115 kV dbl ckt, dbl bundled Hiawatha Plan:

Title: HIA&MID East, HIA at 115 kV, Crosstown @115 kV Equalized

Interest Rate	7.42%	Starting year for study	2007	
'Carrying Charge Rate	10.84%	Investments/Expenses	2007	
Investment Escalation	1.88%	Ending Year	2042	35
Expense Escalation	1.88%	*The 35 year totals below were calculated using the rates above.		

Year	Cumulative Present Worth	Total Investment		Levelized Annual Cost
2042	94,797,345	123,877,676		7,576,974

Year	New Investments 2007 dollars	Expenses 2007 dollars	Escalated New Investments	Escalated Expenses	Investment Revenue Requirement	Revenue Requirements	Present Worth of Revenue Requirements	Cumulative Present Worth 2007 dollars	Cumulative Investment
2007	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0
2010	18,311,000	0	19,363,278	0	2,098,786	2,098,786	1,576,259	1,576,259	19,363,278
2011	0	0	0	0	2,098,786	2,098,786	1,467,379	3,043,638	19,363,278
2012	0	0	0	0	2,098,786	2,098,786	1,366,020	4,409,658	19,363,278
2013	39,486,000	-356,728	44,154,682	-398,906	6,884,712	6,485,806	3,929,777	8,339,435	63,517,959
2014	36,604,000	-391,671	41,701,445	-446,214	11,404,731	10,958,517	6,181,169	14,520,604	105,219,404
2015	0	-459,864	0	-533,753	11,404,731	10,870,978	5,708,241	20,228,845	105,219,404
2016	7,548,000	-527,911	8,925,495	-624,253	12,372,166	11,747,912	5,742,609	25,971,453	114,144,899
2017	4,610,000	-586,004	5,553,801	-705,976	12,974,142	12,268,166	5,582,684	31,554,137	119,698,700
2018	3,404,800	-628,259	4,178,976	-771,111	13,427,101	12,655,990	5,361,352	36,915,489	123,877,676
2019	0	-705,960	0	-882,769	13,427,101	12,544,332	4,946,985	41,862,475	123,877,676
2020	0	-776,183	0	-988,827	13,427,101	12,438,274	4,566,338	46,428,813	123,877,676
2021	0	-870,469	0	-1,129,791	13,427,101	12,297,310	4,202,744	50,631,556	123,877,676
2022	0	-927,586	0	-1,226,559	13,427,101	12,200,542	3,881,654	54,513,210	123,877,676
2023	0	-1,017,791	0	-1,371,139	13,427,101	12,055,962	3,570,708	58,083,918	123,877,676
2024	0	-1,104,260	0	-1,515,595	13,427,101	11,911,506	3,284,233	61,368,151	123,877,676
2025	0	-1,172,345	0	-1,639,292	13,427,101	11,787,809	3,025,626	64,393,778	123,877,676
2026	0	-1,257,610	0	-1,791,578	13,427,101	11,635,523	2,780,244	67,174,022	123,877,676
2027	0	-1,379,149	0	-2,001,658	13,427,101	11,425,443	2,541,470	69,715,491	123,877,676
2028	0	-1,495,294	0	-2,211,029	13,427,101	11,216,073	2,322,563	72,038,055	123,877,676
2029	0	-1,571,063	0	-2,366,738	13,427,101	11,060,363	2,132,117	74,170,172	123,877,676
2030	0	-1,814,139	0	-2,784,300	13,427,101	10,642,801	1,909,908	76,080,079	123,877,676
2031	0	0	0	0	13,427,101	13,427,101	2,243,125	78,323,205	123,877,676
2032	0	0	0	0	13,427,101	13,427,101	2,088,182	80,411,387	123,877,676
2033	0	0	0	0	13,427,101	13,427,101	1,943,942	82,355,329	123,877,676
2034	0	0	0	0	13,427,101	13,427,101	1,809,665	84,164,994	123,877,676
2035	0	0	0	0	13,427,101	13,427,101	1,684,663	85,849,656	123,877,676
2036	0	0	0	0	13,427,101	13,427,101	1,568,295	87,417,952	123,877,676
2037	0	0	0	0	13,427,101	13,427,101	1,459,966	88,877,917	123,877,676
2038	0	0	0	0	13,427,101	13,427,101	1,359,119	90,237,037	123,877,676
2039	0	0	0	0	13,427,101	13,427,101	1,265,238	91,502,275	123,877,676
2040	0	0	0	0	13,427,101	13,427,101	1,177,843	92,680,118	123,877,676
2041	0	0	0	0	13,427,101	13,427,101	1,096,483	93,776,601	123,877,676
2042	0	0	0	0	13,427,101	13,427,101	1,020,744	94,797,345	123,877,676

*Carrying Charge Rate = (Return Requirement+Depreciation Requirement+Income Tax Requirement)
*Book Life is 35 years.

115 kV dbl ckt, dbl bundled Hiawatha Plan with late Cleveland-Hiawatha 345 kV ISD:

Title: HIA&MID East, HIA at 115 kV, Crosstown @115 kV Equalized

Interest Rate	7.42%	Starting year for study	2007	
'Carrying Charge Rate	10.84%	Investments/Expenses	2007	
Investment Escalation	1.88%	Ending Year	2042	35
Expense Escalation	1.88%	*The 35 year totals below were calculated using the rates above.		

