Reply Evidence
Prudence Review of
Newfoundland and Labrador Hydro
Decisions and Actions

Presented to:

The Board of Commissioners of Public Utilities of Newfoundland and Labrador

Presented by:

The Liberty Consulting Group

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279 North Zinns Mill Road, Suite H
Lebanon, PA 17042-9576
admin@libertyconsultinggroup.com
717-270-4500

Introduction

Q. Has your review of Hydro's reply evidence caused you to change your opinions with respect to whether the decisions and actions you reviewed and reported in your July 6, 2015 report were prudent or imprudent?

A. Our review disclosed nothing that would influence our opinions with respect to prudence of the decisions and actions reviewed. However, based on new information Hydro provided, we have adjusted some of the costs that we recommended be disallowed.

Q. Before we discuss the details of Hydro's reply evidence, do you have any general observations on it?

A. Yes. On Page 2 of its reply evidence, starting at line 10, Hydro states "Hydro's track record on the overwhelming majority of its work has not been questioned." Liberty's scope of review was limited to a number of pre-defined issues. To suggest that everything else Hydro did was therefore prudent is not appropriate. Also, even on issues where Liberty found Hydro to be prudent, Liberty identified errors and deficiencies by Hydro, not rising to the level of imprudence, but nevertheless material.

Preventive Maintenance Deferral and Good Asset Management Practice

Q. Please summarize the relationship that Hydro's reply evidence draws between deferral of preventive maintenance and good asset management practice.

A. Hydro's reply evidence on a number of occasions describes preventive maintenance backlogs as an acceptable element of good asset management practice. For example,

- On page 3, lines 22-27: "a list of PM/CMs are regularly scheduled for completion when a planned or unplanned outage occurs, or when the off-peak maintenance season is underway. This backlog list is a normal part of the asset management process as work has to be planned in a manner that minimizes impact on customers."

- On page 10, lines 13-17: "Hydro deferred some six-year maintenance on air blast circuit breakers and power transformers in order to ensure resources were deployed on the most critical work for customer supply. In particular, Hydro deferred this maintenance where it was necessary to address unplanned corrective maintenance work…"
- On page 10, lines 29-36: "The decision to defer involves personnel with responsibility for short-term planning and scheduling, long-term asset planning and work execution and operations. Hydro was faced with a significant amount of priority break in corrective maintenance and capital work in 2013 and as a result more preventative maintenance of a lesser priority was deferred into 2014 and 2015."

Q. What is Liberty's view of how preventive maintenance deferrals conform to good utility practice?

A. Liberty disagrees with Hydro's view. The widespread deferral of preventive maintenance work by Hydro was not well planned, carefully executed, or consistent with good utility practice. We begin by observing that, particularly with respect to air blast circuit breakers, the equipment was of very advanced age. Advanced age, which is characteristic of Hydro's equipment, calls for increased, not decreased maintenance. Hydro appears to have recognized that as well, acting in 2010 to implement a catch-up program on breaker work. As our evidence notes, and as Hydro essentially acknowledges, this effort to displace other priorities itself came quickly to be displaced in turn by other priorities. We have seen and Hydro has supplied in its evidence no basis for concluding that its decision to abandon the catch up program in favor of other priorities resulted from a structured assessment of risks, priorities, or likely consequence. As our report notes, and as Hydro's reply evidence does not dispute, it did not even establish dates for finally performing the maintenance deferred.

A widespread deferral of preventive maintenance, the failure to support it with clear, persuasive assessments of comparative cost, risks, and benefits among the work considered for advancement or deferral, and the omission of an effort even to assign dates for deferred work is not in accord with good asset management practice.

Q. Describe what you consider to be effective end-of-life maintenance practices for air blast circuit breakers.

A. Such breakers should be considered to have a designed end of life at 40 years, and undergo overhauls at about 20 years. Those overhauls seek just to attain (not extend) that duration. Operating such breakers beyond 40 years requires enhanced maintenance, not widespread deferral of maintenance cycles. We would expect a discernible correlation between preventive maintenance cycles and failure rates for equipment already operating beyond expected lives. There is clear and significant risk in deferring preventive maintenance on breakers (such as Hydro's) older than 40 years old. Rather than a widespread pattern of deferral, rigorous maintenance, if not acceleration of maintenance cycles, is required on old breakers. In 2013, Sunnyside breaker B1L03 was 47 years old, Western Avalon breaker B1L37 was 45 years old, and Holyrood breaker B1L17 was 40 years old.

Q. Hydro's reply evidence addressed both corrective maintenance and preventive maintenance. What is the significance of the differences between the two forms of maintenance?

A. Hydro's reply evidence fails to make a critical distinction between preventive maintenance and corrective maintenance. The maintenance deferrals at issue here (as to both transformers and breakers) have been preventive, and not corrective. Corrective maintenance plans and schedules derive in significant part from the problems and concerns identified as part of regularly scheduled preventive maintenance. Until a utility

performs preventive maintenance, it does not possess a sound basis for determining what resulting circumstances or conditions exist or how to prioritize them in relation to other work.

