

MANITOBA HYDRO NFAT APPLICATION

DIRECT TESTIMONY PRESENTATION RE:

ECONOMIC EVALUATION

BILL HARPER
ECONALYSIS CONSULTING SERVICES

APRIL 25, 2014

MANITOBA HYDRO NFAT APPROVALS/COMMITMENTS REQUESTED

- SHORT TERM
 - START KEEYASK CONSTRUCTION FOR 2019 I/S
 - NEW 750 MW INTERCONNECTION
 - MP(250)/WPS (100) EXPORT CONTRACTS
 - WPS (308) EXPORT CONTRACT

- LONGER TERM
 - OVERALL PREFERRED DEVELOPMENT PLAN
 - PROTECT CONAWAPA I/S DATE – MID 2020s
 - WPS ROLE

ECS EVIDENCE

- ADDRESSES MANITOBA HYDRO'S "ECONOMIC EVALUATION"
- FOCUS ON APPROACH AND INTERPRETATION OF RESULTS
- CAVEATS
 - ASSUMED UNDERLYING PLANNING ASSUMPTIONS APPROPRIATE
 - CONCLUSIONS ARE WITH RESPECT TO "ECONOMICS" AND NEED TO BE BALANCED WITH OTHER CONSIDERATIONS (E.G. FINANCIAL, MACRO-ENVIRONMENTAL & SOCIO-ECONOMIC)

AGENDA

1. NEED/ALTERNATIVES
2. REFERENCE CASE ECONOMICS
3. ECONOMIC UNCERTAINTY ANALYSIS
4. MULTIPLE ACCOUNT ANALYSIS
5. GENERAL OBSERVATIONS

FOUNDATION FOR NEED

MANITOBA HYDRO ACT

“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 OF GENERATION, TRANSMISSION, DISTRIBUTION, SUPPLY AND END-USE OF POWER”

BOARD OF DIRECTORS TERMS OF REFERENCE

“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”

IDENTIFIED “NEED”

CEC (SEPTEMBER 2004):

“THE CEAA DEFINES “NEED FOR” AS THE PROBLEM OR OPPORTUNITY THE PROJECT IS INTENDED TO SOLVE OR SATISFY”

“NEED” AS RELATED TO CURRENT NFAT:

PROBLEM – MAINTAIN RELIABILITY

OPPORTUNITY – REDUCE RATES / IMPROVE RELIABILITY

IDENTIFICATION OF ALTERNATIVES

- RESOURCE OPTIONS IDENTIFIED AND SCREENED
 - SHORT-LISTED OPTIONS INCLUDED:
 - ADDITIONAL DSM
 - HYDRO (KEEYASK & CONAWAPA)
 - WIND (ON-SHORE)
 - NATURAL GAS-FIRED GENERATION (SCGTs & CCGTs)
 - IMPORTS
- > ALTERNATIVE DEVELOPMENT PLANS

ALTERNATIVE DEVELOPMENT PLANS NO NEW EXPORT COMMITMENTS

- FOCUS -> DOMESTIC RELIABILITY “PROBLEM”
- ASSESSED -> SEVEN PLANS WITH COMBINATIONS OF WIND, GAS AND HYDRO
- SHORTCOMINGS
 - DSM NOT TREATED AS A “COMPETING OPTION”
 - INCREASED ROLE FOR IMPORTS NOT EXPLORED
- IMPLICATIONS
 - POTENTIAL FOR LATER “NEED” DATE
 - OTHER POSSIBLE OPTIONS

ALTERNATIVE DEVELOPMENT PLANS

EXPANDED EXPORTS

- FOCUS -> ADDRESS BOTH DOMESTIC RELIABILITY “PROBLEM” AND EXPORT “OPPORTUNITY”
- ASSESSED
 - THREE PLANS WITH 250 MW INTERTIE / KEEYASK ADVANCED
 - THREE PLANS WITH LARGER 750 MW INTERTIE (750MW) AND KEEYASK ADVANCED
 - TWO 750 MW PLANS WITH LARGER WPS CONTRACT
 - PLANS VARY IN TERMS OF TIMING AND NATURE OF SUBSEQUENT GENERATION (GAS VS. CONAWAPA)
- SHORTCOMINGS
 - SIMILAR ISSUES RE: DSM -> NEED DATE

EXPANDED EXPORT PLANS ISSUES TO BE ADDRESSED

IMMEDIATE

- SHOULD KEEYASK BE ADVANCED/NEW INTERTIE CONSTRUCTED TO SUPPORT MP/NSP CONTRACTS?
- SHOULD A LARGER 750 MW INTERTIE BE CONSTRUCTED?

LONGER TERM

- SHOULD CONAWAPA CONTINUE TO BE PURSUED?
- ROLE OF WPS CONTRACT

ECONOMIC EVALUATIONS

- COMPARE THE COST/BENEFITS OF TWO OR MORE ALTERNATIVES
- FOCUS ON COST/BENEFIT DIFFERENCES BETWEEN ALTERNATIVES
- PERSPECTIVE IS CRITICAL
 - DETERMINES COST/BENEFITS TO BE INCLUDED
 - DETERMINES DISCOUNT RATE TO BE USED

->SHORTCOMINGS

- SINGLE PERSPECTIVE->NO DISTRIBUTIONAL CONSIDERATIONS
- TYPICALLY OVER PROJECT LIFE->NO TEMPORAL CONSIDERATIONS

REFERENCE CASE ECONOMICS

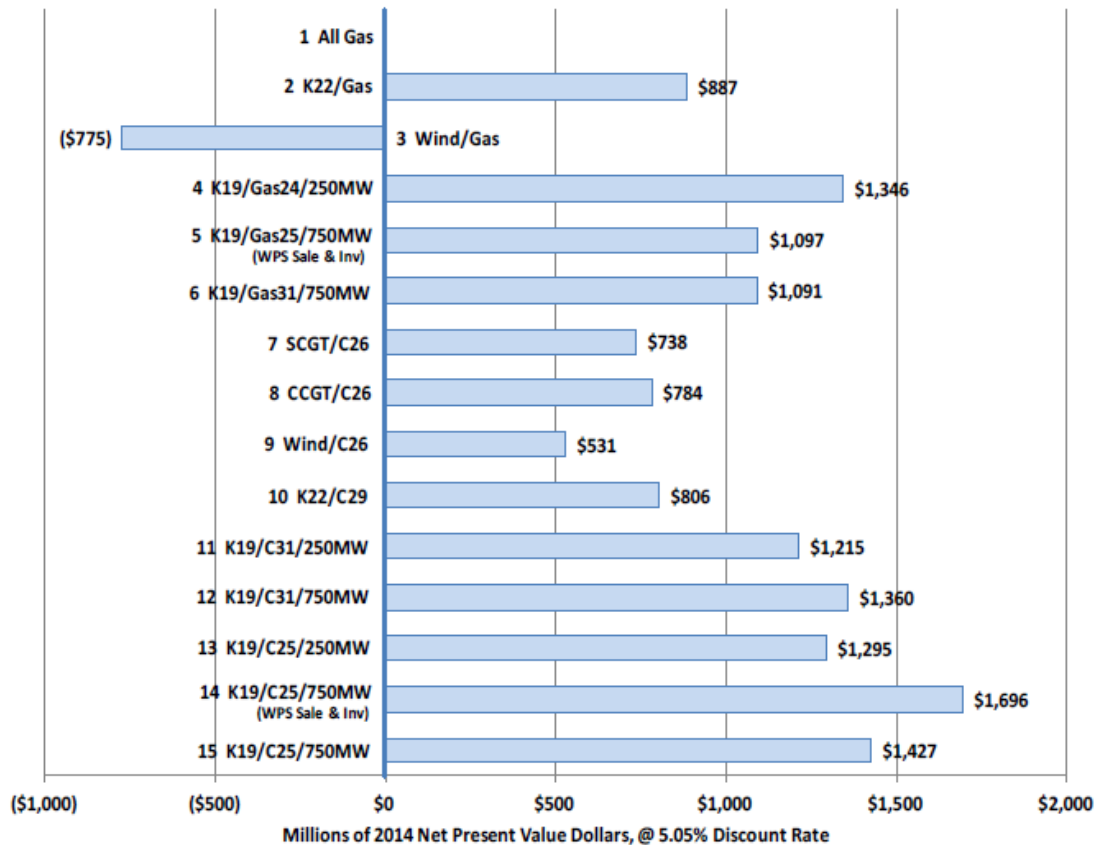
MANITOBA HYDRO REFERENCE CASE ECONOMICS

- BASED ON “MOST LIKELY” COSTS/BENEFITS
- 78 YEAR STUDY PERIOD
 - FIRST 47 MORE DETAILED
- MANITOBA HYDRO PERSPECTIVE
- DISCOUNTED AT 5.05% (2012) /5.40% REAL (2013)
 - REFLECTS TARGET CAPITAL STRUCTURE & RETURN ON EQUITY PREMIUM

