[redacted]

From: [redacted]
Sent: February 26, 2012 11:19 PM
To: PUB Muskrat Falls Review
Subject: Comments on Muskrat Falls
Attachments: Both Sides of Muskrat 2.doc

Dear Madame or Sir

Please accept my analysis on the Muskrat Falls power project. I will attach a Word document as well as the text pasted below.

Regards

[redacted]

The following is a look at the complicated Muskrat Falls issue from a pencil and paper plus simple arithmetic perspective. It is the Warren Buffett approach whereby he attempts to understand what is going on with the business and then does some basic arithmetic calculations to see if the investment meets his smell test. If it passes these two tests then it can be further investigated by complicated economic modeling, however, the decision is largely made.

Muskrat Falls has evolved into an adversarial and somewhat political issue whereby both sides are ready to point out holes in the opposition to score points but will not acknowledge any of the strengths of the other side. This is unfortunate as there is no right or wrong answer. It is not political. It is a highly strategic business decision which given its size, can have significant implications for the future of the province.

Case Against Muskrat Falls

Dr Jim Feehan looked at the issue from a classical pragmatic point of view. Identify the source of the issue / problem and attempt to solve that directly while matching expenditures to expected revenues. This type of approach is generally more conservative and will prevent any catastrophic failures but may not position the province for a giant leap forward. The problem, as he states in his CD Howe Institute paper, is the high winter consumption which leads to increased usage of the Holyrood generating station for which the current costs are about 30% higher than the selling price to consumers. In order to address this problem instigate a user pay system which increases the winter and peak period electricity rates by 30% to discourage consumption. The market will respond with more energy efficiency, more efficient heating systems, alternate heating systems and switch non essential consumption to off peak hours.

The smaller increases in load could be handled by a combination of on-island solutions of small hydro, wind and other initiatives. The combination would address the current problem at low risk and would delay the massive expenditure on Muskrat Falls until there is a larger demand on the island, Labrador industrial needs and a better market on the mainland for the excess power. It is a case of trying to best match the investment to the market needs. It should also enter into the thought process of the looming 2041 period in 29 years when the province takes control over the whole upper Churchill power (5,600 MW).

Dr Feehan was heavily criticized for essentially pricing consumers into the cold. However, in fairness, he was only proposing a 30% increase now in winter and peak periods whereas Nalcor is proposing a phased in 37% increase between now and 2017 until Muskrat comes on stream. This is still below the costs of Muskrat so the rate will slowly escalate by .8% per annum which is lower the expected consumer price index rise of 2% but higher than their actual cost increase because the beauty of hydro is that it is largely a fixed cost into the future and will be very cheap in 35 years when the loans are repaid and Nalcor reclaims all the energy produced.

The scary part of Muskrat Falls to the opposition is the price and the large debt that comes with it. The published costs for Muskrat Falls based upon an 8% return is 7.5 cents for generation in Labrador plus 6.8 cents for delivery to the province for a total delivered cost to the island of 14.3 cents. This is based on all the energy produced from the project, 4873 Giga-Watt-Hours (Gwh). The estimated requirement for the island in 2017 is 2000 Gwh which is only 41% of the production. Twenty per cent of the production will go to Nova Scotia for 35 years in exchange for building the link to the mainland plus providing about $600 million towards other costs. The link will handle up to 900 MW and Nova Scotia will only have need for about 160 MW. The remaining 39% of the energy will be sold wherever possible although for the purposes of the Muskrat debate Nalcor has not assigned any value to it.