It can prove appropriate to re-prioritize corrective maintenance work, but that should happen on the basis of knowing what needs to be done and what risks delay in performing it will involve. Effective deferral of corrective maintenance work takes place with risks known; deferral of preventive maintenance work necessarily involves deferring work without having taken appropriate actions designed to understand potential consequences.

Q. What do you view as the consequences of recognizing this distinction, relative to Hydro's reply evidence?

A. Good utility practice requires that a utility routinely and consistently meet preventive maintenance schedules, with, at most occasional and moderate exception, not the ongoing, widespread, and date-unconstrained basis on which Hydro deferred preventive maintenance work. Good practice does not support deferral of preventive maintenance on a routine basis to accommodate capital or emergent work priorities. A utility should not treat preventive maintenance as having "lesser priority."

Rather than demonstrating good asset management practice, widespread deferrals of preventive maintenance contravenes it directly. Normal utility practice is to provide the resources necessary to adhere to preventive maintenance schedules, in addition to addressing emergent work and critical capital work. Finding an opportune time to take equipment outages should form the only excuse frequently observed for not completing scheduled preventive maintenance work. Typically, only a small percentage of preventive maintenance work is not completed consistent with schedules, and then because of

factors such as the ability to take an outage on critical facilities. Even then, utilities strive to complete deferred work as soon as possible.

"Causes" of Equipment Failures

Q. Summarize Hydro's reply evidence statements about proof of causation of the outages of January 2014.

A. At page 9, beginning at line 12 and at page 11, starting at line 3, Hydro's reply evidence indicates that Hydro should not be held responsible for the inability of anyone at this point, including Hydro notably, to identify the actual causes of equipment failure. That statement requires a substantial amount of additional context before assessing its significance to addressing prudence. For example, the following are, in our view, well established:

- Utilities perform preventive maintenance according to established and planned scopes and schedules because maintenance reduces the risk of operational failures of equipment whose operation is critical to maintaining service.
- Old air blast circuit breakers require that maintenance become more diligent, not more lax.
- Hydro's deferral of maintenance remains even today unsupported by any discernible analysis of risks, costs/benefits, alternatives, or other structured deliberation.
- Deferral was widespread, and in the case of the breakers, it occurred even though Hydro had first made, but then abandoned, a plan to catch up on work already behind schedule in 2010.
- During the early January 2014 events, not one, but multiple pieces of equipment late for preventive maintenance failed; some were far behind schedule. The equipment involved was operating well beyond its expected life, thus making even a short duration past generally applicable cycles a matter of concern.

- Hydro, which owns and operates the failed equipment cannot, after more than a year and a half and after study by external consultants, determine the cause of failure supported by more than speculation.
- With respect to the Sunnyside T1 transformer, its bushings' problems are among the issues that scheduled preventive maintenance is designed to detect and prevent.

The equipment past-due for preventive maintenance and failing in January 2014 caused extensive customer outages.

Q. What is the significance of these contextual observations?

A. Should the Board agree that Hydro acted imprudently, as Liberty concluded, then one needs to ask:

- Where imprudence occurs and where it concerns conduct clearly intended and universally applied to prevent equipment failures, can a utility unable to establish a non-culpable cause for such failures avoid responsibility and transfer to customers all the costs associated with its imprudent conduct? If there is no regulatory means to impose on Hydro consequences that incent the operational discipline one should expect from prudent management, then what expectations may customers have about the ongoing ability of their utility to exercise that discipline?

Hydro's position on causation might have merit had it acted prudently. Causal uncertainty in those circumstances should lead to a conclusion that no proper foundation exists for assigning cost responsibility to the utility. When faced with multiple failures by separate pieces of equipment whose circumstances exemplify a widespread failure to adhere to prudent practice, it is proper to draw a cause/effect association in the absence of

credible exculpatory reasons supported by substantial evidence. Neither Hydro nor Liberty have been able to find such reasons (and such support).

Sunnyside T1 Transformer

Q. Please comment on the factors that Hydro addresses at page 11 of its reply evidence with respect to the Sunnyside T1 transformer maintenance.

A. Hydro cites at page 11 of its reply evidence three factors in support of its transformer maintenance practices, which Liberty found to be imprudent, and which Liberty associated with equipment damages and with customer outages:

- The last power factor test done on the transformer did not indicate a concern with the bushings.
- Preventative maintenance since 2000 only identified bushing defects in 2 percent of transformers.
- Deferring transformer maintenance "allowed Hydro to carry out priority work as part of its ongoing asset management program."

As a preliminary matter, we observe that Hydro states that, "at the relevant point in time there was nothing directing Hydro to treat T1 transformer maintenance as a top priority." Asserting the position in its reply evidence that the matter had to be a "top" priority to make it actionable is not appropriate. Hydro gave it essentially no priority, as the discussion below shows. The three factors that Hydro cites do not excuse the failure to conduct preventive maintenance on the transformer as required by Hydro's program.

