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Request IR-1:

The information request refers to REDACTED 2013 GRA DE-03 – DE – 04 Appendix D Testimony of Leonard Crook, ICF International (04-30-2012)

Referring to page 1, Paragraph 2,

By way of background, since 2006, my colleagues and I have provided NSPI with assistance on various aspects of natural gas supply and planning, including:

- ***Evaluating future natural gas needs***
- ***Assessing the benefits of natural gas storage***
- ***Reviewing and commenting on internal NSPI studies about gas market developments in the Maritimes***
- ***Advising on the RFPs for both replacement natural gas supplies and for the resales od excess gas supply***
- ***Evaluating bids submitted under various RFPs***
- ***Advising in supply contract negotiations***
- ***Hedging Analysis***

a) Please provide the qualitative results of any natural gas storage studies assessing the benefits of natural gas storage that are relied upon in Mr. Crook's testimony. Qualitative results may include general recommendations provided, or conclusions reached, in the studies as to the benefits of natural gas storage in general or in The Maritimes.

b) Please provide a description of the hedging analysis undertaken by Mr. Crook.

Response IR-1:

(a) [redacted]

[redacted].

(b) There were two hedging analyses completed by ICFI. One looked at the reduction in value at risk of swing swaps. The other looked at the usefulness of basis hedges to reduce exposure to extreme basis swings.

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Request IR-2:

The information request refers to REDACTED 2013 GRA DE-03 – DE – 04 Appendix D Testimony of Leonard Crook, ICF International (04-30-2012)

Referring to page 2, paragraph 2

Gas-on-gas competition manifests itself with trading (buying and selling gas) at market centres or trading "hubs" where buyers and sellers conduct transactions. There are a number of types of transactions in or around these hubs. At the core are arms-length transactions for fixed volumes of gas. Most often, these transactions are for a single day, with trade occurring on the day before the gas is delivered. There are also monthly transactions where a daily volume of gas is bought or sold for delivery on every day of the following month.

And to page 4, footnote 1

In addition to fixed price and indexed gas transactions, there are also transactions that are customized to the specific needs of the buyer or seller. One such transaction is a "swing volume" transaction where a minimum and maximum daily volume is specified and one of the parties, generally the buyer, has the right to take an amount of gas each day that is between the maximum and the minimum quantity. Often swing volumes are combined with a fixed or "base" volume in a single contract. Since the buy is receiving an "option" to vary a volume of gas, there is generally a premium above the price paid for the fix volumes of gas associated with the swing service.

And to page 6 paragraph 3

To elaborate on this point, NSPI's gas purchasing strategy has focused on flexibility to ensure that it has enough but no more gas than is required to meet the burn at Tufts Cove. This has been done by layering contracts with different suppliers and by relying on daily markets to fill in the gaps. Within the contracts themselves, there are different tranches of supply at different prices and delivery requirements that further allow NSPI to tailor the supply to the expected burn. Furthermore, the flexibility also allows NSPI to respond quickly to price changes – using more gas when the price is low, for example.

a) Please provide a general description of NSPI's gas purchase transactions.

b) Does NSPI purchase gas on a daily basis or on a monthly basis or a combination thereof?

c) Does NSPI purchase swing volumes?

d) Do swing volumes allow for variances in deliveries during the day of delivery?

Response IR-2:

(a-b) NS Power purchases gas on a long-term, monthly and daily basis in compliance with the guidelines outlined in NS Power's Fuel Manual.

(c) Yes.

(d) No.

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Request IR-3:

Referring to REDACTED 2013 GRA DE-03 - DE-04 Appendix B Page 8 of 13, lines 1 to 5:
We manage financial exposure to changes in the market price of HFO and natural gas through the use of swaps. The HFO and natural gas prices in this application are produced using forward price curves and in-place hedges.
And to REDACTED 2013 GRA DE-03 - DE-04 Appendix B Page 8 footnote 2,
Swap contracts are financial instruments used to lower volatility in pricing terms for a supply contract.

a) Is Mr. Crook aware of any natural gas swap contracts that NSPI has put in place?
b) If so, please describe in general terms the nature of the natural gas swap contracts entered into by NSPI? For example, were any natural gas swap contracts fixed for floating swaps?
c) Is Mr. Crook aware of any studies that may have been performed internally at NSPI or externally to determine if the swap contracts entered into by NSPI achieved the goal of "lower volatility in pricing terms for the supply contract"?
d) Has Mr. Crook ever provided an opinion to NSPI as to the effectiveness of swap contracts in achieving lower price volatility for natural gas supply contracts? If so, please provide Mr. Crook's opinion.
e) Has Mr. Crook or NSPI ever analyzed the respective financial benefits between swap contracts and natural gas storage as alternative methods to take reduce volatility and natural gas price levels in natural gas supply contracts? If so, please provide the results of such analysis.

