

**MANITOBA HYDRO 2017/18 & 2018/19 GENERAL RATE APPLICATION
INTERVENER EVIDENCE INFORMATION REQUESTS - MANITOBA HYDRO
MGF'S RESPONSES
5TH JANUARY 2018**



MH/MGF I - 1

Reference:

Report authors

Preamble:

The MGF report is lengthy and relied on the advice and expertise of more than one author and more than one company.

Question:

- a) Please identify who at MGF worked on the report, what portions of the report they authored and provide their CV's.

MGF Response:

MGF was commissioned to carry out the Capital Expenditure Review, not its personnel. Also, we have no authority to release personnel names or CV's to the Public Domain. Personnel CV's were sent to the PUB, however these are "Confidential - Internal MPUB Use Only".
Four biographies have been submitted to the PUB for limited use.

- b) Did MGF provide the PUB with any background information about its expertise at the time it was retained? If so, please produce.

MGF Response:

Yes, this was sent with our proposal which is commercially sensitive and confidential. They also received and spoke to Client references. These must remain confidential.



- c) What major hydroelectric projects has MGF worked on and in what capacity?

MGF Response:

Due to the sensitive nature of our services, which include Audits, Claims, Peer Reviews, etc., we are not at liberty to discuss specific projects, services or clients. However, our team has worked on numerous Capital Power Generation, Civil and Resource projects.

- d) Has MGF provided any expert advice on either the Site C or Muskrat Falls Hydro Electric projects and if so please identify and provide any reports produced on for those projects which might be publicly available or any other major hydro-electric project in the last 10 years

MGF Response:

See c) above

- e) Please identify which portions of the MGF report relied on the advice and expertise of Klohn Crippen Berger, Amplitude, or any other external experts.

MGF Response:

Klohn Crippen Berger - see Appendix A of report
Amplitude Consultants - see Appendix B of report
Stanley Consultants – Independent Expert Consultants on transmission lines portion of the report

- f) Please identify who at Klohn Crippen Berger worked on the report, what portions of the report they authored and provide their CV's.



MGF Response:

Please see a) above

- g) Please identify who at Amplitude worked on the report, what portions of the report they authored and provide their CV's.

MGF Response:

See a) above

MH/MGF I - 2

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 1 and 81.

Preamble:

Manitoba Hydro seeks to understand the legal basis on which MGF makes the following statement on page 1 of the report: "There is an opportunity for Manitoba Hydro to implement contract management improvements, take ownership for the GCC and drive the GCC contractor to higher levels of predictable performance, to accelerate project schedule and to lower the likely forecast cost at completion"

MGF states on page 81 of the report, "Manitoba Hydro needs to take ownership of the site, as they are the party exposed. They need to hire experienced site supervisors (with trade backgrounds) to implement a more efficient work plan."

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Question (KP):

- a) What type of construction management oversight is MGF contemplating when it says that Manitoba Hydro needs to take “ownership of the site”?

MGF Response:

The performance of BBE has not been as planned, neither in the original contract nor the Amending Agreement No. 7. The cost reimbursable pricing mechanism of the GCC will require that MH exert more control and assurance of BBE performance.

- b) Would MGF agree that the project delivery model currently employed on the Keeyask project does not allow Manitoba Hydro to act as the General Civil Contract (“GCC”) and Manitoba Hydro has in fact hired BBE to do so?

MGF Response:

BBE has been contracted by Manitoba Hydro to act as the General Civil Contractor. MGF’s recommendation is not that Manitoba Hydro acts as the General Civil Contractor but it is responsible for ensuring the performance of BBE, particularly given the cost reimbursable pricing mechanism Manitoba Hydro chose for this contract.

- c) If MGF does not agree, please provide a detailed explanation.

MGF Response:

See b) above.



- d) Has MGF any information that would suggest that the current contract could be amended to permit this construction management oversight? If so, please identify the sections of the contract which could be amended and produce the authority or legal advice to support that this change can be made and the cost (if any) of doing so.

MGF Response:

A contract can be amended if agreed to by both parties.

- e) Can MGF identify other utilities that have employed the model that MGF is recommending in managing its general contractor? Please provide details including cost, outcomes and why such a step was implemented? In addition, provide the contract details if available.

MGF Response:

Owners prefer fixed pricing, either in the form of lump sums or unit rates for scopes of work. This is preferred because it promotes predictability in terms of final cost and time for completion. In such circumstances, the Owner's team is smaller and less hands on, as the Contractor is responsible for performing the contract scope at the lump sum price. Owners who place contracts with a cost reimbursable pricing mechanism normally deploy more oversight to assure that their contractor plans, coordinates and controls construction activities as if the contractor was on a lump sum fixed price compensation model.

- f) Can MGF please provide examples on comparable capital projects where an owner has taken over such a role in the middle of construction? Please provide details including cost,

outcomes and why such a step was implemented? In addition, the contract details if available.

MGF Response:

Confidential.

g) What was the contract model in d) and e) above?

MGF Response:

Cost reimbursable pricing mechanisms.

h) On the projects listed in d) and e) what specific actions did the owner take?

MGF Response:

One specific action was to combine the owner's team with the contractor's team to promote closer working together and better control of the project.

i) What was the outcome of these interventions listed in g) (i.e. cost and schedule benefit, claims, etc.)?

MGF Response:

Better understanding of the issues, more efficient work planning, improved decision making and better controls generally.

- j) Can MGF please identify the risks to the Keeyask Project that would arise by Manitoba Hydro taking on this type of role?

MGF Response:

The recommendation is not for Manitoba Hydro to become the construction manager and replace BBE, but for Manitoba Hydro to exert more control and hold BBE accountable for its performance.

MH/MGF I - 3

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 1, 63, and 80.

Klohn Crippen Berger page 34

Preamble:

In numerous places in the report, MGF and Klohn Crippen Berger refer to the General Civil Works form of contract as a cost reimbursable contract.

On page 80, MGF states, “the GCC contract strategy of adopting a cost reimbursable commercial arrangement for this project was flawed from the outset, with a predictable outcome, i.e. it promotes and rewards inefficient work and doesn’t encourage efficient work.”

Manitoba Hydro has stated in numerous occasions (including in the Project Delivery Strategy Document that was provided to MGF on July 28, 2017) that the form of contract with the General



Civil Works Contractor is a target price contract where the contractor is reimbursed for actual costs and the contractor's profit and General Administration and Overhead ("GA&O") are at risk.

Klohn Crippen Berger at page 34 states: "As noted there is no connection between actual cost and the quantities and unit prices in the Bill of Quantities. This is a critical omission, because as has been demonstrated the contractor may have little incentive to actually perform the work."

Question (KP):

- a) What is MGF's understanding of the difference between a target price contract and a cost reimbursable contract?

MGF Response:

A Target Price Contract is based on a cost reimbursable pricing mechanism in which the Contractor is reimbursed its actual costs and the parties typically share any savings to the Target Price and contribute towards any overspend of the Target Price. A cost reimbursable contract is where the Contractor is paid its actual costs plus monies for overhead and profits and does not share in any savings or contribute to any cost over-run.

- b) Does MGF agree that the contract provides for bonuses only if the contractor achieves certain targets?

MGF Response:

Yes.



- c) Does MGF agree that the contract provides for liquidated damages if the contractor fails to meet certain targets?

MGF Response:

[REDACTED]

1a

- d) Given that the contract structure includes a target price where the contractor's profit and GA&O are at risk, does MGF agree that this provides an incentives and penalties to motivate the contractor to work efficiently?

MGF Response:

Such mechanisms are designed to motivate BBE. However, in this model BBE is not at risk of a loss nor responsible for costs. If the contract costs more, then Manitoba Hydro simply pays. If it takes longer to perform the contract, Manitoba Hydro pays higher indirect costs. If late completion interferes or hinders those contractors following BBE, causing them delay and disruption costs, then Manitoba Hydro pays. BBE is not responsible for these costs.

- e) If MGF does not agree, please explain.

See d) above.

- f) If MGF agrees that there is an incentive for the GCC to complete the project within the prescribed cost and schedule targets, then does MGF also agree that the GCC still carries risk?

MGF Response:

BBE is at risk for its profit target but is not at risk for the costs associated with the GCC. To earn the contracted profit, it must perform the contract within the prescribed cost and schedule targets.

- g) Please have Klohn Crippen Berger provide its position on each of the above questions and to the extent it disagrees with MGF on the answers please explain why.

MH/MGF I - 4

Reference:

MGF's use of the Acumen Fuse software to assess the project's schedules, included as part of the following findings:

SCOPE ITEM 4: Finding No. 2: Keeyask – Hatch Schedule;

SCOPE ITEM 4: Finding No. 5: Keeyask – BBE Schedule Quality;

SCOPE ITEM 7: Finding No. 7: Keeyask – Integrated Master Schedule (IMS);

SCOPE ITEM 10: Finding No. 4: Bipole III – Integrated Master Schedule (IMS);

SCOPE ITEM 17: Finding No. 6: Bipole III Transmission Line – Rokstad Power Company Schedule;

SCOPE ITEM 17: Finding No. 7: Bipole III Transmission Line – Master Schedule;

SCOPE ITEM 24: Finding No. 1: MMTP – Schedule;

SCOPE ITEM 24: Finding No. 2: MMTP – Riel 500 or 230KV Stn. – Inst. Transformer Schedule;

SCOPE ITEM 24: Finding No. 3: MMTP – Glenboro Transmission Line Re-Alignment Schedule;

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SCOPE ITEM 24: Finding No. 4: MMTP – Glenboro Phase Shifter Schedule;
SCOPE ITEM 24: Finding No. 5: MMTP – Dorsey Stn.: Manitoba – US 500KV Tie Line Schedule;
SCOPE ITEM 29: Finding No. 1: GNTL – Iron Range 500/320kV Sub – MTEP 3831 Schedule;
SCOPE ITEM 29: Finding No. 2: GNTL –500kV MTEP 3831 Schedule;
SCOPE ITEM 29: Finding No. 3: GNTL –107626 Blackberry Sub Mods MTEP3831;
SCOPE ITEM 29: Finding No. 4: GNTL –107625 230kV Line Mods MTEP 3831;
SCOPE ITEM 29: Finding No. 5: GNTL –107623 500kV Series Com – MTEP 3831 Schedule; and,
SCOPE ITEM 29: Finding No. 6: GNTL –107627 – Arrowhead Sub Mods, 107628 Forbes Sub Mods,
107629 – Hilltop Sub Mods;

Preamble:

MGF have provided a number of findings on Manitoba Hydro's project schedules based on analysis results from the Acumen Fuse schedule analysis software. MGF have identified a "Fuse score" as an assessment of schedule quality.

