Appendix A – Detailed Reactive Support Analysis

Table A.1 Detailed Reactive Support Analysis

Config #	Healy - Douglas #1 138 kV	Healy - Douglas #2 138 kV	Healy - Douglas #1 230 kV	Healy - Douglas #2 230 kV	Lorraine - Douglas #1 230 kV	Lorraine - Douglas #2 230 kV	Gold Creek 138 kV	Gold Creek 230 kV	upgrade H - W 230 kV	upgrade H - GH 230 kV	Healy - Doug Open End	No GVEA Import Reactor Size (MVAR) Lorr	Doug	Gold Crk	Healy	Total Comp (MVAR)	SP #2 - 75 MW Import Reactor Size (MVAR) Lorr	Doug	Gold Crk	Healy	WP #2 - 125 MW Import Reactor Size (MVAR) Lorr	Doug	Gold Crk	Healy	Reactive Support Requirements (MVAR) Based on Summer Peak case Lorraine Fix	SVC	Douglas Fix	SVC	Gold Creel Fix	SVC	Healy Fix	SVC	Based on Winter Peak case Lorraine Fix	SVC	Douglas Fix	SVC	Gold Creel Fix	SVC	Healy Fix	SVC
0	x				x						-	53	0	-	0																									
											Doug	48	0	-	0	145	53	25	-	0	need voltage support				53	0	25	67	-		0	0	need voltage support							
											Healy	0	92	-	0																									
1	x				x	x					-	70	0	-	0																									
											Doug	66	0	-	0	190	70	35	-	0	need voltage support				70	0	35	85	-		0	0	need voltage support							
											Healy	0	120	-	0																									
2	x	x			x	x					-	76	0	-	0																									
											Doug	70	0	-	5	218	76	55	-	5	need voltage support in GVEA at Wilson / Gold Hill				76	0	55	82	-		5	0	need voltage support in GVEA at Wilson / Gold Hill							
											Healy	0	137	-	0																									
3	x	x			x	x	x				-	76	-	0	0																									
											Doug	72	-	0	0	103	76	-	27	0	need voltage support in GVEA at Wilson / Gold Hill				76	0	-	27	0		0	0	need voltage support in GVEA at Wilson / Gold Hill							
											Healy	70	-	27	0																									
4	x	x			x	x			x	x	-	81	0	-	0																									
											Doug	70	0	-	27	245	81	50	-	27	60	10	-	27	81	0	50	87	-		27	0	60	21	10	127	-		27	0
											Healy	0	137	-	0																									
5	x	x			x	x	x		x	x	-	81	-	0	0																									
											Doug	75	-	4	0	108	81	-	27	0	60	-	10	0	81	0	-	27	0		0	0	60	21	-	10	17		0	0
											Healy	70	-	27	0																									
6			x	x	x	x					-	121	0	-	26																									
											Doug	75	0	-	101	461	121	55	-	85	90	5	-	55	121	0	55	185	-		85	16	90	31	5	235	-		55	46
											Healy	0	240	-	0																									
7			x	x	x	x		x			-	107	-	39	0																									
											Doug	90	-	60	0	190	107	-	83	0	90	-	83	0	107	0	-	83	0		0	0	90	17	-	83	0		0	0
											Healy	78	-	83	0																									
8			x	x	x	x			x	x	-	115	0	-	45																									
											Doug	75	0	-	131	490	115	60	-	100	110	5	-	100	115	0	60	184	-		100	31	110	5	5	239	-		100	31
											Healy	0	244	-	0																									
9			x	x	x	x		x	x	x	-	99	-	62	0																									
											Doug	90	-	71	3	193	99	-	92	3	90	-	88	3	99	0	-	92	0		3	0	90	9	-	88	4		3	0
											Healy	78	-	92	0																									

