

## **APPENDIX A: ECONOMIC EVALUATION BACKGROUNDER**

### **Contents**

1. INTRODUCTION.....	1
2. PURPOSE OF THE BACKGROUNDER .....	2
3. NEED .....	4
4. ALTERNATIVES.....	6
4.1 Reliability Problem Focused Plans .....	6
4.2 Export Opportunity Focused Plans.....	8
5. ECONOMIC EVALUATIONS.....	9
6. REFERENCE CASE ECONOMICS .....	11
6.1 Manitoba Hydro’s Assessment – Approach .....	11
6.2 Manitoba Hydro’s Initial Results.....	11
6.3 Issues Noted Regarding Manitoba Hydro’s Reference Case Economic Evaluations ...	13
6.4 Reference Case Updates – 2012 Planning Assumptions.....	20
6.5 Reference Case Updates – 2013 Planning Assumptions.....	23
7. ECONOMIC UNCERTAINTY ANALYSIS.....	26
7.1 Manitoba Hydro’s Approach .....	26
7.2 Manitoba Hydro’s Initial Economic Uncertainty Analysis Results.....	27
7.3 Issues Noted with Manitoba Hydro’s Economic Uncertainty Analysis .....	28
7.4 ECS Economic Uncertainty Analysis .....	30
7.5 Economic Uncertainty Analysis Updates.....	35
8. MULTIPLE ACCOUNT ANALYSIS.....	46
8.1 Manitoba Hydro’s Market Valuation Account.....	46
8.2 Issues Regarding Manitoba Hydro’s Market Valuation Account.....	46
8.3 Manitoba Hydro’s Customer Account.....	49
8.4 Issues Regarding Manitoba Hydro’s Customer Account .....	49
8.5 Multiple Account Results.....	51
9. CONCLUSIONS REGARDING KEY DECISIONS.....	52
9.1 Keeyask/Intertie.....	52
9.2 Conawapa .....	53

## **1. INTRODUCTION**

On January 13, 2011, the Government of Manitoba advised Manitoba Hydro of its intention to carry out a public Need For and Alternatives To (NFAT) review and assessment of the Manitoba Hydro's proposed Preferred Development Plan ("PDP" or "the Plan") for major new hydro-electric generation and Canada-USA interconnection facilities using an independent body. Subsequently, the Minister of Innovation, Energy and Mines announced that the Government of Manitoba had asked the Manitoba Public Utilities Board ("PUB") to conduct the NFAT Review and established a Terms of Reference for the PUB's review.

Manitoba Hydro's Preferred Development Plan is set out in the Needs For and Alternatives To (NFAT) Business Case which it submitted to the PUB in August 2013. The PDP calls for<sup>1</sup>:

- Construction of the 695 MW Keeyask Project with an in-service date of 2019.
- Construction of the 1,485 MW Conawapa Project with an (updated) in-service date of 2026.
- Construction of a 185 MW North-South Transmission Project with an in-service date to coincide with Conawapa.
- Construction of a 750 MW Manitoba-Minnesota Transmission Project with an in-service date of 2020.
- Construction of simple-cycle gas thermal units towards the end of Manitoba Hydro's planning period to meet forecast domestic load growth.

The PDP also calls for the satisfactory completion and approval of export agreements with Minnesota Power and Wisconsin Public Service. At the time of the original submission, a 250 MW export agreement with Minnesota Power and a 100 MW export agreement with Wisconsin Public Service has been signed while a second larger (i.e.

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<sup>1</sup> NFAT Application, Chapter 2, page 1

308 MW) agreement with Wisconsin Power was still under negotiation<sup>2</sup>. This second agreement was subsequently signed earlier this year.

While the Plan addresses Manitoba Hydro's demand/supply balance for the next 35 years<sup>3</sup>, in order to implement the Plan, Manitoba Hydro requires<sup>4</sup> the following commitments by June 2014:

- Start construction of the Keeyask generating station for a 2019 in-service date,
- Formalize signed export agreements with Minnesota Power (250 MW) and Wisconsin Public Service (100 MW and 308 MW),
- Proceed with a 500 kV/750 MW U.S. interconnection.

Furthermore, while a specific commitment to start construction of the Conawapa generating station is not needed at this time, Manitoba Hydro is seeking authorization to continue planning activities and spending that would protect an in-service date for Conawapa as early as 2026<sup>5</sup>.

## **2. PURPOSE OF THE BACKGROUNDER**

The Minister's Terms of Reference called for the PUB to review and assess the need for and alternatives to Hydro's Plan. It further directed that the PUB's assessment be based upon the evidence submitted by Hydro, intervenors and independent expert consultants used by PUB to assist in the NFAT. The Terms of Reference also called for the PUB's subsequent Report to the Minister to address a range of issues which included:

- An assessment as to whether the needs for Hydro's Plan are thoroughly justified, and sound, its timing is warranted, and the factors that Hydro is relying upon to prove its needs are complete, reasonable and accurate,
- An assessment as to whether the Plan is justified as superior to potential alternatives that could fulfill the need, and

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<sup>2</sup> NFAT Application, Chapter 6, page 28

MH Exhibit 95, page 20

<sup>3</sup> Appendix 4.2

<sup>4</sup> NFAT Application, Executive Summary, page 1

<sup>5</sup> NFAT Application, Executive Summary, page 1

- If the Plan has been justified to provide the highest level of overall socio-economic benefit to Manitobans, and is justified to be the preferable long-term electricity development option for Manitoba when compared to alternatives.

To address these issues Manitoba Hydro's evidence (i.e., its August 2013 NFAT Business Case) included economic evaluations of the Preferred Plan and various alternative plans<sup>6</sup> from a Manitoba Hydro perspective. It also included a Multiple Account Benefit-Cost Analysis<sup>7</sup> that looked at a broader range of positive and negative consequences from the Preferred and alternative plans and, in doing so, employed economic evaluation principles.

CAC-Manitoba retained Econalysis Consulting Services (ECS) to assist with its participation in the NFAT Review and, as part of its retainer, ECS prepared evidence regarding Manitoba Hydro's economic evaluation of the Preferred Development Plan and the alternatives considered<sup>8</sup>. The evidence assumed the underlying planning assumptions made by Manitoba Hydro were appropriate and focused on the approach taken by Manitoba Hydro and the interpretation of the results. The evidence also noted that conclusions regarding the "economics" of the Preferred Plan relative to other alternatives would need to be balanced with the other considerations noted in the Minister's Terms of Reference (e.g., financial, macro-environmental and socio-economic).

Subsequently, during the course of the oral proceeding Manitoba Hydro updated its economic evaluations as new/additional information became available<sup>9</sup>. In his direct testimony<sup>10</sup> Mr. Harper, the ECS consultant responsible for the ECS evidence updated his analysis and conclusions to reflect the revised information. However, subsequent to this further revisions were introduced by Manitoba Hydro<sup>11</sup>.

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<sup>6</sup> Chapters 9, 10 and 12

<sup>7</sup> Chapter 13

<sup>8</sup> CAC Exhibit #30

<sup>9</sup> For example, MH Exhibit #95, pages 122-130, MH Exhibit 129-7, page 2, MH Exhibit 104-2 & 104-8, MH Exhibit 104-15, and MH Exhibit 166,

<sup>10</sup> CAC Exhibit #68

<sup>11</sup> For example, MH Exhibit 104-15

The purpose of this backgrounder is to document both the results of Manitoba Hydro's economic evaluations of the PDP and its alternatives and as well as the observations and issues raised by ECS, incorporating the most recent information available.

### 3. **NEED**

When considering the question of "need", the role/mandate of the proponent is a useful starting point. In the case of Manitoba Hydro, as a Crown Corporation, its purpose is set out in the *Manitoba Hydro Act* which states<sup>12</sup> that its purpose and objectives are (in part) to:

"provide for the continuance of a supply of power adequate for the needs of the province, and to engage in and to promote economy and efficiency in the development, generation, transmission, distribution, supply and end-use of power"

Further insight into the role/mandate of Manitoba Hydro can be found in the Terms of Reference of the Manitoba Hydro Board of Directors<sup>13</sup> which states that:

"The corporation is charged with responsibilities which include, to ensure a safe, reliable, economical and environmentally responsible supply of energy for Manitoba, and to earn revenues to keep rates low for Manitobans through the export of power and the provision of energy-related services (emphasis added)."

The terms of reference is particularly useful as it speaks directly to the issues of exports/and export revenues and how they fit into Manitoba Hydro's purpose and objectives.

In the context of a NFAT review, the Canadian Environmental Assessment Agency defines "need for" as the problem or opportunity the project is intended to solve or satisfy<sup>14</sup>.

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<sup>12</sup> Section 2

<sup>13</sup> [http://www.hydro.mb.ca/corporate/terms\\_of\\_reference.shtml](http://www.hydro.mb.ca/corporate/terms_of_reference.shtml)

<sup>14</sup> Manitoba Clean Environment Commission ("CEC") 2004 Report on the Wuskwatim Generation and Transmission Projects, page 31

The ECS Evidence noted<sup>15</sup> that in lining up this definition of “need for” up with Manitoba Hydro’s purpose and objectives, one can observe that the Preferred Development Plan addresses both a problem and an opportunity.

The “problem” is one of reliability and the fact that based on Manitoba Hydro’s existing resources, its load forecast and its plans for DSM (at the time the NFAT Business Case was prepared) a shortfall in resources to meet future needs was projected to occur in the early 2020s<sup>16</sup>. However, during the course of the proceeding new issues arose potentially impacting the need date to meet current export commitments and domestic load. First, Manitoba Hydro acknowledged that new codes and standards and price elasticity would impact its load forecast (downwards)<sup>17</sup>. Second, Manitoba Hydro’s anticipated future savings from DSM were increased significantly<sup>18</sup>. Finally, the prospect of new pipeline load emerged<sup>19</sup>. The net effect is that, based on Manitoba Hydro’s assumptions, the “domestic need” date is now likely somewhere between 2026 and 2028<sup>20</sup>. Given its mandate, resolving anticipated reliability problems is clearly a legitimate need for Manitoba Hydro to be addressing.

At the same time, an opportunity exists for increased exports if the in-service date for new (hydro-based) generation is advanced and new interconnections to the US are constructed. The more immediate opportunity is with respect to the 250 MW export agreement with Minnesota Power (June 2020 – May 2035) which would require new hydro facilities (i.e., Keeyask) and a new intertie to be in-service prior to that date<sup>21</sup>. However, the new intertie would not only facilitate increased exports but also improve the reliability of supply to Manitoba Hydro’s domestic customers by allowing for increased imports. Again, given its mandate, capitalizing on such opportunities is a legitimate “need” for Manitoba Hydro provided it increases export revenues and reduces domestic rates.

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<sup>15</sup> Pages 9-10

<sup>16</sup> Based on the 2012 planning assumptions the need date was 2022/23 (Chapter 4, page 48). This was subsequently revised, based on the 2013 planning assumptions, to 2023/24 (Chapter 13, page 6).

<sup>17</sup> Exhibit #87 page 12

<sup>18</sup> MH Exhibits 153 & 180

<sup>19</sup> MH Exhibit #87, pages 12

<sup>20</sup> MH Exhibit 95, page 5 and MH Exhibit 129-7, page 21

<sup>21</sup> Chapter 6, page 28

## 4. ALTERNATIVES

As a first step in addressing these needs Manitoba Hydro identifies a number of resource options that could be used. The initial list is fairly extensive and was subjected to a high-level screening process<sup>22</sup> to create a short list of options which included:

- Additional DSM,
- Hydro (Keeyask and Conawapa),
- Wind (On-Shore),
- Natural Gas-Fired Generation (both Single and Combined Cycle), and
- Imports

These candidate options were then combined together to create alternative development plans.

### 4.1 Reliability Problem Focused Plans

Seven alternative plans were developed that focused on the domestic reliability problem<sup>23</sup>. The seven plans included various combinations of wind, natural gas based generation and hydro as follows<sup>24</sup>:

- Plan 1 – All Gas-Fired Generation starting in 2022/23 (combination of SCGTs and CCGTs)
- Plan 2 – Keeyask in 2022/23 followed by Gas-Fired Generation starting in 2029/30.
- Plan 3 – Wind Generation in 2022/23 followed by Gas-Fired Generation starting in 2025/26
- Plan 7 – Natural Gas-Fired Generation (SCGT) in 2022/23 followed by Conawapa in 2026/27
- Plan 8 – Natural Gas-Fired Generation (CCGT) in 2022/23 followed by Conawapa in 2026/27

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<sup>22</sup> Chapter 7, Table 7.1

<sup>23</sup> Chapter 8, Section 8.2.3.3

<sup>24</sup> Chapter 9, Table 9.3. Note: All of the Plans called for the use of Natural Gas-Fired Generation to meet subsequent needs

- Plan 9 – Wind Generation in 2022/23 followed by Conawapa in 2026/27, and
- Plan 10 – Keeyask in 2022/23 followed by Conawapa in 2029/30.

Both the initial ECS evidence<sup>25</sup> and Mr. Harper’s Direct Presentation<sup>26</sup> noted that none of the alternative plans considered either increased levels of DSM or increased reliance on imports – both of which were options short-listed during the screening process.

Of these two omissions the failure to consider increased levels of DSM was noted to be the more significant. While there was no explanation provided in the original Application as to why increased imports were not considered subsequent information<sup>27</sup> has indicated that it is unlikely that Manitoba Hydro would be able to construct a new intertie solely for import – i.e. without a counter party (in terms of an export customer in the US) to champion the construction of required inter-tie facilities on the US side of the border. Furthermore, all the development plans assume that off-peak imports are utilized to the full extent allowed by Manitoba Hydro’s energy planning criteria<sup>28</sup>.

In contrast, increased levels of DSM are a real possibility as demonstrated by the updates that occurred during the oral phase of the proceeding. Increased levels of DSM could not only postpone the need date for new generation but could also create the opportunity for other options/plans to be considered. One such example cited in the ECS Evidence<sup>29</sup> was the fact that Conawapa was not considered as the first new generation resource in any of the alternative plans simply because it could not be constructed soon enough to meet the anticipated domestic need date. However, clearly it becomes an option for the first new generation resource if the need date is postponed beyond the mid-2020s and, in doing so, broadens the scope of alternative plans that could be considered.

Another example, is the fact that a later need date could allow new options to come into play and potentially be considered such as wind or solar – both technologies where costs are declining and/or the current cost assumptions used by Manitoba Hydro have

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<sup>25</sup> Page 11

<sup>26</sup> Slide 8

<sup>27</sup> Rebuttal Evidence, pages 92-93

<sup>28</sup> CAC/MH I-057 and 059

<sup>29</sup> Page 11



been questioned. Delaying the “need date” would increase Manitoba Hydro flexibility to further consider such options whereas early construction of large scale resources could crowd out the consideration of such options from both a timing and resourcing perspective.

Finally, it was noted in the ECS Evidence<sup>30</sup> that the identification of the preferred alternative for meeting domestic need is a key issue as it provides the necessary “benchmark” against which to judge the benefits of alternative plans focused on both reliability and export opportunities.