Looking at the price of Muskrat Falls power to the island in 2017 from an incremental cost perspective is daunting. The published costs are 14.3 cents but the requirement is only 41% and no revenue is received from 20% of the power for 35 years and no value is assigned to the remaining 39% because no firm markets have been negotiated to date. Doing the arithmetic, (14.3/0.41), provides an incremental cost of 35 cents which is much higher than any major production in North America except for small isolated grids. The blended cost to the consumer is still within the published consumer price increases that build towards 37% and increase thereafter by 0.8%. The arithmetic is relatively simple. Eighty per cent of the island production will be made up from low cost existing hydro power that is now sold for 9.5 cents and 20% from the more expensive Muskrat Falls power (9.5 cents * 0.8 + 35 cents * 0.2 = 14.6 cents). Note that these are approximate numbers. As more and more Muskrat power is used, the incremental cost will go down while the selling price to consumers will be rising by 0.8% which is less than half of inflation.

The bottom line for those that are against or at least very worried about Muskrat Falls is that those prices above are only based on a 15% cost overrun at a time when Labrador's construction economy is overheated and a demand on the island that may not happen if there is any faltering of the economy or cut backs in usage due to the planned increases in rates. What happens if there is a 50% overrun and the island demand does not grow as expected? The current mainland electricity rates are being driven down by cheap shale gas prices whereby new plants are springing up in the US and producing electricity for 6 cents. Natural gas is great for peaking power that is only produced when needed and blends well with renewables of wind (less than 10 cents at good locations) and solar (moving downwards towards 10 cents with newer technologies at good locations). Surely, this province could find some incremental power cheaper than Muskrat Falls.

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Nalcor's numbers are very conservative in that they do not include any revenue for sale of excess power and the rate of return is set at 8% at a time when prime is 3% which can be obtained with a Federal loan guarantee. The rate of return assigned to the Utility will not form part of this discussion but suffice to say that Nalcor is owned by the people of the province so any excess can be returned to the people. Therefore, this discussion will focus on the bare minimum requirements to make the economic and strategic argument. Nalcor does not assign any revenue to Greenhouse Gas (GHG) credits for good reason as no current value is known. There is expected to be some value in the future.

The 900 MW link to the mainland North America offers huge operational advantages and efficiencies to balance the load in the province and obtain revenue from otherwise wasted resources. Periodically, the reservoirs for the island's 1250 MW of hydro power fill to capacity when that amount of power is not needed so the water simply spills over the top. Last year it was estimated that upwards of 700 Gwh of potential energy was dumped over the top of the reservoirs (that's bout 6% of the time or 23 full days). The island of Newfoundland is one of the best locations in the world to install wind power due to the intensity and constant wind (called capacity factor) and also the availability of low cost sites. The

link to the mainland would make the possibility for more capacity on the island assuming that rates start to rise again after the shale gas loses some of its luster for reasons that will be explained below.

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The Muskrat Falls project will establish long term strategic infrastructure for the province which will be valuable on the balance sheet for the next 100 years. It will also significantly contribute towards Canada's contribution for a reduction in GHGs. In addition, there are significant mineral deposits in Labrador which will require substantial amounts of power to develop. The industrial development of these resources will generate significant revenues for the province.

The project which includes a 15% overrun estimate is expected to cost $5 Billion plus $1.2 Billion for the link to Nova Scotia for a total cost of $6.2 Billion. The financing will be based upon $1.8 B from Nova Scotia and $4.4 B from Nalcor. Any overruns on the link to Nova Scotia will be covered by them and any overruns on the rest of the project will be covered by Nalcor. Looking at the Nalcor portion, the interest costs at Prime (3%) with a Federal Loan guarantee would be $132 million. The mortgage payment based upon a 35 year mortgage at 3% would be $203 million. The incremental costs to maintain the integrity of those assets, allowing for periodic ice storm to knock down power lines and other storms to cause damage to dams and other infrastructure as well as general maintenance would be in the range of ?% or $100 million. Therefore without allowing any pay down on the principal and using a very favourable interest rate, the bare minimum cost would be $232 million or $303 million with principal repayment over 35 years. This would not escalate substantially unless interest rates went up which off course is expected at some point in the future. An 8% interest rate or cost of capital would push that bare minimum number to $452 million for interest only and $475 million with principal included.