Year	Cumulative Present Worth	Total Investment		Levelized Annual Cost
2042	94,138,022	125,106,189		7,522,884

Year	New Investments 2007 dollars	Expenses 2007 dollars	Escalated New Investments	Escalated Expenses	Investment Revenue Requirement	Revenue Requirements	Present Worth of Revenue Requirements	Cumulative Present Worth 2007 dollars	Cumulative Investment
2007	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0
2010	18,311,000	0	19,363,278	0	2,098,786	2,098,786	1,576,259	1,576,259	19,363,278
2011	0	0	0	0	2,098,786	2,098,786	1,467,379	3,043,638	19,363,278
2012	0	0	0	0	2,098,786	2,098,786	1,366,020	4,409,658	19,363,278
2013	31,597,000	0	35,332,915	0	5,928,520	5,928,520	3,592,115	8,001,774	54,696,193
2014	36,604,000	0	41,701,445	0	10,448,540	10,448,540	5,893,515	13,895,289	96,397,637
2015	0	0	0	0	10,448,540	10,448,540	5,486,423	19,381,712	96,397,637
2016	7,548,000	0	8,925,495	0	11,415,974	11,415,974	5,580,351	24,962,063	105,323,132
2017	4,610,000	0	5,553,801	0	12,017,951	12,017,951	5,468,822	30,430,885	110,876,933
2018	3,404,800	0	4,178,976	0	12,470,910	12,470,910	5,282,948	35,713,833	115,055,909
2019	0	0	0	0	12,470,910	12,470,910	4,918,031	40,631,864	115,055,909
2020	7,889,000	-776,183	10,050,279	-988,827	13,560,260	12,571,433	4,615,223	45,247,087	125,106,189
2021	0	-870,469	0	-1,129,791	13,560,260	12,430,468	4,248,252	49,495,339	125,106,189
2022	0	-927,586	0	-1,226,559	13,560,260	12,333,701	3,924,018	53,419,357	125,106,189
2023	0	-1,017,791	0	-1,371,139	13,560,260	12,189,121	3,610,147	57,029,504	125,106,189
2024	0	-1,104,260	0	-1,515,595	13,560,260	12,044,664	3,320,948	60,350,452	125,106,189
2025	0	-1,172,345	0	-1,639,292	13,560,260	11,920,968	3,059,805	63,410,256	125,106,189
2026	0	-1,257,610	0	-1,791,578	13,560,260	11,768,681	2,812,062	66,222,318	125,106,189
2027	0	-1,379,149	0	-2,001,658	13,560,260	11,558,601	2,571,089	68,793,408	125,106,189
2028	0	-1,495,294	0	-2,211,029	13,560,260	11,349,231	2,350,137	71,143,545	125,106,189
2029	0	-1,571,063	0	-2,366,738	13,560,260	11,193,522	2,157,786	73,301,330	125,106,189
2030	0	-1,814,139	0	-2,784,300	13,560,260	10,775,959	1,933,804	75,235,134	125,106,189
2031	0	0	0	0	13,560,260	13,560,260	2,265,371	77,500,505	125,106,189
2032	0	0	0	0	13,560,260	13,560,260	2,108,891	79,609,396	125,106,189
2033	0	0	0	0	13,560,260	13,560,260	1,963,220	81,572,616	125,106,189
2034	0	0	0	0	13,560,260	13,560,260	1,827,611	83,400,228	125,106,189
2035	0	0	0	0	13,560,260	13,560,260	1,701,370	85,101,598	125,106,189
2036	0	0	0	0	13,560,260	13,560,260	1,583,848	86,685,446	125,106,189
2037	0	0	0	0	13,560,260	13,560,260	1,474,444	88,159,890	125,106,189
2038	0	0	0	0	13,560,260	13,560,260	1,372,598	89,532,488	125,106,189
2039	0	0	0	0	13,560,260	13,560,260	1,277,786	90,810,274	125,106,189
2040	0	0	0	0	13,560,260	13,560,260	1,189,523	91,999,797	125,106,189
2041	0	0	0	0	13,560,260	13,560,260	1,107,357	93,107,155	125,106,189
2042	0	0	0	0	13,560,260	13,560,260	1,030,867	94,138,022	125,106,189

*Carrying Charge Rate = (Return Requirement+Depreciation Requirement+Income Tax Requirement)
*Book Life is 35 years.

345 kV Hiawatha Plan:

Title: HIA&MID East, HIA at 345 kV, Crosstown at 115 kV Equalized

Interest Rate	7.42%	Starting year for study	2007	
'Carrying Charge Rate	10.84%	Investments/Expenses	2007	
Investment Escalation	1.88%	Ending Year	2042	35
Expense Escalation	1.88%	*The 35 year totals below were calculated using the rates above.		

Year	Cumulative Present Worth	Total Investment		Levelized Annual Cost
2042	95,574,140	130,313,794		7,635,453