Question (BP/III/KP):

- a) Does the "Fuse score" produced by Acumen Fuse account for the different level of schedule development typical for projects at different stages of project development, i.e. the difference in level of detail between schedules for a project in its pre-sanction phase vs. a project in construction, or are all schedule assessed the same?

MGF Response:

Acumen Fuse does not account for different levels of schedule development. As such we performed a manual review of problematic activities. If Rolling Wave Planning is used, high level activities (planning packages) can be assigned a different activity type within the P6 schedule which would cause Acumen Fuse to ignore those activities when scoring the quality of the schedule. Rolling Wave Planning is described by the Project Management Institute (PMI), as follows:

“Using the rolling wave planning technique, a detailed decomposition of the high-level activities is performed only for those activities in the “near term”, for example, the next 90 days. ... For periods beyond the detailed planning wave, activities are listed as “planning packages” with much less detail. ... When detailed planning takes place, it replaces the planning packages with additional details.”

- b) Would MGF anticipate the same “Fuse scores” for Bipole III and Keeyask vs. MMTP considering MMTP is still in the licensing phase?

MGF Response:

The Acumen Fuse score is impacted by many different scheduling metrics. “Good quality” schedules should score at least 75 when they are baselined, but the score may change as work on the project progresses. For example, if the project is behind schedule, the score would deteriorate as Acumen Fuse analyzes the planned versus actual start and finish dates. Currently, the MMTP scores are impacted by high duration activities and missing logic. MGF discussed these activities with Manitoba Hydro. With respect to missing logic, the PMI states:

“To establish a meaningful critical path, it is necessary to develop a logic-based network of activities ... The only open ends that should be expected are the project start and project finish milestones.”

- c) Would MGF agree that activities within the schedules that have high float, high duration and missing logic that are used by Manitoba Hydro for capturing internal labour expenses

only significantly reduce the Acumen fuse score, even though they would have no actual impact to the project schedule success? If not, please explain why.

MGF Response:

MGF agrees that activities within the schedules that are used for capturing internal labour expenses significantly reduce the Acumen Fuse score. MGF disagrees they would have no actual impact to the project schedule success. Failure to correctly identify project support or cost activities correctly in the schedule could lead to a false critical path which could negatively affect the project end date.

- d) Does the “Fuse score” produced by Acumen Fuse take into consideration any differences in schedules associated with the type of work being executed? For example, does the “Fuse score” take into consideration projects that inherently have parallel or overlapped activities as is common in Engineer-Procure-Construct type work or construction work occurring in multiple sections or on multiple work fronts?

MGF Response:

The metrics used by Acumen Fuse to score the quality of the Manitoba Hydro schedules did not take into consideration any differences in schedules associated with the type of work being executed, but rather benchmarking necessary to comply with government and industry standards. The PMI states,

“Typically, each predecessor activity would finish prior to the start of its successor activity. Sometimes it is necessary to overlap activities. ... Whenever

possible, the Finish to Start (FS) logical relationship should be used. If other types of relationships are used, they should be used sparingly ...”

The Acumen Fuse schedule quality score will be negatively affected if more than 10% of the activities in the schedule use a logical relationship other than the recommended Finish to Start (FS) relation.

- e) Would MGF agree that Acumen Fuse is primarily a tool that assesses the quality of the schedule’s construction? If not, please explain why.

MGF Response:

MGF disagrees that Acumen Fuse is primarily a tool that assesses the quality of the schedule’s construction. It identifies problem areas in a schedule which can be indicative of the quality of the overall planning of the project. Manitoba Hydro uses the critical path method (CPM). As such, missing logic can lead to inaccurate start and finish dates. High duration activities could represent activities that are not broken down into sufficient detail to accurately estimate the duration or sequence of the activities which affects the start and finish dates of the activities. Overlapping activities can add significant risk to the project if overlapped activities use the same resources. If the schedule contains hard constraints, the hard constraint dates take precedence over the task relationship which can cause the dependency relationship to be violated to honour the constraint date.

- f) Would MGF agree that the “Fuse score” and the Acumen Fuse software does not provide any assessment of the “correctness” of the Schedule logic, i.e. the correct predecessors and successors? If not, please explain why.



MGF Response:

MGF agrees that the “Fuse score” and the Acumen Fuse software does not provide any assessment of the “correctness” of the Schedule logic. However, as an example on the Keeyask project, Klohn Crippen Berger (KCB) reviewed the overall schedule from a high level perspective, looking at the overall durations for major structures. Overall durations summarize the sequence and duration of individual activities. The independent expert consultant indicated “the current schedule looks to be aggressive and unlikely to be met”.

- g) Would MGF agree that Acumen Fuse only considers the existence of schedule relationships and thus only assesses the quality of the schedule’s construction but not whether the relationships in the schedule are correct for the work? If not, please explain why.

MGF Response:

Please refer to question f) above.

- h) Would MGF agree that the correctness of the schedule logic/relationships could only be properly assessed by individuals with an understanding of the appropriate sequence for the work? If not, please explain why.

MGF Response:

Please refer to question f) above.

- i) Can MGF provide any data to show that the “Fuse score” is predictive of on time schedule completion? If not, please explain why.

Considering that the “Fuse score” and Acumen Fuse can’t assess the “correctness” of the schedule logic/relationships would MGF agree that it provides an incomplete assessment of schedule quality and whether a project will be completed on time or not? If not, please explain why not.

MGF Response:

In 2011, Dr. Dan Patterson, PMP, CEO and President, Acumen published a white paper “Does Better Scheduling Drive Execution Success”. The White Paper assessed thirty-five projects ranging in value from US\$15MM to US\$30B and used the Acumen Fuse standard schedule check metric library to score the quality of the project plan. The White Paper concluded that there is indeed a positive correlation between sound project scheduling and successful on-time project execution completion.

Please refer to question f) above regarding assessment of the schedules.

MH/MGF I - 5

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 7.

Preamble:

MGF states, “The 21 days on, 7 days off rotation cycle is not as attractive as the more typical 14 days on, 7 days off used on many other capital projects.”

Question (KP):

- a) Did MGF review turnover of craft labour on the Project and if so, how does it compare to other remote major capital projects?
- b) Was MGF aware that Manitoba Hydro and the Allied Hydro Council (“AHC”), the bargaining agent who represents the craft labour on the Keeyask Project, discussed the potential of shortening the rotations and the AHC advocated on behalf of the craft labour to maintain the 21 days on, 7 days off rotation as it resulted in more take home pay for the craft workforce?
- c) When MGF states that a 21 days on, 7 days off rotation is not as attractive as a 14 days on, 7 days off rotation as it relates to attraction and retention of workers, did MGF consider that almost 1,000 additional workers would need to be employed on the Keeyask Project to maintain the peak onsite workforce?
- d) Did MGF consider the cost impact to the Keeyask Project of adding thousands of additional flights for workers as a result of a shorter rotational schedule?

MGF Response:

The comment on the rotation cycle is a comparative observation with what other major capital projects do and have done to attract and retain their craft workforce on major capital projects.

MH/MGF I - 6

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 7.



Preamble:

On page 7 of the report, MGF states, “Manitoba Hydro advised MGF that they have had great success with local Aboriginal labour, however they have exhausted all availability.” Manitoba Hydro and our Keeyask Cree Nation (“KCN”) Partners take issue with the quotation that the labour pool has been exhausted and feel it is incorrect. On at least two occasions, Manitoba Hydro met with MGF to discuss employment on the Keeyask Project and followed up with a response to an initial finding reiterating that Manitoba Hydro is proud of the local indigenous employment successes achieved on the Keeyask Project to date and will continue to strive to maximize KCN, Indigenous and Manitoba employment on the Project.

Question (KP):

- a) Please confirm that MGF’s characterization referenced above, as stated on Page 7 is MGF’s attempt at paraphrasing a longer discussion with Manitoba Hydro, and is not intended to be a direct quote from Manitoba Hydro.
- b) Please confirm that Manitoba Hydro advised that a significant number of KCN workers have been hired on the Keeyask Project to date, as well as on Keewatinohk and Bipole III, and some of the smaller communities have indicated that they have nearly exhausted the pool of labour within their communities interested and/or available in working on the Keeyask Project.
- c) Please confirm that what is intended to be conveyed by MGF in the statement referenced above is that Manitoba Hydro advised MGF that local indigenous labour has comprised a significant portion of the Project’s workforce to date.

MGF Response:

The statement referred to is a direct statement provided by Manitoba Hydro personnel during a meeting on this subject.

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MH/MGF I - 7

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 8.

Preamble:

MGF refers to “omissions” on page 8 of their report.

On page 9 of the report, MGF has provided a table titled 2017 Capital Project Justification Addendum (“CPJA”) Keyask Cost Increases that they have stated outlines the majority of the total cost increases. MGF has also provided a table on page 10 of the report titled 2017 CPJA Cost Reductions that outlines the “omissions” from the budget.