Muskrat Falls will produce 4873 Gwh of electricity of which 2000 Gwh will be sold at the outset to island consumers and increased overtime to the full production. Twenty per cent (975 Gwh) will go to Nova Scotia in exchange for their investment and the remaining 1898 Gwh is available for sale. In order to evaluate the opportunity, it is best to look at the potential for power sales outside the province first. Without having a ready market assume 4 cents at the NS border which would be about 6 or 7 cents delivered to the US. The revenue from Muskrat would be $76 million for surplus power and $28 million for the surplus island power for a round figure total of about $100 million. Over time as more energy demand is required in the province this revenue would substantially increase. Subtracting this revenue from the bare minimum costs leaves $132 million to be made up from local rate payers to reach the bare minimum requirement. If the Muskrat power was sold to island consumers at the current rate of 10.5 cents (actual 8.5 cents to Nalcor and 2 cents for Newfoundland Power to distribute) then that would raise an additional $170 million which would be about $30 million short to cover the 35 year mortgage but about $40 million more than just the interest. Allowing for a 37% increase for the complete load will raise an additional approximately $275 million per year which would more than handle all the costs.

There are really only 3 main factors: the capital cost, the cost of capital and the market for the power. Each of these is huge in the evaluation. Without a loan guarantee would add a significant amount to the costs as each interest point (100 basis points) adds $44 million. According to the Manitoba Hydro report, the project could go as much as 50% over budget. Doing the arithmetic for Nalcor's portion where 115% is equal to $5 B, the project could go to $6.5 B with the overrun and increase Nalcor's financing needs from $4.4 B to $5.9 B. The incremental $1.5 B may not fit under the loan guarantee and would also add risk to the lenders so there would likely be a substantial premium placed on it in the range of an additional $100 million or more in interest at today's low rates.

In 2010, the Holyrood plant burned $100 million in fuel (1.35 million barrels). It is assumed that 2011 consumption was a little higher at $110 million due to fuel price increases and a small increase in demand. Note that the Holyrood plant burned over 3 million barrels when all three paper mills were operating and Nalcor is projecting that the demand will rise o that level again which would mean an estimated cost of approximately $300 million for oil at Holyrood. The Vale smelter will add substantially to the need for power but if Corner Brook Pulp and Paper is closed it changes the need again.

Case for Natural Gas

The primary reason behind much of the concern about the Muskrat Falls project is the dramatic change in the market cost for natural gas and how that has affected electricity prices. Natural gas trades in the US based upon a per unit of a million British Thermal Units (MMBTU) and sometimes referred to as per thousand standard cubic feet (MCF) which is within a couple of percentage points of being equal. In order to convert this to potential energy in a barrel of oil multiply by 5.8 (5.8 MMBTUs of gas = 1 barrel of oil equivalent). However, in applying this energy conversion to the generation of electricity and particularly to the Holyrood oil fired generation plant, one has to take into account the efficiency factor. Holyrood is 35% efficient whereas a new combined cycle natural gas plant is 61% efficient. Applying the efficiency change makes the equivalent conversion factor 3.33. The current price for natural gas is $2.50 per MMBTU so that would compare to paying $8.30 per barrel for oil for Holyrood which would be a fuel only cost of 1.4 cents (at 61% efficiency) per kilowatt-hour of electricity produced.

The current price for natural gas is the lowest price in about 10 years and it is expected to rebound somewhat over time but is expected to remain relatively low in comparison to oil for a long period of time due the large volumes of shale gas that have been discovered. The issue with natural gas is delivery and storage. The energy density is much lower than oil and thus much more difficult to ship. If the source of the gas is located near a major market, it is shipped through a pipeline and over time a network of pipelines is connected to service a large big market region. For long distance shipping, the gas is cooled and liquefied into Liquefied Natural Gas (LNG) and shipped by tankers around the world. The ypical cost for this shipping is between $2 and $3 per MMBTU depending upon distance and volumes. A current spot delivered price to Newfoundland would be between $4.50 and $5.50 or equal to 2.5 to 3 cents per kwh for fuel only. This, however, is not the best way to estimate natural gas costs because it is difficult to secure deliveries based upon the spot price and much of the world's supplies are shipped on the basis of longer term contracts. For example current delivered costs in Asia are in the range of $12 based upon contracts and as high as $16.50 in Japan. There is also a supply / demand system in play with LNG which is partially independent of the spot price for natural gas. New build suppliers are looking to get into the market in the $10 to $12 per MMBTU range which would equate to 5.6 to 6.7 cents for fuel only. This would be a fair estimate for long term supply with a small escalation.

