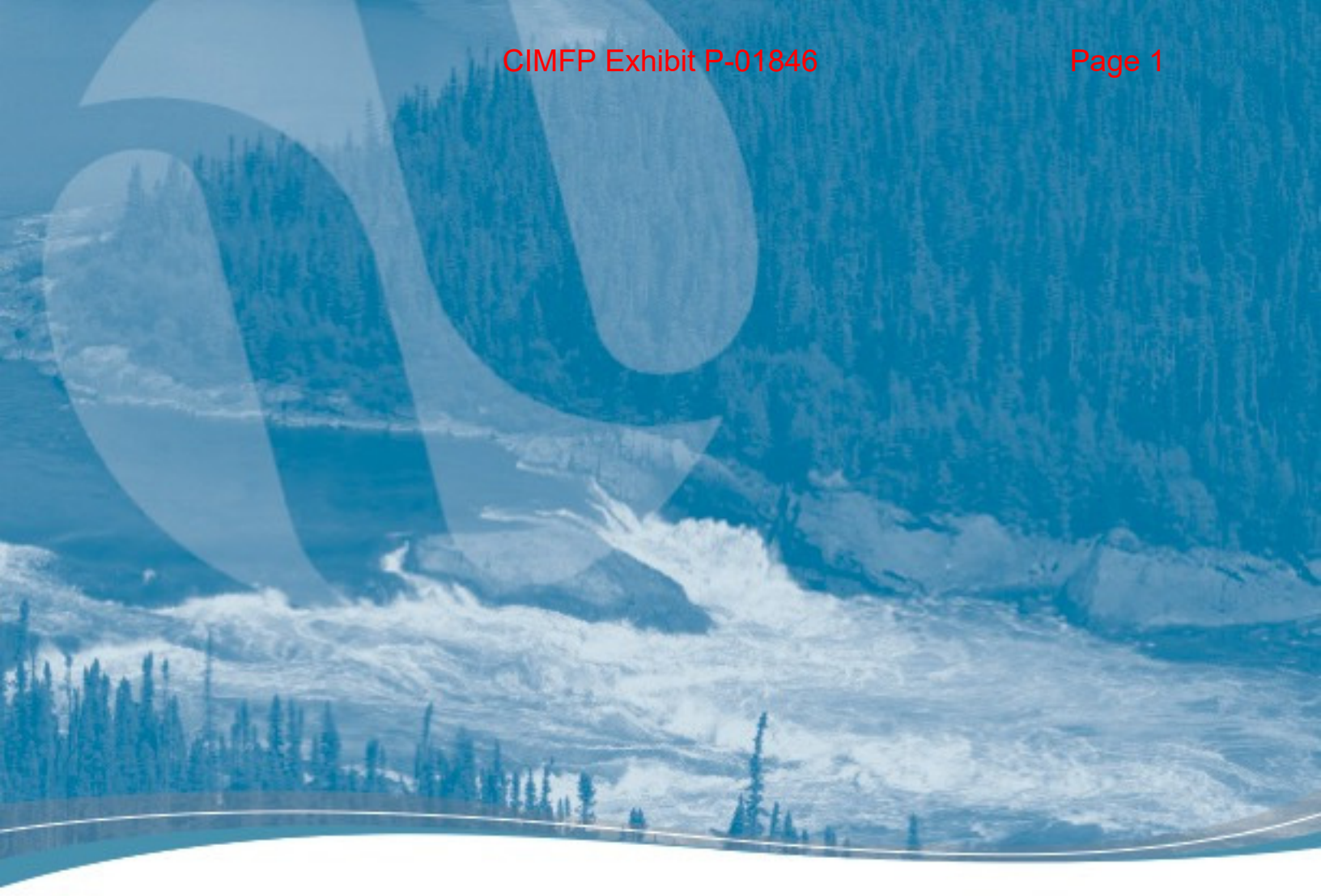

MUSKRAT FALLS PROJECT

REASONABLENESS OF THE ATTAINABILITY OF 2017 FIRST POWER

PRIVILEGED AND CONFIDENTIAL – PREPARED IN CONTEMPLATION OF LITIGATION

18-OCTOBER-2018

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LOWER CHURCHILL PROJECT

1.) INTRODUCTION

LCMC has reviewed the documentation regarding the attainability of the publicly-stated 2017 First Power date decreed at Project Sanction in 17-Dec-2012, in particular considering that the Decision Gate 3 Quantitative Risk Analysis ("QRA") indicated that a low probability of achieving the scheduled July 2017 date.

This Technical Note has been prepared in order to address questions and statements raised during the Muskrat Falls Inquiry related to the reasonableness, or otherwise, of the attainability of a 2017 targeted First Power date for the Muskrat Falls Project.

2.) EXECUTIVE SUMMARY

1. LCMC DG3 declaration of readiness was premised upon a project target schedule that showed Muskrat Falls First Power occurring in July 2017 and Full Power by year-end 2017. The $6.2B capital cost estimate was aligned with this timeline, as was the CPW cash flow analysis.

2. A July 2017 Target First Power date was supported by a detailed project schedule (~10,000 work activities) that integrated all project elements, having been premised upon several years of feasibility studies and investigations into the Muskrat Falls Project. This detailed project schedule, referred to internally as the "Project Control Schedule," provided, what was considered at the time to be, a sound-basis and rationale to support a public statement at the December 2012 Project Sanction announcement that First Power from MF would be targeted by end of 2017.

3. This Project Control Schedule incorporated all detailed construction scheduling prepared by SNC-Lavalin and incorporated all detail design and construction planning available prior to Project Sanction. This schedule was developed based upon, what was considered at the time to be, realistic, benchmarked and externally validated concrete pour sizes and placement rates, which was in-turn aligned with those in the Base Estimate. An approximate 15% (1 day per week) non-productivity allowance was built into the schedule.

4. The Project Control Schedule demonstrated that the critical path work activities for achieving a July 2017 First Power was through the river diversion and north RCC dam construction, both of which had fixed and limited weather windows (e.g. flow conditions in the river for cofferdam construction, temperature limitations for material placement in the cofferdam, and placement of Roller Compacted Concrete "RCC"). Missing these critical weather windows could trigger the non-linear movement of First Power by a number of months. These critical weather window events would be confirmed as key schedule drivers during the DG3 QRA and were effectively pivot points, i.e. a few days delay in a critical path activity could result in months of delay.

5. A comprehensive schedule QRA enabled LCMC to identify critical schedule risk drivers and focus risk mitigation activities, which enabled informed decision making regarding potential schedule outcomes, required for determination of Contingent Equity. Despite the Target Schedule being considered viable, LCMC acknowledged that schedule risk existed, identified by Westney in the report Analysis of Potential Management Reserve and Lender's Owner Contingency for the Lower Churchill Project, as: a) Schedule Risk Exposure; b) Performance Risk Exposure; and c) Skilled Labour Availability, in addition to the numerous weather windows that the construction sequence incorporated. The DG3 QRA highlighted this risk exposure, specifically indicating that while the schedule was achievable, should any of, or a combination of, these risk events occur, then that would result in a low probability of achieving the target schedule, due to the likelihood of missing the weather windows.

6. LCMC leveraged the time-window between the scheduled July 2017 First Power and the publicly declared power before end of 2017 as a schedule reserve of 4 to 5 months, re-setting the First Power date to Dec-2017 during Rev B2 of the Integrated Project Schedule issued March 2013. This 4 to 5 month reserve would be used following the receipt of bids from Contractors for CH0007 (Construction of Intake and Powerhouse, Spillway and Transition Dams), which cautioned price risk if the mid-2017 schedule were to be maintained. LCMC decided to trade this 4 to 5 month schedule reserve in order to reduce the Contract bid price.

7. A number of third-party reviewers (MHI, Independent Engineer, SNC-Lavalin experts) assessed the schedule underpinning the 2017 First Power target, with each concluding that the planned duration appeared viable.

8. Schedules provided by the contract bidders for Muskrat Falls Generation reaffirmed the reasonableness of the 2017 First Power target, with bidders producing detailed construction schedules confirming their ability to achieve the target date. Successful bidders produced execution plans and schedules further reinforcing the attainability of a 2017 First Power, each willingly agreeing to significant contractual liquidated damages should they fail to meet their schedule commitments.

9. 'But-for' Astaldi's poor performance in 2014, it is very probable that First Power from Muskrat Falls would have been achieved by mid-2018. As demonstrated by the analysis in Attachment 17 – 'But-For' Schedule Summary Schedule, Astaldi's actual sustained production, in 2016/2017, equalled or exceeded LCMC/SNC-Lavalin's planning basis of an average of 12,500 m3 / month, thereby validating the DG3 planning basis. All other Muskrat Falls contractors working on the site largely completed their scopes within the available time, albeit re-sequencing disruptions due to Astaldi's slippage.

3.) COMMITMENT TO FIRST POWER IN 2017

LCMC's Decision Gate 3 declaration of readiness made in November 2012[1] was based, in part, upon a July 2017 First Power date, as detailed in the Target Milestone Schedule, Rev B2 (provided in Attachment 01). While July 2017 was a target date, to be used for execution planning purposes, it was based upon a detailed project schedule (i.e. the Project Control Schedule) that integrated all project elements and encapsulated all engineering and project planning work completed up to DG3.[2] With its structure rooted in the 1998 feasibility studies completed by SNC-Lavalin, the Project Control Schedule (provided in Attachment 02) was progressively matured through feasibility engineering and early design to incorporate the results from all findings and field investigations at that time.

