Appendix B: Stability Analysis Results

Nomenclature

K or KEW:	Kewaunee
P or POB:	Point Beach (P1 and P2)
S or SEC:	Sheboygan Energy Center
F or FOX:	Fox Energy
NAP:	North Appleton
GVL:	Granville
CYP:	Cypress
ADN:	Arcadian
FJT	Forest Junction
TH:	Thilmany
L111:	Point Beach-Sheboygan Energy Center 345 kV line
L121:	Point Beach-Forest Junction 345 kV line
Q303:	Point Beach-Kewaunee 345 kV line
L151:	Point Beach-Fox Energy 345 kV line
R304:	Kewaunee-North Appleton 345 kV line
NAPL71:	North Appleton-Werner West 345 kV line
CYP31:	Cypress-Arcadian 345 kV line
6832:	North Appleton-Fox Energy Center 345 kV line
T10:	Kewaunee T10 345/138 kV transformer
SEC31:	Sheboygan Energy Center-Granville 345 kV line
H:	High side
KWH:	Kewaunee T10 High side
KWL:	Kewaunee T10 Low side
POBxy:	Point Beach bus tie xy
Y311	North Appleton-Fitzgerald 345 kV line
CCT:	Critical Clearing Time

Note: The simulated clearing times and critical clearing times (CCT) noted in Appendix B contains planning margin described in Section 3.2

		Inter	rim 1 (with G8	34/J02.	3, with existing K	Kewaunee subst	ation)		
		Intact Sy	stem Fault Cleare	ed in Prim	ary Time - Interim P	eriod 1 (May 2010~/	April 2011)		Same and the second
Event	Element	Fault	Faulted End	Remote	Remote End	Event	Simulated		
File	Faulted	Location	Breakers	Location	Breakers	Notes	Clearing*	High Generation	Low Generation
FItPOBSEC	L111	POB	111	SEC	1-2, 1-6	No SPS	4.5/4.5	ОК	OK
FItPOBFJT	L121	POB	121, 123	FJT	1-2, 2-3		4.5/4.5	ОК	OK
FItPOBFOX	L151	POB	151	FOX	2-3, 3-4	No SPS	4.5/4.5	ОК	OK
FItPOBKEW2	Q-303	POB	Q-303	KEW	Q-303, 1099, 3450	KEW SPS In	4.5/6.5	ОК	OK
FltKEWPOB3r	Q-303	KEW	Q-303, 1099, 3450	POB	Q-303	KEW SPS In	6.5/4.5	OK	OK
FItKEWNAP	R-304	KEW	R-304, 3451	NAP	R-304		6.5/6.5	ОК	OK
FItFOXPOB	L151	FOX	2-3, 3-4	POB	151	_	4.5/4.5	ОК	OK
FItFOXNAP	L6832	FOX	1-2, 6-1	NAP	34-3, 34-4, 45-4, 67-6		4.5/4.5	OK	OK
FItFOXFJT	971L71	FOX	4-5, 5-6	FJT	5-6, 7-1		4.5/4.5	ОК	OK
FItSECPOB	L111	SEC	1-2, 1-6	POB	111		4.5/4.5	OK	OK
FItSECGVL	L-SEC31	SEC	1-2, 3-6	GVL	L-SEC31		4.5/6.5	ОК	OK
FItCYPADN	L-CYP31	CYP	1-2, 5-6	ADN	L-CYP31		4.5/4.5	OK	OK
FLTKEWXFH2R01	T10	KWH	Q-303, 1099, 3450	KWL	1066E, 1066W	Open Q-303 at KEW	6.5/8.5	OK	OK

Table B.1- Stability Results for Faults Clearing in Primary Time under Intact System Conditions

	Interim 2A (with Gos4/J025 and Gos5/J022, with existing Kewaunee substation)												
Int	act System	n Fault Clo	eared in Primary	Time - Inte	erim Period 2A (April	2011 and beyond,	with existi	ng Kewaunee)	- fin is she with the state				
Event	Element	Fault	Faulted End	Remote	Remote End	Event	Simulated						
File	Faulted	Location	Breakers	Location	Breakers	Notes	Clearing*	High Generation	Low Generation				
FItPOBSEC	L111	POB	111	SEC	1-2, 1-6	No SPS	4.5/4.5	ОК	OK				
FItPOBFJT	L121	POB	121, 123	FJT	1-2, 2-3		4.5/4.5	ОК	OK				
FItPOBFOX	L151	POB	151	FOX	2-3, 3-4	No SPS	4.5/4.5	OK	OK				
FItPOBKEW2	Q-303	POB	Q-303	KEW	Q-303, 1099, 3450	KEW SPS In	4.5/6.5	OK	OK				
FltKEWPOB3r	Q-303	KEW	Q-303, 1099, 3450	POB	Q-303	KEW SPS In	6.5/4.5	ОК	OK				
FItKEWNAP	R-304	KEW	R-304, 3451	NAP	R-304		6.5/6.5	ОК	OK				
FItFOXPOB	L151	FOX	2-3, 3-4	POB	151		4.5/4.5	ОК	OK				
FItFOXNAP	L6832	FOX	1-2, 6-1	NAP	34-3, 34-4, 45-4, 67-6		4.5/4.5	ОК	OK				
FItFOXFJT	971L71	FOX	4-5, 5-6	FJT	5-6, 7-1		4.5/4.5	ОК	ОК				
FItSECPOB	L111	SEC	1-2, 1-6	POB	111		4.5/4.5	ОК	OK				
FItSECGVL	L-SEC31	SEC	1-2, 3-6	GVL	L-SEC31		4.5/6.5	ОК	OK				
FItCYPADN	L-CYP31	CYP	1-2, 5-6	ADN	L-CYP31		4.5/4.5	ОК	OK				
FLTKEWXFH2R01	T10	KWH	Q-303, 1099, 3450	KWL	1066E, 1066W	Open Q-303 at KEW	6.5/8.5	ОК	ОК				

Interim 2A (with G834/J023 and G833/J022, with existing Kewaunee substation)

Interim 2B (with G834/J023 and G833/J022, with new Kewaunee substation)

Intact System Fault Cleared in Primary Time - Interim Period 2B (April 2011 and beyond, with Kewaunee Project)											
Event	Element	Fault	Faulted End	Remote	Remote End	Event	Simulated				
File	Faulted	Location	Breakers	Location	Breakers	Notes	Clearing*	High Generation	Low Generation		
FItPOBSEC	L111	POB	111	SEC	1-2, 1-6	No SPS	4.5/4.5	OK	ОК		
FItPOBFJT	L121	POB	121, 123	FJT	1-2, 2-3		4.5/4.5	ОК	ОК		
FItPOBFOX	L151	POB	151	FOX	2-3, 3-4	No SPS	4.5/4.5	OK	ОК		
FItPOBKEW	Q-303	POB	Q-303	KEW	Q-303 New 1 and 2	No SPSs	4.5/4.5	ОК	ОК		
FItKEWPOB	Q-303	KEW	Q-303 New 1 and 2	РОВ	Q-303	No SPSs	4.5/4.5	ОК	ОК		
FItKEWNAP	R-304	KEW	R-304 New 1 and 2	NAP	R-304	_	4.5/6.5	ОК	OK		
FItFOXPOB	L151	FOX	2-3, 3-4	POB	151		4.5/4.5	ОК	OK		
FItFOXNAP	L6832	FOX	1-2, 6-1	NAP	34-3, 34-4, 45-4, 67-6		4.5/4.5	ОК	OK		
FItFOXFJT	971L71	FOX	4-5, 5-6	FJT	5-6, 7-1		4.5/4.5	ОК	OK		
FItSECPOB	L111	SEC	1-2, 1-6	POB	111		4.5/4.5	ОК	ОК		
FItSECGVL	L-SEC31	SEC	1-2, 3-6	GVL	L-SEC31		4.5/6.5	ОК	ОК		
FItCYPADN	L-CYP31	CYP	1-2, 5-6	ADN	L-CYP31		4.5/4.5	ОК	OK		
FItKEWXFH	T10	KWH	T10 High Side	KWL	T10 Low Side		5.5/5.5	ОК	OK		

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Table B.2- Stability Results for Double Circuit Single Line-to-Ground Faults Cleared in Primary Time under Intact System Conditions

Event	Fault	Fault #1	Acceptable	Fault #2	Fault #2	Simulated	Interim Period 1 (May 2010~Apr 2011)	
File	#1	Location	001	π2	Loodion		High Gen	Low Gen
DC3-111-971K51-1	L111 - Point Beach-Sheboygan 345 kV	38.5% from POB	5.5/5.5	971K51 - Forest Junction-Howard's Grove 138 kV	33.9% from FJT	6.5/6.5	OK	ОК
DC3-111-971K51-2	L111 - Point Beach-Sheboygan 345 kV	16.3% from SEC	5.5/5.5	971K51 - Forest Junction-Howard's Grove 138 kV	6.3% from HOG	6.5/6.5	ОК	ОК
DC3-111-HOLG21-1	L111 - Point Beach-Sheboygan 345 kV	SEC	5.5/5.5	HOGL21 - Howard's Grove-Holland 138 kV	76.9% from HOL	6.5/6.5	ОК	ОК
DC3-111-HOLG21-2	L111 - Point Beach-Sheboygan 345 kV	15.7% from SEC	5.5/5.5	HOGL21 - Howard's Grove-Holland 138 kV	31.4% from HOG	6.5/6.5	ОК	ОК
DC3-121-971K51-1	L121-Pt. Beach-Forest Junction 345 kV	FJT	5.5/5.5	971K51 - Forest Junction-Howard's Grove 138 kV	FJT	6.5/6.5	ОК	ОК
DC3-121-971K51-2	L121-Pt. Beach-Forest Junction 345 kV	42.3% from FJT	5.5/5.5	971K51 - Forest Junction-Howard's Grove 138 kV	33.9% from FJT	6.5/6.5	ОК	ОК
DC3-SEC31-3431-1	L-SEC31 - Sheboygan-Granville 345 kV	GVL	7.5/7.5	3431 - Granville-Saukville 345 kV	GVL	7.5/7.5	ОК	ОК
DC3-SEC31-3431-2	L-SEC31-Sheboygan-Granville 345 kV	26.7% from GVL	7.5/7.5	3431 - Granville-Saukville 345 kV	25.3% from SAU	7.5/7.5	ОК	ОК
DC3-SEC31-8231-1	L-SEC31-Sheboygan-Granville 345 kV	43.5% from GVL	7.5/7.5	8231 - Saukville-Barton 138 kV	36.4% from BRT	7.5/7.5	ОК	ОК
DC3-SEC31-8231-2	L-SEC31-Sheboygan-Granville 345 kV	48.3% from GVL	7.5/7.5	8231 - Saukville-Barton 138 kV	36.4% from SAU	7.5/7.5	ОК	ОК
DC3-9932-2642-1	L- CYP31 - Cypress-Arcadian 345 kV	32.0% from ADN	5.5/5.5	2642 - Saukville-Germantown 138 kV	34.2% from SAU	7.5/7.5	ОК	ОК
DC3-9932-2642-2	L- CYP31 - Cypress-Arcadian 345 kV	16.6% from ADN	5.5/5.5	2642 - Saukville-Germantown 138 kV	GER	7.5/7.5	OK	ОК
DC3-9932-2661-1	L- CYP31 - Cypress-Arcadian 345 kV	10.8% from ADN	5.5/5.5	2661 - Germantown-Bark River 138 kV	31.5% from GER	8.5/8.5	ОК	ОК
DC3-9932-2661-2	L- CYP31 - Cypress-Arcadian 345 kV	16.6% from ADN	5.5/5.5	2661 - Germantown-Bark River 138 kV	GER	8.5/8.5	OK	ОК
DC3-9932-9911-1	L- CYP31 - Cypress-Arcadian 345 kV	10.8% from ADN	5.5/5.5	9911 - Granville-Arcadian 345 kV	45.4% from GVL	7.5/7.5	OK	ОК
DC3-9932-9911-2	L- CYP31 - Cypress-Arcadian 345 kV	ADN	5.5/5.5	9911 - Granville-Arcadian 345 kV	ADN	7.5/7.5	ОК	OK

