NON-CONFIDENTIAL

Request IR-1:

The Regulatory Application, pg. 16 states "Once completed, the Project will also increase Nova Scotia's capacity to develop new intermittent sources of electricity, such as wind, and incorporate them in Nova Scotia's electrical transmission system", and that only the Maritime Link project "supports the development of additional intermittent renewable energy resources".

Following from these statements, please provide NSPI's best estimate of the additional MW of wind power that could be technically integrated into the NS system with the addition of the Maritime Link.

Response IR-1:

Please refer to NSUARB IR-4.

NON-CONFIDENTIAL

Request IR-2:

The Regulatory Application, pg. 17, lists one of the advantages of the Maritime Link as being "strengthens Nova Scotia's connection to the North American grid to prepare for and to take advantage of many future energy scenarios".

In order to assess this claim, please provide an analysis of the resource options and Net Present Value of the alternatives presented (section 6.0 in Regulatory Application) in the context of a regulatory scenario whereby NSPI was required to meet a 100% renewable goal/regulation by 2040.

If a given alternative is chosen by the UARB/NSPI, and NSPI was later required to meet a 100% renewable energy regulation by 2040, please provide information on projected stranded assets in each of the alternatives presented

Response IR-2:

Current and anticipated regulatory requirements do not include a 100 percent renewable requirement by 2040, and therefore the requested analysis was not performed for this Application.

Request IR-3:

Please outline over what time intervals energy and capacity from the Maritime Link will be technically available?

(a) What is minimum response time of energy deliveries over the Maritime Link?

(b) What is the projected ramping capability of power delivered over Muskrat Falls (MW per minute)?

Response IR-3:

(a) Please refer to the Energy and Capacity Agreement (ECA) in Appendix 2.03 of the Application. In accordance with the agreement Schedule 5, the ramp up time is 15 minutes.

(b) Muskrat Falls is a run-of-the-river system, and can be taken to full-load in minutes. The HVdc links and the systems to which they are connected will limit the ramping in of energy and will be based upon final equipment selection and system studies. The Maritime Link and NS Block will ramp to load within 15 minutes.

Request IR-4:

(a) How quickly can energy over the Maritime Link be ramped up or down?

(b) What are the switching protocols for the Maritime Link?

(c) What role if any could the maritime link provide in real-time operations conducted by reliability coordinator, system operator?

(d) For each year of operation, what is the anticipated capacity factor of the Maritime Link?

(e) Will loss of 50% of the Maritime Link (250 MW) represent the largest single contingency failure and will this increase the reserve capacity required on the NS system?

Response IR-4:

(a) Please refer to EAC IR-3 which covers the normal ramping. Although the technology can ramp the Maritime Link from full load to no load in 50 to 100 milliseconds, the ramping must be coordinated and scheduled between operating areas in 10-minute blocks.

(b) The protocols will be established by the operators as per the Interconnection Operators Agreement (IOA). See Appendix 2.09 of the Application.

(c) The Maritime Link will be under the operational control of NS Power's System Operators at Ragged Lake and NLHs System Operators in St. John's, in real-time. The Maritime Link will come under the purview of the Reliability Coordinator.

(d) The NS Block will have a capacity factor of about 68 percent. Based on Muskrat Falls surplus and the NS Block alone, the capacity factor of the Maritime Link will be 60 percent, with higher peak hour capacity factors than off-peak hours (overnight).

(e) Please see NSUARB IR-68.

Request IR-5:

Please provide detail of how "VSC systems are ideally suited for application to electricity systems with small amounts of connected generation" (application p 41, line 1).

(a) Does this choice make balancing between NL and NS challenging or does it provide any advantages?

(b) Are there any costs or risks imposed because the link between the two regions is nonsychronous?

Response IR-5:

VSC systems require less reactive support, permitting them to be installed on weaker networks. Other advantages are the absence of commutation failures and the ability of VSC systems to supply reactive power and regulate system voltage.

(a) It provides advantages.

(b) No. Also it should be noted that a synchronous tie between the regions, using AC cables, is not possible over cables of this length.

Request IR-6:

Please comment on the following aspects of performance of the Maritime Link:

(a) Capability to start-up a de-energized AC network (black start)

(b) Capability of a station to energize the DC network or parts thereof

(c) Capability to provide reactive power

(d) Capability to control AC system frequency and provide synthetic inertia

(e) Capability to provide short-circuit power to the AC System

(f) Capability to ride through AC system faults

Response IR-6:

(a) Black start capability is included in the specifications for the Maritime Link converters.

(b) The DC system is energized by the converter that is powered from the AC system.

(c) The converters at both terminals can provide their own reactive power, supply reactive power to the networks and regulate voltages.

(d) The Maritime Link will be equipped with frequency controllers that will intervene when frequency deviation is excessive, that would come into action to stabilize frequency.

(e) Current is limited by the controllers.

(f) This is an advantage of the VSC technology as, unlike the LCC technology, it is not prone to commutation failures.