Year	New Investments 2007 dollars	Expenses 2007 dollars	Escalated New Investments	Escalated Expenses	Investment Revenue Requirement	Revenue Requirements	Present Worth of Revenue Requirements	Cumulative Present Worth 2007 dollars	Cumulative Investment
2007	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0
2010	18,311,000	0	19,363,278	0	2,098,786	2,098,786	1,576,259	1,576,259	19,363,278
2011	0	0	0	0	2,098,786	2,098,786	1,467,379	3,043,638	19,363,278
2012	0	0	0	0	2,098,786	2,098,786	1,366,020	4,409,658	19,363,278
2013	45,289,000	-618,749	50,643,807	-691,908	7,588,068	6,896,160	4,178,412	8,588,071	70,007,085
2014	36,604,000	-674,878	41,701,445	-768,861	12,108,088	11,339,226	6,395,908	14,983,979	111,708,530
2015	0	-788,338	0	-915,006	12,108,088	11,193,082	5,877,374	20,861,353	111,708,530
2016	7,548,000	-901,311	8,925,495	-1,065,798	13,075,522	12,009,724	5,870,587	26,731,940	120,634,025
2017	4,566,000	-997,178	5,500,793	-1,201,330	13,671,753	12,470,423	5,674,722	32,406,662	126,134,817
2018	3,404,800	-1,066,136	4,178,976	-1,308,552	14,124,712	12,816,160	5,429,204	37,835,866	130,313,794
2019	0	-1,195,206	0	-1,494,549	14,124,712	12,630,163	4,980,834	42,816,700	130,313,794
2020	0	-1,311,482	0	-1,670,777	14,124,712	12,453,935	4,572,088	47,388,787	130,313,794
2021	0	-1,468,261	0	-1,905,672	14,124,712	12,219,040	4,175,994	51,564,781	130,313,794
2022	0	-1,562,251	0	-2,065,783	14,124,712	12,058,929	3,836,599	55,401,380	130,313,794
2023	0	-1,711,902	0	-2,306,226	14,124,712	11,818,486	3,500,373	58,901,753	130,313,794
2024	0	-1,855,157	0	-2,546,200	14,124,712	11,578,512	3,192,420	62,094,173	130,313,794
2025	0	-1,967,469	0	-2,751,115	14,124,712	11,373,597	2,919,309	65,013,482	130,313,794
2026	0	-2,108,568	0	-3,003,844	14,124,712	11,120,868	2,657,270	67,670,752	130,313,794
2027	0	-2,310,370	0	-3,353,206	14,124,712	10,771,506	2,396,008	70,066,760	130,313,794
2028	0	-2,502,993	0	-3,701,070	14,124,712	10,423,642	2,158,471	72,225,232	130,313,794
2029	0	-2,627,960	0	-3,958,908	14,124,712	10,165,805	1,959,672	74,184,903	130,313,794
2030	0	-3,032,590	0	-4,654,353	14,124,712	9,470,359	1,699,507	75,884,410	130,313,794
2031	0	0	0	0	14,124,712	14,124,712	2,359,668	78,244,078	130,313,794
2032	0	0	0	0	14,124,712	14,124,712	2,196,675	80,440,753	130,313,794
2033	0	0	0	0	14,124,712	14,124,712	2,044,940	82,485,693	130,313,794
2034	0	0	0	0	14,124,712	14,124,712	1,903,687	84,389,380	130,313,794
2035	0	0	0	0	14,124,712	14,124,712	1,772,190	86,161,570	130,313,794
2036	0	0	0	0	14,124,712	14,124,712	1,649,777	87,811,347	130,313,794
2037	0	0	0	0	14,124,712	14,124,712	1,535,819	89,347,165	130,313,794
2038	0	0	0	0	14,124,712	14,124,712	1,429,733	90,776,898	130,313,794
2039	0	0	0	0	14,124,712	14,124,712	1,330,974	92,107,873	130,313,794
2040	0	0	0	0	14,124,712	14,124,712	1,239,038	93,346,910	130,313,794
2041	0	0	0	0	14,124,712	14,124,712	1,153,452	94,500,362	130,313,794
2042	0	0	0	0	14,124,712	14,124,712	1,073,777	95,574,140	130,313,794

*Carrying Charge Rate = (Return Requirement+Depreciation Requirement+Income Tax Requirement)
*Book Life is 35 years.

345 kV Hiawatha Plan with late Cleveland-Hiawatha 345 kV ISD:

Title: HIA&MID East, HIA at 345 kV, Crosstown at 115 kV Equalized

Interest Rate	7.42%	Starting year for study	2007	
'Carrying Charge Rate	10.84%	Investments/Expenses	2007	
Investment Escalation	1.88%	Ending Year	2042	35
Expense Escalation	1.88%	*The 35 year totals below were calculated using the rates above.		

Year	Cumulative Present Wortl	Total Investment		Levelized Annual Cost
2042	94,373,505	132,445,977		7,537,024

Year	New Investments 2007 dollars	Expenses 2007 dollars	Escalated New Investments	Escalated Expenses	Investment Revenue Requirement	Revenue Requirements	Present Worth of Revenue Requirements	Cumulative Present Worth 2007 dollars	Cumulative Investment
2007	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0
2010	18,311,000	0	19,363,278	0	2,098,786	2,098,786	1,576,259	1,576,259	19,363,278
2011	0	0	0	0	2,098,786	2,098,786	1,467,379	3,043,638	19,363,278
2012	0	0	0	0	2,098,786	2,098,786	1,366,020	4,409,658	19,363,278
2013	31,597,000	0	35,332,915	0	5,928,520	5,928,520	3,592,115	8,001,774	54,696,193
2014	36,604,000	0	41,701,445	0	10,448,540	10,448,540	5,893,515	13,895,289	96,397,637
2015	0	0	0	0	10,448,540	10,448,540	5,486,423	19,381,712	96,397,637
2016	7,548,000	0	8,925,495	0	11,415,974	11,415,974	5,580,351	24,962,063	105,323,132
2017	4,566,000	0	5,500,793	0	12,012,205	12,012,205	5,466,208	30,428,270	110,823,925
2018	3,404,800	0	4,178,976	0	12,465,164	12,465,164	5,280,514	35,708,785	115,002,901
2019	0	0	0	0	12,465,164	12,465,164	4,915,765	40,624,549	115,002,901
2020	13,692,000	-1,311,482	17,443,076	-1,670,777	14,355,819	12,685,043	4,656,932	45,281,481	132,445,977
2021	0	-1,468,261	0	-1,905,672	14,355,819	12,450,147	4,254,977	49,536,458	132,445,977
2022	0	-1,562,251	0	-2,065,783	14,355,819	12,290,036	3,910,126	53,446,585	132,445,977
2023	0	-1,711,902	0	-2,306,226	14,355,819	12,049,593	3,568,822	57,015,407	132,445,977
2024	0	-1,855,157	0	-2,546,200	14,355,819	11,809,619	3,256,141	60,271,548	132,445,977
2025	0	-1,967,469	0	-2,751,115	14,355,819	11,604,704	2,978,628	63,250,176	132,445,977
2026	0	-2,108,568	0	-3,003,844	14,355,819	11,351,975	2,712,492	65,962,668	132,445,977
2027	0	-2,310,370	0	-3,353,206	14,355,819	11,002,614	2,447,416	68,410,084	132,445,977
2028	0	-2,502,993	0	-3,701,070	14,355,819	10,654,750	2,206,328	70,616,411	132,445,977
2029	0	-2,627,960	0	-3,958,908	14,355,819	10,396,912	2,004,223	72,620,634	132,445,977
2030	0	-3,032,590	0	-4,654,353	14,355,819	9,701,467	1,740,980	74,361,614	132,445,977
2031	0	0	0	0	14,355,819	14,355,819	2,398,277	76,759,891	132,445,977
2032	0	0	0	0	14,355,819	14,355,819	2,232,617	78,992,507	132,445,977
2033	0	0	0	0	14,355,819	14,355,819	2,078,399	81,070,907	132,445,977
2034	0	0	0	0	14,355,819	14,355,819	1,934,835	83,005,741	132,445,977
2035	0	0	0	0	14,355,819	14,355,819	1,801,187	84,806,928	132,445,977
2036	0	0	0	0	14,355,819	14,355,819	1,676,770	86,483,698	132,445,977
2037	0	0	0	0	14,355,819	14,355,819	1,560,948	88,044,646	132,445,977
2038	0	0	0	0	14,355,819	14,355,819	1,453,126	89,497,772	132,445,977
2039	0	0	0	0	14,355,819	14,355,819	1,352,752	90,850,523	132,445,977
2040	0	0	0	0	14,355,819	14,355,819	1,259,311	92,109,834	132,445,977
2041	0	0	0	0	14,355,819	14,355,819	1,172,324	93,282,159	132,445,977
2042	0	0	0	0	14,355,819	14,355,819	1,091,346	94,373,505	132,445,977