Appendix B – Detailed Dynamic Results

Table B.1 Summer Valley – Dispatch #2, HCCP offline

Case	Upgrade	Healy Flows (MW		Healy Gen Output (MW)	Wilson-Ft_WW@Wilson	North_Pole-Ft_WW@North_Pole	Douglas-Healy@Douglas	Douglas-Healy@Healy	Lorraine-West_Term@Lorraine	Lorraine-Douglas@Lorraine	Lorraine-Douglas@Douglas	Eva_Creek-Healy@Healy	Eva_Creek-Healy@Eva	Eva_Creek-Wilson@Eva	Gold_Hill-Healy@Healy	Eva_Creek-Healy@Healy	Eva_Creek-Healy@Eva	Eva_Creek-Wilson@Eva	Gold_Hill-Healy@Healy	NPCC1	HEALY	HCCP
		Import	Export*		a0	a1	a2	a3	a4	a5	a6	b0	b1	b2	b3	u0	u1	u2	u3	g0	g3	g4
HCCP offline (g2)	0	30	71	47	x	x	x	x	x	x	x	x	x	x	x					x	x	
		35	76	47	x	x	x	x	x	x	x	x	x	x	x					x	x	
		40	81	47	x	x	x	x	x	x	x	x	x	x	x					x	x	
		45	86	47	x	x	x	x	x	x	x	x	x	x	x					x	x	
		50	91	47	x	x	x	x	x	x	x	x	x	x	x					x	x	
		55	96	47	x	x	x	x	x	x	x	x	x	x	x					x	x	
	1	30	71	47	x	x	x	x	x	x	x	x	x	x	x					x	x	
		35	76	47	x	x	x	x	x	x	x	x	x	x	x					x	x	
		40	81	47	x	x	x	x	x	x	x	x	x	x	x					x	x	
		45	86	47	x	x	x	x	x	x	x	x	x	x	x					x	x	
		50	91	47	x	x	x	x	x	x	x	x	x	x	x					x	x	
		55	96	47	x	x	x	x	x	x	x	x	x	x	x					x	x	
	3	30	71	47	x	x	x	x	x	x	x	x	x	x	x					x	x	
		35	76	47	x	x	x	x	x	x	x	x	x	x	x					x	x	
		40	81	47	x	x	x	x	x	x	x	x	x	x	x					x	x	
		45	86	47	x	x	x	x	x	x	x	x	x	x	x					x	x	
		50	91	47	x	x	x	x	x	x	x	x	x	x	x					x	x	
		55	96	47	x	x	x	x	x	x	x	x	x	x	x					x	x	
		60	101	47	x	x	x	x	x	x	x	x	x	x	x					x	x	
		65	106	47	x	x	x	x	x	x	x	x	x	x	x					x	x	
	5	30	71	47	x	x	x	x	x	x	x					x	x	x	x	x	x	
		35	76	47	x	x	x	x	x	x	x					x	x	x	x	x	x	
		40	81	47	x	x	x	x	x	x	x					x	x	x	x	x	x	
		45	86	47	x	x	x	x	x	x	x					x	x	x	x	x	x	
		50	91	47	x	x	x	x	x	x	x					x	x	x	x	x	x	
		55	96	47	x	x	x	x	x	x	x					x	x	x	x	x	x	
		60	101	47	x	x	x	x	x	x	x					x	x	x	x	x	x	
		65	106	47	x	x	x	x	x	x	x					x	x	x	x	x	x	

marginal | unstable | potential voltage problems | simulations ended

Table B.2 Summer Valley – Dispatch #3, Healy #1 at Min

Case	Upgrade	Healy Flows (MW		Healy Gen Output (MW)	Wilson-Ft_WW@Wilson	North_Pole-Ft_WW@North_Pole	Douglas-Healy@Douglas	Douglas-Healy@Healy	Lorraine-West_Term@Lorraine	Lorraine-Douglas@Lorraine	Lorraine-Douglas@Douglas	Eva_Creek-Healy@Healy	Eva_Creek-Healy@Eva	Eva_Creek-Wilson@Eva	Gold_Hill-Healy@Healy	Eva_Creek-Healy@Healy	Eva_Creek-Healy@Eva	Eva_Creek-Wilson@Eva	Gold_Hill-Healy@Healy	NPCC1	HEALY	HCCP
		Import	Export*		a0	a1	a2	a3	a4	a5	a6	b0	b1	b2	b3	u0	u1	u2	u3	g0	g3	g4
Healy at Min (g3)	0	60	72	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		65	77	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		70	82	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		75	87	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		80	92	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		85	97	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
	1	60	72	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		65	77	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		70	82	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		75	87	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		80	92	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		85	97	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
	3	60	72	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		65	77	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		70	82	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		75	87	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		80	92	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		85	97	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		90	102	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		95	107	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		100	112	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
	5	60	72	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		65	77	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		70	82	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		75	87	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		80	92	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		85	97	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		90	102	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		95	107	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		100	112	18	x	x	x	x	x	x	x					x	x	x	x	x	x	

marginal | unstable | potential voltage problems | simulations ended

Table B.4 Summer Peak – Dispatch #1, Healy Generation at Full Output

Case	Upgrade Case #	Healy Flows (MW		Healy Gen Output (MW)	Wilson-Ft_WW@Wilson	North_Pole-Ft_WW@North_Pole	Douglas-Healy@Douglas	Douglas-Healy@Healy	Lorraine-West_Term@Lorraine	Lorraine-Douglas@Lorraine	Lorraine-Douglas@Douglas	Eva_Creek-Healy@Healy	Eva_Creek-Healy@Eva	Eva_Creek-Wilson@Eva	Gold_Hill-Healy@Healy	Eva_Creek-Healy@Healy	Eva_Creek-Healy@Eva	Eva_Creek-Wilson@Eva	Gold_Hill-Healy@Healy	NPCC1	HEALY	HCCP
		Import	Export*		a0	a1	a2	a3	a4	a5	a6	b0	b1	b2	b3	u0	u1	u2	u3	g0	g3	g4
Healy full output (g1)	0	50	145	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		55	150	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		60	155	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		65	160	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		70	165	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		75	170	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		80	175	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		85	180	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
	1	50	145	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		55	150	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		60	155	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		65	160	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		70	165	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		75	170	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		80	175	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		85	180	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
	3	50	145	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		55	150	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		60	155	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		65	160	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		70	165	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		75	170	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		80	175	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		85	180	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
	5	50	145	103	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		55	150	103	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		60	155	103	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		65	160	103	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		70	165	103	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		75	170	103	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		80	175	103	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		85	180	103	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		90	185	103	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		95	190	103	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		100	195	103	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		105	200	103	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		110	205	103	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		115	210	103	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		120	214	102	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		125	219	102	x	x	x	x	x	x	x					x	x	x	x	x	x	x