Question (KP):

- a) With the reference to “omissions” does MGF mean “reductions” in the budget?
- b) If it does not mean reductions in the budget, what does it mean?

MGF Response:

Additions and Omissions are standard Quantity Surveying terms for Increases and Reductions.

- c) Given that certain networks such as Adverse Effects and Operational Employment shows up on each table on page 9 and 10, did MGF consider that these tables also capture major transfers from one network to another rather than simply increases and reductions?

MGF Response:

MGF did consider this in our review.

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MH/MGF I - 8

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 12.

Preamble:

MGF states that [REDACTED] of the increase to the GCC contract is due to quantities. 1a

Question (KP):

Please provide a listing of the quantities and their value that sum to [REDACTED]. 1a

MGF Response:

The methodology applied compares the Original Contract Bill of Quantities and Amending Agreement No. 7 Bill of Quantities.

Internal MGF backup and calculations are confidential. However, MGF welcomes the opportunity of discussing this information with MH at a mutually convenient time.

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MH/MGF I - 9

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 34.

Preamble:

MGF state in its report on page 34:

“The review of the Basis of Estimate and associated attachments identified areas of significant disconnects and insufficient details with which to understand the development of the \$6.5 billion final pre-construction budget and the \$8.7 billion forecast at completion budget.”

Question (KP):

In helping MGF understand the development and evolution of the Keeyask cost estimate, Manitoba Hydro provided the following documents:

- i. 2014 Basis of Estimate document titled “Keeyask Generating Station, Basis of Estimate Document, 2014 Capital Project Justification Addendum, dated August 2014” - 1,790 pages;
- ii. 2017 Basis of Estimate document titled “Keeyask Generating Station, Basis of Estimate Document, 2017 Capital Project Justification Addendum, dated January 2017”- 3,895 pages;
- iii. “Map to Comparison of Keeyask 2014 to 2017.xlsx” → shows the variances across the major cost categories (with an explanation between the two time periods);
- iv. “Keeyask Generating Station, 2017 Capital Project Justification Addendum, Comparison of 2014 Estimate to 2017 Estimate, dated August 2017”
- v. Hundreds of individual estimate sheets that underpin the 2014, 2016 and 2017 estimates;
- vi. Multiple meetings with the Cost and Schedule Lead on Keeyask to explain how the various documents fit together.

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Considering the volume of information provided to MGF:

- a) What details were insufficient?
- b) Please indicate were the areas of significant disconnects?

MGF Response:

This observation was provided in support of MGF's review regarding completeness and content of the Basis of Estimate and the associated attachments included within.

In MGF's report (page 34) it was noted that values provided within the 'Standard Estimate Sheets' supporting "CEF 2016 Plan" did not align with the values presented for the same items in the SAP output as well as a recently provided comparison.

The same item should not have differing values. Further analysis is required to understand why this occurs, how widespread it is and assess the potential impact on estimate accuracy.

As was provided within the MGF report the following would also apply to the Keeyask project.

Preparing a Basis of Estimate is an industry Best Practice for all levels of estimates as it supports in ensuring many aspects of the project are understood, and/or necessary assumptions made at the time of estimate development have been documented.

As outlined by AACE International Recommended Practice No. 34R-05, "a well written basis of estimate will:

- Document the overall project scope

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- Communicate the estimator's knowledge of the project by demonstrating and understanding of the scope and schedule as it relates to cost
- Alert the project team of potential cost risks and opportunities
- Provide a record of key communications made during estimate preparation
- Provide a record of all documents used to prepare the estimate
- Act as a source of support during dispute resolution
- Establish the initial baseline for scope, quantities and cost for use in the cost trending throughout the project
- Provide historical relationships between estimates throughout the project lifecycle
- Facilitate the review and validation of the cost estimate"

"A Basis of Estimate should:

- Be factually complete, but concise
- Be able to support facts and findings
- Identify estimating team members and their roles
- Describe tools, techniques, estimating methodology and data used to develop the cost estimate
- Identify other projects that were referenced or benchmarked during the estimate preparation
- Be prepared in parallel with the cost estimate
- Establish the context of the estimate, and support estimate review and validation
- Qualify any rates or factors that are referenced either in the estimate or BoE;"

Suggested guidelines for the structure, topics and contents are also included within the Recommended Practice that will assist Manitoba Hydro in ensuring consistent and transparent cost estimates.

MH/MGF I - 10

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 34.

Preamble:

MGF states, “price adjustments over the years were made using escalation calculations to select cost elements of the cost estimate. This is an area upon which Manitoba Hydro can improve.”

Question (KP):

- a) Can MGF provide examples of other methods of calculating escalation?
- b) Can MGF provide information as to other major projects that are using this escalation and how this has improved their forecasting?

MGF Response:

This observation was provided in support of MGF’s review regarding Cost Estimating Methodology for costs carried in the estimate from previously developed estimates.

The comment highlights the need to have detailed estimates updated or updated with competitively solicited quotations where possible, rather than merely updating prior estimates for escalation only.

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MH/MGF I - 11

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 35.

Preamble:

MGF states in its report on page 35 “more consistent alignment is recommended between the level of project execution reporting and financial reporting (i.e. different metrics are used to benefit both groups in different ways).”

Question (KP):

- a) Please confirm what misalignments between the project execution reporting and financial reporting are being referenced?
- b) Please provide all examples.
- c) What is the financial significance of each example of misalignment?

MGF Response:

Documents referenced are as follows:

- Plan Value – June 2017
- Generation Wholesale, Keeyask Generating Station Monthly Project Management Report – August 2017
- Appendix B (2017 CPJ Addendum - Summary of Changes by Work Package) of the 2017 Basis of Estimate
- Work Package WBS Summary (Only includes for Project “P:18568”)
- 2018 06 Keeyask Financial Review - September 2017
- Table 1: 2017 CPJ Addendum Budget Summary within 2017 Basis of Estimate
- Table 1: Comparison of 2014 Estimate to 2017 Estimate within Comparison of 2014 Estimate to 2017 Estimate

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- [Table 2: Comparison of 2014 Estimate to 2017 Estimate – Generating Station within Comparison of 2014 Estimate to 2017 Estimate](#)

This is significant in understanding how the Project and Control Budget are managed and assessed. A “key” or listing should be provided to support the various report line items, which will better assist the reader. This provides alignment and consistency. Details should be available for all presented summaries.

MH/MGF I - 12

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 35.

Preamble:

In reference to Manitoba Hydro’s Cost Estimating Methodology MGF concludes, “that additional governance and cost control measures, not accounting, measures need to be implemented.”

Question (KP):

- a) What does MGF mean by “governance”?
- b) Please advise what is the point in time in the Cost Estimating process for which this recommendation is made?
- c) Can MGF advise of any other major projects using this governance model and if so, who? In addition, please describe how it works.
- d) What would the cost impact be to Manitoba Hydro referenced in part (c) for this “additional governance”?
- e) How would this proposed new governance model, at this stage in the project, impact the cost estimates for Manitoba Hydro’s capital projects?

MGF Response:

MGF means that MH should provide personnel or resources that are not directly related to the “day-to-day” project support operations, that would be responsible/dedicated to providing Corporate oversight, ensuring estimates are produced to support MH’s Stage Gate process. This would include ensuring project deliverables are at an adequate state of maturity to support the desired estimates quality for the intended use of the organization.

This group would ensure all estimates included for supporting the advancement of additional project funding into the next phase of development are sufficient. The group would be responsible for establishing Corporate Standards to be used across all divisions and project types, conduct “Cold-Eye” Reviews of projects underway (i.e. audits or health checks) to ensure project compliance, project data analysis and database development which will support consistent cost planning and cost control. It was noted that Manitoba Hydro standards/procedures are still in “Draft” or “Under Development” status.

This is a practice adopted by many organizations which undertake large capital projects. The size of groups varies depending on project requirements (size, complexity, number of projects, progress and issues associated with ongoing projects) but require subject matter experts who understand the various aspects of a project. Groups responsible for governance can leverage the subject matter experts from within the organization (i.e. other projects, etc.) if available and if workloads permit.

The governance model referenced is widely used on major capital projects across numerous industrial sectors.

MH/MGF I - 13

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 36.

Preamble:

MGF states in its report on page 36:

“CEF 2016 Estimate Sheets were provided in the Basis of Estimate appendices as supporting details to the cost estimate, however, the values included within these estimate sheets did not align with the values carried in the actual estimate. In the 2014 Capital Project Justification Addendum, Basis of Estimate variances occur because of SAP’s use of a more accurate treatment of overhead. It was also noted through conversations that these variances are the result of updated labour rates themselves which are to be applied throughout the next fiscal year. Rates current at the time the CEF 2016 Estimate Sheets were generated, and then adjusted prior to being carried in the final estimate. This was not specified within the 2017 Capital Project Justification Addendum, Basis of Estimate and the reconciled estimate sheets that were provided in 2014 were also neither provided nor developed for the 2017 Estimate. This made one-for-one reconciliations difficult to perform.”

Question (KP):

- a) What are the specific networks within the estimates referenced are misaligned?
- b) What is the dollar value of the differences between the misaligned estimates broken down by network?
- c) What percentage of the Capital Expenditure Forecast (“CEF”) 2016 estimate does the value of the total misalignment reflect?

MGF Response:

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Refer to MH/MGF I-9.

MH/MGF I - 14

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 37.

Preamble:

MGF state in its report on page 37:

“Trends: Manitoba Hydro has indicated that these costs are largely due to estimates that had been completed by the Transmission Group. The Keeyask Project Team did not have copies of these.”

Manitoba Hydro provided MGF with the 2017 Basis of Estimate that provides a definition for Trends and contains all identified Trends in Appendix D.

Question (KP):

- a) Can MGF confirm that they reviewed the Trends that are listed Appendix D of the 2017 Basis of Estimate Document?