*Carrying Charge Rate = (Return Requirement+Depreciation Requirement+Income Tax Requirement)
*Book Life is 35 years.

Parkers Lake-Aldrich 345 kV Plan:

Interest Rate	7.42%	Starting year for study	2007	
'Carrying Charge Rate	10.84%	Investments/Expenses	2007	
Investment Escalation	1.88%	Ending Year	2042	35
Expense Escalation	1.88%	*The 35 year totals below were calculated using the rates above.		

Year	Cumulative Present Worth	Total Investment		Levelized Annual Cost
2042	93,785,538	126,154,368		7,493,707

Year	New Investments 2007 dollars	Expenses 2007 dollars	Escalated New Investments	Escalated Expenses	Investment Revenue Requirement	Revenue Requirements	Present Worth of Revenue Requirements	Cumulative Present Worth 2007 dollars	Cumulative Investment
2007	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0
2010	18,311,000	0	19,363,278	0	2,098,786	2,098,786	1,576,259	1,576,259	19,363,278
2011	0	0	0	0	2,098,786	2,098,786	1,467,379	3,043,638	19,363,278
2012	0	0	0	0	2,098,786	2,098,786	1,366,020	4,409,658	19,363,278
2013	31,597,000	0	35,332,915	0	5,928,520	5,928,520	3,592,115	8,001,774	54,696,193
2014	44,616,000	-397696	50,829,190	-453,079	11,437,896	10,984,817	6,196,003	14,197,777	105,525,382
2015	0	-497404	0	-577,325	11,437,896	10,860,571	5,702,776	19,900,553	105,525,382
2016	7,548,000	-598728	8,925,495	-707,994	12,405,331	11,697,336	5,717,886	25,618,439	114,450,877
2017	4,610,000	-689607	5,553,801	-830,790	13,007,307	12,176,517	5,540,979	31,159,418	120,004,678
2018	3,404,800	-761526	4,178,976	-934,680	13,460,266	12,525,586	5,306,110	36,465,528	124,183,654
2019	1,576,000	-876703	1,970,713	-1,096,276	13,673,872	12,577,596	4,960,103	41,425,631	126,154,368
2020	0	-983611	0	-1,253,083	13,673,872	12,420,789	4,559,919	45,985,550	126,154,368
2021	0	-1122171	0	-1,456,478	13,673,872	12,217,394	4,175,431	50,160,982	126,154,368
2022	0	-1213534	0	-1,604,671	13,673,872	12,069,201	3,839,867	54,000,848	126,154,368
2023	0	-1348663	0	-1,816,880	13,673,872	11,856,992	3,511,778	57,512,626	126,154,368
2024	0	-1479708	0	-2,030,898	13,673,872	11,642,974	3,210,194	60,722,820	126,154,368
2025	0	-1586549	0	-2,218,474	13,673,872	11,455,398	2,940,305	63,663,125	126,154,368
2026	0	-1716977	0	-2,445,987	13,673,872	11,227,884	2,682,841	66,345,966	126,154,368
2027	0	-1897804	0	-2,754,419	13,673,872	10,919,453	2,428,918	68,774,883	126,154,368
2028	0	-2072283	0	-3,064,197	13,673,872	10,609,675	2,196,994	70,971,877	126,154,368
2029	0	-2191327	0	-3,301,139	13,673,872	10,372,733	1,999,562	72,971,439	126,154,368
2030	0	-2545210	0	-3,906,332	13,673,872	9,767,540	1,752,837	74,724,276	126,154,368
2031	0	0	0	0	13,673,872	13,673,872	2,284,351	77,008,627	126,154,368
2032	0	0	0	0	13,673,872	13,673,872	2,126,560	79,135,187	126,154,368
2033	0	0	0	0	13,673,872	13,673,872	1,979,669	81,114,856	126,154,368
2034	0	0	0	0	13,673,872	13,673,872	1,842,924	82,957,780	126,154,368
2035	0	0	0	0	13,673,872	13,673,872	1,715,624	84,673,404	126,154,368
2036	0	0	0	0	13,673,872	13,673,872	1,597,118	86,270,522	126,154,368
2037	0	0	0	0	13,673,872	13,673,872	1,486,798	87,757,320	126,154,368
2038	0	0	0	0	13,673,872	13,673,872	1,384,098	89,141,418	126,154,368
2039	0	0	0	0	13,673,872	13,673,872	1,288,492	90,429,910	126,154,368
2040	0	0	0	0	13,673,872	13,673,872	1,199,490	91,629,399	126,154,368
2041	0	0	0	0	13,673,872	13,673,872	1,116,635	92,746,034	126,154,368
2042	0	0	0	0	13,673,872	13,673,872	1,039,504	93,785,538	126,154,368

*Carrying Charge Rate = (Return Requirement+Depreciation Requirement+Income Tax Requirement)
*Book Life is 35 years.