Response IR-3:

(a) [redacted].

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(b) [redacted].

(c-d) Please refer to Alton IR-1(b).

(e) No.

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Request IR-4:

The information request refers to REDACTED 2013 GRA DE-03 – DE – 04 Appendix D Testimony of Leonard Crook, ICF International (04-30-2012)

Referring to page 3, paragraph 1

Prices at these hubs reflect local and regional supply/demand balances which are in turn influenced by pipeline capacity to and from these locations

And to page 3, paragraph 2

(Gas prices have a seasonal pricing pattern because so much of the gas is used for heating: this also causes prices in many locations to move in a similar pattern)

And to page 3 paragraph 3

Strong demand in a region, due for example to a cold front affecting that region can cause gas prices to spike relative to other hubs which may not be influenced by the cold front. Pipeline capacity into a region affects the ability of supply to reach the market and has an influence on prices when pipes are constrained due either to an outage or very strong demand relative to pipeline capacity.

And to page 4, paragraph 4

One of the hubs with price reporting nearest and most relevant to NSPI is Dracut, Massachusetts, where M&NP-US meets Tennessee Gas Pipeline (TGP,) near Boston. NSPI's current gas contracts are priced with referenced to daily gas prices at Dracut.

And to page 14, paragraphs 2 and 3

Despite lower gas prices, constraints on the pipeline into the Northeast can under some conditions create large price differences between New England, and by extension, Nova Scotia, relative to the rest of the market. These can have significant effect on prices paid by buyers in Nova Scotia. For example in 2010 – 2011 prices at the various New England hubs diverged from the broader North American market more than they normally do. New England prices have typically been at a premium to the broader market due to the distance from supply regions and in the winter due to constrained pipeline capacity and bouts of severe weather.

Thus the basis (i.e. the difference between Henry Hub and New England – represented by the hubs at Dracut, Tennessee Zone 6, Algonquin City gates) typically expands in the winter to reflect the higher demand for gas.

In the winter of 2010-2011, this traditional relationship became exaggerated across the region as gas prices at different times in the winter months diverged far more from Henry Hub than historically has been the case. Buyers in the daily market saw very high prices relative to Henry Hub. This "basis blow-out" appears to have happened for several reasons. First, it was a particularly cold and hard winter, which increased demand. Second, there was a pipeline disruption on TransCanada Pipelines (TCPL) that reduced flows into New York over Iroquois, while there were also some difficulties in getting cargoes into Canaport. Third, the national prices quoted at Henry Hub were influenced by the abundance of gas supplies in the rest of the country such that the usual winter run-up was more moderate than usual. Fourth high levels of storage also moderated prices elsewhere relative to New England.

a) Please provide a ten year history of daily natural gas prices at Dracut, Henry Hub and at a representative Mid-West U.S. hub.

b) Has Dracut pricing reflected the gas price spikes referenced in page 3, paragraph 3?

c) If so, does Mr. Crook agree that price spikes in New England tend to occur more often than other places in North America?

d) Please provide Mr. Crook's opinion on whether or not a natural gas storage system located on the M&NP pipeline system might have assisted NSPI to better manage the effects of the "basis blow-out" referred to on page 14, paragraph 3?

Response IR-4:

(a) NS Power has not prepared this information as part of this Application. This information is available through a subscription to Platt's Gas Daily.

(b) Yes.

(c) Mr. Crook has not prepared this information as part of this Application. Mr. Crook's experience is that other markets, like New York (Transco Zone 6 NY) also see price spikes regularly.

(d) Mr. Crook has not prepared this information as part of this Application.