NON-CONFIDENTIAL

Request IR-7:

Please compare the Maritime Link performance with that of the DC links between Quebec and New Brunswick and/or between the NB/NS intertie.

Response IR-7:

It is very difficult to compare the performance of systems that range from AC to DC, and to different vintages and technologies of DC facilities with very different purposes, without specifiying parameters of interest. The DC links between New Brunswick and Quebec are LCC, whereas, Maritime Link's will be VSC. VSC provides MW and MVar where LCC requires equipment added to achieve similar results. DC systems are asynchronous and will not transfer faults, whereas AC systems are synchronized and will transfer faults.

Request IR-8:

Appendix 6.05, pg. 5 & 18, suggests that the Maritime Link provides an opportunity for "much needed balancing resources for committed and expected new wind generation".

(a) Has NSPI signed a balancing agreement with Nalcor? If not, why?

(b) Please outline any opportunities that exist to sign a balancing agreement with Nalcor

(c) The application offers improved grid flexibility for integration of renewables as a benefit. Explain how much intermittent renewable energy can be accommodated with the addition of 40MW of dispatchable power (Application, page 23, line 23).

(d) How much of NS native hydro generation, in particular Wreck Cove, is considered dispatchable?

(e) Excluding coal fired generation and Tufts Cove Unit 1, how much dispatchable power will be on the NS system prior to operation of the link?

Response IR-8:

(a-b) The framework for establishing a balancing agreement is in place but a formal agreement has not yet been signed.

(c) The incremental renewable energy that could be accommodated by the dispatchable range of the Maritime Link would depend on the type of renewable generation under consideration and the forecast confidence that is available for that technology. It would also depend on the level of intermittent generation penetration present on the system and

the flexibility of other online generation. All else being equal, 40-80 MW of new intermittent source should be possible.

(d) Wreck Cove Units 1 and 2 are dispatchable between their 45 MW minimum operating level and 105 MW maximum. Some consideration must be given to tail race effects and headpond position. System capacity factor is 17 percent.

(e) Dispatchable generating units include the following:

- Tufts Cove 2
- Tufts Cove 3
- Tufts Cove 4/5/6 (Combined Cycle)
- Most hydro units within the seasonal daily limits as defined by watershed hydrology and in some cases system operating licenses
- Combustion turbines

NON-CONFIDENTIAL

Request IR-9:

Over what range of time intervals will energy and capacity sales from the Market Block be scheduled by the System Operator?

Response IR-9:

Please refer to pages 88 and 89 of the Energy Capacity Agreement provided in Appendix 2.03 of the Application.

Request IR-10:

How will wind forecasts determine the energy and power purchases NSP makes over the Maritime Link? Please describe how NS System Operator will manage divergences from wind forecast in the context of the Maritime Link.

Response IR-10:

As the amount of wind generating capacity on a power system increases, the need for more accurate and timely forecasting of wind becomes increasingly important to ensure reliable operation of the power system. In addition to more accurate and timely forecasting, it is important to have resources that can respond to deviations between the amount of wind energy forecasted and wind energy generated.

With high levels of wind penetration, there is potential for higher magnitude deviations between the wind forecast to wind energy generated. During times of large deviations between the forecast and wind energy generated, the system could experience over or under commitment of dispatchable resources and increased difficulty in balancing of the power system. The Maritime Link could be utilized as a resource to help balance the power system in real time. The dispatchability of the Nova Scotia Block and 5-year supplemental block provide some ability to manage deviations from wind energy forecasts. The discretionary block also provides a means to manage deviations from wind energy forecasts in real time. The amount of energy imported through the Maritime Link to manage deviations from the wind forecast will depend on the accuracy of the wind forecast, deviation between wind forecast and wind energy generated, commitment of dispatchable resources based on the wind forecast, flexibility of the thermal generating resources in Nova Scotia, ability to dispatch the Nova Scotia Block and 5-year supplemental blocks (up or down) during the periods of forecast deviations, and the economic feasibility of importing discretionary 3rd block energy through the ML at times of deviation between wind forecast to wind energy generated.

Energy Imbalance Service is provided when a difference occurs between the scheduled and actual delivery of energy to a load located within an operating area over a single hour. The terms under which this service is provided to a Transmission Customer taking Point to Point Transmission Service are shown in Schedule 4 of the OATT:

http://oasis.nspower.ca/site-nsp/media/Oasis/ApprovedOATT052005.pdf

NON-CONFIDENTIAL

Request IR-11:

Please describe dispatchability of the supplemental block. By how many MW can this energy be ramped up or down at any one time? Will the supplemental block be scheduled into baseload operations?

Response IR-11:

The dispatch of the supplemental energy is described in Appendix 2.03, of the Application, Page 89, section V. When the supplemental energy is available, it will be included in the daily schedule.

Request IR-12:

Please describe the flexibility of generation assets within the Newfoundland and Labrador System, including Muskrat Falls power plant.

