

**NEEDS FOR AND  
ALTERNATIVES TO (NFAT)  
REVIEW OF MANITOBA  
HYDRO'S PROPOSAL FOR THE  
KEYYASK AND CONAWAPA  
GENERATING STATIONS**

***PUBLIC VERSION***

*The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.*

*PREPARED FOR*

The Manitoba Public Utilities Board

*PREPARED BY*

**La Capra Associates, Inc.**

One Washington Mall, 9<sup>th</sup> Floor  
Boston, MA 02108

Addendum to TA 9A & 9B

April 2, 2014

# **Economic Analysis 2014 Update for Technical Appendix 9A and 9B**

## **Table of Contents**

I.	Introduction .....	1
II.	LCA Limited Update of Technical Appendices 9A and 9B .....	3
III.	Contents of this Addendum .....	5
IV.	Updated Figures for Appendix 9A .....	6
V.	Updated Figures for Appendix 9B .....	21

**Table of Figures**

Figure 9-21U: Summary- CPVs as Compared to All Gas Plan at the end of Various Periods, Break-Even Year, 78 year IRR and 78 Year CPV of Total Capital – Millions of 2014 Present Value Dollars ..... 6

Figure 9-26U: Probabilistic Analysis Quilt 78 Year with LCA Methodology for Determining Comparisons to All Gas Plan..... 6

Figure 9-29U: Probability Distributions of Plan 14 Preferred Development Plan having Higher Costs than the All Gas Plan- Millions of 2014 Present Value Dollars..... 7

Figure 9-29U(2): Supplemental table to above chart (not included in original filing)..... 7

Figure 9-34U: Probability Distribution of Selected Plans Compared having higher costs than the All Gas Plan after 78 Years using the LCA Methodology – Millions of 2014 Present Value Dollars ..... 8

Figure 9-34U(2): Supplemental table to above chart (not included in original filing)..... 8

Figure 9-35U: Probability Distributions of Selected Plans having higher costs than the All Gas Plan after 50 years using LCA Methodology- Millions of 2014 Present Value Dollars..... 9

Figure 9-35U(2): Supplemental table to above chart (not included in original filing)..... 9

Figure 9-45U: Probability Distributions of Plan 14 Preferred Development Plan having Higher Costs than the All Gas Plan when eliminating Low Discount Rate Scenarios- Millions of 2014 Present Value Dollars ..... 10

Figure 9-45U(2): Supplemental table to above chart (not included in original filing)..... 10

Figure 9-49U: Probability Distributions of Plan 14 Preferred Development Plan having Higher Costs than the All Gas Plan with Higher Probabilities of Higher Capital Costs- Millions of 2014 Present Value Dollars ..... 11

Figure 9-49U(2): Supplemental table to above chart (not included in original filing)..... 11

Figure 9-51U: The Impact of the assumed change in Capital Cost Probabilities on the Probability Distributions of Selected Development Plans having Higher Costs than the All Gas Plan – Millions of 2014 Present Value Dollars..... 12

Figure 9-52U: The Impact of the assumed change in Capital Cost Probabilities on the Probability Distributions of the Selected Development Plans having Higher Costs than the All Gas Plan after 50 Years – Millions of 2014 Present Value Dollars ..... 13

Figure 9-54U: Probability Distributions of Plan 14 Preferred Development Plan having Higher Costs than the All Gas Plan with Changing Energy Cost Probabilities – Millions of 2014 Present Value Dollars..... 14

Figure 9-54U(2): Supplemental table to above chart (not included in original filing)..... 14

Figure 9-56U: The Impact of the assumed change in Energy Price Probabilities on the Probability Distributions of Selected Development Plans having Higher Costs than the All Gas Plan after 78 years – Millions of 2014 Present Value Dollars ..... 15

Figure 9-57U: The Impact of the assumed change in energy Price Probabilities on the Probability Distributions of the Selected Development Plans having Higher Costs than the All Gas Plan after 50 years – Millions of 2014 Present Value Dollars..... 16

Figure 9-76U: Resource Plan Economic Benefits after 78 years to the Province of Manitoba from LCA Perspective – Millions of 2014 Present Value Dollars..... 17

Figure 9-80U: Probability Distributions of Plan 14 Preferred Development Plan having Higher Costs than the All Gas Plan after 78 Years from the Province of Manitoba Perspective by eliminating LCA view of Intra-provincial transfers – Millions of 2014 Present Value Dollars ..... 18

Figure 9-80U(2): Supplemental table to above chart (not included in original filing)..... 18

Figure 9-82U: The Province of Manitoba Perspective of Probability Distributions of Selected Plans having Higher Costs than the All Gas Plan after 78 years – Millions of 2014 Present Value Dollars ..... 19

Figure 9-83U: The Province of Manitoba Perspective of Probability Distributions of the Selected Plans having higher Costs than the All Gas Plan after 50 years – Millions of 2014 Present Value Dollars ..... 20

Figure 9-95U: Probability Distributions of Supplemental Plans having higher costs than the All Gas Plan after 78 Years using the LCA Methodology- Millions of 2014 Present Value Dollars ..... 21

Figure 9-96U: Probability Distributions of Supplemental Plans having higher costs than the All Gas Plan after 50 Years using the LCA Methodology- Millions of 2014 Present Value Dollars ..... 22

*The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.*

Figure 9-99U: Value of PDP Components – 78 Year NPV vs. All Gas ..... 23

Figure 9-100U: Value of PDP Components – 50 Year NPV vs. All Gas ..... 24

Figure 9-101U: Value of PDP Components – 35 Year NPV vs. All Gas ..... 25

Figure 9-102U: Comparing Plan 2-K22/Gas to Plan 1-All Gas to test economics of Keeyask, with an ISY 2022 - Millions of 2014 Present Value Dollars ..... 26

Figure 9-103U: Expected value, risk, reward, and all reference case of Plan 2- K22/Gas Compared to Plan 1-All Gas from Probability Distributions ..... 26

Figure 9-124U: Comparing Plan 14 Preferred Development Plan to Plan 5- K19/Gas25/750MW (WPS Sale INV) to test economics of Conawapa GS ISY 2025 with 750 MW Transmission and WPS Sale & Inv- Millions of 2014 Present Value Dollars ..... 27

Figure 9-125U: Expected value, risk, reward and all reference case of Plan 14- Preferred Development Plan Compared to Plan 5- K19/Gas25/750 MW (WPS Sale& Inv) from Probability Distributions..... 27

Figure 9-148U: Comparing Plan 14 Preferred Development Plan to Plan 5- K19/Gas25/750MW (WPS Sale & INV) to test economics of Conawapa GS ISY 2025 with 750 Transmission and WPS Sale & Inv from the Province of Manitoba Perspective by eliminating LCA view of Intra-provincial transfers- Millions of 2014 Present Value Dollars..... 28

Figure 9-149U: Expected value, risk, reward, and all reference case of Plan 14 Preferred Development Plan Compared to Plan 5- K19/Gas25/750MW (WPS Sale & INV) from Probability Distributions..... 28

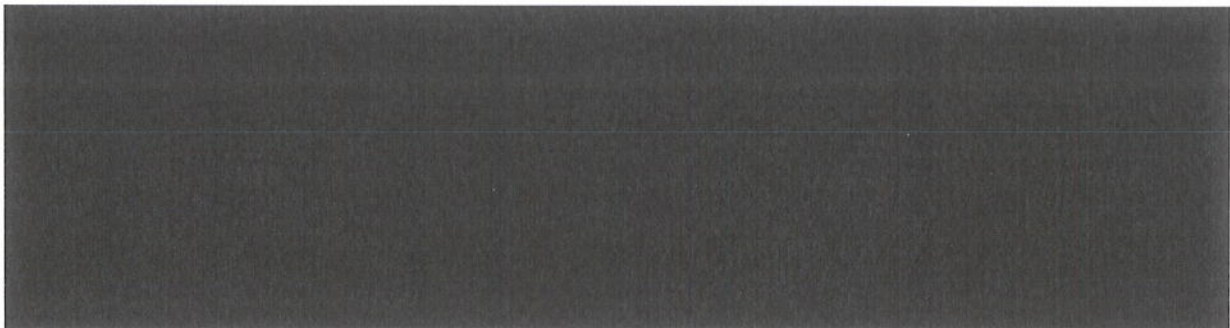


Figure 9-174U: Probability Distributions of Plan 14 Preferred Development Plan having Higher Costs than the All Gas Plan with a 10% Increase in Gross Revenue- Millions of Present Value Dollars ..... 30

*The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.*

Figure 9-175U: Expected value, risk, reward, and all reference case of Plan 14 Preferred Development Plan Compared to Plan 1- All Gas from Probability Distributions ..... 30

Figure 9-176U: Probability Distributions of Plan 14 Preferred Development Plan having Higher Costs than the All Gas Plan with a 10% Decrease in Gross Revenue- Millions of Present Value Dollars ..... 31

Figure 9-177U: Expected value, risk, reward, and all reference case of Plan 14 Preferred Development Plan Compared to Plan 1- All Gas from Probability Distributions ..... 31

Figure 9-178U: Probability Distributions of Plan 14 Preferred Development Plan having Higher costs than the All Gas Plan with Energy Price probabilities for High, Reference, and Low 0% 50% and 50% respectively..... 32

Figure 9-179U: Expected value, risk, reward, and all reference case of Plan 14 Preferred Development Plan Compared to Plan 1- All Gas from Probability Distributions ..... 32



## Acronyms

### Technical Appendix

CCGT	Combined Cycle Gas Turbines
CPV	Cumulative Present Value
DSM	Demand Side Management
ESOW	Expanded Scope of Work
GS	Generating Station
IEC	Independent Expert Consultant
IRR	Internal Rate of Return
ISD	In-Service Date
LCA	La Capra Associates
MH	Manitoba Hydro
MISO	Midcontinent Independent System Operator
MW	Megawatt
NFAT	Needs For and Alternatives To
NPV	Net Present Value
O&M	Operations and Maintenance
PAQ	Probabilistic Analysis Quilt
PDP	Preferred Development Plan
SCGT	Simple Cycle Gas Turbine
SOW	Scope of Work
SPLASH	Simulation for Long-Term Analysis of System Hydraulics
US	United States
WPS	Wisconsin Public Service Corporation

## **I. Introduction**

La Capra Associates submitted two documents representing LCA's review of the economic analysis submitted in the NFAT Application. Technical Appendix 9A is dated January 24, 2013. Technical Appendix 9B is dated February 24, 2014. On March 10, 2014 Manitoba Hydro Panel 2 made a presentation "Need, Alternatives and Economic Evaluation" as part of their direct testimony. While a significant portion of the presentation related to the MH August 16, 2013 NFAT filing material, the presentation did include updated economic analysis. LCA understands that this 2014 update incorporated three changes:

1. Updated Capital Cost Estimates for Keeyask and Conawapa
2. A change in the probability assignments to the reference, high and low capital cost uncertainty branches
3. A new MH methodology to account for eliminating common costs among the plans.

Related information to this updated such as export power prices and details on the capital cost increases were also provided by MH in the MH Panel 2 presentation "Need, Alternatives and Economic Evaluation CSI Information" as part of their direct testimony during the CSI session on March 17, 2014. Some of the information on this MH 2014 updated economic analysis was also extracted from the transcripts of the cross examination and direct testimony of MH Panel 2. The 2014 update economic results begin on slide 122 and continue through slide 135.

### **MH 2014 Update to the 2012 NFAT filing Analysis**

The 2014 update analysis was applied by MH to the MH NFAT filing analysis, 2012 vintage, which includes uncertainty analysis. This 2014 update analysis by MH was not provided for all 15 resource development plans of the NFAT filing.



The 2014 capital cost update to the 2012 analysis was conducted for the following six resource development plans<sup>1</sup>:

- **Plan 1 All Gas**
- **Plan 2** Keeyask in 2022 and then natural gas fueled generation as needed (K22/Gas)
- **Plan 4** Keeyask in 2019, the 250 MW transmission line and then natural gas fueled generation as needed beginning in 2024 (K19/Gas24/250MW)
- **Plan 8** Combined Cycle generation fueled by natural gas for needs prior to Conawapa, which is added in 2026, followed by additional combined cycles (CCGT/C26)
- **Plan 5** Keeyask in 2019, the 750 MW transmission line, and then natural gas fueled generation as needed beginning in 2025. It also includes the WPS Sale and WPS Investment assumptions used in the 2012 analysis within the MH NFAT filing (K19/Gas25/750MW/WPS Sale & Inv)
- **Plan 14** The Preferred Development Plan Keeyask in 2019, the 750 MW transmission line, Conawapa in 2025 and then natural gas fueled generation as needed. It also includes the WPS Sale and WPS Investment assumptions used in the 2012 analysis within the MH NFAT filing (K19/C25/750MW WPS Sale & Inv)

The MH 2014 update analysis also included a change in MH perspective on the probabilities that should be assigned to the capital cost uncertainty branches. This is due to MH having more information on the Keeyask costs. The original NFAT filing of the 2012 analysis included the modeling of uncertainty around the capital costs of generation. MH provide in the NFAT filing reference, high and capital cost estimates for Keeyask, Conawapa, wind generation, simple cycle combustion turbines and combined cycle combustion turbines. In the MH NFAT uncertainty analysis the probabilities assigned by MH were 20% for Low, 50% for Reference and 30% for High Capital Costs. One of the changes in the MH 2014 Update analysis is that they have lowered the probability of the High Capital Costs scenarios to 20% and increased the probability of the reference to 60%.

---

<sup>1</sup> LCA notes that Plan 6 Keeyask in 2019, the 750 MW transmission line and then natural gas fueled generation as needed beginning in 2031 (K19/Gas31/750 MW) was not updated by MH and thus could not be included in the LCA updates reflected in this document.

LCA understands that the third element of changes by MH in the 2014 Update analysis included an adjustment to remove 'common costs' to all plans from the analysis. MH assumed that the common costs for each year of the analysis for each plan of analysis were the annual net revenue from generation in Plan 1 All Gas.