First, the T1 power factor test referred to by Hydro took place in 2007, which was outside the applicable preventive maintenance cycle. Citing its result in connection with transformer conditions outside the time limits indicated by that cycle is unsound.

Second, the significant factor about the discovery of bushing defects lies not in the percentage of times they were observed, but rather in the fact that they were observed confirms that they present real risk, presumably considered by Hydro in determining its required maintenance cycle. Even where there is only a small chance of any single "defect" emerging during inspection and maintenance activity; the more material point is that taken as a group, a collection of small odds possibilities make adherence to preventive maintenance schedules an essential element of prudent management. Hydro's use of the 2 percent factor ignores how many bushings issues it had in fact already encountered. The number is 14, which is not inconsiderable, and which makes clear that adherence to maintenance cycles does give the ability to identify bushings issues, and that failing to do so at the Sunnyside T1 very well may have cost Hydro the opportunity to identify the 15th.

Third, the suggestion by Hydro that its deferral was programmatic is not consistent with the available information. Such an approach could use prior inspection results to produce a reasoned, deliberate, and confined extension to transformer maintenance based on a study of past inspection or preventive maintenance observations about equipment conditions and failure risks. There remains, after our inquiries and after examining Hydro's reply, no evidence of any form of structured or significant analysis of the risks of deferring maintenance versus the rewards of redirecting expenditures elsewhere. With no such analysis and with no scheduled date for performance of the deferred maintenance on T1, we consider it incorrect to conclude that Hydro took a programmatic approach to deferral. Even if it had, Liberty does not find extended deferral of preventive maintenance a rational way to "fund" other work. As compared with corrective maintenance, which generally proceeds from a reasonably known list of work items (and thus a basis for prioritizing and careful assessment of the risks of work deferral),

deferring preventive maintenance is a "blind" exercise in those regards. We therefore have not found it to be an accepted approach in the industry.

Q. Hydro's reply evidence, at page 12, states that it "had no indication of any specific concern with the Sunnyside T1 transformer." What facts bear on the accuracy of this statement from its reply evidence?

A. A number of facts contravene this statement. It is important to keep in mind that the issue that Liberty believes warranted gas testing on the Sunnyside T1 transformer was not the existence of gassing, but a jump in levels observed by Hydro prior to the January 2014 incidents. Hydro's reply evidence indicates a reliance on what "appeared" to its consultant to be a common (and non-threatening) cause for the existence of gas in the class of transformers involved. Hydro also relies upon the fact that examinations of a companion transformer after the January 2014 incidents showed gas there to have resulted from this cause.

Relying on these circumstances to provide context for the Sunnyside T1 Transformer failure does not pass a straightforward test of reasonableness on two counts:

- What was at issue at T1 was an actually observed (by Hydro) increase in gas, not the mere presence of gas, thus making the observations of its expert (which Hydro expressed as not having been definitive in any event) about gas presence unenlightening about T1's known circumstances prior to January 2014.
- Assuming that cause for an effect observed at another piece of equipment necessarily implies the same cause for a similar effect at another suggests a belief that there can only be one cause for such an effect, which is not the case.

Q. What do these facts mean with respect to what Hydro should have done with respect to gassing in the Sunnyside T1 transformer?

A. Prudence in these particular circumstances here is a function of the material point at issue. That point is whether Hydro should have undertaken action in response to the increase in gas levels. First, deciding not to do so because gas exists (whether increasing or not) in other transformers is imprudent. Gas increases provide an indicator of potential problems that are threatening. Second, observing after the fact that another transformer has gas leaking due to a different and non-threatening cause does not add anything to an understanding of what risks T1 faced as 2014 began.

Breaker B1L03

Q. Hydro observes at page 13 of its reply evidence the importance of the fact "that Hydro experienced sustained cold weather during much of the outage period which can have an impact on circuit breaker performance." What significance does that observation offered in its reply evidence have?

A. That cold weather existed is certainly true, however, this phenomenon is a frequent occurrence in the region. It constitutes a factor that prudence requires a utility to consider in designing and executing its preventive maintenance strategies. Thus, cold spells do not excuse equipment failure, but rather underscore the importance of faithful execution of required preventive maintenance. Moreover, Hydro has also reported sufficient information from which to conclude that it has no basis, following investigation, to attribute the breaker failure to cold weather in any event.

Q. Hydro's reply evidence observes on page 14 that the costs of replacing Breaker B1L03 should be allowed because it "would have been replaced in the next couple of years in any event as part of Hydro's air blast breaker replacement program." What significance does Hydro's reference to such plans in its reply evidence have?

A. Presumably, Hydro will replace a great deal of the equipment in its system at some uncertain future dates and at some uncertain future costs as well. That fact does not lay a

foundation for current recovery of costs of that equipment. What needs to be considered here is what Hydro would have done but for the equipment failure that Liberty associates with imprudence.