REFERENCE CASE ECONOMICS

INITIAL NFAT APPLICATION

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



REFERENCE CASE ECONOMICS 2013 UPDATE

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
1 All Gas	-			
Lowest Capital Investment Development Plan				
2 K23/Gas	2 -1			
	\$728			
4 K19/Gas30/250MW	4 -1	4 -2		
MP Sale	\$1,133	\$405		
12 K19/C33/750MW	12 -1	12 -2	12 -4	
MP Sale	\$1,204	\$476	\$71	
14 K19/C26/750MW	14 -1	14 -2	14 -4	14 -12
MP Sale, WPS Sale & Inv Preferred Development Plan	\$1,462	\$734	\$329	\$258

REFERENCE CASE ECONOMICS ISSUES NOTED

- NOT TRULY A “MANITOBA HYDRO” PERSPECTIVE
 - INCLUDES COSTS/BENEFITS ACCRUING TO KCN
- AGGREGATION OF “MANITOBA HYDRO” AND “PROVINCIAL” PERSPECTIVES
 - MIXING OF PERSPECTIVES -> DISCOUNT RATE?
- TREATMENT OF WPS CONTRACT/INVESTMENT
 - CONTRACT NOT THEN SIGNED / NO WPS INVESTMENT
- LONG TIME HORIZON -> INTER-GENERATIONAL ISSUES
- RATEPAYER PERSPECTIVE
 - NOT EQUIVALENT TO MANITOBA HYDRO PERSPECTIVE
- BASIS FOR “MANITOBA HYDRO” DISCOUNT RATE

MANITOBA HYDRO DISCOUNT RATE

- MANITOBA HYDRO APPROACH
 - DEBT/EQUITY RATIO -> 75/25
 - DEBT RATE – COST OF DEBT PLUS GUARANTEE
 - EQUITY RATE – 3.0% OVER DEBT RATE

->ISSUES

- EQUITY RATE PURPORTEDLY REFLECTS ALLOWED RETURN ON EQUITY FOR REGULATED UTILITIES BUT RECENT EXPERIENCE WOULD SUGGEST A HIGHER RATE
- IS THIS APPROACH APPROPRIATE GIVEN MANITOBA HYDRO'S REGULATORY CONSTRUCT?

RETURN ON EQUITY - VALUE

- REGULATORS GENERALLY SET WITH REFERENCE TO LONG TERM CANADA BOND RATE (30 YR)
- MANITOBA HYDRO -> 4.65% PREMIUM
- RECENT FORMAL ASSESSMENTS
 - BCUC (2013) – 8.75% vs 3.8% (LTCB) – 4.95%
 - AUC (2009)* – 9.0% vs. 4.32% (LTCB) – 4.68%
 - OEB (2009) – 9.75% vs. 4.25% (LTCB) – 5.50%
- ECS RECOMMENDATION – 5.25% LTCB PREMIUM
 - AVERAGE OF FORMAL ASSESSMENT VALUES
 - INCLUDES AN ADJUSTMENT (0.25%) TO REFLECT USE OF 30 YEAR BONDS AS BENCHMARK

RETURN ON EQUITY

MANITOBA HYDRO REBUTTAL

- REBUTTAL REFERENCES CONCENTRIC REPORT AS SUPPORT FOR 3% ROE PREMIUM – HOWEVER REPORT SUGGESTS EVEN HIGHER PREMIUMS

	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
ROE	9.30%	9.90%	8.38%	8.75%	9.45%	8.93%	9.50%	9.40%
Government Long Term Bond Rate	4.65%	4.65%	2.70%	2.70%	2.70%	2.70%	3.31%	3.31%
Premium	4.65%	5.25%	5.68%	6.05%	6.75%	6.23%	6.19%	6.09%

RETURN ON EQUITY - APPROACH

ISSUE:

- MANITOBA HYDRO IS NOT REGULATED ON A “RATE OF RETURN” BASIS -> WHY ADOPT AN ROE STYLE APPROACH?

OBSERVATIONS:

- COST OF DEBT-> PROV. GUARANTEE-> FINANCIAL INTEGRITY
- CUSTOMERS ULTIMATELY RESPONSIBLE FOR SHORTFALLS IN EQUITY TO MAINTAIN FINANCIAL INTEGRITY
- WHAT DO CUSTOMERS REQUIRE TO BE NEUTRAL REGARDING TIMING OF EQUITY CONTRIBUTIONS?
- ROE REFLECTS FAIR COMPENSATION FOR UTILITY INVESTORS -> REASONABLE PROXY

REFERENCE CASES – 2012 NFAT ECONOMICS COMPARISON

ECS Table #5 – Comparison of 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

REFERENCE CASES- 2012 / CAPITAL UPDATE

PLAN		Millions 2014\$ - NPV – Relative to ALL GAS		
		2012 PER NFAT APPLICATION	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

2012 REFERENCE CASE UPDATES

ECS ANALYSIS TAKE AWAYS

- NEXT RESOURCE FOR DOMESTIC NEED
 - ECONOMICS OF BUILDING KEEYASK FOR EARLY 2020s SUPERIOR TO OTHER NON-INTERTIE OPTIONS ASSESSED
- PLAN #4 ECONOMICS SUPERIOR TO NO INTERTIE AND 750 INTERTIE PLANS
- MP SALE/DOMESTIC NEED (PLANS #6 & #12)
 - PLAN #6 (750 MW/GAS) ECONOMIC RELATIVE TO PLAN #2
 - PLAN #12 (750 MW/CONAWAPA) ECONOMICS LESS THAN PLAN #2 AT HIGHER DISCOUNT RATE
 - PLAN #6 (GAS) SUPERIOR TO PLAN #12 (CONAWAPA)
- WPS CONTRACT IMPACT (PLANS #5 & #14)
 - WITH NO NEW Tx INVESTMENT, GAS ECONOMICS MARGINALLY LESS THAN PLAN #2 / CONAWAPA ECONOMICS LESS AT HIGHER DISCOUNT RATE
 - GAS/CONAWAPA ECONOMICS CHANGES AT HIGHER DISCOUNT RATE TO FAVOUR GAS

REFERENCE CASES – 2013 UPDATE

ECONOMIC COMPARISONS

		MILLIONS 2014 \$- NPV RELATIVE TO ALL GAS			
		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	\$26
PLAN #4	K19/Gas/ 250	\$1133	\$1015	N/A	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
Source		NFAT, Table 12.5 MH-95, Slide 123	ECS Evidence, page 57	MH-104-15	ECS Calculation

2013 UPDATE: DSM ECONOMICS

MANITOBA HYDRO VIEW

	CHANGE IN PLAN NPV (\$2014 M) WITH CHANGE IN DSM LEVEL		
	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		

2013 REFERENCE CASES

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	\$26	-\$197	?
6	?	?	?	\$386	\$262
5 – No Inv	?	\$377	\$256	\$410	\$285
12	\$1,204	?	?	?	?
14 – No Inv	\$1,245	\$374	\$123	\$45	-\$169
Source	NFAT Table 12.4	MH 104-15	ECS Calculation	MH 104-15	ECS Calculation