### MH 2014 Update to the 2013 NFAT filing Analysis

The MH NFAT filing included a 2013 update analysis within an updated Reference Scenario. The MH NFAT filing 2013 update analysis included changes in resource in-service dates to match the needs which arise from the 2013 load forecast which is lower than the 2012 load forecast. The MH NFAT filing 2013 analysis was conducted for the following five resource development plans:

- **Plan 1 All Gas**
- **Plan 2 Keeyask moved to 2023 and then natural gas fueled generation as needed (K23/Gas)**
- **Plan 4 Keeyask in 2019, the 250 MW transmission line and then natural gas fueled generation as needed beginning later in 2025 (K19/Gas30/250MW)**
- **Plan 12 Keeyask in 2019, the 750 MW transmission line, and Conawapa now delayed until 2033. (K19/C33/750MW)**
- **Plan 14 The Preferred Development Plan Keeyask in 2019, the 750 MW transmission line, Conawapa delayed to 2025 and then natural gas fueled generation as needed. It also includes the WPS Sale and WPS Investment assumptions used in the 2013 analysis within the MH NFAT filing (K19/C25/750MW WPS Sale & Inv)**

The 2013 update in the MH NFAT filing was only conducted as a new Reference Scenario.

The Keeyask and Conawapa updated capital cost economic analysis in the presentation of March 10, 2014 was applied to only **Plan 1 All Gas, Plan 5 (K19/Gas25/750MW/WPS Sale & Inv), and Plan 14 Preferred Development Plan (K19/C25/750MW WPS Sale & Inv)** under the MH NFAT filing 2013 update analysis. The capital cost update also incorporated some new economic analysis which includes different level of DSM programs; costs, energy savings and peak demand savings. The presentation on March 10<sup>th</sup> by MH included DSM analyses involving only **Plan 1 All Gas, Plan 5**

(K19/Gas25/750MW/WPS Sale & Inv), and Plan 14 Preferred Development Plan (K19/C25/750MW WPS Sale & Inv).

## **II. LCA Limited Update of Technical Appendices 9A and 9B**

La Capra Associates was asked by counsel for the PUB Panel if there was any analysis from our January 24, 2014 and February 28, 2014 reports that could be updated to incorporate this new MH analysis, capital cost and DSM results. LCA was able to update significant amounts of the analysis in Technical Appendices 9A and 9B. These technical appendices did not include any analysis of the 2013 update provided by MH in their NFAT filing. The LCA analysis updated within this document applied to only analysis relative to LCA's review of the MH 2012 NFAT filing analysis. There are additional aspects derived from LCA review of the MH 2014 update for capital costs that was applied by MH to the 2013 analysis that will be part of the LCA direct testimony, which are not part of this addendum to Technical Appendices 9A and 9B.

The LCA review of the MH NFAT 2012 analysis also included the development of additional metrics, internal rate of return (IRR), cumulative present value break-even, and the cumulative present values of cash flows at the end of 20, 35 and 50 years. These additional metrics are provided to supplement the MH 78 year NPV metric.

As LCA discussed in Technical Appendix 9A LCA differs from MH in its approach to uncertainty analysis and risk profiles (S-Curves). LCA determines the economics of each plan as compared to the All Gas plan as the base case for each of the 27 scenarios or 'branches' of the uncertainty 'tree'. The LCA methodology will determine the performance of a resource development plan such as the Preferred Development Plan by subtracting the present value of the its costs under non-reference scenario assumptions (for example, high capital cost, high energy prices and high discount rates assumptions) from the present value of the costs of the All Gas Plan under the same non-reference scenario assumptions (for example, high capital cost, high energy prices and high discount rates assumptions).

In addition based upon consultation with MPA, another IEC used for this NFAT review, LCA decided that the Manitoba Provincial Perspective of View is better represented without treating the 1% debt guarantee fee charged by the Province to MH

and its customers as a transfer payment. As discussed in technical Appendix 9A it is believed that this fee is compensatory for the assumption of risk by the Province.

LCA used the limited information described in the introduction of this addendum to update a reasonable portion of the analysis in Technical Appendices 9A and 9B. The analysis still utilizes the LCA methodology for Uncertainty Analysis and for determining the Provincial View that was used in TA 9A & 9B. The LCA update in this addendum is limited to only the plans studied by MH and provided in their presentations for direct testimony, both public and CSI.

The LCA update in this addendum includes 2012 analysis for the reference scenario, uncertainty analysis and risk profiles (S-curves), sensitivities to discount rates, capital cost, and energy prices. The LCA update includes metrics from the MH perspective and the Province of Manitoba Perspective. The LCA update includes the metrics of CPV at 20, 35 and 50 years, IRR and Cumulative Present Value Breakeven.

### **III. Contents of this Addendum**

In the pages that follow there are table and charts that match up closely with figures in TA 9A & 9B. The tables and charts in those appendices were all labeled as figures and numbered sequentially and continually, such that the first figure in Technical Appendix 9B is Figure 9-103. LCA has updated the TA 9A & 9B figures that could be at least partially updated from the information available from MH's direct testimony presentations.

The figures which follow use the same numerical designation as the corresponding figure in TA 9A or 9B with the letter 'U' added. For example the first figure in this addendum is Figure 9-21U. This is a partial update to Figure 9-21 provided on Page 9A-48 as shown in TA 9A. If the information is less than the original it is due to an inability to derive update information from the limited information provided in the MH presentations. LCA did not have any detailed cash flow analysis tables until after March 28, 2014 and thus was not able to use them in this analysis.

There are a few figures which were added in this addendum. There were added since they provide numerical information for a S-Curve figure. For example, the table in

*The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.*

Figure 9-29U(2) found below was not in TA 9A. LCA has attempted to make the appearance of the addendum figures as close as possible to the original figures.

The extremely limited time to conduct the analysis of the MH 2014 Capital Cost Update has not afforded LCA the opportunity to produce a full Technical Appendix, which would include more explanations, discussion, observations, and summaries. The typical observations LCA would make for each updated figure are of the same type of observation made for the original figure in TA 9A or 9B. The numerical values of metrics have changed, thus conclusions that may result from the updated metrics may differ substantially from conclusions made from the original metric.



The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.

### IV. Updated Figures for Appendix 9A

Plans	Compared to All Gas						Approximated 78 Year IRR
	78 CPV of Total Capital	78 NPV	50 CPV	35 CPV	20 CPV	Break Even Year	
2 K22/Gas	\$398	\$489	\$81	(\$584)	(\$1,781)	2059	5.9%
4 K19/Gas24/250MW	\$429	\$917	\$489	(\$170)	(\$1,493)	2050	6.4%
5 K19/Gas25/750MW (WPS)	\$430	\$667	\$267	(\$263)	(\$1,720)	2053	6.0%
8 CCGT/C26	\$381	\$403	(\$204)	(\$1,091)	(\$2,999)	2067	5.5%
14 K19/C25/750 (WPS)	\$898	\$798	(\$180)	(\$1,653)	(\$4,759)	2065	5.6%

Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-21U: Summary- CPVs as Compared to All Gas Plan at the end of Various Periods, Break-Even Year, 78 year IRR and 78 Year CPV of Total Capital - Millions of 2014 Present Value Dollars

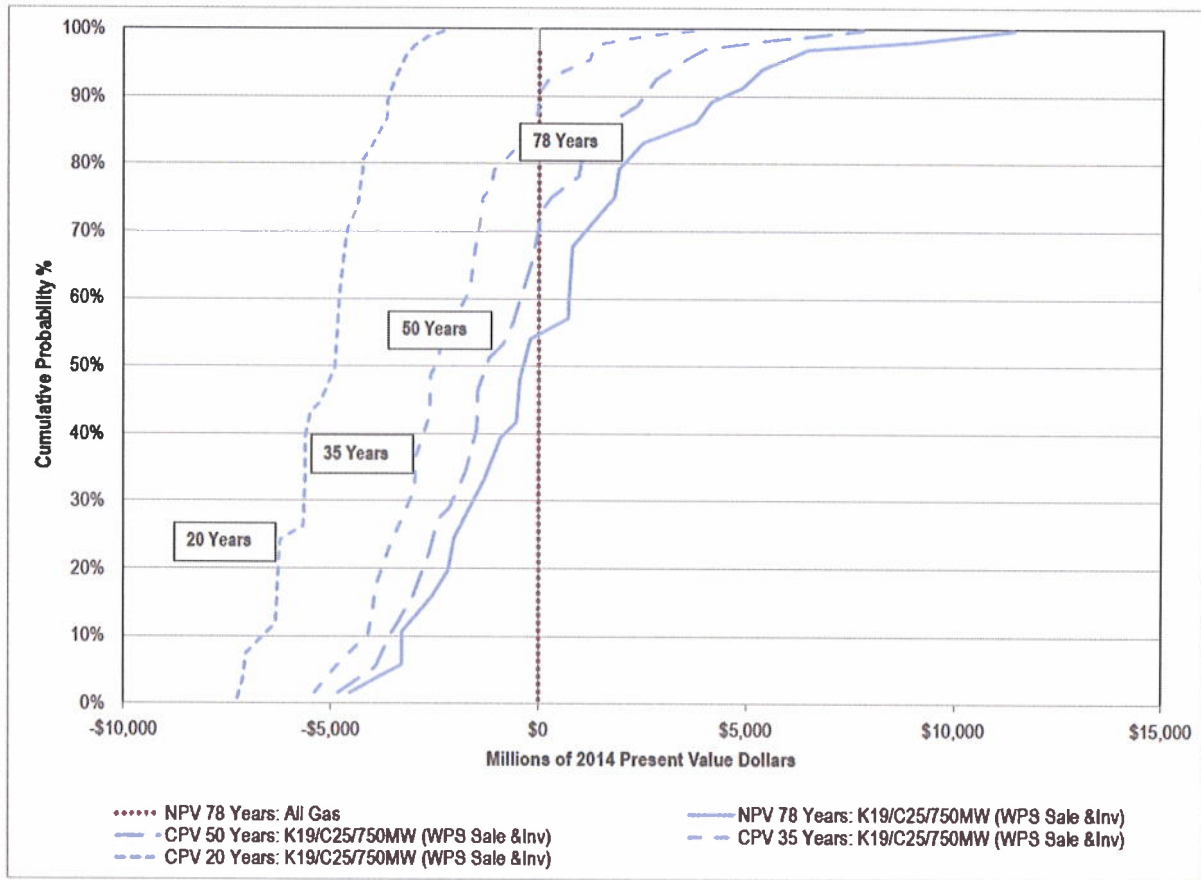
Development Plan			1	2	4	8	5	14	
			All Gas	K22/Gas	K19/Gas 24 /250MW	CCGT/C26	K19/Gas25 /750MW	K19/C25 /750MW	
			WPS Sale & Investment						
Energy Prices	Discount Rates	Capital Costs	Millions of 2014 NPV Dollars						
Low	Low	H	0	-339	211	-439	546	-521	
		Ref	0	84	714	174	974	700	
		L	0	471	1164	715	1352	1805	
	Ref	H	0	-1288	-1049	-1935	-868	-3292	
		Ref	0	-885	-542	-1293	-380	-2035	
		L	0	-518	-92	-735	45	-917	
	High	H	0	-1694	-1673	-2537	-1587	-4552	
		Ref	0	-1307	-1164	-1896	-1067	-3292	
		L	0	-956	-713	-1342	-618	-2179	
	Ref	Low	H	0	1913	2576	2358	2269	4144
			Ref	0	2335	3079	2971	2697	5365
			L	0	2723	3529	3512	3074	6470
Ref		H	0	86	411	-239	179	-459	
		Ref	0	489	917	403	667	798	
		L	0	855	1368	961	1092	1916	
High		H	0	-733	-637	-1360	-854	-2579	
		Ref	0	-345	-127	-718	-333	-1318	
		L	0	6	324	-165	116	-205	
High		Low	H	0	4346	5101	5459	4099	9085
			Ref	0	4769	5603	6072	4526	10306
			L	0	5156	6054	6613	4904	11410
	Ref	H	0	1560	1955	1627	1270	2498	
		Ref	0	1963	2461	2269	1758	3755	
		L	0	2329	2912	2827	2183	4873	
	High	H	0	292	450	-74	-104	-545	
		Ref	0	679	959	567	415	715	
		L	0	1031	1411	1121	866	1829	

Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-26U: Probabilistic Analysis Quilt 78 Year with LCA Methodology for Determining Comparisons to All Gas Plan



The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.



Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

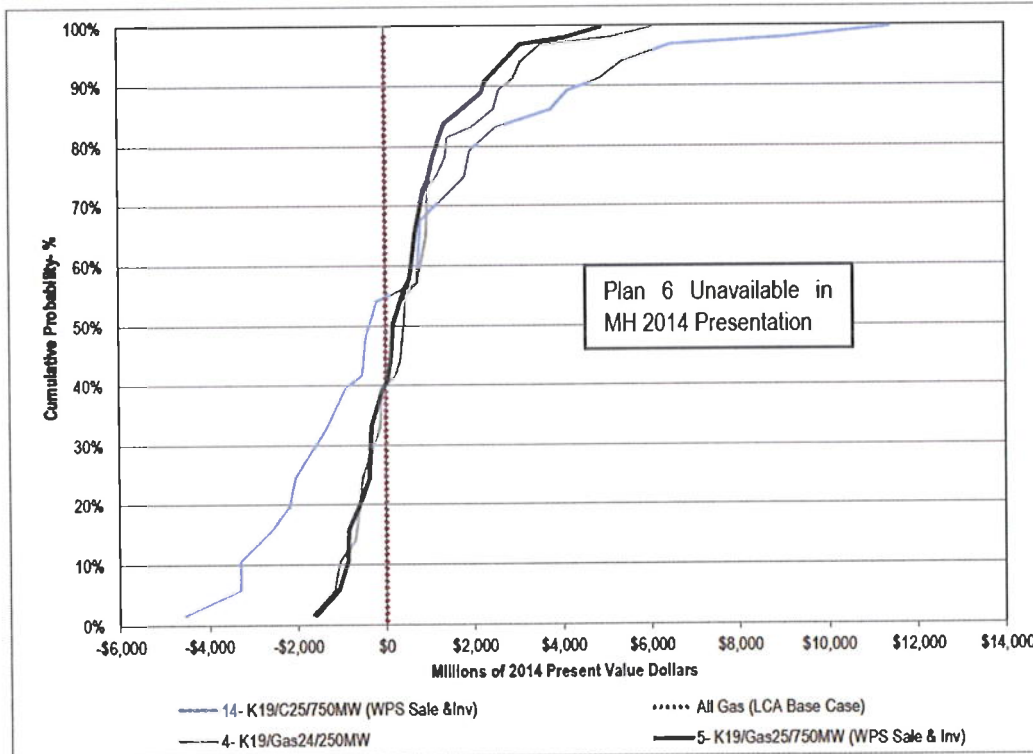
Figure 9-29U: Probability Distributions of Plan 14 Preferred Development Plan having Higher Costs than the All Gas Plan- Millions of 2014 Present Value Dollars

Base Case: All Gas				
Change Case: K19/C25/750MW (WPS Sale & Inv)				
Time Period	20 Years	35 Years	50 Years	78 Years
	Millions of 2014 CPV Dollars			
REF-REF-REF NPV	-4785	-1664	-184	798
10th Percentile - "Risk"	-6637	-4142	-3578	-3292
90th Percentile - "Reward"	-3606	-13	2506	4424
Expected Value	-5120	-2193	-794	187

Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-29U(2): Supplemental table to above chart (not included in original filing)

The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.



Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

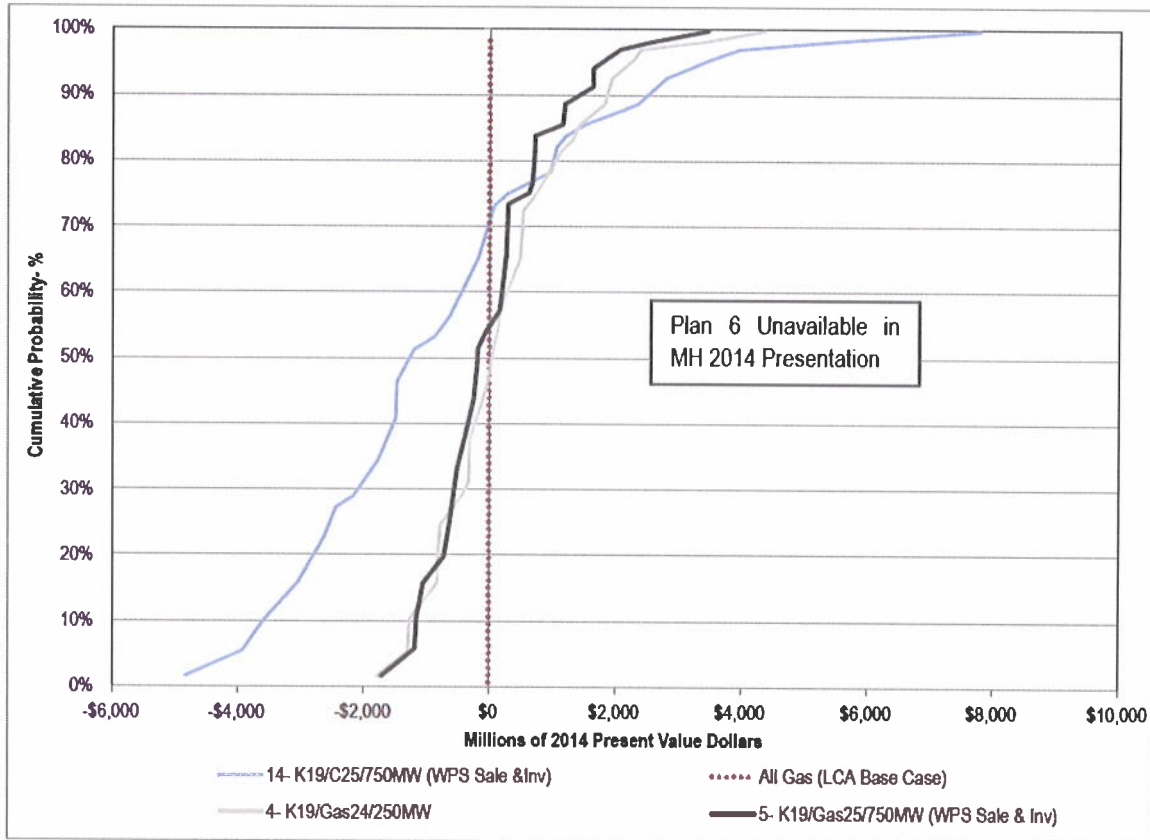
Figure 9-34U: Probability Distribution of Selected Plans Compared having higher costs than the All Gas Plan after 78 Years using the LCA Methodology - Millions of 2014 Present Value Dollars

LCA Base Case: 78 Year Study Period			
Plan Number	14	5	4
Millions of 2014 PVDollars			
REF-REF-REF NPV	798	667	917
10th Percentile - "Risk"	-3292	-895	-1064
90th Percentile - "Reward"	4424	2237	2705
Expected Value	187	410	609

Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-34U(2): Supplemental table to above chart (not included in original filing)

The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.



Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

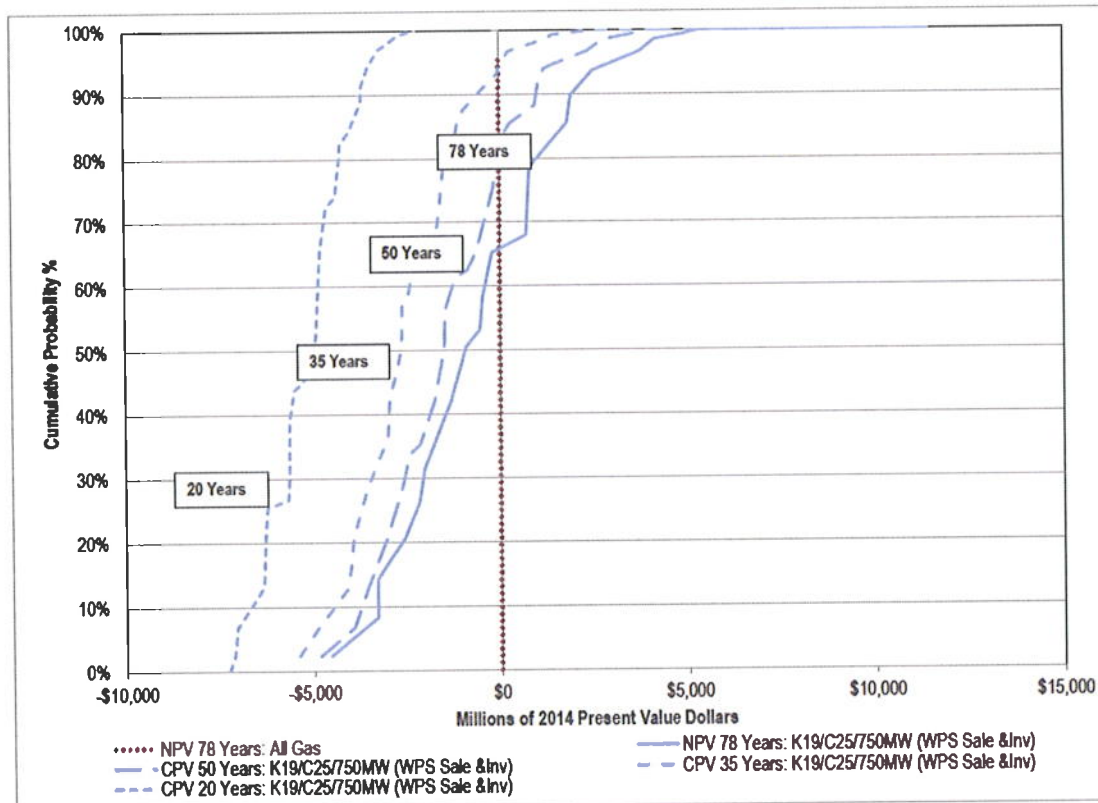
Figure 9-35U: Probability Distributions of Selected Plans having higher costs than the All Gas Plan after 50 years using LCA Methodology- Millions of 2014 Present Value Dollars

LCA Base Case: 50 Year Study Period			
Plan Number	14	5	4
Millions of 2014 PV Dollars			
REF-REF-REF NPV	-184	265	487
10th Percentile - "Risk"	-3578	-1152	-1265
90th Percentile - "Reward"	2506	1431	1861
Expected Value	-794	6	184

Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-35U(2): Supplemental table to above chart (not included in original filing)

The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.



Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-45U: Probability Distributions of Plan 14 Preferred Development Plan having Higher Costs than the All Gas Plan when eliminating Low Discount Rate Scenarios- Millions of 2014 Present Value Dollars

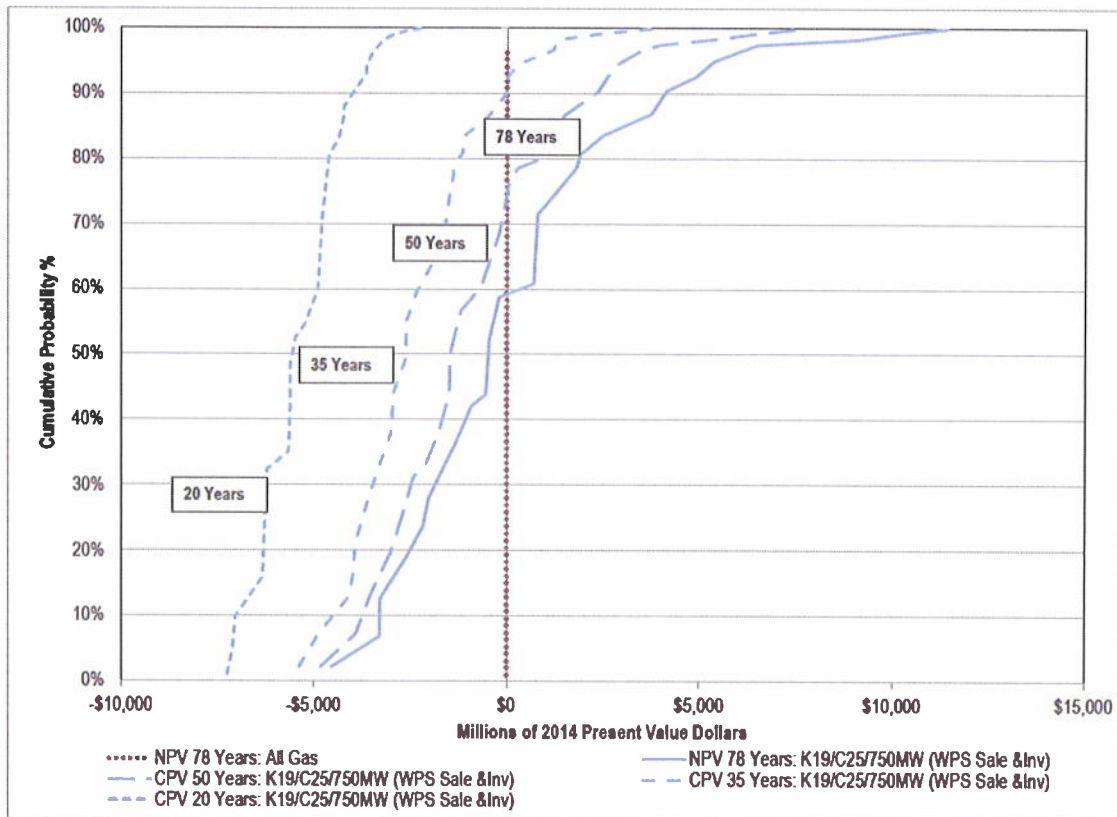
Base Case: All Gas				
Change Case: K19/C25/750MW (WPS Sale & Inv)				
Time Period	20 Years	35 Years	50 Years	78 Years
Millions of 2014 CPV Dollars				
REF-REF-REF NPV	-4785	-1664	-184	798
10th Percentile - "Risk"	-6685	-4457	-3723	-3292
90th Percentile - "Reward"	-3652	-563	1004	1954
Expected Value	-5153	-2560	-1438	-761

Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-45U(2): Supplemental table to above chart (not included in original filing)



The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.



Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

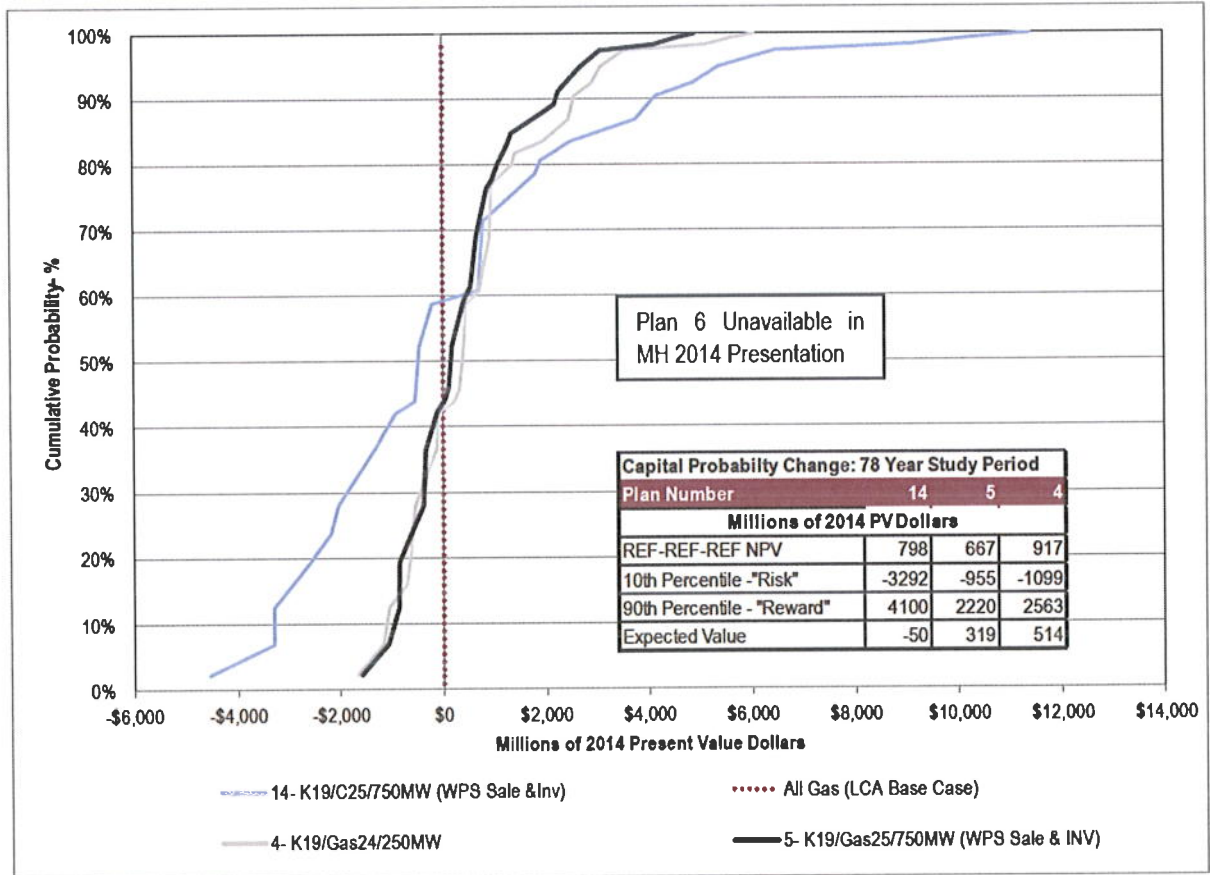
Figure 9-49U: Probability Distributions of Plan 14 Preferred Development Plan having Higher Costs than the All Gas Plan with Higher Probabilities of Higher Capital Costs- Millions of 2014 Present Value Dollars

Base Case: All Gas				
Change Case: K19/C25/750MW (WPS Sale & Inv)				
Time Period	20 Years	35 Years	50 Years	78 Years
Millions of 2014 CPV Dollars				
REF-REF-REF NPV	-4785	-1664	-184	798
10th Percentile - "Risk"	-7036	-4492	-3739	-3292
90th Percentile - "Reward"	-3996	-17	2305	4100
Expected Value	-5400	-2443	-1036	-50

Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-49U(2): Supplemental table to above chart (not included in original filing)

The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.