marginal | unstable | potential voltage problems | simulations ended

Table B.5 Summer Peak – Dispatch #2, HCCP Offline

Case	Upgrade Case #	Healy Flows (MW		Healy Gen Output (MW)	Wilson-Ft_WW@Wilson	North_Pole-Ft_WW@Nor	Douglas-Healy@Douglas	Douglas-Healy@Healy	Lorraine-West_Term@Lor	Lorraine-Douglas@Lorrain	Lorraine-Douglas@Dougla	Eva_Creek-Healy@Healy	Eva_Creek-Healy@Eva	Eva_Creek-Wilson@Eva	Gold_Hill-Healy@Healy	Eva_Creek-Healy@Healy	Eva_Creek-Healy@Eva	Eva_Creek-Wilson@Eva	Gold_Hill-Healy@Healy	NPCC1	HEALY	HCCP
		Import	Export*		a0	a1	a2	a3	a4	a5	a6	b0	b1	b2	b3	u0	u1	u2	u3	g0	g3	g4
HCCP offline (g2)	0	75	115	48	x	x	x	x	x	x	x	x	x	x	x					x	x	
		80	120	48	x	x	x	x	x	x	x	x	x	x	x					x	x	
		85	125	48	x	x	x	x	x	x	x	x	x	x	x					x	x	
		90	130	48	x	x	x	x	x	x	x	x	x	x	x					x	x	
		95	135	48	x	x	x	x	x	x	x	x	x	x	x					x	x	
	1	75	115	48	x	x	x	x	x	x	x	x	x	x	x					x	x	
		80	120	48	x	x	x	x	x	x	x	x	x	x	x					x	x	
		85	125	48	x	x	x	x	x	x	x	x	x	x	x					x	x	
		90	130	48	x	x	x	x	x	x	x	x	x	x	x					x	x	
		95	135	48	x	x	x	x	x	x	x	x	x	x	x					x	x	
		100	140	48	x	x	x	x	x	x	x	x	x	x	x					x	x	
	3	75	115	48	x	x	x	x	x	x	x	x	x	x	x					x	x	
		80	120	48	x	x	x	x	x	x	x	x	x	x	x					x	x	
		85	125	48	x	x	x	x	x	x	x	x	x	x	x					x	x	
		90	130	48	x	x	x	x	x	x	x	x	x	x	x					x	x	
		95	135	48	x	x	x	x	x	x	x	x	x	x	x					x	x	
		100	140	48	x	x	x	x	x	x	x	x	x	x	x					x	x	
		105	144	47	x	x	x	x	x	x	x	x	x	x	x					x	x	
		110	150	48	x	x	x	x	x	x	x	x	x	x	x					x	x	
		115	155	48	x	x	x	x	x	x	x	x	x	x	x					x	x	
		120	159	47	x	x	x	x	x	x	x	x	x	x	x					x	x	
		125	165	48	x	x	x	x	x	x	x	x	x	x	x					x	x	
	5	75	115	48	x	x	x	x	x	x	x					x	x	x	x	x	x	
		80	120	48	x	x	x	x	x	x	x					x	x	x	x	x	x	
		85	125	48	x	x	x	x	x	x	x					x	x	x	x	x	x	
		90	130	48	x	x	x	x	x	x	x					x	x	x	x	x	x	
		95	135	48	x	x	x	x	x	x	x					x	x	x	x	x	x	
		100	140	48	x	x	x	x	x	x	x					x	x	x	x	x	x	
		105	144	47	x	x	x	x	x	x	x					x	x	x	x	x	x	
		110	150	48	x	x	x	x	x	x	x					x	x	x	x	x	x	
		115	155	48	x	x	x	x	x	x	x					x	x	x	x	x	x	
		120	159	47	x	x	x	x	x	x	x					x	x	x	x	x	x	
		125	165	48	x	x	x	x	x	x	x					x	x	x	x	x	x	
		130	169	47	x	x	x	x	x	x	x					x	x	x	x	x	x	
		135	175	48	x	x	x	x	x	x	x					x	x	x	x	x	x	
		140	179	47	x	x	x	x	x	x	x					x	x	x	x	x	x	
		145	184	47	x	x	x	x	x	x	x					x	x	x	x	x	x	
		150	189	47	x	x	x	x	x	x	x					x	x	x	x	x	x	
		155	195	48	x	x	x	x	x	x	x					x	x	x	x	x	x	

marginal | unstable | potential voltage problems | simulations ended

Table B.6 Summer Peak – Dispatch #3, Healy #1 at Min

Case	Upgrade Case #	Healy Flows (MW		Healy Gen Output (MW)	Wilson-Ft_WW@Wilson	North_Pole-Ft_WW@North_Pole	Douglas-Healy@Douglas	Douglas-Healy@Healy	Lorraine-West_Term@Lorraine	Lorraine-Douglas@Lorraine	Lorraine-Douglas@Douglas	Eva_Creek-Healy@Healy	Eva_Creek-Healy@Eva	Eva_Creek-Wilson@Eva	Gold_Hill-Healy@Healy	Eva_Creek-Healy@Healy	Eva_Creek-Healy@Eva	Eva_Creek-Wilson@Eva	Gold_Hill-Healy@Healy	NPCC1	HEALY	HCCP
		Import	Export*		a0	a1	a2	a3	a4	a5	a6	b0	b1	b2	b3	u0	u1	u2	u3	g0	g3	g4
Healy at Min (g3)	0	75	85	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		80	90	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		85	95	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		90	100	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		95	105	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
	1	75	85	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		80	90	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		85	95	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		90	100	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		95	105	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		100	110	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
	3	75	85	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		80	90	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		85	95	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		90	100	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		95	105	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		100	110	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		105	115	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		110	120	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		115	125	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		120	130	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		125	135	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		130	140	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		135	145	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		140	150	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		145	155	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
	5	75	85	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		80	90	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		85	95	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		90	100	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		95	105	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		100	110	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		105	115	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		110	120	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		115	125	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		120	130	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		125	135	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		130	140	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		135	145	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		140	150	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		145	155	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		150	160	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		155	165	18	x	x	x	x	x	x	x					x	x	x	x	x	x	