The cost to build a new natural gas electricity plant is well established at about $1 million per megawatt or $500 million to replace Holyrood. An import terminal to receive and store LNG in sufficient volumes to operate the equivalent of Holyrood could be done for about $500 million. The current operations would only require about the equivalent of 1.5 tanker loads of LNG per year (4.5 BCF) growing to 4 tanker loads per year based upon the demand estimate done by Nalcor. The most economical way is to reduce the storage requirement is to do a partial drop from tankers enroute from the North Sea to Boston and pass within 200 nautical miles of the NL coast. The import terminal estimate is based upon a proration of the Newfoundland LNG estimate of $1.4 Billion to build a large transshipment terminal in Arnolds Cove which could handle 4 tanker loads per week and the current proposals on the table for an export terminal in Kitimat, British Columbia. The commissioned cost to replace Holyrood could be done for $1 Billion unless some site specific environmental requirement drives costs in which case another site such as Arnolds Cove should be utilized.

The shale gas phenomena has had a major effect on gas prices but most analysts consider that prices will settle in the $6 plus range with LNG delivery in the $10 range. This is mainly due to some of the other factors such as environment effects of fracking and long term energy security will drive US and other region's policy to conserve their supplies through limiting production and not allowing the export of shale gas. Even at $5 per MMBTU at the production site, the current known reserves for the 3 projects offshore NL would gross $25 Billion. This is revenue that can be extracted after all the capital is paid down for the rig. A supply price to Placentia Bay of $10 to $12 per MMBTU could be sufficient to

revisit the pipeline option. A landed supply of natural gas at that price would also provide a strong economic stimulus to the province in both gas revenues and industrial activity using natural gas.

The delivered cost of electricity for an on island natural gas option as per the above details could be in the 12 cent range for commencement in 2015 with a small long term escalation in the range of 0.8% as proposed for Muskrat Falls. The best way to ascertain whether this can be achieved would be to ask for and provide some study financing for large reputable players to respond to a request for proposals to deliver power for 25 years based upon purchase contracts of the demand forecast by Nalcor.

Other Factors

The key to going beyond debates about numbers between economists and others could be to put out a request for proposals for power. Back in the early ninety's, NL Hydro, at the request of the government, put out a request for 50 MW of non-utility generated (NUG) power. There were a lot of potential projects that surfaced including burning waste gas distillates at Come-By-Chance at 30 MW, a peat plant, 80 MW, in Stephenville and a large number of small hydro plants. If such a request were made at this time to replace Holyrood, there could be several competing bids to build and operate a LNG plant. Another possibility is to put a gas plant on one of the rigs and run a cable to shore.

Managing an electrical grid is very complicated and challenging. Making sure that sufficient electrical power is available for every possible moment when it is required throughout the year is the biggest and most expensive operational issue. In the case of hydro power it provides the benefit of being able to match the production of electricity to the time when it is needed. This works to a point but the reservoirs storing the water must be replenished with rain or snow melt in order to keep operating. The Labrador reservoirs are frozen over for much of the winter and the precipitation falls in the form of snow which will not contribute towards the volume of water until it melts. Therefore, Muskrat Falls will not be able to put out full power all winter. Similarly, however for a shorter time frame, the hydro on the island is not able to put out full power all winter. This situation can cause a deficiency of power to provide electric heat and also to power some of the industrial loads throughout the winter. Even if Muskrat Falls is constructed, it is likely that further thermal energy will be required from either Holyrood or other replacements to carry the complete period over the winter.