2013 REFERENCE CASE UPDATES

TAKE AWAYS

- INCREASED DSM (~DSM 2) ECONOMIC REGARDLESS OF PLAN
- WITH INCREASED DSM -> ALL GAS PLAN MORE ECONOMIC THAN PLAN 2
- WITH INCREASED DSM -> ADVANCING KEEYASK/750 MW IS ECONOMIC RELATIVE TO PREFERRED DOMESTIC NEED PLAN (PLAN 1) WHEN FOLLOWED BY GAS
- GAS MORE ECONOMIC THAN CONAWAPA AS POST-KEEYASK RESOURCE
- CAVEATS
 - NO ALLOWANCE FOR UNCERTAINTY

ECONOMIC UNCERTAINTY ANALYSIS

MANITOBA HYDRO

ECONOMIC UNCERTAINTY ANALYSIS

- PERFORMED IN LIEU OF USING RISK-ADJUSTED HURDLE RATE
- 27 SCENARIOS BASED ON HIGH/REFERENCE/LOW OUTCOMES FOR KEY FACTORS WITH PROBABILITIES FOR EACH
- KEY FACTORS ASSESSED WERE:
 - ECONOMICS (INFLATION/INTEREST RATES/DISCOUNT RATES)
 - ENERGY PRICES (NATURAL GAS/ELECTRICITY EXPORTS)
 - CAPITAL COSTS
- EXPECTED VALUE MORE INFORMATIVE THAN REFERENCE VALUE

ECONOMIC UNCERTAINTY ANALYSIS

ISSUES NOTED

- USE OF UNCERTAINTY ANALYSIS IMPROVEMENT OVER PREVIOUS USE OF “HURDLE RATE”
- MORE FACTORS/MORE OUTCOMES WOULD LEAD TO MORE ROBUST RESULTS
- CONCERN REGARDING INCLUSION OF DISCOUNT RATE AS ONE OF THE “FACTORS”

ECONOMIC UNCERTAINTY ANALYSIS

MANITOBA HYDRO REBUTTAL

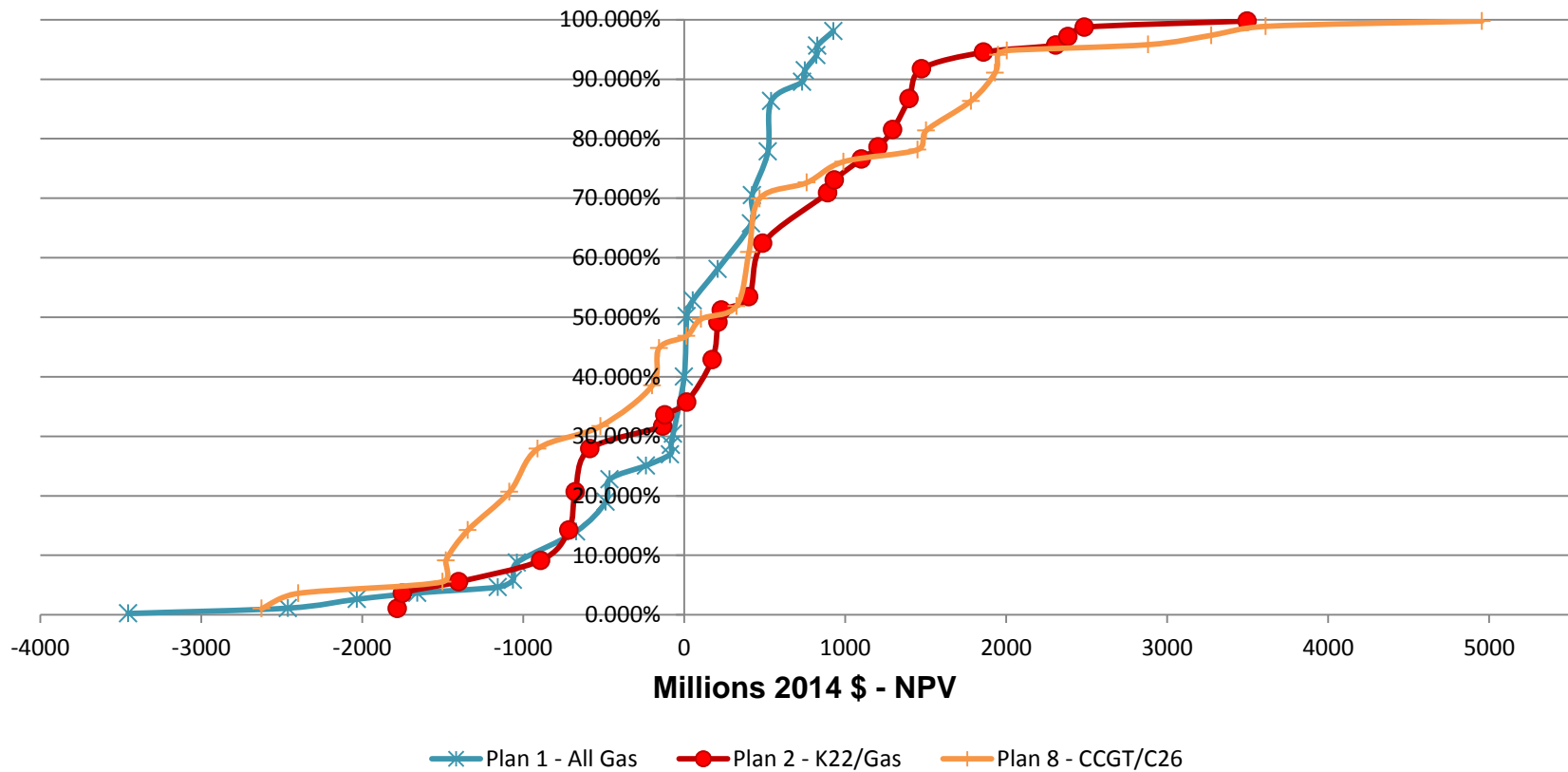
- CONSIDERED MAJOR FACTORS
 - AGREE, CONCERN WITH DEPTH OF ANALYSIS GIVEN THAT THE COMPARATIVE RESULTS ARE CLOSE
- 3-POINT PROBABILITY DISTRIBUTION REASONABLE
 - AGAIN, CONCERN IS WITH ROBUSTNESS GIVEN COMPARATIVE RESULTS ARE CLOSE
- CALCULATING EXPECTED VALUE ACROSS DISCOUNT RATES ACCEPTED PRACTICE
 - MANITOBA HYDRO HAS ACKNOWLEDGED ECS'S CONCERN RE IMPACT OF INCLUDING "COMMON COSTS" -> REVISED ANALYSIS IN EXHIBIT 104-2
 - NOT CLEAR IF ALL/ONLY "COMMON COSTS" REMOVED