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Table B.7 Winter Peak – Dispatch #1, Healy Generation at Full Output

Case	Upgrade Case #	Healy Flows (MW		Healy Gen Output (MW)	Wilson-Ft_WW@Wilson	North_Pole-Ft_WW@North_Pole	Douglas-Healy@Douglas	Douglas-Healy@Healy	Lorraine-West_Term@Lorraine	Lorraine-Douglas@Lorraine	Lorraine-Douglas@Douglas	Eva_Creek-Healy@Healy	Eva_Creek-Healy@Eva	Eva_Creek-Wilson@Eva	Gold_Hill-Healy@Healy	Eva_Creek-Healy@Healy	Eva_Creek-Healy@Eva	Eva_Creek-Wilson@Eva	Gold_Hill-Healy@Healy	NPCC1	HEALY	HCCP
		Import	Export*		a0	a1	a2	a3	a4	a5	a6	b0	b1	b2	b3	u0	u1	u2	u3	g0	g3	g4
Healy full output (g1)	0	65	161	104	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		70	166	104	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		75	171	104	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		80	176	104	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		85	181	104	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		90	186	104	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		95	191	104	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		100	195	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
	1	65	161	104	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		70	166	104	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		75	171	104	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		80	176	104	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		85	181	104	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		90	186	104	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		95	191	104	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		100	195	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
	3	65	161	104	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		70	166	104	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		75	171	104	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		80	176	104	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		85	181	104	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		90	186	104	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		95	191	104	x	x	x	x	x	x	x	x	x	x	x					x	x	x
		100	195	103	x	x	x	x	x	x	x	x	x	x	x					x	x	x
	5	65	161	104	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		70	166	104	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		75	171	104	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		80	176	104	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		85	181	104	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		90	186	104	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		95	191	104	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		100	195	103	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		105	201	104	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		110	205	103	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		115	210	103	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		120	215	103	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		125	220	103	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		130	225	103	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		135	230	103	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		140	235	103	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		145	239	102	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		150	244	102	x	x	x	x	x	x	x					x	x	x	x	x	x	x
		155	249	102	x	x	x	x	x	x	x					x	x	x	x	x	x	x

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Table B.8 Winter Peak – Dispatch #2, HCCP Offline

Case	Upgrade Case #	Healy Flows (MW		Healy Gen Output (MW)	Wilson-Ft_WW@Wilson	North_Pole-Ft_WW@North_Pole	Douglas-Healy@Douglas	Douglas-Healy@Healy	Lorraine-West_Term@Lorraine	Lorraine-Douglas@Lorraine	Lorraine-Douglas@Douglas	Eva_Creek-Healy@Healy	Eva_Creek-Healy@Eva	Eva_Creek-Wilson@Eva	Gold_Hill-Healy@Healy	Eva_Creek-Healy@Healy	Eva_Creek-Healy@Eva	Eva_Creek-Wilson@Eva	Gold_Hill-Healy@Healy	NPCC1	HEALY	HCCP
		Import	Export*		a0	a1	a2	a3	a4	a5	a6	b0	b1	b2	b3	u0	u1	u2	u3	g0	g3	g4
HCCP offline (g2)	0	75	117	50	x	x	x	x	x	x	x	x	x	x	x					x	x	
		80	122	50	x	x	x	x	x	x	x	x	x	x	x					x	x	
		85	127	50	x	x	x	x	x	x	x	x	x	x	x					x	x	
		90	132	50	x	x	x	x	x	x	x	x	x	x	x					x	x	
		95	136	49	x	x	x	x	x	x	x	x	x	x	x					x	x	
		100	142	50	x	x	x	x	x	x	x	x	x	x	x					x	x	
		105	147	50	x	x	x	x	x	x	x	x	x	x	x					x	x	
	1	75	117	50	x	x	x	x	x	x	x	x	x	x	x					x	x	
		80	122	50	x	x	x	x	x	x	x	x	x	x	x					x	x	
		85	127	50	x	x	x	x	x	x	x	x	x	x	x					x	x	
		90	132	50	x	x	x	x	x	x	x	x	x	x	x					x	x	
		95	136	49	x	x	x	x	x	x	x	x	x	x	x					x	x	
		100	142	50	x	x	x	x	x	x	x	x	x	x	x					x	x	
		105	147	50	x	x	x	x	x	x	x	x	x	x	x					x	x	
	3	75	117	50	x	x	x	x	x	x	x	x	x	x	x					x	x	
		80	122	50	x	x	x	x	x	x	x	x	x	x	x					x	x	
		85	127	50	x	x	x	x	x	x	x	x	x	x	x					x	x	
		90	132	50	x	x	x	x	x	x	x	x	x	x	x					x	x	
		95	136	49	x	x	x	x	x	x	x	x	x	x	x					x	x	
		100	142	50	x	x	x	x	x	x	x	x	x	x	x					x	x	
		105	147	50	x	x	x	x	x	x	x	x	x	x	x					x	x	
		110	151	49	x	x	x	x	x	x	x	x	x	x	x					x	x	
		115	157	50	x	x	x	x	x	x	x	x	x	x	x					x	x	
		120	161	49	x	x	x	x	x	x	x	x	x	x	x					x	x	
		125	166	49	x	x	x	x	x	x	x	x	x	x	x					x	x	
		130	171	49	x	x	x	x	x	x	x	x	x	x	x					x	x	
		135	176	49	x	x	x	x	x	x	x	x	x	x	x					x	x	
		140	181	49	x	x	x	x	x	x	x	x	x	x	x					x	x	
	5	75	117	50	x	x	x	x	x	x	x					x	x	x	x	x	x	
		80	122	50	x	x	x	x	x	x	x					x	x	x	x	x	x	
		85	127	50	x	x	x	x	x	x	x					x	x	x	x	x	x	
		90	132	50	x	x	x	x	x	x	x					x	x	x	x	x	x	
		95	136	49	x	x	x	x	x	x	x					x	x	x	x	x	x	
		100	142	50	x	x	x	x	x	x	x					x	x	x	x	x	x	
		105	147	50	x	x	x	x	x	x	x					x	x	x	x	x	x	
		110	151	49	x	x	x	x	x	x	x					x	x	x	x	x	x	
		115	157	50	x	x	x	x	x	x	x					x	x	x	x	x	x	
		120	161	49	x	x	x	x	x	x	x					x	x	x	x	x	x	
		125	166	49	x	x	x	x	x	x	x					x	x	x	x	x	x	
		130	171	49	x	x	x	x	x	x	x					x	x	x	x	x	x	
		135	176	49	x	x	x	x	x	x	x					x	x	x	x	x	x	
		140	181	49	x	x	x	x	x	x	x					x	x	x	x	x	x	
		145	186	49	x	x	x	x	x	x	x					x	x	x	x	x	x	
		150	191	49	x	x	x	x	x	x	x					x	x	x	x	x	x	
		155	195	48	x	x	x	x	x	x	x					x	x	x	x	x	x	