One of the key factors in favour of transferring (selling) power to the US from NL is that their peak requirements are during the summer air conditioning period whereas NL has more need during the heating season.

Discussion & Summary

The strategic view from this brief is to cover the interest cost for the Muskrat Falls investment from external power sales in the early years and overtime pay down the capital in future years when revenue is increased from escalation of sales price but expenditures are fixed for the long term. This appears to be achievable if Muskrat Falls is brought in on budget with a loan guarantee and there is a market at 5 cents or better for the surplus electricity. Even if none of the capital was repaid for 35 years, a $5 Billion debt on a long term asset that is producing a valuable commodity would not be a significant burden at that time. The province would be plugged into the North American grid as well as to Labrador for Upper Churchill power when that contract expires in 29 years. The incremental costs of power would be contained and allow for industrial development in Labrador.

The Federal loan guarantee is the most important factor in the Muskrat Falls option. Without it, there would be a minimum of an additional $88 to $120 million in interest payments leaving the province. That is assuming that the Province is the co-signature on the loans. If Nalcor were to approach the Bond holders on their own as a Crown Corporation, the additional financing costs could be substantially increased. If the province is the co-signature on the loans, then an expert opinion should be obtained on whether this approximate increase of 60% in debt would have an impact on the province's future cost of capital in the event that deficit financing is required. The province could face some difficult finance costs in the future.

Without the loan guarantee, the natural gas option appears to be a much better and safer option in a comparison to Muskrat Falls. If the province wants to get bold and enter into a new era then an attractive option would be to work a deal with the offshore operators and build a pipeline to shore and connect this province into the offshore natural gas. The industrial development opportunities would escalate with the availability of accessible natural gas. Natural gas production should be a part of the future of this province for centuries to come when all sources are considered including offshore Labrador and the Arctic. The cost of electric heat with or without Muskrat Falls is very high in relation to natural gas. This can be a longer term detriment when competing with other jurisdictions for business and people. If the cost to heat a home is $4,000 per year here versus $1,000 elsewhere then that is factored into the cost of living. Industrial fabrication is also made more economical with natural gas.

Given that there will be an on-going need for some additional back-up power during the winter months some of the other options for electric heat and conservation should be highly encouraged. A concerted effort should be made to install heat pumps in many residential and commercial locations and even utilize the wood pellet heating systems in much of the province. Wood pellets could also provide an economic stimulus to rural parts of the province. Holyrood will need to be replaced eventually and it may be time to do a small natural gas plant (150 MW to 170 MW) module through a Request For Proposal (RFP) process. The plant could be on stream within a couple of years and would largely pay for itself in fuel savings even before Muskrat would come on stream. It may be sufficient with all the other sources to pick up the additional winter needs over the long term.

As stated in the outset, there is no right answer or wrong answer, just a business and strategic decision on the best way forward for the province. Typically huge game changing decisions are made when the market analysis and strategic analysis is completed. In this situation, Nalcor has chosen a path forward without a known market for 39% of the energy for the first number of years. Based upon their analysis, the project can be made economic through an increase in local rates and any revenue derived from the surplus energy could be gravy to be returned to the rate payer or invested at the discretion of the Government of NL. This chosen strategic path could be due to the fact that the current electricity markets are in decline in price and any long term contracts signed would be at deep discounts. Perhaps better to sell on the spot markets at higher rates even if some of the energy is dumped over the reservoirs in the short term and then sign contracts when the market is more favourable. They are also factoring in that in their estimation the province will eventually need all of the energy.

The above brief attempts to provide a basic simple analysis on both sides of a very complex mega project. Part of the issue may point to a need to change the communication plan on this project. The other part of the issue is the very real need to fully evaluate all the options given the dramatic change in market conditions in the past year and a half.

The brief is strictly my own interpretation and is not representative of any group or interest.