Interim 1 (with G834/J023, with existing Kewaunee substation)

Event File	Fault #1	Fault #1 Location	Acceptable CCT*	Fault #2	Fault #2 Location	Simulated Clearing time	Interim F (May 2011 ~ K	Interim Period 2A (May 2011 ~), W existing Kew	
							High Gen	Low Gen	
DC3-111-971K51-1	L111 - Point Beach-Sheboygan 345 kV	38.5% from POB	5.5/5.5	971K51 - Forest Junction-Howard's Grove 138 kV	33.9% from FJT	6.5/6.5	ОК	ОК	
DC3-111-971K51-2	L111 - Point Beach-Sheboygan 345 kV	16.3% from SEC	5.5/5.5	971K51 - Forest Junction-Howard's Grove 138 kV	6.3% from HOG	6.5/6.5	ОК	ОК	
DC3-111-HOLG21-1	L111 - Point Beach-Sheboygan 345 kV	SEC	5.5/5.5	HOGL21 - Howard's Grove-Holland 138 kV	76.9% from HOL	6.5/6.5	ОК	ОК	
DC3-111-HOLG21-2	L111 - Point Beach-Sheboygan 345 kV	15.7% from SEC	5.5/5.5	HOGL21 - Howard's Grove-Holland 138 kV	31.4% from HOG	6.5/6.5	ОК	ОК	
DC3-121-971K51-1	L121-Pt. Beach-Forest Junction 345 kV	FJT	5.5/5.5	971K51 - Forest Junction-Howard's Grove 138 kV	FJT	6.5/6.5	ОК	ОК	
DC3-121-971K51-2	L121-Pt. Beach-Forest Junction 345 kV	42.3% from FJT	5.5/5.5	971K51 - Forest Junction-Howard's Grove 138 kV	33.9% from FJT	6.5/6.5	ОК	ОК	
DC3-SEC31-3431-1	L-SEC31 - Sheboygan-Granville 345 kV	GVL	7.5/7.5	3431 - Granville-Saukville 345 kV	GVL	7.5/7.5	ОК	ОК	
DC3-SEC31-3431-2	L-SEC31-Sheboygan-Granville 345 kV	26.7% from GVL	7.5/7.5	3431 - Granville-Saukville 345 kV	25.3% from SAU	7.5/7.5	ОК	ОК	
DC3-SEC31-8231-1	L-SEC31-Sheboygan-Granville 345 kV	43.5% from GVL	7.5/7.5	8231 - Saukville-Barton 138 kV	36.4% from BRT	7.5/7.5	ОК	ОК	
DC3-SEC31-8231-2	L-SEC31-Sheboygan-Granville 345 kV	48.3% from GVL	7.5/7.5	8231 - Saukville-Barton 138 kV	36.4% from SAU	7.5/7.5	ОК	ОК	
DC3-9932-2642-1	L- CYP31 - Cypress-Arcadian 345 kV	32.0% from ADN	5.5/5.5	2642 - Saukville-Germantown 138 kV	34.2% from SAU	7.5/7.5	ОК	ОК	
DC3-9932-2642-2	L- CYP31 - Cypress-Arcadian 345 kV	16.6% from ADN	5.5/5.5	2642 - Saukville-Germantown 138 kV	GER	7.5/7.5	ОК	ОК	
DC3-9932-2661-1	L- CYP31 - Cypress-Arcadian 345 kV	10.8% from ADN	5.5/5.5	2661 - Germantown-Bark River 138 kV	31.5% from GER	8.5/8.5	ОК	ОК	
DC3-9932-2661-2	L- CYP31 - Cypress-Arcadian 345 kV	16.6% from ADN	5.5/5.5	2661 - Germantown-Bark River 138 kV_	GER	8.5/8.5	ОК	OK	
DC3-9932-9911-1	L- CYP31 - Cypress-Arcadian 345 kV	10.8% from ADN	5.5/5.5	9911 - Granville-Arcadian 345 kV	45.4% from GVL	7.5/7.5	ОК	OK	
DC3-9932-9911-2	L- CYP31 - Cypress-Arcadian 345 kV	ADN	5.5/5.5	9911 - Granville-Arcadian 345 kV	ADN	7.5/7.5	ОК	ОК	

Interim 2A (with G834/J023 and G833/J022, with existing Kewaunee substation)

Event		Fault	Fault #1	Acceptable	able Fault Fault #2 * #2 Location		Simulated	Interim F (May 2011 ~)	Period 2B , W/ new Kew
File		#1	Location	CCI	#2	LUCAUUII	Cleaning unie	High Gen	Low Gen
DC3-111-971K51-1	L111 -	Point Beach-Sheboygan 345 kV	38.5% from POB	5.5/5.5	971K51 - Forest Junction-Howard's Grove 138 kV	33.9% from FJT	6.5/6.5	ОК	ОК
DC3-111-971K51-2	L111 -	Point Beach-Sheboygan 345 kV	16.3% from SEC	5.5/5.5	971K51 - Forest Junction-Howard's Grove 138 kV	6.3% from HOG	6.5/6.5	ОК	ОК
DC3-111-HOLG21-1	L111 -	Point Beach-Sheboygan 345 kV	SEC	5.5/5.5	HOGL21 - Howard's Grove-Holland 138 kV	76.9% from HOL	6.5/6.5	ОК	ОК
DC3-111-HOLG21-2	L111 -	Point Beach-Sheboygan 345 kV	15.7% from SEC	5.5/5.5	HOGL21 - Howard's Grove-Holland 138 kV	31.4% from HOG	6.5/6.5	ОК	ОК
DC3-121-971K51-1	L121-F	Pt. Beach-Forest Junction 345 kV	FJT	5.5/5.5	971K51 - Forest Junction-Howard's Grove 138 kV	FJT	6.5/6.5	OK	ОК
DC3-121-971K51-2	L121-	Pt. Beach-Forest Junction 345 kV	42.3% from FJT	5.5/5.5	971K51 - Forest Junction-Howard's Grove 138 kV	33.9% from FJT	6.5/6.5	ОК	ОК
DC3-SEC31-3431-1	L-SEC	31 - Sheboygan-Granville 345 kV	GVL	7.5/7.5	3431 - Granville-Saukville 345 kV	GVL	7.5/7.5	ОК	ОК
DC3-SEC31-3431-2	L-SEC	31-Sheboygan-Granville 345 kV	26.7% from GVL	7.5/7.5	3431 - Granville-Saukville 345 kV	25.3% from SAU	7.5/7.5	ОК	ОК
DC3-SEC31-8231-1	L-SEC	C31-Sheboygan-Granville 345 kV	43.5% from GVL	7.5/7.5	8231 - Saukville-Barton 138 kV	36.4% from BRT	7.5/7.5	ОК	ОК
DC3-SEC31-8231-2	L-SEC	31-Sheboygan-Granville 345 kV	48.3% from GVL	7.5/7.5	8231 - Saukville-Barton 138 kV	36.4% from SAU	7.5/7.5	ОК	ОК
DC3-9932-2642-1	L- CY	P31 - Cypress-Arcadian 345 kV	32.0% from ADN	5.5/5.5	2642 - Saukville-Germantown 138 kV	34.2% from SAU	7.5/7.5	ОК	ОК
DC3-9932-2642-2	L- CY	P31 - Cypress-Arcadian 345 kV	16.6% from ADN	5.5/5.5	2642 - Saukville-Germantown 138 kV	GER	7.5/7.5	ОК	ОК
DC3-9932-2661-1	L- CY	P31 - Cypress-Arcadian 345 kV	10.8% from ADN	5.5/5.5	2661 - Germantown-Bark River 138 kV	31.5% from GER	8.5/8.5	ОК	ОК
DC3-9932-2661-2	L- CY	P31 - Cypress-Arcadian 345 kV	16.6% from ADN	5.5/5.5	2661 - Germantown-Bark River 138 kV	GER	8.5/8.5	ОК	ОК
DC3-9932-9911-1	L- CY	P31 - Cypress-Arcadian 345 kV	10.8% from ADN	5.5/5.5	9911 - Granville-Arcadian 345 kV	45.4% from GVL	7.5/7.5	ОК	ОК
DC3-9932-9911-2	L- CY	P31 - Cypress-Arcadian 345 kV	ADN	5.5/5.5	9911 - Granville-Arcadian 345 kV	ADN	7.5/7.5	OK	ОК

Interim 2B (with G834/J023 and G833/J022, with new Kewaunee substation)

Table B.3- Stability Results for 3-Phase Faults Cleared in Primary Time under Prior Outage Condition Units Tripping

Note: Among various contingencies evaluated, only faults with stability issues are listed in Table B.3.

			2000000000	1		0						
	Primary Clearing Time, Prior Outage: 6832 (FOX-NAP, 38894-39556), (POB PSSs In Service) Existing KEW Sub											
Event	Element	Fault	Faulted End	Remote	Remote End	Event	Simulated	High Generation	Low Generation			
File	Faulted	Location	Breakers	Location	Breakers	Notes	Clearing*	Base	Base			
FItKEWNAP	R-304	KEW	R-304, 3451	NAP	R-304		6.5/6.5	K,P,F,S ***	OK			

Interim 1 (with G834/J023, with existing Kewaunee substation)

*** Stable at 5.5/4.5 with G1 restricted to 560 MW gross (G1 restriction 560 MW with R304 breaker at NAP replaced). Existing clearing time at faulted end is 4.5 cycles without margin

	Primary Clearing Time, Prior Outage: SEC31 (SEC-GVL, 39865-38870), (POB PSSs In Service) Existing KEW Sub											
Event	Element	Fault	Faulted End	Remote	Remote End	Event	Simulated	High Generation	Low Generation			
File	Faulted	Location	Breakers	Location	Breakers	Notes	Clearing*	Base	Base			
FItKEWNAP	R-304	KEW	R-304, 3451	NAP	R-304		6.5/6.5	K,P,S,F **	OK			

** Stable at 5.5/4.5 - replace R-304 breaker at NAP. 4.5 is MECT for R304 fault at KEW. Existing clearing time at faulted end is 4.5 cycles without margin

Primary Clearing Time, Prior Outage: POB 2-3 (POB-B23, 38898-39211), (POB PSSs In Service) Existing KEW Sub											
Event	Element	Fault	Faulted End	Remote	Remote End	Event	Simulated	High Generation	Low Generation		
File	Faulted	Location	Breakers	Location	Breakers	Notes	Clearing*	Base	Base		
FItPOBFJT	L121	POB	121, 123	FJT	1-2, 2-3		4.5/4.5	P1 **	P1*		