Parkers Lake-Aldrich 345 kV Plan with late Cleveland-Hiawatha 345 kV ISD:

Title: HIA&MID East, ALD @ 345 kV Equalized

Interest Rate	7.42%	Starting year for study	2007	
'Carrying Charge Rate	10.84%	Investments/Expenses	2007	
Investment Escalation	1.88%	Ending Year	2042	35
Expense Escalation	1.88%	*The 35 year totals below were calculated using the rates above.		

Year	Cumulative Present Wortl	Total Investment		Levelized Annual Cost
2042	100,667,328	142,660,099		8,038,753

Year	New Investments 2007 dollars	Expenses 2007 dollars	Escalated New Investments	Escalated Expenses	Investment Revenue Requirement	Revenue Requirements	Present Worth of Revenue Requirements	Cumulative Present Worth 2007 dollars	Cumulative Investment
2007	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0
2010	18,311,000	0	19,363,278	0	2,098,786	2,098,786	1,576,259	1,576,259	19,363,278
2011	0	0	0	0	2,098,786	2,098,786	1,467,379	3,043,638	19,363,278
2012	0	0	0	0	2,098,786	2,098,786	1,366,020	4,409,658	19,363,278
2013	31,597,000	0	35,332,915	0	5,928,520	5,928,520	3,592,115	8,001,774	54,696,193
2014	36,604,000	0	41,701,445	0	10,448,540	10,448,540	5,893,515	13,895,289	96,397,637
2015	0	0	0	0	10,448,540	10,448,540	5,486,423	19,381,712	96,397,637
2016	7,548,000	0	8,925,495	0	11,415,974	11,415,974	5,580,351	24,962,063	105,323,132
2017	4,610,000	0	5,553,801	0	12,017,951	12,017,951	5,468,822	30,430,885	110,876,933
2018	3,404,800	0	4,178,976	0	12,470,910	12,470,910	5,282,948	35,713,833	115,055,909
2019		0	0	0	12,470,910	12,470,910	4,918,031	40,631,864	115,055,909
2020	21,668,000	-983611	27,604,189	-1,253,083	15,462,928	14,209,846	5,216,717	45,848,581	142,660,099
2021	0	-1122171	0	-1,456,478	15,462,928	14,006,450	4,786,861	50,635,442	142,660,099
2022	0	-1213534	0	-1,604,671	15,462,928	13,858,257	4,409,062	55,044,505	142,660,099
2023	0	-1348663	0	-1,816,880	15,462,928	13,646,048	4,041,656	59,086,161	142,660,099
2024	0	-1479708	0	-2,030,898	15,462,928	13,432,030	3,703,471	62,789,632	142,660,099
2025	0	-1586549	0	-2,218,474	15,462,928	13,244,454	3,399,509	66,189,142	142,660,099
2026	0	-1716977	0	-2,445,987	15,462,928	13,016,941	3,110,326	69,299,468	142,660,099
2027	0	-1897804	0	-2,754,419	15,462,928	12,708,509	2,826,874	72,126,342	142,660,099
2028	0	-2072283	0	-3,064,197	15,462,928	12,398,731	2,567,462	74,693,804	142,660,099
2029	0	-2191327	0	-3,301,139	15,462,928	12,161,789	2,344,440	77,038,244	142,660,099
2030	0	-2545210	0	-3,906,332	15,462,928	11,556,596	2,073,893	79,112,137	142,660,099
2031	0	0	0	0	15,462,928	15,462,928	2,583,230	81,695,367	142,660,099
2032	0	0	0	0	15,462,928	15,462,928	2,404,794	84,100,161	142,660,099
2033	0	0	0	0	15,462,928	15,462,928	2,238,684	86,338,845	142,660,099
2034	0	0	0	0	15,462,928	15,462,928	2,084,047	88,422,892	142,660,099
2035	0	0	0	0	15,462,928	15,462,928	1,940,093	90,362,984	142,660,099
2036	0	0	0	0	15,462,928	15,462,928	1,806,081	92,169,066	142,660,099
2037	0	0	0	0	15,462,928	15,462,928	1,681,327	93,850,393	142,660,099
2038	0	0	0	0	15,462,928	15,462,928	1,565,190	95,415,582	142,660,099
2039	0	0	0	0	15,462,928	15,462,928	1,457,075	96,872,657	142,660,099
2040	0	0	0	0	15,462,928	15,462,928	1,356,428	98,229,085	142,660,099
2041	0	0	0	0	15,462,928	15,462,928	1,262,733	99,491,818	142,660,099
2042	0	0	0	0	15,462,928	15,462,928	1,175,510	100,667,328	142,660,099

*Carrying Charge Rate = (Return Requirement+Depreciation Requirement+Income Tax Requirement)
*Book Life is 35 years.

Quad 345 kV Plan:

Title: HIA&MID East, X-Plan

Interest Rate	7.42%	Starting year for study	2007	
'Carrying Charge Rate	10.84%	Investments/Expenses	2007	
Investment Escalation	1.88%	Ending Year	2042	35
Expense Escalation	1.88%	*The 35 year totals below were calculated using the rates above.		

Year	Cumulative Present Worth	Total Investment		Levelized Annual Cost
2042	96,104,596	159,742,623		7,658,720