Response IR-12:

After the Muskrat Falls Hydroelectric Generation Facility is in service, Newfoundland and Labrador will have predominantly hydro assets, the capacity factors of which vary but about 67 percent is typical. The largest station is at Churchill Falls, which has multi-year storage capability therefore highly flexible. The on-island generation will be predominantly hydro assets as well, with similar characteristics and will be able to be dispatched higher or lower based upon demand and water levels. Generation at most sites is provided by multiple machines and allows the turn-down of the output to be efficiently achieved for lower load demand. Muskrat Falls will consist of four (4) units (206 MW capacity) for a total of 824 MW. Churchill Falls has 11 units totalling 5428 MW. Bay d'Espoir is a seven unit 600 MW hydro facility, Granite Canal is a 40 MW plant located electrically at the eastern tip of the Maritime Link in Newfoundland.

Request IR-13:

Please provide a detailed breakdown of the simulation results used to calculate the predicted average energy production of Muskrat Falls as prepared by Nalcor's hydrological consultant (Term Sheet Appendix H). What level of confidence is associated with the predicted average energy production and what variation is anticipated over the design life of the Maritime Link?

Response IR-13:

The NS Block is 170 MW of the 824 MW of Muskrat Falls output and Nalcor is contractually responsible to deliver the electricity. The hydrologic risk for the production level is Nalcor's as part of the commercial arrangements.

Request IR-14:

Please provide the MW of storage capability available from the Muskrat Falls power plant, differentiated by season as appropriate.

Response IR-14:

Due to the contractual rights and obligations, the NS Block is guaranteed by Nalcor. The Muskrat Falls Hyrdrology Report can be found here: http://www.pub.nf.ca/applications/muskratfalls2011/files/exhibits/abridged/CE-23-Public.pdf

Request IR-15:

Please provide a MW figure of storage capability available in the Newfoundland and Labrador electricity system, differentiated by plant or energy resource.

Response IR-15:

Due to the contractual rights and obligations for the supply of the NS Block, the storage capacity of the Newfoundland and Labrador system is not relevant.

Request IR-16:

What level of power and energy is available from Upper Churchill to Nalcor before 2041 (i.e. "recall power")?

(a) Describe the dispatchability of this energy resource

(b) Is it available all year?

(c) Within what time frames is it available (i.e. day-ahead, hour-ahead, within the hour)?

(d) How much of this resource is currently used within Labrador?

(e) Does NSPI project that this power will be available for sale over the Maritime Link?

Response IR-16:

(a-c) NLH has a power purchase agreement with CF(L)Co for 300 MW of Power until 2041. This is commonly referred to as the "Recall Power". NSPML is not aware of any restrictions on the dispatchability of this energy resource.

(d) According to Nalcor's 2011 Annual Report it exported 1,594 GWh of Recall Power from Labrador.

(e) With the completion of the Maritime Link and Phase 1 of the Lower Churchill Project, the new electrical transmission system enables Nalcor's ability to potentially transmit this energy through Nova Scotia.

Request IR-17:

What is Newfoundland's current level of Demand Side Management effort as a percentage of annual load?

(a) Please describe Newfoundland's energy efficiency policies

Response IR-17:

NSPML is not aware of Newfoundland's current level of DSM as a percentage of load in that province.

The Government of Newfoundland and Labrador policy on energy efficiency is provided at the following web site:
http://www.exec.gov.nl.ca/exec/cceeet/2011_energy_efficiency_action_plan.html

The two utilities in Newfoundland and Labrador, Newfoundland and Labrador Hydro and Newfoundland Power, have a joint energy efficiency program under the TakeCharge brand. Information on it is available at the following web site:
http://takechargenl.ca/

Request IR-18:

Please provide information on Newfoundland's current and planned level of wind energy development.

Response IR-18:

This issue is not in scope.

Request IR-19:

With reference to the NS Transmission Utilization Agreement, to what extent does NSPI foresee the use of redispatch to avoid internal NS transmission constraints? How can NS facilities redispatch in a manner that matches the flexibility of Nalcor resources? Is redispatch permitted for intra-day scheduling changes?

Response IR-19:

The extent to which the Nova Scotia generation is redispatched will be influenced by the amount of energy that Nalcor may flow through Nova Scotia, which generating unit is most economic, and the time of day and year. It is expected that the higher priced market periods in the NorthEast will attract the most volume flow through Nova Scotia. NS Power anticipates most redispatch occurring during the summer in the day, and expects redispatch to diminish through time as coal generation is constrained off by tightening emission limits. The amount of redispatch is best represented as a cost and currently estimated, when required to do so, to be between $6 and $8 million each year. The cost of redispatch is expected to be covered by the Nalcor Surplus Energy revenue.

The majority of the time, the NS facilities will not have to redispatch to allow the energy to flow, as Nalcor will be required to provide a schedule of energy to flow for each hour in a day, allowing NS Power to plan its dispatch with this information as part of the normal generation plan.

There is no mechanism in the Nova Scotia Transmission Utilization Agreement that allows for a change of scheduled flow on an intra-day time frame, therefore there is no obligation to redispatch on the intra-day.

