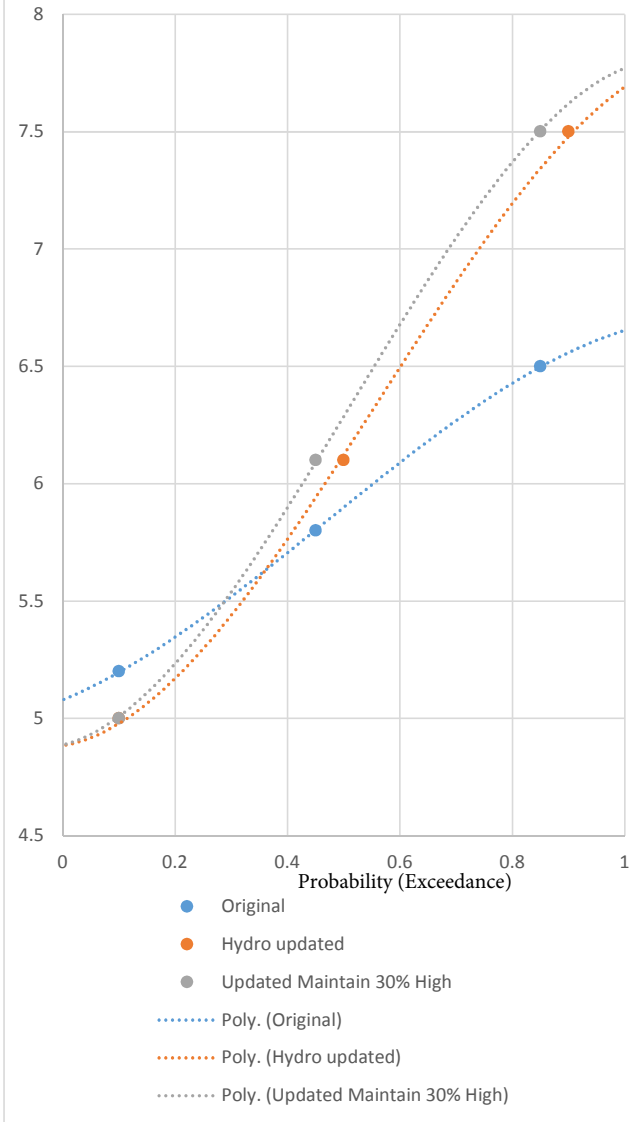


VOLUME 8**Index – MIPUG Book of Documents****Manitoba Hydro's Needs For and Alternatives To (NFAT) Review****April 13, 2014**

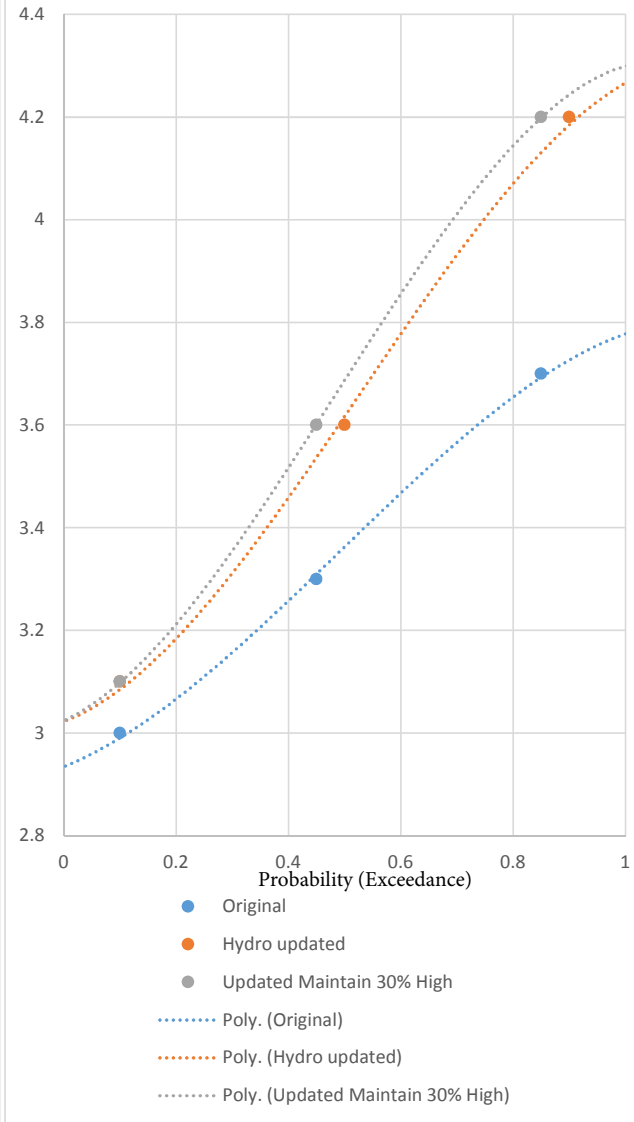
Tab #	Description	Sources
1	<p>a) Cost S-Curve Graphs on the Likelihood of the Cost Variation to Conawapa and Keeyask – Created by MIPUG</p> <p>b) MH-104-8: Updated calculations all plans with new info provided Mar 10 2014</p>	<p>a) Data from MH-Exhibit 104-8 pages 1 and 2.</p> <p>b) MH-104-8 from NFAT filing. Available online: http://www.pub.gov.mb.ca/nfat_hearing/NFAT%20Exhibits/MH-104-8.pdf</p>