Hydro seeks to recover costs for advancing replacement from some uncertain future date because its imprudence led to premature failure of the equipment replaced. This position should be considered in the context of: (a) the absence of any clear plan or schedule to replace the equipment involved, and (b) the presence of an imprudent approach to maintaining that equipment. Liberty believes that the appropriate question is whether, but for the imprudence, Hydro can show that it would have undertaken the replacement within the time periods that apply for determining the rates and rate base in this general rate proceeding.

Q. What information bears on the question of whether the plans cited in Hydro's reply evidence have significant weight?

A. The available information demonstrates only a small likelihood that Hydro would have replaced Breaker B1L03 in 2015. Its 2012 air blast circuit breaker replacement program called for replacement of five such breakers from 2013 through 2014. Comparing its July 2012 and 2014 breaker upgrade plans indicates that it replaced only one of them (at Hardwoods) by the end of 2013.

These facts suggest a relatively small probability that, absent imprudence, Hydro would have made replacements in the test period for this proceeding. Given the general pattern of imprudent maintenance applicable as well to this breaker particularly, the issue is whether allowing recovery on the chance of replacement during the test period should be allowed.

The "Betterment" Argument

Q. Hydro's reply evidence on page 14 introduces through a newly performed external consultant's report the issue of "betterment" by stating that the duration of the life of the replaced transformer "means that recovery of the new transformers' costs reflecting when the old transformer would have ultimately been replaced is appropriate in any event." What are your comments about the "betterment" concept?

A. We have no argument with the general concept of betterment. However, it has no application here. Hydro cites a "betterment" report by Gannett Fleming, Inc. ("Gannett Fleming"), included in its reply evidence, in support of this position. Hydro also states that the results of the analysis reflected in that report "show the recoverable costs for the Sunnyside replacement equipment on a betterment basis."

A threshold problem arises from the need to address what happens with respect to recovery of the remaining costs of the replaced equipment. The notion of "betterment" would imply that if the replacement is "better" than what it replaced then the recoverable costs for the measurement of that "betterment" come on top of those replaced. If so, Hydro is in effect asserting that customers should pay more than they would have had there been no imprudence. That result makes no sense. The "worst" case for customers should be that they pay no more than what would have been paid in the absence of imprudence.

Q. What forms does betterment take that are even theoretically applicable here?

A. Liberty's prudence report allowed for the possibility that service operational improvements or reduced operating costs might have resulted from the imprudence-induced replacement of the equipment at issue. At page 3 of its report, Gannet Fleming lists such factors as including: increased physical output or service capacity, reduction in

operating costs, and improved output quality. The report then acknowledges that none of these enhancements resulted, leaving only "an extension of the estimated useful life" as a possibility.

Q. Please respond to the notion that customers somehow derive benefit in the immediate term by the life extension represented by the replacement of damaged equipment by Hydro.

A. There are no such benefits. In the absence of imprudence, the assets would have remained in service and revenue requirements associated with them would have continued to be calculated in this rate proceeding on the basis of remaining investment as it continues to be depreciated. To the extent that Hydro would not have installed new equipment, it would not be asking in this proceeding for any changed costs associated with the replaced equipment. To the extent that Hydro's approach would increase customer costs, it ignores the results that customers would have experienced in the absence of imprudence. Moreover, while the system would likely have needed replacement equipment at some point, customers would derive benefit from its installation. That benefit, in the absence of imprudence only occurs following what would have been the end of the life of the replaced equipment. By that point, the earlier than necessary substitution of the replacement equipment will mean that it will benefit customers for a shorter period than will actually be the case.

The most direct way to ensure that customers pay no more than would have occurred absent imprudence is to conclude that, absent imprudence, Hydro would not have replaced and would have made no claim for the replaced equipment (subject to the case of Breaker B1L03, discussed earlier) in this rate proceeding. In the first proceeding whose test period post-dates the likely end of the lives of the replaced equipment, Hydro would have the opportunity to show that the equipment is used and useful and not in

existence prematurely. Given that the replacement equipment at that time will have been in operation for some time, it would seem logical to begin consideration of the amount for inclusion in rate base on the basis of depreciated cost at that time. Otherwise, customers would be forced to pay costs beyond those associated with the useful life of the equipment. In other words, the useful life would consist of that portion that follows the end of the expected life of the replaced equipment, assuming no premature retirement associated with imprudence.

2014 Revenue Deficiency -Outage Inquiry Legal Fees

Q. A discussion of the cause of legal fees that Liberty associated with outages begins at line 8 of page 21 of Hydro's reply evidence. How does that discussion compare with what you learned from Hydro during the work leading to Liberty's July 2015 report?