ECONOMIC UNCERTAINTY ANALYSIS NO NEW INTERTIE

MANITOBA HYDRO UNCERTAINTY ANALYSIS

2012 NFAT – UPDATED CAPITAL COSTS

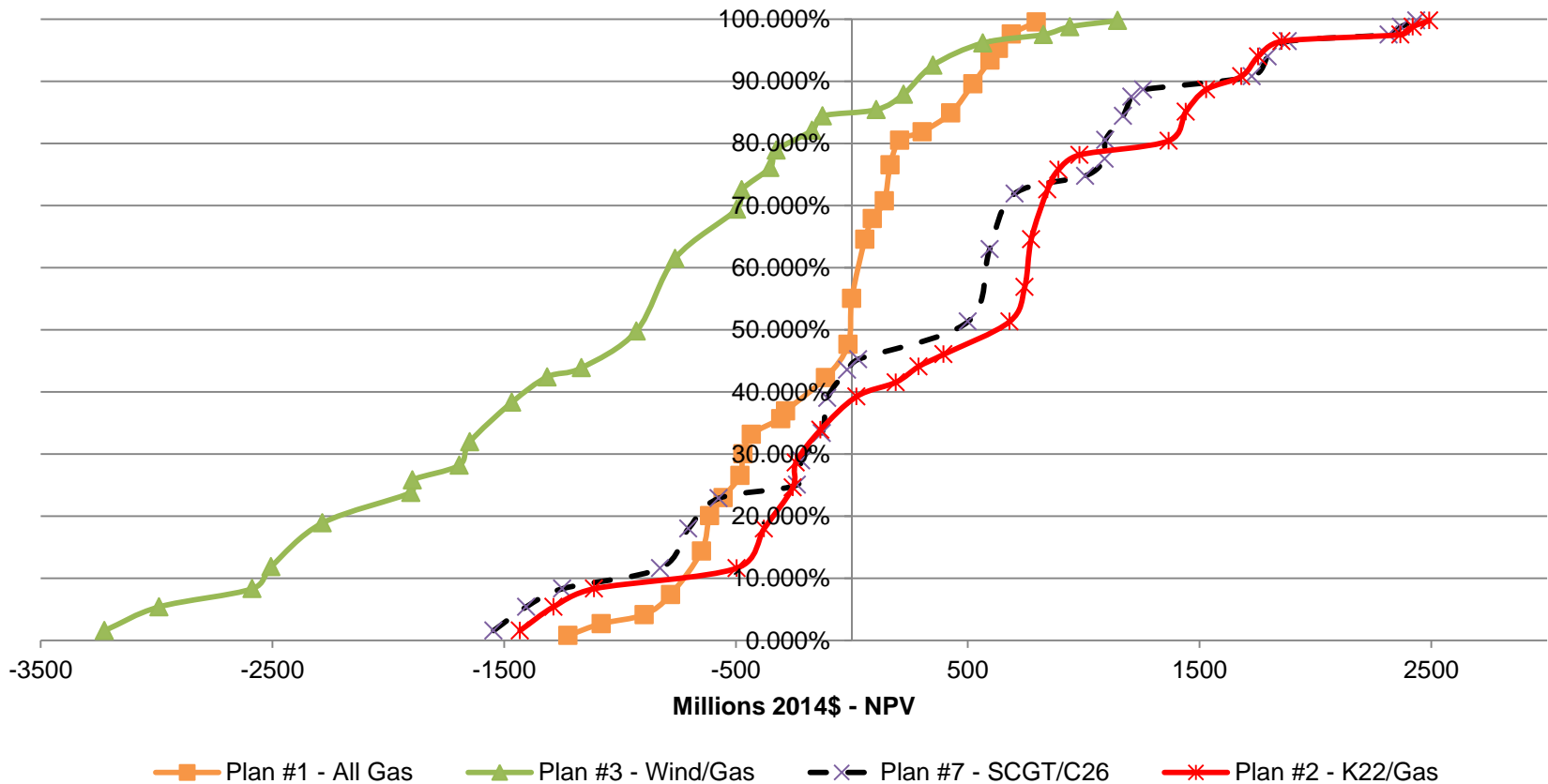
S-Curves: No New Intertie



ECS UNCERTAINTY ANALYSIS

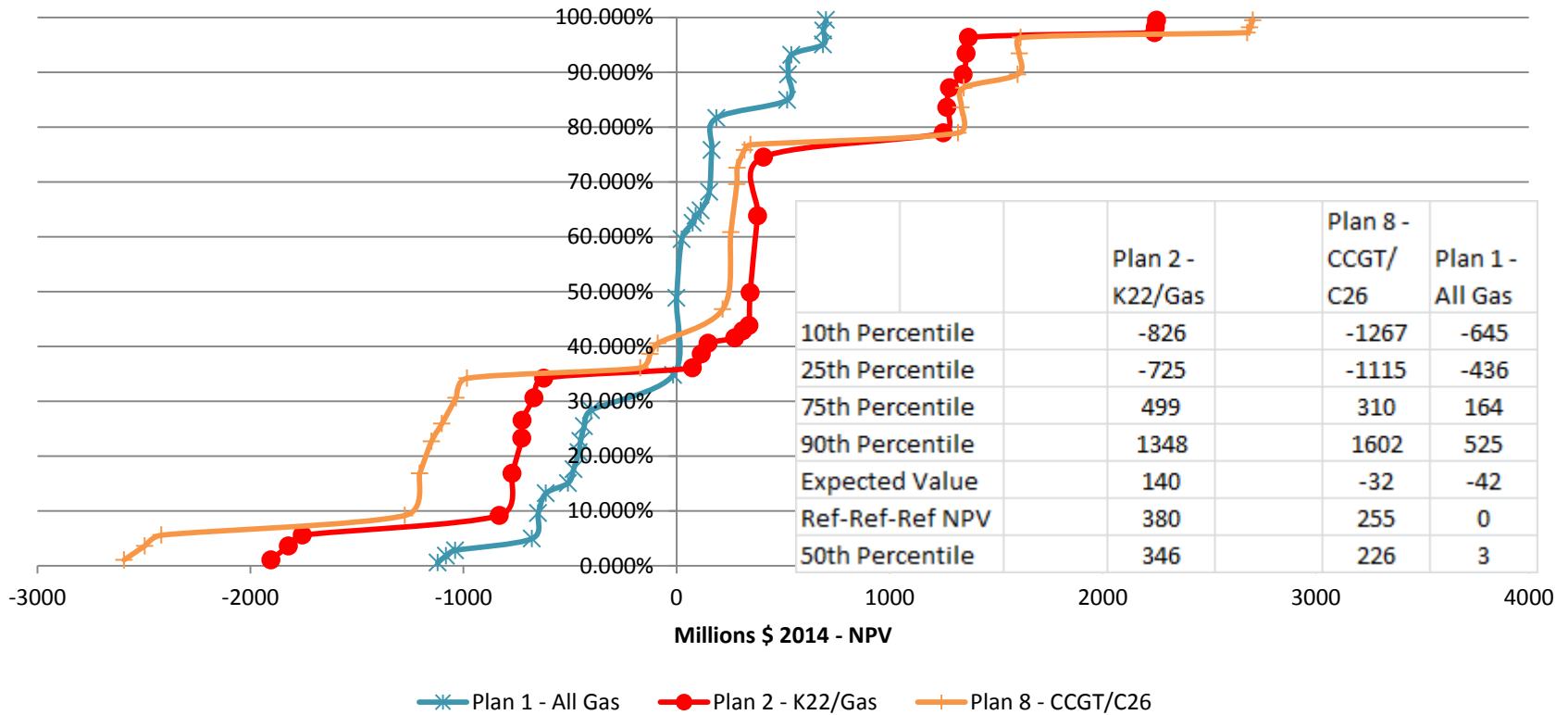
2012 NFAT @ COMMON 5.2%

S-Curves: No New Intertie



ECS UNCERTAINTY ANALYSIS - 2012 NFAT UPDATED CAPITAL COST & 5.2% COMMON

S Curves: No New Intertie



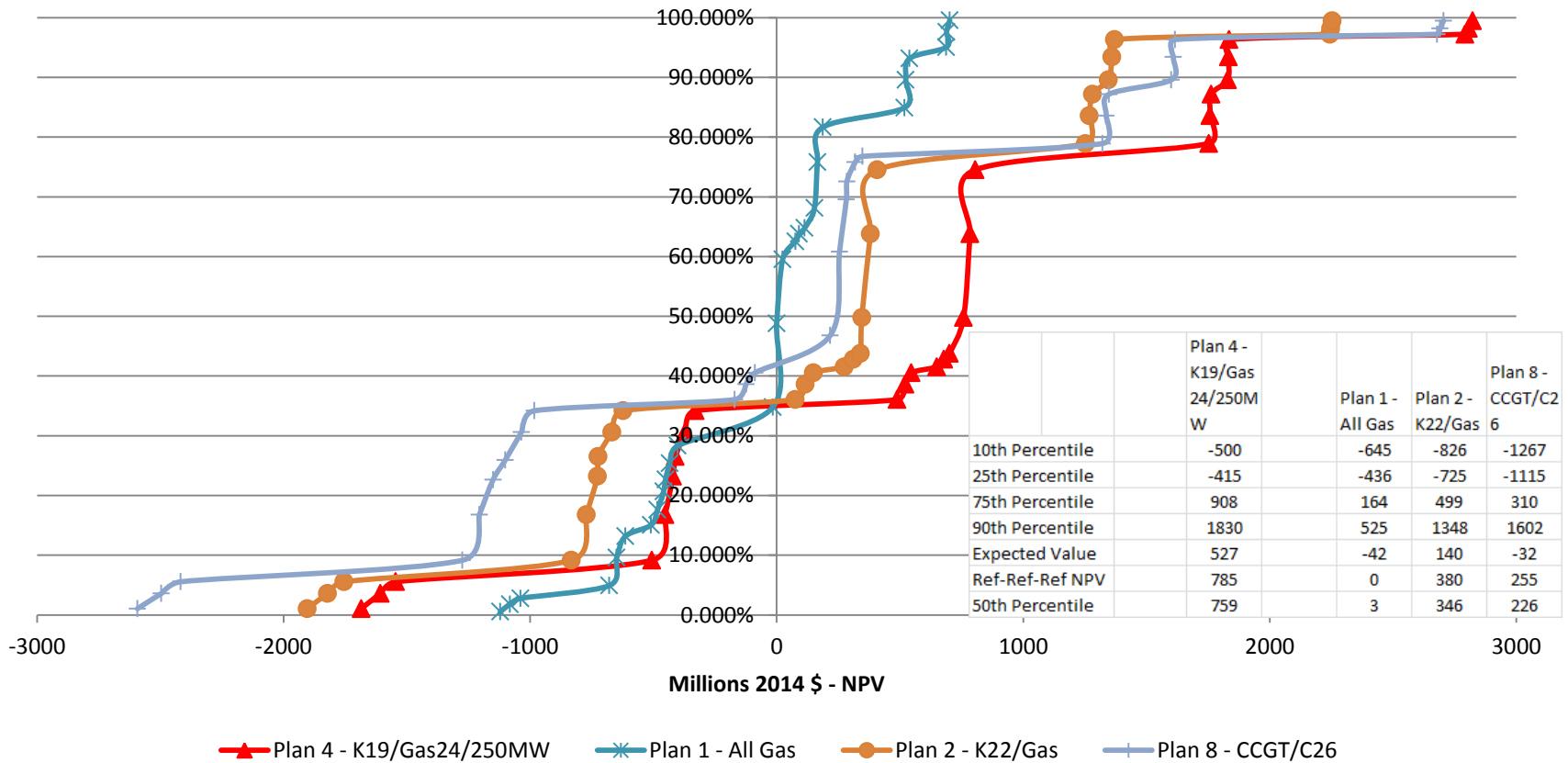
PREFERRED “DOMESTIC NEED” PLAN?

- BOTH MH and ECS UNCERTAINTY ANALYSES SUPPORT PLAN #2 AS PREFERRED ECONOMIC PLAN FROM THOSE ASSESSED
- OUTSTANDING ISSUES
 - HIGHER DSM LIKELY ECONOMIC LEADING TO A LATER DOMESTIC NEED DATE FOR KEEYASK
 - IMPACT OF 2013 PLANNING ASSUMPTIONS