NON-CONFIDENTIAL

Request IR-20:

Please provide estimated costs to NS system of providing redispatch service to Nalcor?

Response IR-20:

Please refer to page 144 lines 19 through 21 and page 145 lines 1 through 3 of the Maritime Link Project Application.

Request IR-21:

Please provide an estimate of the number of days/hours when NSP anticipates encountering transmission constraints

(a) Between Cape Breton and the Mainland

(b) Between Nova Scotia and New Brunswick

(c) Please describe the time of day / time of year when NSP anticipates encountering transmission constraints

(d) Please describe the protocols that will be followed if such transmission constraints are encountered

(e) Please describe any initiatives that NSP plans to alleviate these transmission constraints

Response IR-21:

(a) With the NS Block displacing one coal unit, there is no implication to the transmission constraints between Cape Breton and the mainland for the 153 MW. For the Surplus Energy, the system constraints will be dependent upon the volume of Surplus Energy Nalcor wishes to flow plus the on-island generation and load at any given time. The operation of the PHP mill will have a significant effect, because when the mill is running, there is a low likelihood of constraints in the summer months due to lower system loads in general. In total, the number of days could range from one to twelve, depending upon the circumstances.

(b) None.

(c) Please refer to part (a).

(d) NS Power will use an economic dispatch protocol to determine which is the most economic unconstrained generation source to supply the NS load, reduce the output on the most expensive unit that is constrained, and provide the lowest cost outcome for customers. This protocol is part of the capabilities of the generation dispatch tools used by NS Power and the industry in general.

(e) NS Power is currently studying the extent of the investment required in the transmission system that allows the energy to flow as required by the NSTUA and determine if redispatch can be avoided economically.

Request IR-22:

P135 of the application indicates that the cost models limited the NS portion of Maritime Link electricity to 300 MW before 2025. Why? What potential transmission upgrades are required to retain the full 500 MW capacity in NS? Are there other costs?

Response IR-22:

This limit reflects a transmission constraint that currently limits the amount of energy from the Maritime Link that can remain in Nova Scotia to 300 MW. Please refer to NSDOE IR-8 for information about the potential transmission upgrades. There are no other costs.

Request IR-23:

Please provide technological assumptions behind figure 6-4, pg. 122, "Estimated Range of Capital Investments to Support Large Scale Wind Integration" in Maritime Link Regulatory Application. Provide the breakdown of integration technologies on a per MW and MWh basis, including energy storage, load shifting, gas cycling.

Response IR-23:

Please refer to Synapse IR-18 Attachment 1 and Attachment 2, filed electronically.

Request IR-24:

Please provide a cost estimate of the Maritime Link providing wind integration services.

Response IR-24:

Inherent in the value of the Energy and Capacity Agreement, NS Power has specified load following flexibility in the scheduling of plus or minus 40 MW in 30 minute increments on the NS Block as part of the agreement. Regulation service of plus or minus 20 MW is also available from the Maritime Link subject to approval of rates by the NLPUB.

Request IR-25:

Will the NSPI renewable energy integration study mentioned in Appendix 6.02, pg. 39 consider the impact of the Maritime Link? Please provide any preliminary results from this study.

Response IR-25:

The NS Power Renewable Integration Study is giving consideration to the Maritime Link. Results are not finalized. Please refer to CA IR-22.

Request IR-26:

The "Challenges of Large Scale Wind Integration" whitepaper (appendix 6.02), table 1.2, p. 4 lists construction of the Maritime Link providing services for all 5 challenges mentioned, but only specifically lists the Maritime Link as a recommendation for "Sustaining Planning Reserve Margins". Please outline why the Maritime Link could be recommended to ease the other wind integration challenges mentioned in the paper (System Stability, System Ramping Requirements, Thermal Cycling, Minimum Unit Commitment).

Response IR-26:

Unlike many renewable energy sources, the Maritime Link offers attributes other than just energy to the operation of the electric power system. The whitepaper is an effort to outline some of these key system requirements and offers clarification on how these could be addressed. The subject was approached from the perspective of wind integration challenges rather than Maritime Link advantages.

Since the Maritime Link project offers more than just the physical transmission interconnection, but also energy, capacity, and other attributes, it does contribute to a range of system planning and operating requirements. The Nova Scotia Block is a flexible supply, on-peak to match needs during the highest demand periods, the ramp up and down timing is flexible and after the first five years, will act like a two shifting generation source with no operational downside effects from the operation akin to thermal cycling problems of a thermal unit. The VSC converter technology provides system stability attributes which are presented in EAC IR-7.

Request IR-27:

Please explain why upgrades to the New Brunswick link cannot provide a solution for system stability, system ramping requirements, and minimum unit commitment (Appendix 6.02, p. 4).

Response IR-27:

An upgraded New Brunswick transmission interconnection would enhance system stability. The upgrade to the New Brunswick transmission interconnection on its own would not contribute to ramping and unit commitment challenges without additional contractual services from a third party.