Capital Costs (Billions of 2014 Base \$)

Conawapa Base Cost S-curves for Economic Modelling



Keyyask Base Cost S-curves for Economic Modelling



Created on MIPUG based on data provided in MH-104-8

NEEDS FOR AND ALTERNATIVES TO (NFAT)**Manitoba Hydro Undertaking #27**

Manitoba Hydro to file the additional calculations performed on all of the plans upon which Manitoba Hydro conducted a probabilistic analysis, using base level DSM, with respect to the new information provided as of March 10, 2014.

Response:

Please see the attached Updated Economic Uncertainty Analysis Results.

Updated Economic Uncertainty Analysis Results

The economic uncertainty analysis as provided in Manitoba Hydro’s Exhibit 104-2 has been further updated to reflect the following:

- addition of Plan 6 (K-19/Gas31/750MW) and Plan 12 (K-19/C31/750MW),
- Plans 5 and 14 are now shown with no WPS investment in the new 750 MW US interconnection (Manitoba Hydro is assumed to pay the WPS portion of investment costs); Plan 5 and Plan 14 are now labeled as K-19/Gas25/750MW (WPS Sale & no WPS Inv) and K-19/C25/750MW (WPS Sale & no WPS Inv), respectively.

The following updates reflected in Manitoba Hydro’s Exhibit 104-2 are also applied:

- updated capital costs for Keeyask and Conawapa,
- updated probability weightings associated with the Capital Costs factor,
- updated treatment of common factors (costs and revenues common to all alternatives).

Updated Capital Costs

As a result of recently receiving General Civil Contract bids for Keeyask, Manitoba Hydro has updated its capital cost estimates for Keeyask and Conawapa. The updated capital cost estimates used in the updated economic uncertainty analysis, in billions of 2014 base dollars, are provided in the table below. Consistent with the assumptions documented in the NFAT submission, all costs prior to June 2014 are not included in the totals as they are considered sunk and having been made to protect the in-service dates shown in the table.

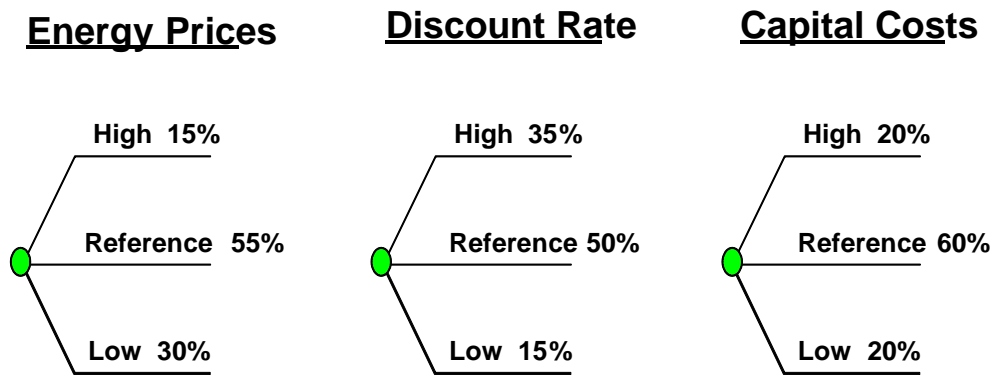
Updated Capital Cost Estimates for Keeyask and Conawapa Used in Economic Uncertainty Analysis