Year	New Investments 2007 dollars	Expenses 2007 dollars	Escalated New Investments	Escalated Expenses	Investment Revenue Requirement	Revenue Requirements	Present Worth of Revenue Requirements	Cumulative Present Worth 2007 dollars	Cumulative Investment
2007	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0
2010	18,311,000	0	19,363,278	0	2,098,786	2,098,786	1,576,259	1,576,259	19,363,278
2011	0	0	0	0	2,098,786	2,098,786	1,467,379	3,043,638	19,363,278
2012	0	0	0	0	2,098,786	2,098,786	1,366,020	4,409,658	19,363,278
2013	50,899,000		56,917,114	0	8,268,032	8,268,032	5,009,635	9,419,293	76,280,391
2014	38,403,000	-1343731	43,750,972	-1,530,858	13,010,199	11,479,341	6,474,941	15,894,234	120,031,363
2015	21,739,000	-1764375	25,231,964	-2,047,870	15,745,092	13,697,222	7,192,273	23,086,507	145,263,327
2016	7,548,000	-2195335	8,925,495	-2,595,980	16,712,526	14,116,547	6,900,443	29,986,950	154,188,822
2017	4,610,000	-2590073	5,553,801	-3,120,336	17,314,503	14,194,166	6,459,119	36,446,069	159,742,623
2018	0	-2912837	0	-3,575,152	17,314,503	13,739,351	5,820,288	42,266,356	159,742,623
2019	0	-3401741	0	-4,253,715	17,314,503	13,060,788	5,150,655	47,417,011	159,742,623
2020	0	-3860842	0	-4,918,562	17,314,503	12,395,941	4,550,797	51,967,808	159,742,623
2021	0	-4446732	0	-5,771,465	17,314,503	11,543,038	3,944,963	55,912,771	159,742,623
2022	0	-4847162	0	-6,409,462	17,314,503	10,905,041	3,469,484	59,382,255	159,742,623
2023	0	-5423421	0	-7,306,280	17,314,503	10,008,222	2,964,213	62,346,468	159,742,623
2024	0	-5985089	0	-8,214,527	17,314,503	9,099,976	2,509,040	64,855,508	159,742,623
2025	0	-6449748	0	-9,018,693	17,314,503	8,295,810	2,129,320	66,984,828	159,742,623
2026	0	-7010989	0	-9,987,782	17,314,503	7,326,721	1,750,680	68,735,508	159,742,623
2027	0	-7779816	0	-11,291,407	17,314,503	6,023,096	1,339,774	70,075,283	159,742,623
2028	0	-8524803	0	-12,605,267	17,314,503	4,709,236	975,163	71,050,446	159,742,623
2029	0	-9042794	0	-13,622,576	17,314,503	3,691,927	711,696	71,762,142	159,742,623
2030	0	-10532836	0	-16,165,564	17,314,503	1,148,939	206,183	71,968,325	159,742,623
2031	0	0	0	0	17,314,503	17,314,503	2,892,553	74,860,878	159,742,623
2032	0	0	0	0	17,314,503	17,314,503	2,692,751	77,553,629	159,742,623
2033	0	0	0	0	17,314,503	17,314,503	2,506,750	80,060,379	159,742,623
2034	0	0	0	0	17,314,503	17,314,503	2,333,597	82,393,976	159,742,623
2035	0	0	0	0	17,314,503	17,314,503	2,172,405	84,566,381	159,742,623
2036	0	0	0	0	17,314,503	17,314,503	2,022,347	86,588,727	159,742,623
2037	0	0	0	0	17,314,503	17,314,503	1,882,654	88,471,381	159,742,623
2038	0	0	0	0	17,314,503	17,314,503	1,752,610	90,223,991	159,742,623
2039	0	0	0	0	17,314,503	17,314,503	1,631,549	91,855,540	159,742,623
2040	0	0	0	0	17,314,503	17,314,503	1,518,850	93,374,390	159,742,623
2041	0	0	0	0	17,314,503	17,314,503	1,413,936	94,788,327	159,742,623
2042	0	0	0	0	17,314,503	17,314,503	1,316,269	96,104,596	159,742,623

*Carrying Charge Rate = (Return Requirement+Depreciation Requirement+Income Tax Requirement)

*Book Life is 35 years.

Quad 345 kV Plan with late Cleveland-Hiawatha 345 kV ISD:

Title: HIA&MID East, X-Plan

Interest Rate	7.42%	Starting year for study	2007	
'Carrying Charge Rate	10.84%	Investments/Expenses	2007	
Investment Escalation	1.88%	Ending Year	2042	35
Expense Escalation	1.88%	*The 35 year totals below were calculated using the rates above.		

Year	Cumulative Present Worth	Total Investment		Levelized Annual Cost
2042	95,267,454	161,586,961		7,589,853

Year	New Investments 2007 dollars	Expenses 2007 dollars	Escalated New Investments	Escalated Expenses	Investment Revenue Requirement	Revenue Requirements	Present Worth of Revenue Requirements	Cumulative Present Worth 2007 dollars	Cumulative Investment
2007	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0
2010	18,311,000	0	19,363,278	0	2,098,786	2,098,786	1,576,259	1,576,259	19,363,278
2011	0	0	0	0	2,098,786	2,098,786	1,467,379	3,043,638	19,363,278
2012	0	0	0	0	2,098,786	2,098,786	1,366,020	4,409,658	19,363,278
2013	50,899,000	0	56,917,114	0	8,268,032	8,268,032	5,009,635	9,419,293	76,280,391
2014	24,711,000	-668853	28,152,235	-761,997	11,319,452	10,557,456	5,954,950	15,374,243	104,432,626
2015	21,739,000	-976037	25,231,964	-1,132,864	14,054,345	12,921,480	6,784,939	22,159,182	129,664,590
2016	7,548,000	-1294025	8,925,495	-1,530,182	15,021,779	13,491,598	6,594,956	28,754,138	138,590,085
2017	4,610,000	-1592895	5,553,801	-1,919,007	15,623,756	13,704,749	6,236,407	34,990,545	144,143,885
2018	0	-1846701	0	-2,266,599	15,623,756	13,357,156	5,658,382	40,648,926	144,143,885
2019	0	-2206534	0	-2,759,167	15,623,756	12,864,589	5,073,282	45,722,208	144,143,885
2020	13,692,000	-3860842	17,443,076	-4,918,562	17,514,411	12,595,849	4,624,187	50,346,395	161,586,961
2021	0	-4446732	0	-5,771,465	17,514,411	11,742,946	4,013,284	54,359,679	161,586,961
2022	0	-4847162	0	-6,409,462	17,514,411	11,104,949	3,533,086	57,892,765	161,586,961
2023	0	-5423421	0	-7,306,280	17,514,411	10,208,130	3,023,421	60,916,186	161,586,961
2024	0	-5985089	0	-8,214,527	17,514,411	9,299,884	2,564,159	63,480,344	161,586,961
2025	0	-6449748	0	-9,018,693	17,514,411	8,495,718	2,180,631	65,660,976	161,586,961
2026	0	-7010989	0	-9,987,782	17,514,411	7,526,629	1,798,447	67,459,422	161,586,961
2027	0	-7779816	0	-11,291,407	17,514,411	6,223,004	1,384,242	68,843,664	161,586,961
2028	0	-8524803	0	-12,605,267	17,514,411	4,909,144	1,016,559	69,860,223	161,586,961
2029	0	-9042794	0	-13,622,576	17,514,411	3,891,834	750,233	70,610,456	161,586,961
2030	0	-10532836	0	-16,165,564	17,514,411	1,348,846	242,058	70,852,513	161,586,961
2031	0	0	0	0	17,514,411	17,514,411	2,925,950	73,778,463	161,586,961
2032	0	0	0	0	17,514,411	17,514,411	2,723,841	76,502,304	161,586,961
2033	0	0	0	0	17,514,411	17,514,411	2,535,692	79,037,996	161,586,961
2034	0	0	0	0	17,514,411	17,514,411	2,360,540	81,398,536	161,586,961
2035	0	0	0	0	17,514,411	17,514,411	2,197,487	83,596,022	161,586,961
2036	0	0	0	0	17,514,411	17,514,411	2,045,696	85,641,718	161,586,961
2037	0	0	0	0	17,514,411	17,514,411	1,904,390	87,546,109	161,586,961
2038	0	0	0	0	17,514,411	17,514,411	1,772,845	89,318,954	161,586,961
2039	0	0	0	0	17,514,411	17,514,411	1,650,386	90,969,340	161,586,961
2040	0	0	0	0	17,514,411	17,514,411	1,536,387	92,505,727	161,586,961
2041	0	0	0	0	17,514,411	17,514,411	1,430,261	93,935,988	161,586,961
2042	0	0	0	0	17,514,411	17,514,411	1,331,466	95,267,454	161,586,961