A. Liberty associated $876,000 (rounded) in legal fees with the outage response because that was how Hydro described them in the course of review of invoices and accounting entries. Hydro then did not observe that any of those fees were associated with other causes, a number of which concern proceedings not a part of the Board's outage inquiry. We learned for the first time from Hydro's reply evidence of the possibility that some of these costs arose from other matters.

Q. What did you learn about these legal fees since reviewing Hydro's reply evidence?

A. We submitted RFI PR-PUB-NLH-204 seeking to secure source documents and calculations supporting Hydro's classification of $622,742.68 of the $875,799.00 as the amount attributable to "Phase 1" of the Board's outage inquiry. The response described a process by which the law firm involved apportioned its billings to Hydro among all the matters Hydro's reply evidence says were involved. We remain open to an apportionment that has substantiation. Two issues remain about the substantiation provided by the

response to PR-PUB-NLH-204. The first issue is why the apportionment applied percentages rather than a simple totaling of the amounts of fees and expenses determinable from billing information. The second issue is that the response did not provide the billings, which comprise the source documents requested. The response did state that the billings could be made available for Liberty to review; however, we were unable to do so before our reply was required.

Sunnyside Environmental Remediation Costs

Q. What is your response to the concern Hydro expresses starting at page 22, line 26 of its reply evidence about double counting of environmental remediation costs following the January 2014 incidents?

A. The information Hydro had made available at the time of Liberty's report showed two sets of costs. That information assigned each set to a different category ($346,000 to Professional Services – Consulting fees and $335,900 to Sunnyside Replacement Equipment - Consulting). The accounting categories were different, and the amounts in question did not match. Liberty therefore considered them to concern distinct sets of activities.

Liberty asked Hydro (through RFIs PR-PUB-NLH-205 through 209) for information that would support the view expressed in its reply evidence that both sets of costs were in fact charges for the same services. The detailed information provided by Hydro in response to those RFIs does support a conclusion, with the reservation expressed below, that the two sets of costs involved are for the same services, and should therefore only be counted once. The Sunnyside Replacement Equipment Consulting fees should therefore be reduced by $335,900.

The reservation concerns the reply evidence statement on page 23, beginning on line 7. There, Hydro states that an invoice for Toxicology and Chemistry Analysis involved services unrelated to Sunnyside. PR-PUB-NLH-208 and 209 asked Hydro to provide invoices and other documentation demonstrating that the services involved did not concern Sunnyside environmental remediation or the Board's outage investigation. The response provided the invoice for $14,301, which, on its surface, contains no information helpful in responding to the two RFIs. The response essentially repeats the statement made in the reply evidence on page 23, which still leaves the record without substantiation from contemporaneous source documents.

It may be correct that the work addressed by this invoice had nothing to do with either Sunnyside environmental remediation or other factors associated with the Board's outage investigation. However, Hydro has not submitted source documentation about the work sufficient to make such a conclusion clear.

Supply Related Costs

Q. Please comment on Hydro's observation on page 7, lines 8-17 of its reply evidence about the inclusion of same $504,610 costs in two distinct quantifications.

A. At the time of its report, Liberty understood the costs to be distinct. We asked for clarifying information in RFIs PR-PUB-NLH-187 through 191. Review of those responses confirms that Table 9.1 of the prudence report does include $504,610 of Holyrood 1 replacement power costs. This amount forms part of the $2,419,410 labeled "Holyrood 1 Turbine, 2014 Repairs, Depreciation and Replacement Power," as well as part of the $2,189,110 of costs labeled "Capacity and Energy Purchases, Replacement Generation." Liberty agrees, based on the review of the RFI responses that a deduction of $504,610 is appropriate to avoid double counting.

Holyrood 1 Capital and Depreciation Amounts

Q. Please comment on the discussion on page 30, lines 10-21 of Hydro's reply evidence regarding the relationship between $5,500,000 for Holyrood Unit 1 Turbine Generator 2014 Capital costs and depreciation of $1 million.

A. First, as a matter of clarification, Hydro is not correct in asserting that the $5.5 million of Holyrood 1 capital costs for 2014 (PR-PUB-NLH-129 Revisions 1 and 2) includes depreciation. That amount reflects capital expenditures before depreciation. In addition, note that Hydro has revised the 2014 and 2015 depreciation amounts to $800,000 from $1.0 million in Revision 2 to this RFI response (dated September 4, 2015).

With these clarifications, Liberty would agree that revenue requirement determinations to be made by others in the current rate case need to consider the time periods across which they apply. For example, a disallowance of the 2014 pre-depreciation capital amount of $5.5 million and of 2014 depreciation of $1.0 million would cause double counting of the amount reflected by 2014 depreciation.

Black Start Project

Q. Please summarize your reasons for concluding that Hydro was imprudent in failing to provide black start capability at Holyrood for an extended period.