(Billions of 2014 Base \$)

	Keeyask - 2019			Keeyask – 2022			Conawapa – 2025			Conawapa - 2026			Conawapa - 2031		
	Low	Ref	High	Low	Ref	High	Low	Ref	High	Low	Ref	High	Low	Ref	High
2012 NFAT Analysis	3.0	3.3	3.7	3.1	3.4	3.9	5.1	5.7	6.4	5.2	5.8	6.5	5.3	6.0	6.7
2014 Update	3.1	3.6	4.2	3.1	3.7	4.4	5.0	6.1	7.5	5.0	6.1	7.5	5.2	6.4	7.9

Updated Probability Weightings

As described in Appendix 9.3 of the NFAT submission, the Capital Costs factor and associated probability weightings apply to capital costs for hydro-electric generation, natural gas-fired generation, wind generation and transmission line and station. To reflect the greater certainty in the new estimate for Keeyask and the enhanced labour productivity reserve methodology, the low, reference and high probabilities have been updated. The updated probabilities are presented below. The reference capital cost scenario probability weighting has been updated to 60% from the 50% used in the NFAT submission and the high capital cost scenario probability weighting has been updated to 20% from the 30% used in the NFAT submission. The probability weighting for the low capital cost scenario has not changed from that assumed in the NFAT submission.



Results

The latest NPV results with the three updates are presented in the quilt and table below. The results for Plan 1, Plan 2, Plan 4 and Plan 8 are unchanged from those provided in MH Exhibit 104-2. The results for Plan 6 and Plan 12 have been added to the quilt and table below. The results for Plan 5 and Plan 14 have been adjusted for the assumption that WPS does not invest in the new 750 MW US interconnection and Manitoba Hydro pays that portion of investment costs. The assumption that the WPS Sale is included in Plan 5 and Plan 14 remains unchanged.

Relative to All Gas – Ref – Ref – Ref, expected values range from essentially zero to more than \$600M. While Plan 4 has the highest expected value, this plan is no longer realistically viable and the economic benefits can only be considered as hypothetical. Excluding Plan 4, Plan 6 has the highest expected value. Plan 1 has the lowest expected value. Again, relative to All Gas – Ref – Ref – Ref, 10th percentile values range from -\$700M to -\$2.9B. All plans have some

downside risk. Excluding Plan 4 because it is no longer viable, Plan 2 has the least downside risk. Plan 14 has the most downside risk followed by Plan 12.