Request IR-28:

Appendix 6.02, Table 3.2 provides a capacity credit for contracted wind and community feedin tariff. Please explain how this capacity credit is determined.

Response IR-28:

NSPI assumed a 20 percent capacity value for Network Resource Integration Service (NRIS) connected wind projects.

Request IR-29:

Will NS wind generation be curtailed in favor purchasing surplus Nalcor energy via the Maritime Link?

(a) If so, who will bear the cost of curtailed wind?

Response IR-29:

The NS Power System Operator will only curtail wind generation when system dispatch cannot accommodate the production while maintaining the stable and reliable operation of the electric system. Situations can arise where energy transactions (purchases) that are contracted hours or days ahead in anticipation of system needs only to find that unexpected system load or other conditions, like wind forecast variance relative to actual wind generation, exist. In such circumstances, system operators are compelled to take whatever action is in the best interests of power system stability and the customer. Export of excess generation is sometimes an option for marketers and system operators in the event of such conditions.

(a) Customers are responsible for the prudently incurred costs of system operation.

Request IR-30:

With the allocation of transmission rights to Nalcor (from NSPI, Bayside and MEPCO), what level of NS wind generation can be supported before requiring wind curtailment to control excess generation?

(a) Will restricted access to export transmission require further export capacity be built?

(b) Will the Maritime link facilitate export of excess wind to the NL system? Under what conditions?

Response IR-30:

NS Power has already begun to experience some instances where wind curtailment has been necessary.

(a) Transmission rights on the NS transmission system will not be allocated to Nalcor but will be held by NS Power pursuant to a service agreement under the OATT. Further export capacity from NS would only be built if it were economically justified.

(b) Maritime Link is capable of flowing excess power back to Newfoundland which could serve as a possible method of wind power storage.

Request IR-31:

What level of wind power does NSP estimate can be placed on the system as a proportion of demand, before being curtailed, under each scenario provided (i.e. NB connection, Maritime Link, indigenous wind)

(a) Please provide any estimates of the amount (GWh and as a % of generation) of curtailed wind generation estimated in each scenario.

Response IR-31:

With the present amount of wind generation on the system (approximately 300 MW installed), NS Power has already begun to experience situations where it was necessary to curtail wind generation to maintain system security. Such situations are expected to become more frequent and more severe with further addition of wind generation on the system.

Please refer to Synapse IR-8 for details.

(a) Please refer to Synapse IR-2.

Request IR-32:

Please provide GWh production, by year, and by resource in all three scenarios in a table and graph. Include GWh production from coal and natural gas in each scenario.

Response IR-32:

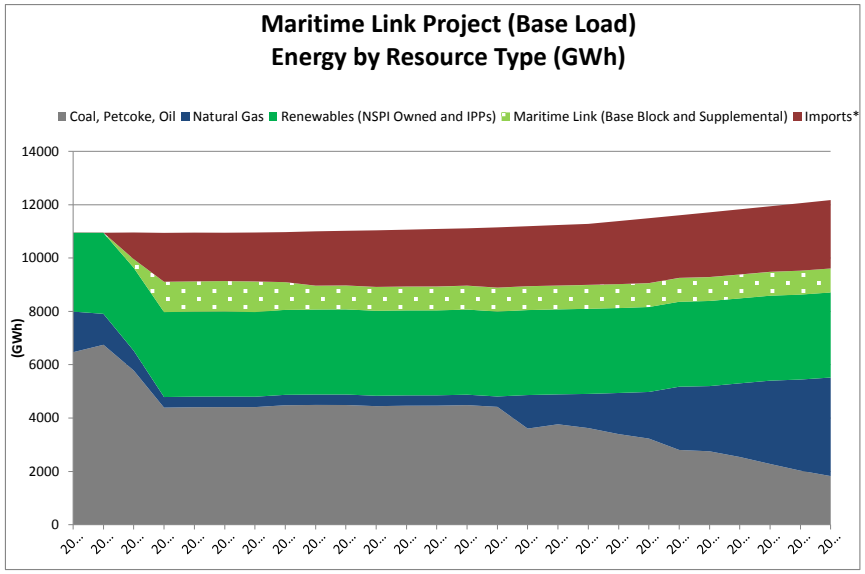
Please refer to Attachment 1.