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Muskrat Falls will produce 4873 Gwh of electricity of which 2000 Gwh will be sold at the outset to island consumers and increased overtime to the full production. Twenty per cent (975 Gwh) will go to Nova Scotia in exchange for their investment and the remaining 1898 Gwh is available for sale. In order to evaluate the opportunity, it is best to look at the potential for power sales outside the province first. Without having a ready market assume 4 cents at the NS border which would be about 6 or 7 cents delivered to the US. The revenue from Muskrat would be $76 million for surplus power and $28 million for the surplus island power for a round figure total of about $100 million. Over time as more energy demand is required in the province this revenue would substantially increase. Subtracting this revenue from the bare minimum costs leaves $132 million to be made up from local rate payers to reach the bare minimum requirement. If the Muskrat power was sold to island consumers at the current rate of

10.5 cents (actual 8.5 cents to Nalcor and 2 cents for Newfoundland Power to distribute) then that would raise an additional $170 million which would be about $30 million short to cover the 35 year mortgage but about $40 million more than just the interest. Allowing for a 37% increase for the complete load will raise an additional approximately $275 million per year which would more than handle all the costs.

There are really only 3 main factors: the capital cost, the cost of capital and the market for the power. Each of these is huge in the evaluation. Without a loan guarantee would add a significant amount to the costs as each interest point (100 basis points) adds $44 million. According to the Manitoba Hydro report, the project could go as much as 50% over budget. Doing the arithmetic for Nalcor's portion where 115% is equal to $5 B, the project could go to $6.5 B with the overrun and increase Nalcor's financing needs from $4.4 B to $5.9 B. The incremental $1.5 B may not fit under the loan guarantee and would also add risk to the lenders so there would likely be a substantial premium placed on it in the range of an additional $100 million or more in interest at today's low rates.

In 2010, the Holyrood plant burned $100 million in fuel (1.35 million barrels). It is assumed that 2011 consumption was a little higher at $110 million due to fuel price increases and a small increase in demand. Note that the Holyrood plant burned over 3 million barrels when all three paper mills were operating and Nalcor is projecting that the demand will rise to that level again which would mean an estimated cost of approximately $300 million for oil at Holyrood. The Vale smelter will add substantially to the need for power but if Corner Brook Pulp and Paper is closed it changes the need again.

Case for Natural Gas

The primary reason behind much of the concern about the Muskrat Falls project is the dramatic change in the market cost for natural gas and how that has affected electricity prices. Natural gas trades in the US based upon a per unit of a million British Thermal Units (MMBTU) and sometimes referred to as per thousand standard cubic feet (MCF) which is within a couple of percentage points of being equal. In order to convert this to potential energy in a barrel of oil multiply by 5.8 (5.8 MMBTUs of gas = 1 barrel of oil equivalent). However, in applying this energy conversion to the generation of electricity and particularly to the Holyrood oil fired generation plant, one has to take into account the efficiency factor. Holyrood is 35% efficient whereas a new combined cycle natural gas plant is 61% efficient. Applying the efficiency change makes the equivalent conversion factor 3.33. The current price for natural gas is $2.50 per MMBTU so that would compare to paying $8.30 per barrel for oil for Holyrood which would be a fuel only cost of 1.4 cents (at 61% efficiency) per kilowatt-hour of electricity produced.

The current price for natural gas is the lowest price in about 10 years and it is expected to rebound somewhat over time but is expected to remain relatively low in comparison to oil for a long period of time due the large volumes of shale gas that have been discovered. The issue with natural gas is delivery and storage. The energy density is much lower than oil and thus much more difficult to ship. If the source of the gas is located near a major market, it is shipped through a pipeline and over time a network of pipelines is connected to service a large big market region. For long distance shipping, the gas is cooled and liquefied into Liquefied Natural Gas (LNG) and shipped by tankers around the world. The typical cost for this shipping is between $2 and $3 per MMBTU depending upon distance and volumes. A current spot delivered price to Newfoundland would be between $4.50 and $5.50 or equal to 2.5 to 3 cents per kwh for fuel only. This, however, is not the best way to estimate natural gas costs because it is difficult to secure deliveries based upon the spot price and much of the world's supplies are

shipped on the basis of longer term contracts. For example current delivered costs in Asia are in the range of $12 based upon contracts and as high as $16.50 in Japan. There is also a supply / demand system in play with LNG which is partially independent of the spot price for natural gas. New build suppliers are looking to get into the market in the $10 to $12 per MMBTU range which would equate to 5.6 to 6.7 cents for fuel only. This would be a fair estimate for long term supply with a small escalation.