#### 4.2 Export Opportunity Focused Plans

Various alternative development plans were also created that focused on both the domestic reliability problem and the export opportunity. These plans essentially fell into three categories:

- First, there were three plans with a small 230 kV (250 MW) intertie and Keeyask advanced to 2019 in order to meet the MP contract<sup>31</sup>.
- Then there were three plans with a larger 500 kV (750 MW) intertie, that also envisioned the advancement of Keeyask to 2019 and the MP contract<sup>32</sup>.
- Finally, there were two plans that along with Keeyask in 2019, the MP contract and with the 750 MW intertie, also included a larger 308 MW contract with WPS which necessitated the advancement of additional generation (beyond just Keeyask) in order to meet these additional requirements. To meet these additional requirements one plan called for Conawapa to be in-service in 2025/26 (later altered to 2026/27 in the 2013 Update<sup>33</sup>) while the second one called for new natural gas fired generation to be place in-service to meet the additional export requirements. The Preferred Development Plan is the first of these two plans.

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<sup>30</sup> Page 13

<sup>31</sup> Chapter 8, Section 8.2.3.2

<sup>32</sup> Chapter 8, Section 8.2.3.1

<sup>33</sup> Chapter 12, page 7

The ECS Evidence and the subsequent Direct Testimony Presentation of Mr. Harper again both noted that alternative levels of DSM activity were not considered as “options” for purposes of creating the alternative plans.

The purpose in considering these plans is to help address the immediate issues facing the Provincial Government, namely:

- Should the Keeyask be constructed with an early in-service date of 2019 and a new intertie constructed to support the Minnesota Power (and Northern States Power) export contracts and
- Should a larger 750 MW intertie be constructed?

Consideration of these alternatives will also assist in addressing two more longer-term and interlinked issues:

- Should spending on Conawapa continue with the view to supporting/protecting an in-service date as early as the mid-2020s
- The future role of the WPS 308 MW export contract.

This last point is linked to the optionality provisions in the WPS contract which mean that Manitoba Hydro has no obligation to deliver under the contract if Conawapa is not committed to/built by a certain date but also permit WPS to terminate contract if Conawapa is not committed to/built by a certain date<sup>34</sup>.

## **5. ECONOMIC EVALUATIONS**

The purpose of economic evaluations (sometimes also referred to as benefit/cost analyses) is to compare the benefits and cost of two or more alternatives in order to identify which alternative yields the greatest economic benefit.

Since the focus is on comparing alternatives it looks at differences in the costs and benefits as between alternatives and excludes costs that are common to all alternatives. It is this exclusion of common costs that leads to the exclusion of sunk costs – the rationale being that since these dollars have already been spent they will be common costs regardless of which alternative is ultimately pursued.

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<sup>34</sup> March 10, 2014 Transcript, pages 1320-1321; March 13, 2014, pages 2276-2277 and March 14, 2014, page 2581

It needs to be emphasized that economic evaluations are carried out from a specific perspective and that this perspective is critical since it's this perspective that defines what costs and benefits are to be included.

Also, since the alternatives being compared typically involve different streams of costs and benefits over time economic evaluations discount these streams to a common point in time so as to allow for their comparison on an equivalent basis. In order to do so a "discount rate" is used and a net present value ("NPV") calculation is performed.

Discount rates represent the rate at which people would willingly trade off present for future costs or benefits. Discounting arises for a number of reasons including the fact that people generally prefer benefits to occur sooner rather than later (and vice versa for costs), benefits achieved sooner (or dollars associated with costs avoided) can be invested and grow to larger amounts in the future and the future is somewhat uncertain. Given these various considerations different parties will have different views as to what is the appropriate discount rate.

Again, perspective is important as the discount rate used will be the discount rate considered appropriate for the party from whose perspective the evaluation is being performed (e.g. if the evaluation is being done from the perspective of a private corporation assessing alternative investment opportunities the discount rate would reflect the corporation's cost of capital).

There are shortcomings to economic evaluations. One of these is that they are done from a particular perspective and don't take into account distributional issues which may arise if the perspective taken represents the collective view of a number of stakeholders. A good example being electric utilities where an analysis undertaken from the collective perspective of ratepayers will not capture what could be differences in impacts on specific groups of rate payers. Similarly, there may be more than one stakeholder and hence more than one perspective from which a particular assessment could be viewed and carried out. Again giving rise to potential distributional issues.

Another is that economic evaluations are typically done over the life of the project and focus on overall costs and consequences. While discount rates can address temporal

differences as to when benefits and costs occur, for projects with long time frames there may be inter-generational issues in terms of who the costs and benefits are accruing to.

## **6. REFERENCE CASE ECONOMICS**

### **6.1 Manitoba Hydro's Assessment – Approach**

In the NFAT Business Case, Manitoba Hydro set out a “Reference Case” for each alternative development plan based on what it considered the “most likely” costs and benefits<sup>35</sup>. In doing so, Manitoba Hydro adopted a 78 year study period to reflect both the long life of some of the assets being included and the fact some of the assets were not being placed into service until a number of years into the study period. However, the costs and benefits specified were more detailed for the first 35 years of the study period<sup>36</sup>. Finally, all costs to be incurred prior to June 2014<sup>37</sup> were considered to be “sunk costs”

In each case the evaluation was purportedly done from a Manitoba Hydro perspective – i.e. the costs and benefits that Manitoba Hydro would experience. Given this “Manitoba Hydro” perspective costs and benefits were discounted using Manitoba Hydro’s weighted average cost of capital –which for the original NFAT was 5.05% real and for the 2013 Update was 5.4% real. This weighted average cost of capital reflects Manitoba Hydro’s target capital structure of 75% debt/25% equity, its forecast cost debt and a premium over the cost of debt to establish the cost of equity for the equity component of the average<sup>38</sup>.

### **6.2 Manitoba Hydro's Initial Results**

Figure 9.2 from Manitoba Hydro’s NAFAT Business Case, summarizes the results of the economic evaluation under taken for each Plan’s Reference Case based on its 2012 planning assumptions and is copied below.

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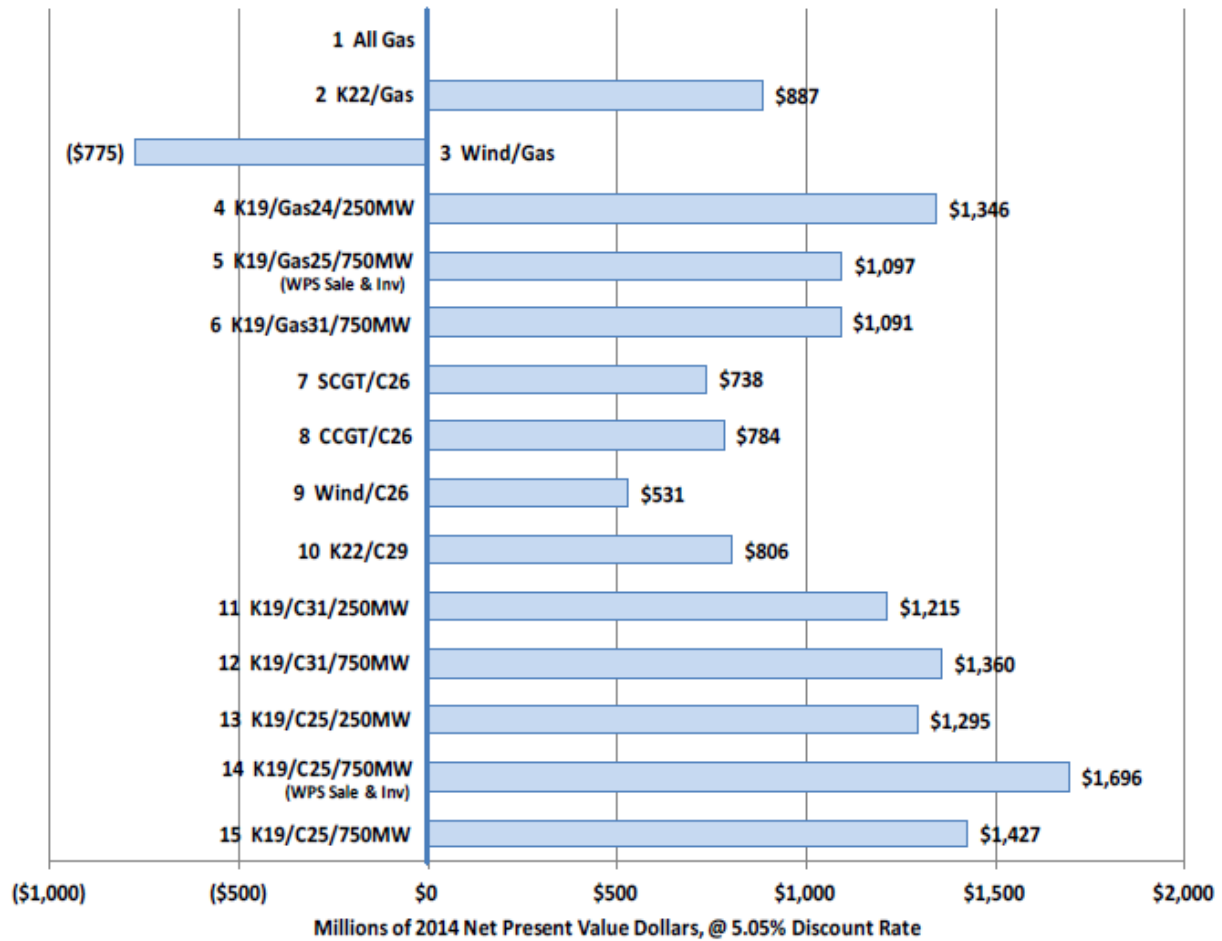
<sup>35</sup> Chapter 9

<sup>36</sup> Chapter 9, page 7

<sup>37</sup> Chapter 9, page 2

<sup>38</sup> Appendix 9.3, pages 6-7

**Figure 9.2 DEVELOPMENT PLAN NPVs – BENEFITS TO MANITOBA HYDRO  
(RELATIVE TO ALL GAS PLAN)**



The notable results are:

- Plan 2 (Keeyask in 2022 followed by Gas) is the most economic plan focused just on domestic need.
- The economics for Plan 4 which involves the advancing Keeyask and a small intertie to meet the MP contract are superior to those of Plan #2
- Plans that involve a larger intertie and Conawapa after Keeyask have superior economics to Plan 4
- In contrast, Plans with a larger intertie and gas generation after Keeyask are not superior to Plan 4.
- All of the Plans with a larger 750 MW intertie are superior to Plan 2 – the best no intertie plan

- Overall, Plan 14 – the preferred plan involving the 750 intertie, the WPS contract and Conawapa – has the superior economics.

As part of its NFAT Application, Manitoba Hydro updated its economic evaluation for a sub-set of the 15 plans using its more recent 2013 Planning Assumptions, which included an increase in the discount rate to 5.4%. These results are set out in Figure 12.4 of the NFAT Business Case which is copied below.

**Table 12.4 2013 ECONOMIC ANALYSIS - REFERENCE SCENARIO**

Development Plan	Incremental NPV, millions of 2014 Dollars @ 5.40% Discount Rate			
	1 - All Gas	2 - K23/Gas	4 - K19/Gas30/250MW	12 - K19/C33/750MW
<b>1 All Gas</b>	-			
Lowest Capital Investment Development Plan				
<b>2 K23/Gas</b>	2 -1			
	\$728			
<b>4 K19/Gas30/250MW</b>	4 -1	4 -2		
MP Sale	\$1,133	\$405		
<b>12 K19/C33/750MW</b>	12 -1	12 -2	12 -4	
MP Sale	\$1,204	\$476	\$71	
<b>14 K19/C26/750MW</b>	14 -1	14 -2	14 -4	14 -12
MP Sale, WPS Sale & Inv Preferred Development Plan	\$1,462	\$734	\$329	\$258

While the differences between the net present values of the various plans were reduced with the 2013 Update their relative rankings remained unchanged with Plan 14 – the Preferred Plan – continuing to demonstrate the superior economic results.

### 6.3 Issues Noted Regarding Manitoba Hydro’s Reference Case Economic Evaluations

The ECS Evidence noted a number of issues with Manitoba Hydro’s economic evaluation of the alternative plans’ reference cases.

#### *Treatment of KCN Investment*

First the evaluation was not truly from a Manitoba Hydro perspective as it included costs that would be paid by and benefits that would accrue to KCN – its partner in the

Keeyask generation station. However, as the investment by KCN is relative small (\$25 M out of a total cost of over \$6 B for the station<sup>39</sup>) and the benefits commensurate with the investment this is unlikely to have an impact on the conclusions drawn from the evaluation.

#### *Aggregation of Manitoba Hydro and Provincial Benefits*

Second, after undertaking the evaluation from a Manitoba Hydro perspective, Section 9.3.3 of the Application then combines – for each plan - the net present values as calculated from Manitoba Hydro’s perspective with the net present value of the cash transfers to the Province (i.e. water rentals, debt guarantee fees and capital taxes) using the Manitoba Hydro discount rate. The various plans are then compared based on the overall total.

The concern is that the results no longer represent a Manitoba Hydro perspective but at the same time they do not represent a broader societal perspective for two reasons – first the provincial transfers are discounted at the Manitoba Hydro’s discount rate and second the comparison does not consider any costs to the province. In contrast Multiple Account analysis in Chapter 13 tracks more appropriately the societal perspective.

#### *Treatment of WPS Contract and Investment*

The third issue noted was that the treatment of WPS contract and investment – the NFAT application treated both as an alternative that was available to Manitoba Hydro at its choice – whereas at the time of the Application the WPS contract had not been signed and shortly after the Application was released it became known that WPS would not be investing in the US intertie line - necessitating an increase in MH’s investment unless a new investor could be found.

Subsequently the WPS agreement was signed. However there appear to be optionality clauses that could limit the viability of some of the alternative development plans put forward by Manitoba Hydro (for example Plan 5)<sup>40</sup>.

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<sup>39</sup> CAC/MH II-006 a)

<sup>40</sup> March 14, 2104, page 2581

As part of its most recent updates<sup>41</sup> Manitoba Hydro has revised its alternative plans to exclude any transmission investment by WPS and has effectively addressed at least some aspects of this concern.

### *Intergenerational Issues*

The fourth issue is that with the long study period which covers multiple generations, it is important to understand how costs and benefits accrue over time and whether – from this perspective – there are material differences between the plans. This issue has been explored by other parties including La Capra.

### *Ratepayer Perspective*

The fifth issue is the fact that looking at costs and benefits from a Manitoba Hydro perspective is not the same as looking at them from a rate payer perspective. While Manitoba Hydro is regulated on a cost of service basis accounting policies give rise to differences as between when costs and benefits accrue to Manitoba Hydro and when they accrue to ratepayers in their bills. Also, financial policies give rise to different retained earnings requirements under different plans and, finally, customers' views as to what discount rate should applied to their costs/benefits (i.e., bills) may vary from Manitoba Hydro's discount rate. This issue is dealt with more in the discussion of the Multiple Account analysis (see Section 8).