EAC IR-032 Att 1

Generation by Resource Type
Maritime Link Base Load

GWh	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**
Coal, Petcoke, Oil	6471	6748	5782	4391	4407	4411	4411	4481	4493	4490	4447	4463	4466	4485	4420	3606	3767	3625	3399	3231	2804	2754	2541	2279	2028	1825
Natural Gas	1522	1160	741	397	396	396	389	391	391	393	389	387	387	392	389	1258	1122	1281	1542	1748	2371	2445	2762	3123	3417	3695
Renewables (NSPI Owned and IPPs)	2959	3041	3112	3187	3187	3192	3187	3187	3187	3192	3187	3187	3187	3192	3187	3187	3187	3192	3187	3187	3187	3192	3187	3187	3187	3192
Maritime Link (Base Block and Supplemental)	0	0	323	1135	1135	1139	1135	1038	895	897	895	895	895	897	895	895	895	897	895	895	895	897	895	895	895	897
Imports*	0	0	1001	1834	1829	1812	1836	1876	2037	2049	2122	2131	2156	2149	2259	2248	2268	2286	2364	2433	2346	2426	2444	2457	2530	2565
	10,952	**10,949**	**10,959**	**10,944**	**10,954**	**10,950**	**10,958**	**10,972**	**11,002**	**11,022**	**11,039**	**11,064**	**11,091**	**11,114**	**11,150**	**11,193**	**11,239**	**11,281**	**11,386**	**11,494**	**11,603**	**11,714**	**11,828**	**11,941**	**12,057**	**12,174**

* Imports over the NS-NB Tieline and surplus energy from Maritime Link



* Imports over the NS-NB Tieline and surplus energy from Maritime Link

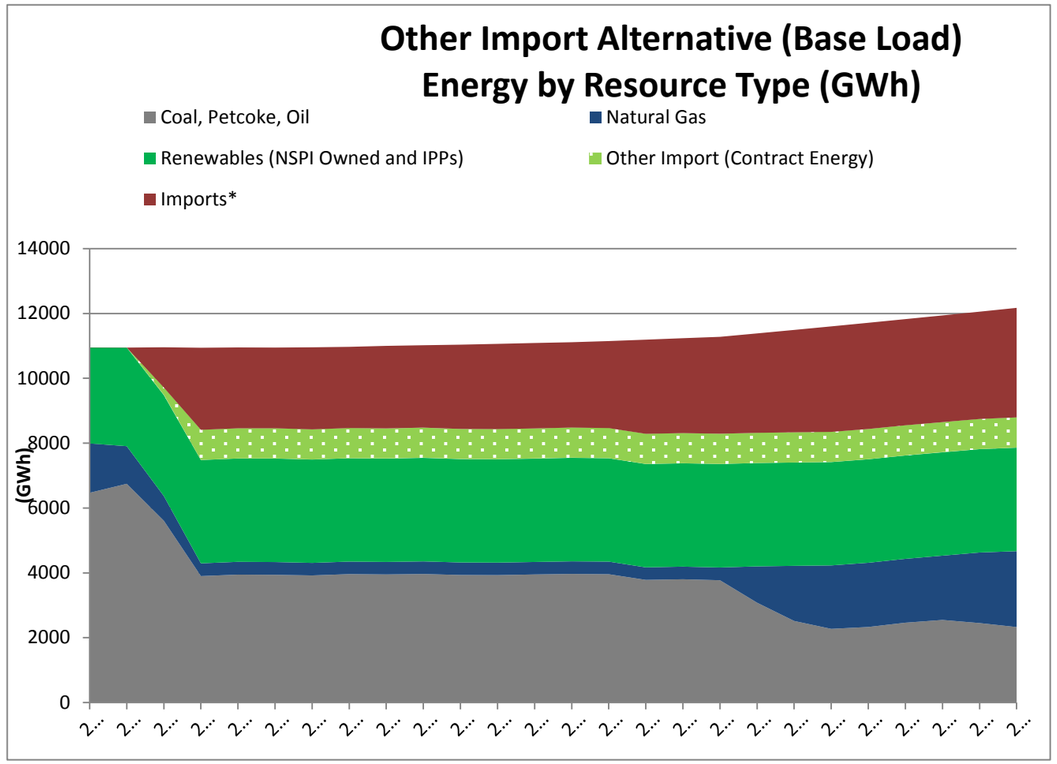
EAC IR-032 Att 1

Generation by Resource Type

Other Import Base Load

GWh	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**
Coal, Petcoke, Oil	6471	6748	5609	3901	3947	3940	3921	3962	3952	3965	3935	3930	3952	3968	3959	3783	3803	3772	3080	2517	2273	2331	2464	2548	2452	2329
Natural Gas	1522	1160	761	393	394	394	387	387	385	389	387	386	385	389	389	387	389	394	1121	1701	1957	1981	1970	1983	2177	2341
Renewables (NSPI Owned and IPPs)	2959	3041	3112	3187	3187	3192	3187	3187	3187	3192	3187	3187	3187	3192	3187	3187	3187	3192	3187	3187	3187	3192	3187	3187	3187	3192
Other Import (Contract Energy)	0	0	235	932	932	934	932	932	932	934	932	932	932	934	932	932	932	934	932	932	932	934	932	932	932	934
Imports*	0	0	1241	2532	2494	2490	2531	2505	2546	2541	2599	2629	2636	2632	2684	2905	2928	2989	3067	3158	3255	3276	3276	3291	3310	3379
	10,952	**10,949**	**10,959**	**10,944**	**10,954**	**10,950**	**10,958**	**10,972**	**11,002**	**11,022**	**11,039**	**11,064**	**11,091**	**11,114**	**11,150**	**11,193**	**11,239**	**11,281**	**11,386**	**11,494**	**11,603**	**11,714**	**11,828**	**11,941**	**12,057**	**12,174**

* Imports over the upgraded NS-NB Tieline.