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Table B.9 Winter Peak – Dispatch #3, Healy #1 at Min

Case	Upgrade Case #	Healy Flows (MW		Healy Gen Output (MW)	Wilson-Ft_WW@Wilson	North_Pole-Ft_WW@North_Pole	Douglas-Healy@Douglas	Douglas-Healy@Healy	Lorraine-West_Term@Lorraine	Lorraine-Douglas@Lorraine	Lorraine-Douglas@Douglas	Eva_Creek-Healy@Healy	Eva_Creek-Healy@Eva	Eva_Creek-Wilson@Eva	Gold_Hill-Healy@Healy	Eva_Creek-Healy@Healy	Eva_Creek-Healy@Eva	Eva_Creek-Wilson@Eva	Gold_Hill-Healy@Healy	NPCC1	HEALY	HCCP
		Import	Export*		a0	a1	a2	a3	a4	a5	a6	b0	b1	b2	b3	u0	u1	u2	u3	g0	g3	g4
Healy at Min (g3)	0	75	85	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		80	90	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		85	95	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		90	100	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		95	105	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
	1	75	85	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		80	90	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		85	95	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		90	100	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		95	105	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		100	110	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
	3	75	85	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		80	90	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		85	95	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		90	100	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		95	105	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		100	110	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		105	115	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		110	120	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		115	125	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		120	130	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		125	135	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		130	140	18	x	x	x	x	M	x	x	x	x	x	x					x	x	
		135	145	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
		140	150	18	x	x	x	x	x	x	x	x	x	x	x					x	x	
	5	75	85	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		80	90	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		85	95	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		90	100	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		95	105	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		100	110	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		105	115	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		110	120	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		115	125	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		120	130	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		125	135	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		130	140	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		135	145	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		140	150	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		145	155	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		150	160	18	x	x	x	x	x	x	x					x	x	x	x	x	x	
		155	165	18	x	x	x	x	x	x	x					x	x	x	x	x	x	

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Appendix C – Detailed Power Flow Results

Table C.1 Power Flow Results – Summer Valley

Case	Trans Config	Healy Flows (MW) Import	Export*	Healy Gen	Outage From Bus	To Bus	ID	Volt (kV)	Overload From Bus	To Bus	ID	Volt (kV)	Rating (MVA)	% Rating
HCCP offline (g2)	3	65	106	47	Ft. WW	N. Pole	1	138	Ft. WW Sub	FTWP Tap	1	69	46	105
									Ft. WP Tap	Badger Tap	1	69	46	105
Healy at Min (g3)	3	100	112	18	Ft. WW	N. Pole	1	138	Ft. WW Sub	FTWP Tap	1	69	46	105
									Ft. WP Tap	Badger Tap	1	69	46	105