Besides becoming the DG3 execution control basis for the work, the Project Control Schedule was prepared in order to demonstrate how a July 2017 First Power date could be logically achieved, including the sequence, constraints and required investments to be made pre-sanction, specifically the early infrastructure works (i.e. roads, site clearing, starter camp, construction power, and communications), as well as the turbine model testing. It also provided a key input into the development of the DG3 Base Estimate and assessment of escalation costs, leading to the eventual cost flows for CPW modelling.[3]

Regarding the establishment of target dates, as stated in the Target Milestone Schedule:

> *"The dates contained in this Target Milestone Schedule reflect the base planning dates as established by Nalcor using the un-risked project schedule developed in Gateway Phase 3, and as-such exclude any schedule reserve for specific risks or changes that may occur."* [4]

This July 2017 Target Date was predicated upon Project Sanction occurring September 2012, with an early works site infrastructure program commencing prior to Project Sanction, and the award and mobilization of the Bulk Excavation Works Contractor at the Muskrat Falls Generation Site (e.g. contract CH0006) prior to Project Sanction.[5] Despite Project Sanction slipping from September to December 2012, activities critical to maintain the July 2017 First Power continued to advance, with successive releases of the enabling capital funds. The detailed planning completed as part of the Project Control

[1] Reference Nalcor document *Nalcor Energy – Lower Churchill Project Phase 1 Decision Gate 3 Support Package* (November 2012), LCP Admin Record No. 200-010141-00007

[2] For further insight into the various levels of schedules within the Muskrat Falls Project and their varied intentions and relationship with each other, refer to the Project Controls Management Plan, Nalcor document no. LCP-PT-MD-0000-PC-PL-0001-01.

[3] Reference LCMC's submission to Nalcor Investment Evaluation made on 26-Jul-2012.

[4] Reference Nalcor document *Target Milestone Schedule*, Nalcor document no. LCP-PT-ED-0000-EP-SH-0001-01, Rev. B2, page 7.

[5] Reference DG3 QRA, Attachment B.16 Time Model Updates – September 2012. With the potential slip of Project Sanction beyond September 2012, as a de-risking measure, agreement was made that Project Sanction would no longer be a condition precedent (i.e. predecessor) to the award of Contract CH0006 – Bulk Excavation Works, rather the contract could be awarded, and the contractor mobilize, but not commence overburden removal, prior to Project Sanction, thereby preserving the river diversion window.

Schedule development confirmed that the deterministic, as-scheduled critical path for First Power was through the Muskrat Falls Generating Facility, with the transmission system planned to be available by mid-2017 for energization and testing using power from Churchill Falls.

With the work progressing to maintain the critical path to enable a July 2017 First Power to be realized, combined with LCMC's confidence in the both the quantity and quality of the engineering and planning work completed by SNC-Lavalin and itself, the Project Team diligently worked towards achievement of the First Power date. The DG3 declaration of readiness made by the Project Team reaffirms its commitment to the attainability of a July 2017 First Power. It did; however, caution Nalcor Executive that if strategic risks were to materialize, the date could be at risk.

As detailed in the *Lower Churchill Project Phase 1 Decision Gate 3 Support Package* in November 2012, Nalcor Executive advised its Board of Directors that First Power from Muskrat Falls would occur in 2017. With what would become a public affirmation of first power before year-end 2017, upwards of 5-month schedule reserve was; therefore, created between that internally targeted date of July 2017, and the commitments made to the Board of Directors, Shareholder and public. In recognition of the risks to a 2017 First Power, the Decision Gate Support Package provides the rational for, conditions of, and risks to achieving a 2017 First Power, as extracted and provided below:

> *"The project schedule for the Interconnected Island Option will result in First Power from Muskrat Falls in 2017. The Labrador Island Transmission Link will also be available in 2017, which will allow the displacement of power from the Holyrood plant with less expensive Labrador power, which will be of benefit to rate payers. Key to achieving this schedule is the successful completion of an early works construction program in 2012. Nalcor made the decision to invest a prudent amount of funds to develop key infrastructure at the Muskrat Falls site in advance of full construction. This involved construction of an access road on the south side of the river, power to support construction and clearing at the site. A subsequent decision was made to acquire and install temporary working accommodations and to commence preliminary mass excavation. These decisions were made to mitigate risk to the construction schedule.*
>
> *Further challenges to the schedule exist because of tight weather windows for certain activities, such as powerhouse construction, cofferdam completion and river diversion. Contingency plans are being considered and will be employed should these risks materialize."* [6]

Irrespective of the external communication of a First Power before the end of 2017 and the resultant ~5 month reserve, the LCMC Project Team continued to work diligently towards the July 2017 target date.

[6] Reference Nalcor document *Nalcor Energy – Lower Churchill Project Phase 1 Decision Gate 3 Support Package* (November 2012), LCP Admin Record No. 200-010141-00007

As discussed in the section that follows, the establishment of a comprehensive Project Control Schedule that integrated all engineering and construction planning insights, fully demonstrated that a July 2017 First Power was attainable.

4.) PROJECT CONTROL SCHEDULE DEMONSTRATES ATTAINABILITY OF JULY 2017

The Project Control Schedule (referred to as EPCM Project Control Schedule in *Figure 1* below), which underpinned the viability of the First Power Target Date of July 2017, established the overall timelines for the construction of all elements of the Muskrat Falls Generating Facility. From a schedule perspective, the Project Control Schedule demonstrated that while challenging, it was quite achievable to construct the Muskrat Falls Generating Facility in the available time, absence the occurrence of unmanageable risk events which could not be mitigated (e.g. seasonality weather restrictions).

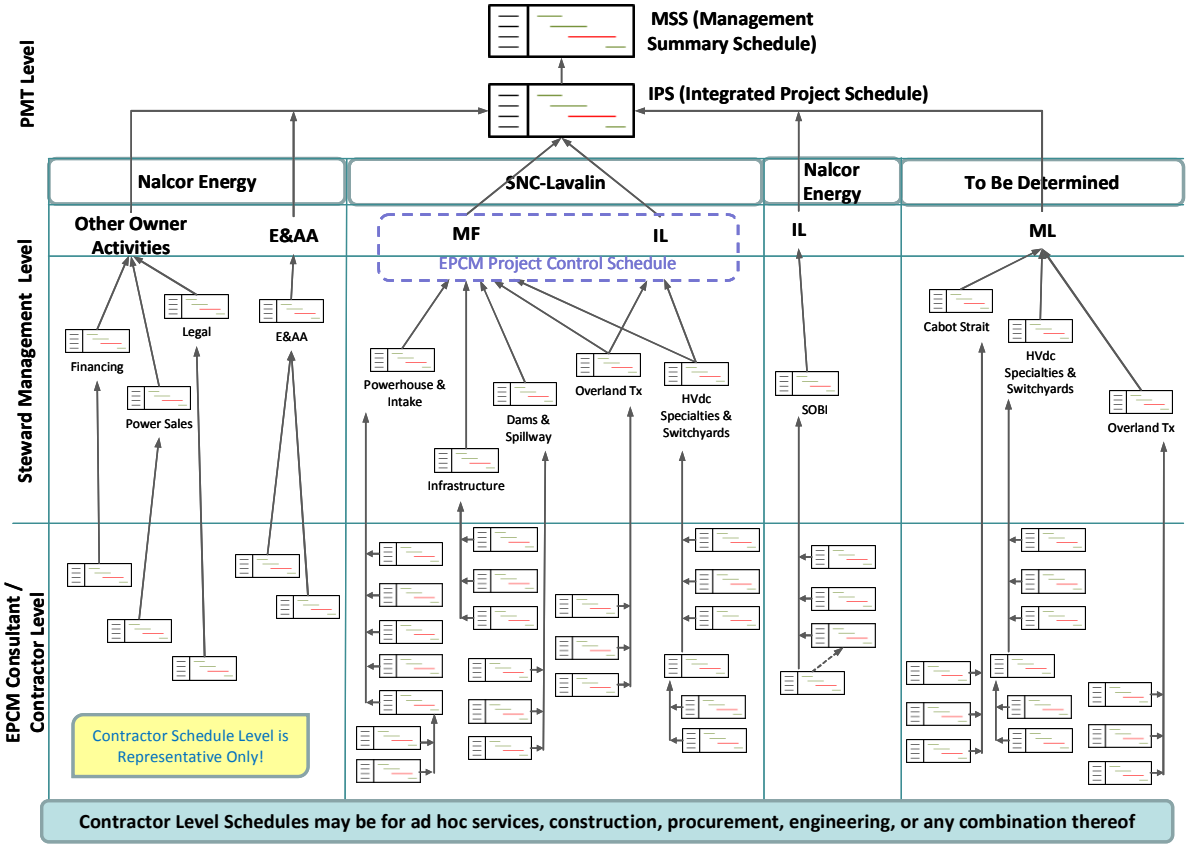

Figure 1: *Project Schedule Breakdown and Roll-up highlighting Nalcor PMT / EPCM / EPC Interface*

With the continuity of the technical resources from SNC-Lavalin through the feasibility studies and into detailed engineering, the Project Control Schedule was continually matured, benefitting from having Lee Stanton, a 30^{+} year SNC-Lavalin hydro-veteran, having the lead role in the development. With the input and validation of SNC-Lavalin's engineering and construction teams, Mr. Stanton led the creation of the underpinning Project Control Schedule for the generation station. Its development leveraged the

benefit of years of planning and scheduling work that was completed as part of earlier studies. While there were changes and modifications to the design of the various physical structures comprising the generation facility from the earlier studies, the basic layout and design was generally consistent. As part of the preparation of this technical note, Lee Stanton prepared a summary of his experience, his background on this project and additional context on the development of the Project Control Schedule (Reference Attachment 03).

While this Project Control Schedule, contained as Attachment 02, leveraged the knowledge of the earlier work that had been completed during the study phases, following the award of the EPCM Services Agreement in Dec 2010, Mr. Stanton and his associates at SNC-Lavalin developed, from first principles, this final schedule that would confirm the viability of a 2017 First Power date. Aided by engineering design complete up to mid-2012, including details of the CATIA 3D model prescribing the concrete pours, joints and volumes comprising the Muskrat Falls structures, and experiences from other similar close-coupled hydro plants (e.g. La Grande-1 and Limestone), a robust multi-thousand-line item schedule was developed using Primavera planning software.

For a glimpse into the level of detail incorporated within the Project Control Schedule, Attachment 04 provides a cross-reference of Powerhouse concrete pours from the CATIA 3D model and the associated Primavera Schedule ID. Once complete, the Muskrat Falls Generating Facility would be represented by some 7,400 work activities within the Project Control Schedule. This serves to illustrate the comprehensiveness of scheduling work upon which LCMC concluded that a July 2017 First Power was, excluding any external driven uncertainties / strategic risks which could not be mitigated, achievable.