A. The key element of our analysis contained in Chapter Ten of the Liberty report was the conscious decision on the part of Hydro to forego black start at Holyrood for a prolonged period while it relied on the Hardwoods CT to provide black start service. We do not consider that a reasonable alternative to have pursued. The error in that reliance was exposed in January 2013, when black start from Hardwoods was unavailable when needed, but Hydro nevertheless continued to rely on Hardwoods. The initial decision, and continuing to rely on the Hardwoods option after January 2013 was, in our view, clearly imprudent.

Q. Hydro and its expert disagree with your conclusion of imprudence. Please comment on their analysis.

A. Hydro and LaCapra take exception to both the technical analysis and the resulting estimates for disallowance in the Liberty report. From a technical perspective, the decision to rely on the Hardwoods CT as the black start resource was plainly wrong. Our interpretation of the Hydro and LaCapra positions is that black start at Holyrood was not necessary in the first place. They base their position on assertions that: (a) black start anywhere on the Avalon would be just as good, (b) any benefits from black start at Holyrood would be limited, and (c) the Hardwoods solution best balanced cost and risk.

Q. Do you view black start on the Avalon as equivalent to black start at the Holyrood Plant?

A. No. Consider the importance of service restoration effectively and as quickly as possible in the (hopefully rare) case in which the system suffers a widespread blackout and generating facilities become isolated from the system. Keeping the Holyrood units warm would expedite restoration (as compared with use of Hardwoods for black start), once the transmission system returns to a status that will enable it to receive the output of the generating units. Hydro cannot keep the Holyrood units warm and ready to go if it must rely on a distant power source, like Hardwoods. Pending return of transmission capability, there would be no way to get Hardwoods power to Holyrood to keep the units warm. Black start at Hardwoods therefore is clearly not equivalent to black start at Holyrood. Accordingly, it would not be considered as a black start solution by a reasonable utility manager.

Q. If off-site black start capability were possible, would the Hardwoods CT be a reasonable possibility?

A. Liberty's report notes that the Hardwood's CT's utilization forced outage probability

averaged over 26% between 2008 and 2012. This means that it would not have been available if needed for black start more than a quarter of the time. The CT would not provide a reasonable option for black start given this experience with its availability.

Q. How does the ability to keep generating units warm and ready to go affect consideration of black start?

A. Two primary purposes exist in the case of units like those at Holyrood: (a) to keep the units warm and ready to go, and (b) to provide the ability to bootstrap generators to begin re-energizing the system when it becomes available. Hydro appears to have been sensitive to the latter purpose in 2012 but not the former. This is evidenced in Hydro's response to PUB-NLH-023 in June 2014 in the Black Start application. That response indicates that Hydro only recognized the first primary benefit after the January 11, 2013 incident. Curiously therefore, LaCapra argues that this warming benefit is limited to, in their words, "only" about 11 hours. Using that fact to support Hydro's 2012 decision is inapt, given that Hydro's considerations in 2012 did not consider the warming benefit at all. In short, Hydro failed to recognize a key objective of black start, which was imprudent, and La Capra's discussion of the length of the warming benefit focuses on an issue that Hydro did not even consider in 2012. In summary, black start at Hardwoods is not the same as black start at Holyrood, and the events of January 11, 2013, clearly demonstrated that.

Q. Hydro and LaCapra characterized the benefits of black start at Holyrood as limited to only about 11 hours and therefore presumably insufficient to justify added investment. Do you agree?

A. Eleven hours of outage time on January 11, 2013, in blizzard conditions, is a very long time, both to the utility people trying to restore service and the customers suffering through it. To suggest that the characterization of that benefit as limited is wrong, and

outside the range of acceptable utility practice as observed in our many decades of industry experience.

Q. Hydro and LaCapra also claim that the Hardwoods solution best balanced cost and risk. Do you agree?

A. There is no evidence that Hydro conducted an accurate cost versus risk assessment in deciding to use the Hardwoods CT for black start capability. In fact, we know that Hydro apparently did not understand the risks and therefore could not have conducted an accurate assessment. In any event, Hardwoods was not a viable solution so that its costs were irrelevant.

Q. Can you comment on LaCapra's position that events requiring black start are rare?

A. Fortunately, all catastrophic events are relatively rare. That does not mean that a public utility need not plan for them. LaCapra points out that the black start scenario materialized three times between 1990 and 2012. Such scenarios will most likely occur in the dead of winter and can affect hundreds of thousands of customers. These are big events anywhere, but especially in Newfoundland, where there is such extreme weather coupled with a high dependence on electric heat. Black start is intended to mitigate the consequences of such events, and there is a good reason for the black start at Holyrood requirement.

Q. LaCapra suggests that the combination of events on January 11, 2013 were never before "experienced by Hydro management's experience" in over 30 years. Is this important?

A. Even if correct, such an observation runs counter to sound planning practices. Utility planners are required to plan for events that they might see, at most, once-in-a-career. Whether or not Hydro's management has actually seen any such events is irrelevant.

Dismissing for planning purposes realistic events that have low probability is not prudent.