Table C.2 Power Flow Results – Summer Peak

Case	Trans. Config	Healy Flows Import	Export*	Healy Gen	Outage From Bus	To Bus	ID	Volt (kV)	Overload From Bus	To Bus	ID	Volt (kV)	Rating (MVA)	% Rating
Healy full output (g1)	3	75	165	103	base case				Hamilton	FTWW	1	69	46	105
					Eva Creek	Wilson	1	138	Nenana bus voltage = 0.9225 pu					
					Wilson	Ft. WW	1	138	Gold Hill XFMR		1	138/69	112	143
									Gold Hill	Aurora	1	69	68	129
									Aurora	Zehnder	1	69	68	118
					N. Pole Ind	Carney	1	138	FTWW XFMR		1	138/69	100	101
									Hwy Park	Dawson	1	69	57	103
									FTWW Sub	FTWP Tap	1	69	66	109
					FT. WW XFMR		1	138/69	Gold Hill XFMR		1	138/69	112	106
					Gold Hill XFMR		1	138/69	FTWW XFMR		1	138/69	100	138
									Hamilton	Ft WW	1	69	46	105
									Low 69 kV voltages between 0.95 and 0.946					
HCCP offline (g2)	3	110	150	48	base case				Hamilton	FTWW	1	69	46	105
					Eva Creek	Wilson	1	138	Nenana bus voltage = 0.9322 pu					
					Wilson	Ft. WW	1	138	Gold Hill XFMR		1	138/69	110	129
									Gold Hill	Aurora	1	69	68	117
									Aurora	Zehnder	1	69	68	107
					N. Pole Ind	Carney	1	138	Hwy Park	Dawson	1	69	57	101
									FTWW Sub	FTWP Tap	1	69	66	104
					FT. WW XFMR		1	138/69	Gold Hill XFMR		1	138/69	112	105
					Gold Hill XFMR		1	138/69	FTWW XFMR		1	138/69	100	137
									Zehnder	Hamilton	1	69	68	103
HCCP, Healy, and Eva Creek offline (g3)	3	130	140	18	base case				Hamilton	FTWW	1	69	46	107
					Wilson	Ft. WW	1	138	Gold Hill XFMR		1	138/69	112	121
									Gold Hill	Aurora	1	69	68	125
					N. Pole Ind	Carney	1	138	Hwy Park	Dawson	1	69	57	103
					FT. WW XFMR		1	138/69	Gold Hill XFMR		1	138/69	112	103
					Gold Hill XFMR		1	138/69	FTWW XFMR		1	138/69	100	135
									Hamilton	Ft WW	1	69	46	105
									Low 69 kV voltages between 0.95 and 0.946					

Table C.3 Power Flow Results – Winter Peak

Case	Trans. Config	Healy Flows Import	Export*	Healy Gen	Outage From Bus	To Bus	ID	Volt (kV)	Overload From Bus	To Bus	ID	Volt (kV)	Rating (MVA	% Rating
Healy full output (g1)	3	65	161	104	base case				FTWW XFMR		1	138/69	100	103
					Eva Creek	Wilson	1	138	Nenana bus voltage = 0.9126 pu					
					Healy	Nenana	1	138	Hamilton	Ft WW	1	69	66	106
					Nenana	Ester	1	138	Hamilton	Ft WW	1	69	66	106
					Ester	Gold Hill	1	138	Hamilton	Ft WW	1	69	66	105
					Wilson	Ft. WW	1	138	Gold Hill XFMR		1	138/69	112	139
					N. Pole Ind	Carney	1	138	Carney XFMR		1	138/69	30	138
									Hwy Park	Dawson	1	69	57	119
					FT. WW XFMR		1	138/69	Gold Hill XFMR		1	138/69	112	131
									Low 69 kV voltages between 0.95 and 0.86					
					Gold Hill XFMR		1	138/69	Hamilton	Ft WW	1	69	66	168
									Low 69 kV voltages between 0.95 and 0.92					
HCCP offline (g2)	3	100	142	50	base case				FTWW XFMR		1	138/69	100	101
					Eva Creek	Wilson	1	138	Nenana bus voltage = 0.9409 pu					
					Healy	Nenana	1	138	Hamilton	Ft WW	1	69	66	105
									Low 138 kV voltage at Eva Creek = 0.9376					
					Nenana	Ester	1	138	Hamilton	Ft WW	1	69	66	105
					Ester	Gold Hill	1	138	Hamilton	Ft WW	1	69	66	104
					Gold Hill	Wilson	1	138	Hamilton	Ft WW	1	69	66	102
					Wilson	Ft. WW	1	138	Gold Hill XFMR		1	138/69	112	121
					N. Pole Ind	Carney	1	138	Hwy Park	Dawson	1	69	57	118
									Carney XFMR		1	138/69	30	140
									Low 69 kV voltages between 0.95 and 0.94					
					FT. WW XFMR		1	138/69	Gold Hill XFMR		1	138/69	112	127
									Low 69 kV voltages between 0.95 and 0.89					
					Gold Hill XFMR		1	138/69	Hamilton	Ft WW	1	69	66	167
									Low 69 kV voltages between 0.95 and 0.92					
HCCP, Healy, and Eva Creek offline (g3)	3	125	135	18	base case				FTWW XFMR		1	138/69	100	101
					Healy	Eva Creek	1	138	Nenana bus voltage = 0.9450 pu					
					Eva Creek	Wilson	1	138	Nenana bus voltage = 0.9398 pu					
					Healy	Nenana	1	138	Hamilton	Ft WW	1	69	66	105
									Low 138 kV voltage at Eva Creek = 0.9376					
					Nenana	Ester	1	138	Hamilton	Ft WW	1	69	66	105
					Ester	Gold Hill	1	138	Hamilton	Ft WW	1	69	66	104
					Gold Hill	Wilson	1	138	Hamilton	Ft WW	1	69	66	103
					Wilson	Ft. WW	1	138	Gold Hill XFMR		1	138/69	112	114
					N. Pole Sub	N. Pole Ind	1	138	Hamilton	Ft WW	1	69	66	101
					N. Pole Ind	Carney	1	138	Hwy Park	Dawson	1	69	57	119
									Carney XFMR		1	138/69	30	138
									Low 69 kV voltages between 0.95 and 0.94					
					FT. WW XFMR		1	138/69	Gold Hill XFMR		1	138/69	112	125
									Low 69 kV voltages between 0.95 and 0.89					
					Gold Hill XFMR		1	138/69	Hamilton	Ft WW	1	69	66	167
									Low 69 kV voltages between 0.95 and 0.92					