### *Manitoba Hydro's Discount Rate*

The final area of concern raised in the ECS evidence was the basis for Manitoba Hydro's discount rate which reflects its target debt/equity ratio of 75/25 and is calculated as a weighted average using its forecast new cost of borrowing plus the debt guarantee fee as the cost of debt and adds a premium of 3% to set the return for the equity component.

- *Return on Equity Premium*

The first issue in this area is that while the equity rate purportedly<sup>42</sup> reflects the return on equity allowed for regulated utilities, recent experience would suggest the rate should be higher.

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<sup>41</sup> For example, MH Exhibit 104-15



For utilities regulated on rate of return basis, regulators periodically undertake formal assessments of the appropriate Return on Equity (ROE) for the utilities they regulate and in doing so use a number of methods to determine what a fair and reasonable rate of return is. One of the common standards used is to set the ROE with reference to the long term Canada bond rate (typically 30 years) – as this is considered to be a benchmark for the risk-free cost of debt.

Looking at the calculation of Manitoba Hydro's 5.05% real weighted average cost of capital<sup>43</sup> the nominal ROE is 9.3% which represents a premium of 4.65% over its underlying forecast for Canadian bond yields.

In contrast, the ECS Evidence cited three recent decisions by Canadian regulators where such had resulted in ROEs with premiums ranging from 4.68% to 5.5% over Canadian bond yields. Using an average of these three premium values and adjusting for the fact that Manitoba Hydro uses a blend of 10 and 30 bond rates as opposed to 30 rates for determining its cost of debt yields a premium of 5.25% over Canadian bond yields or 3.60% (as opposed to 3%) over Manitoba Hydro's cost of debt. Using this equity premium gives rise to an overall weighted cost of capital of 5.2% (versus the 5.05% used by Manitoba Hydro in its initial NFAT).

In its Rebuttal Evidence<sup>44</sup>, Manitoba Hydro referred to a recent report by Concentric Advisors setting out 2013 authorized ROE values for Canadian gas and electric distribution utilities as well as U.S. gas distributors as support for its ROE premium. The report also included values for the Canadian and US long term bond rates. The following table sets out the resulting differences or premiums between the authorized ROEs and the long term government bond rates.

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<sup>42</sup> **Need Reference**

<sup>43</sup> PUB/MH I-156 a)

<sup>44</sup> Page 126

	Manitoba Hydro	ECS	Concentric Advisors – Authorized 2013 ROE and Government Bond Rates					
			Electric Distr. – Cnd.		Gas Distr. – Cnd.		Gas Distr. - US	
			Average	Median	Average	Median	Average	Median
<b>ROE</b>	9.30%	9.90%	8.38%	8.75%	9.45%	8.93%	9.50%	9.40%
<b>Government Long Term Bond Rate</b>	4.65%	4.65%	2.70%	2.70%	2.70%	2.70%	3.31%	3.31%
<b>Premium</b>	4.65%	5.25%	5.68%	6.05%	6.75%	6.23%	6.19%	6.09%

All of the 2013 results are higher than not only Manitoba Hydro’s premium but also the ECS recommended premium. As a result the report does not support Manitoba Hydro’s approach.

- *Return on Equity Approach*

The second issue in this area is whether using a weighted cost capital approach that includes a return on equity is appropriate given that Manitoba Hydro is not regulated on a rate of return basis but rather on a cost of service basis.

When considering this question, it is useful to consider the purpose of equity/retained earnings in the Manitoba Hydro context. Manitoba Hydro’s ability to borrow at favourable rates reflects the fact that its debt is guaranteed by the province which in turn expects Manitoba Hydro to be financially self-supporting. One of the key metrics in assessing whether a company is financially self-supporting is its debt equity ratio – which gives rise to Manitoba Hydro having a target debt equity ratio which it strives to maintain over the long term.

However the equity in the company does not come from shareholders rather it all comes from net income and while export revenues may contribute to net income (more so in good water years than bad) at the end of the day it is customers who are ultimately responsible for addressing shortfalls in equity in order to maintain Manitoba Hydro’s financial integrity. So the question then arises as to what do customers require in terms of a return in order to be neutral regarding the timing of equity contributions?

One reasonable proxy for this would be the compensation that utility investors receive which is the ROE allowed by regulators. Overall, this would suggest that Manitoba Hydro's approach is reasonable.

- *Impact of Using 5.20% vs. 5.05% Discount Rate*

The ECS Evidence calculated the impact of using 5.20% as opposed to 5.05% in calculating the Reference case NPVs for each of the alternative development plans based on the 2012 planning assumptions used in the initial NFAT Business Case. Furthermore, variations of Plan 5 and 14 (i.e. the plans with the WPS contract) were included where there was no investment by WPS in the proposed intertie. The results are replicated below<sup>45</sup>.

**Comparison of 2012 Reference Case NPVs (Millions 2014 \$)**

Plan	Description	NPV (relative to All Gas) @ 5.05%	NPV (relative to All Gas) @ 5.20%
#1	All Gas	0	0
#3	Wind/Gas	(\$775)	(\$763)
#7	SCGT/C26	\$738	\$595
#8	CCGT/C26	\$784	\$632
#9	Wind/C26	\$531	\$385
#10	K22/C29	\$806	\$597
#2	K22/Gas	\$887	\$774
#4	K19/Gas 24/250 MW	\$1,346	\$1,210
#13	K19/C25/250 MW	\$1,295	\$1,037
#11	K19/C31/250 MW	\$1,215	\$994
#6	K19/Gas 31/750 MW	\$1,091	\$955
#15	K19/C25/750 MW	\$1,427	\$1,152
#12	K19/C31/750 MW	\$1,360	\$1,123
#5	K19/G25/750 MW WPS Inv&Sale	\$1,097	\$967
#5 a)	K19/G25/750 MW WPS Sale	\$914	\$785
#14	K19/C25/750 MW WPS Inv&Sale	\$1,696	\$1,417
#14 a)	K19/C25/750 MW WPS Sale	\$1,513	\$1,235

With the increase in the discount rate:

<sup>45</sup> CAC Exhibit #60, page27

- The conclusion that Plan 2 yields the highest economic benefit from amongst the no-intertie plans does not change.
- The conclusion that Plan 4 (with a small intertie) is superior to any of the no-intertie plans does not change.
- All of the Plans with larger intertie are still superior to the no-intertie option although the results are virtually equivalent for Plan 5 when there is no WPS investment.
- Plan 4 continues to be superior to all the larger intertie plans where gas follows Keeyask.
- Relative to Plan 4, it is no longer economic to advance Conawapa without the WPS contract and that, without the WPS investment, Plan 4 and 14 are virtually equal from an economic perspective.
  - *Impact on 2013 Update of using 5.55% vs. 5.40% Discount Rate*

The ECS Evidence<sup>46</sup> also calculated the impact of revising the 5.4% discount rate to 5.55% (again to reflect a higher return on equity premium) on the calculation of the NPVs for the various development plans relative to the All Gas Plan. The results are replicated below.

**Impact of 2013 Update with Revised Discount Rate (5.55%)**

Plan	Description	Millions 2014\$ - NPV			
		2012 Assumptions @ 5.05%	2013 Assumptions @ 5.05%	2013 Assumptions @ 5.40%	2013 Assumptions @ 5.55%
2	K23/Gas	\$887	\$960	\$728	\$638.38
4	K19/Gas 30/250 MW	\$1,346	\$1,347	\$1,133	\$1,014.81
12	K19/C33/750 MW	\$1,360	\$1,763	\$1,204	\$991.33
14	K19/C26/750 MW WPS Sale&Inv	\$1,696	\$2,125	\$1,462	\$1,206.22

The use of the higher (5.55%) discount rate does not change the ranking of the Plans but it does decrease differences between their values.

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<sup>46</sup> Page 57

#### 6.4 Reference Case Updates – 2012 Planning Assumptions

Tenders for the Keeyask General Civil Contract closed in December 2013. Based on the bids received and the final contractor selected Manitoba Hydro has updated its capital costs for both Keeyask and Conawapa<sup>47</sup>. Manitoba Hydro has also calculated the impact of these updates on the economic evaluation of the reference cases for a selected number of the alternative development plans using the initial 2012 planning assumptions. The results are set out in the following table<sup>48</sup> along with: i) the initial economic evaluation results from the NFAT Business Case and ii) the economic evaluation results incorporating the updated capital costs and a 5.2% discount rate.

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<sup>47</sup> MH Exhibit #95, pages96-108

<sup>48</sup> CAC Exhibit #68, page 22

## 2012 REFERENCE CASES – CAPITAL COST UPDATE

PLAN		Millions 2014 \$ - NPV – Relative to All Gas		
		2012 PER NFAT APPLICATION (5.05%)	2012 NFAT – NEW CAPITAL (5.05%)	2012 NFAT – NEW CAPITAL (5.2%)
2	K22/GAS	\$887	\$489	\$380
4	K19/GAS/250	\$1,346	\$917	\$785
8	CCGT/C26	\$784	\$403	\$255
6	K19/G31/750	\$1,091	\$662	\$531
12	K19/C31/750	\$1,360	\$536	\$306
5	K19/G25/750 WPS SALE & INV	\$1,097	\$667	\$542
5 a)	K19/G25/750 WPS SALE & NO INV	\$914	\$484	\$360
14	K19/C25/750 WPS SALE & INV	\$1,696	\$798	\$524
14 a)	K19/C25/750 WPS SALE & NO INV	\$1,513	\$614	\$343

The updated capital costs do not change the conclusion that Plan #2 is most “economic” alternative for meeting just domestic need (i.e., no intertie). However, as a result of the updated capital costs, Plan #4 (with the 250 MW intertie) is now superior, from an economic perspective, to all the no intertie plans and also to all of the plans with a 750 MW intertie. This conclusion holds regardless of whether the discount rate used in 5.05% or 5.20%.

Although Plan #4 appears superior on paper, Manitoba Hydro's view is that it is "hypothetical" from a business perspective. The reasons put forward for this position are two-fold. First, a 250 MW interconnection would require renegotiation of the current contract with Minnesota Power which would not be expected to result in the same level of benefits given Manitoba Hydro's entire economic case is now in the public forum. Second, in its own regulatory proceedings, Minnesota Power has taken the position that the 250 MW intertie would not meet the long-term needs of the region or be cost-effective. As a result, the view is that such a line is not likely to be approved by US authorities<sup>49</sup>.

If one adopts this perspective and removes the 250 MW line from consideration and then if there is no WPS contract:

- Plan #6 (where Keeyask is advanced with a 750 MW intertie and gas-fired generation follows) is superior to the no-intertie alternatives using either discount rate as it was in the original NFAT Business Case,
- Plan #6 is superior to Plan #12 (where Conawapa follows Keeyask) using either discount rate, which is a change from the original NFAT Business Case, and
- Plan #12, which was superior to the no intertie option in the original NFAT Business Case is now inferior if the discount rate is increased to 5.20%.

In contrast, with the WPS contract but no investment in the US portion of the intertie:

- Plan #5 a) (where Keeyask is advanced with a 750 MW intertie and gas-fired generation is also advanced to meet the WPS contract requirements) is marginally less economic than Plan #2, which has no intertie.
- Plan 14 a) (where Conawapa follows Keeyask to meet the WPS requirements) is superior to both Plan 5 a) and Plan 2 at the 5.05% discount rate but is marginally less superior to both at the higher 5.20% discount rate.

Overall, this would suggest that while there is economic benefit to advancing Keeyask in conjunction with the Minnesota Power export contract and a 750 MW intertie, there

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<sup>49</sup> MH Exhibit 104-16

would appear to no economic benefit from the WPS contract in conjunction with advancing either gas-fired generation or Conawapa.

#### 6.5 Reference Case Updates – 2013 Planning Assumptions

##### *Capital Cost Updates*

During the course of the oral proceeding Manitoba Hydro also issued revised economic evaluation results for Plans 2, 5 and 14 (relative to All Gas) using the 2013 planning assumption and the updated capital costs. The following table<sup>50</sup> summarizes the results and contrasts them with the original economic evaluation results based on the 2013 planning assumptions.

#### **REFERENCE CASES – 2013 PLANNING ASSUMPTIONS**

		<b>MILLIONS 2014 \$- NPV RELATIVE TO ALL GAS</b>			
		2013 Ass 5.4%	2013 Ass 5.55%	2013 Ass K Update / 5.4%	2013 Ass K Update / 5.55%
PLAN #2	K23/Gas	\$728	\$638	\$111 (\$164)	\$26 (?)
PLAN #4	K19/Gas/ 250	\$1133	\$1015	N/A	N/A
PLAN #5 – No Inv	K19/Gas/ 750/WPS	N/A	N/A	\$377	N/A
PLAN #12	K19/C33/ 750	\$1204	\$991	N/A	N/A
PLAN #14 – With Inv	K19/C26/ 750/WPS	\$1462	\$1206	N/A	N/A
PLAN #14 – No Inv	K19/C26/ 750/WPS	\$1245	N/A	\$374	\$123

<sup>50</sup> CAC Exhibit #68, page 24. Note: Values for Plan #5 not included in CAC Exhibit #68. The Plan 2 values in brackets are the revised values provided by Manitoba Hydro in Exhibit 104-15 – Revision 1, after the CAC Exhibit was prepared.



Source		NFAT, Table 12.5 MH-95, Slide 123	ECS Evidence, page 57	MH-104-15	ECS Calculation
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While limited in terms of the number of development plans assessed, the results are similar to those based on the 2012 planning assumptions and the capital cost updates in that the economics of both Plans 2 and 14 (with no investment) decline materially relative to the All Gas Plan. Except now, based on the 2013 planning assumptions, Plan 14 is marginally superior to Plan 2 even at the higher (5.55%) discount rate.

*Alternative DSM Levels*

Manitoba Hydro has also recently provided information as to how different levels of DSM impact the overall economics of selected plans using the 2013 planning assumptions and the updated capital costs. The results are summarized below<sup>51</sup>.

	<b>CHANGE IN PLAN NPV (\$2014 M) WITH CHANGE IN DSM LEVEL</b>		
	ALL GAS	PLAN 5 – No Inv	PLAN 14 – No Inv
BASE TO DSM 1	\$426	\$388	\$175
DSM 1 TO DSM 2	\$297	\$368	\$218
DSM 2 TO DSM 3	-\$347	-\$384	-\$400
Source	MH-104-4		

There are two key points to be taken from this table. First, for all three plans the economics improves until one moves from DSM 2 to DSM 3. This suggests that higher levels of DSM will yield superior economic results regardless of which alternative development plan is adopted. The second point is that the improvement in the

<sup>51</sup> CAC Exhibit 68, page 25

economics of the Plans is far greater for the All Gas Plan and Plan 5 (where Gas follows Keeyask) than for Plan 14 (where Conawapa follows Keeaysk), suggesting with higher levels of DSM the relative economics of the Preferred Plan (and perhaps other plans with Conawapa) will deteriorate.