* For stability, G1 needs to be restricted to 580 MW gross

** For stability, G1 needs to be restricted to 620 MW gross

		21000		000		-)	THE A PLAN AND A MAY A CALL					
	Primary Clearing Time, Prior Outage: L111 (POB-SEC, 39433-39865), (POB PSSs In Service) Existing KEW Sub											
Event	Element	Fault	Faulted End	Remote	Remote End	Event	Simulated	High Generation	Low Generation			
File	Faulted	Location	Breakers	Location	Breakers	Notes	Clearing*	Base	Base			
FItKEWNAP	R-304	KEW	R-304, 3451	NAP	R-304		6.5/6.5	K,P,F ***	K,P ***			

Interim 2A (with G834/J023 and G833/J022, with existing Kewaunee substation)

*** Stable at 5.5/4.5, Replace R-304 breaker at North Appleton. Note: MECT of R304 at Kew is 4.5

Primary Clearing Time, Prior Outage: L121 (POB-FJT, 38898-39304), (POB PSSs In Service) Existing KEW Sub												
Event	Element	Fault	Faulted End	Remote	Remote End	Event	Simulated	High Generation	Low Generation			
File	Faulted	Location	Breakers	Location	Breakers	Notes	Clearing*	Base	Base			
FItKEWNAP	R-304	KEW	R-304, 3451	NAP	R-304		6.5/6.5	OK	K,P^			

* Stable at 5.0/4.5 or Stable at 5.5/4.5 with G2 reduced to 620 MW-replace R304 breaker at NAP. Existing clearing time at faulted end is 4.5 cycles without margin

Primary Clearing Time, Prior Outage: L151 (POB-FJT, 38898-39304), (POB PSSs In Service) Existing KEW Sub													
Event	Element	Fault	Faulted End	Remote	Remote End	Event	Simulated	High Generation	Low Generation				
File	Faulted	Location	Breakers	Location	Breakers	Notes	Clearing*	Base	Base				
FItKEWNAP	R-304	KEW	R-304, 3451	NAP	R-304		6.5/6.5	ОК	К,Р ^				

A Stable at 5.0/4.5 or Stable at 5.5/4.5 with G2 reduced to 620 MW gross (replace R-304B at NAP and G2 at 620 MW). Existing clearing time at faulted end is 4.5 cycles without margin Note: Without G2 reduction, Vsag will trip P with 5.5/4.5 (P1 1.513s for 19KV, P2 1.521s for 19KV, B1B5 1st 1.083s, B1B5 2nd 1.575s). Thus, if time delay can be readjusted to avoid violation, only thing to be done is replacing R-304 breaker at NAP

Primary Clearing Time, Prior Outage: R-304 (KEW-NAP, 39630-39359), (POB PSSs In Service) Existing KEW Sub											
Event	Element	Fault	Faulted End	Remote	Remote End	Event	Simulated	High Generation	Low Generation		
File	Faulted	Location	Breakers	Location	Breakers	Notes	Clearing*	Base	Base		
FItFOXNAP	L6832	FOX	1-2, 6-1	NAP	34-3, 34-4, 45-4, 67-6		4.5/4.5	K,P,F*	ОК		

* Stable at 4.0/4.5 OR Stable at 4.5/4.5 with G2 reduced to 600 MW gross. At 4.5/4.5 with G2 at 620 MW, 345 kV 2nd criteria is violated: B1: 1.583s and B2: 1.583s.

		Primary	/ Clearing Time, Prior O	utage: 6832	(FOX-NAP, 38894-39556), (I	POB PSSs In Service) Exis	sting KEW Su	b	
Event	Element	Fault	Faulted End	Remote	Remote End	Event	Simulated	High Generation	Low Generation
File	Faulted	Location	Breakers	Location	Breakers	Notes	Clearing*	Base	Base
FItKEWNAP	R-304	KEW	R-304, 3451	NAP	R-304		6.5/6.5	K,P,F,S ^^^	К,Р ^^
FLTKEWXFH2R01	T10	КШН	Q-303, 1099, 3450	KWL	1066E, 1066W	Open Q-303 at KEW	6.5/8.5	P,F ***	OK at 5.0/8.5

*** Stable at 6.0/8.5 with G2 reduced to 580 MW gross. 5.0 cycle is the existing clearing time at the high side of T10 transformer.

^{^A} Stable at 5.5/4.5 with G2 at 580 MW (replace R-304 breaker at NAP and reduce G2 to 580 MW gross). Existing clearing time at faulted end is 4.5 cycles without margin

^^ Stable at 5.5/4.5 with both G1 and G2 at 540 MW (replace R-304 breaker at NAP and reduce both G1 and G2 to 540 MW). Existing clearing time at faulted end is 4.5 cycles without margin

		Primary	Primary Clearing Time, Prior Outage: SEC31 (SEC-GVL, 39865-38870), (POB PSSs In Service) Existing KEW Sub										
Event	Element	Fault	Faulted End	Remote	Remote End	Event	Simulated	High Generation	Low Generation				
File	Faulted	Location	Breakers	Location	Breakers	Notes	Clearing*	Base	Base				
FItKEWNAP	R-304	KEW	R-304, 3451	NAP	R-304		6.5/6.5	K,P,S,F ***	K,P ****				
FLTKEWXFH2R01	T10	KWH	Q-303, 1099, 3450	KWL	1066E, 1066W	Open Q-303 at KEW	6.5/8.5	K,P,S,F ^^	К,Р ^				

A Stable at 6.0/8.5 with G2 at 620 (G2 reduction to 620 gross). 5.0 cycle without margin is the existing clearing time at the high side of T10 transformer.

^^ Stable at 5.5/8.5 or Stable at 6.0/8.5 with G2 at 580 MW (G2 reduction to 580 gross). 5.0 cycle without margin is the existing clearing time at the high side of T10 transformer.

*** Stable at 5.5/4.5 with G2 580 MW - Replace R-304 breaker at NAP and G2 at 580 MW gross. Existing clearing time at faulted end is 4.5 cycles without margin

**** Stable at 5.5/4.5 with G2 at 620 MW gross. Existing clearing time at faulted end is 4.5 cycles without margin

Primary Clearing Time, Prior Outage: POB 1-2 (POB-B12, 39433-38898), (POB PSSs In Service) Existing KEW Sub												
Event	Element	Fault	Faulted End	Remote	Remote End	Event	Simulated	High Generation	Low Generation			
File	Faulted	Location	Breakers	Location	Breakers	Notes	Clearing*	Base	Base			
FItKEWNAP	R-304	KEW	R-304, 3451	NAP	R-304		6.5/6.5	K,P,Fs ***	K,P ***			

*** Stable at 5.5/4.5. Replace R-304 breaker at NAP. Existing clearing time at faulted end is 4.5 cycles without margin

Primary Clearing Time, Prior Outage: POB 2-3 (POB-B23, 38898-39211), (POB PSSs In Service) Existing KEW Sub													
Event	Element	Fault	Faulted End	Remote	Remote End	Event	Simulated	High Generation	Low Generation				
File	Faulted	Location	Breakers	Location	Breakers	Notes	Clearing*	Base	Base				
FitPOBFJT L121 POB 121, 123 FJT 1-2, 2-3 4.5/4.5 P1* P1*													

* For stability, G1 needs to be restricted to 580 MW gross

		Primar	v Clearing Time, Prior	POB PSSs In Serv	vice) Existing K	EW Sub			
Event	Element	Fault	Faulted End	Remote	Remote End	Event	Simulated	High Generation	Low Generation
File	Faulted	Location	Breakers	Location	Breakers	Notes	Clearing*	Base	Base
FItKEWNAP	R-304	KEW	R-304, 3451	NAP	R-304		6.5/6.5	OK	K,P ***

*** Stable at 5.5/4.5 with G2 at 620 MW (replace R-304 breaker at NAP and reduce G2 to 620 MW). Existing clearing time at faulted end is 4.5 cycles without margin

			Inter the 2D (, , , , , , , , , , , , , , , , , , , ,	ente entre na entre	1							
	Primary Clearing Time, Prior Outage: 6832 (FOX-NAP, 38894-39556), (POB PSSs In Service) New KEW Sub														
Event	Element	Fault	Faulted End	Remote	Remote End	Event	Simulated	High Generation	Low Generation						
File	Faulted	Location	Breakers	Location	Breakers	Notes	Clearing*	Base	Base						
FItKEWNAP	R-304	KEW	R-304, 3451	NAP	R-304		4.5/6.5	K,P,F*	OK						

Interim 2B (with G834/J023 and G833/J022, with new Kewaunee substation)

* Stable at 4.5/4.5 with G2 restricted to 600 MW gross (G2 restriction 600 MW gross with R-304 breaker at NAP replaced)

Γ	Primary Clearing Time Prior Outage: POR 2-3 (POR-R23 38898-39211) (POR PSSs In Service) New KEW Sub												
ŀ			Prima	iry clearing Time, i	Prior Outage:	POB 2-3 (POB-B23, 36636-33211)	, (FOD F333	III Service) Net					
l	Event	Element	Fault	Faulted End	Remote	Remote End	Event	Simulated	High Generation	Low Generation			
ſ	File	Faulted	Location	Breakers	Location	Breakers	Notes	Clearing*	Base	Base			
ľ	FItPOBFJT	L121	POB	121, 123	FJT	1-2, 2-3		4.5/4.5	P1 **	P1*			

* To be stable at 4.5/4.5, G1 needs to be restricted to 580 MW gross ** To be stable at 4.5/4.5, G1 needs to be restricted to 620 MW gross

Table B.4- Stability Results for 3-Phase Faults Cleared in Delayed (Breaker Failure) Time under Intact Conditions, Units Tripping

4			Intact Syste	m Breaker Failure Events - Interim Period 1 (May 2010	0~April 2011)		
Event	Element	Fault	Remote	Event	Simulated	High Gen	Low Gen
File	Faulted	Location	Location	Notes	clearing time	Existing	Existing
BFIPOBSEC	L111	POB	SEC	T1X03 Tripped, Aux Moved	3.5/10.0/4.5	OK	OK
BFIPOBFOX	L151	POB	FOX	T2X03 Tripped, Aux Moved	3.5/10.0/4.5	ОК	OK
BFIPOBKEW2	Q-303	POB	KEW	Trip T10 Primary, Delay POB Split	3.5/10.0/6.5	ОК	ОК
BFINAPKEW	R-304	NAP	KEW	Split NAP Primary, Xformer Trip BF***	5.5/14.25/5.5	ОК	ОК
BFIFJTPOB	L121	FJT	POB	Trips Transformer**	3.5/10.5/4.5	ОК	OK
BFIFJTCYP	971L51	FJT	CYP	Trips Line 971L71**	3.5/10.5/4.5	ОК	ОК
BFIFJTFOX	971171	FJT	FOX	Trips Line 971L51**	3.5/10.5/4.5	ОК	ОК
BFIFOXPOB2	L151	FOX (2)	POB	BF Trips Fox Unit 1	3.5/10.5/4.5	ОК	ОК
BFIFOXNAP2	L6832	FOX (2)	NAP	BF Trips Fox Unit 2	3.5/10.0/4.5	ОК	OK
BFIFOXFJT2	971L71	FOX (2)	FJT	BF Trips Fox Unit 2	3.5/10.0/4.5	ОК	ОК
BFISECPOB1	L111	SEC (1)	POB	Do Not Trip Gen (worst case)	3.5/10.5/4.5	ОК	ОК
BFISECGVL1	L-SEC31	SEC (1)	GVL	Do Not Trip Gen (worst case)	3.5/10.5/6.5	ОК	ОК
BFICYPADN	L-CYP31	CYP	ADN	Trips CYP Units	3.5/10.5/4.5	ОК	ОК
BFICYPFJT	971L51	CYP	FJT	Trips CYP Units	3.5/10.5/4.5	OK	ОК