 - WITH THESE REVISIONS, 2013 REFERENCE CASE ANALYSIS INDICATES PLAN #1 (ALL GAS) MORE ECONOMIC THAN PLAN #2
 - WITH DELAYED NEED DATE, WOULD OTHER OPTIONS BE VIABLE/MORE ECONOMIC THAN ALL GAS OR KEEYASK?

ECONOMIC UNCERTAINTY ANALYSIS ADVANCE KEYASK / SMALL INTERTIE

ECS UNCERTAINTY ANALYSIS - 2012 NFAT UPDATED CAPITAL COST & 5.2% COMMON

S Curves: No Intertie vs. 250 Intertie



ISSUE: SHOULD KEYASK BE ADANCED WITH 250 INTERTIE TO SUPPORT MP/NSP CONTRACTS?

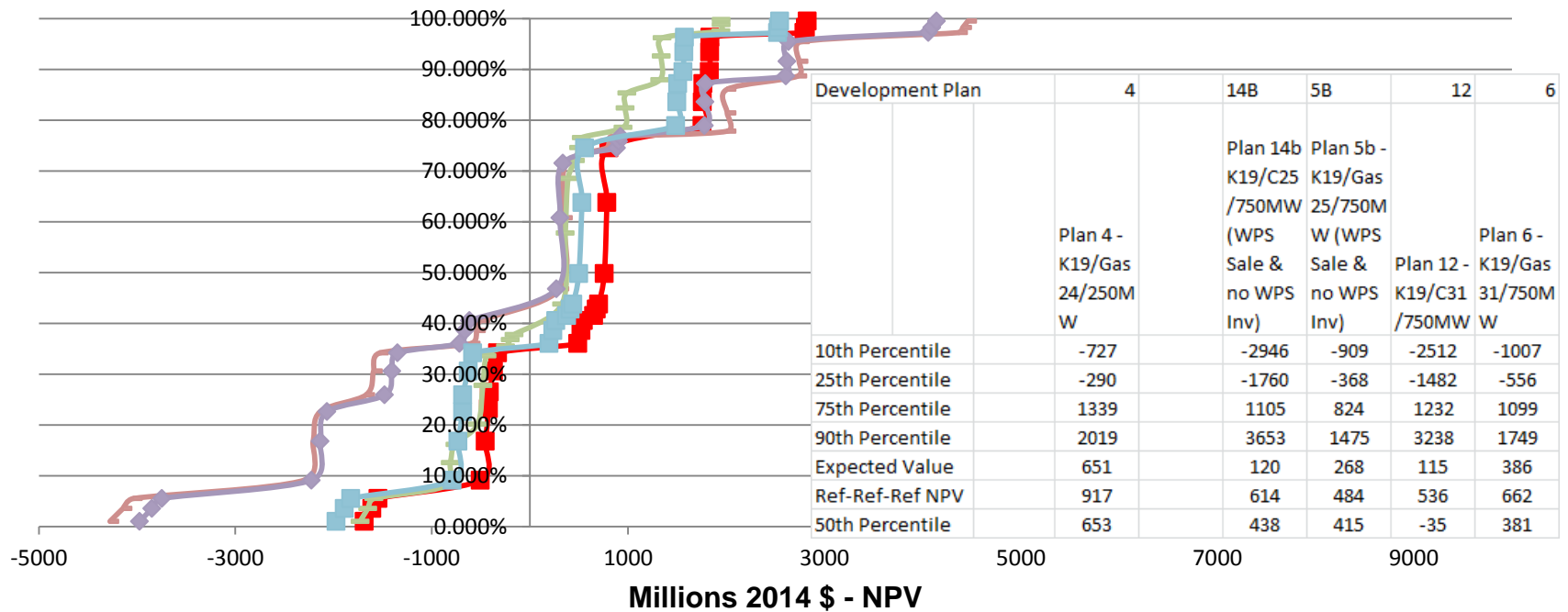
- INITIAL MH AND ECS ANALYSES BOTH SUPPORTED ADVANCING KEYASK AND CONSTRUCTING 250 MW INTERTIE AS ECONOMIC
- CONCLUSIONS UNCHANGED WITH CAPITAL COST UPDATE
- CAVEATS:
 - NO UPDATE FOR 2013 PLANNING ASSUMPTIONS
 - NO UPDATE FOR INCREASED DSM
 - NO ADJUSTMENTS FOR IEC REPORTS
- HOWEVER, INCREASE IN ECONOMICS IS MATERIAL