While the forgoing results are based on a Manitoba Hydro perspective and the not the TRC (or societal) view used in Manitoba Hydro Exhibit #95<sup>52</sup>, the results are directionally the same in that increases in DSM savings are “economic” until one moves from DSM 2 to DSM 3.

Drawing on this observation regarding the economics of increased DSM savings, the following table summarizes results provided by Manitoba Hydro using the 2013 planning assumptions along with the updated capital costs and DSM 2 savings/spending levels for various development plans and contrasts the results with those of earlier analyses<sup>53</sup>.

PLAN	MILLIONS 2014\$ -NPV – RELATIVE TO ALL GAS				
	2013 UPDATE NFAT SUBM BASE DSM (5.40%)	2013 UPDATE BASE DSM NEW CAPITAL (5.40%)	2013 UPDATE BASE DSM NEW CAPITAL (5.55%)	2013 UPDATE DSM 2 NEW CAPITAL (5.40%)	2013 UPDATE DSM 2 NEW CAPITAL (5.55%)
2	\$728	\$111 (\$164)	\$26	-\$197 (-\$38)	?
6	?	?	?	\$386	\$262
5 – No Inv	?	\$377	\$256	\$410	\$285
12	\$1,204	?	?	-\$18	?
14 – No Inv	\$1,245	\$374	\$123	\$45	-\$169
Source	NFAT Table 12.4	MH 104-15	ECS Calculation	MH 104-15	ECS Calculation

<sup>52</sup> Slide 129

<sup>53</sup> CAC Exhibit 68, page 26. Note: The 2013 Update/DSM 2 value for Plan 12 was not available when the CAC exhibit was prepared and the Plan 2 values using the updated capital costs were subsequently revised (MH Exhibit 104-15 – Revision 1) by Manitoba Hydro to those shown in brackets. Also, ECS calculations were possible only where Manitoba Hydro provided the underlying cash flow assumptions.

The above table reflects economic evaluation results for the various reference cases based on the most current information available. These results in conjunction with the previous table suggest that:

- Increased levels of DSM (over the base DSM levels included in the 2013 planning assumptions) are economic regardless of the Plan chosen.
- With increased levels of DSM, the All Gas Plan appears to be superior to Plan 2 in terms of the most economic plan with no new intertie
- With increased levels of DSM advancing Keeyask with a 750 MW intertie is superior to plans with no new intertie, when followed by gas-fired generation. However, the economics of advancing gas-fired generation to support the WPS contract are marginal.
- Gas-fired generation is more economic than Conawapa as the post-Keeyask resource.

## **7. ECONOMIC UNCERTAINTY ANALYSIS**

### **7.1 Manitoba Hydro's Approach**

As well as performing economic evaluations based on the reference case cost for each alternative development plan, Manitoba Hydro examined the sensitivity of the economic evaluation results based on various scenarios where the values of the key input assumptions were changed. By assigning probabilities to each of the key input assumption outcomes, probabilities were determined for each of the scenarios and both expected values and probability distributions were generated for each alternative development plan.

The actual uncertainty analysis involved generating 27 scenarios based on high, reference and low values for three key variables:

- Economics (i.e., inflation rates/interest rates/discount rates)
- Energy Prices (for both natural gas and electricity exports)
- Capital Costs (for both hydro-electric and natural gas-fired generation)

## 7.2 Manitoba Hydro's Initial Economic Uncertainty Analysis Results

The following table summarizes the results of Manitoba Hydro's initial economic uncertainty analysis as presented in the NFAT Business Case using the 2012 planning assumptions<sup>54</sup>.

### **Results of Manitoba Hydro's Economic Uncertainty Analysis**

Development Plan	1	3	7	2	4	13	11	6	15	12	5	14
Millions 2014\$ - NPV	All Gas	Wind/Gas	SCGT/C26	K22/Gas	K19/Gas2 4/250MW	K19/C25/ 250MW	K19/C31/ 250MW	K19/Gas3 1/750MW	K19/C25/ 750MW	K19/C31/ 750MW	K19/Gas2 5/750MW (WPS Sale & INV)	K19/C25/ 750MW (WPS Sale &Inv)
10th Percentile	-3502	-4599	-1217	-1249	-898	-1988	-1363	-1181	-2186	-1594	-828	-1429
25th Percentile	-560	-2200	-297	-248	115	-650	-363	-183	-904	-361	139	-204
75th Percentile	1481	383	1363	1636	2092	1854	2074	1832	2008	2009	1726	2255
90th Percentile	1905	1209	1956	2007	2479	3180	2953	2215	3360	3220	2256	3377
Expected Value	-70	-1084	455	564	971	712	736	706	760	821	772	1085
Ref-Ref-Ref NPV	0	-775	738	887	1346	1295	1215	1091	1427	1360	1097	1696
50th Percentile	115	-641	661	849	1266	941	1040	1007	1003	1016	1053	1266

#### *No Intertie/Domestic Need-Based Plans*

The results of the economic uncertainty analysis led Manitoba Hydro to conclude<sup>55</sup> that for plans with no interconnection:

- Plans with hydro are clearly more economic than the All Gas Plan, and
- Plans with Keeyask followed by Gas (i.e. Plan 2) are marginally more economic than plans with Gas followed by Conawapa.

#### *250 MW Intertie*

The results of the uncertainty analysis also led Manitoba Hydro to conclude that "it is more beneficial to advance Keeyask G.S. and invest in a small interconnection than to consider any of the plans without a new U.S. interconnection"<sup>56</sup>.

#### *750 MW Intertie*

In the case of the 750 MW intertie, there was a noticeable difference in the risk profile for those plans with and those plans without Conawapa. While development plans with

<sup>54</sup> Chapter 10, page 17

<sup>55</sup> Chapter 14, page 6

<sup>56</sup> Chapter 10, page 31. See also Chapter 14, page 16

natural gas generation had lower downside risk, the plans with Conawapa had higher expected values as a result of having higher upside potential<sup>57</sup>.

The Preferred Plan (Plan 14) is the only 750 MW intertie plan that had a higher expected value than Plan 4 (with the 250 MW intertie). However, it also had a materially different risk profile with both greater downside risk and higher upside potential. This led Manitoba Hydro to conclude that “careful consideration must be given to the trade-offs between the plans given the different characteristics of these plans (Conawapa G.S. versus Gas and 750 MW interconnection versus 250 MW interconnection)”<sup>58</sup>.

#### *Protect Conawapa In-Service Date*

Finally, analysis<sup>59</sup> undertaken by Manitoba Hydro indicated that if a 250 MW interconnection is chosen then the cost of protecting an early in-service date for Conawapa outweighs the expected benefit. However, if a 750 MW interconnection is chosen then protecting an in-service date in the mid-2020s for Conawapa increases the expected value of the outcome.

### 7.3 Issues Noted with Manitoba Hydro’s Economic Uncertainty Analysis

In its pre-filed evidence ECS noted that this approach was preferable to the hurdle rate approach used in the Wuskwatim NFAT to address risk<sup>60</sup>. The Evidence also noted that the resulting expected values produced by such analyses are more useful and informative for decision making purposes than the net present values calculated for each alternative development plan’s reference case<sup>61</sup>.

At the same time, the ECS Evidence noted<sup>62</sup> that the probabilistic-based risk assessment was fairly simplistic in that only three factors were considered and, in each case, only three possible outcomes assigned.

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<sup>57</sup> Chapter 10 , page 30

<sup>58</sup> NFAT Application, Chapter 10, page 39

<sup>59</sup> PUB/MH I-279

<sup>60</sup> Page 40

<sup>61</sup> Page 42

<sup>62</sup> Page 40

Manitoba Hydro took exception to these comments in both its interrogatories<sup>63</sup> regarding the ECS Evidence and its Rebuttal Evidence<sup>64</sup>, noting that it had chosen the most relevant risk factors and that three point probability distributions were reasonable. In both the subsequent interrogatory responses and direct testimony<sup>65</sup>, Mr. Harper agreed that Manitoba Hydro's approach was reasonable but also noted that in many cases the comparative analysis results (i.e., the S-Curves) were fairly close and that the inclusion of more factors and probability points would have aided in differentiating the results.

The other issue raised regarding Manitoba Hydro's economic uncertainty analysis was the inclusion of the discount rate as one of the factors to be varied across the scenarios<sup>66</sup>. The ECS Evidence expressed the view that varying the discount rate in the uncertainty analysis was problematic, particularly since it was not clear that the analysis actually excluded all the "common costs".

In its Rebuttal Manitoba Hydro asserted<sup>67</sup> and had experts<sup>68</sup> appear to confirm that the approach used was accepted practice. On the other hand, Manitoba Hydro appears to have acknowledged the concern about the inclusion of common costs and in Exhibit 104-2 reported the results after "common costs" were removed. However, it is not clear that all common costs have been or actually can be effectively removed. What Manitoba Hydro did was define "common costs" as the net revenues under the All Gas Plan – on the basis that the values were higher under all other plans.

This is a fairly simple approach and ignores the fact components of the All Gas net revenue calculations (for example thermal costs) are likely to be higher under the All Gas plan than for other plans. At the same time, it is may be impossible to actually separate out the common costs that remain unchanged across the various plans. This is because MH's system is operated on an integrated basis with result that the operation of individual stations (even currently existing ones) can change depending upon the types and timing of new resources added.

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<sup>63</sup> MH/CAC-Mr. Harper 10

<sup>64</sup> Pages 127-128

<sup>65</sup> CAC Exhibit 68, page 31

<sup>66</sup> Page 40-41

<sup>67</sup> Page 129

<sup>68</sup> Dr. Borison from Navigant Consulting

Based on these concerns the ECS Evidence<sup>69</sup> re-did Manitoba Hydro’s economic uncertainty analysis with two changes. First the reference discount rate was changed to 5.2% and, second, this same rate was utilized to discount the cash flows in all scenarios.

#### 7.4 ECS Economic Uncertainty Analysis

The following table summarizes the economic uncertainty analysis results using this approach<sup>70</sup>.

#### **Probabilistic Analysis Results @ Common 5.2% Discount Rate**

Development Plan Millions 2014 \$ - NPV	Plan #1 - All Gas	Plan #3 - Wind/Gas	Plan #7 - SCGT/C26	Plan #2 - K22/Gas	Plan #4 - K19/Gas2 4/250MW	Plan #13 - K19/C25/ 250MW	Plan #11 - K19/C31/ 250MW	Plan #6 - K19/Gas3 1/750MW	Plan #15 - K19/C25/ 750MW	Plan #12 - K19/C31/ 750MW	Plan #5 - K19/Gas2 5/750MW (WPS Sale & INV)	Plan #14 - K19/C25/ 750MW (WPS Sale &Inv)
10th Percentile	-732	-2549	-1035	-800	-477	-2092	-1708	-767	-2341	-1847	-403	-1706
25th Percentile	-514	-1898	-244	-253	112	-807	-487	-159	-933	-564	14	-326
75th Percentile	159	-391	1014	880	1318	1690	1630	1054	1869	1789	1078	2117
90th Percentile	531	280	1548	1623	2128	3035	2647	1862	3323	2919	1646	3257
Expected Value	-124	-1136	272	419	832	459	484	564	496	557	642	821
Ref-Ref-Ref NPV	0	-763	595	774	1210	1037	994	955	1152	1123	967	1417
50th Percentile	-11	-927	398	610	1044	755	721	779	848	839	839	1123

#### *No Intertie*

While the numerical results from the revised analysis differ from Manitoba Hydro’s the overall conclusions are the same, namely that Plan #2 offers the best overall economic value in terms of both expected value and risk profile. This can clearly be seen from the S-Curves for the various no intertie plans, where Plan #2 dominates the other alternatives<sup>71</sup>.