Interim 1 (with G834/J023, with existing Kewaunee substation)

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1		11 11 2 2	1.000	Intact System Breaker Failure Events - I	nterim Period 2A (April	2011 and beyo	nd, W/ existing Kewaun	ee)	a starter and the				
Event	Element	Fault	Remote	Event	Simulated		High Gen			Low Gen			
File	Faulted	Location	Location	Notes	clearing time	Existing	3.5/9.5/4.5	3.5/9.25/4.5	Existing	3.5/9.5/4.5	3.5/9.25/4.5	3.5/9.0/4.5	
BFIPOBSEC	L111	POB	SEC	T1X03 Tripped, Aux Moved	3.5/10.0/4.5	K,P	P A	OK	K,P	K,P	K,P*	ОК	
BFIPOBFOX	L151	POB	FOX	T2X03 Tripped, Aux Moved	3.5/10.0/4.5	ОК	ОК	OK	K,P***	ОК	ОК	ОК	
BFIPOBKEW2	Q-303	POB	KEW	Trip T10 Primary, Delay POB Split	3.5/10.0/6.5		See Below	for Detailed Study R	esult for Q303	breaker failure at F	Point Beach		
BFINAPKEW	R-304	NAP	KEW	Split NAP Primary, Xformer Trip BF**	5.5/14.25/5.5	OK	ОК	OK	OK	OK	OK	ОК	
BFIFJTPOB	L121	FJT	POB	Trips Transformer**	3.5/10.5/4.5	OK	OK	OK	OK	OK	OK	OK	
BFIFJTCYP	971L51	FJT	CYP	Trips Line 971L71**	3.5/10.5/4.5	OK	OK	OK	OK	OK	OK	OK	
BFIFJTFOX	971171	FJT	FOX	Trips Line 971L51**	3.5/10.5/4.5	OK	OK	OK	OK	OK	OK	ОК	
BFIFOXPOB2	L151	FOX (2)	POB	BF Trips Fox Unit 1	3.5/10.5/4.5	OK	OK	OK	OK	OK	OK	ОК	
BFIFOXNAP2	L6832	FOX (2)	NAP	BF Trips Fox Unit 2	3.5/10.0/4.5	OK	ОК	OK	OK	ОК	OK	ОК	
BFIFOXFJT2	971L71	FOX (2)	FJT	BF Trips Fox Unit 2	3.5/10.0/4.5	OK	OK	OK	OK	ОК	OK	OK	
BFISECPOB1	L111	SEC (1)	POB	Do Not Trip Gen (worst case)	3.5/10.5/4.5	OK	OK	OK	OK	OK	OK	OK	
BFISECGVL1	L-SEC31	SEC (1)	GVL	Do Not Trip Gen (worst case)	3.5/10.5/6.5	OK	ОК	OK	ОК	ОК	OK	ОК	
BFICYPADN	L-CYP31	CYP	ADN	Trips CYP Units	3.5/10.5/4.5	OK	OK	OK	OK	ОК	OK	ОК	
BFICYPFJT	971L51	CYP	FJT	Trips CYP Units	3.5/10.5/4.5	OK	ОК	OK	OK	OK	OK	ОК	

Interim 2A (with G834/J023 and G833/J022, with existing Kewaunee substation)

^19kV-1.542sec, 345kV B5-1st 1.113 sec, 345 kV B5-2nd 1.558 sec. See also *

* Stable at 3.5/9.0/4.5. Relay upgrades shown in Section 1.1 will address the issue. ** Stable at 3.5/9.5/4.5. Relay upgrades shown in Section 1.1 will address the issue.

		Det	tailed study result for Q30	3 Breaker Failu	re at Point Bea	ch (Interim 2, V	V/O West SS, V	// existing Ke	waunee) - Tested	w/o 345 kV Vol	tage Sag Criteri	ia, w/ 19 kV Voli	tage Criteria	
				High Gen				Low Gen						
		Existing	3.5/9.5/6.5	3.5/9.25/6.5	3.5/9.0/6.5	3.5/8.75/6.5	3.5/8.5/6.5	Existing	3.5/9.5/6.5	3.5/9.25/6.5	3.5/9.0/6.5	3.5/8.75/6.5	3.5/8.5/6.5	3.5/8.0/6.5
Angular Stability		P2	P2	P2*	P2	ок	ок	K,P	K,P	P**	P2	P2	P2	P2
Angular Stability	10 10	OK	OK	OK	ок	P2 1.521s	ок	OK	ОК	OK	OK	ок	OK	OK
Voltage Criteria	245 W/ 1ct	OK	OK	OK	ок	B5 1.083s	ок	ок	ОК	B1 1.1s	OK	ок	OK	B5 1.029s
Voltage Officia	345 kV/2nd	OK	OK	OK	ОК	B5 1.542s	ок	ОК	ОК	OK	OK	ОК	OK	OK

* Stable at 3.5/9.25/6.5 with G2 restricted to 620 MW. ** Stable at 3.5/9.25/6.5 with G2 restricted to 580 MW. Stable at 3.5/9.0/6.5 with G2 restricted to 600 MW As described in Section 1.1, installing a series breaker will address the issue. The upgrade will clear a Q-303 breaker failure at Point Beach in primary time.

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											Statute of the local division of the
			21 N	Intact System Breaker Failure Events - Interim Period 2	B (April 2011 and beyo	ond, W/ Kewau	nee Project)	C. No. of A. L.	A CONTRACTOR	. با اللاقية بطعين	AND MUT HIS
Event	Element	Fault	Remote	Event	Simulated	Hi	gh Gen		L	ow Gen	
File	Faulted	Location	Location	Notes	clearing time	Existing	3.5/9.5/4.5	Existing	3.5/9.5/4.5	3.5/9.25/4.5	3.5/9.0/4.5
BFIPOBSEC	L111	POB	SEC	T1X03 Tripped, Aux Moved	3.5/10.0/4.5	P,K	ОК	P,K	P,K	P,K**	ОК
BFIPOBFOX	L151	POB	FOX	T2X03 Tripped, Aux Moved	3.5/10.0/4.5	ОК	OK	P,K*	ОК	OK	ОК
BFIPOBKEW	Q-303	POB	KEW	Future: Delay POB Split, No T10 Trip	3.5/10.0/4.5	OK	OK	P2	P2*	ОК	ОК
BFIKEWPOB	Q-303	KEW	POB	Delay KEW T10 Trip	3.5/10.0/4.5	ОК	ОК	OK	OK	ОК	OK
BFIKEWNAP2	R-304	KEW	NAP	Delay KEW T10 Trip	3.5/10.0/6.5	ОК	ОК	P,K ***	ОК	ОК	ОК
BFIKEWXFH2	KEW T10	KWH	KWL	Future (Existng No BF possible)	3.5/10.0/4.5	ОК	ОК	ОК	ОК	ОК	ОК
BFINAPKEW2	R-304	NAP	KEW	Split NAP Primary, Xformer Trip BF**'	5.5/14.25/4.5	ОК	OK	ОК	ОК	OK	ОК
BFIFJTPOB	L121	FJT	POB	Trips Transformer**	3.5/10.5/4.5	OK	OK	OK	OK	ОК	ОК
BFIFJTCYP	971L51	FJT	CYP	Trips Line 971L71**	3.5/10.5/4.5	OK	OK	OK	OK	ОК	ОК
BFIFJTFOX	971171	FJT	FOX	Trips Line 971L51**	3.5/10.5/4.5	OK	ОК	OK	OK	ОК	ОК
BFIFOXPOB2	L151	FOX (2)	POB	BF Trips Fox Unit 1	3.5/10.5/4.5	ОК	OK	ОК	ОК	ОК	ОК
BFIFOXNAP2	L6832	FOX (2)	NAP	BF Trips Fox Unit 2	3.5/10.0/4.5	ОК	ОК	OK	ОК	ОК	OK
BFIFOXFJT2	971L71	FOX (2)	FJT	BF Trips Fox Unit 2	3.5/10.0/4.5	ОК	ОК	OK	ОК	OK	ОК
BFISECPOB1	L111	SEC (1)	POB	Do Not Trip Gen (worst case)	3.5/10.5/4.5	OK	OK	OK	ОК	OK	ОК
BFISECGVL1	L-SEC31	SEC (1)	GVL	Do Not Trip Gen (worst case)	3.5/10.5/6.5	OK	ОК	OK	ОК	OK	OK
BFICYPADN	L-CYP31	CYP	ADN	Trips CYP Units	3.5/10.5/4.5	OK	ОК	OK	ОК	OK	ОК
BFICYPFJT	971L51	CYP	FJT	Trips CYP Units	3.5/10.5/4.5	OK	ОК	OK	ОК	OK	OK

Interim 2B (with G834/J023 and G833/J022, with new Kewaunee substation)

* Relay upgrades or installing a series breaker described in Section 1.1 will address the issue. ** Relay upgrades described in Section 1.1 will address the issue *** Relay upgrades described in Section 1.1 will address the issue

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Table B.5- Stability Results for Point Beach Bus Single Line-to-Ground Faults Cleared inDelayed Time under Intact Conditions

E	Breaker	Cimulated	Interim 1		
Location	Element Clearing		High Gen	Low Gen	
POB Bus 1	POB-SEC	4.75/24.5	OK	ОК	
POB Bus 1	POB Bus 1-2	4.75/12.5	OK	ОК	
POB Bus 2	POB Bus 2-1	4.75/12.5	OK	OK	
POB Bus 2	POB Bus 2-3	4.75/12.5	ОК	OK	
POB Bus 3	POB Bus 3-2	4.75/12.5	ОК	OK	
POB Bus 3	POB-KEW	4.75/12.5	OK	OK	
POB Bus 3	POB Bus 3-4	4.75/12.5	ОК	OK	
POB Bus 4	POB Bus 4-3	4.75/12.5	OK	OK	
POB Bus 4	POB Bus 4-5	4.75/12.5	OK	OK	
POB Bus 5	POB Bus 5-4	4.75/12.5	OK	OK	
POB Bus 5	POB-FOX	4.75/24.5	OK	OK	

Interim 1 (with G834/J023, with existing Kewaunee substation)

Interim 2A (with G834/J023 and G833/J022, with existing Kewaunee substation)