* Imports over the upgraded NS-NB Tieline.

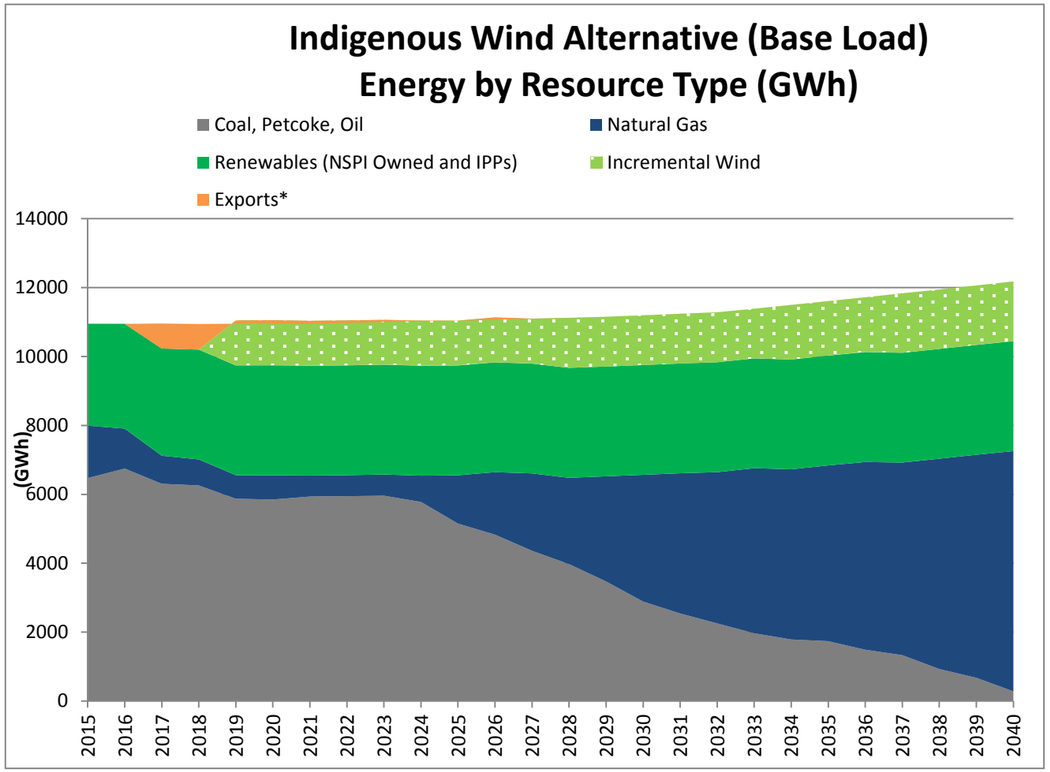
EAC IR-032 Att 1

Generation by Resource Type

Indigenous Wind Base Load

GWh	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**
Coal, Petcoke, Oil	6471	6748	6306	6258	5872	5849	5935	5946	5960	5780	5150	4829	4360	3974	3471	2887	2541	2252	1966	1786	1736	1488	1331	929	674	280
Natural Gas	1522	1160	816	756	684	705	612	610	616	762	1403	1815	2247	2506	3053	3680	4071	4391	4793	4941	5103	5450	5591	6106	6476	6976
Renewables (NSPI Owned and IPPs)	2959	3041	3112	3187	3187	3192	3187	3187	3187	3192	3187	3187	3187	3192	3187	3187	3187	3192	3187	3187	3187	3192	3187	3187	3187	3192
Incremental Wind	0	0	0	0	1303	1308	1303	1303	1303	1308	1303	1303	1303	1449	1443	1443	1443	1449	1443	1583	1583	1589	1724	1724	1724	1730
Exports*	0	0	725	744	-92	-104	-79	-74	-63	-20	-4	-70	-7	-5	-3	-3	-3	-3	-3	-3	-6	-4	-5	-4	-3	-3
	10,952	**10,949**	**10,959**	**10,944**	**10,954**	**10,950**	**10,958**	**10,972**	**11,002**	**11,022**	**11,039**	**11,064**	**11,091**	**11,114**	**11,150**	**11,193**	**11,239**	**11,281**	**11,386**	**11,494**	**11,603**	**11,714**	**11,828**	**11,941**	**12,057**	**12,174**

* Exports over the NS-NB Tieline.



* Exports over the NS-NB Tieline.

NON-CONFIDENTIAL

Request IR-33:

What is the estimated economic life of the natural gas resource options provided (e.g. Appendix 6.03, p. 19)? Please provide retirement dates of new natural gas capacity additions in each scenario.

Response IR-33:

The economic life of the natural gas options is 40 years.

Each natural gas unit that is added in a scenario is assumed to be replaced-in-kind at the end of its 40 year life. These costs are reflected in the Study Period costs for each scenario.