Q. Do you have any other comments on the Hydro reply evidence on the Black Start project?

A. LaCapra acknowledges two shortcomings by Hydro, although not believing that they rise to the level of imprudence. LaCapra cites: (1) Hydro's decision to accept the loss of on-site black start capability at Holyrood for several years, and (2) Hydro's communications with the Board as shortcomings. This acknowledgment confirms at least two observations important to Liberty's analysis.

Q. How does LaCapra's position on communications with the Board compare with Liberty's?

A. Our positions are identical. LaCapra may incorrectly believe that Liberty based its finding of imprudence, at least in part, on the issue of communications. This is not true. We criticized Hydro for its failure to engage in common-sense communications with its regulator. LaCapra also concluded that Hydro "should have done more to keep the Board informed." Both Liberty and LaCapra appear to agree that Hydro's conduct was inappropriate, but not alone sufficient to support a finding of imprudence with respect to providing black start capability.

Q. Please turn to Page 26 of Hydro's reply evidence. Line 18 reads "Hydro is seeking recovery only for the amount it ultimately incurred for the service provided." Do you agree that customers should pay for those costs of the Black Start project?

A. Hydro first lost its capability for black start at the Holyrood Plant in 2010. At that point, Hydro became deficient in meeting a very critical system need. Hydro allowed that deficiency to continue until mid-2014, a period of 52 months. Hydro finally re-established black start capability at the Holyrood Plant with a temporary solution that

filled its need for 12 months. In summary, Hydro had an obligation to provide a critical system need for 64 months, yet met its obligation for only 12 months. Hydro claims it is due compensation for that 12 months, but what about the 52 months of failure? The question is should the 52 months of failure be ignored and forgotten. It is not appropriate to simply ignore the period of failure; there should be some meaningful consequence for that failure. Denying Hydro recovery of the costs of the long belated solution is one means of attaching consequence to actions that placed customers at risk for an extended period of time.

Q. Did Hydro's failure to meet its obligations in this period have consequences?

A. Yes, it had severe consequences in January 2013, when, due to the lack of black start capability at the Holyrood Plant, the duration of a power outage to a significant number of customers was extended by eleven hours. However, while these events underscore the reality and the severity of the risk, the fact that consequences actually occurred is not the fundamental matter of importance. What is important is that Hydro knowingly took inappropriate risks; there should be consequences for the imprudence in doing so.

Q. What is your rationale for assuming that the sanction should be the total cost of the Black Start project? Could it not be more or less?

A. While determination of a fair and reasonable sanction may be difficult, it is our view that disallowing costs associated with the Black Start project comprises a reasonable means for incenting Hydro to avoid imprudent courses of action in the future.

Q. In your experience, has such an approach to assigning consequence for imprudent actions been used before?

A. This approach is a useful means for attaching consequence to high-risk actions where good fortune has prevented bad outcomes. Otherwise, there would be no way to incent

management to act prudently where failures do not lead directly to quantifiable damages. Liberty recently participated in a case in Nova Scotia in which the utility was sanctioned $2 million because the regulator felt its conduct in a rate case was inappropriate.

Q. On Page 27, Line 6 of Hydro's reply evidence Hydro states that some of the investment on this project also serves a longer-term benefit in that it facilitates the connection of the new CT for black start purposes and there is therefore no rationale for disallowance of the costs associated with this part of the project cost. Do you agree?

A. No. There remains a reasonable rationale for disallowance; *i.e.*, the incenting of prudent behavior through attaching consequences to imprudence and that is the need for sanctions. Any work done under the Black Start project was part of the imprudent project. Therefore, a reasonable option before the Board is to offset the money spent in this endeavor by an equivalent disallowance.

<u>Unit 1 Turbine Failure</u>

Q. What is Liberty's primary basis for concluding imprudence with respect to this project?

A. We have provided reasons for concluding imprudence for this project in our report. The primary driver (the first emphasized in our report), is termed as "DC Motor Inadequacies." The primary root cause of the January 2013 event was Hydro's failure to maintain the motor in working order with the result that it could not perform its intended function. Specifically, there were three distinct problems with the motor relating to incorrect alignments or settings and any one of the three would likely have prevented the motor from functioning properly. Neither Hydro nor LaCapra even discuss how or why those settings and alignments came about, although it is clear that Hydro has the responsibility to assure that its critical equipment works. Hydro did not properly manage

this critical asset over a prolonged period and its imprudence caused a catastrophic turbine failure, an extended outage, and high repair costs.

Q. LaCapra's response focuses on purported testing inadequacies. Were they also a root cause of the failure?

A. Three incorrect settings on the motor caused the turbine to fail. In other words, Hydro set the causative events in motion, not inadequate testing. The failure to detect the problem, via tests, is also a major imprudence issue, but it is secondary to the primary problem, which is Hydro's inability to care properly for the motor in the first place.

Q. Please discuss how testing inadequacies, although you characterize them as secondary, influenced the prudence conclusion.