MGF Response:

MGF can confirm that Appendix D was reviewed.

- b) If MGF did review the document listed in (a), can MGF confirm that the vast majority of Trends in this document are **not** due to Transmission related scope as referenced above?

MGF Response:

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MGF can confirm that the vast majority of Trends in this document are not due to Transmission related scope.

Further to the above, the comment was intended to address a finding associated to the Trends related to the Transmission scope and should not characterize all "Trends".

- c) If not confirmed, please provide details as to what MGF referencing.

MH/MGF I - 15

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 37.

Preamble:

MGF states in its report on page 37:

"Delay Estimates & Trends: Manitoba Hydro's Keeyask Project, Costs and Schedule Group should hold the accountability for all change management, including the review and approval process associated with potential, proposed and approved project changes. A Change Log should be developed and used for tracking and managing changes for current projects.

MGF has not seen a Consolidated Project Change Log. What has been expressed as the project Change Log is simply a document management tool, which does not provide a summary of values by change, the history of the change nor how changes have evolved from either trends or Project Change Authorizations (PCAs). The Change Log is an important project management tool which should capture all potential, pending and approved changes on the project and provide an increased level of traceability. This is extremely valuable when attempting to reconcile actual costs with the approved changes"

Question (KP):

- a) Is MGF aware that Manitoba Hydro has the following documents for the Keeyask Project:
- i. Contract revision register,
 - ii. Project Change Authorization database where values are also summarized in a log format, and,
 - iii. Monthly Contingency Reports that tracks contract and project changes and their impact the overall project contingency.

MGF Response:

MGF is aware of the above-mentioned documents

- b) Is the log which MGF is recommending different than which has been noted in part a) of this question?

MGF Response:

Yes.

- c) If so, how does this additional information assist in monitoring or managing the project changes beyond what is already in place for the project?

MGF Response:

The additional information would align and consolidate all referenced submissions on a single document. This can be used to monitor the progression

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of a change from its inception to the final implementation. Key elements associated to the change are presented within the log (Reference Number, Change Type, Change Description, Initiator, Date Submitted, Date Approved, Status, Comments, Impacts (Cost/Schedule/Quality/Man Hours), any previously provided submissions.

MH/MGF I - 16

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 38.

Preamble:

MGF states in its report on page 38:

“MGF reviewed the line item entitled “Keeyask Generating Station (excluding GCC)” as reported in the CEF 2014 and 2017 CPJA Budget, to understand how the costs were assembled.

Manitoba Hydro has used a variety of different formats and structures with which to assign costs to Scopes of Work. Note the following:

- *The structure of the Cost Summary Tables included in the CPJA Basis of Estimate was not explained.*
- *The Work Package WBS Summary was logical but the estimate summaries did not follow this structure.*
- *The Detailed Estimate Summary was by Network, by Project and aligned with SAP, not the WBS or summaries within the Basis of Estimate.”*

Manitoba Hydro provided both a 2014 and 2017 Basis of Estimate document and a Work Breakdown Structure Summary diagram that outlines the various networks on the Keeyask Project.

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Question (KP):

- a) Did MGF review both the 2014 and 2017 Basis of Estimate documents and the Work Breakdown Structure Summary prior to preparing its report?
- b) Does MGF agree that the networks used by Manitoba Hydro track costs in SAP?
- c) Do the networks in the WBS match the detailed summary in Appendix B (2017 CPJ Addendum - Summary of Changes by Work Package) of the 2017 Basis of Estimate document?
- d) Do the networks in the WBS match the detailed summary in Appendix C (Keeyask Generating Station Phase 2 Estimate - Detailed Summary 2014 Capital Expenditure Forecast (CEF2014) of the 2014 Basis of Estimate?
- e) Can MGF confirm which tables do not align with the WBS?
- f) Did MGF review the document titled "Map to Comparison of Keeyask 2014 to 2017" which describes how each network is tied to the rollup summaries in 2014 and 2017 Basis of Estimate documents?
- g) Considering Manitoba Hydro provided the map in (f), how was the structure of the Cost Summary Tables included in the CPJA Basis of Estimate not explained?
- h) If MGF can confirm part g) of this question, does MGF agree that the recommendation made is not necessary? If MGF is of the opinion that the recommendation is still necessary, please explain why.

MGF Response:

The above queries do not impact our Observations and Findings, nor do they change our conclusions and recommendations.

If the estimates were set up in a consistent and aligned manner to the estimate summary such a map, reconciling the estimate would not be required.

It should also be noted that MGF had to request the "Map to Comparison of Keeyask 2014 to 2017" document.

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MH/MGF I - 17

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 39.

Preamble:

MGF states that “a control budget should have more relevant and accurate market underpinning prior to execution”

Question (KP):

- a) Was MGF aware at that the time the control budget was set in 2014 that approximately 90% of the total contract values were already awarded?
- b) Was MGF aware that a majority of the contracts that were awarded more than two years after establishing the control budget in 2014 were equipment supply contracts with relatively small dollar values?
- c) If MGF was aware that 90% of the total contract values were already awarded at the time control budget was set, then what is meant by “more relevant and accurate market underpinning”?

MGF Response:

MGF had noted large percentage variances between 2014 and 2017 estimates in relation to Networks that were escalated from previous estimates.

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MH/MGF I - 18

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 41.

Preamble:

MGF reviewed the Hatch Schedule and stated in the conclusion “that many of their activities are currently behind schedule.”

On page 33 of the report, MGF concludes, “The production of Issued for Construction drawings has not impacted BBE’s progress”.

Question (KP):

- a) Given the comments from BBE that the production of Issued for Construction (IFC) drawings has not impacted BBE’s progress, would MGF agree that if the production of IFC drawings continues to meet the needs of construction, the variance of drawing delivery dates from the original baseline schedule is not a concern?
- b) If it is a concern, please explain the impact.

MGF Response:

MGF does not agree with this statement. Variances between baseline and actual dates are always a concern. When activities are slipping, the underlying reason for the delay should be determined so corrective action can be taken to prevent further delays which may impact the project end date.

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MH/MGF I - 19

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 44.

Preamble:

MGF has reviewed BBE's schedule and has concluded that the order of magnitude of delay is 410 days. MGF goes on to state that it is important to note that no mitigation strategies or schedule recovery options have been added to this forecast.

Question (KP):

- a) Would MGF confirm that to reach the 410-day magnitude they relied on 1-month's data and extrapolated it to the end of the project?

MGF Response:

MGF did not rely on one-month's data. MGF used the concrete productivity factor derived from the information provided by MH covering the actual productivity rates experienced between October 2016 to end of September 2017.

- b) If MGF did not rely on 1-month's data to extrapolate it to the end of the project, how did they determine the 410 days? Please provide the calculation and underlining data.

MGF Response:

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MGF applied a productivity factor based on information provided by MH reflecting actual Productivity Rates experienced between October 2016 and the end of September 2017. As this project has many weather and environmental constraints impacting construction, increased durations caused activities to be pushed to the next construction window.

- c) Would MGF agree that applying a concrete productivity factor for the whole season and extrapolating that out may produce a different result?

MGF Response:

Please refer to question a) above.

- d) Would MGF agree that the magnitude may be lower using a whole season's data?

MGF Response:

Please refer to question a) above.

- e) If MGF does not agree with part c) and/or d) of this question, please provide details as to why not.

MGF Response:

Please refer to question a) above.

- f) If schedule mitigation activities, such as the winter concrete program that was shared with MGF through SharePoint and as discussed with Manitoba Hydro's Contracts Manager together with additional efforts focused on improving productivity at site are successful, would MGF agree that this forecasted delay would be reduced?

MGF Response:

MGF agrees that the forecasted delay could be reduced using schedule mitigation activities and successful improvement of productivity at site.

- g) Would MGF agree that there a number of other mitigation strategies which Manitoba Hydro could undertake and the GCC and which, if successful, would reduce the budget as proposed by MGF?

MGF Response:

Yes.

- h) If MGF does not agree with g) above, please explain why not?
i) Did MGG ask Manitoba Hydro about their plans to mitigate? If not, why not?

MGF Response:

In a conference call with BBE in October, they indicated they were working on a winter concrete plan to mitigate.

- j) Why were the mitigation strategies, and their impact, not incorporated into the Report?

MGF Response:

We received a document “Winter Work White Paper Rev. 0; however, without a Primavera P6 schedule to review, we were not in a position to interrogate the Winter Work plan and incorporate any mitigation strategies into the report.

MH/MGF I - 20

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 47 and 49.

Preamble:

On page 47 of the report, MGF indicated that they reviewed the Integrated Master Schedule for the Keeyask Project and concluded that the order of magnitude of delay of unit 7 in service date is 229 days. On page 49, MGF goes on to say that this slippage (delay) is due to a delay in the installation of turbine units 5 to 7 as a result of slippage (delay) on the BBE schedule and the Voith Schedule.

Question (KP):

- a) Would MGF agree that if Manitoba Hydro can work with BBE and Voith to align the schedules to support installation of the turbine and generator components then this delay will be mitigated?

MGF Response:

MGF agrees that if Manitoba Hydro can work with BBE and Voith to align the schedules to support installation of the turbine and generator components the delay on turbine units 5 to 7 may be mitigated.

- b) If MGF does not agree, please provide details as to why not.

MH/MGF I - 21

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 55.

Preamble:

MGF states that the indirect percentage applied to Extra Work Orders is considerably less than the actual percentage for indirects and a low indirect percentage will underestimate the projected cost to complete.

Question (KP):

- a) Can MGF please explain their understanding of how Extra Work Orders are estimated, executed, reconciled (including adjustments to the target price), and used to forecast at completion?

MGF Response:

The GCC is a Cost Reimbursable Contract, albeit with a target price. Therefore, the Contractor receives actual costs.