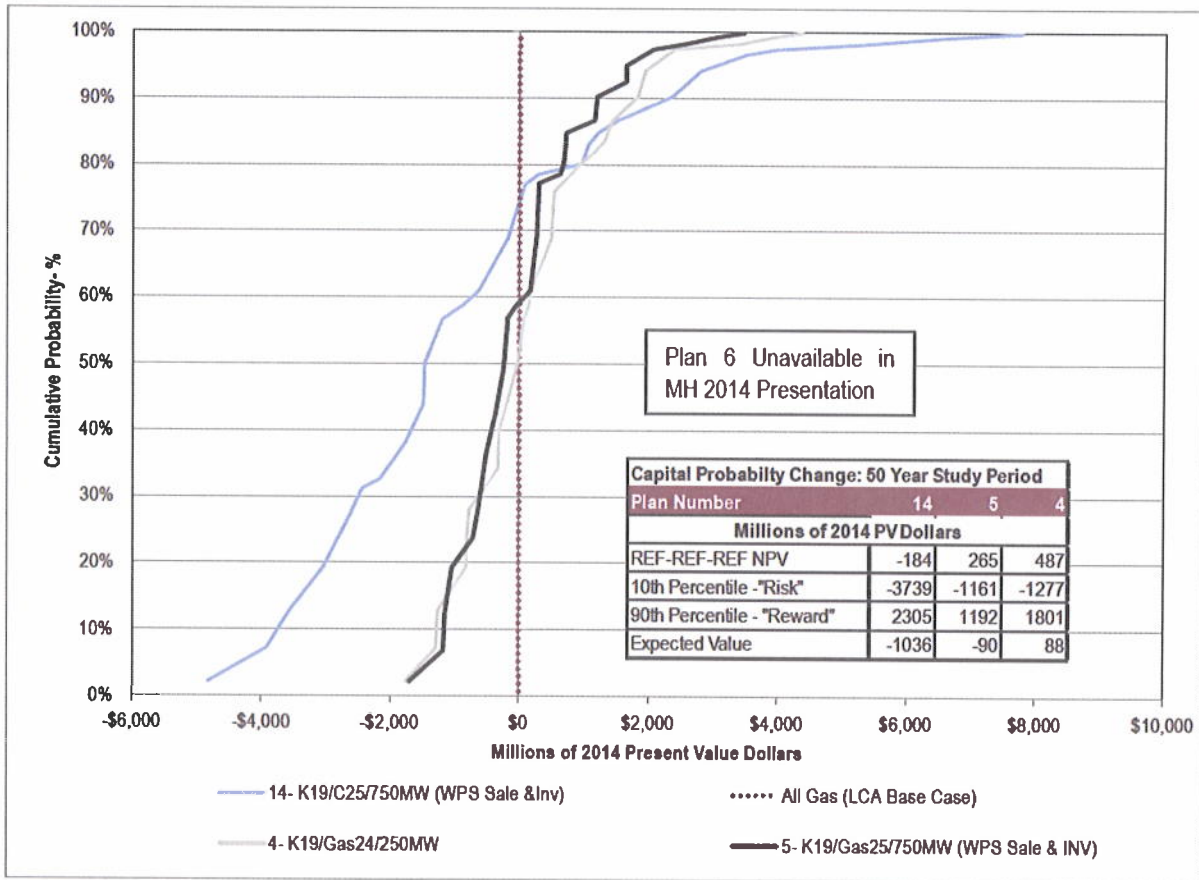


Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-51U: The Impact of the assumed change in Capital Cost Probabilities on the Probability Distributions of Selected Development Plans having Higher Costs than the All Gas Plan – Millions of 2014 Present Value Dollars



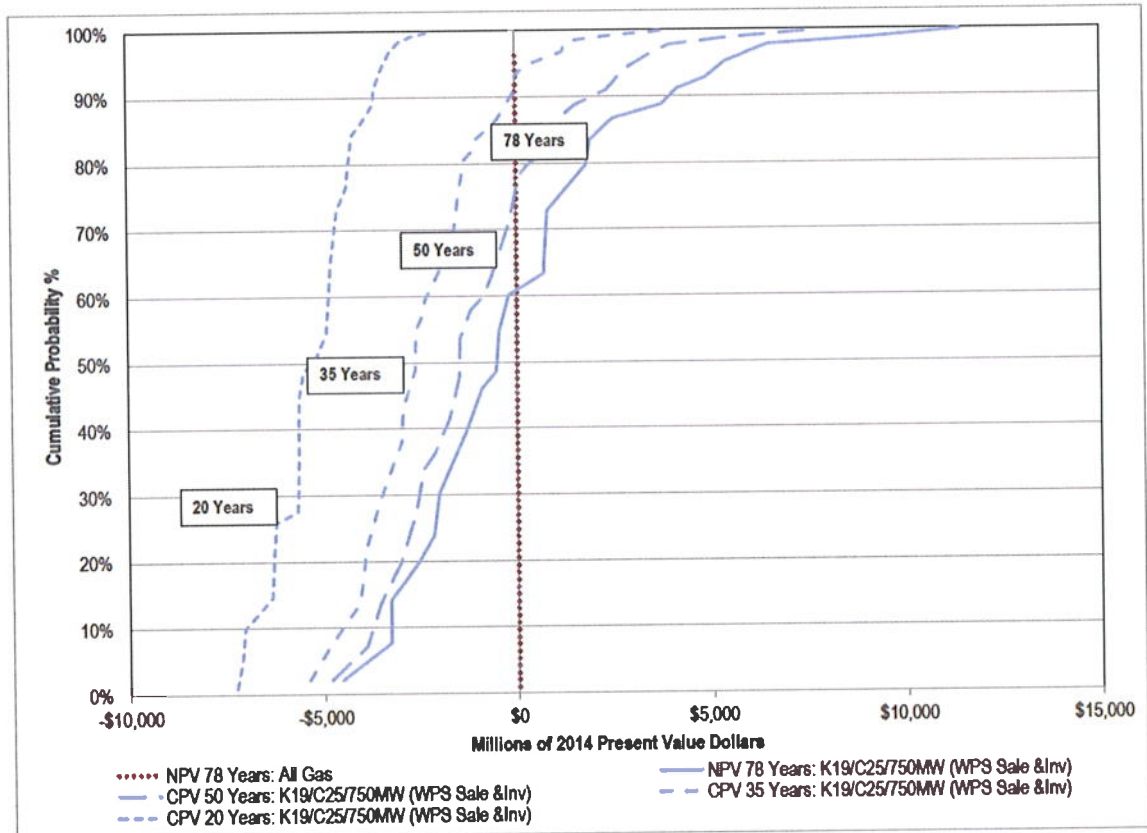
The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.



Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-52U: The Impact of the assumed change in Capital Cost Probabilities on the Probability Distributions of the Selected Development Plans having Higher Costs than the All Gas Plan after 50 Years – Millions of 2014 Present Value Dollars

The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.



Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

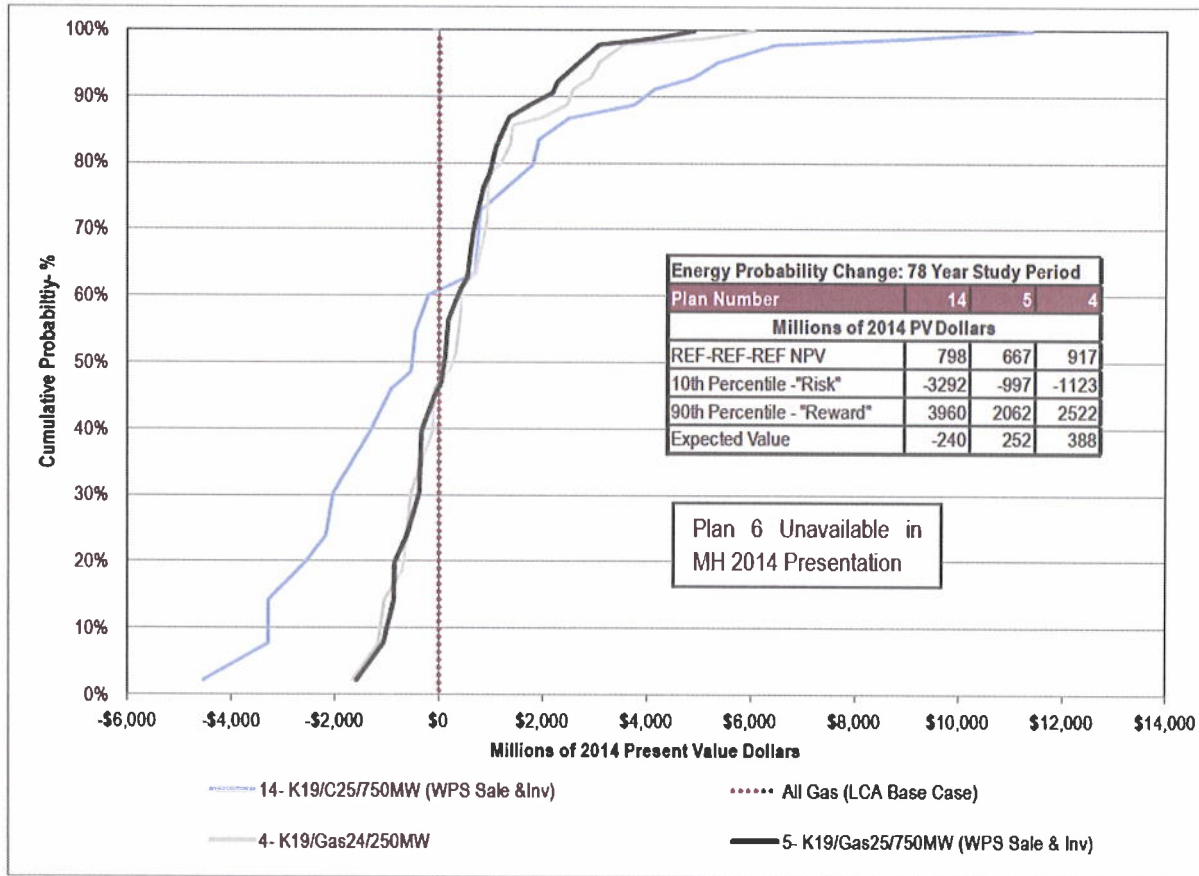
Figure 9-54U: Probability Distributions of Plan 14 Preferred Development Plan having Higher Costs than the All Gas Plan with Changing Energy Cost Probabilities – Millions of 2014 Present Value Dollars

Base Case: All Gas				
Change Case: K19/C25/750MW (WPS Sale & Inv)				
Time Period	20 Years	35 Years	50 Years	78 Years
Millions of 2014 CPV Dollars				
REF-REF-REF NPV	-4785	-1664	-184	798
10th Percentile - "Risk"	-7033	-4545	-3763	-3292
90th Percentile - "Reward"	-3652	-116	1993	3960
Expected Value	-5242	-2471	-1159	-240

Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-54U(2): Supplemental table to above chart (not included in original filing)

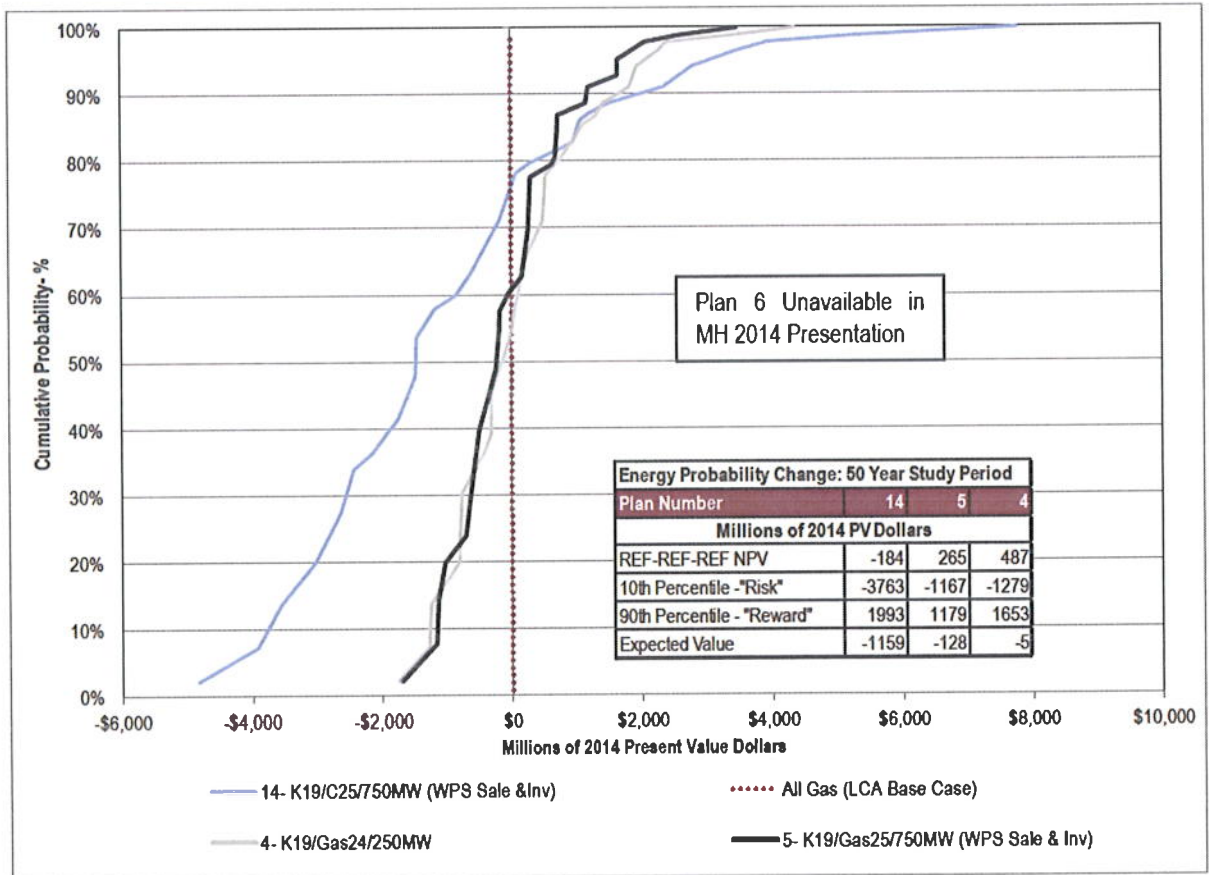
The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.



Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-56U: The Impact of the assumed change in Energy Price Probabilities on the Probability Distributions of Selected Development Plans having Higher Costs than the All Gas Plan after 78 years - Millions of 2014 Present Value Dollars

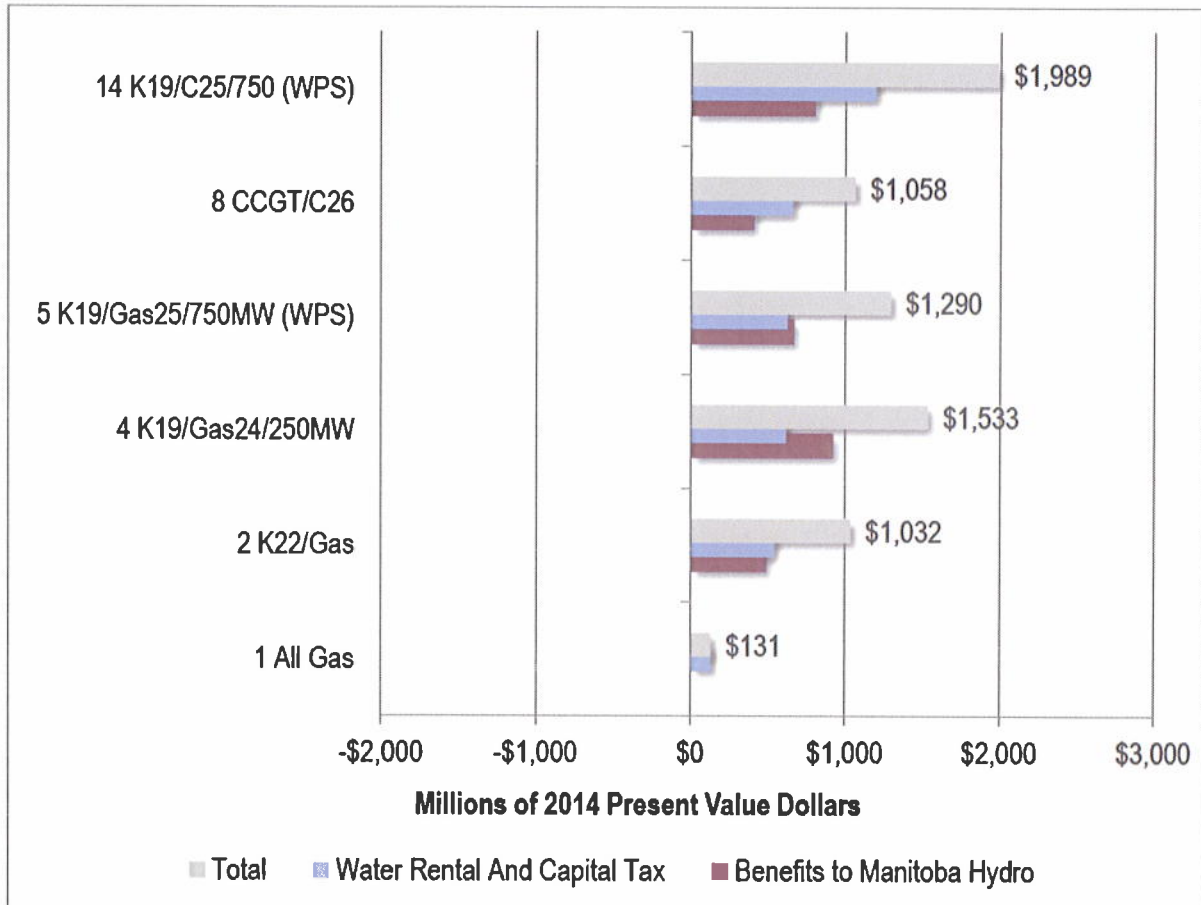
The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.



Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-57U: The Impact of the assumed change in energy Price Probabilities on the Probability Distributions of the Selected Development Plans having Higher Costs than the All Gas Plan after 50 years - Millions of 2014 Present Value Dollars

The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.

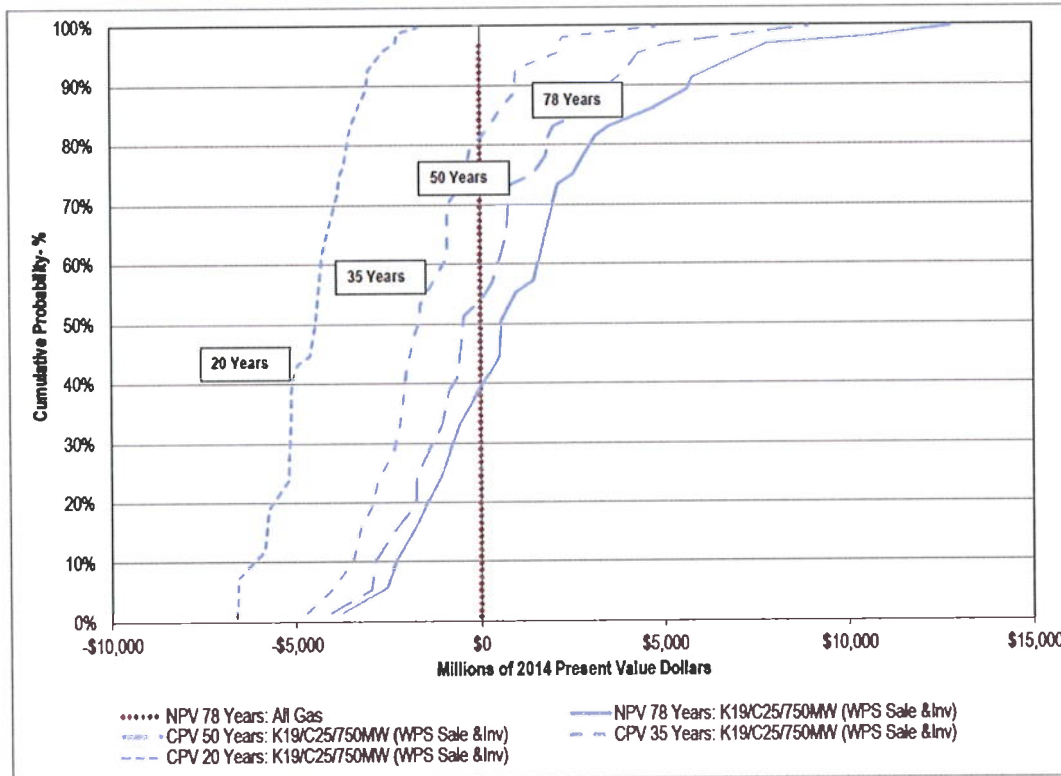


Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-76U: Resource Plan Economic Benefits after 78 years to the Province of Manitoba from LCA Perspective - Millions of 2014 Present Value Dollars



The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.



Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-80U: Probability Distributions of Plan 14 Preferred Development Plan having Higher Costs than the All Gas Plan after 78 Years from the Province of Manitoba Perspective by eliminating LCA view of Intra-provincial transfers – Millions of 2014 Present Value Dollars

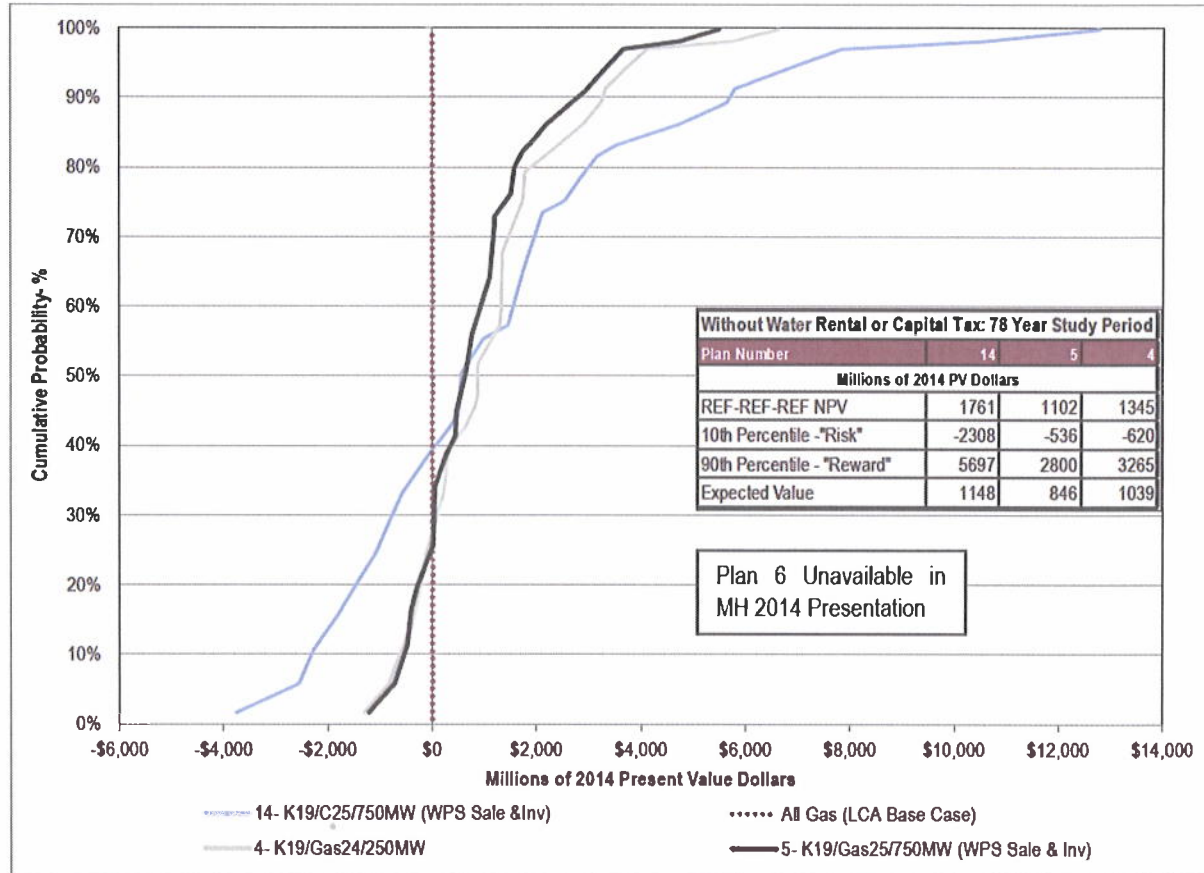
Base Case: All Gas				
Change Case: K19/C25/750MW (WPS Sale & Inv)				
Time Period	20 Years	35 Years	50 Years	78 Years
Millions of 2014 CPV Dollars				
REF-REF-REF NPV	-4287	-901	698	1761
10th Percentile - "Risk"	-6160	-3500	-2864	-2308
90th Percentile - "Reward"	-3045	976	3503	5697
Expected Value	-4589	-1435	81	1148

Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-80U(2): Supplemental table to above chart (not included in original filing)



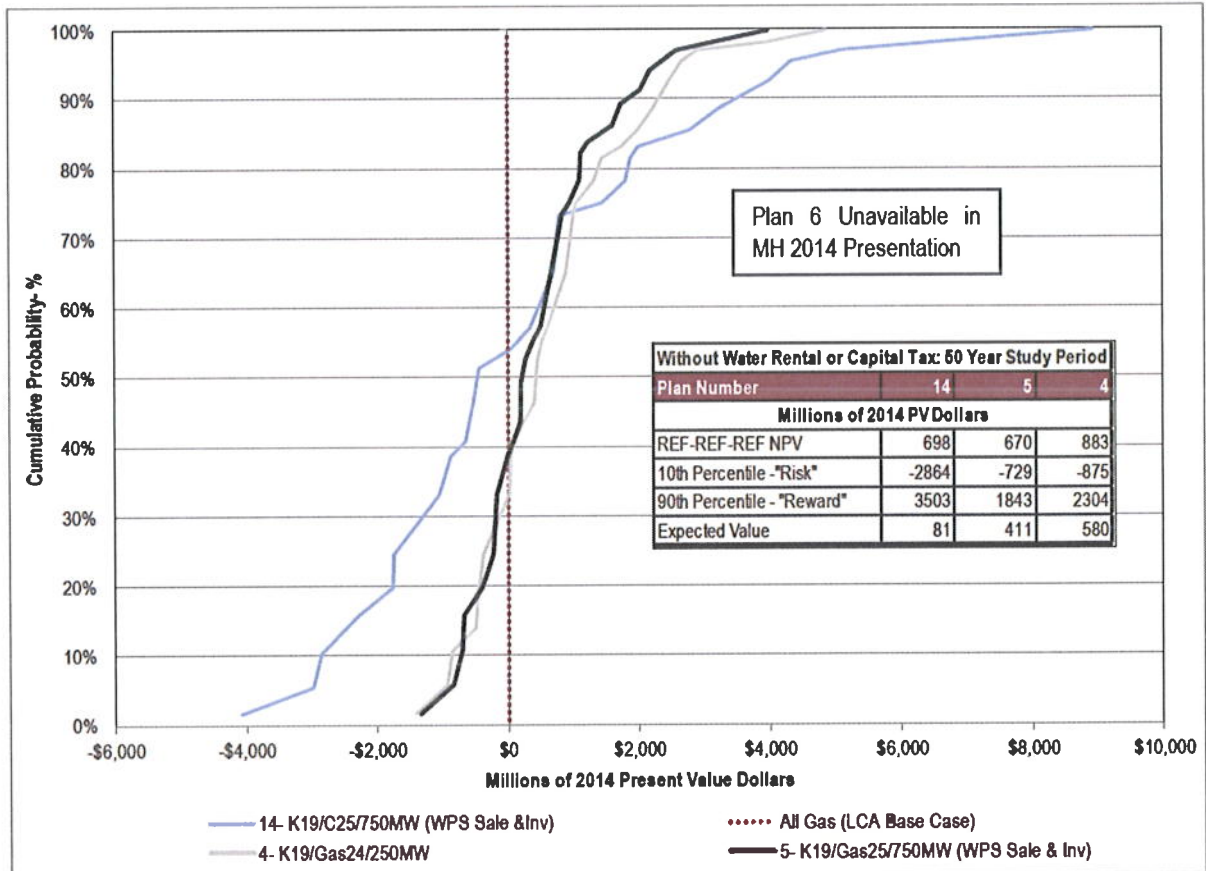
The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.



Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-82U: The Province of Manitoba Perspective of Probability Distributions of Selected Plans having Higher Costs than the All Gas Plan after 78 years - Millions of 2014 Present Value Dollars

The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.

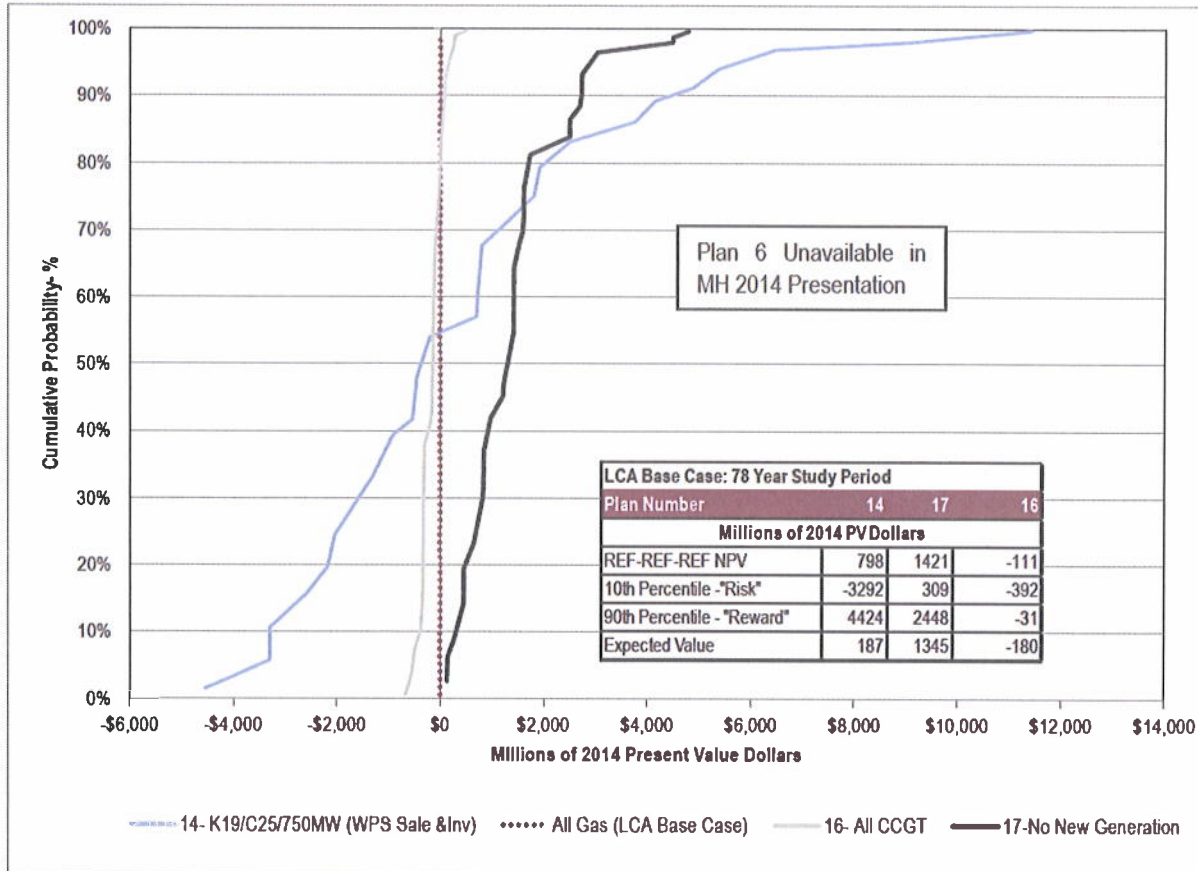


Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-83U: The Province of Manitoba Perspective of Probability Distributions of the Selected Plans having higher Costs than the All Gas Plan after 50 years - Millions of 2014 Present Value Dollars

The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.

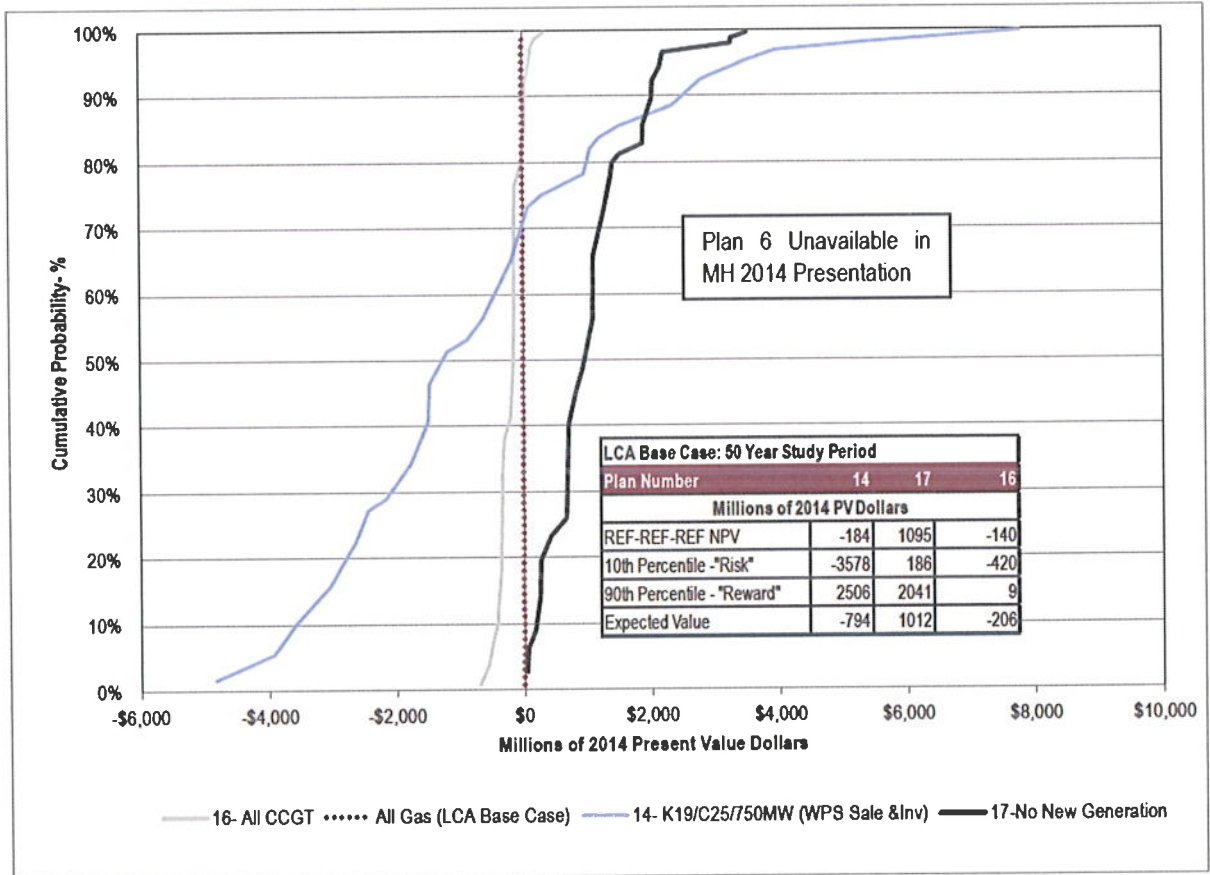
### V. Updated Figures for Appendix 9B



Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-95U: Probability Distributions of Supplemental Plans having higher costs than the All Gas Plan after 78 Years using the LCA Methodology- Millions of 2014 Present Value Dollars

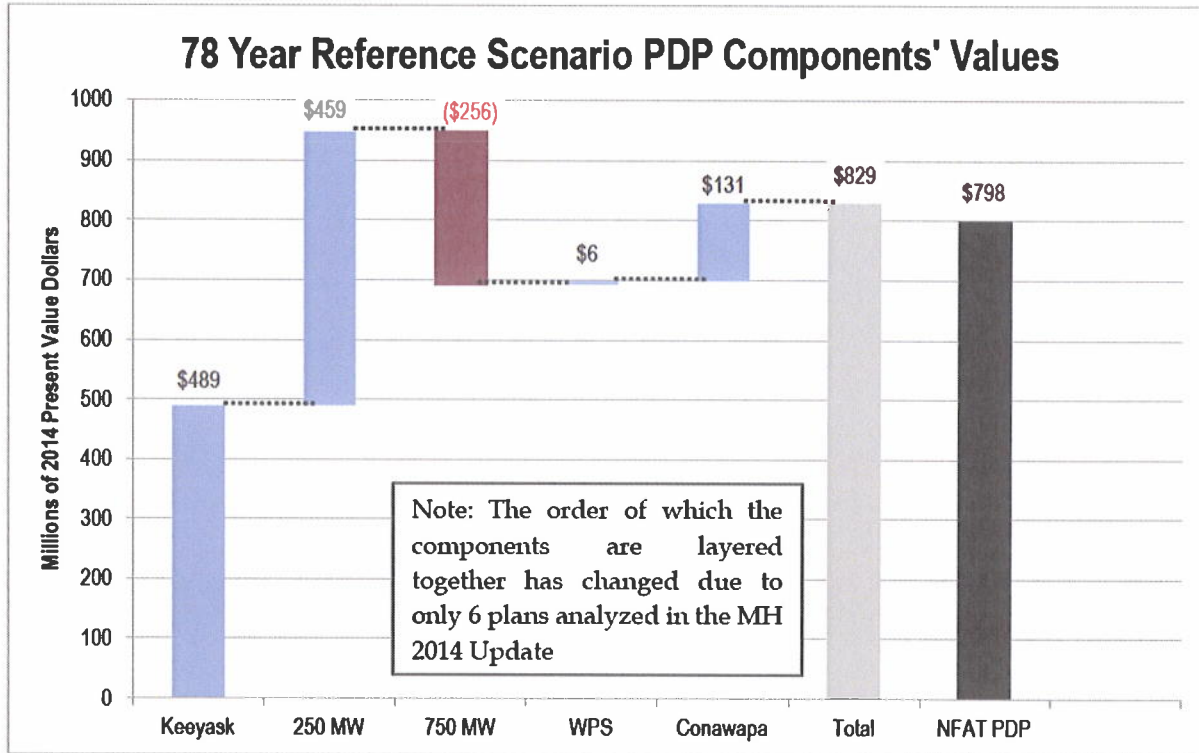
The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.



Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-96U: Probability Distributions of Supplemental Plans having higher costs than the All Gas Plan after 50 Years using the LCA Methodology- Millions of 2014 Present Value Dollars

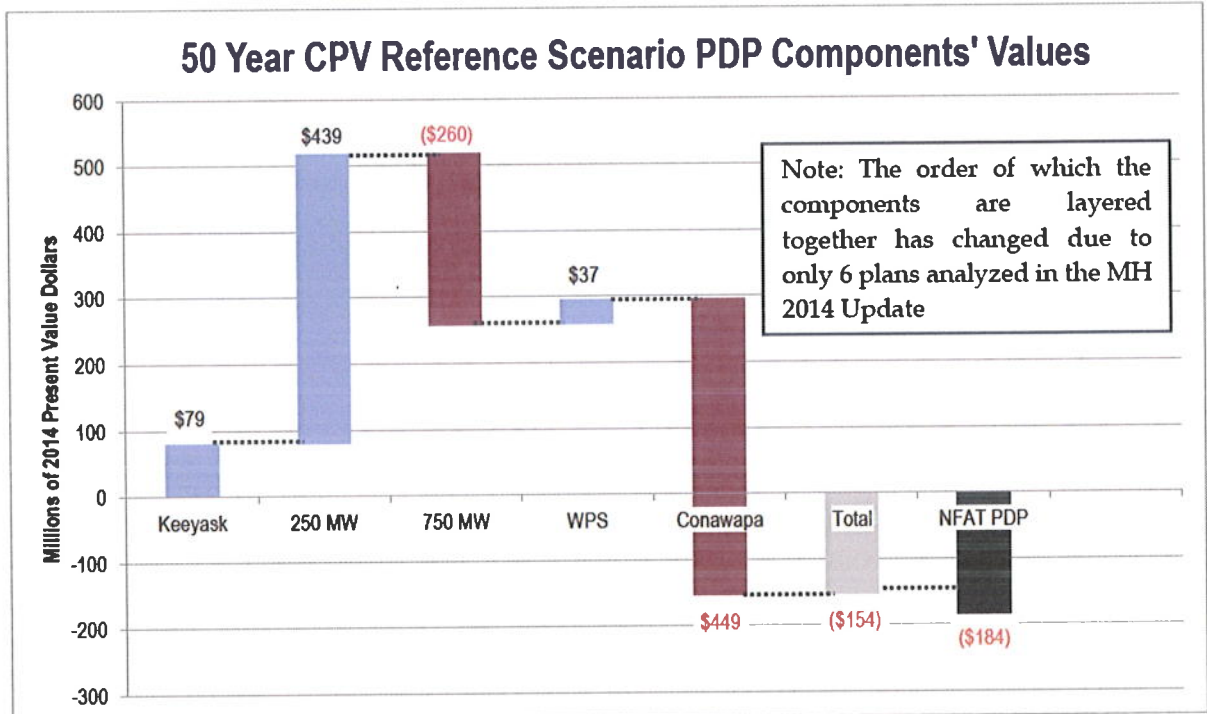
The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.



Updated for increased capital costs of Keyeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-99U: Value of PDP Components – 78 Year NPV vs. All Gas

The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.

