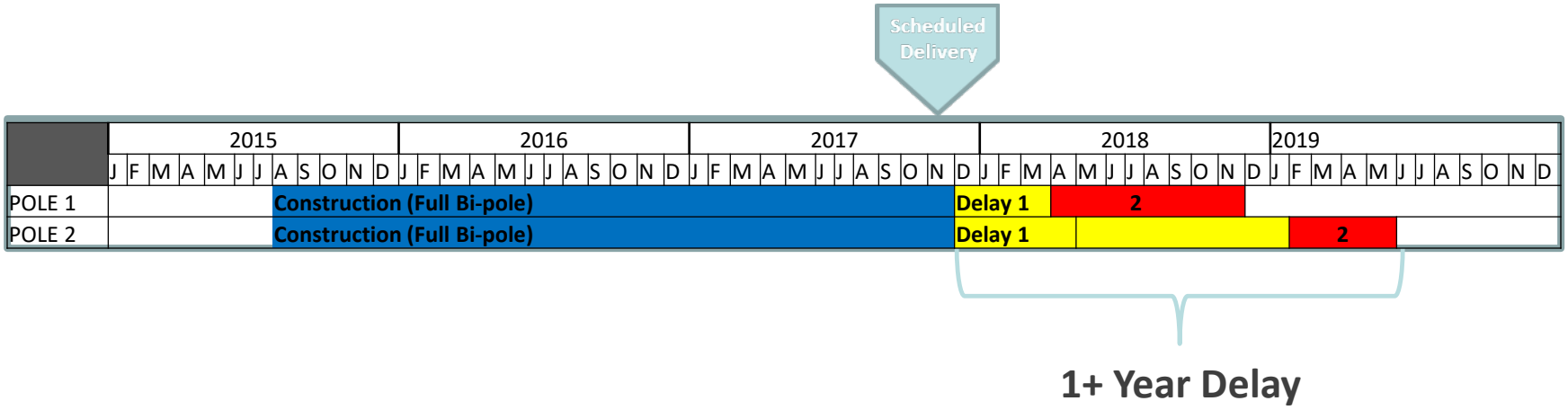


South West Link 4+ Years Behind Schedule

- Original date for operation was Dec 2014
- Currently a delay of more than 3 years
- GE pushed the scheduled forward in small step – 1 to 4 months at a time
- Delays are a result of consistent problems with technical solutions from GE

CIMFP Exhibit P-03019

Labrador-Island Transmission Link



Other Projects

Project	Status
Konti Skan ***Denmark, Sweden***	▪ Delivered by GE Grid in 2010 ▪ Replaced controls as soon as warranty expired in 2017 ▪ ABB selected in 2017 to supply new controls; scheduled delivery 2019
Champa-Kurukshetra ***India***	▪ GE delivered Pole 1 in March 2017 & Pole 2 in October 2017 ▪ Bipole not fully functional – regular trips ▪ Replacing failed hardware components of their P&C system
Rio Maderia ***Brazil***	▪ Two parallel lines, Rio 1 & 2 ▪ ABB delivered Rio 1 in 2014 ▪ GE delivered Rio 2 in 2016 ▪ Ongoing issues reported

Champa-Kurukshetra, India

- Planned project delivery was 33 months, actual ??
- Dynamic commissioning was 6-7 months late
- Significant number of outages in first year – equipment and P&C software
  - Large number of outages related to lane tracking and change over
- Operating for last 3 months at 99% reliability
- Oversight at PES in Stafford was key to advancing software

DolWin3, Germany

- Planned project construction was 5 years, original delivery was Sept 2017
- Challenge with GE was related to P&C software from Stafford
- Due to delays with P&C software, TenneT advanced Plan B with alternate vendor while working through issues with GE
- Sept 2018, DolWin3 transferred 700MW for 10 days, followed by trial operations
- The system is now in operation with little issue
- 3rd party oversight at PES in Stafford was key to advancing software

Rio Maderia, Brazil

- Two parallel lines, Rio 1 & 2
- ABB delivered Rio 1 in 2014
- GE delivered Rio 2 in 2016, 2 years late
- Many issues with GE system during commissioning resulting in numerous revisions of software
  - Issues with trips and equipment failures
- Currently Rio 1 & 2 are operating independently
  - Working to integrate both systems under a master control

Request IR-4:

The March 2019 Muskrat Falls Quarterly Project Update reports that four categories of the LIL were not complete: the LITL Muskrat Falls Converter, the Soldiers Pond Converter, the LITL Soldiers Pond Sync Condensors, and the Misc category.

(j) Please identify which category includes the problems with the GE Grid Solutions software.

(k) Please identify any outstanding issues for the LIL, other than the software problem.

Response IR-4:

(j) The following categories include the problems with the General Electric (GE) Grid Solutions software: Labrador-Island Transmission Link, Muskrat Falls Converter, and the Soldiers Pond Converter.

(k) Beyond software, in its June 2019 Project Update, Nalcor reports, there is an issue with oil contamination on the synchronous condenser, as well as an inability to achieve rotor lift on Unit 2, and hydrogen piping contamination on all units. Nalcor reports that the first two of these units will be commissioned by Q3 2019 with the third to follow in Q4, 2019.