The cost to build a new natural gas electricity plant is well established at about $1 million per megawatt or $500 million to replace Holyrood. An import terminal to receive and store LNG in sufficient volumes to operate the equivalent of Holyrood could be done for about $500 million. The current operations would only require about the equivalent of 1.5 tanker loads of LNG per year (4.5 BCF) growing to 4 tanker loads per year based upon the demand estimate done by Nalcor. The most economical way is to reduce the storage requirement is to do a partial drop from tankers enroute from the North Sea to Boston and pass within 200 nautical miles of the NL coast. The import terminal estimate is based upon a proration of the Newfoundland LNG estimate of $1.4 Billion to build a large transshipment terminal in Arnolds Cove which could handle 4 tanker loads per week and the current proposals on the table for an export terminal in Kitimat, British Columbia. The commissioned cost to replace Holyrood could be done for $1 Billion unless some site specific environmental requirement drives costs in which case another site such as Arnolds Cove should be utilized.

The shale gas phenomena has had a major effect on gas prices but most analysts consider that prices will settle in the $6 plus range with LNG delivery in the $10 range. This is mainly due to some of the other factors such as environment effects of fracking and long term energy security will drive US and other region's policy to conserve their supplies through limiting production and not allowing the export of shale gas. Even at $5 per MMBTU at the production site, the current known reserves for the 3 projects offshore NL would gross $25 Billion. This is revenue that can be extracted after all the capital is paid down for the rig. A supply price to Placentia Bay of $10 to $12 per MMBTU could be sufficient to revisit the pipeline option. A landed supply of natural gas at that price would also provide a strong economic stimulus to the province in both gas revenues and industrial activity using natural gas.

The delivered cost of electricity for an on island natural gas option as per the above details could be in the 12 cent range for commencement in 2015 with a small long term escalation in the range of 0.8% as proposed for Muskrat Falls. The best way to ascertain whether this can be achieved would be to ask for and provide some study financing for large reputable players to respond to a request for proposals to deliver power for 25 years based upon purchase contracts of the demand forecast by Nalcor.

Other Factors

The key to going beyond debates about numbers between economists and others could be to put out a request for proposals for power. Back in the early ninety's, NL Hydro, at the request of the government, put out a request for 50 MW of non-utility generated (NUG) power. There were a lot of potential projects that surfaced including burning waste gas distillates at Come-By-Chance at 30 MW, a peat plant, 80 MW, in Stephenville and a large number of small hydro plants. If such a request were made at this time to replace Holyrood, there could be several competing bids to build and operate a LNG plant. Another possibility is to put a gas plant on one of the rigs and run a cable to shore.

Managing an electrical grid is very complicated and challenging. Making sure that sufficient electrical power is available for every possible moment when it is required throughout the year is the biggest and

most expensive operational issue. In the case of hydro power it provides the benefit of being able to match the production of electricity to the time when it is needed. This works to a point but the reservoirs storing the water must be replenished with rain or snow melt in order to keep operating. The Labrador reservoirs are frozen over for much of the winter and the precipitation falls in the form of snow which will not contribute towards the volume of water until it melts. Therefore, Muskrat Falls will not be able to put out full power all winter. Similarly, however for a shorter time frame, the hydro on the island is not able to put out full power all winter. This situation can cause a deficiency of power to provide electric heat and also to power some of the industrial loads throughout the winter. Even if Muskrat Falls is constructed, it is likely that further thermal energy will be required from either Holyrood or other replacements to carry the complete period over the winter.