ECONOMIC UNCERTAINTY ANALYSIS ADVANCE KEYASK / LARGER INTERTIE

MANITOBA HYDRO UNCERTAINTY ANALYSIS

2012 NFAT – UPDATED CAPITAL COSTS

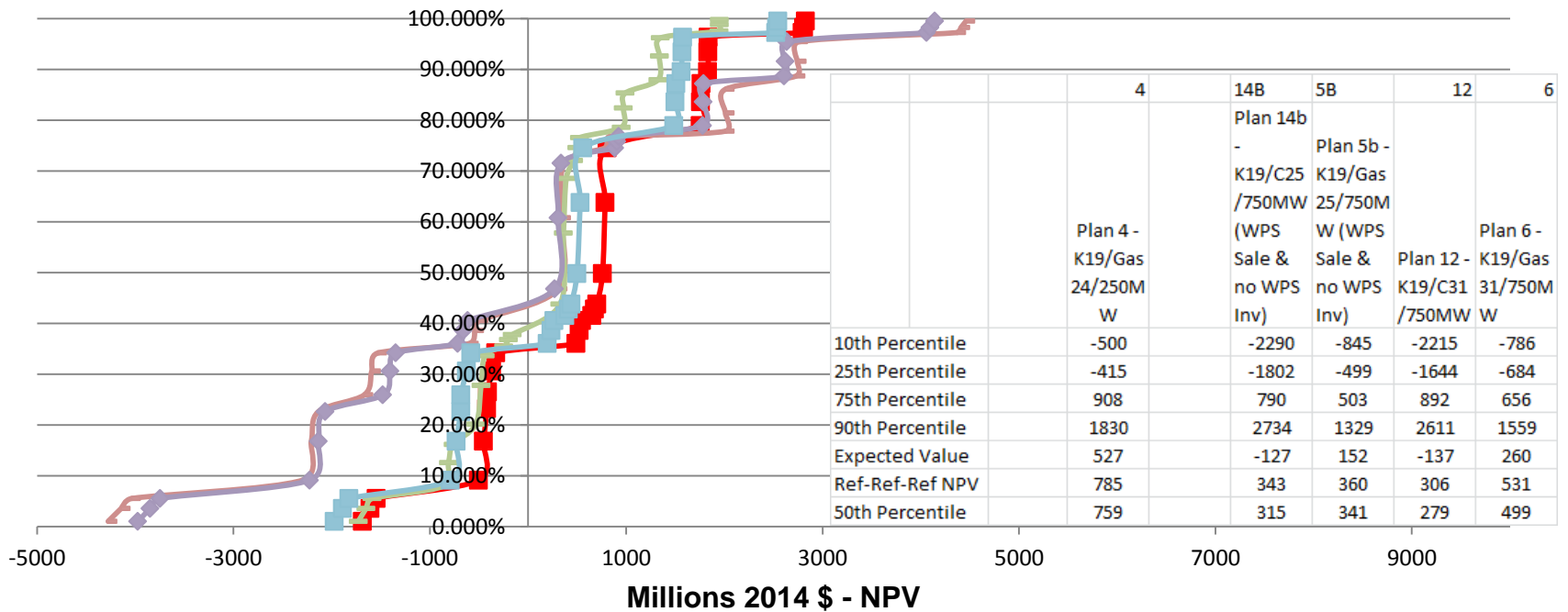
S-Curves: 250 MW (#4) vs. 750 MW Plans (No Inv.)



- Plan 4 - K19/Gas24/250MW
 — Plan 14b - K19/C25/750MW (WPS Sale & no WPS Inv)
- Plan 5b - K19/Gas25/750MW (WPS Sale & no WPS Inv)
 ◆ Plan 12 - K19/C31/750MW
- Plan 6 - K19/Gas31/750MW

ECS UNCERTAINTY ANALYSIS – 2012 NFAT UPDATED CAPITAL COSTS- 5.2% COMMON

S-Curves: 250 MW (#4) vs. 750 MW Plans (No Inv.)



- Plan 4 - K19/Gas24/250MW
 — Plan 14b - K19/C25/750MW (WPS Sale & no WPS Inv)
- Plan 5b - K19/Gas25/750MW (WPS Sale & no WPS Inv)
 — Plan 12 - K19/C31/750MW
- Plan 6 - K19/Gas31/750MW

ISSUE: SHOULD KEEYASK BE ADVANCED WITH A 750 MW AS OPPOSED TO A 250 MW INTERTIE

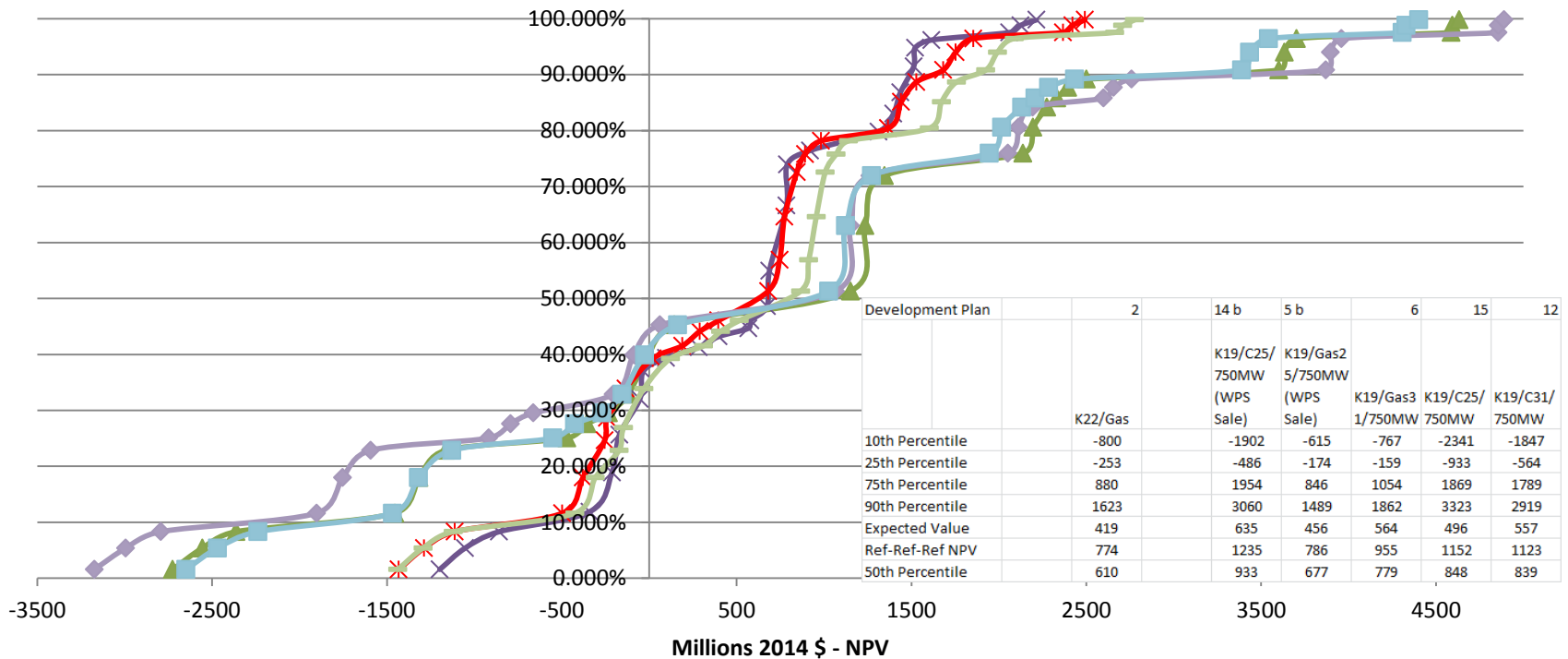
- ECONOMICS OF 250 MW INTERTIE SUPERIOR TO 750 MW INTERTIE PLANS (BOTH EXPECTED VALUE AND RISK PROFILE)
- CONSISTENT FINDINGS – MH AND ECS USING 2012 NFAT WITH UPDATED CAPITAL COSTS
- FINDINGS APPLY WITH/WITHOUT WPS CONTRACT
- FINDINGS APPLY EVEN WITH ADDITIONAL EXTERNAL TRANSMISSION INVESTMENT

**ECONOMIC UNCERTAINTY ANALYSIS
ADVANCE KEEYASK
750 MW INTERTIE VS. NO INTERTIE**

ECS UNCERTAINTY ANALYSIS

2012 NFAT – 5.2% COMMON

S Curves: No Intertie vs. 750 MW (No Inv)