Revised Capital Costs and Revised Treatment of Common factors

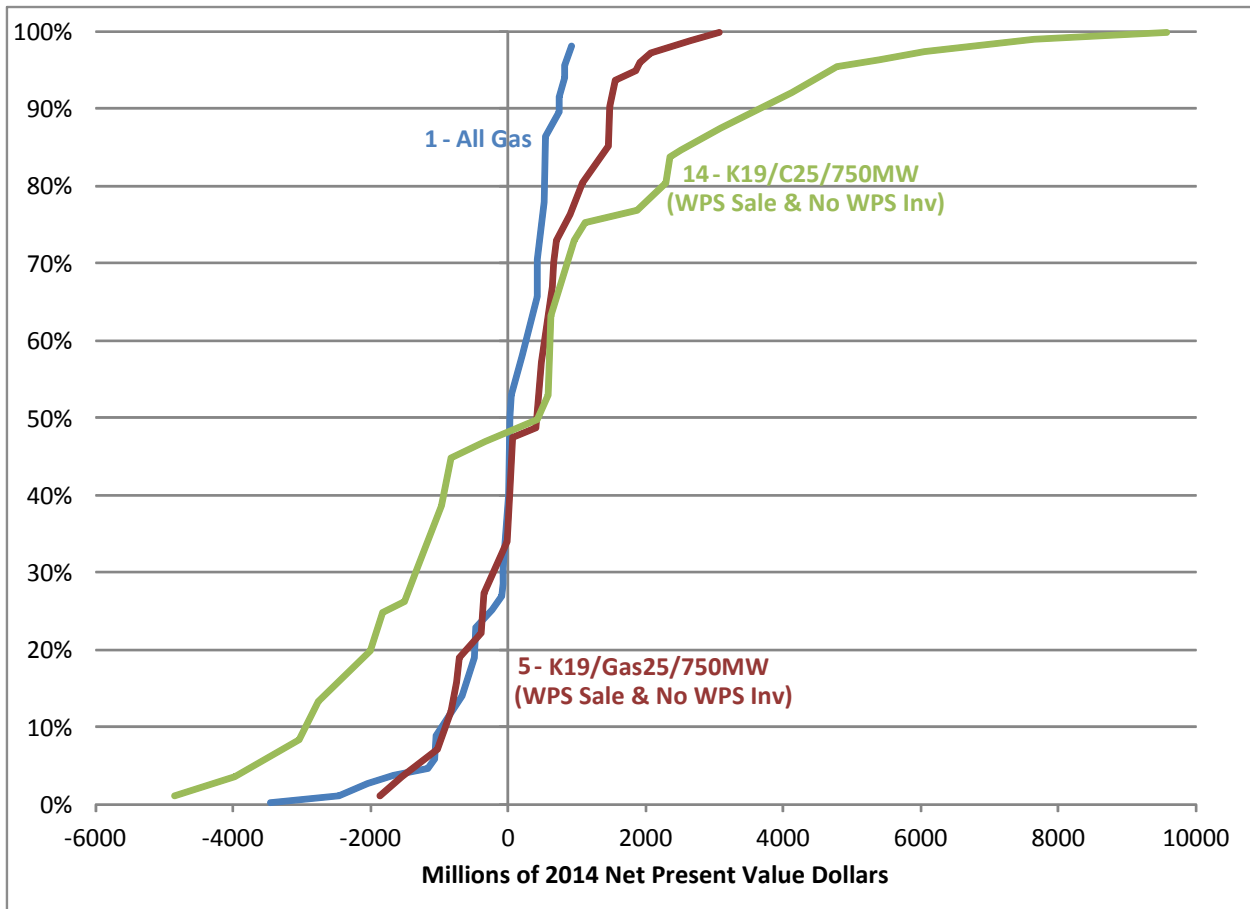
Development Plan			1	2	4	8	6	12	5	14	
			All Gas	K22/Gas	K19/Gas24 /250MW	CCGT/C26	K19/Gas31 /750MW	K19/C31 /750MW	K19/Gas25 /750MW	K19/C25 /750MW	
			WPS Sale & no WPS Inv								
Energy Prices	Discount Rates	Capital Costs	Millions of 2014 NPV Dollars								
Low	Low	H	-1062	-1401	-851	-1501	-1079	-2143	-758	-1825	
		Ref	-68	16	646	106	392	-53	698	424	
		L	734	1205	1898	1449	1613	1750	1906	2359	
	Ref	H	-463	-1751	-1512	-2398	-1793	-3717	-1546	-3969	
		Ref	208	-677	-334	-1085	-614	-1977	-355	-2010	
		L	750	232	658	15	369	-476	637	-325	
	High	H	-88	-1782	-1761	-2625	-2060	-4202	-1872	-4838	
		Ref	416	-891	-748	-1480	-1033	-2668	-820	-3044	
		L	823	-133	110	-519	-172	-1345	61	-1500	
	Ref	Low	H	-2033	-120	543	325	298	1410	-7	1869
			Ref	-1039	1296	2040	1932	1770	3501	1449	4118
			L	-237	2486	3292	3275	2991	5304	2658	6053
Ref		H	-671	-585	-260	-910	-517	-1204	-707	-1345	
		Ref	0	489	917	403	662	536	484	614	
		L	542	1397	1910	1503	1645	2037	1477	2300	
High		H	17	-716	-620	-1343	-880	-2214	-1034	-2759	
		Ref	520	175	393	-198	148	-680	18	-966	
		L	927	933	1251	762	1008	643	899	578	
High		Low	H	-3454	892	1647	2005	1333	4820	402	5388
			Ref	-2460	2309	3143	3612	2804	6911	1858	7638
			L	-1658	3498	4396	4955	4025	8714	3066	9573
	Ref	H	-1158	402	797	469	526	1178	-103	1125	
		Ref	-487	1476	1974	1782	1704	2918	1088	3084	
		L	55	2384	2967	2882	2687	4418	2081	4770	
	High	H	-82	210	368	-156	115	-352	-384	-824	
		Ref	422	1101	1381	989	1143	1182	669	969	
		L	828	1859	2239	1949	2003	2505	1549	2513	