*Carrying Charge Rate = (Return Requirement+Depreciation Requirement+Income Tax Requirement)
*Book Life is 35 years.

Appendix E: Modeling Changes

IDEV/Chage Preformed	2012 Change	2018 Change	2018 With CapX	30 % Wind Penetration Peak
North Mankato Plan				
Outer Metro 115 kV development	1)115 kV line from scott co to westgate 2) 115 kV line from Scott Co to West Waconia 3) 115 kV line form West Waconia to Glenco	1)115 kV line from scott co to westgate 2) 115 kV line from Scott Co to West Waconia 3) 115 kV line form West Waconia to Glenco		
10 MW load at Crooks	B0 load of sugar beet plant is not in the model. Added 13 MW 2.62 MVAR load to at crooks to represent. ID = "SB"	13.5 mw		
Kegan Lake to Lebenon Nills	47 MVA	47 MVA		
Fischer-Will Pipe- Apple Valley	191 MVA conductor ratings used	191 MVA conductor ratings used		
Place A tap at the Wilson Bus	Split Wilson Bus to model breaker	Split Wilson Bus to model breaker		
Blue Lake Generation	Changed id numbers on xfmrs and machines	Changed id numbers on xfmrs and machines		
Carver County		Second transformer was missing		
Troy load	Added current normally open	Added current normally open		
Added Baisin load projectsion	Added load near renville based on information from Jim Edwards	Added load near renville based on information from Jim Edwards		
Rogers Lake Caps	fixed rogers lake caps to 82 mvar	fixed rogers lake caps to 82 mvar		
Panther xfmr bandwidth	new 1.0-1.04	new 1.0-1.04		
Fixed Yankee Doodle Project	moved yankee doodle-inver grove to yankee doodle - pilot knob	moved yankee doodle-inver grove to yankee doodle - pilot knob		
PARKERS LAKE REACTOR	MOVE REACTORS FROM XFMR 10 TO 9 AND ADD A SECOND 15 MVAR REACTOR	MOVE REACTORS FROM XFMR 10 TO 9 AND ADD A SECOND 15 MVAR REACTOR		
BLUE LAKE 230/115 KV XFMR	SWITCHED TAP SIDE OF XFMR	SWITCHED TAPED SIDE OF XFMR		
Douglas Co. Transformer #2	added xfmr at douglas co	added xfmr at douglas co		
Lawrance Transformer (60122) #2	added second transformer	added second transformer		
Bay front-pilson-ino pump	113 MVA ratings	114 MVA ratings		
Hydro Lane xfmr upgrade	copied ft. ridgley xfmr	copied ft. ridgley xfmr		
Park Falls Xfmr upgrades	copied ironwood xfmrs	copied ironwood xfmrs		
Paynsville xfmr upgrade	copied linconco xfmr	copied linconco xfmr		
Iron wood 2nd transformer	copied first transformer	already existed		
Osakis-sauk center	replaced conductor to 477	replaced conductor to 477		
Fenton Interconnect	Fenton 115/69 kV xfmr (not LTC) and in/out at chandler to fenton	Fenton 115/69 kV xfmr (not LTC) and in/out at chandler to fenton		
Stone Lake upgrade	161 kV from Stone Lake - Cuderay	161 kV from Stone Lake - Cuderay		
Split buses for cap banks	Split many buses for cap bank category c contingency modeling	Split many buses for cap bank category c contingency modeling		
West Gate Normally Open between transformers	opened line between xfmrs on 69 kV bus	opened line between xfmrs on 69 kV bus		