Fault	Breaker Failure	Simulated	Interim 2A w/ Existing KEW		
Location	Element tripped	Clearing	High Gen	Low Gen	
POB Bus 1	POB-SEC	4.75/24.5	OK	ОК	
POB Bus 1	POB Bus 1-2	4.75/12.5	ОК	OK	
POB Bus 2	POB Bus 2-1	4.75/12.5	ОК	OK	
POB Bus 2	POB Bus 2-3	4.75/12.5	ОК	P2 angular, 345KV B5**	
POB Bus 3	POB Bus 3-2	4.75/12.5	ОК	OK	
POB Bus 3	POB-KEW	4.75/24.5	ОК	OK	
POB Bus 3	POB Bus 3-4	4.75/12.5	ОК	ОК	
POB Bus 4	POB Bus 4-3	4.75/12.5	ОК	OK	
POB Bus 4	POB Bus 4-5	4.75/12.5	ОК	ОК	
POB Bus 5	POB Bus 5-4	4.75/12.5	OK	OK	
POB Bus 5	POB-FOX	4 75/24 5	OK	OK	

** Stable at 4.75/12.0. As described in Section 1.1, Change Relay setting (without Breaker Failure relay replacement) for Failure of Point Beach Bus Tie 2-3 to no more than 11 cycle total breaker failure clearing time for bus faults

	POB SLG Bus Paults with Breaker Pailure (PSSs III)						
Fault	Breaker Failure	Simulated	Interim 2B w/ New KEW				
Location	Element tripped	Clearing	High Gen	Low Gen			
POB Bus 1	POB-SEC	4.75/24.5	OK	ОК			
POB Bus 1	POB Bus 1-2	4.75/12.5	OK	ОК			
POB Bus 2	POB Bus 2-1	4.75/12.5	OK	OK			
POB Bus 2	POB Bus 2-3	4.75/12.5	OK	OK			
POB Bus 3	POB Bus 3-2	4.75/12.5	OK	OK			
POB Bus 3	POB-KEW	4.75/12.5	OK	OK			
POB Bus 3	POB Bus 3-4	4.75/12.5	OK	ОК			
POB Bus 4	POB Bus 4-3	4.75/12.5	OK	OK			
POB Bus 4	POB Bus 4-5	4.75/12.5	OK	OK			
POB Bus 5	POB Bus 5-4	4.75/12.5	OK	OK			
POB Bus 5	POB-FOX	4.75/24.5	OK	OK			

Interim 2B (with G834/J023 and G833/J022, with new Kewaunee substation)

Table B.6- Stability Results for GSU Single Line-to-Ground Faults Cleared in Delayed Time under Intact Conditions, Units Tripping

Interim 1 (with G834/J023, with existing Kewaunee substation)

POB	GSU BF Faults	Interim 1		
Fault Location	Breaker Failure Element tripped	Simulated Clearing	High Gen	Low Gen
POB Unit 1 GSU	POB Bus 2	4.5/13.5/14.0*	ОК	ОК
POB Unit 2 GSU	POB Bus 4	4.5/13.5	ОК	ОК

* - Primary Clearing Time/Bus Breaker Failure Time/Line Breaker Failure Time (GSU #1 Only)

Interim 2A (with G834/J023 and G833/J022, with existing Kewaunee substation)

POB	GSU BF Faults		Interim 2 (w/ e	xisting KEW)
Fault Location	Breaker Failure Element tripped	Simulated Clearing	High Gen	Low Gen
POB Unit 1 GSU	POB Bus 2	4.5/13.5/14.0*	OK	ОК
POB Unit 2 GSU	POB Bus 4	4.5/13.5	OK	ОК

* - Primary Clearing Time/Bus Breaker Failure Time/Line Breaker Failure Time (GSU #1 Only)

Interim 2B (with	G834/J023 an	d G833/J022	, with new	Kewaunee substation)
------------------	--------------	-------------	------------	---------------------	---

P	OB GSU BF Fault	s	Interim 2 (w/	new KEW)
Fault Location	Breaker Failure Element tripped	Simulated Clearing	High Gen	Low Gen
POB Unit 1 GSU	POB Bus 2	4.5/13.5/14.0*	OK	ОК
POB Unit 2 GSU	POB Bus 4	4.5/13.5	OK	OK

* - Primary Clearing Time/Bus Breaker Failure Time/Line Breaker Failure Time (GSU #1 Only)

Table B.7- Stability Results for Auxiliary Transformer High Side Single Line-to-Ground Faults Cleared in Delayed Time under Intact Conditions, Units Tripping

	Breaker	Interim 1		
Faulted	Failure	High Gen	Low Gen	
	Element Tripped	5.1/24.5	5.1/24.5	
POB AUX1 HS	POB-SEC @ SEC	OK	ОК	
POB AUX2 HS	POB-FOX @ FOX	ОК	ОК	
Faulted Element	Breaker Failure Element Tripped	5.1/13.3*	5.1/13.3*	
POB AUX1 HS	POB Bus 2**	ОК	OK	
POB AUX2 HS	POB Bus 4***	ОК	ОК	

Interim	1 (with	G834/I023	with	existing	Kewaunee	substation
inter in .		0037/3043.	wiin	CAIDINE I	Is cruunice	Substation

* - The Stability Model Time Step is 0.25 cycles, so a 13.3 cycle fault actually clears in 13.5 cycles. ** - POB-Forest Junction 345 kV line Trips, POB Generator 1 is Isolated. *** - POB Generator 2 is isolated

Interim 2A (with G834/J023 and G833/J022, with existing Kewaunee substation)

	Breaker	Interim 2A		
Faulted Element	Failure	High Gen	Low Gen	
Lionon	Element Tripped	5.1/24.5	5.1/24.5	
POB AUX1 HS	POB-SEC @ SEC	ОК	ОК	
POB AUX2 HS	POB-FOX @ FOX	ОК	ОК	
Faulted Element	Breaker Failure Element Tripped	5.1/13.3*	5.1/13.3*	
POB AUX1 HS	POB Bus 2**	OK	ОК	
POB AUX2 HS	POB Bus 4***	OK	OK	

* - The Stability Model Time Step is 0.25 cycles, so a 13.3 cycle fault actually clears in 13.5 cycles. ** - POB-Forest Junction 345 kV line Trips, POB Generator 1 is Isolated. *** - POB Generator 2 is isolated

Interim 2B (with G834/J023 and G833/J022, with new Kewaunee substation)

	Breaker	Interim 2B		
Faulted	Failure	High Gen	Low Gen	
	Element Tripped	5.1/24.5	5.1/24.5	
POB AUX1 HS	POB-SEC @ SEC	ОК	ОК	
POB AUX2 HS	POB-FOX @ FOX	ОК	ОК	
Faulted Element	Breaker Failure Element Tripped	5.1/13.3*	5.1/13.3*	
POB AUX1 HS	POB Bus 2**	OK	OK	
POB ALIX2 HS	POB Bus 4***	OK	OK	

* - The Stability Model Time Step is 0.25 cycles, so a 13.3 cycle fault actually clears in 13.5 cycles. ** - POB-Forest Junction 345 kV line Trips, POB Generator 1 is Isolated.

*** - POB Generator 2 is isolated

Table B.8- Stability Results for GSU Three Phase 345 kV Faults Cleared in Primary (5.5 cycles, including 1 cycle margin) Time under Intact and Prior Outage Conditions, Units Tripping

Interim 1 (with G834/J023, with existing Kewaunee substation)

		the second s	
		Inter	im 1
Fault	Prior Outage	High Gen	Low Gen
FItPBGSU1	None	OK	ОК
FItPBGSU1	111	ОК	ОК
FItPBGSU1	121	ОК	ОК
FItPBGSU1	151	ОК	ОК
FItPBGSU1	Q-303	ОК	ОК
FItPBGSU1	R-304	ОК	ОК
FItPBGSU1	6832	ОК	ОК
FItPBGSU1	971L71	ОК	ОК
FItPBGSU1	L-SEC31	ОК	ОК
FItPBGSU1	L-CYP31	ОК	ОК
FItPBGSU1	T10	ОК	ОК
FItPBGSU1	NAPL71	ОК	ОК
FItPBGSU1	971L51	ОК	ОК
FItPBGSU1	Y-311	ОК	ОК
FItPBGSU1	B12	ОК	ОК
FItPBGSU1	B23	ОК	ОК
FItPBGSU1	B34	ОК	ОК
FItPBGSU1	B45	OK	ОК

		Inter	rim 1
Fault	Prior Outage	High Gen	Low Gen
FItPBGSU2	None	OK	ОК
FItPBGSU2	111	OK	ОК
FItPBGSU2	121	OK	ОК
FItPBGSU2	151	OK	ОК
FItPBGSU2	Q-303	OK	ОК
FItPBGSU2	R-304	OK	ОК
FItPBGSU2	6832	OK	ОК
FItPBGSU2	971L71	OK	ОК
FItPBGSU2	L-SEC31	OK	ОК
FItPBGSU2	L-CYP31	OK	ОК
FItPBGSU2	T10	OK	ОК
FItPBGSU2	NAPL71	OK	ОК
FItPBGSU2	971L51	OK	ОК
FItPBGSU2	Y-311	OK	ОК
FItPBGSU2	B12	OK	ОК
FItPBGSU2	B23	OK	ОК
FItPBGSU2	B34	OK	ОК
FItPBGSU2	B45	OK	ОК

5.5 cyles (1-cycle margin).

		Interim 2A (w/	existing KEW)
Fault	Prior Outage	High Gen	Low Gen
FItPBGSU1	None	OK	ОК
FItPBGSU1	111	ОК	ОК
FItPBGSU1	121	ОК	ОК
FItPBGSU1	151	ОК	ОК
FItPBGSU1	Q-303	OK	ОК
FItPBGSU1	R-304	ОК	ОК
FItPBGSU1	6832	OK	ОК
FItPBGSU1	971L71	OK	ОК
FItPBGSU1	L-SEC31	OK	ОК
FItPBGSU1	L-CYP31	OK	ОК
FItPBGSU1	T10	OK	ОК
FItPBGSU1	NAPL71	OK	ОК
FItPBGSU1	971L51	OK	ОК
FItPBGSU1	Y-311	OK	ОК
FItPBGSU1	B12	OK	OK
FltPBGSU1	B23	OK	OK
FitPBGSU1	B34	OK	OK
FItPBGSU1	B45	OK	OK

		Interim 2A (w/	existing KEW)
Fault	Prior Outage	High Gen	Low Gen
FItPBGSU2	None	ОК	OK
FItPBGSU2	111	OK	OK
FItPBGSU2	121	ОК	ОК
FItPBGSU2	151	ОК	OK
FItPBGSU2	Q-303	ОК	ОК
FItPBGSU2	R-304	OK	OK
FItPBGSU2	6832	ОК	OK
FItPBGSU2	971L71	ОК	OK
FItPBGSU2	L-SEC31	ОК	OK
FItPBGSU2	L-CYP31	OK	OK
FItPBGSU2	T10	ОК	OK
FItPBGSU2	NAPL71	OK	OK
FItPBGSU2	971L51	ОК	OK
FItPBGSU2	Y-311	ОК	OK
FItPBGSU2	B12	ОК	OK
FItPBGSU2	B23	OK	OK
FItPBGSU2	B34	OK	OK
FltPBGSU2	B45	OK	OK

Interim 2A (with G834/J023 and G833/J022, with existing Kewaunee substation)

5.5 cyles (1-cycle margin).