A. Hydro's root cause analysis cited testing inadequacies. Liberty agrees that there were testing inadequacies and that they were indeed pivotal to the outcome. Our use of the word secondary is not meant to minimize their importance. They contributed significantly to the imprudence. To clarify, there were actually two testing inadequacies and Hydro and LaCapra address only one of them in the reply evidence.

The first testing inadequacy relates to a maintenance vendor's apparent failure to test the speed of the motor in 2011. Hydro's specification required that such a test be done, and Hydro believes it was done. It is not in dispute, however, that no documentation of such a test is available, then or now. It is obvious that had the test been done, one or more of the misalignments would have been revealed when the motor failed to reach speed. One can only conclude that the test was never done.

Liberty concluded that Hydro was imprudent in not applying appropriate quality oversight to this vendor, and specifically not checking the documentation that should

have been provided. Documentation is required as a quality check. Not examining the documentation precludes its effectiveness as such a check. In the reply evidence, Hydro and LaCapra do not discuss this matter.

Q. Please describe the second testing inadequacy that contributes to a conclusion of imprudence.

A. The second testing inadequacy, and the one receiving the primary focus by Hydro and LaCapra, is the manner in which the DC lube oil system was regularly tested at the plant. Liberty continues to believe that a functional test of a system must, above all, verify that the system works as intended. This is simply common sense. Hydro and LaCapra suggest otherwise, relying on a bad procedure give to Hydro by the turbine manufacturer 45 years ago.

Q. Hydro's reply refers to common mode failures. Please explain the issue and why you thought it was important to bring it up in your report?

A. Liberty included this topic in its report as a warning for the future, not as evidence of imprudence on the Unit 1 turbine failure of 2013. The Liberty report specifically stated that "it does not, however, have relevance to the January 2013 circumstances."

The issue arose when Hydro provided an unexpected response to PR-PUB-NLH-126. That response revealed that, in the event of a loss of offsite power, the primary and secondary sources of lube oil are lost. This leaves only the DC system to prevent damage. This scenario is known as a common mode failure, meaning a single event results in both the primary and secondary sources being disabled. Hydro has taken the position that a loss of offsite power is not a single event, but rather requires many failures. This view is not appropriate. Those many failures have indeed occurred simultaneously many times in just the last two years. The bottom line is that a loss of offsite power is a credible

contingency and, should it occur, the turbines will trip and will have only one line of defense.

2014 Replacement Costs

Q. Did you recommend disallowance of certain replacement costs that Hydro had requested for 2014?

A. Hydro's request for replacement costs in 2014 was evaluated for prudence from a power supply planning perspective and Liberty found no basis to conclude imprudence. Liberty also evaluated the request from a transmission maintenance perspective and concluded that Hydro was imprudent. The transmission failures resulted in Holyrood Unit 1 being offline for about four days and replacement costs associated with that outage were calculated to be $2,189,110. Since that time, Hydro has revised the underlying data with the result that the estimate is now $2,204,317.

Q. Did Hydro address your estimate in its reply evidence?

A. Hydro stated that "prudence-related disallowances cannot and should not be based on rough estimations." The fact is that sometimes rigorous estimates are not possible. When they are not, the issue is not excusing imprudence because of their lack, but rather using the best estimate available. Hydro has not proposed a better estimate basis, making Liberty's approach reasonable under the circumstances.

There are methods available for a more accurate assessment than Liberty's estimate in this case, but they require better information, which Hydro cannot produce. In a rigorous calculation, we would examine each hour in question and determine which more expensive units were forced to run because of Unit 1's absence. We would compare the fuel costs of those replacement units to the cost of Unit 1 and calculate the added costs. Hydro is unable to provide the dispatch stack on the subject days and the associated unit

costs. Therefore, less rigorous methods become necessary in order to calculate an estimate, which nevertheless remains reasonable under the circumstances.

Q. Has Hydro or LaCapra offered a better estimate?

A. Hydro proposed a variation of Liberty's estimate that takes into account additional days during the period January 1-12. Liberty used the last four days of the period, while Hydro has suggested using the average of the first four and the last four. That calculation results in a disallowance of $984,674 according to the reply evidence and $992,277 if the revised Hydro data is used. The first four days of January 2014 were particularly chaotic, characterized by extreme temperatures, supply shortages, and manual load shedding. Liberty therefore thinks that the use of only the last four days is more representative and more accurate.

Q. Hydro also argues that Liberty duplicated certain costs with the recommended disallowances associated with the Unit 1 turbine failure event. Do you agree?

A. Yes, based on the additional information Hydro supplied Liberty has revised its recommended disallowance as explained in the preceding "Supply Related Costs" section of this evidence.

Q. Hydro also questions your estimate on the basis that you did not adjust for Unit 1's partial availability on January 8. Do you agree?

A. This was addressed in Liberty's response to PR-NLH-PUB-002. The short period in which the unit was available later in the day on January 8 would not have a significant impact and should not be taken into account.