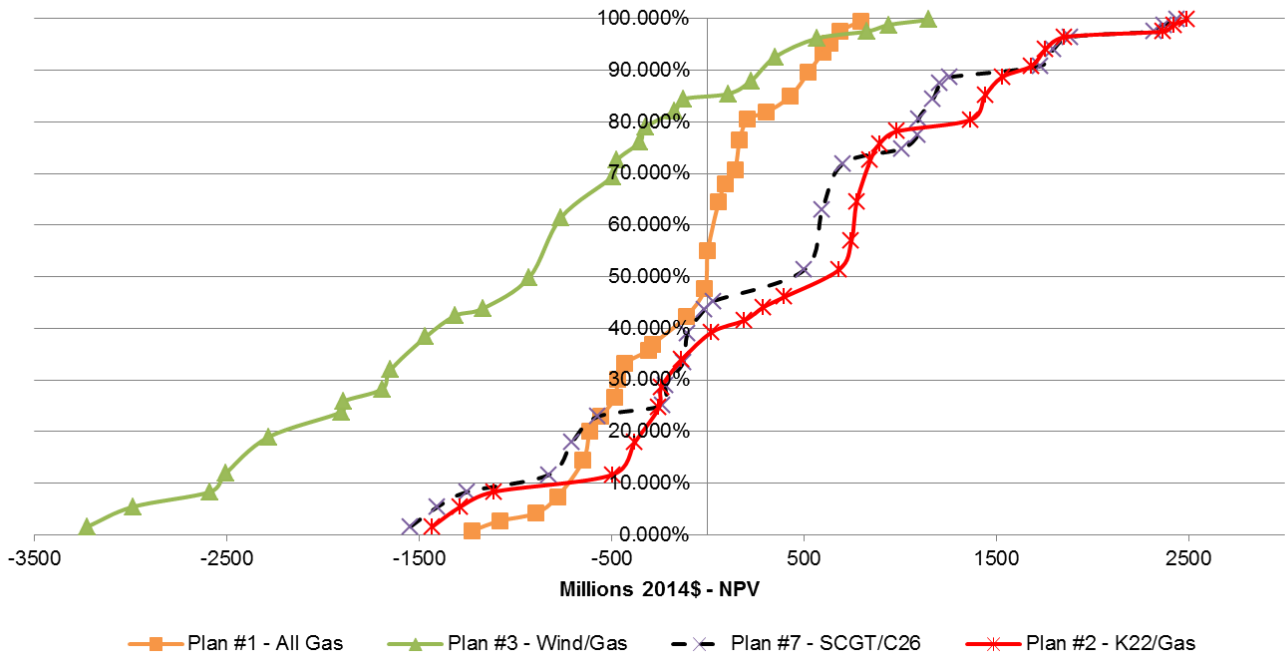
<sup>69</sup> Page 42

<sup>70</sup> See ECS Evidence, page 43, Table #7

<sup>71</sup> CAC Exhibit 68, page 34

## ECS Uncertainty Analysis – 2012 NFAT @ 5.2% Discount Rate

### S-Curves: No New Intertie



### 250 MW Intertie

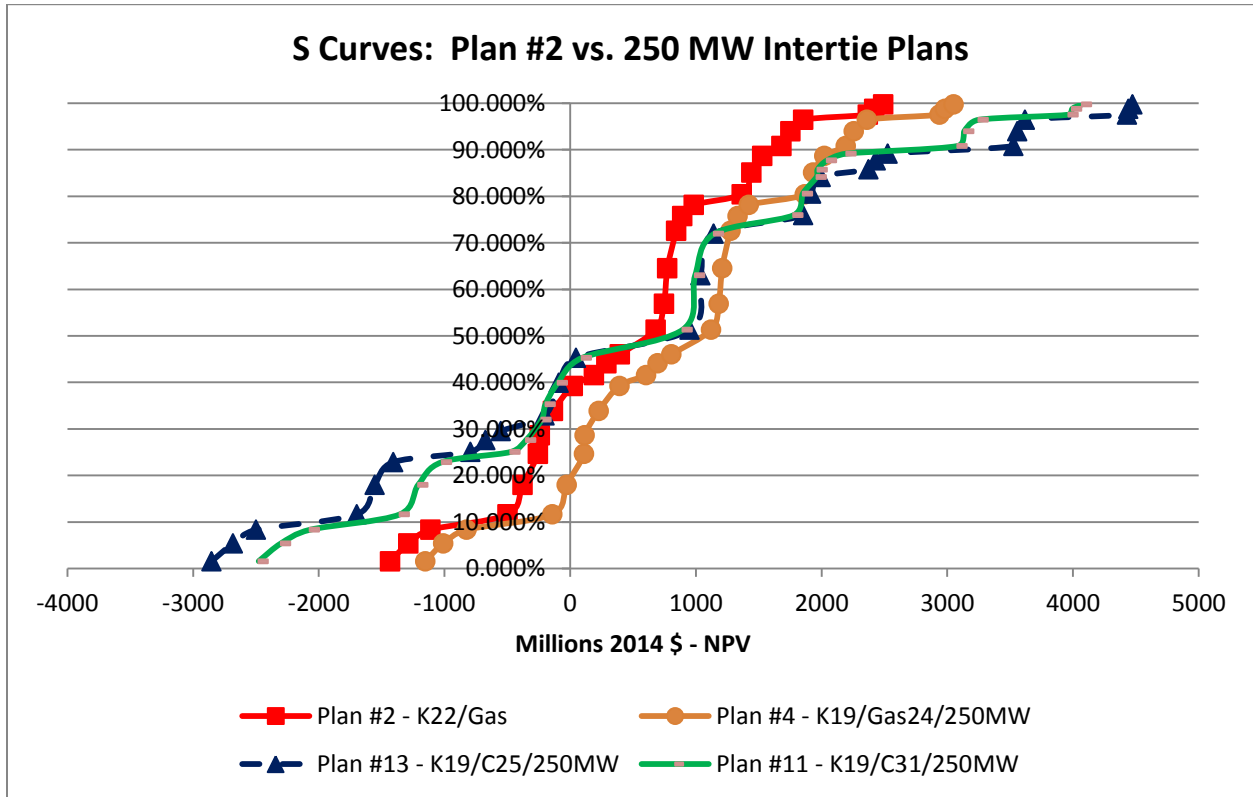
Similarly, while the numbers vary, the ECS economic uncertainty analysis also supported<sup>72</sup> the conclusion that advancing Keyyask with a small intertie is superior (from an economic perspective) to any of the no intertie options and that Plan 4 was the most economical 250 MW plan. Again, this conclusion is clearly supported by the relative S-Curves for the 250 MW plans and Plan 2 (the preferred no intertie plan)<sup>73</sup>, where Plan 4 dominates Plan 2 and has a higher expected value/lower risk profile than the other 250 MW intertie plans.

<sup>72</sup> CAC Exhibit 60, page 46

<sup>73</sup> CAC Exhibit 60, page 45



**ECS Uncertainty Analysis – 2012 NFAT @ 5.2% Discount Rate**

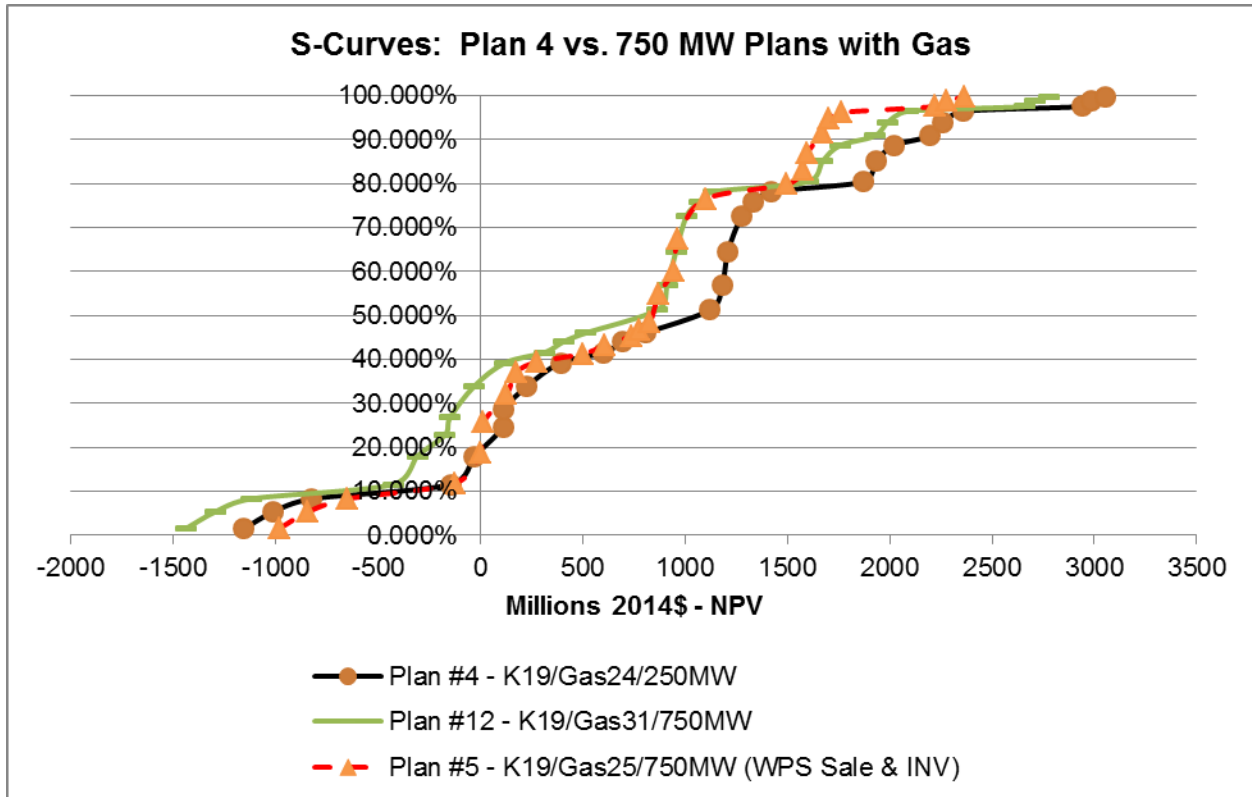


*750 MW Intertie*

Based on the ECS analysis, the risk profiles for the 750 MW intertie plans that had gas following Keyyask were similar to those for Plan 4. However, as seen below, the S-Curve for Plan 4 generally dominated that for the 750 MW/Gas plans and, as a result, had a higher expected value<sup>74</sup>.

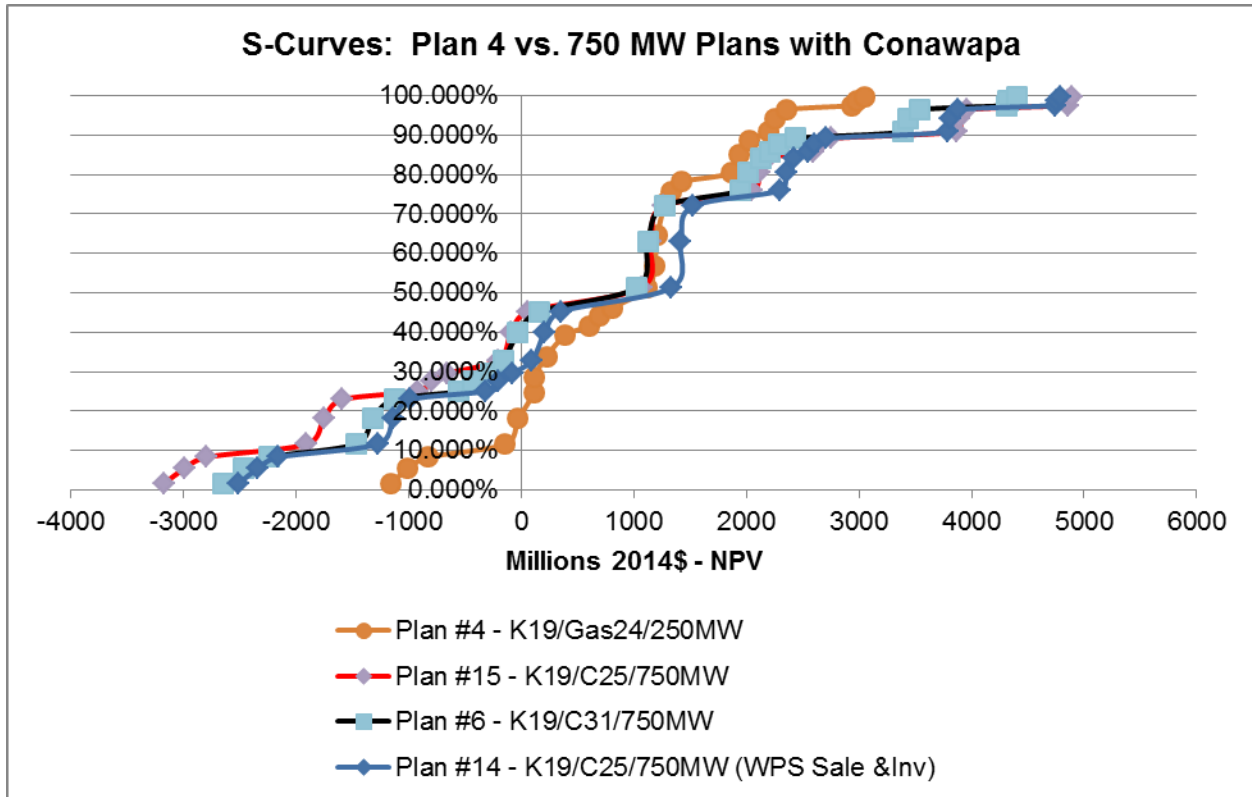
<sup>74</sup> CAC Exhibit 60, pages 46-47

## ECS Uncertainty Analysis – 2012 NFAT @ 5.2% Discount Rate



In contrast, for 750 MW intertie plans where Conawapa followed Keeyask the risk profiles were markedly different, with both higher downside risk and higher upside potential. Overall, only the Preferred Plan had an expected value close to that of Plan 4 suggesting there was no longer the risk/reward trade-off indicated by Manitoba Hydro's analysis. Furthermore, the ECS Evidence noted that the Preferred Plan included in the analysis assumed investment by WPS in the U.S. intertie and that without this investment the expected value would decline.

**ECS Uncertainty Analysis – 2012 NFAT @ 5.2% Discount Rate**



Overall, the ECS Evidence concluded that based strictly on plan versus plan comparison, Plan 4 is preferable in that it offers the same (or higher) expected value than any of the 750 MW intertie plans with the same or lower risk. However, the ECS Evidence went on to note<sup>75</sup> that Manitoba Hydro did not have to commit to a particular “plan” at this point in time and that there was flexibility as to the type of generation that would be built after Keeyask. Given this flexibility the ECS Evidence concluded that there may be little difference the expected value and risk profile of a “pathway” based on constructing a 250 MW intertie in the near term and one based on a 750 MW intertie<sup>76</sup>.

*Protect Conawapa In-Service Date*

The ECS Evidence also indicated that maintaining the flexibility for a 2025 in-service date for Conawapa is beneficial if there is WPS (or similar) contract in place and

<sup>75</sup> CAC Exhibit 60, page 49

<sup>76</sup> CAC Exhibit 60, page 52

additional outside investment in U.S. transmission. Otherwise, while maintaining flexibility for a 2031 in-service date is beneficial doing so for 2025 may not be<sup>77</sup>.

In the case of the 250 MW intertie, the Evidence suggested there is no benefit to maintaining flexibility for a 2025 in-service date but that there could well be benefit to maintaining a 2031 in-service.

### 7.5 Economic Uncertainty Analysis Updates

As noted earlier, during the oral proceeding Manitoba Hydro updated its capital costs for Keeyask and Conawapa based on the results of the General Civil Contract bids received in December 2013. The economic uncertainty analysis for a subset of the alternative development plans initially analyzed was then updated to reflect these revised capital costs along with updated probability weightings associated with the capital cost factor, the updated treatment of common costs and the removal of the WPS investment<sup>78</sup>. The results are summarized in the following table.

#### **Summary Results – Manitoba Hydro’s Updated Probabilistic Analysis 2012 NFAT – Updated Capital Costs and 5.05% Discount Rate**

	Plan 14 - K19/C25 /750MW (WPS &Inv)	Plan 5 - K19/Gas 25/750M W (WPS Sale & INV)	Plan 4 - K19/Gas 24/250M W	Plan 1 - All Gas	Plan 2 - K22/Gas	Plan 8 - CCGT/C2 6	Plan 14b - K19/C25 /750MW (WPS Sale & no WPS Inv)	Plan 5b - K19/Gas 25/750M W (WPS Sale & no WPS Inv)	Plan 12 - K19/C31/ 750MW	Plan 6 - K19/Gas3 1/750MW
10th Percentile	-2768	-728	-727	-953	-862	-1457	-2946	-909	-2512	-1007
25th Percentile	-1537	-178	-290	-244	-622	-980	-1760	-368	-1482	-556
75th Percentile	1314	992	1339	483	1026	916	1105	824	1232	1099
90th Percentile	3850	1655	2019	737	1448	1898	3653	1475	3238	1749
Expected Value	303	450	651	-9	268	143	120	268	115	386
Ref-Ref-Ref NPV	798	667	917	0	489	403	614	484	536	662
50th Percentile	640	648	653	16	219	136	438	415	-35	381

<sup>77</sup> CAC Exhibit 60, page 55

<sup>78</sup> MH Exhibits 104-2 and 104-8

Using the new cash flows associated with these plans<sup>79</sup>, ECS updated its economic uncertainty analyses and Mr. Harper presented the results during his direct testimony on April 25, 2014. The following table summarizes the ECS results presented at that time.