One of the key factors in favour of transferring (selling) power to the US from NL is that their peak requirements are during the summer air conditioning period whereas NL has more need during the heating season.

Discussion & Summary

The strategic view from this brief is to cover the interest cost for the Muskrat Falls investment from external power sales in the early years and overtime pay down the capital in future years when revenue is increased from escalation of sales price but expenditures are fixed for the long term. This appears to be achievable if Muskrat Falls is brought in on budget with a loan guarantee and there is a market at 5 cents or better for the surplus electricity. Even if none of the capital was repaid for 35 years, a $5 Billion debt on a long term asset that is producing a valuable commodity would not be a significant burden at that time. The province would be plugged into the North American grid as well as to Labrador for Upper Churchill power when that contract expires in 29 years. The incremental costs of power would be contained and allow for industrial development in Labrador.

The Federal loan guarantee is the most important factor in the Muskrat Falls option. Without it, there would be a minimum of an additional $88 to $120 million in interest payments leaving the province. That is assuming that the Province is the co-signature on the loans. If Nalcor were to approach the Bond holders on their own as a Crown Corporation, the additional financing costs could be substantially increased. If the province is the co-signature on the loans, then an expert opinion should be obtained on whether this approximate increase of 60% in debt would have an impact on the province's future cost of capital in the event that deficit financing is required. The province could face some difficult finance costs in the future.

Without the loan guarantee, the natural gas option appears to be a much better and safer option in a comparison to Muskrat Falls. If the province wants to get bold and enter into a new era then an attractive option would be to work a deal with the offshore operators and build a pipeline to shore and connect this province into the offshore natural gas. The industrial development opportunities would escalate with the availability of accessible natural gas. Natural gas production should be a part of the future of this province for centuries to come when all sources are considered including offshore Labrador and the Arctic. The cost of electric heat with or without Muskrat Falls is very high in relation to natural gas. This can be a longer term detriment when competing with other jurisdictions for business and people. If the cost to heat a home is $4,000 per year here versus $1,000 elsewhere then that is factored into the cost of living. Industrial fabrication is also made more economical with natural gas.

Given that there will be an on-going need for some additional back-up power during the winter months some of the other options for electric heat and conservation should be highly encouraged. A concerted effort should be made to install heat pumps in many residential and commercial locations and even utilize the wood pellet heating systems in much of the province. Wood pellets could also provide an economic stimulus to rural parts of the province. Holyrood will need to be replaced eventually and it may be time to do a small natural gas plant (150 MW to 170 MW) module through a Request For Proposal (RFP) process. The plant could be on stream within a couple of years and would largely pay for itself in fuel savings even before Muskrat would come on stream. It may be sufficient with all the other sources to pick up the additional winter needs over the long term.

As stated in the outset, there is no right answer or wrong answer, just a business and strategic decision on the best way forward for the province. Typically huge game changing decisions are made when the market analysis and strategic analysis is completed. In this situation, Nalcor has chosen a path forward without a known market for 39% of the energy for the first number of years. Based upon their analysis, the project can be made economic through an increase in local rates and any revenue derived from the surplus energy could be gravy to be returned to the rate payer or invested at the discretion of the Government of NL. This chosen strategic path could be due to the fact that the current electricity markets are in decline in price and any long term contracts signed would be at deep discounts. Perhaps better to sell on the spot markets at higher rates even if some of the energy is dumped over the reservoirs in the short term and then sign contracts when the market is more favourable. They are also factoring in that in their estimation the province will eventually need all of the energy.

The above brief attempts to provide a basic simple analysis on both sides of a very complex mega project. Part of the issue may point to a need to change the communication plan on this project. The other part of the issue is the very real need to fully evaluate all the options given the dramatic change in market conditions in the past year and a half.

The brief is strictly my own interpretation and is not representative of any group or interest.

[redacted]