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From: [REDACTED]
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To: PUB Muskrat Falls Review
Cc: [REDACTED]
Subject: Muskrat Falls Review - Comments
Attachments: Dr_S_Bruneau_comments_for_the_PUB.pdf

Please find attached my comments related to the viability of natural gas fired power generation for an isolated Island grid.
Thank you

Dr. Stephen E. Bruneau, PhD, P.Eng

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BOARD OF COMMISSIONERS
OF PUBLIC UTILITIES
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Discussion Points - Natural Gas for Island Electrical Generation.

S.Bruneau Feb/2012

Need for new dispatchable power

Estimates of Newfoundland Island demand forecast are a matter of public record, and essentially reflect a modest growth between 1 and 2% per annum compounded going forward. Island thermal generation (primarily the near-end-of-service Holyrood station) is the primary seasonal capacity infill with a relatively low annualized capacity factor between 15 and 30% but with a maximum output approaching 100% capacity. This wide seasonal range suggests limited utility of non-dispatchable energy sources due to the maximization of pre-existing hydro reservoir storage and the unacceptability of water or wind spillage. Ideal replacement of existing thermal generation points to new hydro or new thermal generation for the island.

Relative value of hydroelectricity and natural gas-fired generation

Environmental stewardship suggests that electrical generating options that lower atmospheric emissions of CO₂, NO_x and SO_x (and other particulates) are preferred. The reduction in CO₂ emissions when electrical generation switches to natural gas from fuel oil or coal is typically around 40%. Reductions in the harmful pollutants and particulates are even higher. The benefit of hydro-electric generation in this regard is highest amongst the realistic replacement options though not complete for various Life-Cycle-Analysis reasons. Thus the greatest environmental benefit is realized when hydro power replaces coal or oil-fired generation and much less so when hydro power replaces natural gas fired generation. For most environmental concerns, the jurisdiction in which fuel replacement occurs is irrelevant as the atmosphere is entirely fluid, mixing and non-jurisdictional. Thus where natural gas is available but is not used in favor of hydro power which may otherwise be directed to jurisdictions where coal and oil persist, environmental benefits are not maximized.

Common choice for Islands w/ isolated grids - replace oil & coal with natural gas via pipeline

The successful replacement of oil and coal-fired generation with new gas-fired generation on insular island grids via the construction of a subsea pipeline link has occurred in Tasmania, Tobago, Sardinia, New Zealand, Ireland, Vancouver Island and elsewhere. Costs for new combined cycle dual fuel generation facilities may be inferred from recent construction projects around the world, likewise, pipeline costs may also be estimated on the basis of pipe size, length, depth, pressure/throughput, material specification and special risk mitigating expenses. To the point, the capital and operating costs for a domestic natural gas delivery and power generation system may be estimated from recent infrastructure developments elsewhere and can be shown to be a compelling economical option for electric generation on isolated grids with nearby natural gas resources.

Oil and gas industry growth in Newfoundland and Labrador

Oil production, responsible for the much improved prosperity of the Province, is moving into a mature phase in which declines and tie-ins, explorations and new developments characterize the activities. The financial, technological, regulatory and political risks have subsided to a near routine industry level as far as offshore development, operation and maintenance is concerned. The pioneering and novel technologies and bold leadership required to start the industry here necessitated the focus on oil production alone, especially where open markets for marginal reserves of natural gas were too far away to support the rate of return and net present value required for producer business interest.

Natural gas Industry background in Newfoundland and Labrador

In the late 1990's the Sable offshore energy project (SOEP) was developed. It involved the establishment of a subsea and overland (MNE) gas transmission system from an offshore N.S. gathering system to markets in the US Northeast. Negotiations between industry partners and the governments of NS and NB resulted in certain withdrawal contracts for domestic gas use and/or resale. The success of those contracts and fuel transportation and re-sale arrangements have been such that Nova Scotia now considers Natural Gas to be the primary generation back-up for intermittent renewable energy supplies, it has purchased a significant ownership share of the main transmission MNE pipeline, has invested in other pipelines and is planning significant increased investment in access to natural gas as a key component in its future generation strategy. As one of the key pressures for this they cite the federal government intentions to require thermal coal units to meet GHG emission levels equal to or better than a natural gas combined cycle generating unit.