**Summary Results - ECS's Updated Probabilistic Analysis**  
**2012 NFAT – Updated Capital Costs and 5.25% Common Discount Rate**

Development Plan	14	5	4	1	2	8	14B	5B	12	6
	Plan 14 - K19/C25 /750MW (WPS Sale &Inv)	Plan 5 - K19/Gas 25/750M W (WPS Sale & INV)	Plan 4 - K19/Gas 24/250M W	Plan 1 - All Gas	Plan 2 - K22/Gas	Plan 8 - CCGT/C2 6	Plan 14b - K19/C25 /750MW (WPS Sale & no WPS Inv)	Plan 5b - K19/Gas 25/750M W (WPS Sale & no WPS Inv)	Plan 12 - K19/C31/ 750MW	Plan 6 - K19/Gas3 1/750MW
10th Percentile	-2105	-630	-500	-645	-826	-1267	-2290	-845	-2215	-786
25th Percentile	-1596	-316	-415	-436	-725	-1115	-1802	-499	-1644	-684
75th Percentile	1005	658	908	164	499	310	790	503	892	656
90th Percentile	2914	1486	1830	525	1348	1602	2734	1329	2611	1559
Expected Value	56	335	527	-42	140	-32	-127	152	-137	260
Ref-Ref-Ref NPV	524	542	785	0	380	255	343	360	306	531
50th Percentile	499	524	759	3	346	226	315	341	279	499

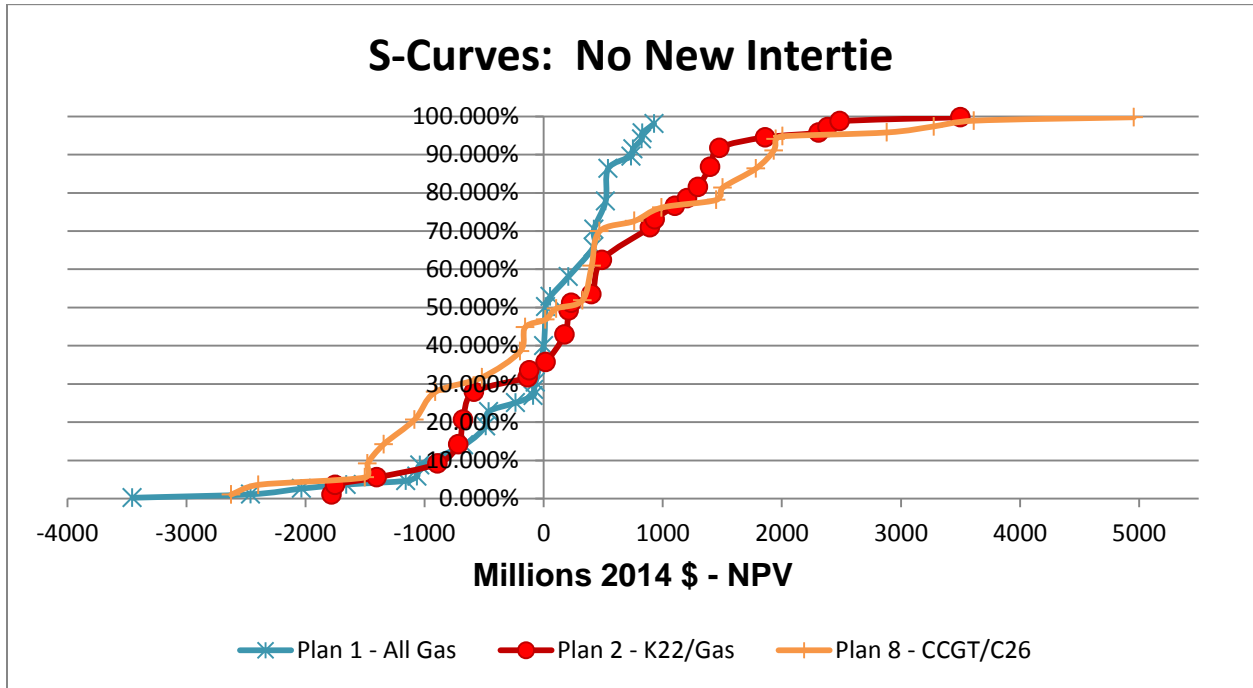
The detailed results and conclusions from these analyses are presented in the following sections. It should be noted that, like the original economic uncertainty analyses, the updated results are based on the 2012 planning assumptions and do not reflect the 2013 planning assumptions or the higher levels of DSM savings now considered to be economic.

<sup>79</sup> MH Exhibits 104-5 and 104-9

*No Intertie*

Three no intertie plans were updated. The S-Curves based on Manitoba Hydro's analyses are set out below<sup>80</sup>. While the curves are now closer together, Plan 2 is still the superior plan in terms of expected value and risk profile.

**Manitoba Hydro's Economic Uncertainty Analysis**  
**2012 NFAT – Updated Capital Costs and 5.05% Discount Rate**

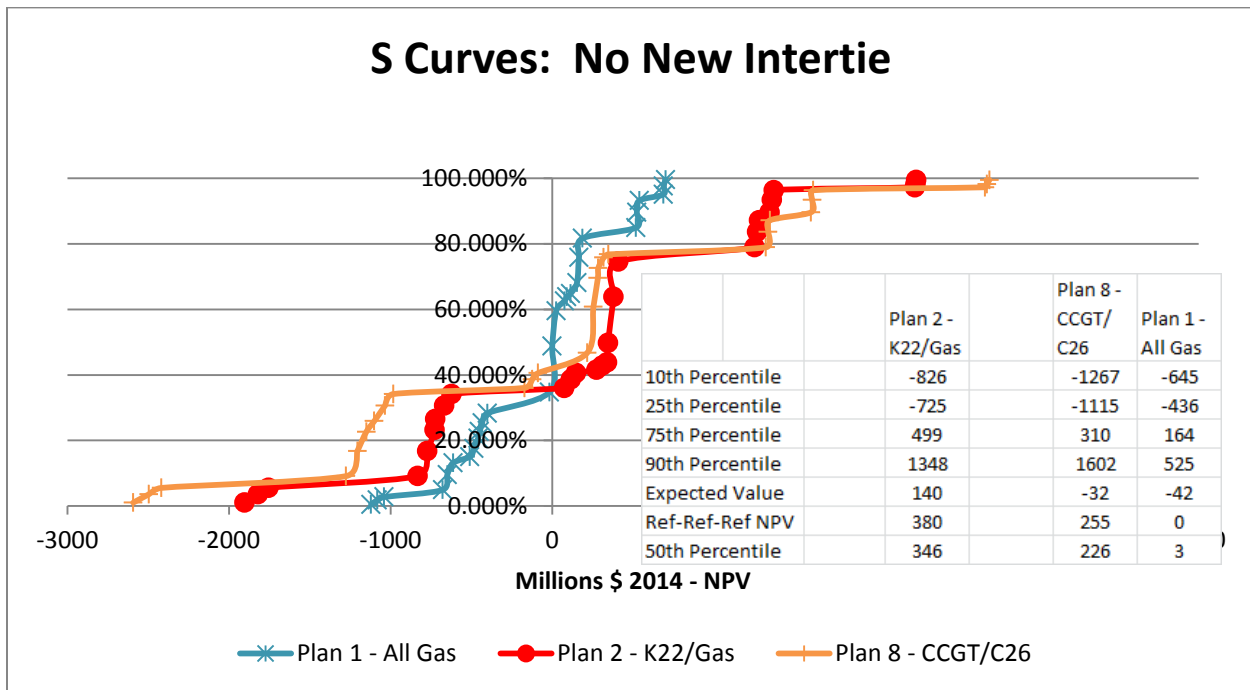


The ECS analysis of the updated 2012 NFAT data yielded similar results indicated in the following chart<sup>81</sup>.

<sup>80</sup> CAC Exhibit 68, page 33

<sup>81</sup> CAC Exhibit 68, page 35

**ECS's Economic Uncertainty Analysis**  
**2012 NFAT – Updated Capital Costs & 5.2% Common Discount Rate**



Overall both forms of analysis (MH's and ECS's) support Plan #2 as the preferred plan to meet just domestic need (i.e. no intertie) from an economic perspective.

However, there are several outstanding issues that need to be borne in mind when considering these results. First, higher levels of DSM than the Base DSM savings associated with the 2012 planning assumptions are likely to prove to be economic. Second, there are more recent 2013 planning assumptions that could/should be factored in. With these revisions the 2013 Reference case analyses suggests that Plan #1 (All Gas) is more economic than Plan #2<sup>82</sup>. Finally, with the higher levels of DSM the need date for the first resource could be delayed perhaps – as discussed earlier – creating the opportunity for other options to be viable/more economic.

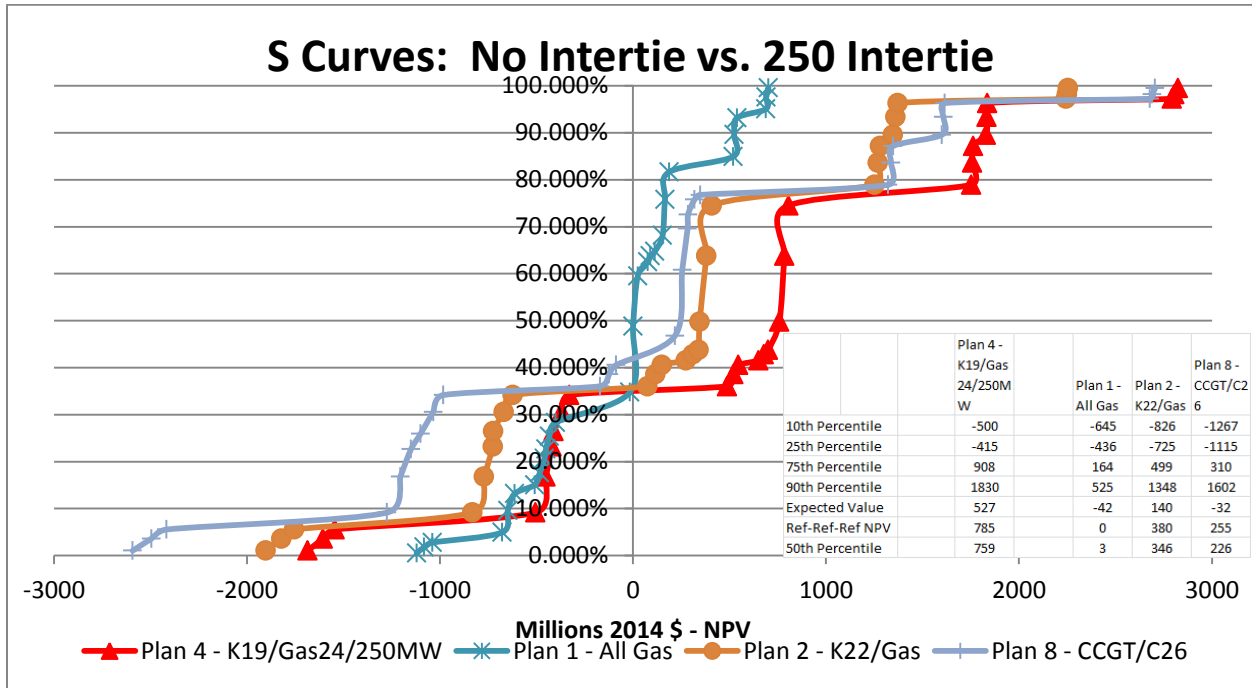
*Advance Keeyask with Small (250 MW) Intertie*

Manitoba Hydro's updated analyses indicate that Plan 4 has a higher expected value, the same/less downside risk and more upside potential than any of the three no intertie

<sup>82</sup> MH Exhibit 104-16

plans analyzed<sup>83</sup>. The ECS analysis of the updated 2012 NFAT data also suggests<sup>84</sup> that Plan 4 is superior to any of the no intertie plans as illustrated in the following figure.

**ECS's Economic Uncertainty Analysis**  
**2012 NFAT – Updated Capital Costs & 5.2% Common Discount Rate**



Overall, both Manitoba Hydro's and ECS's analyses of the updated 2012 NFAT data continue to support the advancement of Keeyask and the construction of a small intertie as being more economic than any of the no intertie plans. However, in considering these conclusions it is important to bear in mind that these results:

- Do not incorporate the more recent 2013 planning assumptions,
- Do not account for the impact of increased levels of DSM, and
- Do not reflect any of the reservations expressed by the Independent Expert Consultants<sup>85</sup> and others<sup>86</sup> regarding Manitoba Hydro's export price forecasts.

<sup>83</sup> MH Exhibit 104-8

<sup>84</sup> CAC Exhibit 68, page 38

<sup>85</sup> For example, Potomac Economics Report, page 5

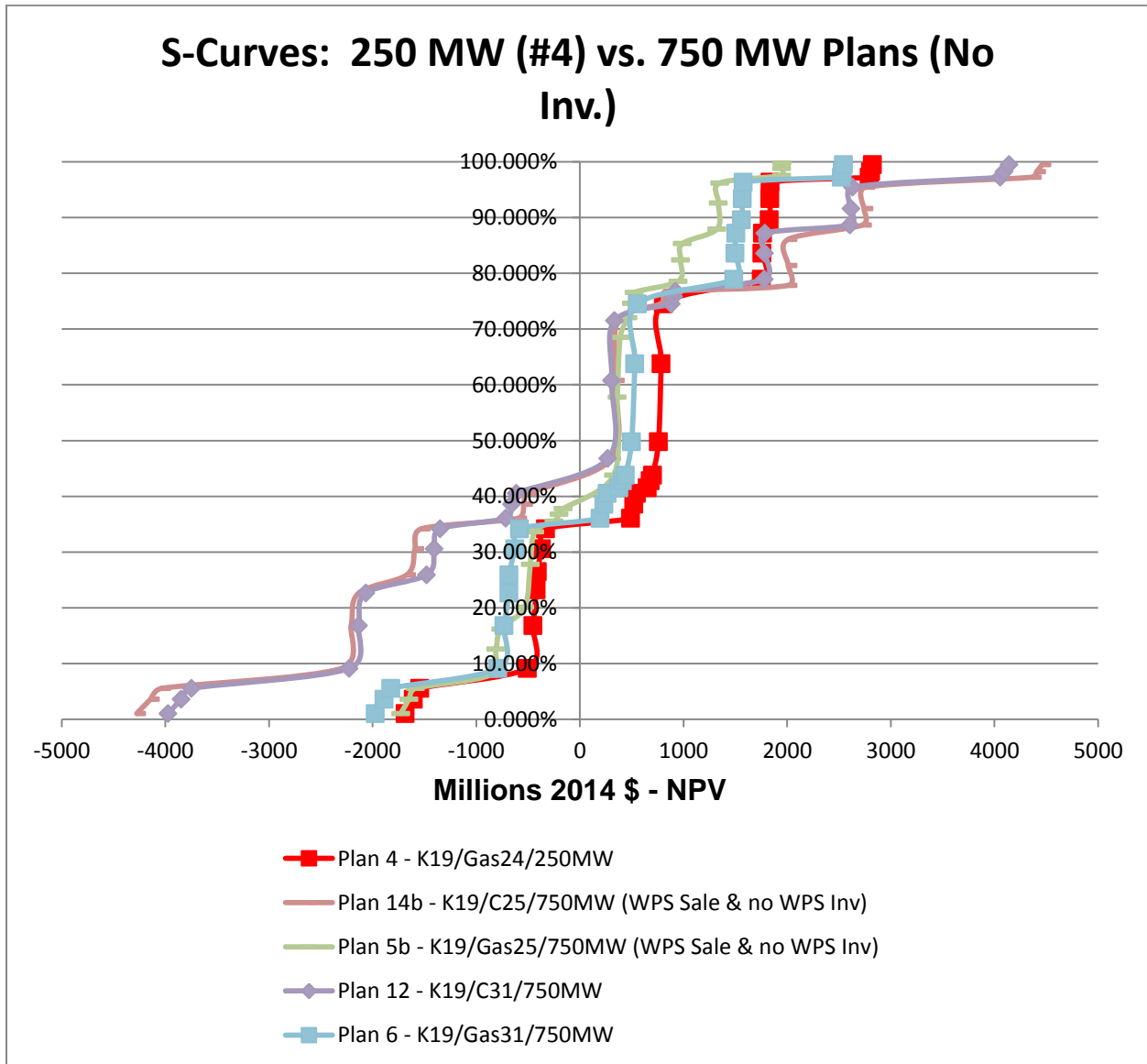
<sup>86</sup> For example, Doug Gotham, CAC Exhibit 66



750 MW vs. 250 MW Intertie

With the updated capital costs and no WPS investment in the 750 MW intertie, the results from Manitoba Hydro's analyses<sup>87</sup> indicate that Plan 4 dominates all plans including Plan 14 (with no WPS investment) for more than 70% of the time and the overall expected value is materially higher than the maximum value under the 750 MW based plans.