The main role for Change Orders on Reimbursable Contracts is to forecast the final cost.

- b) Can MGF explain how using a higher indirect percentage would be beneficial for Manitoba Hydro when considering adjustments to the target price?

MGF Response:

Using indirect %'s on Change Orders that reflect actual indirects, will ensure a more accurate cost to complete estimate.

MH/MGF I - 22

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 57.

Preamble:

On page 57 of the report, MGF states that Manitoba Hydro should carry out procurement of equipment on behalf of the General Civil Works Contractor to save GA&O costs.

Question (KP):

- a) What does MGF mean by "equipment"?
- b) Has MGF reviewed Manitoba Hydro's contract with BBE and if so can it point to sections of the contract that would permit Manitoba Hydro to take over procurement of equipment?
- c) If Manitoba Hydro can and does take over that work, please list the penalties and risks to the contract, the relationship and to Manitoba Hydro if Manitoba Hydro is late or unable to fulfill the performance of that work. For example, please consider Manitoba Hydro's responsibility if it purchases the equipment:

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- a. Are there risks associated with logistics of delivery to the site, such as timing, storage, quantities, and the variation of product aligning with the installation schedule?
 - b. Are there risks associated with worker training and safety?
 - c. Are there risks associated with performance of the equipment?
 - d. Are there risks associated with maintenance of the equipment?
 - e. Can any of these or other risks be quantified?
- d) What are the expected costs and quantification of risk of this approach that are not included in MGF's evaluation?
- e) Has MGF reviewed Manitoba Hydro's corporate procurement policies and obligations on Crown Corporations related to the New West Partnership Trade Agreement and if so, has MGF considered any barriers and/or risks to Manitoba Hydro of taking over procurement of equipment?
- f) Has MGF had experience with an owner of a major civil construction project taking over procurement of equipment and if so, please identify who and to what extent the owner was doing so and why it did so? Were there delay claims made associated with the late procurement of the equipment or any other claims?
- g) Can MGF please quantify the expected savings from January 2018 to completion of GCC if MH were to procure equipment on behalf of the GCC?

MGF Response:

For example, equipment purchases in June 2017 comprised trucks, coaches, buses, heaters and concrete pumps, etc. Manitoba Hydro may assume this role if it considers its procurement function is sufficiently skilled to perform the work. The work can be removed from BBE's scope by change order thus saving Manitoba Hydro paying for this service and the GA&O mark-up BBE adds to the cost. It is common for Owners to buy and free issue equipment and materials to its contractors for reasons such as lower cost, long lead items, etc.



MH/MGF I - 23

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 58.

Preamble:

MGF reviewed BBE's craft to foreman ratio and calculated an order of magnitude for adjusting the ratio to more closely align with "typical ratios for similar construction projects".

Question (KP):

- a) What is the mathematical calculation for the order of magnitude estimate of \$91,600,000?

MGF Response:

The figure is calculated as follows:

The Foreman variance hours by labor rate plus indirects (indirect cost is based on a factor of [REDACTED] of direct cost) plus [REDACTED] for GA&O.

1a

- b) Is MGF assuming that additional craft workers are hired?

MGF Response:

MGF's calculation does not address change in craft hours.

- c) What are the incremental costs from now until the end of the project if this does not change?

MGF Response:

Refer to d) below.

- d) Does this order of magnitude consider “to go” costs or is it based on labour hours for the entire project?

MGF Response:

The costs are from Amending Agreement No. 7 to project completion.

MH/MGF I - 24

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 62.

Preamble:

MGF states the following conclusion on page 62 of their report:

“MGF recommends that Manitoba Hydro assigns a single owner of Cost Estimating and Scheduling. This will ensure no scopes of work are missed or overlapping, promote consistency in the development and appoint a custodian for all estimate back-up, methodologies and history.

This ensures that clear accountability is assigned and would align Manitoba Hydro’s approach with industry best practice.”

Question (KP):

- a) Is MGF aware that the Keeyask Transmission project is an integrated part of the overall Capital Project Justification for the Keeyask Generation Station?

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- b) Is MGF aware that the Keeyask Project Division controls the budget and schedule for Keeyask Transmission scope?
- c) Is MGF aware that the lead responsible for Keeyask Transmission scope is required to follow the Project Change Authorization process where the Keeyask Project Director approves changes to scope, budget, and/or schedule?

MGF Response:

MGF was aware that “The transmission business unit is responsible for the following scope for the Keeyask project, which is generally referred to as the Generation Outlet Transmission (GOT):”, as well as “The Keeyask Transmission Business Unit provided an estimate for the delay cost and trends related to the scope described...”. This was presented within the 2017 Capital Project Justification Addendum, Basis of Estimate Document.

MH had communicated that all leads are required to follow the Project Change Authorization process.

The intent of the comment was in response to feedback from MH upon MGF’s request for additional information related to estimate details pertaining to the GOT which were not available. It was indicated that this information was held by the Transmission Business Unit.

MH/MGF I - 25

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 63.



Preamble:

In review of the Board Recommendation for the award of the GCC, MGF states that there is no contingency held for concrete productivity risk in the Contingency for Manitoba Hydro Held Risks' section of the Total Purchase Order Upset Limit calculation.

This Board Recommendation also states, *"If BBE does not achieve productivity estimates the \$0.384B labour management reserve would have to be used."*

This \$0.384B labour management reserve was approved as part of the \$6.5B control budget in 2014.

Question (KP):

- a) Does MGF agree, that with the above approval in 2014 by the Manitoba Hydro-Electric Board, Manitoba Hydro included contingency in the form of a labour management reserve to account for productivity risk in the \$6.5B control budget?
- b) If MGF does not agree, please explain why.

MGF Response:

The concrete productivity risk is not referred to in the Contingency for Manitoba Hydro held Risks' section in the Total Purchase Order Upset Limit (internal) that the Board approved in the sum of [REDACTED]. As concrete productivity is a Manitoba Hydro risk, we expected it to be identified here and an assessment of potential cost included in the sum to be approved by the Board. As Manitoba Hydro states above, the Board Recommendation did state *"If BBE does not achieve productivity estimates the \$0.384 labour management reserve would have to be used."*

1a

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MH/MGF I - 26

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 63.

Preamble:

MGF states that based on the findings of the Capital Review, the Final Cost for the Keeyask project will not meet the budget of \$8.7 billion, but rather be in the range of \$9.5 billion to \$10.5 billion.

Question (KP):

- a) Please provide the specific calculations used to develop this forecasted range.

MGF Response:

MGF used MH's spent to date and cost to go figures, on top of these MGF applied additional costs for items such as earthwork productivity; concrete productivity; additional scaffold & crane costs; additional indirect costs; etc.

In addition, MGF applied interest and escalation in line with MH's percentage.

Finally, MGF applied a 10% contingency to take into account project risk and uncertainty.

- b) Does MGF agree that the lower end of the range of MGF's forecasted budget closely aligns with Manitoba Hydro's estimate of a P90 budget that would have been \$9.6 billion?

MGF Response:

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Yes, we agree, however MH did not use the P90 estimate but chose to use the P50 estimate in the sum of \$8.7billion.

(Ref. Manitoba Hydro's Keeyask Project Introduction Presentation July 25, 2017 to MGF)

MH/MGF I - 27

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 70.

Preamble:

MGF has flagged three instances in BBE's September 2017 Monthly Cost Report where the value of installed concrete differs.

When this preliminary finding was shared with Manitoba Hydro, Manitoba Hydro provided an explanation to address these specific variances in the file titled "Response to MGF - Keeyask - Concrete Quantity Reporting". In this response, Manitoba Hydro stated that:

"On Page 31, the quantity that is referenced is planned batch quantity which differs from the "neat line" volumes. The batch quantity includes waste concrete, temporary works, leveling slabs and over-break quantities. The quantity referred to (278,962 cu/m) represents the remaining quantity to be batched after Amending Agreement #7.

On Page 211, the values reported are the total quantity of concrete for the Keeyask Project.

On Page 264, the quantities referred to are the remaining neat line quantities of concrete to be placed as per Amending Agreement #7."

Question (KP):

- a) Did MGF receive this correction?

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- b) Did MGF accept this correction and incorporate it into the Report?
- c) If MGF did accept this correction, but did not incorporate it into the Report, why not?
- d) If MGF did accept this correction and did incorporate it into the Report, how was it incorporated and where?
- e) If MGF did not accept this correction, why was it not accepted?
- f) If MGF did not accept this condition previously, but now accepts it, what impact does that have on the Finding and does it change it in any way?

MGF Response:

MGF's finding is based on the information, figures and narrative provided in BBE's September 2017 Monthly Cost Report.

MH/MGF I - 28

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 73.

Preamble:

MGF states that *"during the site visit to the Keeyask site on 9th and 10th November 2017, MGF performed a survey of earthworks to compare to the value reported by BBE. The quantity of embankment fill claimed by BBE is approximately 10% higher than the quantity assessed by MGF"*.

Question (KP):

- a) Can MGF please describe the methodology they undertook to measure quantities to arrive at the conclusion?

MGF Response:

Average end area method was used to calculate the volume. Heights of existing embankment and remaining fill heights were determined by referencing the existing known elevation point at concrete structures, survey stakes and speaking with MH site personnel. Survey profiles of existing embankment and center line profiles provided to MGF staff on site by MH were also used in the calculation of the volumes.

- b) Can MGF please identify which structures were assessed to come to this conclusion?

MGF Response:

North Dyke, North Dam, Central Dam and South Dam.

- c) Can MGF please provide the quantities by structure they used to make this comparison (i.e. provide both MGF's calculated quantities and BBE's reported quantities by structure)?

MGF Response:

Internal MGF backup and calculations are confidential. However, MGF welcomes the opportunity of discussing this information with MH at a mutually convenient time.