As is typical with many engineering and construction projects, the development of the design and schedule occurred concurrently, with each influencing the other (e.g. constructability considerations driving design option selection). As the planning and scheduling was performed, there were meetings and reviews with the design and construction teams whereby elements of the design were modified to enhance execution.

In the establishment of this Project Control Schedule, several key premises and assumptions were made, including:

- It was acknowledged that this schedule would serve as a planning tool to demonstrate the achievability of the target date, which would later be further validated following the submission of contractor bids. Of particular interest would be the bidder's views for Commitment Package CH0007 – Construction of Intake, Powerhouse and Spillway, as this was the largest scope which influenced the execution of almost all other contract packages and would effectively become the project critical path.
- Work activity sequence and durations were based upon typical construction methodologies and techniques as determined by the joint LCMC / SNC-Lavalin Project Team. It was recognized that the bidding contractors, and the subsequent winning bidder, would utilize their own construction experience in order to determine their optimal construction methodologies and

techniques that would be used for the construction. Irrespective of the Project Team's schedule view, it was recognized that it would be the winning bidder's schedules that were critical to confirm the achievability of a 2017 First Power date.

- The approach taken when developing the Muskrat Falls construction schedule was to attempt to optimize the schedule around the Turbine and Generator (T/G) duration. The engineering, fabrication, embedment, and assembly durations of the T/G therefore provided the overall duration for the work, and the civil and hydro-mechanical work supporting that duration.
- As with all hydro projects, there were key scheduling and work activity constraints that were necessary due to environmental and seasonal restrictions. Primarily, these were related to the river, including river freeze-up in the winter, the timing of the spring freshet (flood), river diversion and raising the upstream reservoir level to flood the upper falls (winter head pond – elevation at 25m). The timing of these various environmental elements dictated the available work periods for many aspects of the work, which in turn were reflected in the logic, constraints and working calendars contained in the Project Control Schedule.
- While LCMC fully expected contractors to work a 7-day work week, proactively in order to provide an in-built schedule contingency, the Project Control Schedule was built using a 6-day rather than 7-day work week. Acting as a schedule reserve or buffer, this provision provided ~8 months of cumulative schedule allowance or float**.**
- The schedule assumed the work would be executed on a dual, 10-hr shift basis (day / night), which is typical of most remote construction projects.

As the Project Control Schedule development progressed, it became clear that there were three principle project milestones:

1. **Ready to Divert** – In order to achieve this milestone, the Spillway Phase I works (and related structures) had to be complete in order to start river diversion and construct the cofferdam. The DG3 schedule would call for the earliest diversion to occur in 2015, however this was later moved out by 1 year to 2016 to mitigate cost pressures, as captured within PCN-0137 (further details provided in Section 7 of this Report).

2. **Ready to Impound** – The objective of this milestone is for the water retaining structures (i.e. the North spur, the dams and intake) to be ready to impound the reservoir and provide water for the unit testing.

3. **First Power** – This is the point where the reservoir has been impounded to at least the Minimum Operating Level and the first turbine and generator has been installed and tested as per the official definition of First Power.

The Project Control Schedule confirmed that the deterministic (i.e. prior to consideration of strategic risks that could not be mitigated) primary critical path to First Power was through the water availability to the generating units, referred to as simply the "Water Path". The Water Path was driven by impoundment of the reservoir, which itself was driven by construction of the spillway and installation of

hydro-mechanical works (i.e. gates), construction of the main temporary cofferdam across the river, diversion of the river through the spillway, and construction of the North Roller Compacted Concrete (RCC) dam and the South rockfill dam. The diversion of the river is what makes the workface available to start the construction of the North (in-river) RCC dam.

It was confirmed that a secondary, and near-critical, path existed, specifically the supply and installation of the turbine and generator units referred to as simply the "Unit Path". This Unit Path is driven by the construction of the powerhouse and intake civil structures, installation of the turbine embedded components, completion of the Phase II concrete works in the powerhouse, assembly and installation of the turbines and generator components, as well as the necessary Balance of Plant (ancillary and auxiliary services) works in order to reach the "Ready to Turn" milestone for the Turbine unit.

The Project Control Schedule revealed that both the primary and the secondary critical paths were very close together, meaning that during execution they would be competing as to which was actually driving overall completion at any given point in time. While this indicates a "tight" schedule, or one without significant flexibility, it also generally means that – from a time perspective – it is largely optimized and can drive executing parties to improved performance, as teams strive to stay off the critical path, or to take the "lead" in the race to completion and avoid contractual penalties (e.g. liquidated damages).

Figure 2 illustrates this basic scheduling logic, with the primary critical path outlined in red, while *Figure 3* presents a visual timeline of the pathway to a July 2017 Target First Power.

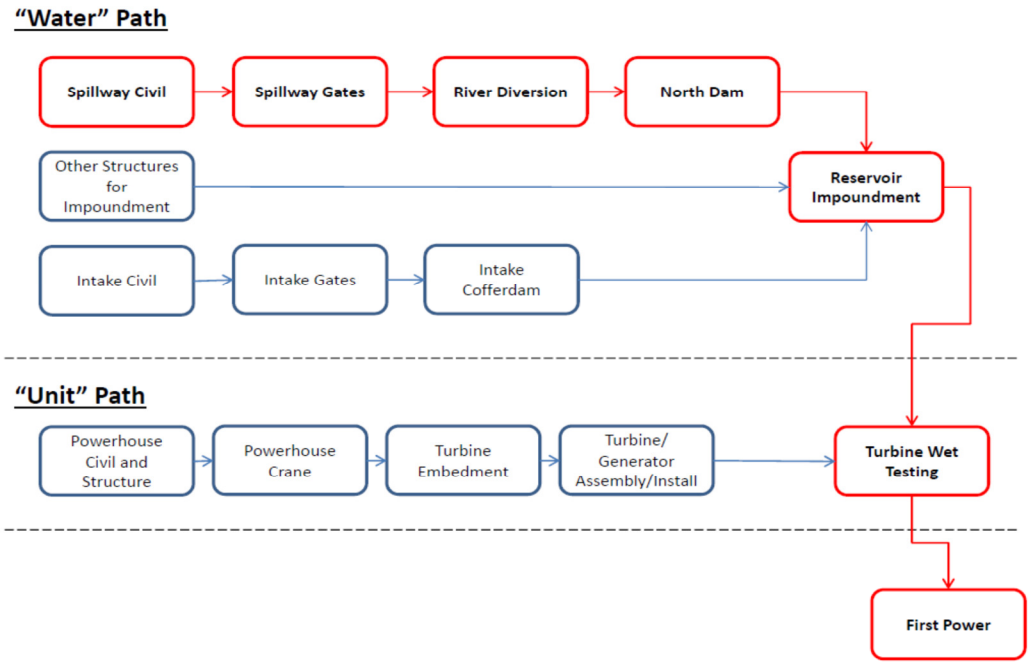

Figure 2: *Representation of primary and secondary schedule critical paths to First Power for Muskrat Falls Generating Facility at DG3*

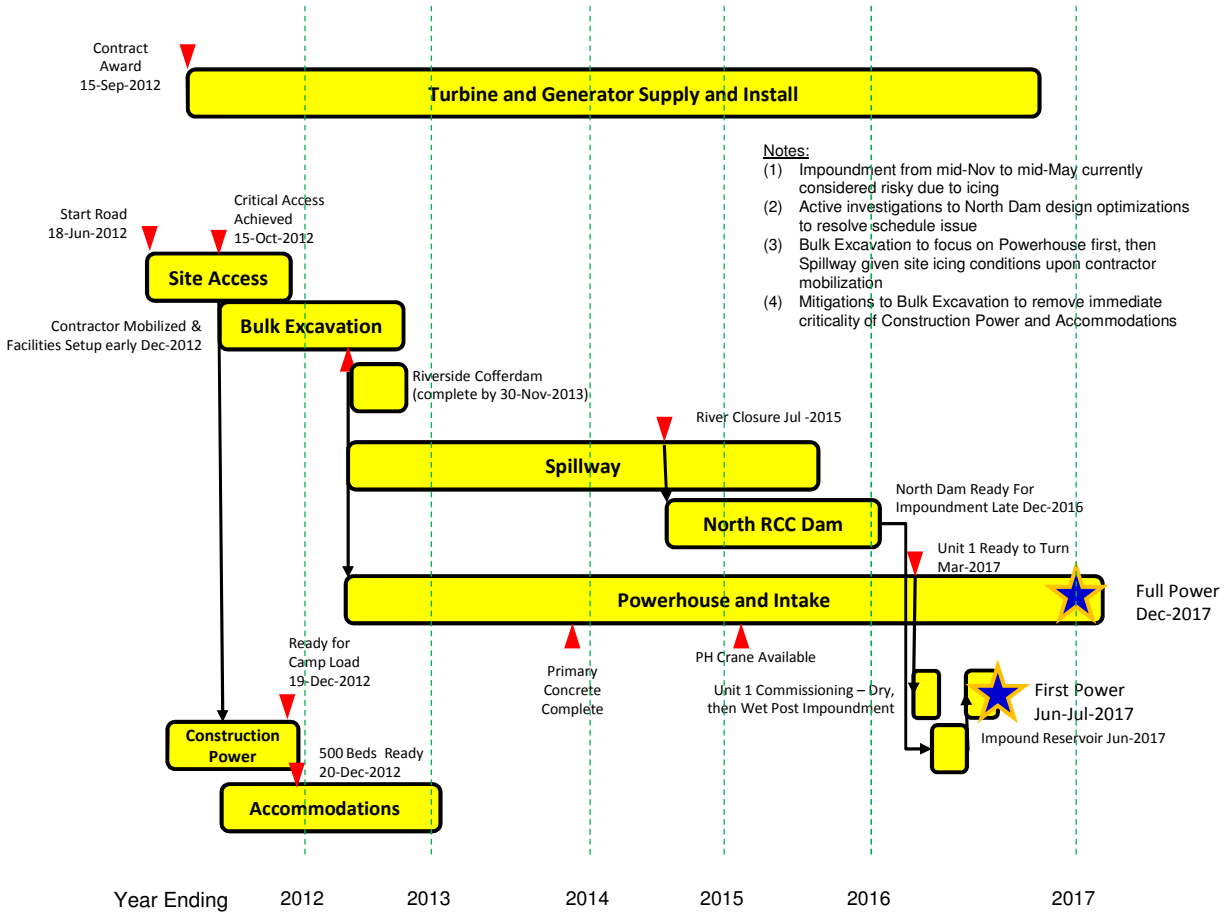

Figure 3: *Underlying Muskrat Falls Schedule Logic for Project Control Schedule (circa August 2012)* [7]

Attachment 05 – Muskrat Falls Construction Sequence provides a visual depiction of the resulting construction sequence as captured in the Project Control Schedule forming the basis of the DG3 declaration of readiness.