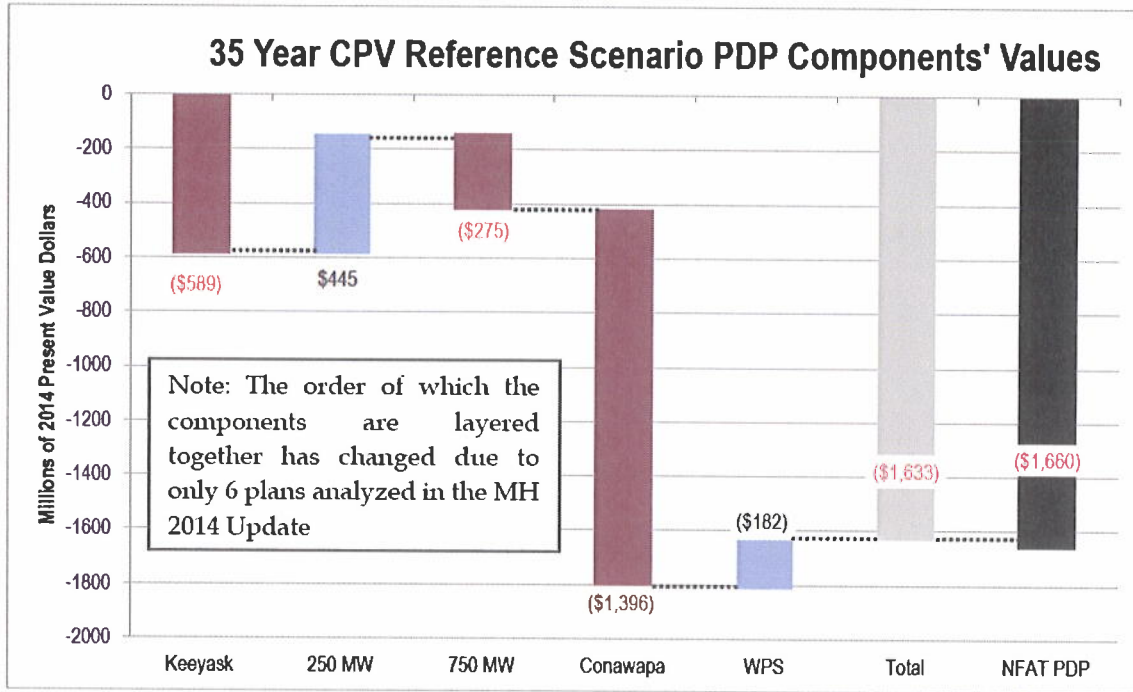


Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-100U: Value of PDP Components - 50 Year NPV vs. All Gas



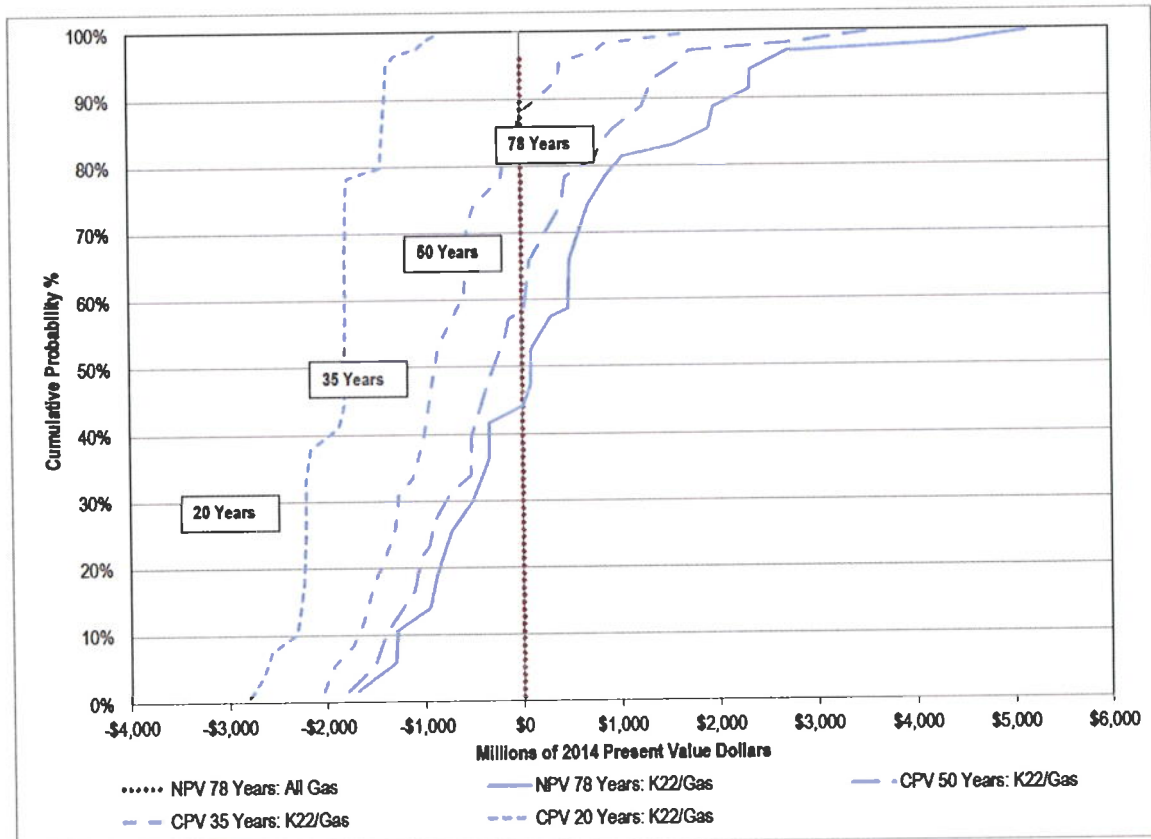
The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.



Updated for increased capital costs of Keyyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-101U: Value of PDP Components – 35 Year NPV vs. All Gas

The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.



Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

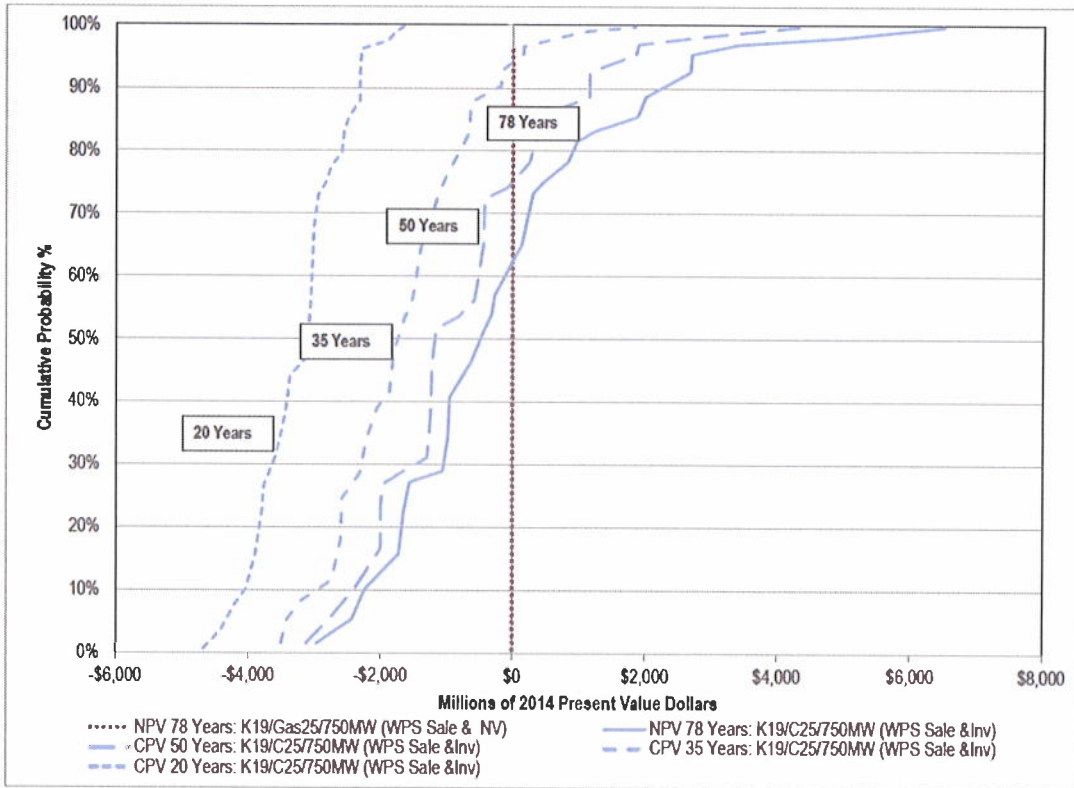
Figure 9-102U: Comparing Plan 2-K22/Gas to Plan 1-All Gas to test economics of Keeyask, with an ISY 2022 - Millions of 2014 Present Value Dollars

Base Case:All Gas				
Change Case:K22/Gas				
Time Period	20 Years	35 Years	50 Years	78 Years
Millions of 2014 CPV Dollars				
REF-REF-REF NPV	-1792	-589	79	489
10th Percentile - "Risk"	-2325	-1687	-1407	-1291
90th Percentile - "Reward"	-1379	173	1274	2158
Expected Value	-1906	-796	-168	237

Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-103U: Expected value, risk, reward, and all reference case of Plan 2- K22/Gas Compared to Plan 1-All Gas from Probability Distributions

The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.



Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

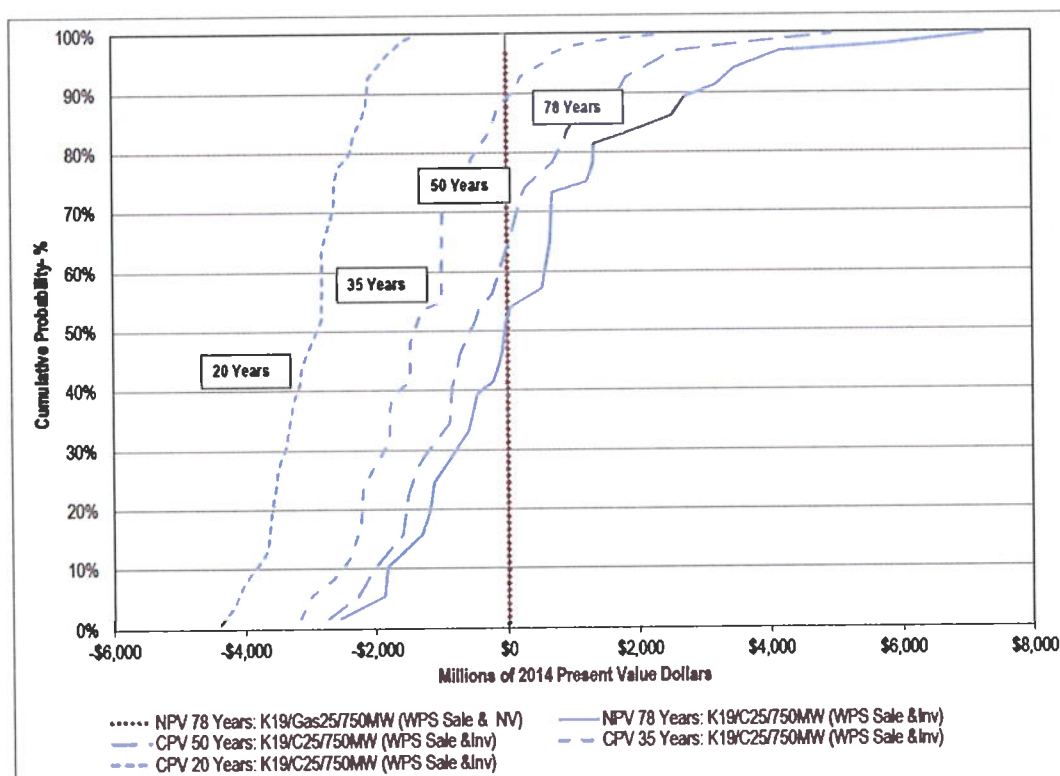
Figure 9-124U: Comparing Plan 14 Preferred Development Plan to Plan 5-K19/Gas25/750MW (WPS Sale INV) to test economics of Conawapa GS ISY 2025 with 750 MW Transmission and WPS Sale &Inv- Millions of 2014 Present Value Dollars

Base Case:K19/Gas25/750MW (WPS Sale & INV)				
Change Case:K19/C25/750MW (WPS Sale &Inv)				
Time Period	20 Years	35 Years	50 Years	78 Years
	Millions of 2014 CPV Dollars			
REF-REF-REF NPV	-3053	-1396	-449	131
10th Percentile - "Risk"	-4051	-2959	-2402	-2236
90th Percentile - "Reward"	-2309	-244	1154	2236
Expected Value	-3226	-1698	-800	-223

Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-125U: Expected value, risk, reward and all reference case of Plan 14- Preferred Development Plan Compared to Plan 5- K19/Gas25/750 MW (WPS Sale& Inv) from Probability Distributions

The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.



Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where the information was available.