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- d) MGF recommends the use of spot checks to ensure accuracy of quantities reported by BBE. What is the approximate number of spot checks MGF recommends to ensure accuracy of quantities?

MGF Response:

The number of spot checks should be a function of the invert profile and as MH on site engineering personnel deem necessary to calculate volumes with a degree of accuracy, sufficient to validate the GCC volumes.

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MH/MGF I - 29

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 76.

Preamble:

MGF indicates that the budget for scaffolding and crane category is nearly expended but the physical progress of the work is only [REDACTED] MGF calculates the additional scaffold cost to be in the order of magnitude of \$103.5M.

1a

Question (KP):

- a) Does this calculated value only represent MGF's expected additional scaffold cost or does it include crane costs as well?

MGF Response:

Crane costs are included

- b) Please provide the basis and assumptions used for these calculations.

MGF Response:

The costs are calculated on the scaffold and crane spend to date and the project percentage complete to date. This is pro-rated for the cost to complete.

MGF has applied a tapering off factor to allow for reduced costs due to upfront purchases and reduction in activity as the work progresses.

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c) What is the value of indirects MGF is applying to this calculation?

MGF Response:

A factor of [REDACTED] of direct costs.

1a

d) Does the forecasted value provided by MGF consider that a majority of the scaffolding has already been purchased and will be redeployed around the site?

MGF Response:

The majority of costs represent labour costs.

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MH/MGF I - 30

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 78.

Preamble:

MGF indicates that actual average concrete productivity is likely to worsen, as there are more complicated pours to come and three more winter seasons to work through.

Question (KP):

- a) Can MGF provide evidence to support which structures are more complicated when compared to what has already been placed. Please provide the man hour factors in this comparison.

[MGF Response:](#)

[See item c\)](#)

- b) Can MGF describe what work they forecast will be completed in future winters?

[MGF Response:](#)

[See item c\)](#)

- c) What is MGF's assumed timeframes for winter work?

MGF Response:

The above questions have not been taken into account in developing the Order of Magnitude sum of \$136,500,000.

The GCC has commenced draft tubes formwork and associated concrete pours. Also, MH recently planned winter pours. In our opinion this will have an impact on productivity.

MH/MGF I - 31

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 78.

Preamble:

Given that the Keyask Generation Station has seven nearly identical units and concrete on three of these units are nearly complete.

Question (KP):

- a) Would MGF agree that there would be lessons learned due to repeatability that should increase the productivity and lower the cost for the remaining units?

MGF Response:

See c) below

- b) Has MGF factored in the potential for increase of productivity due to repeatability in their forecasted budget?

MGF Response:

See c) below

c) If not, please explain why.

MGF Response:

Refer to item MH/MGF I-30 c). Potentially there may be some offset, however this will depend on Crew repetition, Supervision & Management repetition and applying lessons learned.

MH/MGF I - 32

Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, page 81.

Preamble:

MGF states, *“the application of incorrect machinery and work methods causes delay and additional cost. The following picture depicts an example where both Schedule and Cost are pushed out in favour of the Contractor and at the expense of the Client”*.

Question (KP):

- a) Can MGF confirm that the information provided on page 81 of the report is based solely on the picture and not on an actual site visit of the work area depicted in the picture?

MGF Response:

Yes, based on the photo and MGF personnel experience.

- b) Can MGF confirm that the picture on page 81 was taken in 2016, and that MGF representatives were not on site until mid-2017?

MGF Response:

Yes, the photograph has a date stamp. MGF personnel were on site on a number of occasions up to 11th November 2017.

- c) Can MGF give any examples of projects that they have directly managed from site? If so, please provide specific details of the type of equipment and soil conditions they were used in?

MGF Response:

Refer to item MH/MGF I-1 c).

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The MGF team member that reviewed this element of the report has over 40 years' experience as a Supervisor in earthmoving and grading on hydro, open pit mine development, railroad and resource projects.

- d) Can MGF provide the documentation or research that supports MGF's claim that the equipment and methodology recommended by MGF is more effective than the equipment being utilized in the photo?

MGF Response:

Based on experience, double handling of material should be avoided if possible.

- e) Is it MGF's opinion that a Technical Specification should be followed exactly as prescribed in all cases, even when conditions in the field do not readily support this?

MGF Response:

No.

A Contractor may seek opportunities to improve productivity and cost. A test programme may be implemented.

Any deviations from the Technical Specification should be approved by formal instruction from the Client/Project Manager.

- f) Did MGF discuss this observation with the Manitoba Hydro site staff responsible for overseeing the earthworks?

MGF Response:

Yes, Manitoba Hydro earthworks inspector.

- g) If so, did MGF receive any explanation from Manitoba Hydro staff that, while the Specification was followed in most instances for this work, the ground conditions in the area captured in the photo did not allow for the specified equipment to be applied?

MGF Response:

No, however he stated that he did question the use of a padfoot roller when he arrived on site.

- h) Would the explanation in part g) of this question address MGF's concern about the type of machinery selected in the work conducted in the picture on page 81?

MGF Response:

See MGF response g) above

- i) Would MGF agree that, although a smooth drum or rubber tire roller could be used to for compaction of Class 1 material, there is a risk that these methods would seal the surface of each material lift creating a laminar surface increasing the risk of water migrating through the structure?

MGF Response:

Risk may be eliminated by scarifying the existing surface before placing subsequent lifts. As per section 3.3 sub section 3.3.3 of Technical Specification “if the impervious fill is too dry to bond properly with the lift of material to be placed thereon, it shall be moistened and scarified to a sufficient depth to provide a satisfactory bonding surface before the succeeding lift of material is placed”

In MGF’s opinion, greater compaction effort and time is required with a pad foot compactor for this type of material, i.e. sandy silt/silty sand

- j) If MGF does not agree, please explain why not.

MGF Response:

See i) above.

- k) Can MGF confirm that migration of water through a water-retaining dam or dyke structure is not desirable?

MGF Response:

Not applicable to MGF’s review.

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Reference:

SCOPE ITEM 10: Finding No. 1: HVDC Converter Stations – Manitoba Hydro Internal Labour Cost Capital Expense vs. Operation Expense (Beyond Finish Date) starting on page 83 of the report.

Preamble:

MGF provided this finding to Manitoba Hydro as a draft in advance of the report and Manitoba Hydro provided a response on November 22 to advise that this finding incorrectly identified MH as having internal labour costs budgeted beyond the project in-service date that are being incorrectly applied to capital expenditures as opposed to operating expenditures.

Question (BP111):

- a) Did MGF receive this correction?
- b) Did MGF accept this correction and incorporate it into the Report?
- c) If MGF did accept this correction, but did not incorporate it into the Report, why not?
- d) If MGF did accept this correction and did incorporate it into the Report, how was it incorporated and where?
- e) If MGF did not accept this correction, why was it not accepted?
- f) If MGF did not accept this condition previously, but now accepts it, what impact does that have on the Finding and does it change it in any way?

MGF Response:

In MGF's opinion these costs should not be part of a capital budget.

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MH/MGF I - 34

Reference:

SCOPE ITEM 10: Finding No. 3: HVDC Converter Stations – Risk Management on page 86 of the report.

Preamble:

MGF provided this finding to Manitoba Hydro as a draft in advance of the report and Manitoba Hydro provided a response on November 19 to advise MGF that it had incorrectly indicated that the risk identified in the June 2017 Bipole III Converter Stations Project Controls Report is the same as subsequently identified in the September 2017 Controls Report and therefore it is not correct to say that the risk has remained unmitigated.

Question (BP111):

- a) Did MGF receive this correction?
- b) Did MGF accept this correction and incorporate it into the Report?
- c) If MGF did accept this correction, but did not incorporate it into the Report, why not?
- d) If MGF did accept this correction and did incorporate it into the Report, how was it incorporated and where?
- e) If MGF did not accept this correction, why was it not accepted?
- f) If MGF did not accept this condition previously, but now accepts it, what impact does that have on the Finding and does it change it in any way?

MGF Response:

MH's response arrived after this analysis was performed and during the period in which the Final Report was being consolidated. As such there was insufficient time to review MH's response.

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Reference:

SCOPE ITEM 10: Finding No. 4: Bipole III – Integrated Master Schedule for Converter Stations starting on page 87 of the report.

Preamble:

In review of the Bipole III Integrated Master Schedule MGF have identified the work on the Keewatinohk 230kV AC Switchyard to be 93 days behind schedule.

Question (BPIII):

- a) Can MGF provide further detail to outline how it has determined that the Keewatinohk 230kV AC Switchyard work is 93 days behind schedule?

MGF Response:

The schedules used were the 033401 – KCVS 230 kVAC Switchyard Project – Latest Rev – 20171027.xer and 03341 – KCVS 230kV AC Switchyard Project – Over Target – Baseline – 20151117.xer. The 93-day delay represents the schedule Forecast finish date versus the Baseline finish date.

- b) What has MGF considered as the current completion date for this work (both date and activity name)?

MGF Response:

As indicated in the Final Report, the project start and finish dates for the individual schedules that are incorporated into the Integrated Master Schedule represent the overall findings. Detailed analysis was not performed on the

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individual schedules. The baseline and actual/dates describe the schedule start date and the schedule end date.

- c) What has MGF considered as the original completion date for this work (both date and activity name)?

MGF Response:

Using the overall schedule information, the baseline (03341 – KCVS 230kV AC Switchyard Project – Over Target – Baseline – 2015117.xer) completion date for this schedule was 7th October 2017.

- d) Manitoba Hydro considers the delay compared to the original baseline schedule to be 48 days and not 93 days as the final taking over of the work from the contractor occurred on November 24, 2017. Additionally, Manitoba Hydro also considers this delay to have no impact to the overall project in-service date. Would MGF agree with this delay assessment and that there is no impact of the overall project in-service date?