Key Schedule Drivers

The Project Control Schedule indicated that there were two key influencers or drivers on the achieving the sequence and timelines developed within the Project Control Schedule. They were (1) achieving the weather windows, and (2) achieving the planned concrete placement rates. Further details on each of these are provided below.

Driver 1: Weather Windows

Several of the primary or secondary critical path activities within the Project Control Schedule were constrained by limited weather windows, wherein non-completion of the activity within the weather

[7] Extracted from Decision Gate 3 Basis of Estimate, Nalcor document no. LCP-PT-ED-0000-EP-ES-0001-01, Rev. B1, page 57.

window by a matter of days or weeks could result in the loss of a full or partial year on the overall schedule. These activities included:

- **Riverside RCC Cofferdam** – Required for protection of the spillway excavation from the river during construction; placement of RCC is temperature dependent. Based upon historical climatic data, the Fall cut-off for placement of RCC is mid-October. The Riverside RCC Cofferdam is necessary to prevent the flooding of the spillway excavation worksite from downstream, during winter freeze-up and formation of the hanging ice dam that forms in the river downstream of Muskrat Falls. With the Riverside RCC cofferdam required to be completed before mid-Oct 2013 in order to facilitate the commencement of spillway concreting by CH0007, non-completion could result in loss of a construction season for the spillway and eventual loss of the targeted 2015 diversion window. This is an example of how a delay in days and weeks of this key activity would lead to a year loss overall. However, because of the Project Team's awareness of this key risk and the mitigations applied it did not materialize and the spillway excavation was protected as planned.

- **River Diversion** – Must occur in the window of post spring thaw and freshet; which concludes mid-July, and freeze-up in mid-December. Diversion of the river requires construction of a cofferdam across the Churchill River. This cofferdam cannot start until after the passing of the annual spring freshet due to the high river flows and velocities. Based upon historical observations, the increased flow in the river often recedes by mid-June, but has been known to continue until mid-July. Planning, therefore, was based upon the ability to start the cofferdam in mid-July, with knowledge that within a given year, an earlier start may be possible, depending upon actual conditions. Placement of material in the cofferdam, particularly till material, was required to ensure impermeability of the cofferdam, but becomes much more difficult and costly during winter conditions. Based upon historical observations of climatic data, it was deemed that placement after end-November becomes difficult, and impractical after mid-December. This generally coincides with historical observations of ice formation and buildup in the Churchill River. This ice buildup would further complicate any cofferdam construction during this period. Again, during the planning process, it is recognized that in a given year the climatic conditions may differ from the historical ranges or norms, which may permit extended working durations, or potentially reduce the assumed windows. The approach was to utilize somewhat conservative durations for the windows in order to drive construction design and execution, while increasing likelihood of work completion in the window. Because of the Project Team's awareness of this critical risk, mitigation were put in place and River closure and River Diversion occurred as planned.

- **North RCC Dam** – As with the Riverside RCC Cofferdam, the construction of the North RCC Dam is temperature dependent, having a historical working window of mid-May through mid-October.

- **Impoundment** – While the reservoir can be impounded at any time of year, there are certain windows that carry different concerns and risks.
    - The optimal period of impoundment is following the spring freshet up to the onset of ice buildup in the river. This window is from approximately mid-June (mid-July in planning basis, due to the historical observations that the spring freshet can extend through to mid-July) through to approximately late November to mid-December.
    - Spring Freshet Impoundment. Impoundment during the freshet, approximately early to mid-May through to mid-June or even mid-July, would be the shortest duration impoundment due to the increased flows in the river. While this may be desirable in large reservoirs due to the lengthy impoundment duration, in smaller reservoirs such as at Muskrat Falls, it generally isn't necessary. During reservoir impoundment, there are many structures, and parts of structures, that are being subjected to their designed hydro-static loading (the pressure imparted by the upstream water level) for the first time. A slower impoundment duration allows monitoring of structures, and their reaction to the hydro-static loading, with time to enact repair or mitigation measures if necessary. A "fast" impoundment, during the spring freshet, would reduce the time available for any such measures. Impoundment during the early part of this time frame was deemed to carry some level of potential risk from ice formation.
    - Winter impoundment, from approximately late-November or mid-December through to approximately the end of April or mid-May was deemed to carry risk at the time of DG3, with the amount of risk increasing further into the window, especially after December. During a winter impoundment there is an increased risk of ice buildup that could cause issues with the upstream ice boom; potential issues with ice buildup on the intake trashracks, possibly creating issues with turbine commissioning; and potential for ice issues in the spillway. It was recognized at the time of DG3 that further studies were required to further define the parameters around a potential winter impoundment, and thus further refine the impoundment windows in order to reduce the potential effect of this constraint on the schedule.

Driver 2 – Required Concrete Placement Rates

Given the requirement for ~450,000 MT of concrete required to be placed for the construction of the Intake, Powerhouse, Spillway and Transition Dams at Muskrat Falls would require an average of 12,500 m^3 per month and some months exceeding 20,000 m^3, confidence in the pour sequence and placement rates were seen as a key indicator of the achievability of the schedule to meet the 2017 First Power date.

In order to develop a schedule based upon realistic production rates, significant consultation and discussion occurred throughout the LCMC / SNC-Lavalin organization which included a team of experienced construction and hydro professionals. These individuals were providing viewpoints on what was reasonable in terms of production methodologies, sequence, and expected concrete production rates. In confirming the required concrete production rates required, planned rates were benchmarked

against analogous projects, included several of those listed in Table 1. While the team noted that the planned production rates for MFG were high, benchmarking revealed that actual monthly placement rates that were achieved on the La Grande 1 (LG1) generating station in northern Quebec, exceeded the planned placement rates at Muskrat Falls. Similarly, the team noted that the demands of the construction schedule indicated that there are times in the construction program where the concrete placement rates seem, and were, high when viewed at a high level. However, when looked at in detail, many of the pours were, by intention, being placed in different structures (primarily the spillway, intake and powerhouse during the most intensive periods) that were different which meant that simultaneous major work fronts were available and hence the rates were achievable.

As a final check of production rate exposure, as input to the time-risk modeling completed during the DG3 QRA, SNC-Lavalin's Lead Estimator benchmarked the required production to meet the schedule against Eastmain 1-A. This review indicated that the planned concrete placement rates and cycle times were reasonable, however the ability to sustain the required production rates for three years could be a challenge. The Lead Estimator highlighted, as had other involved construction professionals, that the high volumes of concrete to be placed, at a high tempo, could lead to concerns with batch plant maintenance opportunities. It is noted that batch plant maintenance or down time has had no impact on the project schedule through 2018, due to Astaldi's strategy of installing dual 100 MT per hour each batch plants, plus a supplemental 50 MT per hour plant (which never was required). The early identification of this potential risk to concrete production was; therefore, effectively mitigated.

Name	Location	Capacity (MW)	Commissioned Date	Owner
Churchill Falls	Labrador	5,600	1971-74	Nalcor Energy
Eastmain	James Bay, Quebec	480	2011-2012	Hydro-Quebec
Karahnjukar	Iceland	690	2009	Landsvirkjun
La Grande 1	James Bay, Quebec	1,436	1994-95	Hydro-Quebec
La Grande 3	James Bay, Quebec	2,418	1982-84	Hydro-Quebec
La Grande 4	James Bay, Quebec	2,779	1984-86	Hydro-Quebec
LaForge 2	James Bay, Quebec	878	1996	Hydro-Quebec
Limestone	Northern Manitoba	1,350	1990-92	Manitoba Hydro
Paradise River	Newfoundland	11	1989	Nalcor Energy
Long Spruce	Northern Manitoba	980	1979	Manitoba Hydro
Peribonka	Saguenay, Quebec	450	2007-08	Hydro-Quebec
Revelstoke	British Columbia	2,000	1984	BC Hydro
Smoky Falls (re-development)	Northern Ontario	268	2014	Ontario Power Generation
Wuskwatim	Northern Manitoba	211	2012	Manitoba Hydro

Table 1: *Names, locations, and name plate sizes of some of the key projects considered in assessing the production rates / norms and construction methods used in the DG3 planning basis*

Figure 4 presents the final concrete production rates that were included within the DG3 Project Control Schedule. While this graph shows a total of ~350k m^3, at the time of DG3 approval, estimated concrete quantities were later recalculated to be ~450k m^3, resulting in a required average placement rate of 12,500 m^3 over ~3 years.