Request IR-5:

The Labrador Transmission Assets are said to be "Ready for Power Transmission," but "Commissioning Complete" is not expected until September 2020 (March 2019 Muskrat Falls Quarterly Project Update, p. 51).

(l) Does NSPML understand the LTA to be ready to transmit all the expected Muskrat Falls capacity to the LIL? If not,

i. What is the current capability of the LTA?

ii. What remains to bring the LTA to full planned capacity?

(m) Why are the LTA not considered to be completely commissioned?

Response IR-5:

(l - m) The LTA is fully ready for service to transmit all expected power from Muskrat Falls. There is no further testing required on the LTA. This Nalcor milestone refers to the point when all LCP assets (LTA, LIL and Muskrat Falls) have completed commissioning.

Request IR-6:

Are all of the AC transmission facilities on the island of Newfoundland required for the delivery of the Nova Scotia Block in full operation?

Response IR-6:

Yes, all of the AC transmission facilities required for the NS Block are in full operation. The synchronous condensers are not yet in-service; however, NSPML anticipates they will be operational in time for delivery of the NS block.

Request IR-7:

Please provide the hourly net flow on the Maritime Link for each hour since the line entered service on January 15, 2018.

Response IR-7:

Please refer to Confidential Attachment 1 for the hourly net flow.

DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS
[redacted]			

DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS
[redacted]	[redacted]	[redacted]	[redacted]

DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS
[redacted]	[redacted]	[redacted]	[redacted]

DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS

DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS
[redacted]			

DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS
[redacted]			

DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS
[redacted]	[redacted]	[redacted]	[redacted]

DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS
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DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS

DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS
[redacted]	[redacted]	[redacted]	[redacted]

DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS
[redacted]	[redacted]	[redacted]	[redacted]

DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS
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DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS
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DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS

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DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS
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[redacted]	[redacted]	[redacted]	[redacted]

DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS
[redacted]	[redacted]	[redacted]	[redacted]

DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS
[redacted]	[redacted]	[redacted]	[redacted]

DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS

DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS
[redacted]	[redacted]	[redacted]	[redacted]

DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS
[redacted]	[redacted]	[redacted]	[redacted]

DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS
[redacted]	[redacted]	[redacted]	[redacted]

DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS

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[redacted]	[redacted]	[redacted]	[redacted]

DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS
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[redacted]	[redacted]	[redacted]	[redacted]

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[redacted]			

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[redacted]			

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[redacted]			

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[redacted]	[redacted]	[redacted]	[redacted]

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[redacted]	[redacted]	[redacted]	[redacted]

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[redacted]			

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DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS
[redacted]			

DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS
[redacted]	[redacted]	[redacted]	[redacted]

DATE	HOUR	Transfers [MW] NS to NL	Transfers [MW] NL to NS
[redacted]	[redacted]	[redacted]	[redacted]

Request IR-8:

Please provide the price paid for NS Power's purchases from or sales to Nalcor for each hour since the Maritime Link entered service on January 15, 2018.

Response IR-8:

Please refer to Confidential Attachment 1.

Company	Counterparty	Contract	Trade	Product	Net Quantity	Price	Net Value	Beg time	End time	Currency	Unit	Gross quantity	Gross value	Trade time zone	Settletime zone	Position Mode	Trade Type
[redacted]																	

Company	Counterparty	Contract	Trade	Product	Net Quantity	Price	Net Value	Beg time	End time	Currency	Unit	Gross quantity	Gross value	Trade time zone	Settletime zone	Position Mode	Trade Type
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Request IR-9:

Has the Maritime Link been used to allow any transactions other than those in which NS Power was a party or beneficiary? If so, please:

(a) describe those transactions, including the parties, timing, and pricing; and

(b) explain why NS Power was not involved in the transaction.

Response IR-9:

(a-b) NS Power has been a beneficiary from all transactions for which the Maritime Link has been used since the Maritime Link was placed into service. The primary use of the Maritime Link to date has been for direct transactions between NS Power and Nalcor Energy Marketing. At times, Nalcor has also purchased energy from beyond Nova Scotia and transmitted energy though Nova Scotia and across the Maritime Link for use in Newfoundland. In these cases, NS Power is not a direct party to the energy transactions, but does benefit from the payment received from Nalcor for the use of transmission service through Nova Scotia.

Request IR-10:

If NS Power has quantified any benefits of the Maritime Link to NS Power ratepayers, other than energy transactions, please identify those benefits (e.g., reduced operation of steam plants to maintain operating reserves), identify the periods of time in which those benefits accrued, and (if possible) quantify the benefits.

Response IR-10:

As part of the Consensus Agreement approved by the NSUARB with respect to NS Power's 2017-2019 Fuel Stability Plan and Base Cost of Fuel Application, NS Power agreed to track the benefits realized for customers from the Maritime Link prior to the start of the Nova Scotia Block and provide such information to customers on no less than a quarterly basis. Since 2018, NS Power has been filing such quarterly reports with the NSUARB, together with its Quarterly FAM Reports, describing and quantifying the financial and other benefits realized for customers from the Maritime Link. Please refer to NS Power's reports for Q1-Q4 2018 and Q1 2109 which are on file with the UARB for the details with respect to the benefits achieved during those periods.