MGF Response:

MGF agrees that the schedule identifies the activity 'Contractual work "Taken-Over" by MH for "Test after completion"' was complete on the 24th November 2017. The original baseline (033401 – KCS 230 kV AC Switchyard Project – Original Baseline 20141125) had a forecasted date of 28th April 2017. The most recent baseline (033401 – KCS 230kV AC Switchyard Project – Over Target – Baseline – 20151117.xer) has 7th October 2017 as the Finish Date for the same

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activity. This activity has a 48-day delay between the actual finish date and the most recent baseline finish date.

MGF further agrees that the delay on this schedule does not impact the overall project in-service date.

- e) If MGF does not agree that 48 days is the accurate date, please provide further details as where the discrepancy is between Manitoba Hydro's estimate and MGF's.

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Reference:

SCOPE ITEM 11: Finding No. 3: HVDC Converter Stations – Variation Management on page 90 of the report.

Preamble:

MGF provided this finding to Manitoba Hydro as a draft in advance of the report and Manitoba Hydro provided a response on November 27 to advise MGF that it had misinterpreted the application of mark-up on several of the lumps sum Variations reviewed (e.g. Siemens Mortenson Consortium lump sum contract variations).

Question (BPIII):

- a) Did MGF receive this correction?
- b) Did MGF accept this correction and incorporate it into the Report?
- c) If MGF did accept this correction, but did not incorporate it into the Report, why not?
- d) If MGF did accept this correction and did incorporate it into the Report, how was it incorporated and where?
- e) If MGF did not accept this correction, why was it not accepted?
- f) If MGF did not accept this condition previously, but now accepts it, what impact does that have on the Finding and does it change it in any way?

MGF Response:

MH's response arrived after this analysis was performed and during the period in which the Final Report was being consolidated. As such there was insufficient time to review MH's response.

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Reference:

SCOPE ITEM 13: Finding No. 3: HVDC Converter Stations – Contingency Review starting on page 95 of the report; and

SCOPE ITEM 19: Finding No. 3. Bipole III Transmission Line – Contingency Review starting on page 112.

Preamble:

MGF has noted that the current Converter Stations contingency and Transmission Line contingency values are different that Manitoba Hydro's corporate standard of a P50 or 50% confidence level for contingency.

Question (BPIII):

Can MGF clarify the background or specific document referenced for its statement that P50 is Manitoba Hydro's "Corporate Standard" for contingency?

MGF Response:

This statement has been provided within MH Procedure RSK-002, Page 10 of 14 and it is also stated on Page 16 of the 2014 Keeyask Basis of Estimate Document that "Manitoba Hydro's corporate standard is to set contingency at a P50 or 50% confidence level."

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Reference:

November 28, 2017 letter from MGF to Manitoba PUB, page 3.

MGF report pages 98 and 118

Preamble:

MGF states, "Stanley's participation will add value to the (MGF) report".

At pages 98 and 118 MGF references Stanley Consultants Inc. and in both references, which appear in the section on Bipole III Transmission scope item 14 (page 98) and the second in the section on Manitoba Minnesota Transmission Project scope item 21 (118), MGF states, "As such, Stanley did not address this scope".

Question:

- a) What was Stanley Consultants retained to review and comment upon?
- b) What expertise does Stanley Consultants have that neither MGF nor Klohn Crippen Berger have such that their expertise was considered necessary for the review of Manitoba Hydro's capital projects?
- c) As the references at pages 98 and 118 are the only time Stanley's review is referenced in the MGF report and are only referenced to identify that they did not address those issues, please identify what work Stanley consultants performed and where in the MGF report that MGF's opinions were influenced or changed by the information and reports provided by Stanley
- d) If MGF's opinions were influenced or changed by the information or reports provided by Stanley please identify how MGF's opinions were changed and why.
- e) Please identify all parts of the MGF report, which relies on information or reports provided by Stanley Consultants or incorporated information provided by Stanley consultants.
- f) Who at Stanley consultants provided that background information or reports.

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- g) Please provide the curriculum vitae of each of the Stanley consultants who provided the review and provided input into the report.
- h) Please provide any reports or background information produced by Stanley consultants and provided to MGF.

MGF Response:

Stanley Consultants were engaged as Independent Expert Consultants specific to the transmission lines portion of the report. The Stanley submissions are incorporated in MGF's report.

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Reference:

SCOPE ITEM 15: Finding No. 1: Bipole III Transmission Line – Section N4 starting on page 98 of the report.

Preamble:

MGF provided this finding to Manitoba Hydro as a draft in advance of the report and Manitoba Hydro provided a response on November 22 to advise MGF that the Rokstad Contract had been adjusted for reduced scope (primarily foundations scope removed in N4) and updated unit rates once the contract was awarded in December 2016, which was post the finalization of CPJA 08a (2016). As such all reductions to the contract budget are returned to the project control budget.

Question (BP111):

- a) Did MGF receive this correction?
- b) Did MGF accept this correction and incorporate it into the Report?
- c) If MGF did accept this correction, but did not incorporate it into the Report, why not?

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- d) If MGF did accept this correction and did incorporate it into the Report, how was it incorporated and where?
- e) If MGF did not accept this correction, why was it not accepted?
- f) If MGF did not accept this condition previously, but now accepts it, what impact does that have on the Finding and does it change it in any way?

MGF Response:

MH's response arrived after this analysis was performed and during the period in which the Final Report was being consolidated. As such there was insufficient time to review MH's response.

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Reference:

SCOPE ITEM 15: Finding No. 3: Bipole III Transmission Line – CEF 2016 Estimate on page 100 of the report.

Preamble:

MGF provided this finding to Manitoba Hydro as a draft in advance of the report and Manitoba Hydro provided a response on November 22 to advise MGF that CEF2016 estimate does in fact include costs for Distribution Line Crossings and the Transmission Line Construction Yard.

Question (BPIII):

- a) Did MGF receive this correction?
- b) Did MGF accept this correction and incorporate it into the Report?
- c) If MGF did accept this correction, but did not incorporate it into the Report, why not?
- d) If MGF did accept this correction and did incorporate it into the Report, how was it incorporated and where?
- e) If MGF did not accept this correction, why was it not accepted?

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- f) If MGF did not accept this condition previously, but now accepts it, what impact does that have on the Finding and does it change it in any way?

MGF Response:

MH's response arrived after this analysis was performed and during the period in which the Final Report was being consolidated. As such there was insufficient time to review MH's response.

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Reference:

SCOPE ITEM 17: Finding No. 1: Bipole III Transmission Line – Risk Register Estimate on page 102 of the report.

Preamble:

MGF provided this finding to Manitoba Hydro as a draft in advance of the report and Manitoba Hydro provided a response on November 24 to advise MGF that the Risk Register does in fact include the attributes that MGF noted as missing.

Question (BPIII):

- a) Did MGF receive this correction?
- b) Did MGF accept this correction and incorporate it into the Report?
- c) If MGF did accept this correction, but did not incorporate it into the Report, why not?
- d) If MGF did accept this correction and did incorporate it into the Report, how was it incorporated and where?
- e) If MGF did not accept this correction, why was it not accepted?
- f) If MGF did not accept this condition previously, but now accepts it, what impact does that have on the Finding and does it change it in any way?

MGF Response:

MH's response arrived after this analysis was performed and during the period in which the Final Report was being consolidated. As such there was insufficient time to review MH's response.

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Reference:

SCOPE ITEM 17: Finding No. 2: Bipole III Transmission Line – Contract Management on page 102 of the report?

Preamble:

Manitoba Hydro advises that this contract was in fact shown as closed in the Contracts listing and any un-used funds were returned to the project control budget post CPJA 08a (2016).

Question (BPIII):

Can MGF clarify the specific document referenced for its statement that this contract is “open” as both documents MGF have referenced indicate the contract as being closed?

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Reference:

SCOPE ITEM 17: Finding No. 3: Bipole III Transmission Line – Variation Management on page 103 of the report; and,

SCOPE ITEM 17: Finding No. 4: Bipole III Transmission Line – Variation Management on page 104 of the report.

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Preamble:

MGF provided this finding to Manitoba Hydro as a draft in advance of the report and Manitoba Hydro provided a response on November 27 to advise MGF that MH does maintain variation log/summaries will all variations tracked.

Question (BPIII):

- a) Did MGF receive this correction?
- b) Did MGF accept this correction and incorporate it into the Report?
- c) If MGF did accept this correction, but did not incorporate it into the Report, why not?
- d) If MGF did accept this correction and did incorporate it into the Report, how was it incorporated and where?
- e) If MGF did not accept this correction, why was it not accepted?
- f) If MGF did not accept this condition previously, but now accepts it, what impact does that have on the Finding and does it change it in any way?

MGF Response:

MH's response arrived after this analysis was performed and during the period in which the Final Report was being consolidated. As such there was insufficient time to review MH's response.

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Reference:

SCOPE ITEM 17: Finding No. 5: Bipole III Transmission Line – Rokstad Power Company Schedule on page 105 of the report; and,
SCOPE ITEM 17: Finding No. 6: Bipole III Transmission Line – Rokstad Power Company Schedule starting on page 105 of the report.

Preamble:

MGF have noted that Rokstad Power has a completion date of April 21, 2018 for the [REDACTED] 1a, 4b
[REDACTED] sections of the Transmission Line.

Question (BP111):

- a) Can MGF clarify why they have indicated an end date of April 21, 2018 for the Rokstad Power work?

MGF Response:

The end date of 21st April, 2018 is a result of the activity “Final Record and As Built Submissions” taken from the Rokstad’s schedule (031063 RPC Update to Aug 20 2017-POBS Removed) .

- b) Can MGF indicate the description of the activity in the schedule they have identified as the end date for the Rokstad Power work?