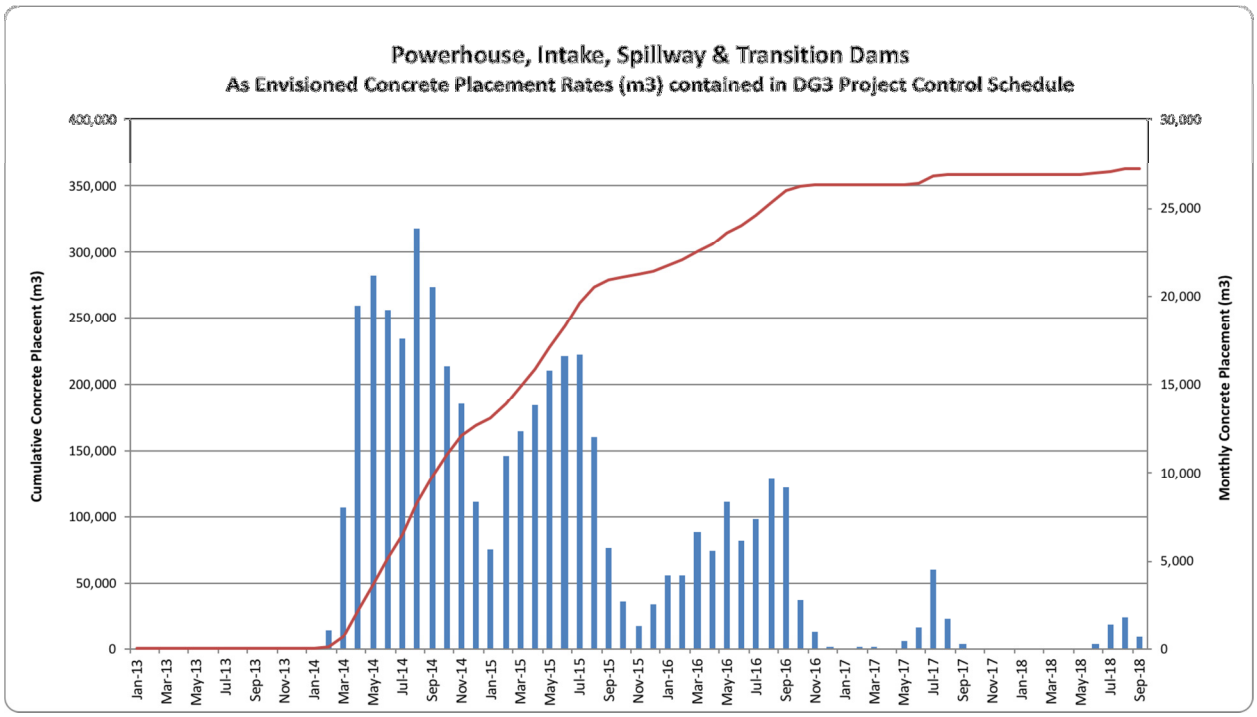

Figure 4: *As Planned Concrete Production Rates forming basis for DG3 Project Control Schedule*

5.) SCHEDULE STRESS TESTING TO VALIDATE ATTAINABILITY

With a detailed Project Control Schedule, available and verified by experienced personnel, that verified the attainability of a targeted July 2017 First Power, LCMC endeavoured to stress test the schedule to validate attainability. Under the *Project Risk Management Plan*[8], a quantitative risk assessment (QRA) was initially completed in May – June 2012 and documented within the *Decision Gate 3 Project Cost and Schedule Risk Analysis*.[9] The QRA, for identification of Management Reserve, would continue through 2012 with the final report issued in October 2012.

As indicated within Section 10.2 of the DG3 QRA document, stress testing using time-risk modelling techniques identified that the Target First Power date would be most influenced by the identified 3 strategic risks which would influence the outcome of the following schedule critical items:

- Award of CH0006 Mass Excavation Contract and timely completion of the RCC Riverside Cofferdam before onset of winter 2013/14;
- Availability of the MF accommodations complex to support CH0007 Contractor;
- Primary and secondary concreting durations in the Intake, Powerhouse and Spillway by CH0007 Contractor to facilitate readiness for river diversion through the spillway within the weather

[8] Reference Nalcor document *Project Risk Management Plan*, document no. LCP-PT-MD-0000-RI-PL-0001-01, Rev B1 issued June 2011.

[9] Reference Nalcor document *Decision Gate 3 Project Cost and Schedule Risk Analysis Repor*t, document no. LCP-PT-ED-0000-RI-RP-0002-01, Rev B1.

window of 2015 (i.e. would the CH0007 bidders confirm the underpinning concrete placement rates contained within the Project Control Schedule);

- North RCC Dam construction window due to ambient temperature restrictions on roller compacted concrete;
- Reservoir Impoundment (seasonal activity) and availability of water for turbine and generator wet testing & commissioning (unit 1 only); and
- HVdc Overland Transmission Line construction – seasonality and duration driven, with start of construction dependent upon release from environmental assessment.

The QRA advised that should the unexpected occur, the ability to achieve a July 2017 First Power was remote (less than a P10), while there could potentially be an 11 to 21 month exposure (P25 and P75) for Full Power beyond the December 2017 scheduled date. This range of time exposure was significantly influenced by the tight weather windows associated with each of (i) bulk excavation works (and the riverside RCC cofferdam), (ii) river diversion, and (iii) reservoir impoundment. The QRA further revealed that there was no single risk event contributing to the overall time-risk exposure, rather a number of discrete items, which when compounded, could cumulatively push First Power out to 2019. *Figure 5* presents the time-modelling results from the QRA.

While the QRA identified the potential of time-risk pre-dominantly influenced by the 3 strategic risks, it more importantly identified what were the critical schedule risk drivers, and what were the threats that needed extra focus, thereby informing the team of where to focus its delivery efforts to maximize the likelihood of achieving the sequence and dates developed with the Project Control Schedule.

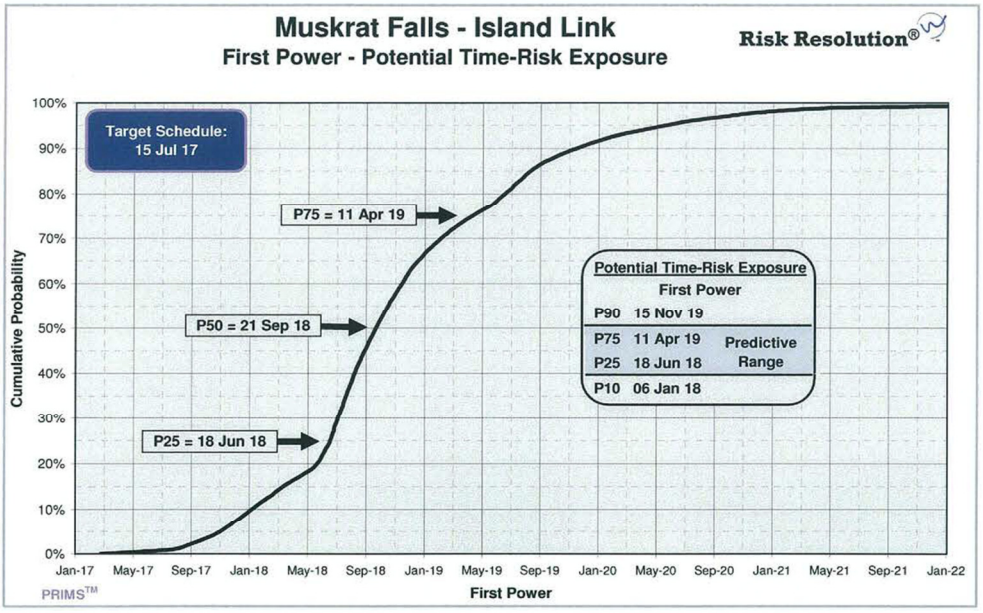

Figure 5: *DG3 QRA time-risk modelling results*

As stated in *Muskrat Falls Project – The Sanction Decision*[10], the DG3 QRA confirmed that without consideration of schedule reserve, the target dates were achievable, but aggressive, and conditional upon achieving key assumptions for the primary and secondary critical path activities. Hence the focus going forward was to stick with the detailed plan that had been developed by the team, but recognize there were schedule stressors (i.e. weather and placement rates), and ensure Nalcor Executive were aware of the potential schedule stressors. The Decision Gate 3 Support Package summarizes this approach:

> *"Further challenges to the schedule exist because of tight weather windows for certain activities, such as powerhouse construction, cofferdam completion and river diversion. Contingency plans are being considered and will be employed should these risks materialize."* [11]

Armed with the insights from the QRA, LCMC worked to implement time-risk mitigation measures that would help secure power from Muskrat Falls before the end of 2017. As a first priority was the timely award of Commitment Package CH0006 – Bulk Excavation Works so as to maintain the ability to complete the Riverside RCC Cofferdam by 30-Nov-2013 (reference *Figure 3* for details). With the forecasted slip of Project Sanction from September to December 2012, LCMC had agreement from Nalcor Executive that the contract for Bulk Excavation Works could be awarded, and the contractor could proceed with mobilization but not commence excavation works, thereby mitigating this critical path schedule exposure. It should be noted that the Bulk Excavation and Riverside RCC Dam construction was successfully de-risked, with all planned scope completed per the timeline of the Project Control Schedule, thereby maintaining the critical path to a July 2017 First Power.

6.) THIRD PARTY REVIEWS CONFIRM JULY 2017 SCHEDULE VIABLE

Prior to, and shortly thereafter, Project Sanction, three separate reviews of the project schedule were completed by independent third parties. Each review concluded that the project scheduling was of good quality, and that in-general the project schedule was achievable, but there were risks to the schedule.

Manitoba Hydro International (MHI)

MHI prepared a report entitled *Review of the Muskrat Falls and Labrador Island HVdc Link and the Isolated Island Options* in October 2012. This report, presented in Attachment 06, was prepared at the request of the Government of Newfoundland and Labrador to provide an Independent Assessment of the two generation supply options, as prepared by Nalcor Energy in preparation for Decision Gate 3.

[10] Reference Nalcor document *Muskrat Falls Project – Sanction Decision, Briefing Note as Requested by Nalcor Legal Counsel McInnes-Cooper* (Volume 3 of 5 volume set)

[11] Reference Nalcor document *Nalcor Energy – Lower Churchill Project Phase 1 Decision Gate 3 Support Package* (November 2012), LCP Admin Record No. 200-010141-00007, page vii.