REDACTED

Request IR-5:

The information request refers to REDACTED 2013 GRA DE-03 – DE – 04 Appendix D Testimony of Leonard Crook, ICF International (04-30-2012)

Referring to pages 8, 9, 10, 11, 12, and 13, Mr. Crook describes the international LNG market, the decline of gas supply from SOEP and the uncertainty surrounding the Deep Panuke gas supply.

a) Is Mr. Crook suggesting that NSPI may have to purchase more gas supply on the international LNG market due to declining natural gas supplies in The Maritimes?

b) If so, what are the implications for the prices of natural gas that NSPI might have to pay in the future?

c) Does Mr. Crook have an opinion on whether LNG prices will be higher or lower than natural gas prices in North America? If so, please provide that opinion.

Response IR-5:

(a) [redacted].

(b) LNG prices are generally higher than continental North American gas prices.

(c) As long as LNG prices remain linked to oil, and oil prices remain high and as long as North American gas supplies are in surplus, then Mr. Crook believes LNG prices would be higher than domestic gas prices on an annual basis.

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Request IR-6:

The information request refers to REDACTED 2013 GRA DE-03 – DE – 04 Appendix D Testimony of Leonard Crook, ICF International (04-30-2012)

Referring to page 5, paragraph 3

For much of its history as a gas consuming market, the gas supply in New England has come from relatively distant places – the Gulf Coast, the mid-America region and Alberta. In a sense, New England was at the "end of the pipe." The transportation costs over the long distance tended to make New England a high priced market relative to areas closer to supply. This is one reason for the viability of the Distrigas terminal in Everitt. Similarly, economics supporting the development of Nova Scotian gas was possible by the high prevailing prices in New England.

a) Given the declines in SOEP supply and the uncertainty of the Deep Panuke supply described on pages 11, 12 and 13 of Mr. Crook's testimony, would Mr. Crook classify Nova Scotia becoming the "new" end of the pipe?

b) Does Mr. Crook have an opinion on how this occurrence might affect the natural gas price volatility and security of supply for NSPI and its customers?

c) If so what is Mr. Crook's opinion?

Response IR-6:

(a) Mr. Crook believes that absent increases in supply from Sable Offshore Energy Project (SOEP), Nova Scotia could become the new end of the pipe.

(b-c) Mr. Crook has not prepared this information as part of this Application**.**

NON-CONFIDENTIAL

Request IR-7:

The information request refers to REDACTED 2013 GRA DE-03 – DE – 04 Appendix D Testimony of Leonard Crook, ICF International (04-30-2012)

Referring to page 10 paragraph 4

Another feature of the North American market attractive to LNG suppliers is the abundance of storage compared to Europe.

a) Why is the abundance of storage in North America attractive to LNG suppliers?

Response IR-7:

(a) Economic storage provides a place to store gas when market prices are not attractive or when the market cannot otherwise use the LNG that is offloaded.

REDACTED

Request IR-8:

The information request refers to REDACTED 2013 GRA DE-03 – DE – 04 Appendix D Testimony of Leonard Crook, ICF International (04-30-2012)

Referring to Page 11 paragraph 3:

Another trend to be mindful of is the growth in the use of gas in the power sector generally and particularly in New England. Several independent system operators (ISOs) as well as some gas system operators are looking into the interactions between gas and power systems as power assumes a larger role in the gas market. The concerns focus on two areas. First is the ability of gas systems to supply power generators under peak gas demand conditions when power suppliers have always relied on interruptible gas supply and transportation. With higher levels of gas use for power generation, the peak demand can occur on both systems at the same time with firm gas customers having a claim on capacity that power generators do not. Thus there are the implications for reliable power supply. The cure for this is additional pipeline capacity which is costly and may not be recoverable under current ISO rules.

a) **Does Nova Scotia exhibit the same trends as New England with gas fired generation growing?**
b) **Does NSPI use interruptible gas supply for the natural gas it burns at Tufts Cove?**
c) **Does NSPI use interruptible transportation on Maritimes and Northeast Pipeline to deliver the natural gas it burns at Tufts Cove?**
d) **Could NSPI be faced with the same problem of peak gas use for NSPI occurring at the same time as peak demand in the gas market as described in Mr. Crook's testimony?**
e) **If so, are there implications for reliable power supply in Nova Scotia?**
f) **If so, is the cure for this additional pipeline capacity on Maritimes and Northeast Pipeline?**

g) Could a high deliverability gas storage system located on the Halifax lateral of Maritimes and Northeast Pipeline also be a solution to the problem of coincident peaks in gas demand as described in Mr. Crook's testimony?