Request IR-34:

What other variable renewable integration technologies are assumed in the indigenous wind scenario?

Response IR-34:

Capital cost estimates for wind integration assumptions included the development of fast-acting/two shifting generation, some expansion of the New Brunswick interconnection (for reliability purposes), other transmission investments, and energy storage/demand control.

NON-CONFIDENTIAL

Request IR-35:

Did the analysis of alternatives include a cost of GHG emissions (i.e. carbon price for those emissions accepted within regulatory constraints)?

(a) If so, please provide the assumptions of the cost per tonne of GHG per year.

(b) Please provide carbon prices assumed in the 2007 and 2009 Integrated Resource Plans

If not, what added cost to all scenarios would result from carbon prices (i.e. Market Price of Offsets) contemplated in the 2009 IRP?

Response IR-35:

(a-b) No, the analysis did not include a carbon price for the emissions within the modeled CO_2 limits.

Please refer to Attachment 1 for the assumed cost of offsets from the 2007 IRP Basic Assumptions.

Please refer to Attachment 2 for the assumed market cost of offsets from the 2009 IRP Update Basic Assumptions.

The calculation regarding carbon prices was not conducted as part of the analysis.

Appendix H

2007 IRP Basic Assumptions
Environmental

CO_2 / Greenhouse Gases

Assumed Cost of Offsets (2006$US / tonne CO_2)			
Year	**Base**	**Low**	**High**
2010	11.50	3.00	17.50
2015	18.50	4.50	32.50
2020	23.50	6.50	41.50
2025	30.00	8.50	53.00

IRP Update
Basic Assumptions - Environmental

CO_2 / Greenhouse Gases

Assumed Market Cost of Offsets (2008 $CDN / tonne CO_2)			
Year	**Low**	**Base**	**High**
2010	15.00	20.00	20.00
2015	19.00	29.00	37.00
2020	24.00	40.00	50.00
2025	31.00	44.00	62.00

NSPI will retain ownership of all GHG benefits resulting from PPAs and NSPI-customer-funded DSM.

Credits/offsets may be required and are available only for target scenarios that are more stringent than Base.

NOVA SCOTIA POWER
An Emera Company

Request IR-36:

Did the analysis of alternatives consider the prospect of new regulations that penalize GHG emissions from fossil fuel purchases on a lifecycle basis?

Response IR-36:

The alternatives considered the existing laws and regulations and the proposed regulations from the federal and provincial governments.

Request IR-37:

Please provide any information available on the life-cycle greenhouse gas emissions of shale gas in general or gas from Marcellus Shale production.

Response IR-37:

NSPML did not did not consider the greenhouse gas emissions of shale gas for this Application.

Request IR-38:

Please provide GWh and MW savings from DSM for each year in high load case.

Response IR-38:

The same level of DSM savings was assumed for both the base and low load cases. These amounts are detailed on p.7 of Appendix 6.03 of the Application.

Request IR-39:

Please provide Annual GWh and MW Load Projections in high and low load cases without DSM.

Response IR-39:

Please refer to NSUARB IR-61 Attachment 1.

NON-CONFIDENTIAL

Request IR-40:

Please describe methodology used to assess long-term DSM forecast values, including estimated avoided costs, cost-effectiveness test used, cost/benefit ratios of tests, assumed levelized cost of efficiency resource.

Response IR-40:

The DSM values used in the forecast are expected savings as provided by Efficiency Nova Scotia Corporation (ENSC) to 2032 and extended to the end of the 2040 planning period by NS Power (included on page 7 of Appendix 6.03 of the Application). Please reference ENSC's most recent DSM plan for the requested details.

NON-CONFIDENTIAL

Request IR-41:

Please provide GWh and MW DSM savings targets in the most recent Integrated Resource Plan, per year.

Response IR-41:

The projected targets from the 2009 IRP are detailed below. Please note the stars in the table make reference to columns not shown below.

TOTAL	Incremental Achievable Potential Demand Savings (MW)	Cumulative Demand Savings (MW)	Incremental Achievable Potential Energy Savings (GWh)	Cumulative Energy Savings (GWh)
2008*	2		16	
2009*	7	9	50	66
2010**	17	26	83	149
2011***	31	57	146	295
2012***	44	101	205	500
2013***	63	164	305	805
2014***	57	222	276	1,081
2015***	57	279	276	1,357
2016***	57	336	276	1,632
2017***	56	392	268	1,901
2018***	54	446	261	2,162
2019***	53	500	255	2,417
2020***	52	551	249	2,666
2021***	51	602	243	2,909
2022***	50	652	238	3,148
2023***	49	700	233	3,381
2024***	48	748	229	3,610
2025***	47	795	225	3,834
2026***	46	841	221	4,055
2027***	45	886	217	4,273
2028***	45	931	214	4,487
2029***	44	976	211	4,698
2030***	44	1,019	209	4,907
2031***	43	1,063	206	5,113
2032***	43	**1,106**	204	**5,317**