As part of its review to confirm the least cost option, MHI requested to review key aspects of the engineering and planning completed by LCMC/SNC-Lavalin since DG2, including the project cost estimate and schedules. MHI's review of the schedule for the Muskrat Falls Generating Facility resulted in them concluding the following:

> *"The high level schedule that was reviewed reflected the project contracting strategy and depicted the key project activities that impact the project schedule. The schedule is consistent with the current contract packaging strategy and has considered labour workforce levelling. Based on a selected review, the schedule is supported by a very detailed work breakdown structure that should address project and construction management, and cost control during project execution."*
>
> *"There are a few areas in the schedule that will be challenging, for example, early installation of the project infrastructure, RCC cofferdam construction and the main structures concrete. In discussion with the project team; however, it is apparent that they are well aware of these issues and are taking measures to manage the risks associated with the components of the schedule."*
>
> *"For MHI's perspective, the project scheduling is comprehensive, detailed and consistent with best industry practice for similar projects. The current project schedule is appropriate and reasonable to meet the requirements of Decision Gate 3."*

Independent Engineer

The Interim Independent Engineer's Report dated November 2013 supported the overall project timeline. Within this report, presented as Attachment 07, it is noted:

> *"Similar projects have taken approximately 5-7 years to complete. Nalcor's estimated 5.25 year build-out and commissioning period is observed to be within that range."*

DG3 Independent Project Review (IPR)

The MFG schedule was reviewed by the Independent Project Review (IPR) team as part of the DG3 readiness checks (Attachment 08). The IPR team noted that they *"…observed a very thorough, detailed and collaborative approach to developing the construction schedule; this provides a sound basis for an effective owner-CM contractor interface going forward."*

7.) CHANGE IN TARGET FIRST POWER DATE FROM JULY TO DECEMBER 2017

Subsequent to DG3 and following the viewpoints being voiced by all pre-qualified bidders of Commitment Package CH0007-001 – Construction of the Intake and Powerhouse, Spillway and Transition Dams regarding the challenges associated with maintaining a 2015 river diversion, a decision was taken to move river diversion to 2016. While all CH0007 bidders advised that a 2015 diversion could be achieved, considering an expected contract award in July 2013, it would come at a price premium. To alleviate this cost risk, Project Change Notice PCN-0137 (provided as Attachment 09) was approved in April 2013 formally re-sequencing the schedule, moving diversion to 2016, therein resulting in a new target First Power date of December 2017. It is noted that this decision was a cost driven decision as MF/LCP was a cost driven project.

The switch of river diversion to 2016 resulted in the resequencing of some work activities within the Project Control Schedule but did not modify the critical path, nor contradict the public declaration of power from Labrador in 2017. Rather, PCN-0137 sought to leverage the natural reserve between July and December 2017 that had been provided at DG3, in order to reduce cost exposure. It must be emphasized that although the diversion shifted 1-year, it did not mean that all other activities would move day-for-day, due to the seasonal windows associated with the river diversion window.

Table 2 summarizes the changes to key dates within the Project Control Schedule following the approval of PCN-0137. These revised timelines and strategy were included in the CH0007 and CH0032 bid packages via an addendum during the bid phases.

Key Date	Original / DG3 Plan	Current
Commence Mass Excavation	October 2012	December 2012
Spillway Excavation Complete	End October-2013	No Change
Spillway Ready For Diversion (2)	Q2-2015	Late Q1-2016
North Spur Ready for Diversion (3)	Q4-2015	Mid 2016
Cofferdam Construction (4)	Jul-Oct 2015	Jul-Oct 2016
River Diverted	End October 2015	End Oct-2016
North (RCC) Dam Construction (5)	May 2016 to Mar 2017	May 2017 to Oct-2017
Reservoir Impoundment	May 2017	Nov-2017
First Power (6)	Mid 2017	Late 2017
Full Power	Late 2017	Mid 2018

Table 2: *Table summary of key changes to DG3 Project Control Schedule (extracted from PCN-137)*

It is noteworthy that the very first issue (Revision B) of the Integrated Project Schedule ("IPS"), reference Attachment 10, incorporated the changes introduced by PCN-0137. Note that Revision A of the IPS was prepared while PCN-0137 was being contemplated but its issued was delayed in order to incorporate the changes stemming from the approval of PCN-0137.

8.) CONTRACTOR'S SCHEDULES REAFFIRM 2017 FIRST POWER ATTAINABILITY

As introduced within Section 4 of this Technical Note, the critical path to First Power at DG3 was the Water Path, specifically through river diversion and the construction of the spillway. Contracts for both the spillway civil (part of CH0007-001) and the hydro-mechanical works (CH0032-001 gates and hoists) were both awarded in late 2013, following Financial Close.

By November 2013, the target date for First Power had shifted from July to December 2017, due to a decision taken to respond to CH0007 bidder cautions of bid price risk of maintaining the as-planned 2015 diversion window (further details contained in Section 7).

With this adjustment, the selected contractors for both CH0007 and CH0032 demonstrated viable schedules to support the achievement of a December 2017 First Power date, while the bid schedule of the majority of the unsuccessful bidders also supported this date.

Commitment Package CH0007-001

Commitment Package CH0007-001 –Construction of the Intake and Powerhouse, Spillway and Transition Dams was awarded to Astaldi Canada in late November 2013. As part of this Contract, Astaldi agreed to the milestone dates required to achieve a 2017 First Power, submitting a bid schedule that demonstrated how this would be achieved. Attachment 11 provides a copy of Exhibit 9 – Interface and Milestone Schedule as extracted from the Contract between Muskrat Falls Corporation and Astaldi. The interface and milestone dates contained within Exhibit 9 were aligned with those of CH0032 and what was required to achieve a December 2017 First Power from Unit 1.

To further reinforce its view of the attainability of its baseline schedule, Astaldi agreed to significant liquidated damages, up to a maximum of 7.5% of the Contract Price (>$75M), if the milestones dates contained within the schedule were not achieved. Attachment 12 is an extract of the Contract detailing this agreement.

Subsequent to award, Astaldi submitted a Baseline Schedule, person hour loading and concrete curves (contained in Attachment 13) which supported the achievability of the Interface and Milestone Schedule dates contained in Exhibit 9 of the Contract, which were subject to liquidated damages.

Commitment Package CH0032-001

Following the award of CH0007-001, Commitment Package CH0032-001 – Supply and Install Powerhouse and Spillway Hydro-Mechanical Equipment was awarded to Andritz Hydro in December 2013. As part of this Contract, Andritz agreed to the milestone dates required to achieve a 2017 First Power, submitting a bid schedule that demonstrated how this would be achieved. Attachment 14 provides a copy of Exhibit 9 – Interface and Milestone Schedule as extracted from the Contract between Muskrat Falls Corporation and Andritz. The interface and milestone dates contained within Exhibit 9 were aligned with those of CH0007 and what was required to achieve a December 2017 First Power from Unit 1.

Similar to Astaldi, Andritz agreed to significant liquidated damages, up to a maximum of 20% of the Contract Price (>$35M), if the milestone dates contained within the schedule were not achieved. Attachment 15 is an extract of the Contract detailing this agreement.

Subsequent to award, Andritz submitted a Baseline Schedule (contained in Attachment 16) which supported the achievability of the Interface and Milestone Schedule dates contained in Exhibit 9 of the Contract, which were subject to liquidated damages.

In summary, Andritz and Astaldi's acceptance of the interface and milestone dates required to achieve a 2017 First Power, and further agreement to substantial liquidated damages if not met, further reaffirmed LCMC view that a 2017 First Power was attainable.

9.) WHAT TRANSPIRED TO RESULT IN SLIPPAGE TO 2019 FIRST POWER

The events which transpired and influenced the current forecasted first power date from 2017 to 2019 are discussed within *Muskrat Falls Project – Post Sanction*.[12] While that report presents great detail on the root causes that resulted in the increased cost of the Project, the overall slippage of schedule can largely be attributed to two items:

1. Delay of award of key contracts as a result of unexpected contract market conditions and resulting delay in Financial Close
2. Astaldi's poor start-up and early performance deficit which directly impacted the critical path to First Power.

Delay of Financial Close

The DG3 planning basis, upon which the Project Control Schedule supporting a July 2017 First Power was premised, envisioned Project Sanction occurring in September 2012, followed by Financial Close in May 2013. Achieving Financial Close was a condition precedent of making the substantial financial

[12] Reference Nalcor document *Muskrat Falls Project – Post Sanction, Briefing Note as Requested by Nalcor Legal Counsel McInnes-Cooper* (Volume 4 of 5 volume set)

commitments required for Commitment Packages CH0007-001 and CH0032-001, thus slippage of Financial Close would result in delay in the award of these packages.

As it would happen, Project Sanction was not achieved until December 2012, some 2.5 months later than anticipated, while Financial Close was not reached until November 2013, some 6 months later than the DG3 planning basis. In regard to Financial Close, this delay was driven by the additional time to achieve the conditions precedent, including:

- Release of the Labrador-Island Transmission Link from Environmental Assessment;
- Firm pricing for Material Contracts (specifically CH0007-001, CH0032-001, CD0501-001 – HVdc Converters, CT0319-001 – 315kV HVac TL) which had been delayed to due to market pricing far exceeding DG3 estimate.

So, while it would appear that Financial Close was the driving factor for delay, the delay was rooted in the time required to obtain acceptable pricing and commercial conditions for the Material Contracts. Bid prices and Contractor willingness to accept risk was quite different than pre-DG3 market intelligence.

Table 3 below summarizes the planned vs actual date for these major milestones.

Milestone	Target / Planned Date		Actual Date
	DG3	Adjusted w/ PCN-137	
Project Sanction	September 2012	December 2012	December 2012
Financial Close	May 2013	No change	November 2013
CH0007 Award	June 2013	July 2013	September 2013 (LNTP) November 2013 (Full Award)
CH0032 Award	January 2013	June 2013	December 2013

Table 3: *Summary of DG3 planned vs actual date for several Target Milestones*

Astaldi's Performance Deficit

Request for Proposal responses (i.e. bids) were received for Commitment Package CH0007-001 on 16-Apr-2013, with what was then an expected award of July 2013. RFP submissions reflected this award date and developed their construction plan around this date. The extended negotiation period and delayed full award for field mobilization until November 2013, required Astaldi to reconsider and adjust its production plan, that would become its March 2014 baseline schedule submission. While Astaldi agreed to the schedule adjustment and maintained its commitment to the December 2017 First Power timeline, it would later be determined it could not achieve the production rates underpinnings its baseline schedule in the early years. Astaldi did achieve the concrete placement rates in later years.