MGF Response:

Please refer to question a) above.

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- c) Can MGF indicate whether the activity they have associated with the completion of Rokstad Power's work actually corresponds with the completion of construction work or whether this is a trailing / post-construction activity?

MGF Response:

The activity "Final Record and As Built Submissions" is a trailing /post-construction activity.

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Reference:

SCOPE ITEM 17: Finding No. 7: Bipole III Transmission Line – Master Schedule starting on page 106 of the report.

Preamble:

MGF provided this finding to Manitoba Hydro as a draft in advance of the report and Manitoba Hydro provided a response on November 24 to advise that a recovery plan have been obtained from Rokstad on numerous occasions, and a further recovery plan was received Dec. 13, 2017. However, a recovery plan from Forbes has not been requested and is not deemed necessary at this time, as Forbes is still on target to complete their work. Manitoba Hydro continues to monitor both contractors' progress.

Question (BPIII):

- a) Why has MGF identified the requirement for a recovery schedule from Forbes?

MGF Response:

In a meeting with MH's scheduler, the MH scheduler indicated there were slippages and recovery plans from both contractors were expected.



- b) Would MGF agree that Forbes is on-track to complete their work without any impact to the project in-service date?

MGF Response:

MGF agrees that Forbes is on-track to complete their work without any impact to the overall project in-service date.

- c) If not, please explain why not.
- d) Did MGF receive the correction to the report identified above

MGF Response:

MH's response arrived after this analysis was performed and during the period in which the Final Report was being consolidated. As such there was insufficient time to review MH's response.

- e) Did MGF accept this correction and incorporate it into the Report?

MGF Response:

Please refer to question d) above.

- f) If MGF did accept this correction, but did not incorporate it into the Report, why not?

MGF Response:

Please refer to question d) above.

- g) If MGF did accept this correction and did incorporate it into the Report, how was it incorporated and where?
- h) If MGF did not accept this correction, why was it not accepted?
- i) If MGF did not accept this condition previously, but now accepts it, what impact does that have on the Finding and does it change it in any way?

MGF Response:

Please refer to question b) above.

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Reference:

Page 119, Scope Item 22, Finding No.1.

Preamble:

Documented conclusions and recommendations regarding estimating methodology suggest the following:

“MGF recommends that an appropriate Basis of Estimate (BoE) be developed for the project. Preparing a BoE is an industry Best Practice for all levels of estimates as it supports in ensuring many aspects of the project are understood, and/or necessary assumptions made at the time of estimate development have been documented.”

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Question (MMTP):

Recognizing that a Basis of Estimate document does add value during the estimating processes would you agree it would be more appropriate to prepare during our next re-estimate of the project budget, rather than preparing one for the existing budget?

MGF Response:

As indicated within AACE International Recommended Practice No. 34R-05 a Basis of Estimate is a document that should be prepared in parallel with the cost estimate.

The act of completing this deliverable and process assists the project team in identifying areas of increased confidence as well as areas of increased uncertainty that perhaps need further investigation or review.

In our opinion, this should be prepared as soon as possible, as the incurred project costs are only increasing with time.

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Reference:

Pages 128, Scope Item 25. Finding No.1.

Preamble:

MGF has reviewed the current budget for MMTP and determined compared to “industry standards” that the per kilometer costs are low.

There are a wide variety of variables that impact the costs of a transmission project, and no frame of reference has been provided by MGF in their determination of “industry standard”.

To better understand the relevance of the comparison, further information is required.

Question (MMTP):

With respect to the industry standard project cost of \$1,946,812USD per km sited in MGF's report please provide the following information:

- a) The number of projects selected when determining the industry standard cost per kilometer.

Stanley Consultants Response:

Number of projects is indeterminate. Cost per mile estimates were developed from three (3) sources:

(1) The Western Electricity Coordinating Council (WECC) white paper on Capital Costs for Transmission and Substations developed by Black & Veatch in 2014 lists comparable cost per mile values used for estimating.

(2) Midcontinent Independent System Operator (MISO) report in 2015 which provides comparable costs per mile for capital projects within the MISO region.

(3) Budget data based on project work and experience for six (6) projects within the northern great plains region. Projects completed between 2012 – 2016 and cost per mile calculated based on available budgetary data.

Calculated data (item #3) were used for verification purposes of WECC and MISO published data and as a means of providing for more accurate escalation values as these project completion dates were known and thus allowed for escalation calculations.

- b) The location of each project used to determine the industry standard cost per kilometer.

Stanley Consultants Response:

WECC data is western Great Plains region and into Rocky Mountain region. MISO data is within MISO in central United States. Calculated data is from projects based on northern Great Plains region in MN, ND, MT, SD and partial data from project that extended into Alberta.

- c) The year of completion of each project used to determine the industry standard cost per kilometer.

Stanley Consultants Response:

WECC data published in 2014. MISO data published in 2015. Calculated data from projects completed 2012-2016.

- d) The tower type and design used for each project used to determine the industry standard cost per kilometer.

Stanley Consultants Response:

WECC and MISO data have indeterminate structure design. Calculated data projects included self-supporting lattice tower (1 project) and tubular steel structures (5 projects). None of the projects included guyed tangent lattice towers. It is worth noting that type of transmission structures does not have a significant impact on overall cost per mile for comparison purposes.

- e) The line lengths of each project used to determine the industry standard cost per kilometer.

Stanley Consultants Response:

WECC and MISO are indeterminate, other than to state a minimum transmission line length (WECC > 10 miles, MISO > 20 miles). Calculated data had the following line lengths (in miles): 214, 250, 279, 250, 210, 186.

- f) The project delivery model used by each project used to determine the industry standard cost per kilometer (i.e., engineer, procure, and construct versus internal resources).

Stanley Consultants Response:

WECC and MISO project delivery methods are indeterminate. Calculated data projects were design-build with mixture of internally designed (2 projects) and contracted design (4 projects).

It is worth noting that internal vs. externally contracted design does not have a significant impact on overall cost per mile for comparison purposes.

- g) Clearance requirements used by each project used to determine the industry standard cost per kilometer.

Stanley Consultants Response:

Clearance requirements were not considered in comparison cost per mile calculations. It is assumed that all projects met minimum NESC clearance requirements. Clearance standards or requirements does not have a significant impact on overall cost per mile for comparison purposes.

- h) Live line clearances used by each project used to determine the industry standard cost per kilometer.

Stanley Consultants Response:

Clearance requirements were not considered in comparison cost per mile calculations. It is assumed that all projects met minimum NESC clearance requirements. Clearance standards or requirements does not have a significant impact on overall cost per mile for comparison purposes.

- i) Conductor size used by each project used to determine the industry standard cost per kilometer.

Stanley Consultants Response:

WECC and MISO conductor sizes are indeterminate. Conductor sizes for known calculated projects were 795/Drake (bundled), 1272/Bittern (bundled), 1590/Lapwing, 1431/Bobolink.

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- j) Maximum load carrying capacity used by each project used to determine the industry standard cost per kilometer.

Stanley Consultants Response:

WECC and MISO load carrying capacity are indeterminate. Load capacity for known calculated projects were 1570 MWe, 1650 MWe, 1280 MWe, 2500 MWe.

- k) Voltage level of the line used by each project used to determine the industry standard cost per kilometer.

Stanley Consultants Response:

Voltage levels for all comparison work was based on projects of the same voltage levels. WECC and MISO published data breaks down cost per mile by voltage level and circuit configuration. Calculated data, as stated, was used as verification of these comparison values and was also based on same voltage/same circuit values.

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Reference:

PUB Scope of work for Klohn Crippen Berger in its review of Keeyask

Preamble:

Manitoba Hydro seeks to understand the expertise of the Klohn Crippen Berger

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Question (KP):

- a) Did representatives of Klohn Crippen Berger attend an on-site visit of Keeyask? If so, how many times?

[MGF Response:](#)

[See KCB Responses.](#)

- b) What major hydroelectric projects has Klohn Crippen Berger worked on and in what capacity?

[MGF Response:](#)

[See KCB Responses.](#)

- c) Has Klohn Crippen Berger provided any expert advice on either the Site C or Muskrat Falls Hydro Electric projects and if so please identify and provide any reports produced on for those projects which might be publicly available or any other major hydro-electric project in the last 10 years.

[MGF Response:](#)

[See KCB Responses.](#)

- d) To the extent Klohn Crippen Berger has had involvement with either of Site C or Muskrat Falls, can it provide information on the extent to which the initial

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anticipated budget was met or any other major hydro-electric project in the last 10 years.

MGF Response:

[See KCB Responses.](#)

- e) Is Klohn Crippen Berger aware of any major construction projects – meaning those which have a total anticipated cost of greater than 1 billion dollars where the owner has taken over the role of construction manager in the middle of construction? In addition, if so does it know why this occurred?

MGF Response:

[See KCB Responses.](#)

- f) Is Klohn Crippen Berger aware of any major construction projects – meaning those that have a total anticipated cost of greater than 1 billion dollars where the owner has acted as its own construction manager? If so, please identify and provide details of the impact on cost and quality.

MGF Response:

[See KCB Responses.](#)

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Reference:

MGF Report for Manitoba Hydro Capital Expenditure review, Appendix A Klohn Crippen Berger Report page 29.

Preamble:

As a comparator on the reasonableness of the unit prices on Keeyask, Klohn Crippen Berger compared the unit prices on Keeyask with some historical information obtained for similar work for the construction of a large hydroelectric power project in northern Canada.

Question (KP):

- a) What year was the work executed in the project referenced above?

MGF Response:

See KCB Responses.

- b) Was it in a remote northern location with similar logistics challenges as the Keeyask Project?

MGF Response:

See KCB Responses.

- c) Was the contract value and complexity of the project comparable to the Keeyask Project?

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MGF Response:

See KCB Responses.