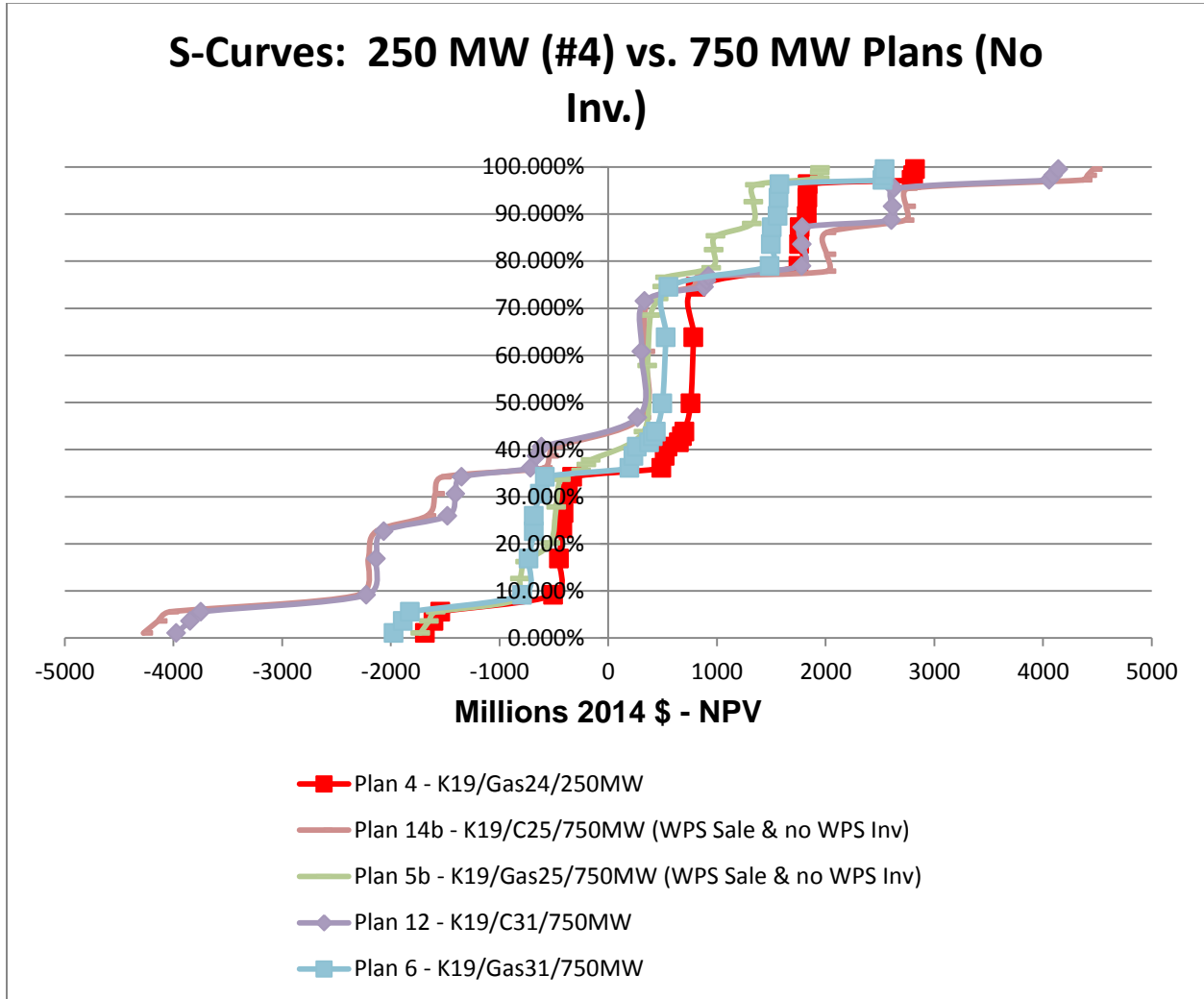
**Manitoba Hydro's Economic Uncertainty Analysis  
2012 NFAT – Updated Capital Costs and 5.05% Discount Rate**



<sup>87</sup> CAC Exhibit 68, page 41

The ECS analysis of the updated 2012 NFAT data yields similar results as indicated in the figure below<sup>88</sup>.

**ECS's Economic Uncertainty Analysis**  
**2012 NFAT – Updated Capital Costs & 5.2% Common Discount Rate**



<sup>88</sup> CAC Exhibit 68, page 42

Overall, these results are consistent and lead to the conclusion that the economics of a Plan #4 which includes a 250 MW intertie are superior to those of any of the 750 MW intertie-based plans in terms of both expected value and risk profile.

However, recent statements and filings<sup>89</sup> by Manitoba Hydro suggest that the 250 MW intertie is no longer viable or, at the very least, would involve renegotiations with Minnesota Power that are unlikely to result in similarly beneficial terms to Manitoba Hydro. As result, the following section compares the advancing of Keeyask with a 750 MW intertie to the Plan 2, the preferred no intertie (i.e. domestic need) plan.

#### *750 MW Intertie vs. No Intertie*

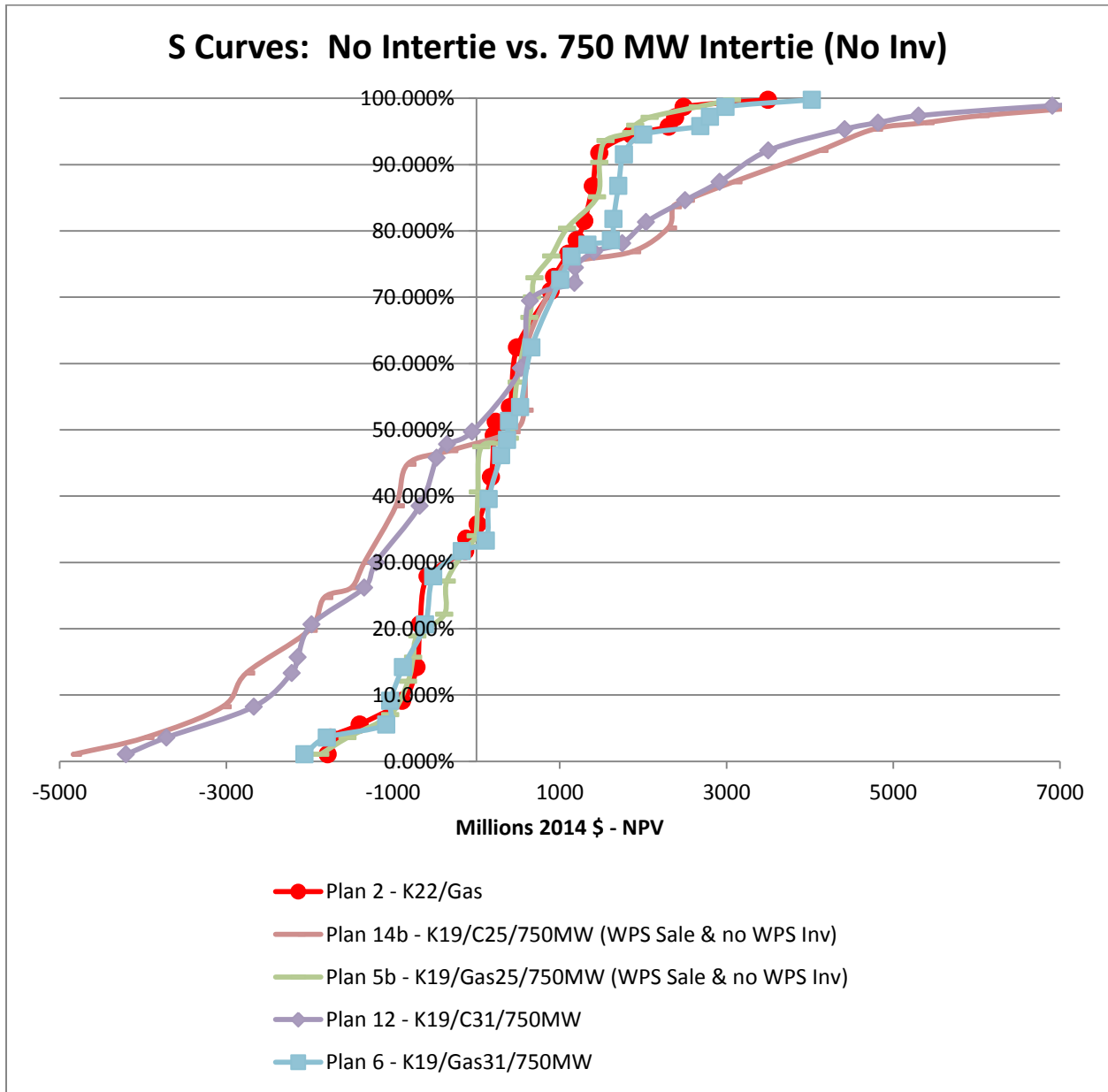
The following figure<sup>90</sup> sets out the S-Curves for the Plan 2 and the various 750 MW intertie plans based on Manitoba Hydro's economic uncertainty analysis of the updated 2012 NFAT data. The 750 MW intertie plans with Gas following Keeyask (i.e. Plans 5 and 6) have expected values that are equal to or greater than those for Plan 2 and similar risk profiles. In contrast, 750 MW intertie plans with Conapawa following Keeyask have lower expected values than Plan 2 and a higher risk profile.

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<sup>89</sup> MH Exhibit 104-16

<sup>90</sup> CAC Exhibit 68, page 46

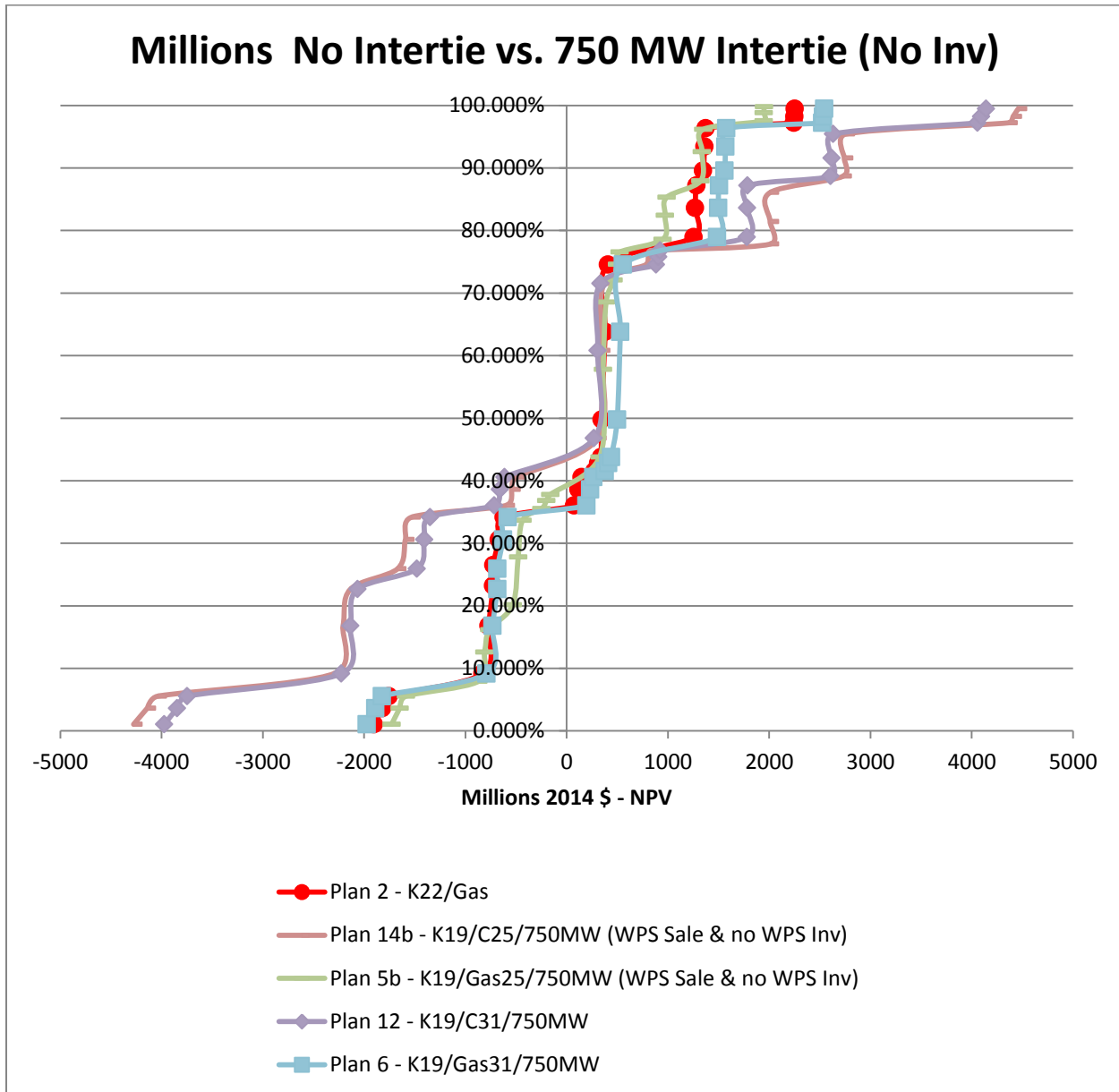
**Manitoba Hydro's Economic Uncertainty Analysis  
2012 NFAT – Updated Capital Costs and 5.05% Discount Rate**



The ECS analysis of the updated 2012 NFAT data yields similar results in terms of risk profiles and comparative values<sup>91</sup>.