		Interim 2B (w/ new KEW)	
Fault	Prior Outage	High Gen	Low Gen
FItPBGSU1	None	OK	OK
FItPBGSU1	111	OK	ОК
FItPBGSU1	121	OK	ОК
FItPBGSU1	151	OK	ОК
FItPBGSU1	Q-303	OK	ОК
FItPBGSU1	R-304	OK	OK
FItPBGSU1	6832	OK	OK
FItPBGSU1	971L71	OK	OK
FltPBGSU1	L-SEC31	OK	OK
FItPBGSU1	L-CYP31	OK	OK
FItPBGSU1	T10	OK	OK
FItPBGSU1	NAPL71	ОК	OK
FItPBGSU1	971L51	OK	OK
FItPBGSU1	Y-311	ОК	OK
FItPBGSU1	B12	OK	OK
FltPBGSU1	B23	OK	OK
FItPBGSU1	B34	OK	OK
FltPBGSU1	B45	ОК	OK

Interim 2B (with G834/J023 and G833/J022, with new Kewaunee substation)

		Interim 2B (v	// new KEW)
Fault	Prior Outage	High Gen	Low Gen
FItPBGSU2	None	OK	OK
FItPBGSU2	111	OK	OK
FItPBGSU2	121	ОК	OK
FItPBGSU2	151	OK	OK
FItPBGSU2	Q-303	OK	OK
FItPBGSU2	R-304	OK	OK
FItPBGSU2	6832	OK	OK
FItPBGSU2	971L71	OK	OK
FItPBGSU2	L-SEC31	OK	OK
FItPBGSU2	L-CYP31	OK	OK
FItPBGSU2	T10	OK	OK
FItPBGSU2	NAPL71	OK	OK
FItPBGSU2	971L51	OK	OK
FItPBGSU2	Y-311	OK	OK
FItPBGSU2	B12	OK	ОК
FItPBGSU2	B23	OK	OK
FItPBGSU2	B34	OK	OK
FItPBGSU2	B45	OK	OK

5.5 cyles (1-cycle margin).

Table B.9- Stability Results for Auxiliary Transformer High Side 3-Phase Faults Cleared in Primary Time (6.1 cycles, including 1 cycle margin) under Intact and Prior Outage Conditions

		High Generation	Low Generation
Fault	Prior Outage	Interim 1 5.75/6.1	Interim 1 5.75/6.1
FItPOBAX1	None	ОК	OK
FItPOBAX1	111	ОК	OK
FItPOBAX1	121	OK	OK
FItPOBAX1	151	OK	ОК
FItPOBAX1	Q-303	OK	OK
FItPOBAX1	R-304	ОК	OK
FItPOBAX1	6832	ОК	OK
FItPOBAX1	971L71	ОК	OK
FItPOBAX1	L-SEC31	OK*	ОК
FItPOBAX1	L-CYP31	ОК	ОК
FItPOBAX1	T10	ОК	ОК
FItPOBAX1	NAPL71	ОК	ОК
FItPOBAX1	971L51	ОК	ОК
FItPOBAX1	Y-311	ОК	ОК
FItPOBAX1	B12	OK	ОК
FItPOBAX1	B23	ОК	ОК
FItPOBAX1	B34	ОК	OK
FItPOBAX1	B45	ОК	OK
*SEC Gens I	solated		
		High Generation	Low Generation
Fault	Prior Outage	Interim 1 5.75/6.1	Interim 1 5.75/6.1
FItPOBAX2	None	ОК	OK
FItPOBAX2	111	OK	OK
FItPOBAX2	121	OK	OK
FItPOBAX2	151	OK	OK
FItPOBAX2	Q-303	OK	OK
	E 001	OK	OK

Interim 1 (with G834/J023, with existing Kewaunee substation)

		riigh Ceneration	Low Concretion
Fault	Prior Outage	Interim 1 5.75/6.1	Interim 1 5.75/6.1
FItPOBAX2	None	ОК	ОК
FItPOBAX2	111	ОК	ОК
FItPOBAX2	121	ОК	ОК
FItPOBAX2	151	ОК	OK
FItPOBAX2	Q-303	ОК	OK
FItPOBAX2	R-304	OK	OK
FItPOBAX2	6832	OK	OK
FItPOBAX2	971L71	OK	OK
FItPOBAX2	L-SEC31	OK	OK
FItPOBAX2	L-CYP31	OK	OK
FItPOBAX2	T10	OK	OK
FItPOBAX2	NAPL71	OK	OK
FItPOBAX2	971L51	ОК	OK
FItPOBAX2	Y-311	OK	OK
FItPOBAX2	B12	OK	OK
FItPOBAX2	B23	OK	OK
FItPOBAX2	B34	OK**	OK**
FItPOBAX2	B45	OK	ОК

**POB GEN 2 Isolated

American Transmission Company

		High Generation	Low Generation
	Drion	Interim 2A w/ existing	Interim 2A w/ existing
Fault	Outage	5.75/6.1	5.75/6.1
FItPOBAX1	None	ОК	OK
FItPOBAX1	111	ОК	ОК
			K,P agnular, 345KV
FItPOBAX1	121	OK	(Stable 5.5/6.0)
FItPOBAX1	151	OK	OK
FItPOBAX1	Q-303	OK	ОК
FItPOBAX1	R-304	K,P (Stable 5.5/6.0)	K,P (Stable 5.5/6.0)
FItPOBAX1	6832	K,P,F (Stable 5.0/6.0)	OK
FItPOBAX1	971L71	OK	OK
FItPOBAX1	L-SEC31	OK*	ОК
FItPOBAX1	L-CYP31	K,P,F (Stable 5.0/6.0)	ОК
FItPOBAX1	T10	OK	OK
FItPOBAX1	NAPL71	K,P,F (Stable 5.5/6.0)	ОК
FItPOBAX1	971L51	ОК	ОК
FItPOBAX1	Y-311	K,P,F (Stable 5.5/6.0)	ОК
FItPOBAX1	B12	ОК	ОК
FItPOBAX1	B23	ОК	ОК
FItPOBAX1	B34	OK	ОК
EHDORAV1	B45	ОК	ОК
I FILPUDAAT I	040		the second se
*SEC Gen	s Isolated		
*SEC Gen	s Isolated	High Generation	Low Generation
*SEC Gen	s Isolated	High Generation Interim 2A w/ existing	Low Generation
*SEC Gen	s Isolated Prior Outage	High Generation Interim 2A w/ existing KEW 5.75/6.1	Low Generation Interim 2A w/ existing KEW 5.75/6.1
Fault	s Isolated Prior Outage None	High Generation Interim 2A w/ existing KEW 5.75/6.1 OK	Low Generation Interim 2A w/ existing KEW 5.75/6.1 OK
Fault FitPOBAX2	S Isolated Prior Outage None	High Generation Interim 2A w/ existing KEW 5.75/6.1 OK OK	Low Generation Interim 2A w/ existing KEW 5.75/6.1 OK K,P (Stable 5.5/6.0)
Fault FitPOBAX2 FitPOBAX2	Prior Outage None 111	High Generation Interim 2A w/ existing KEW 5.75/6.1 OK OK	Low Generation Interim 2A w/ existing KEW 5.75/6.1 OK K,P (Stable 5.5/6.0)
Fault FitPOBAX2 FitPOBAX2 FitPOBAX2	Prior Outage None 111	High Generation Interim 2A w/ existing KEW 5.75/6.1 OK OK K,P (Stable 5.5/6.0)	Low Generation Interim 2A w/ existing KEW 5.75/6.1 OK K,P (Stable 5.5/6.0) K,P (Stable 5.0/6.0)
Fault FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2	Prior Outage None 111 121 151	High Generation Interim 2A w/ existing KEW 5.75/6.1 OK OK K,P (Stable 5.5/6.0) OK	Low Generation Interim 2A w/ existing KEW 5.75/6.1 OK K,P (Stable 5.5/6.0) K,P (Stable 5.0/6.0) OK
FltPOBAX2 FltPOBAX2 FltPOBAX2 FltPOBAX2 FltPOBAX2 FltPOBAX2 FltPOBAX2	Prior Outage None 111 121 151 Q-303	High Generation Interim 2A w/ existing KEW 5.75/6.1 OK OK K,P (Stable 5.5/6.0) OK OK	Low Generation Interim 2A w/ existing KEW 5.75/6.1 OK K,P (Stable 5.5/6.0) K,P (Stable 5.0/6.0) OK OK
FliPOBAX2 FliPOBAX2 FliPOBAX2 FliPOBAX2 FliPOBAX2 FliPOBAX2 FliPOBAX2 FliPOBAX2	Prior Outage None 111 121 151 Q-303 R-304	High Generation Interim 2A w/ existing KEW 5.75/6.1 OK OK K,P (Stable 5.5/6.0) OK OK K,P (Stable 5.5/6.0)	Low Generation Interim 2A w/ existing KEW 5.75/6.1 OK K,P (Stable 5.5/6.0) K,P (Stable 5.0/6.0) OK OK K,P (Stable 5.0/6.0)
FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2	D+0 s Isolated Prior Outage None 111 121 151 Q-303 R-304 6832	High Generation Interim 2A w/ existing KEW 5.75/6.1 OK OK K,P (Stable 5.5/6.0) OK K,P (Stable 5.5/6.0) OK	Low Generation Interim 2A w/ existing KEW 5.75/6.1 OK K,P (Stable 5.5/6.0) K,P (Stable 5.0/6.0) OK K,P (Stable 5.0/6.0) OK
FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2	Prior Outage None 111 121 151 Q-303 R-304 6832 971L71	High Generation Interim 2A w/ existing KEW 5.75/6.1 OK OK OK K,P (Stable 5.5/6.0) OK K,P (Stable 5.5/6.0) OK OK OK	Low Generation Interim 2A w/ existing KEW 5.75/6.1 OK K,P (Stable 5.5/6.0) K,P (Stable 5.0/6.0) OK OK K,P (Stable 5.0/6.0) OK
FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2	Prior Outage None 111 121 151 Q-303 R-304 6832 971L71 L-SEC31	High Generation Interim 2A w/ existing KEW 5.75/6.1 OK OK K,P (Stable 5.5/6.0) OK K,P (Stable 5.5/6.0) OK K,P (Stable 5.5/6.0) OK K,P,S (Stable 5.0/6.0)	Low Generation Interim 2A w/ existing KEW 5.75/6.1 OK K,P (Stable 5.5/6.0) K,P (Stable 5.0/6.0) OK OK K,P (Stable 5.0/6.0) OK K,P (Stable 5.0/6.0) OK K,P (Stable 5.5/6.0)
FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2	Prior Outage None 111 121 151 Q-303 R-304 6832 971L71 L-SEC31 L-CYP31	High Generation Interim 2A w/ existing KEW 5.75/6.1 OK OK K,P (Stable 5.5/6.0) OK K,P (Stable 5.5/6.0) OK K,P (Stable 5.5/6.0) OK OK OK	Low Generation Interim 2A w/ existing KEW 5.75/6.1 OK K,P (Stable 5.5/6.0) K,P (Stable 5.0/6.0) OK OK K,P (Stable 5.0/6.0) OK K,P (Stable 5.5/6.0) OK
FilePOBAX2 FilePOBAX2 FilePOBAX2 FilePOBAX2 FilePOBAX2 FilePOBAX2 FilePOBAX2 FilePOBAX2 FilePOBAX2 FilePOBAX2 FilePOBAX2 FilePOBAX2 FilePOBAX2 FilePOBAX2	Prior Outage None 111 121 151 Q-303 R-304 6832 971L71 L-SEC31 L-CYP31 T10	High Generation Interim 2A w/ existing KEW 5.75/6.1 OK OK K,P (Stable 5.5/6.0) OK K,P (Stable 5.5/6.0) OK K,P,S (Stable 5.0/6.0) OK OK	Low Generation Interim 2A w/ existing KEW 5.75/6.1 OK K,P (Stable 5.5/6.0) K,P (Stable 5.0/6.0) OK OK K,P (Stable 5.0/6.0) OK K,P (Stable 5.5/6.0) OK OK
FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2	Dito s Isolated Prior Outage None 111 121 151 Q-303 R-304 6832 971L71 L-SEC31 L-CYP31 T10 NAPL71	High Generation Interim 2A w/ existing KEW 5.75/6.1 OK OK KP (Stable 5.5/6.0) OK KP (Stable 5.5/6.0) OK KP (Stable 5.5/6.0) OK K,P (Stable 5.5/6.0) OK K,P (Stable 5.5/6.0) OK	Low Generation Interim 2A w/ existing KEW 5.75/6.1 OK K,P (Stable 5.5/6.0) K,P (Stable 5.0/6.0) OK OK K,P (Stable 5.0/6.0) OK K,P (Stable 5.5/6.0) OK OK OK OK
FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2 FitPOBAX2	Prior Outage None 111 121 151 Q-303 R-304 6832 971L71 L-SEC31 L-CYP31 T10 NAPL71 971L51	High Generation Interim 2A w/ existing KEW 5.75/6.1 OK OK OK K,P (Stable 5.5/6.0) OK K,P (Stable 5.5/6.0) OK OK	Low Generation Interim 2A w/ existing KEW 5.75/6.1 OK K,P (Stable 5.5/6.0) K,P (Stable 5.0/6.0) OK OK K,P (Stable 5.0/6.0) OK K,P (Stable 5.0/6.0) OK K,P (Stable 5.5/6.0) OK OK OK OK
FilePOBAX1 *SEC Gen FilePOBAX2	Prior Outage None 111 121 151 Q-303 R-304 6832 971L71 L-SEC31 L-CYP31 T10 NAPL71 971L51 Y-311	High Generation Interim 2A w/ existing KEW 5.75/6.1 OK OK K,P (Stable 5.5/6.0) OK OK K,P (Stable 5.5/6.0) OK K,P, (Stable 5.5/6.0) OK OK OK OK OK OK	Low Generation Interim 2A w/ existing KEW 5.75/6.1 OK K,P (Stable 5.5/6.0) K,P (Stable 5.0/6.0) OK OK K,P (Stable 5.0/6.0) OK OK OK OK OK OK OK OK
FileOBAX1 *SEC Gen FilePOBAX2 FilePOBAX2	D+0 s Isolated Prior Outage None 111 121 151 Q-303 R-304 6832 971L71 L-SEC31 L-CYP31 T10 NAPL71 971L51 Y-311 B12	High Generation Interim 2A w/ existing KEW 5.75/6.1 OK OK K,P (Stable 5.5/6.0) OK K,P (Stable 5.5/6.0) OK K,P,S (Stable 5.5/6.0) OK OK OK OK OK OK OK	Low Generation Interim 2A w/ existing KEW 5.75/6.1 OK K,P (Stable 5.5/6.0) K,P (Stable 5.0/6.0) OK OK K,P (Stable 5.0/6.0) OK K,P (Stable 5.5/6.0) OK OK OK OK OK OK CK OK