Appendix D – Transmission Configuration Single Line Drawings

Table D.1 – Transmission Configuration #0

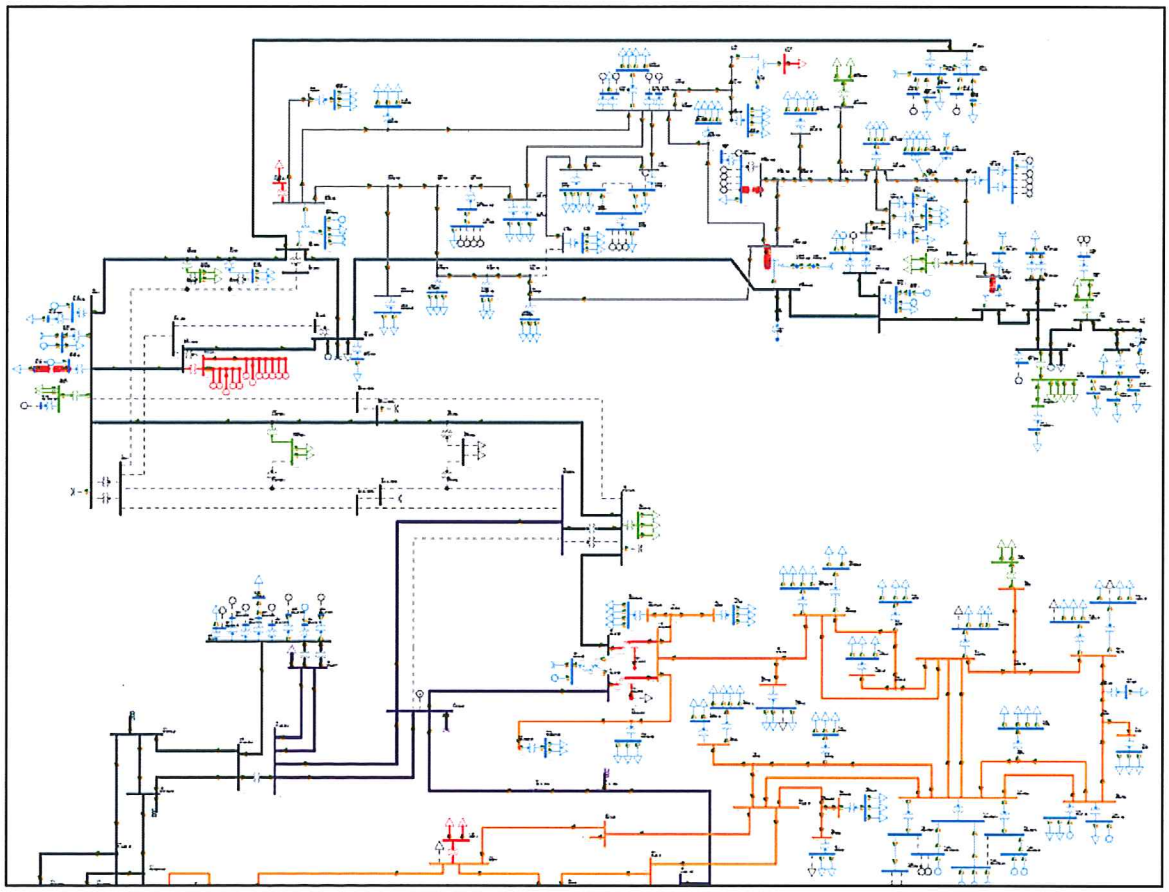

Table D.2 – Transmission Configuration #1