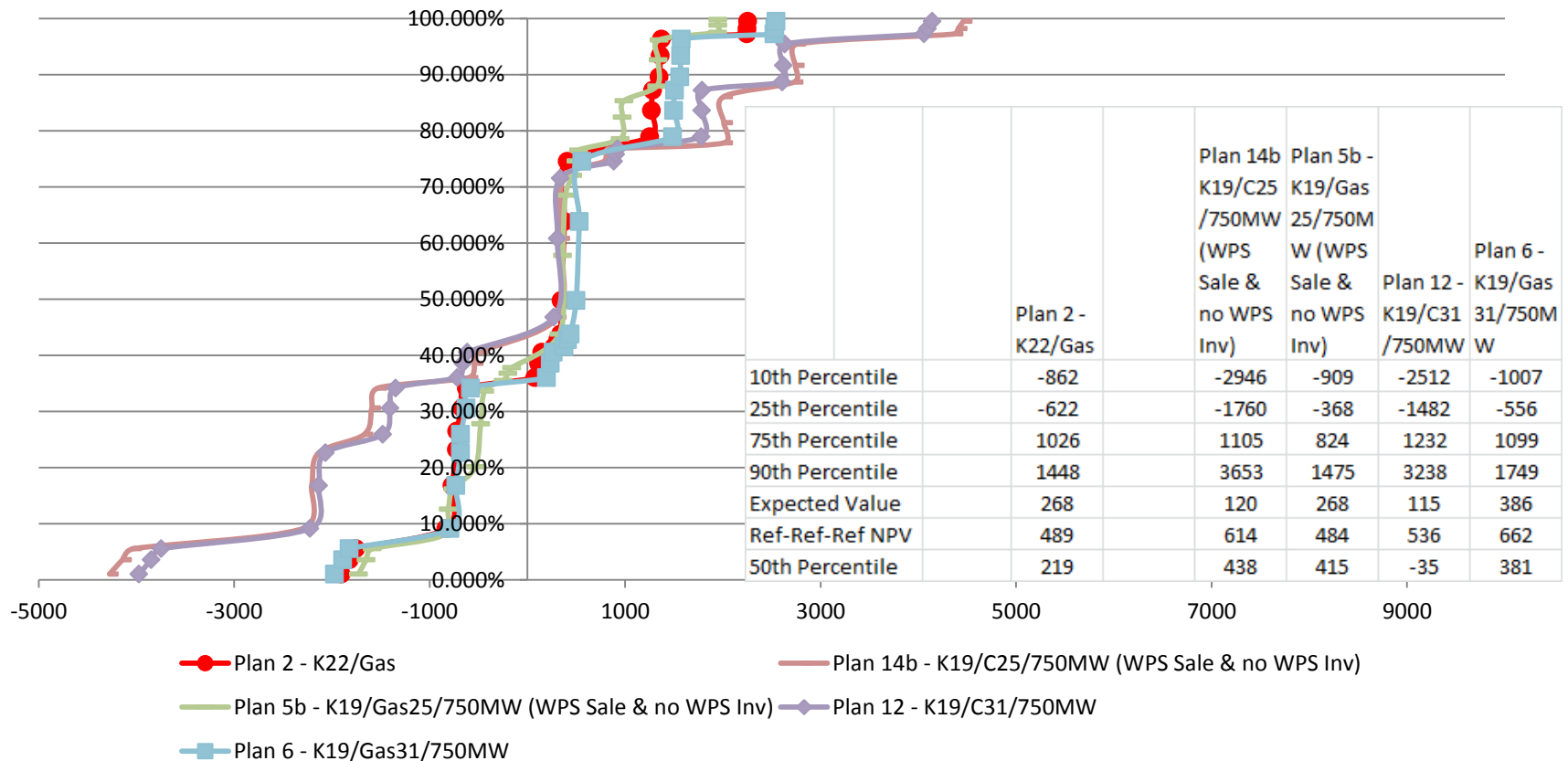


- ▲ K19/C25/750MW (WPS Sale)
 ✕ K19/Gas25/750MW (WPS Sale)
✕ K22/Gas
- K19/Gas31/750MW
 ◆ K19/C25/750MW
■ K19/C31/750MW

MANITOBA HYDRO UNCERTAINTY ANALYSIS

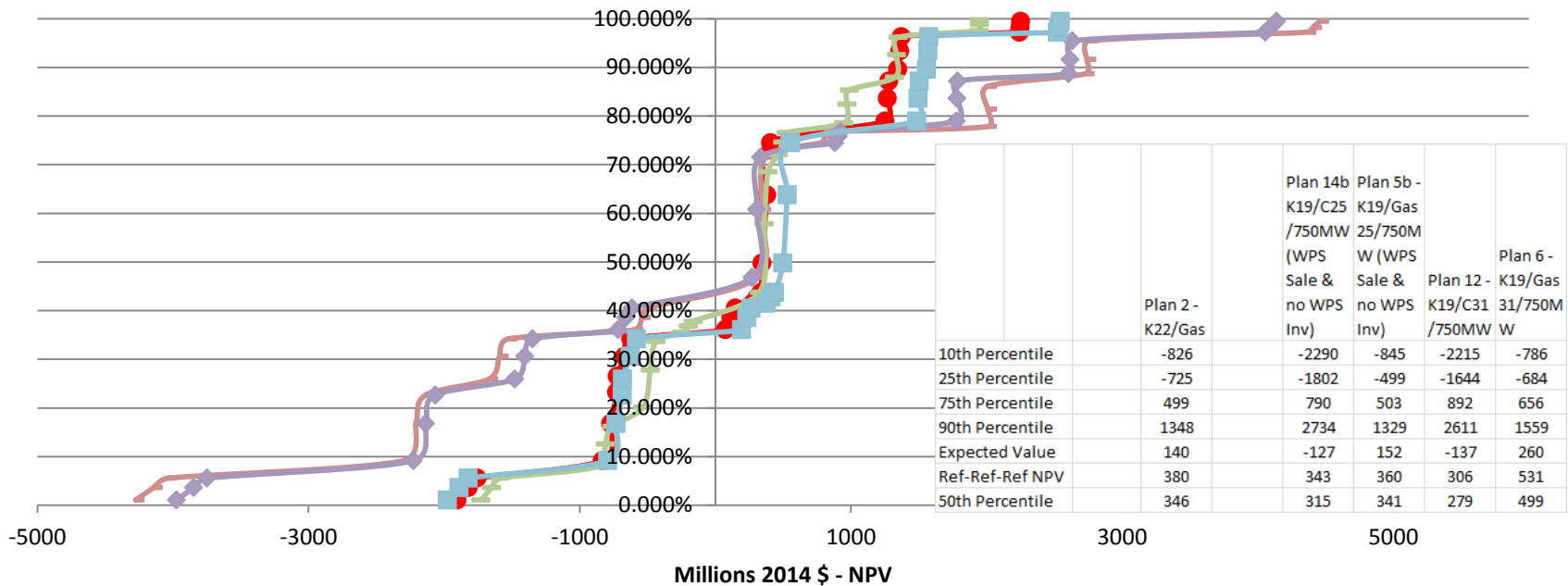
2012 NFAT – UPDATED CAPITAL COSTS

S Curves: No Intertie vs. 750 MW Intertie (No Inv)



ECS UNCERTAINTY ANALYSIS – 2012 NFAT UPDATED CAPITAL COSTS – 5.2% COMMON

Millions No Intertie vs. 750 MW Intertie (No Inv)



- Plan 2 - K22/Gas
- Plan 5b - K19/Gas25/750MW (WPS Sale & no WPS Inv)
- Plan 6 - K19/Gas31/750MW
- Plan 14b - K19/C25/750MW (WPS Sale & no WPS Inv)
- ◆ Plan 12 - K19/C31/750MW

ISSUE: IF 250 MW INTERTIE NOT VIABLE,
SHOULD KEYASK BE ADVANCED WITH A 750
MW INTERTIE ?

- ECONOMICS OF THE NO INTERTIE PLAN ARE SUPERIOR TO THE 750 INTERTIE PLANS WITH CONAWAPA – HIGHER EXPECTED VALUE/LOWER RISK
- ECONOMICS OF 750 PLANS WITH GAS EQUAL/SUPERIOR TO NO INTERTIE PLAN WITH SIMILAR RISK PROFILE
- ECONOMICS OF 750/GAS PLANS NOW SUPERIOR TO 750/CONAWAPA PLANS

PROTECT CONAWAPA IN-SERVICE DATE

CONAWAPA/750 OPTIONS – 2012 NFAT

OPTIONS	DEFER FURTHER SPEND	PROTECT MID-2020s	PROTECT 2031
PLAN 5 – K19/G25/WPS	AT WPS/MH DISCRETION	AT WPS/MH DISCRETION	AT WPS/MH DISCRETION
PLAN 6 – K19/G31	AVAILABLE	AVAILABLE	AVAILABLE
PLAN 12 –K19/C31	NOT AVAILABLE	AVAILABLE	AVAILABLE
PLAN 14 – K19/C25/WPS	NOT AVAILABLE	AVAILABLE	NOT AVAILABLE
PLAN 15 – K19/C25	NOT AVAILABLE	AVAILABLE	NOT AVAILABLE

PROTECT CONAWAPA IN-SERVICE DATE?