Development Plan			1	2	4	8	6	12	5	14	
			All Gas	K22/Gas	K19/Gas24 /250MW	CCGT/C26	K19/Gas31 /750MW	K19/C31 /750MW	K19/Gas25 /750MW	K19/C25 /750MW	
			WPS Sale & no WPS Inv								
			Millions of 2014 NPV Dollars								
10th Percentile - "Risk"			-953	-862	-727	-1457	-1007	-2512	-909	-2946	
25th Percentile			-244	-622	-290	-980	-556	-1482	-367	-1760	
75th Percentile			483	1026	1339	916	1099	1232	824	1105	
90th Percentile - "Reward"			738	1448	2019	1898	1749	3239	1475	3653	
Expected Value			-9	268	651	143	386	115	268	120	
Ref-Ref-Ref NPV			0	489	917	403	662	536	484	614	

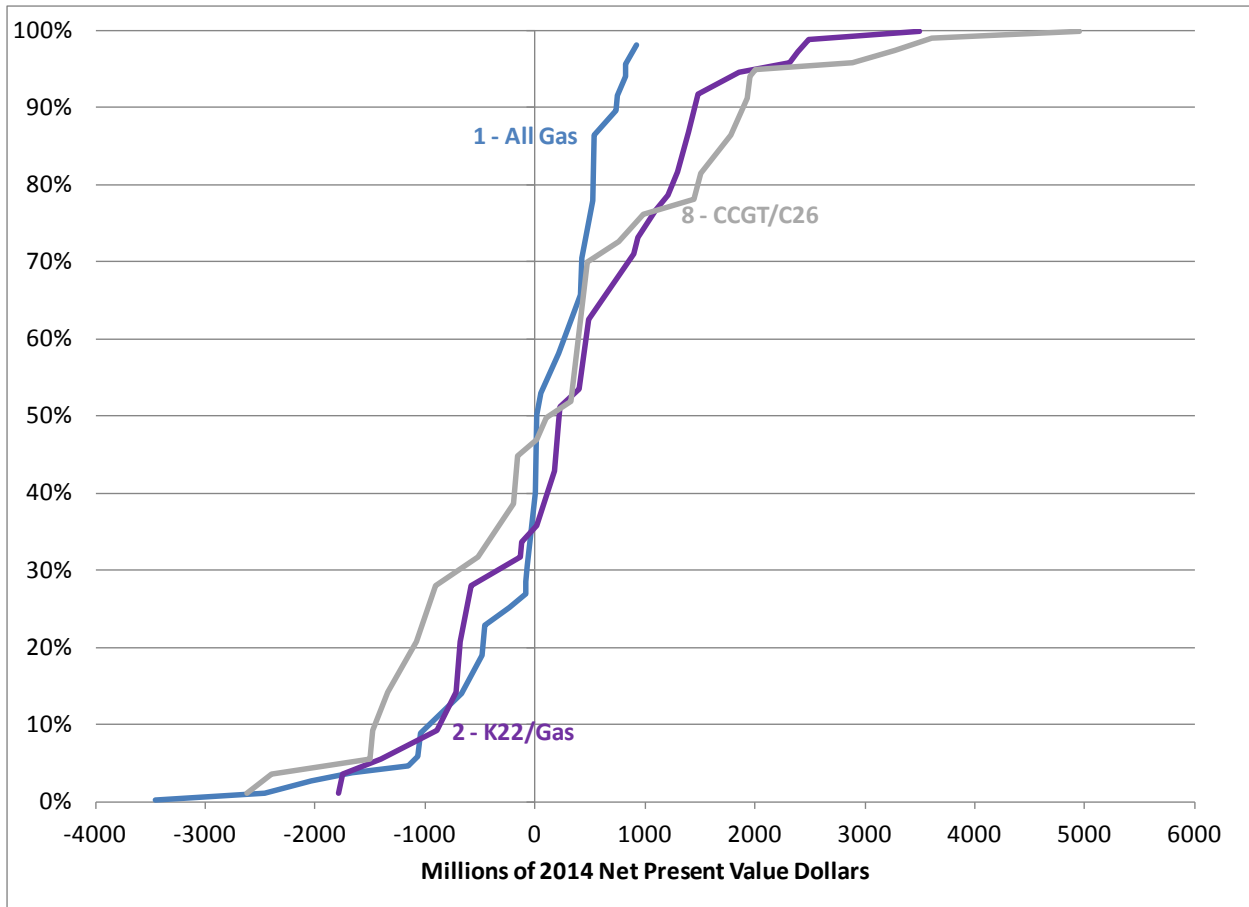
S-curves are provided below for the following four sets of comparisons:

- 1) Plan 1, Plan 5, Plan 14
- 2) Plan 1, Plan 2, Plan 8
- 3) Plan 1, Plan 2, Plan 6
- 4) Plan 1, Plan 6, Plan 8.