<sup>91</sup> CAC Exhibit 68, page 47

**ECS's Economic Uncertainty Analysis**  
**2012 NFAT – Updated Capital Costs & 5.2% Common Discount Rate**



Overall both analyses indicate that:

- The economics of the no intertie plan (i.e. Plan 2) is superior to the 750 MW intertie plans with Conawapa – in that the expected value is higher and the risk profile is less.
- In contrast, the economics of the 750 MW plans with Gas are equal or superior to those of Plan #2 but have a similar risk profile.

- Consistent with the previous two points, the economics of the 750 intertie plans followed by Gas are now superior to 750 intertie plans followed by Conawapa.

#### *Protect Conawapa In-Service Date*

Based on the original 2012 NFAT information, both Manitoba Hydro's initial Business Case and the ECS Evidence concluded that, with a 750 MW intertie, it would be prudent to protect both a mid-2020s and an early 2030 in-service date for Conawapa. However, with the recent updates in capital costs, plans with natural gas-fired generation after Keeyask are now more economic (i.e. higher expected value) and have a lower risk profile than the plans with Conawapa as the subsequent resource. Also, the results from the 2013 Reference Case analyses with higher levels of DSM suggest that this difference will increase if higher levels of DSM savings are pursued. Finally, with higher levels of DSM and Keeyask advanced to 2019, the need date for the next generation resource is roughly 2030 even with the WPS contract and new pipeline load<sup>92</sup>.

All these results and observations suggest that<sup>93</sup>:

- There is no need for an early (i.e. mid-2020s) in-service date for Conawapa and hence the aggressive spending that would be required to protect such a date.
- There may be potential benefits from Conawapa and hence future outcomes that would favour Conawapa for a later in-service date. However, given the overall uncertainty assessment and the lower expected value, a careful re-assessment is required prior to committing to further spending on Conawapa to protect an in-service date around 2030. Furthermore, if approved, such spending would need to be carefully scoped out with a view to minimizing financial commitments in the short-term and establishing key decision points where re-assessment would take place regarding the value of continued spending.

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<sup>92</sup> MH Exhibit 104-16

<sup>93</sup> CAC Exhibit 68, page 51

## **8. MULTIPLE ACCOUNT ANALYSIS**

In its Multiple Account analysis Manitoba Hydro examines the consequences of the alternative development plans from a number of perspectives and creates what it calls “accounts” to track the findings for each perspective.

The first of these accounts is what it calls the market valuation account.

### **8.1 Manitoba Hydro’s Market Valuation Account**

The market valuation account is also meant to look at the costs and benefits of each alternative development plan but from a societal perspective. In the original NFAT<sup>94</sup> the market valuation account used the 2012 reference values for each plan. However, early in the oral proceeding these values were updated to reflect the higher capital costs associated with Keeyask and Conawapa and the market valuation values were revised<sup>95</sup>. The revised values also accounted for WPS decision not to invest in the new US intertie.

The Market Valuation Account employs a 6% (real) discount rate which is meant to reflect the “social opportunity” cost of capital (i.e., society’s perspective as to the discount rate) as opposed to the previous economic evaluations which were done from Manitoba Hydro’s perspective and therefore used what was considered Manitoba Hydro’s cost of capital. This same 6% value was used for the other accounts that were monetized, such as the government and environmental accounts.

However, for the market valuation account costs and benefits were only discounted at 6% for the 2012-2047 period – subsequent costs and benefits were discounted to 2047 using a 5.05% discount rate and then discounted to 2014 using 6%<sup>96</sup>.

### **8.2 Issues Regarding Manitoba Hydro’s Market Valuation Account**

#### *Recent Updates*

The first issue of note regarding Manitoba Hydro’s Market Value Account is that (except for the updated Keeyask and Conawapa capital costs) it is based on the original NFAT

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<sup>94</sup> Chapter 13, pages 5 and 22

<sup>95</sup> MH Exhibit 129-7, page 5 and MH Exhibit 166

<sup>96</sup> Chapter 13, page 63

Business Case using the 2012 planning assumptions. This means that values have not been revised to account for the more current 2013 planning assumptions, It also means the alternative development plans do not incorporate the higher levels of DSM that have been demonstrated to be economic. The 2013 planning assumptions (excluding the change in discount rate) would appear to improve the economics of the Preferred Plan and other plans where Conawapa follows Keeyask relative to Plan 2 or Plan 4<sup>97</sup>. However, higher levels of DSM improve the economics of plans where natural gas-fired generation follows Keeyask relative to plans where Conawapa follows Keeyask<sup>98</sup>. As a result, how the overall market valuation results for the various plans would change if these updates were incorporated is unclear.

#### *Use of Declining Discount Rate*

The second issue of note is the use of a 5.05% discount rate to discount costs and benefits after 2047 back to that point in time as opposed to using 6% as the discount rate for the entire evaluation period. No rationale was provided in the original NFAT Business Case for doing so. However, in the interrogatories<sup>99</sup> posed to ECS on its evidence Manitoba Hydro appears to suggest that the use of lower/declining discount rates is appropriate for long-term intergeneration projects.

To this point, it was noted both in the response to Manitoba Hydro's interrogatories and in Mr. Harper's direct testimony<sup>100</sup> that the use of declining discount rates for intergenerational projects is a matter of ongoing theoretical debate and that both opinions and practice vary widely. However, probably even more important is the fact that in such debates issues as to the appropriate discount rate to use are frequently confused/confounded by concerns regarding the inability to assign appropriate future values (i.e., costs or benefits) to future consequences. Indeed it is this inability to properly value future outcomes, particularly ones of social consequence such as environmental impacts, that frequently leads to parties seeking to alter the discount rate.

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<sup>97</sup> Chapter 12, Page 12

<sup>98</sup> MH Exhibit 104-16

<sup>99</sup> MH/CAC – Harper 16 a)

<sup>100</sup> CAC Exhibit 68, page 55



as opposed to difference in views as to how society values future vs. present day outcomes.

*Embedded Equity*

During the oral proceeding Manitoba Hydro<sup>101</sup> introduced the notion of embedded equity as an additional “benefit” that could be ascribed to each plan. The concept<sup>102</sup> being that the use of a weighted cost of capital that included a premium for equity results in a lower NPV relative to the All Gas case and that difference can be viewed as the equity being “embedded” in the NPV calculations and viewed as a “benefit”. For the preferred plan the value is \$1.3 billion and the calculation is set out below, where 4.65% is Manitoba Hydro’s cost of borrowing<sup>103</sup>.

<b>CALCULATION OF EMBEDDED EQUITY BENEFIT” (Millions 2014 \$ - NPV)</b>			
Discount Rate	All Gas	PDP	Change
5.40%	-\$2,810	-\$2,765	\$45
4.65%	-\$3,738	-\$2,374	\$1,364
Change	-\$928	\$391	\$1,319

However, breaking down the calculation, the use of a 5.4% as opposed to 4.65% discount rate impacts the NPV of the preferred plan itself by only \$391 M. This is the change in NPV of the preferred plan from using the lower discount rate and if embedded equity is to be associated with the higher discount rate what should be attributed to the preferred plan.

<sup>101</sup> MH Exhibit 129-7, pages 4 and 20

<sup>102</sup> March 25, 2014 Transcript, page 3679

<sup>103</sup> See MH Exhibit 175

Indeed, the major contribution to the \$1.3 B is the over \$900 M reduction in the NPV of the All Gas plan that occurs upon using 4.65%. However, this would suggest that there is close to \$1 B in negative equity associated with the NPV calculation of the All Gas plan which counter intuitive. The conclusion to be arrived at overall is that the embedded equity in each plan cannot be calculated using different discount rates and, indeed, the \$1.3 B has nothing to do with embedded equity.

To actually calculate the embedded equity associated with each plan one would need to look at the results of the financial analysis for each alternative development plan as set out in Chapter 11 of the NFAT Business Case. Clearly, plans involving more capital investment such as Plan 14 will have higher embedded equity. This is a direct result of such plans needing more equity in order to maintain the 75/25 debt/equity ratio required for Hydro's self-supporting financial status. However, in this context the addition equity cannot be considered a "benefit" and is more akin to a cost.

### 8.3 Manitoba Hydro's Customer Account

Manitoba Hydro's Customer Account reflects both the reliability and rate impacts of the various development plans on customers. Rate impacts are not expressed in NPV terms but rather in cumulative percentage increases at specific points in time during the study period (i.e. 2031/32 and 2061/62)<sup>104</sup>.

### 8.4 Issues Regarding Manitoba Hydro's Customer Account

#### *Customer Bill Impact Metric*

In the ECS Evidence<sup>105</sup> the issue was raised as to why customer rate/bill impacts were not expressed in NPV terms as was done in the Wuskwatim NFAT. Subsequently, in response to an interrogatory from Manitoba Hydro<sup>106</sup> it was noted that the cumulative bill increase metric only reflects the bill level at the specified points in time and does not capture any differences between the plans in terms of the trajectory of rate increases over the period. In contrast using NPV will capture such differences thus making it a better measure of bill impacts.

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<sup>104</sup> Chapter 13, page 28

<sup>105</sup> Page 60

<sup>106</sup> MH/CAC – Harper 23 a)

### *Discount Rate for Customer Bill Impacts*

In response to interrogatories<sup>107</sup> Manitoba Hydro has provided the NPV of customer revenues associated with each of the development plans using a 1.86% (real) discount rate. The 1.86% was calculated using the forecast short-term Canadian T-bill rate (excluding the debt guarantee fee) and converted to real terms using its forecast CPI. In its Rebuttal Evidence<sup>108</sup> Manitoba Hydro put forward four reasons why this approach was appropriate.

The first reason was that literature and practice supports the use of lower intergenerational discount rates. However, as noted by experts appearing for the CAC<sup>109</sup>, the literature and practice in this area all deals with discounting from a societal perspective and not a customer perspective which is the point of view the customer account is meant to represent.

The second rationale is that the revenue requirement already includes the cost of debt and equity. However, as noted by CAC experts, this fact isn't relevant to the customer perspective. To the extent the plans generate different bills for customers what is relevant is the potentially different streams of bill payments overtime – not what types of costs went into determining the rates the bills are based on.

The next point made by Manitoba Hydro is that uncertainty was addressed in its uncertainty analysis and does not have to be included again. While uncertainty has been analyzed and the sources of risk are now better understood, risks have not been eliminated and there are still risks associated with each of the proposed plans. In contrast, Hydro's proposed 1.86% discount rate reflects the real return on treasury bills and therefore is appropriate only instances when there is no risk.

Finally, the use of the rates associated with treasury bills assumes that customers are generally net savers and therefore receiving/not receiving funds sooner versus later will impact on savings. However for many customers this may not be the case. Examples

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<sup>107</sup> PUB/MH I-149

<sup>108</sup> Pages 138-142

<sup>109</sup> CAC Exhibit 68, page 58

include indebted households where its debt levels that could be affected and business customers of Hydro where higher bills may delay investments in business activities.

Overall different customers will have different discount rates. However, a rate based on treasury bills likely represents the low end of the resulting range of possible values.

Indeed, in response to an interrogatory from Manitoba Hydro<sup>110</sup>, Mr. Harper suggested that an appropriate time preference rate for customers is somewhere in the range of 3% to 8% in real terms and set out the rationale as to why.

**8.5 Multiple Account Results**

In Exhibit 166 Manitoba Hydro provide the updated multiple account analysis for a range of alternative development plans for those accounts that had been “monetized”. The results are set out below.

Plan #	14	12	6	5	4	2	1
Account	PDP (with WPS sale)	K19/C31/ 750 MW	K19/Gas31/ 750 MW	K19/Gas25/ 750 MW	K19/G24/ 250MW	K22/Gas	All Gas
Market Valuation	0	97	573	313	577	314	251
Government	0	-117	-367	-358	-365	-407	-687
Economy	0	-27	-104	-100	-101	-120	-193
Environment	0	1	-129	-95	-217	-181	-334
Monetized Net Benefit	<b>0</b>	<b>-46</b>	<b>-27</b>	<b>-240</b>	<b>-105</b>	<b>-395</b>	<b>-963</b>

What’s noticeable in terms of the results is that there are significant distributional issues in that the plans yielding the greatest environmental and provincial benefits impose the greatest cost from a market valuation perspective which tends to reflect the perspective of Manitoba Hydro and its customers. Also, while not evident from the multiple account

<sup>110</sup> MH/CAC – Harper 23 b)

analysis reports prepared by other parties<sup>111</sup> indicate that there are also distributional issues from an inter-generational perspective.

In economic theory the principle is that if the alternative chosen is the one with the greatest benefit then winners under the plan should be able to compensate the losers in a way that makes every one better off. However, in practice, such redistribution of benefits usually requires either regulatory or government intervention.

## **9. CONCLUSIONS REGARDING KEY DECISIONS**

### **9.1 Keeyask/Intertie**

As noted in the introduction one of the immediate issues facing Manitoba Hydro (and the Provincial Government) is whether Keeyask should be advanced to 2019 and an intertie constructed in conjunction with approval of the Minnesota Power Contract.

Based on the analysis available it appears that advancing Keeyask in conjunction with a 750 MW intertie is economic as compared to any of the development plan with no intertie and which would focus solely on domestic need. This conclusion is supported by both the updated 2012 economic uncertainty analysis and the updated 2013 Reference Case results which suggest that at higher levels of DSM the economics will improve even further.

However, there still remain significant information gaps and uncertainties which the PUB and the Provincial Government will have to address and/or satisfy itself regarding:

- The first is whether the 250 MW intertie is truly not viable or, at a minimum, has sufficient uncertainty associated with it to be less attractive than the 750 MW intertie.
- The second is to better understand the degree to which the economics of advancing Keeyask and the 750 MW intertie hinges on the future for carbon pricing, which depends more on politics and societal norms than economics. This will involve reviewing in detail Manitoba Hydro's export pricing assumptions which are subject to confidentiality restrictions.
- The third, and final, uncertainty is closely linked to the second and relates to the impact higher levels of (economic) DSM could have on the benefits and risks

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<sup>111</sup> La Capra and InterGroup

associated with advancing Keeyask from what could prove to be a “need date” considerably further out into the future than assumed in the alternative plans assessed.

## 9.2 Conawapa

Conawapa is currently not the preferred resource to follow Keeyask from an economic perspective. This conclusion is supported by the updated economic uncertainty analysis. Furthermore, the 2013 Reference Case analysis indicates that at higher levels of economic DSM the economics of Conawapa will further deteriorate relative to plans that have natural gas-fired generation as the next resource after Keeyask. Finally, with increased levels of DSM new resources after Keeyask will not be required until the close to 2030 at the earliest.

All of this suggests that it is unnecessary to protect an in-service date for Conawapa in the mid-2020s. It also suggests that, while it may be beneficial to protect a later in-service date, careful consideration will have to be given before making any such commitment and spending should be minimized to the extent possible.

It is also clear from the Multiple Account analysis that any formal commitment to actually proceed with Conawapa in the future involves a range of issues (e.g., environmental, socio-economic and inter-generational) that go well beyond standard utility system planning. As result, any such decision should be subject to a full public debate and a public review process.