Interim 2A (with G834/J023 and G833/J022, with existing Kewaunee substation)

**POB GEN 2 Isolated

FItPOBAX2

FItPOBAX2

B34

B45

OK**

OK

OK**

OK

		High Generation	Low Generation		
Fault	Prior Outage	Interim 2B w/ new KEW 5.75/6.1	Interim 2 B w// new KEW 5.75/6.1		
FItPOBAX1	None	ОК	ОК		
FItPOBAX1	111	ОК	OK		
FItPOBAX1	121	ОК	OK		
FItPOBAX1	151	ОК	OK		
FItPOBAX1	Q-303	ОК	ОК		
FItPOBAX1	R-304	K,P (5.5/6.0 stable)	K,P (5.5/6.0 stable)		
FItPOBAX1	6832	K,P,F (5.0/6.0 stable)	ОК		
FItPOBAX1	971L71	ОК	ОК		
FItPOBAX1	L-SEC31	OK*	ОК		
FItPOBAX1	L-CYP31	K,P,F (5.0/6.0 stable)	OK		
FItPOBAX1	T10	ОК	ОК		
FItPOBAX1	NAPL71	K,P,F (5.5/6.0 stable)	ОК		
FItPOBAX1	971L51	OK	ОК		
FItPOBAX1	Y-311	K,P,F (5.5/6.0 stable)	OK		
FItPOBAX1	B12	OK	OK		
FItPOBAX1	B23	OK	OK		
FItPOBAX1	B34	OK	ОК		
FItPOBAX1	B45	OK	ОК		

Interim 2B (with G834/J023 and G833/J022, with new Kewaunee substation)

*SEC Gens Isolated

		High Generation	Low Generation
Fault	Prior Outage	Interim 2B w/ new KEW 5.75/6.1	Interim 2 B w// new KEW 5.75/6.1
FItPOBAX2	None	ОК	OK
FItPOBAX2	111	ОК	P (uv 19 kV at 1.521sec, 345 kV B1 1st- 1.096 sec, 2nd-1.562 sec) (5.5/6.0 stable)
FIIPOBAX2	121	P1 (uv 345kV B1 1st-1.183sec, 2nd- 1.571 sec) (5.5/6.0 stable)	K,P (5.0/6.0 stable)
FItPOBAX2	151	ОК	ОК
FltPOBAX2	Q-303	ОК	ОК
FItPOBAX2	R-304	ОК	K,P (5.0/6.0 stable)
FItPOBAX2	6832	ОК	ОК
FItPOBAX2	971L71	ОК	ОК
FItPOBAX2	L-SEC31	K,P,S (5.0/6.0 stable)	K,P (5.5/6.0 stable)
FItPOBAX2	L-CYP31	ОК	ОК
FItPOBAX2	T10	ОК	ОК
FItPOBAX2	NAPL71	ОК	ОК
FItPOBAX2	971L51	ОК	ОК
FItPOBAX2	Y-311	ОК	ОК
FItPOBAX2	B12	ОК	K,P (5.5/6.0 stable)
FItPOBAX2	B23	ОК	ОК
FItPOBAX2	B34	OK**	OK**
FItPOBAX2	B45	OK	ОК

**POB GEN 2 isolated

American Transmission Company

Table B.10- Stability Results for Kewaunee and Point Beach Generation Outage under Intact Conditions

UNIT TRIP		Interim 1	
UNIT TRIP	Trip time (sec)	High Gen	Low Gen
POBG1trip	0.15	ОК	ОК
POBG2trip	0.15	ОК	ОК
POBG1G2trip	0.15	ОК	ОК
KEWG1trip	0.15	ОК	ОК

Interim 1 (with G834/J023, with existing Kewaunee substation)

Interim 2A (with G834/J023 and G833/J022, with existing Kewaunee substation)

UNIT TR	IP	Interim 2A (KE	(w/ existing W)
UNIT TRIP	Trip time (sec)	High Gen	Low Gen
POBG1trip	0.15	ОК	OK
POBG2trip	0.15	ОК	OK
POBG1G2trip	0.15	ОК	OK
KEWG1trip	0.15	ОК	OK

Interim 2B (with G834/J023 and G833/J022, with new Kewaunee substation)

UNIT T	RIP	Interim 2B (w/ new KEW						
UNIT TRIP	Trip time (sec)	High Gen	Low Gen					
POBG1	0.15	OK	ОК					
POBG2	0.15	ОК	ОК					
POBG1G2	0.15	OK	ОК					
KEW	0.15	ОК	ОК					

Appendix C: Competing Wind Generators

Queue Number	Control Area	MW	Commercial Operation Date (From 3-31-2009 status report)	Geographical Location
G384	WPS	99	TBD (suspended)	Kewaunee-Mishicot 138 kV line
G427	WEC	98	TBD (suspended)	Cypress 345 kV Substation
G590	WEC	98	TBD (suspended)	Tecumseh Rd 138 kV Substation
G611	WEC	99	12-31-2011	Elkhart Lake-Forest Junction 138 kV line
G773	WPS	150	12-01-2012	Forest Junction-Lost Dauphin 138 kV line

Appendix D: Operating Restrictions

With all stability upgrades assumed in-service and the Minimum Excitation Limiter settings for Point Beach and Kewaunee units modified, generation restrictions identified for each interim period are:

- During Interim 1 period (2010 after G834/J023 2011 before G833/J022)
 - iii. G1 at 560 MW (gross) under prior outage condition of 6832 (North Appleton-Fox River 345 kV line)
 - iv. G1 at 580 MW (gross) under prior outage condition of Point Beach Bus Tie 2-3
- During Interim 2A period (Without Kewaunee project, 2011 after G833/J022 beyond)
 - viii. G2 at 620 MW (gross) under prior outage of 121 (Point Beach-Forest Junction 345 kV line)
 - ix. G2 at 620 MW (gross) under prior outage of 151 (Point Beach-Fox River 345 kV line)
 - x. G2 at 600 MW (gross) under prior outage of R304 (Kewaunee-North Appleton 345 kV line)
 - xi. Both G1 and G2 at 540 MW (gross) under prior outage of 6832 (North Appleton-Fox River 345 kV line)
 - xii. G2 at 580 MW (gross) under prior outage of SEC31 (Sheboygan Energy Center-Granville 345 kV line)
 - xiii. G1 at 580 MW (gross) under prior outage of Point Beach Bus Tie 2-3
 - xiv. G2 at 620 MW (gross) under prior outage of Point Beach Bus Tie 4-5
- During Interim 2B period (With Kewaunee project, 2011 after G833/J022 beyond)
 - i. G2 at 600 MW (gross) under prior outage condition of 6832 (North Appleton-Fox River 345 kV line)
 - ii. G1 at 580 MW (gross) under prior outage condition of Point Beach Bus Tie 2-3

Appendix E: Short Circuit / Breaker Duty Analysis Results

	Maximum Fau	It Duty (Amps)	Minimum Faul	t Duty* (Amps)
	Single-phase	Three-Phase	Single-phase	Three-Phase
Scenario 1 = Existing system	23293.9	21160.4	9288	11100.6
Scenario 2 = Existing with new GSU of POB G2 (Fall 2009~May 2010)	23878.5	21419.7	9288	11100.6
Scenario 3 = With G834 (J023) and new GSU of POB G1 (May 2010~May 2011)	24516	21758.5	9288	11100.6
Scenario 4 = With G833/4 (J022/3) with existing Kewaunee (May 2011~beyond)	24660.4	21927.2	9288	11100.6
Scenario 5 = With G833/4 (J022/3) with new Kewaunee (May 2011~beyond)	24801.6	22017	9288.2	11100.7
** Scenario 6 = With G833/4 (J022/3) with new Kewaunee and potential East sub	25448.4	22749.3	9786.8	11954.8
** Scenario 7 = With G833/4 (J022/3) with new Kewaunee and potential East/North sub with line conversion	26615.1	23988.7	10915.9	13402.2

Table E.1 – Maximum and	d Minimum Fa	ault Duties at the	e G833-4 Point c	of Interconnection
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* POB G1 and G2 offline and Q-303 out of service

** Scenario 6 and 7 were also studied to provide maximum and minimum fault duties that may appear due to potential future transmission reinforcement.