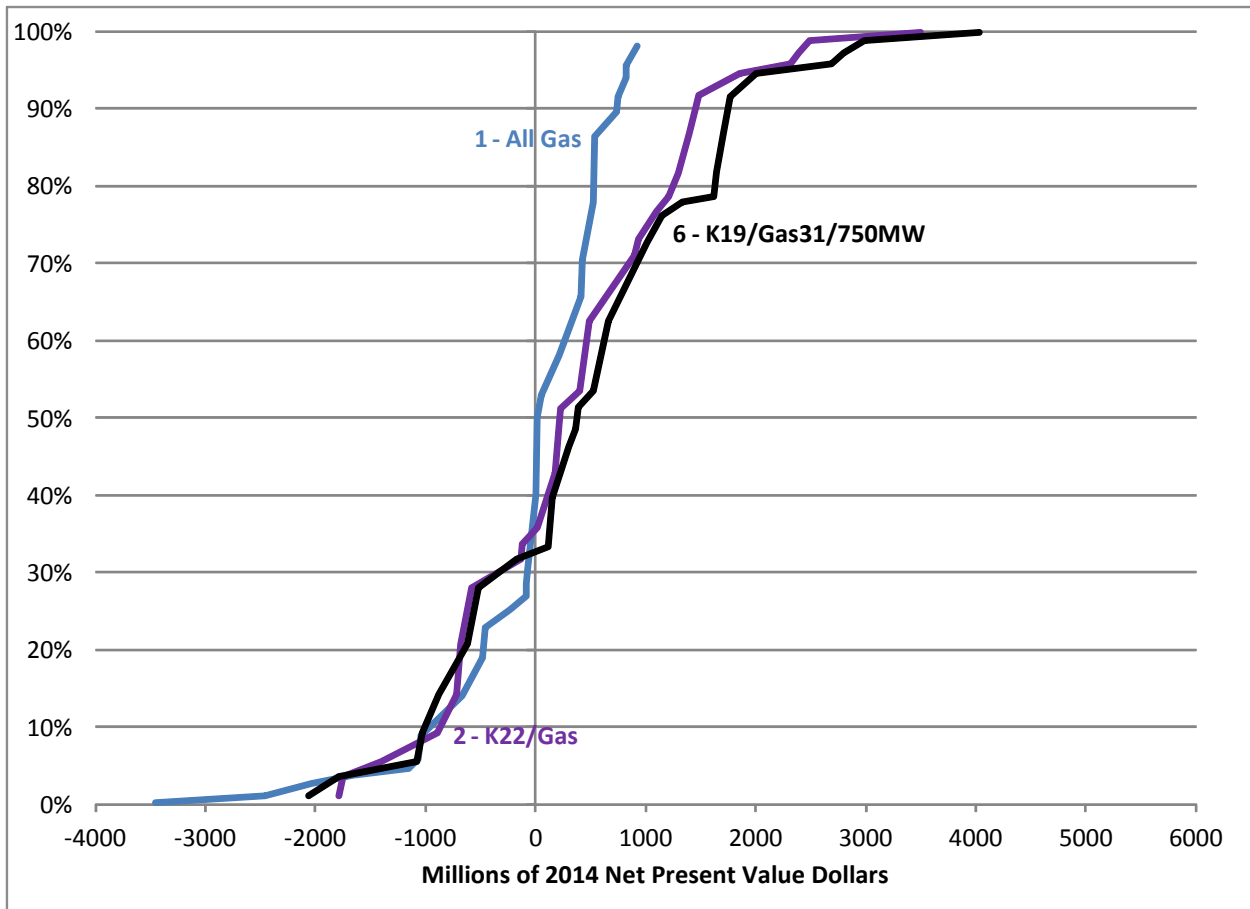
S-Curves - Plans 1, 5 and 14



S-Curves - Plans 1, 2 and 8



S-Curves - Plans 1, 2 and 6



S-Curves - Plans 1, 6 and 8