Response IR-8:

(a) NS Power has seen a growth in the amount of natural gas. In 2008, 10 percent of NS Power's generation was based on natural gas and this increased to 20 percent in 2011. The future use of natural gas in Nova Scotia will depend on a number of factors such as the relative price of gas with compared to other energy sources. As more intermittent renewable generation is added to the Nova Scotia power system, the amount of energy generated from natural gas may be more or less than presently generated.

(b) [redacted].

(c) [redacted].

(d) [redacted].

(e-f) No. Tufts Cove units 1, 2 and 3 can generate electricity using heavy fuel oil.

(g) Mr. Crook has not prepared this information as part of this Application.

NON-CONFIDENTIAL

Request IR-9:

The information request refers to REDACTED 2013 GRA DE-03 – DE – 04 Appendix D Testimony of Leonard Crook, ICF International (04-30-2012)

Referring to page 11 paragraph 4:

The other concern about gas system and power system interaction is the effect of intermittent power generation (wind) and the need for firming power which is almost always gas fired quick start generation. The issue is similar in that these quick start generators, which also provide ancillary services to the grid, can impose large demands on gas systems that may not have the capability to manage the swings absent investment in storage or some other rapidly deployable gas delivery systems.

a) Is Mr. Crook aware of the targets that exist in Nova Scotia to increase the amount of renewable energy generation in the province?

b) Is Mr. Crook aware of NSPI`s historic and proposed growth in wind generation both purchased and self-generated?

c) If so, please provide Mr. Crook's opinion, if any, on the need for investments in storage or other rapidly deployable gas delivery systems to manage the large demand swings that may occur in Nova Scotia as a result of the use of more intermittent power generation?

Response IR-9:

(a-b) Mr. Crook is aware that there is an increasing amount of renewable energy that is being added to Nova Scotia's electrical system as a result of the Renewable Electricity Standard.

(c) Mr. Crook has not conducted this specific study. Mr. Crook is aware that NS Power is undertaking a study to understand that the impact of the increase in renewable energy on the electrical system in Nova Scotia.

NON-CONFIDENTIAL

Request IR-10:

The information request refers to REDACTED 2013 GRA DE-03 – DE – 04 Appendix D Testimony of Leonard Crook, ICF International (04-30-2012)

Referring to page 15, first paragraph:

Fourth, high levels of storage also moderated prices elsewhere relative to New England.

a) Please provide an explanation for why high levels of storage moderated prices elsewhere in North America but not New England.

b) Please confirm that natural gas prices in The Maritimes are tied to New England gas prices.

c) Does Mr. Crook agree that natural gas storage located in The Maritimes would have a similar moderating effect on natural gas prices in New England, and hence Nova Scotia?

Response IR-10:

(a) New England has no conventional underground storage.

(b) Confirmed.

(c) In Mr. Crook's opinion, the degree of moderation would depend on the size of the storage, storage costs, operating rules and the availability and cost of adequate pipeline transportation between the storage and the New England market.

NON-CONFIDENTIAL

Request IR-11:

The information request refers to REDACTED 2013 GRA DE-03 – DE – 04 Appendix D Testimony of Leonard Crook, ICF International (04-30-2012)

Referring to pages 15 last paragraph and 16, first paragraph:
The* REDACTED *structure for the 2013 – 2014 period is based on the recent bid prices received by NSPI for the 2011-2012 winter and spring which I discussed previously. Whether this is a reasonable price structure depends on future developments at SOEP and Deep Panuke.* REDACTED. *Moreover, if there is a more normal winter, gas prices could be stronger and we could see congestion on pipelines into New England. Under these conditions, one might expect something closer to the* REDACTED *I described.

a) Is Mr. Crook concerned that another "basis blow-out" might occur during the period 2013 – 2014?

b) If so, would Mr. Crook recommend that NSPI enter into a storage contract, were such a service available, to mitigate the potential effects of "basis blow-outs"?

Response IR-11:

(a) The previous basis blow-out occurred due to a combination of severe weather, pipeline failure, and mild weather elsewhere coupled with abundant gas supplies available at Henry Hub. All of this could happen again.

(b) Mr. Crook has not prepared this information as part of this Application.