Once the contract was awarded, Astaldi had a very slow start primarily due to start-up issues in 2014, failure of the integrated cover system, and significant productivity and planning gaps attributable to

gaps in management and supervisory capacity and capability, and an apparent lack of ability / willingness to exercise its management rights under the Collective Agreement. These delays, when coupled with poor contractor execution, and an inability of the contractor to effectively simultaneously construct the spillway and intake/powerhouse facilities, led to asymmetrical schedule slippage. While the diversion works were completed generally in accordance with the DG3 timeline adjusted by PCN-0137, the Intake and Powerhouse construction lagged. There were several contributing factors to this lag, including:

- The extended time to construct the Integrated Cover System ("ICS") by the contractor, compared to their intended schedule;
- The utility of the ICS as an effective construction aid in order to facilitate winter concreting;
- The impact upon the sequence of concreting due to the construction of, and subsequent removal of, the ICS, which led to actual erection sequence that was different than planned (Unit 3, in particular, was significantly impacted by the ICS construction and removal);
- The formwork failure in Draft Tube Number 2 in May 2016, which has clear impact in the construction of Draft Tubes 2 and 3, but also in other areas; and
- Inadequately planned and scheduled work by the CH0007 contractor that failed to adequately consider construction logistics that led to extended overall timelines.

Throughout 2014 and 2015 LCMC worked with Astaldi to address these and the other evident issues that was impeding the work. Astaldi decided to halt concrete placement during the winter months of 2015/2016 and focus on re-grouping, however once concrete was restarted in early Spring 2016, Astaldi's concrete placement rates demonstrated that the LCMC/SNC-Lavalin's DG3 assumptions were reasonable and achievable. During the period from July 2016 through June 2017 (12 months) a total of ~ 150,000 m^3 was placed, with an average production of ~12,500 m^3 per month and a peak month of ~24,000 m^3; on par with the original production assumptions made at the time of DG3. Astaldi continued this strong production pace, placing ~227,000 m^3 for the entire period of April 2016 through September 2017 (18 months); an average of 12,600 m^3 per month. Had these production rates been achieved throughout the Contract period and Astaldi had performed better, the original Contract schedule was achievable.

Figure 6 provides a comparison of the Astaldi bid concrete curve (baseline plan) vs the actual concrete curve from 2014 through 2017.

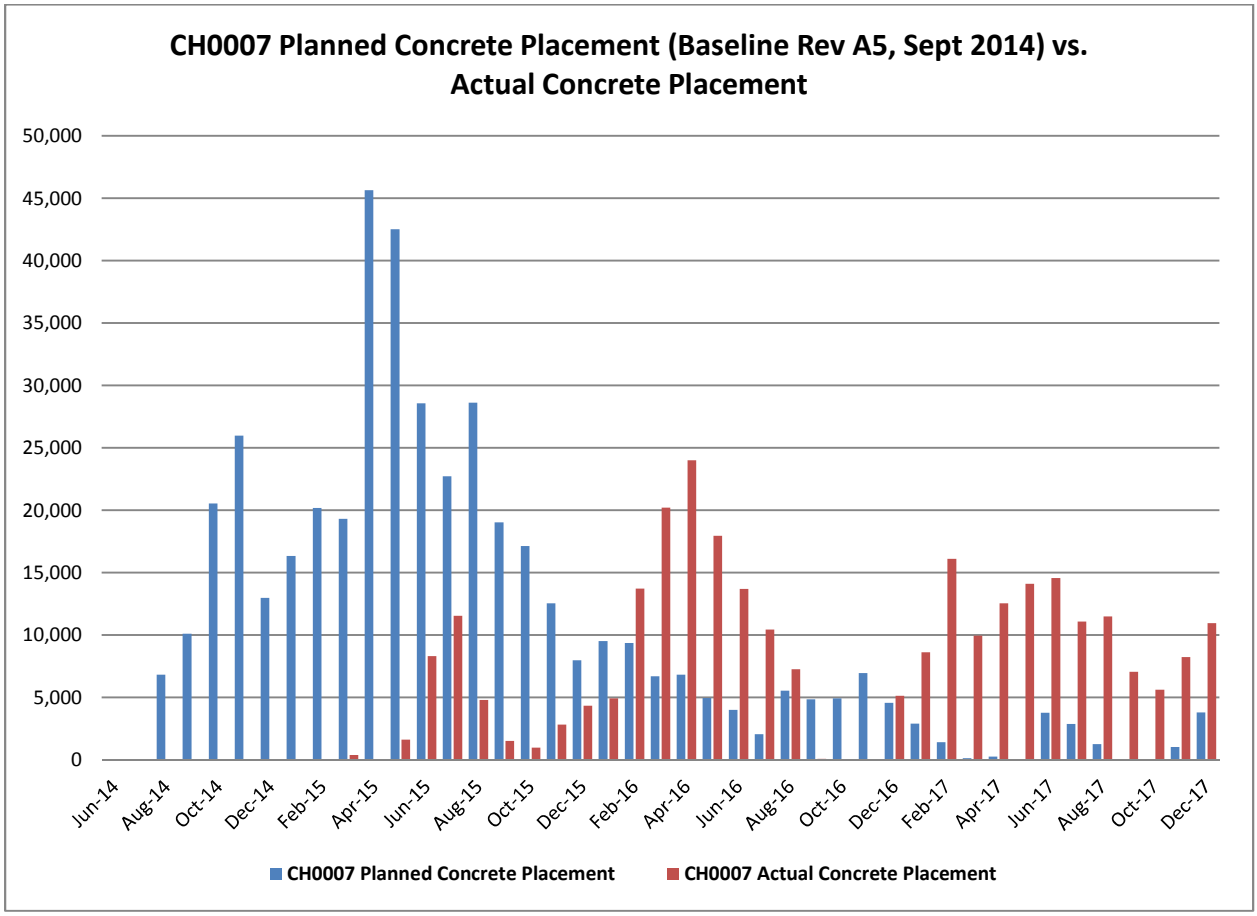

Figure 6: *Astaldi Baseline Planned vs. Actual Concrete Placement Rate*

Supporting Notes to Figure 6:

(1) The excessive peaks shown in the CH0007 Baseline information reflects a substantial amount of concrete placement scheduled that had available schedule float in a variety of structures.

(2) The baseline curve represents a focus upon executing multiple workfaces largely simultaneously – primarily the intake/powerhouse and spillway. This reflects the schedule need to support works to achieve river diversion, as well as the need to progress intake/powerhouse scope to meet the interface points with other contractors. Conversely, the actual placement record indicates a primary focus on concrete works required for diversion concrete, and the impacts of the Integrated Cover System.

(3) The lack of defined peaks and valleys in the baseline placement curve reflects the intent to utilize a cover structure

(4) The September 2014 Baseline represents a point at which the Contractor Schedule submission was finally in a state to be used for project tracking (Rev A5 accepted 30Oct14, Rev A1 submitted by Contractor 09Apr14)

(5) Actual placed concrete only carried to Dec 2017 (Powerhouse enclosed in Q4 2017); Contract concrete placement not completed at that point.

Figure 7 provides a theoretical concrete curve if Astaldi's progress in 2016/2017 had been achieved from mid-2014, as per their baseline plan. This concrete curve aligns with the 'but-for' schedule presented in Attachment 17. The imagery that follows directly after Figure 7 is intended to illustrate the planned (from Astaldi Sep-2014 Contract Baseline) versus actual status of CH0007-001 scope completion by Astaldi.

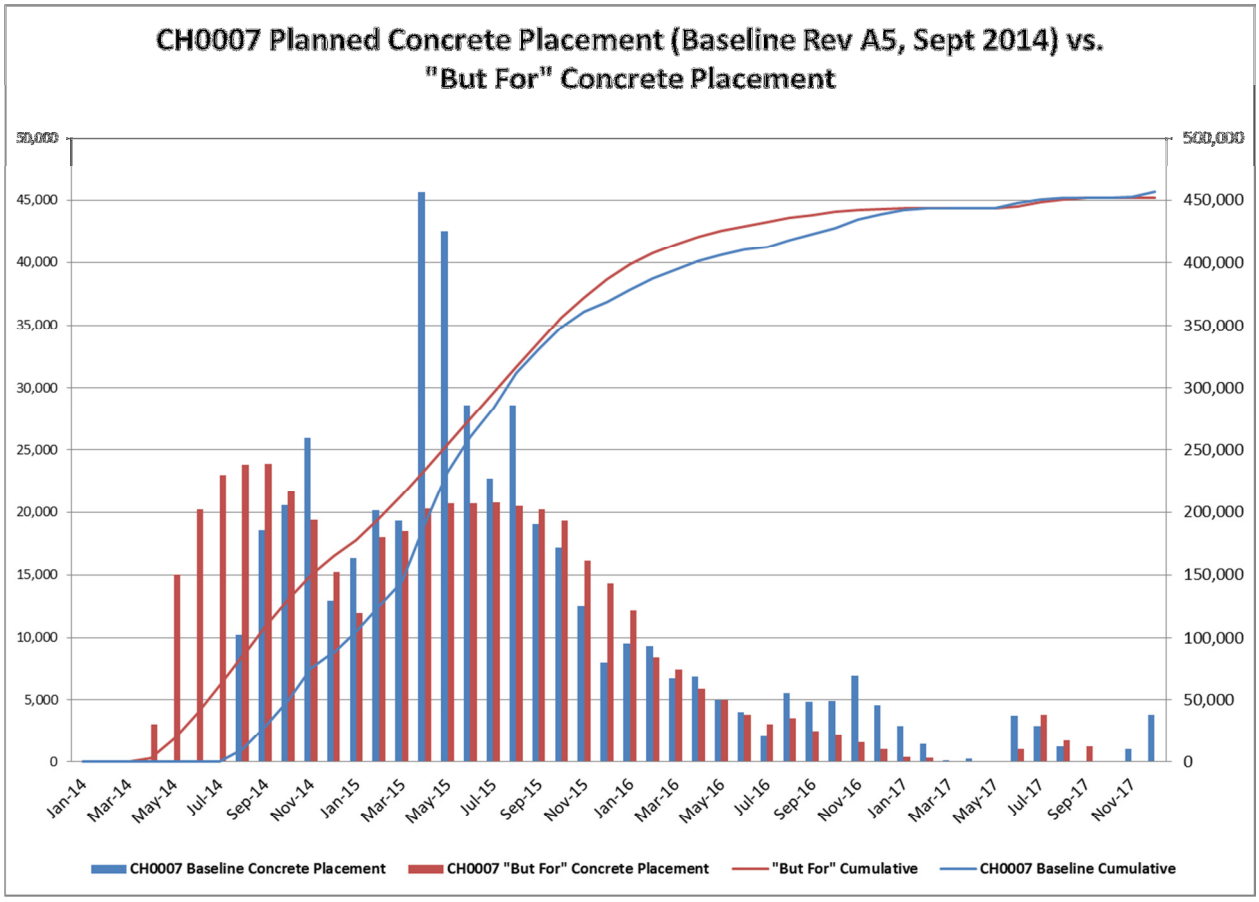

Figure 7: *Theoretical Concrete Placement Based Upon Actual Placement Rates in 2016/2017*