As a result of the original SOEP-MNE application for gas transmission the NEB received competitor applications for transmission rights. A compelling proposition was advanced by an independent private organization, NAPP (for whom I was regional manager of operations), to use a considerably larger transmission system for the SOEP project so as to make economical the stranded natural gas reserves offshore Newfoundland. The application was rejected as the regulator and province of NS were under considerable pressure by the energy partners of SOEP to not delay the development process. At stake for the province of Newfoundland and Labrador was future natural gas market accessibility and costs. As the producers offshore Newfoundland were focused on the oil-production risks alone there was little appetite for third party meddling in the secondary interest of a gas business – especially with others collecting secure contract tariffs for their gas while they carried the principle resource development risks. Thus the natural gas industry discussion for the province of Newfoundland and Labrador was very soundly put on ice and the third party proponents for development eventually acquiesced.

Natural Gas Industry Misunderstood

One of the regrettable outcomes of these events is the considerable misunderstanding that the informed public holds to this day – that the Grand Banks natural gas industry that was deemed too risky and uneconomical over a decade ago is one and the same as the concept for a business arrangement with an offshore producer for the supply of natural gas for domestic thermal generation. In other words, what would in most jurisdictions appear to be a very attractive business proposition to purchase nearby and surplus stranded gas for replacement of foreign oil – was seemingly passed over by those responsible for securing long term generation security for the Island. Remarkable for its absence, a good faith discussion with a producer for the long term supply of natural gas has either not happened or failed for reasons that have not been explained. It would be very unusual for an offshore producer to initiate these kinds of discussions when it would appear to contradict or interfere with local government policy or politics as would now be the case. Furthermore the business case for selling gas to a regulated government utility entity for domestic requirements is usually low risk but is also of marginal interest due to its small net present value relative to the primary business of producing oil for international markets. Thus the incentive and the obligation to put forward a business proposition for the purchase of natural gas sits squarely on the desk of local authorities, not the producers.

The Navigant report for Nalcor called “Independent Supply Decision Review” has a chapter called Consideration and Screening of Island Supply Options. In that chapter Navigant presents its assessment of the reasonableness of the supply options considered by Nalcor for Island supply. Navigant does not conduct an analysis of natural gas as a supply option, but rather defers to Nalcor’s choice to exclude natural gas as an option because it was deemed by Nalcor to be commercially unavailable.

The exact source cited to support the claim of “commercial unavailability” was a 2001 report by an industry group that was contracted by Government to assess “the technical and economic aspects of developing THE offshore gas and gas liquids resources of Newfoundland and Labrador”. Included were considerations for use of gas on the island for generation, however, it must be very clearly understood that the explicit and implicit purpose of the study was to look at the development of the natural gas resources in their entirety and for their transportation and sale in the North American energy grid. This fact is further obviated by the finding that a sustainable production rate of 700 million standard cubic feet of gas per day was required in order to maintain the economics of the system that they were considering. This flow rate equates to 4200MW continuous production - far in excess of all conceivable domestic requirements. In an inexplicable reversal of logic, present authorities have taken this to mean that natural gas can only be brought to the Island for domestic use today if demand for 700 million cubic feet of gas per day can be arranged. Therefore, the question of whether natural gas can be purchased from the producers for domestic use only, has neither been asked nor answered.

The depth of the misunderstanding is underscored by the apparent lack of knowledge expressed by Navigant in its summation of natural gas availability in Newfoundland. They correctly state that gas is available as an associated product from NL off-shore oil production, and are superficially correct that the nearest gas pipeline is in Nova Scotia. But the statement that gas is generally re-injected into reservoirs to maintain or increase oil production is misleading.