- 2012 NFAT
 - ECS ANALYSIS -> ECONOMICALLY PRUDENT TO PROTECT BOTH MID-2020s and EARLY 2030s DATES
- RECENT UPDATES (CAPITAL COSTS/DSM/2013)
 - 2012 UNCERTAINTY ANALYSIS SUGGESTS GAS PREFERRABLE TO CONAWAPA
 - 2013 REFERENCE RESULTS WITH DSM 2 -> INCREASES SPREAD BETWEEN GAS AND CONAWAPA
 - WITH KEEYASK IN 2019 AND WPS NEXT NEED DATE ~2030
- OBSERVATIONS
 - NO NEED FOR EARLY I/S DATE AND ASSOCIATED AGGRESSIVE SPEND
 - SOME “FUTURES” FAVOUR CONAWAPA -> CAREFUL ASSESSMENT REQUIRED OF CONTINUED SPEND REQUIREMENT AND KEY DECISION POINTS

MULTIPLE ACCOUNT ANALYSIS

MARKET VALUATION ACCOUNT BACKGROUND

- BASED ON BROADER SOCIETAL PERSPECTIVE
- CALCULATED USING 2012 REFERENCE VALUES UPDATED FOR HIGHER CAPITAL COSTS
- EMPLOYS A 6% “SOCIAL OPPORTUNITY” COST OF CAPITAL -> REASONABLE
- SAME 6% VALUE USED FOR GOVERNMENT AND ENVIRONMENTAL ACCOUNTS
- HOWEVER, FOR MARKET VALUATION ACCT. COST AND BENEFITS ARE ONLY DISCOUNTED AT 6% FOR 2014-2047 PERIOD.
- SUBSEQUENT COSTS/BENEFITS DISCOUNTED TO 2047 USING 5.05%.

MARKET VALUATION ACCOUNT ISSUES

- MARKET VALUATION NOT ADJUSTED FOR HIGHER DSM (~DSM 2) OR 2013 PLANNING ASSUMPTIONS
 - HIGHER DSM APPEARS TO PROVIDE GREATER BENEFIT TO KEYASK/GAS/750 PLANS
- NO INITIAL RATIONALE PROVIDED FOR USING 5.05% AFTER 2047
 - INCREASES RELATIVE VALUE OF PREFERRED PLAN
 - INTERROGATORIES (TO ECS) SUGGEST USE OF LOWER DISCOUNT RATE APPROPRIATE FOR INTERGENERATIONAL PROJECTS
- EMBEDDED EQUITY AS A “BENEFIT”

USE OF LOWER INTERGENERATIONAL DISCOUNT RATES

- VARIATION IN PRACTICE
 - US EPA - > TIME DECLINING RATES BASED ON SAVINGS
 - US OMB -> 7% BASED ON PRIVATE INVESTMENT
- ONGOING THEORETICAL DEBATE
- NEED TO SEPARATE ISSUES RELATED TO VALUING A FUTURE OUTCOME vs. DISCOUNTING ITS VALUE

“MOST ISSUES OF LONG-TERM SUSTAINABILITY OR QUALITY OF LIFE ARE NOT DISCOUNTING ISSUES AT ALL. IT IS NOT THE FUTURE VALUES DISCOUNTED TO THE PRESENT THAT NEED TO BE ADDRESSED, BUT RATHER THE VALUES THAT PEOPLE HOLD TODAY IN RESPECT OF THE POSSIBLE LONG TERM CONSEQUENCES”

SHAFFER (2010)

EMBEDDED EQUITY “BENEFIT”

CALCULATION OF “BENEFIT” (Millions 2014 \$ - NPV)

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

Source: MH Exhibit #175

- USING 4.65% vs. 5.4% INCREASES PDP NPV BY \$391M.
- MOST OF \$1,319 M DUE TO LOWER VALUE FOR ALL GAS PLAN.
- PDP REQUIRES MORE CAPITAL->MORE EQUITY TO MAINTAIN SELF-SUPPORTING STATUS.

CUSTOMER ACCOUNT BACKGROUND

- RATE IMPACT METRIC BASED ON CUMULATIVE RATE INCREASES
- NET PRESENT VALUE OF FORECAST CUSTOMER REVENUES WOULD BE A MORE INFORMATIVE METRIC (PER WUSKWATIM NFAT)
- MANITOBA HYDRO HAS PROVIDED NPV VALUES FOR CUSTOMER REVENUES BASED ON 1.86% REAL DISCOUNT RATE

1.86% - MANITOBA HYDRO'S RATIONALE

- LITERATURE AND PRACTICE SUPPORT USE OF LOWER INTERGENERATIONAL DISCOUNT RATES
 - REFERENCES RELATE TO SOCIETAL/MARKET PERSPECTIVE NOT CUSTOMER PERSPECTIVE
- REVENUE REQUIREMENT ALREADY INCLUDES COST OF DEBT AND EQUITY
 - NOT RELEVANT TO CUSTOMER PERSPECTIVE
- UNCERTAINTY HAS ALREADY BEEN ACCOUNTED FOR
 - UNCERTAINTY HAS BEEN ANALYZED AND BETTER UNDERSTOOD BUT BY NO MEANS ELIMINATED
- TIME PREFERENCE RATE BASED ON REAL GOVERNMENT BOND YIELDS
 - GOVERNMENT RATE APPLICABLE WHEN NO RISK
 - ASSUMES CHANGES IN ELECTRIC BILLS AFFECT “SAVINGS”

OVERALL MULTIPLE ACCOUNT RESULTS

Capital Cost Sensitivity

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	0	-46	-27	-240	-105	-395	-963

*Plan 14 and plan 5 do not include the WPS investment.

OVERALL MULTIPLE ACCOUNT RESULTS OBSERVATIONS

- RESULTS SUGGEST SIGNIFICANT DISTRIBUTIONAL ISSUES
- PLANS YIELDING GREATEST ENVIRONMENTAL AND PROVINCIAL BENEFITS IMPOSE THE GREATEST COST ON MANITOBA HYDRO/RATE PAYERS
- THERE ARE ALSO INTERGENERATIONAL ISSUES
- ECONOMIC THEORY-> WINNERS COMPENSATE LOSERS

OVERALL OBSERVATIONS

KEYASK/INTERTIE

- FROM INFORMATION AVAILABLE TO-DATE ADVANCING KEYASK/750/GAS-BASED PLAN APPEARS ECONOMIC RELATIVE TO PLANS WITH NO INTERTIE
 - SUPPORTED BY THE UPDATED 2012 UNCERTAINTY ANALYSIS
 - THE 2013 REFERENCE CASE RESULTS INDICATE THAT AT DSM2 LEVELS THESE ECONOMICS WILL IMPROVE
- HOWEVER INFORMATION GAPS REMAIN:
 - IS THE 250 MW INTERTIE ALTERNATIVE TRULY NOT VIABLE?
 - WHAT ARE THE IMPLICATIONS OF FUTURE CARBON PRICING ASSUMPTIONS EMBEDDED IN THE ANALYSIS?
 - WOULD THE ECONOMICS STILL HOLD IF SIGNIFICANTLY HIGHER LEVELS OF ECONOMIC DSM WERE AVAILABLE?

OVERALL OBSERVATIONS

CONAWAPA

- CURRENTLY NOT THE “PREFERRED” OPTION FROM AN ECONOMIC PERSPECTIVE
 - SUPPORTED BY THE UPDATED 2012 UNCERTAINTY ANALYSIS
 - THE 2013 REFERENCE CASE RESULTS INDICATE THAT AT DSM2 LEVELS THE ECONOMICS WILL DETERIORATE FURTHER RELATIVE TO KEEYASK/750/GAS PLANS
- MAY BE BENEFICIAL TO PROTECT A LATER IN SERVICE DATE -> BUT REQUIRES CAREFUL CONSIDERATION
- FORMAL COMMITMENT INVOLVES CONSIDERATIONS BEYOND “SYSTEM PLANNING” -> REQUIRES FULL PUBLIC DEBATE