Supporting Notes to Figure 7:

(1) Assumed usage of a starter batch plant to facilitate concrete testing requirements, temporary infrastructure concrete requirements, and permanent concrete installation while main batch plant being prepared. (Part of DG3 plan)
(2) Assumed ICS design and steel fabrication started immediately following Contract award, with steel erection starting early and ongoing while concreting operations underway.
(3) Assumed that early focus is upon spillway construction, with the Intake, Powerhouse and Transition Dam construction ramping up as the ICS proceeds, and following the initial concrete placement on the bedrock surface.
(4) Assumed a holiday slowdown or shutdown will occur in the latter part of December and early part of January.
(5) Assumed that mass concrete structures, such as Transition Dams, would have construction optimized to meet project requirements while providing craft resource levelling.
(6) Assumed that Contractor would take advantage of concrete lift design and request concessions to optimize concrete placement.

Figure 8: *Astaldi as-planned status of the civil structures by October 2014 – CH0007 Construction visualization with Astaldi bid (downstream view). Note the intended concrete placement in the various structures, but in particular Intake unit 1 located towards the left background in the above photo.*

Photo 1: *Intake actual status as of 10-Oct-2014. Intake 1 is in the background, next to the rock wall. Note that while formwork is being constructed, there is no concrete placed at this point.*

Figure 9: *Astaldi as-planned status of the civil structures by June 2015 – CH0007 Construction visualization with Astaldi bid (Upstream view). Note the intended status, particularly in the intake (foreground, mid-right side of photo), as well as the powerhouse building erected over the South Service Bay and Unit 1, while the ICS remains in place over units 2, 3, and 4, as well as the North Service Bay.*

Photo 2: *Intake structure (under ICS) status at end June 2015. ICS in place over units 1 and 2, with little concrete placed in the intake (towards the background of the photo).*

Photo 3: *Intake Structure (Unit 1) status under ICS as of end June 2015. Access stairways, scaffolding and formwork, and small amounts of concrete placed.*

Photo 4: *The intake structure as viewed from upstream on 31-July-2018. Civil construction nearing completion in units 3 and 4 on the left of the photo, while hydro-mechanical work is underway (behind construction shelters) in units 1 and 2. Bay 1 of unit 1 (far right of photo) has embedded parts work completed, and thus the shelter is removed in the photo.*

Photo 5: *Top of intake structure, including Gate Hoist Building, as seen from the spillway hoist house on 31-Jul-2018. Civil work is completing in units 3 and 4 (foreground) while hydro-mechanical installation is underway in units 1 and 2 (embedded parts being placed via the cranes in the background).*

11.) CURRENT OUTLOOK

As discussed in Section 10, had it not been for the market conditions that precipitated the delay in award of CH0007-001 and Astaldi's performance deficit, First Power would have occurred by now. In an effort to illustrate what would have reasonably been expected to transpire in the absence of these two events, Attachment 17 presents a simplified "But-For" analysis. Fortunately, the weather risk highlighted in the DG3 QRA transpired only to a limited degree – a wet year in 2017 hindering North RCC Dam construction (further compounded by site disruptions and protests which had occurred throughout 2016 into 2017).

Looking forward, as is illustrated in Figure 9 below, the current risk-adjusted forecasted First Power date (coming from the 2017 QRA completed this past March) is consistent with the out-turn date projected from the DG3 QRA – an ~ 79-month construction duration from Project Sanction, with First Power now expected in early Q4-2019. This despite a situation wherein schedule extension has resulted from what were unknown risks at DG3.

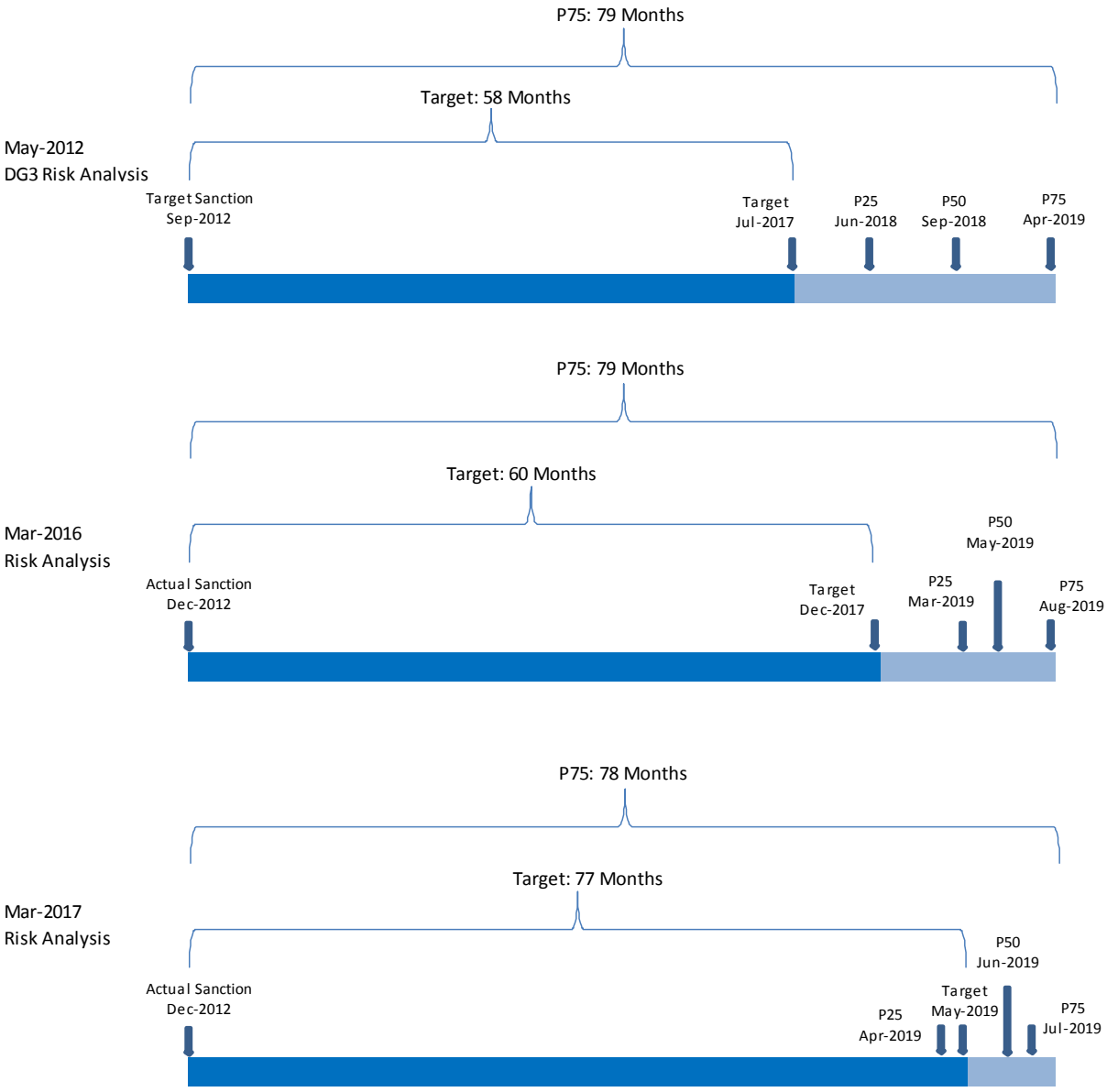

Figure 9: *QRA time-risk projections for Muskrat Falls Generation – 2012, 2016 and 2017*

12.) LIST OF ATTACHMENTS

Attachment No.	Title
01	Target Milestone Schedule, Nalcor document no. LCP-PT-ED-0000-EP-SH-0001-01, Rev. B2
02	Project Control Schedule (September 2012)
03	Summary of Experience and Background on Lower Churchill Project – Lee Stanton
04	Powerhouse Pours Rev 1 (August 2012)
05	Muskrat Falls Construction Sequence – 3D Image Cross-Reference (October 2012)
06	MHI Report – Review of the Muskrat Falls and Labrador Island HVdc Link and the Isolated Island Options (October 2012)
07	Independent Engineer's Report (November 2013)
08	Independent Project Review Presentation (August 2012)
09	Approved PCN-0137 – Change to Diversion Timeline at MF and Overall Schedule Change for MF Project (and attachments)
10	Integrated Project Schedule – Rev B2 (March 2013)
11	CH0007-001 Contract (Astaldi) – Exhibit 9 Interface and Milestone Schedule (November 2013)
12	CH0007-001 Contract (Astaldi) – Articles and Exhibit 2 Compensation (November 2013)
13	CH0007-001 Astaldi Baseline Schedule (First Submission - March 2014)
14	CH0032-001 Contract (Andritz) – Exhibit 9 Interface and Milestone Schedule (December 2013)
15	CH0032-001 Contract (Andritz) – Articles and Exhibit 2 Compensation (December 2013)
16	CH0032-001 Andritz Baseline Schedule (First Submission - December 2013)
17	'But-For' Summary Schedule