Figure 9-148U: Comparing Plan 14 Preferred Development Plan to Plan 5- K19/Gas25/750MW (WPS Sale & INV) to test economics of Conawapa GS ISY 2025 with 750 Transmission and WPS Sale & Inv from the Province of Manitoba Perspective by eliminating LCA view of Intra-provincial transfers- Millions of 2014 Present Value Dollars

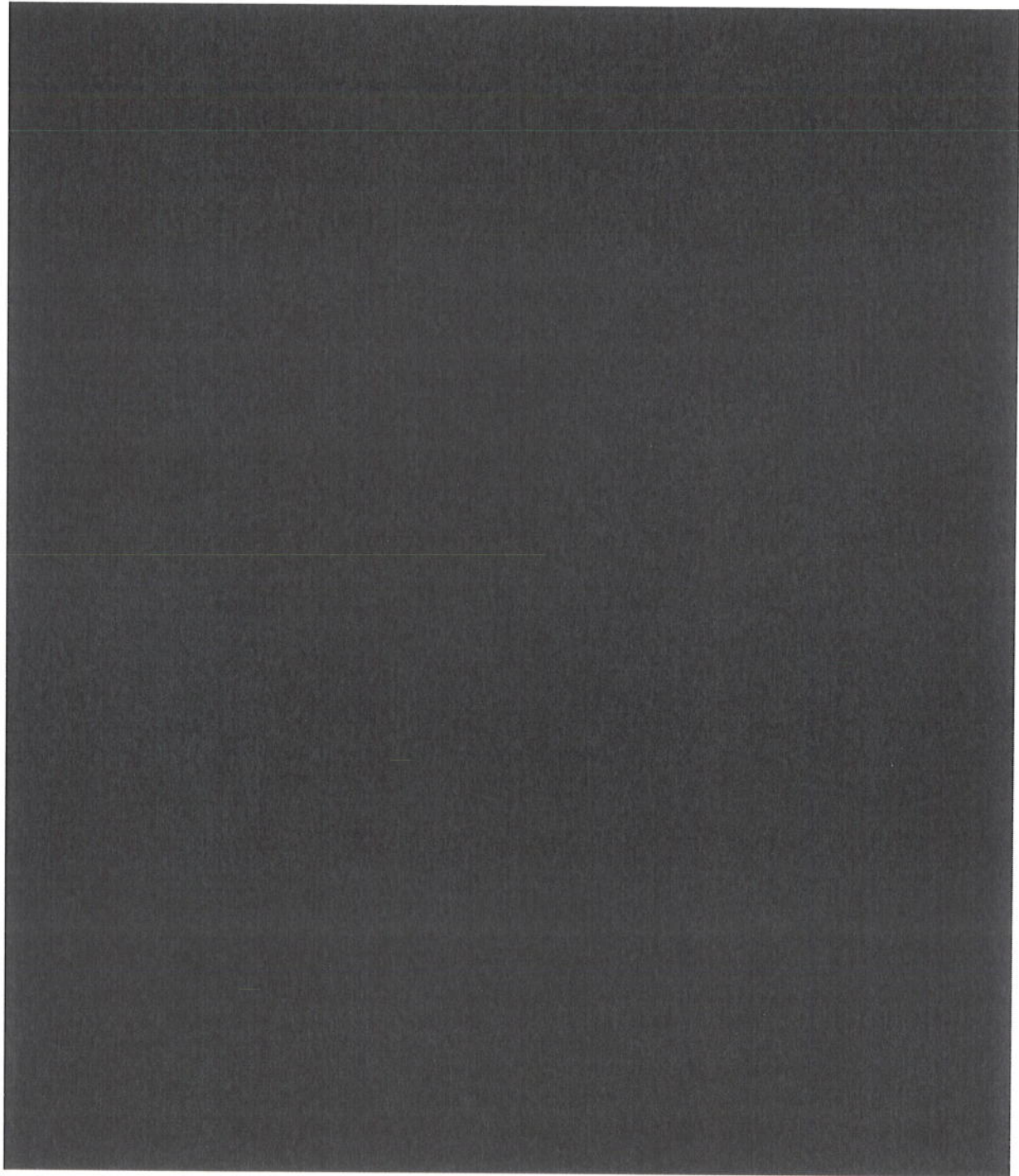
Base Case:K19/Gas25/750MW (WPS Sale & INV)				
Change Case:K19/C25/750MW (WPS Sale & Inv)				
Time Period	20 Years	35 Years	50 Years	78 Years
	Millions of 2014 CPV Dollars			
REF-REF-REF NPV	-2817	-995	27	659
10th Percentile - "Risk"	-3841	-2521	-2027	-1835
90th Percentile - "Reward"	-2105	91	1699	2900
Expected Value	-2975	-1302	-329	302

Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where the information was available.

Figure 9-149U: Expected value, risk, reward, and all reference case of Plan 14 Preferred Development Plan Compared to Plan 5- K19/Gas25/750MW (WPS Sale & INV) from Probability Distributions

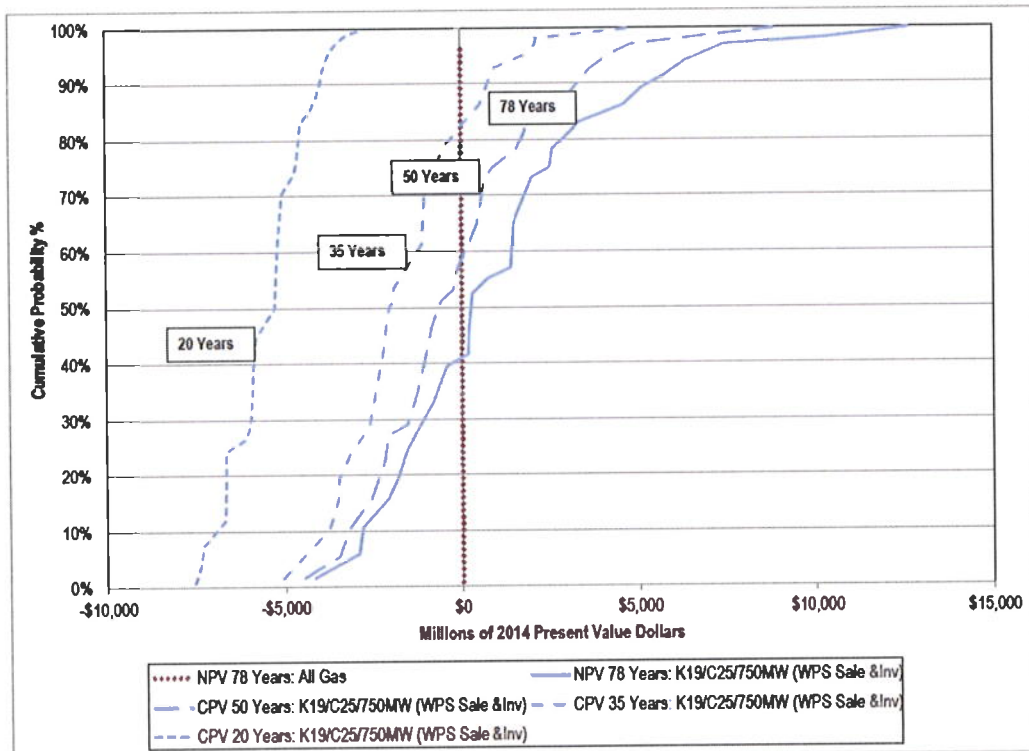


*The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.*





The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.



Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

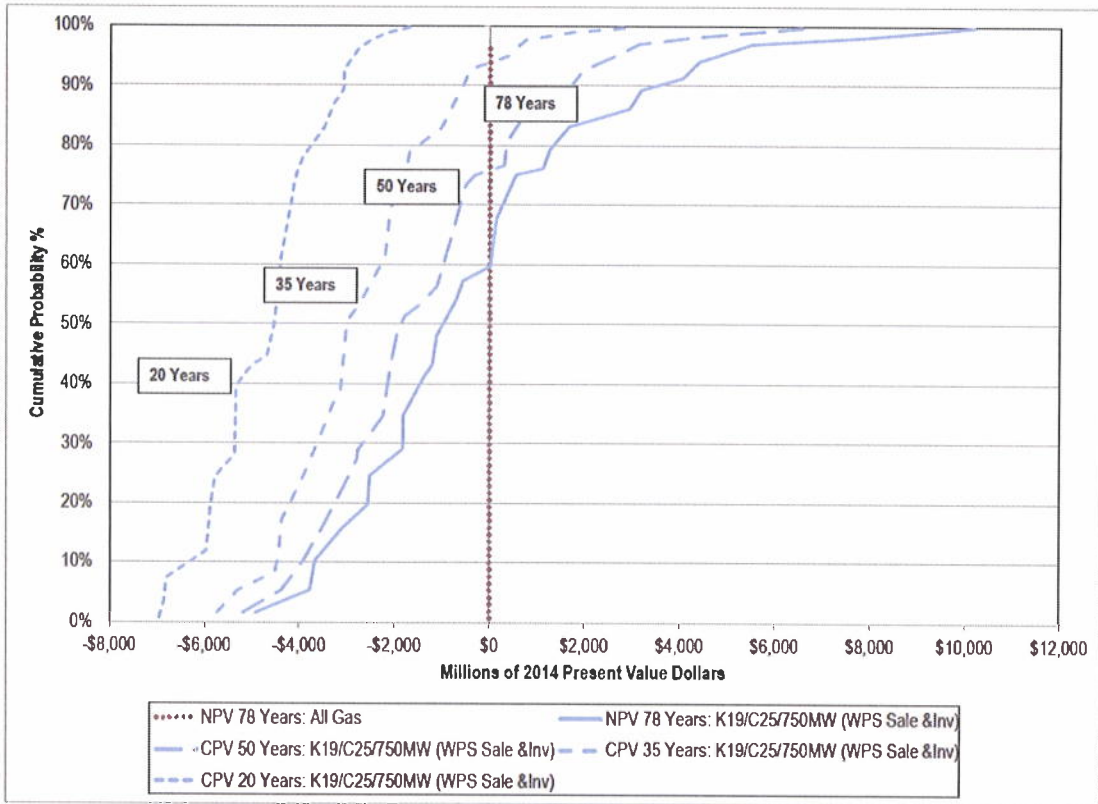
Figure 9-174U: Probability Distributions of Plan 14 Preferred Development Plan having Higher Costs than the All Gas Plan with a 10% Increase in Gross Revenue- Millions of Present Value Dollars

Base Case: All Gas				
Change Case: K19/C25/750MW (WPS Sale & Inv)				
Time Period	20 Years	35 Years	50 Years	78 Years
Millions of 2014 CPV Dollars				
REF-REF-REF NPV	-5185	-1127	427	1459
10th Percentile - "Risk"	-6961	-3806	-3214	-2825
90th Percentile - "Reward"	-3963	752	3295	5340
Expected Value	-5498	-1687	-220	845

Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

Figure 9-175U: Expected value, risk, reward, and all reference case of Plan 14 Preferred Development Plan Compared to Plan 1- All Gas from Probability Distributions

The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.



Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where information was available.

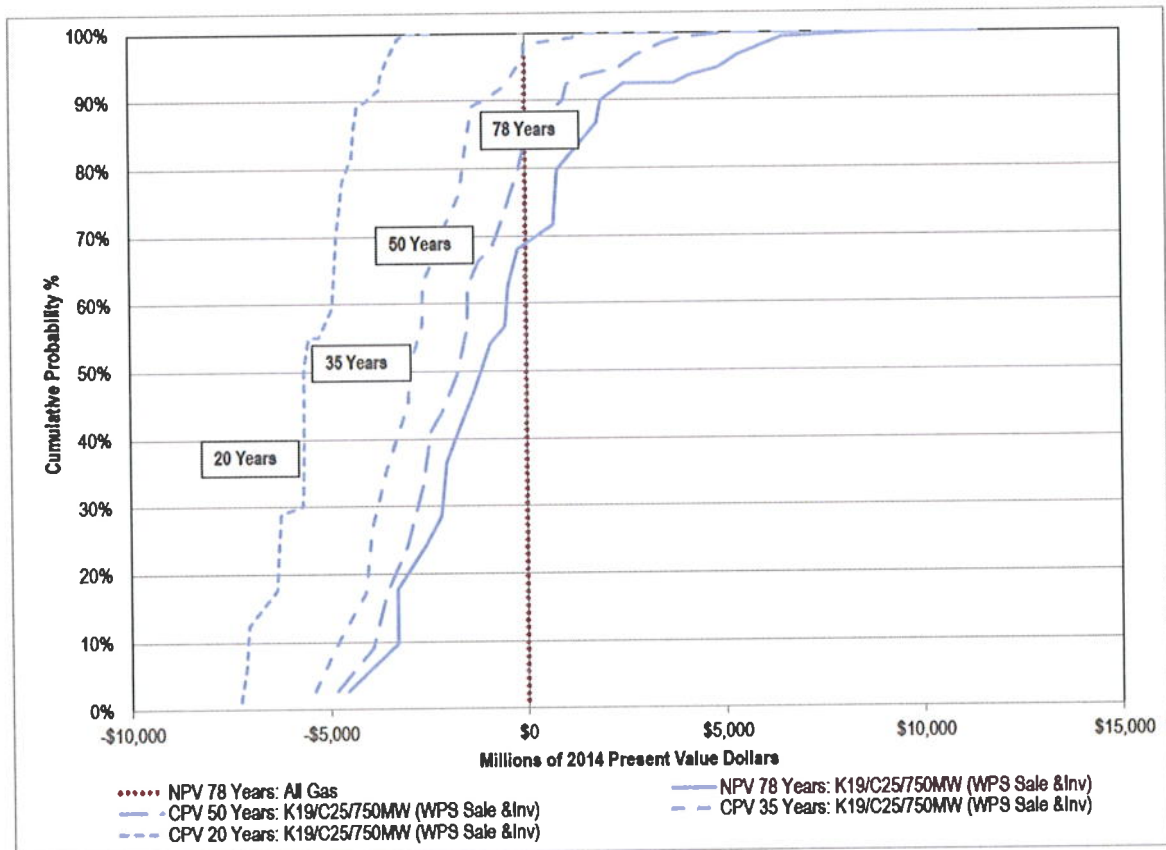
Figure 9-176U: Probability Distributions of Plan 14 Preferred Development Plan having Higher Costs than the All Gas Plan with a 10% Decrease in Gross Revenue- Millions of Present Value Dollars

Base Case: All Gas				
Change Case: K19/C25/750MW (WPS Sale & Inv)				
Time Period	20 Years	35 Years	50 Years	78 Years
	Millions of 2014 CPV Dollars			
REF-REF-REF NPV	-4384	-2202	-795	137
10th Percentile - "Risk"	-6313	-4469	-3942	-3671
90th Percentile - "Reward"	-3075	-571	1717	3508
Expected Value	-4743	-2699	-1369	-471

Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where the information was available.

Figure 9-177U: Expected value, risk, reward, and all reference case of Plan 14 Preferred Development Plan Compared to Plan 1- All Gas from Probability Distributions

The Commercially Sensitive Information contained within this report has been redacted in accordance with the protective order.



Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where the information was available.

Figure 9-178U: Probability Distributions of Plan 14 Preferred Development Plan having Higher costs than the All Gas Plan with Energy Price probabilities for High, Reference, and Low 0% 50% and 50% respectively

Base Case: All Gas				
Change Case: K19/C25/750MW (WPS Sale & Inv)				
Time Period	20 Years	35 Years	50 Years	78 Years
Millions of 2014 CPV Dollars				
REF-REF-REF NPV	-4785	-1664	-184	798
10th Percentile - "Risk"	-7077	-4786	-3875	-3292
90th Percentile - "Reward"	-3996	-1028	958	1916
Expected Value	-5402	-2842	-1647	-814

Updated for increased capital costs of Keeyask and Conawapa per Manitoba Hydro's March 10, 2014 Presentation for plans where the information was available.

Figure 9-179U: Expected value, risk, reward, and all reference case of Plan 14 Preferred Development Plan Compared to Plan 1- All Gas from Probability Distributions