All Grand Banks production platforms use natural gas for power generation. In 2010, the withdrawal and use of natural gas as a fuel for electrical generation and heating was greater for Hibernia alone than was the total oil-fired energy used at Holyrood for the same year. This point must be taken in and considered carefully to fully understand the scale of the natural gas energy resources already used and/or are presently available for use. Remarkably, the quantity of natural gas that is produced, rerouted and reinjected into a storage reservoir at WhiteRose annually is considerably more than double the amount required for all thermal generation needs in Newfoundland. Since reinjection into the oil producing reservoirs is detrimental to oil production at White Rose all gas that is not used as fuel is packed away for future access if a market arises. The natural gas quantities produced at Hibernia are much higher though the reinjection in some cases is also used for supporting oil pressure and so not all can be said to be available for sale if a market were to exist. The natural gas reserves presently accessible with existing wells and production facilities is considerably greater than the total cumulative thermal energy requirement of the Island for the next thirty years, thus the long term supply question is in little doubt. Worrying to those who know is the permanent loss of a portion of the natural gas that has already made it to the surface but is reinjected for preservation. Though the exact figures are unclear it is very likely that more gas is permanently lost in this way than would be required for Island thermal needs - yet it needn't be so if arrangements to buy surplus gas were made.

The absence of effort to examine natural gas viability

The risks associated with icebergs, platform modifications or equipment additions, production disruptions and business losses are all a matter of technological and financial planning and are of the same order as those that have been carried out countless times in the past for successful natural gas developments in other jurisdictions around the world. The primary uncertainty in the argument for the viability of gas-fired generation for the island is the matter of willingness to negotiate a mutually rewarding gas price.

As an example of just how realistic it is for Producers and Government to agree on terms that are mutually beneficial recall the following: in 2008 the Province of Newfoundland and Labrador approved the decision to permit North Amethyst development by Husky, PetroCanada and itself as an equity stakeholder. The Government was pleased to point out the excellent value for all stakeholders, the quick turnaround time for the development plan assessment, and the overall good business elements of the deal. In particular the best possible overall value from the project was realized through "equity participation, royalties and local benefits". All parties were very happy.

Natural Gas Price – the only real uncertainty

Though arrangements for natural gas purchase and transport to the Island would undoubtedly be more complicated than North Amethyst Oil, it is difficult to understand how or why they could not take place, or why they would not also result in an agreement that would be mutually beneficial. The gas price remains the single greatest uncertainty in the equation as there are many factors and considerations involved. Some of those that may ultimately influence a business arrangement to purchase natural gas from a producer offshore include:

- Consideration of irretrievable losses of reinjected gas,
- North American open market gas prices,
- Natural gas royalty regime or the creation thereof,
- Replacement cost for the consumer,
- Producer opportunity cost/book value for future sale in alternate market,
- Price equivalency for gas energy used by producers on the platform
- Cost of O&M for all associated platform equip. mods etc
- Cost of well schedule and production changes to accommodate export
- Cost saving associated with market access vs reinjection handling
- Good will and mutually beneficial trading of value between partners
- Competition amongst producers for the business
- Platform and infrastructure development plans
- Upside of increased demand and new markets for greater quantities
- Potential to move oil in the pipeline or a looped line
- Value of other industrial benefits and add-ons such as a fibre optic cable

Concluding viewpoint

It is my opinion that Grand Banks (probably White Rose) gas is likely the cheapest source of long-term (30 years) dispatchable energy for island electricity generation if good faith bargaining were to take place. Dual-fuelling with oil storage on standby could provide supply security for a new thermal generating facility at or near Holyrood. Of considerable importance to note is the prospect for another fixed platform at or near White Rose. With prior arrangement, this facility may prove to be the ideal launching site for a pipeline to the Island. Many possibilities exist for gas export arrangements including third party ownership and operation of various parts of the gas compression and transmission system. The retirement of Holyrood and the construction of a new gas fired facility may also be a very attractive regulated business proposition for numerous private enterprises.

Stephen E. Bruneau

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