Arden Hills Load Icrease	Added 50 MW of load at Arden hills 115 kV for TCAAP development	Added 50 MW of load at Arden hills 115 kV for TCAAP development		
Ratings Changes	Apache - Arden Hills 280 MVA	Apache - Arden Hills 280 MVA		
Ratings Changes	Apache - Terminal 398 MVA rating	Apache - Terminal 398 MVA rating		
Impedence and rating change Troy Switching Station	T2 4/0 between troy and troy switching East river ratings on troy-henry line	T2 4/0 between troy and troy switching East river ratings on troy-henry line	T2 4/0 between troy and troy switching East river ratings on troy-henry line	not needed
Cap X addition	n/a	n/a	Used 2017 Models with previous corrections and added all CAPX facilities	
St. Thomas - Helena 115 kV			CAPX idev deleted this line replaced.	CAPX idev deleted this line replaced.
Outer Loop 345 kV				Cerated 345 Outer Loop. See IDEV
Wind Addition				Added Wind Generators to model All 560 MVA base with no reactive capability.
Transformer unloading at wind generation				Added transformers to wind step up. Wind modeled for penetration study to keep var consumption from beeing a problem. Xfrmrs added at fenton, yankee, steven co, lincoln co. Mapel River ok.
hazelton-salem				
manitoba 1250 hydro expansion				
2% load increase to have 2018 models		Scaled zones 601-605 up 2% for load. Scaled 2.12% gen for owner 600&605 to max the rest on swing bus	Scaled zones 601-605 up 2% for load. Scaled 2.12% gen for owner 600&605 to max the rest on swing bus	Scaled zones 601-605 up 2% for load. Generation dispatched to match 2018 projections.
Sauk river - wait park - st cloud conductor upgrade	795 SAC conductor added	795 SAC conductor added	795 SAC conductor added	795 SAC conductor added
parkfalls rating change	47 MVA park falls	47 MVA park falls	47 MVA park falls	47 MVA park falls
rating change union - sauk	Union - sauk rating 84 mVA	Union - sauk rating 84 mVA	Union - sauk rating 84 mVA	Union - sauk rating 84 mVA
transformer move t corners - hydro	tcorners to hydro xfmr move	tcorners to hydro xfmr move	tcorners to hydro xfmr move	tcorners to hydro xfmr move
Prescott and Monroe Co. Caps	10 MVAR bank at Prescott, Split Monroe CO. into 2-30 MVAR banks	10 MVAR bank at Prescott, Split Monroe CO. into 2-30 MVAR banks	10 MVAR bank at Prescott, Split Monroe CO. into 2-30 MVAR banks	10 MVAR bank at Prescott, Split Monroe CO. into 2-30 MVAR banks
Edina - Eden Prairie	Changed impedence and ratings see idev	Changed impedence and ratings see idev	Changed impedence and ratings see idev	Changed impedence and ratings see idev
~~Main St - Gopher - Terminal~~	~~changed resistance by 1 decimal place~~	~~changed resistance by 1 decimal place~~	~~changed resistance by 1 decimal place~~	~~changed resistance by 1 decimal place~~
Prior Lake - Terminal	changed rating to 310 MVA	changed rating to 310 MVA	changed rating to 310 MVA	changed rating to 310 MVA
Parkers Lake Area 115 kV lines	Parkers Lake - Basset Creek - Medicine Lake - Aldrich ratings changed	Parkers Lake - Basset Creek - Medicine Lake - Aldrich ratings changed	Parkers Lake - Basset Creek - Medicine Lake - Aldrich ratings changed	Parkers Lake - Basset Creek - Medicine Lake - Aldrich ratings changed
Long Lake - Tanners Lake	Rating Change	Rating Change	Rating Change	Rating Change
Chemolite - Linde	Rating Drop	Rating Drop	Rating Drop	Rating Drop
Nine Mile - Edina - Wilson	Rating Change	Rating Change	Rating Change	Rating Change
Coon Creek Ratings	updated every line from coon creek with summer 2312 line ratings	updated every line from coon creek with summer 2312 line ratings	updated every line from coon creek with summer 2312 line ratings	updated every line from coon creek with summer 2312 line ratings
Riverside - Moore Lake	Updated to 2312 summer line ratings	Updated to 2312 summer line ratings	Updated to 2312 summer line ratings	Updated to 2312 summer line ratings
Inver Hills - Rich Valley	Updated to 2312 summer line ratings	Updated to 2312 summer line ratings	Updated to 2312 summer line ratings	Updated to 2312 summer line ratings
Terminal - Apache	Updated to 2312 summer line ratings	Updated to 2312 summer line ratings	Updated to 2312 summer line ratings	Updated to 2312 summer line ratings
Kohlman lake - Ramsey ratings	Updated to 2312 summer line ratings	Updated to 2312 summer line ratings	Updated to 2312 summer line ratings	Updated to 2312 summer line ratings
Deleted 60103-60104 from Jason E.	Deleted 60103-60104 from Jason E.	Deleted 60103-60104 from Jason E.	Deleted 60103-60104 from Jason E.	Deleted 60103-60104 from Jason E.

Gen Shift Fenton To Adams				Moved 200 MW of Gen form fenton to Adams 60045
Changed Vschedled at Fenton to 1.025				Changed Vschedled at Fenton to 1.025
Added Switched shunts to conpensate for XFMR var consumption at Lincoln CO and Stevens co				90 MVAR of caps (3 30's at lincoln and stevens)
Creation of Sherco outage model				
Adjusted Maple River Taps				Adjusted Maple River Taps 345/230
Yankee Gen V Schedule set to 1.025				Yankee Gen V Schedule set to 1.025
Removed Sherco Corridor				
Added "SVC's" to calculate reactive needs				
Lake Marion Transformer Upgraded			Replaced Lake Marion 345/115 kV transformer with one of 672 rating	Replaced Lake Marion 345/115 kV transformer with one of 672 rating
West Waconia 2nd transformer added				added second West Waconia transformer for high wind
Added Non-Concident Loads to Eden Prairie Area				
Created 2018 High Wind Offpeak				
Srinivas Model Change near scott co	Ran idev from srinivas "Chaska correction"	Ran idev from srinivas "Chaska correction"	Ran idev from srinivas "Chaska correction"	Ran idev from srinivas "Chaska correction"
30 MW addition at Gopher		30 MW addition at Gopher	30 MW addition at Gopher	30 MW addition at Gopher
Stinson Phase Shifter correction MP	Phase shifter modeled correctly	Phase shifter modeled correctly	Phase shifter modeled correctly	Phase shifter modeled correctly
~~Aldrich N.O.~~	~~Opened bus tie breakers at Aldrich~~	~~Opened bus tie breakers at Aldrich~~	~~Opened bus tie breakers at Aldrich~~	~~Opened bus tie breakers at Aldrich~~