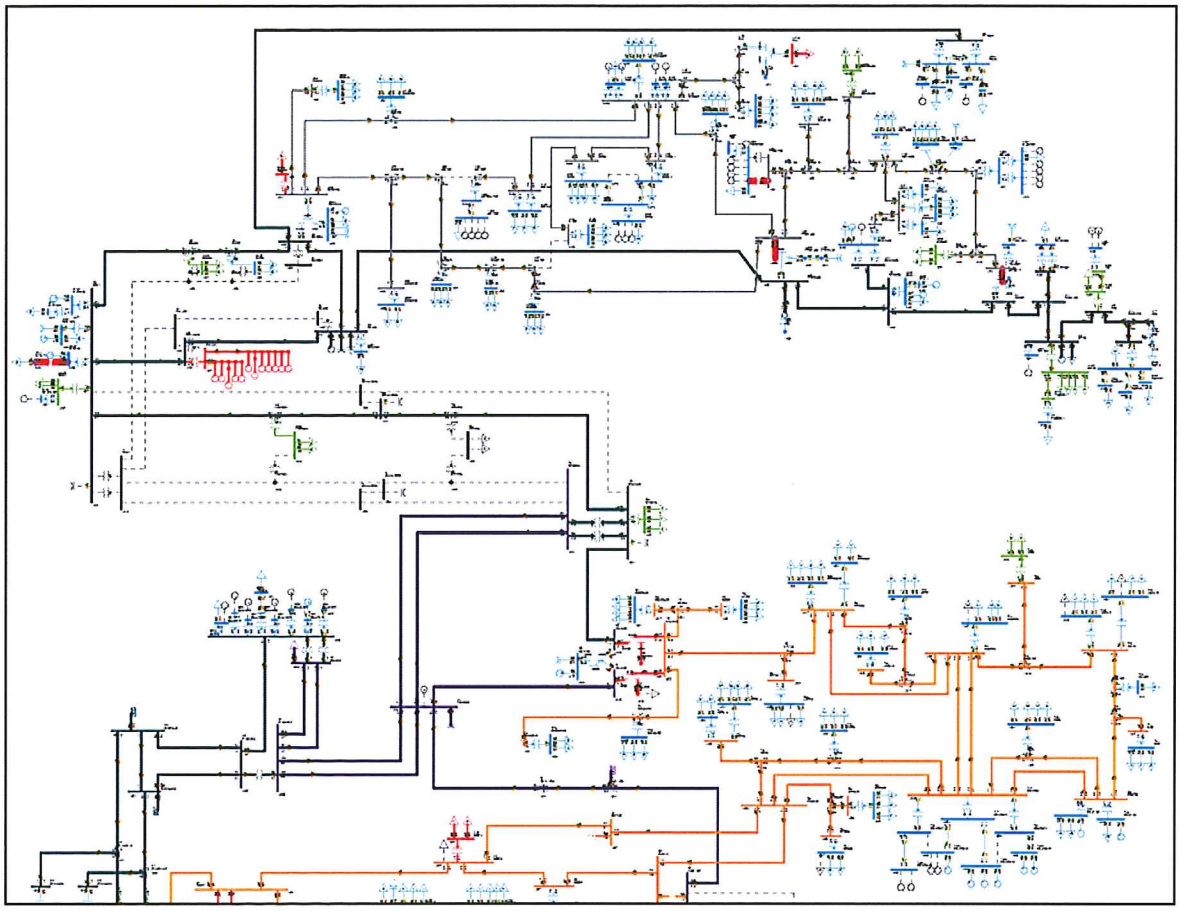

Table D.3 – Transmission Configuration #3

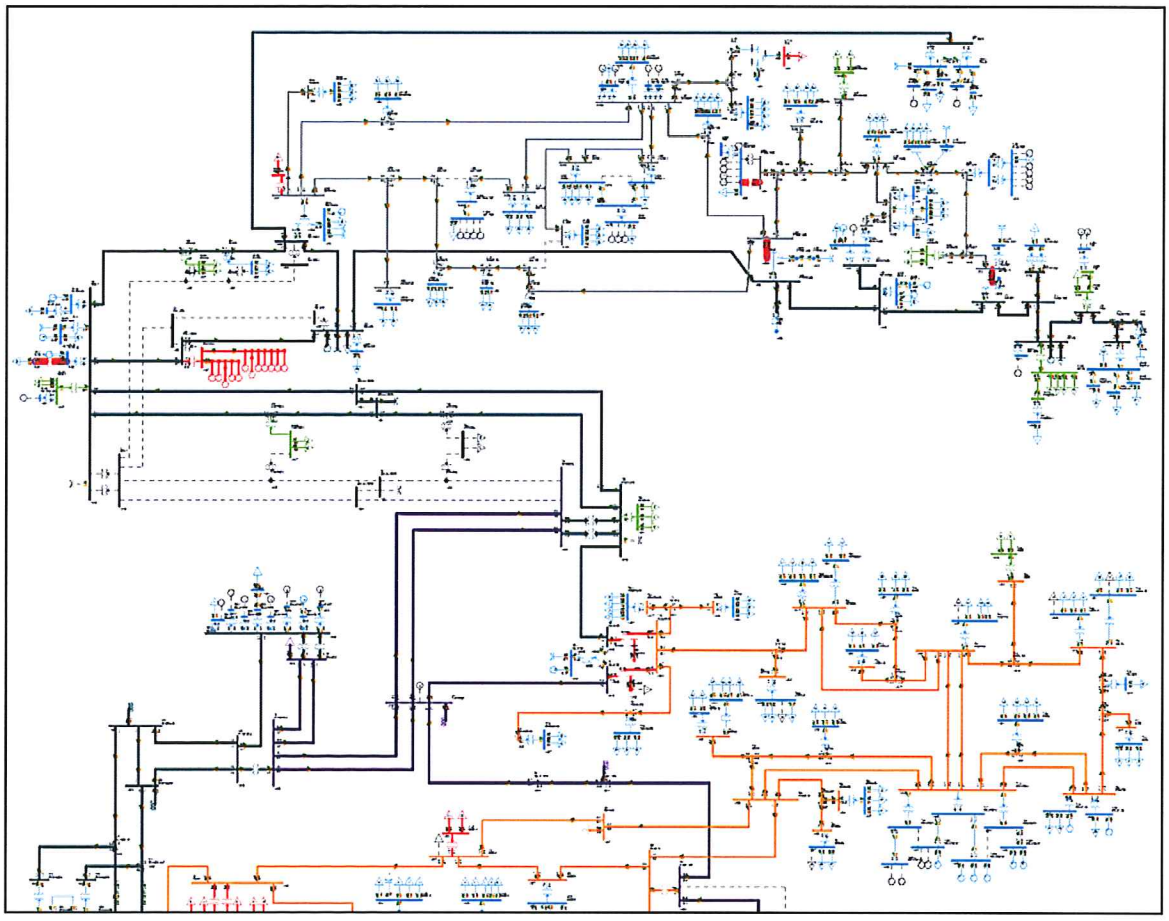

Table D.4 – Transmission Configuration #5