Table E.2 – Thevenin Equivalent Impedances in Ohms corresponding to Maximum Fault Duty

	Pos Seq.	Neg. Seq.	Zero Seq.
Scenario 1 = Existing system	0.492146+ j 9.400272	0.563439+ j 9.4053	0.589203+ j 6.794582
Scenario 2 = Existing with new GSU of POB G2 (Fall 2009~May 2010)	0.47915+ j 9.28685	0.547887+ j 9.291845	0.530596+ j 6.397666
Scenario 3 = With G834 (J023) and new GSU of POB G1 (May 2010~May 2011)	0.476195+ j 9.141977	0.648689+ j 9.140315	0.480063+ j 6.038944
Scenario 4 = With G833/4 (J022/3) with existing Kewaunee (May 2011~beyond)	0.480694+ j 9.071247	0.754597+ j 9.060422	0.480063+ j 6.038944
Scenario 5 = With G833/4 (J022/3) with new Kewaunee (May 2011~beyond)	0.500629+ j 9.033035	0.774579+ j 9.021229	0.483616+ j 5.974935
** Scenario 6 = With G833/4 (J022/3) with new Kewaunee and potential East sub	0.483549 + j 8.742337	0.734901 + j 8.732362	0.491449 + j 5.944132
** Scenario 7 = With G833/4 (J022/3) with new Kewaunee and potential East/North sub with line conversion	0.455713 + j 8.290790	0.685388 + j 8.282391	0.496780 + j 5.818807

** These scenarios were also studied to provide maximum and minimum fault duties that may appear due to potential future transmission reinforcement.

	1	I		Three Phase Fault Analysis																				
				Denied	14.5	2010		Symutrical	1		1		-	On	nge	1		Ensir						
				Brailer Roles		1	-	Fail Coret	-			100 71		A F Long Lon Sw	auto 1 (Existen	9	12.7	102yn (0)						
				raby				Vertel		-					and I person						1.4			
														1										
											Scenario 7:													Scenario 7.
(Scenario 2	Scenarie 3:	Scenario &	Scenario 5	Scenario S	With G830.4 (J0223) with	Somario 2	Scenario 3	Scenario 4	Scenarie 5	Scenario 6	Scenario 7		Scenario 2:	Scenario 3	Scenario &	Scenario 5:	Scenaric &	(1022.5) viti
						Exiting with	WA GEN	Win 68354	With G6334	With G8334	new Konstance and schedul	(*)	(4)	(*)	(4)	(*)	14)		Existing with new GSU of	With G854 UC252 and new	With G8334 (J022-51 with	With G8334 (J02273 with	Viih 68334 (JC22/3) with	new Kowautee and colanital
						POB 62	GSU d'POB G1	existing	new Kowarnee	now Kovouree	EastNoth sub								PC6 62	GSU EFPOB G1	existing	new Kavaures	tov Kevanos	EastNorth sub
Station	Bus Kane	хv	Braiker	64)	Scenario 1: Existing system	(Fal 2009-6/ay 2010)	May 2010-May 2011)	Kavaunea (May 2011-bayond)	(May 2011-beyond)	East sub	with line conversion							Existing system	2010) 2010)	2511)	2011-beyond	2011-beyond)	East sub	constation
FOREST_AINCTION	Forest.kt_4	138	65X-45 (Transf 2)	50	35599	35853	35931	35%9	35867	35926	37101	0.7%	0.98	1.05	0.8%	0.9%	428	24	22.3	22.2	22.4	23.8	23.7	19.2
FOREST_JUNCTION	Forest.kt_1	138	85K-12 (00371K11)	50	35599	35853	35931	35969	35867	35926	37101	0.78	0.5%	1.01	28.0	0.98	4.25	24	22.3	22.2	22.4	23.8	23.7	19.2
FOREST_JUNCTION FOREST_JUNCTION	Forest.kt 3	133	ESC-23 (0371021) ESC-34 (03771031)	50	35599	35853	35931	35969	35867	35926	3/101	0.7%	0.9%	1.05	0.85	0.95	4.28	24	22.3	22.2	22.4	23.4	23.7	19.2
FOREST_AINCTION	Forest.kt.5	138	8.9(-56 (003222)	50	35599	35853	35931	35969	35867	35926	37101	0.7%	0.98	1.01	0.8X	0.9%	4.28	24	22.3	22.2	22.4	23.8	23.7	19.2
FOREST_JUNCTION	Forest.kt_6	138	BSX:47 (E-57)	50	35599	35853	35931	35969	35867	35926	37101	0.7%	0.9%	1.05	8.0 28.0	0.9%	4.28	24	22.3	22.2	22.4	23.8	23.7	19.2
FOREST_JUNCTION	Forest.kt_8	138	BSK-89 (Transf 1)	50	35599	35853	35931	35969	35567	35926	37101	0.7%	0.9%	14	18.0	0.91	424	24	22.3	222	22.4	23.8	23.7	19.2
FOREST_JUNCTION	Forest.kt_10	138	BSK-1011 (0X4035)	50	35599	35853	35931	35969	35867	35926	37101	0.7%	0.9%	1.05	0.88	0.9%	4.25	24	22.3	111	22.4	23.8	23.7	19.2
FOREST_JUNCTION	Farest.kt_11	138	BSK-1112 (0072851)	50	35599	35853	35931	35%9	35867	35926	37101	0.7%	0.9%	1.01	0.83	0.5%	428	24	22.3	22.2	22.4	23.8	23.7	19.2
FOREST_JUNCTION	ForestJct1	345	65-L12 (Transf 2)	50	18715	18875	13961	19002	18887	18935	22991	0.8%	1.11	81	0.9%	LG	2.1	62.6	62.2	62.1	0	62.2	62	54
FOREST JUNCTION	ForestJct3	345	65-L45 (Transf 1)	50	18716	15875	18961	19002	11117	18936	22001	0.8%	1.35	1.51	0.5%	1.6	22.85	62.6	62.2	62.1	62	62.2	62	54
FOREST_AINCTION	ForestJctS	345	65-L56 (L971L51)	50	18715	18875	18961	19002	18887	18936	22991	0.8%	1.31	1.58	0.9%	1.4	2.16	62.6	62.2	62.1	62	£2.2	62	54
FOREST_JUNCTION	ForestJct7	345	65-171(971171)	50	19715	1975	18961	19002	13337	18986	22591	0.8%	131	1.58	0.5%	1.45	22.85	62.6	62.2	62.1	62	62.2	62	54
FOX_RNER_SWITCH_Y	AR FOIL BUS_3	345	89.54	50	21345	21580	21681	21730	21556	21548	22987	LIN	1.65	1.84	1.03	1.6	7.7%	57	55.4	55.3	55.4	56.9	56.7	54
FOX, RMER, SWITCH, Y	AR FOIL BUS_1	345	85L-12	50	21345	21580	21681	21730	21556	21643	22987	1.05	1.68	1.85	1.05	1.4	7.7%	57	55.4	55.3	55.4	56.9	56.7	54
FOX_RMER_SWITCH_Y	AR FOX_GSU1_311	345	ESL-45	50	21345	21580	21681	21730	21556	21648	22987	1.15	1.65	1.85	1.05	1.48	7.7%	57	55.4	55.3	55.4	56.9	56.7	54
FOX RAFE SWITCH Y	AR FOX_GSUZ_311	345	852-61	50	21345	21580	21581	21733	21556	21548	22987	1.11	1.45	1.85	1.04	1.6	1.14	57	55.4	55.3	55.4	56.9	56.7	54 54
NORTH APPLETON	KIP_Bus_G4	138	LIVEHIQ	63	39630	40830	40961	41000	39791	39841	40451	3.24	3.6	22	0.43	0.5%	2.15	37.1	32.9	32.9	32.9	36.8	36.8	35.8
NORTH_APPLETON	NAP_BUS_G4	138	837	63	39555	40815	40898	40938	39720	31769	40428	1.25	3.65	18	0.43	0.5%	225	37.2	32.4	32.4	32.4	37	36.9	35.8
NORTH_APPLETON	NIP_Bus_G4	133	THE 1, 138 KV	63	37422	38655	38721	38753	37560	37598	38165	3.35	1.55	14	0.43	0.5%	2.65	40.6	36.1	35	36.1	40.4	40.3	39.4
NORTH APPLETON	NAP_BUS_GS	138	LINE 6351	63	39737	41000	41084	41125	39906	39956	40629	3.25	3.45	1.53	0.43	0.63	126	36.9	32.3	32.3	12.3	36.7	36.6	35.5
NORTH APPLETON	NIP_Bus_G6	138	THF 3, 138 KV	63	37531	38660	38726	34758	37570	37708	36171	3.05	3.21	13	0.43	0.58	1.78	40.4	37.2	37.2	92	40.2	40.1	39.4
NORTH_APPLETON	KIP_Bus_G4	133	6124	63	41005	42265	42350	42392	41177	41227	41902	3.15	3.38	1.4	0.41	12.0	28	34.9	30.5	30.4	30.4	34.6	34.6	33.5
NORTH APPLETON	KUP_BUS_G4	13	BUSSECT 4-5	63	33172	34114	34170 41035	41076	39183	33317	40589	3.0	JR	1.6	0.43	12.0	27	37	32.9	32.8	12.8	36.7	35.6	35.6
NORTH_APPLETON	NUP_BUS_G5	133	CIP 5	63	41005	42266	42350	42392	41177	41227	41902	1.18	3.15	3.45	0.43	0.5%	2.25	34.9	30.5	30.4	30.4	34.6	34.6	33.5
NORTH_APPLETON	NUP_BUS_GS	138	BUS SECT 5-6	63	33729	34573	34628	34655	33340	33874	\$4236	2.58	2.7%	2.7%	0.3%	0.6	121	46.5	43.2	43.1	41	45.3	45.2	45.7
NORTH_APPLETON	NAP_BUS_G5	138	LINE 6853	63	38944	40171	40252	40291	39107	39156	39803	1.18	3.45	3.94	0.43	0.5%	2.24	38.2	33.7	33.6	33.6	34.6	37.8	30.8
NORTH APPLETON	KUP Bus C6	138	6362 GCB	63	39720	42200	41046	41085	39884	39933	40573	3.18	3.15	16	0.43	0.5%	2,15	37	32.8	32.7	32.7	36.7	36.6	35.6
NORTH APPLETON	NUP_BUS_G6	138	LINE II 13	63	38391	39646	39724	39762	38546	38594	39200	3.31	3.5X	3.65	0.43	0.5%	2.15	39.1	34.1	34.1	34.1	38.8	38.7	37.8
NORTH_APPLETON	NUP_3458_L1	345	BUS SECT 12-1	40	22585	2352	23065	23106	22759	22814	23313	1.85	2.18	2.35	0.8%	1.05	3.25	43.5	422	42.1	Q.1	43.1	43	41.7
NORTH APPLETON	NUP_3458_L34	345	8534-4 LINE R304	40	20599	20971	21017	21040	20692	20741	21201	1.83	2.63	211	0.5%	0.7%	2.95	38.4	31.8	31.7	31.7	38.3	38.2	36.8
NORTH_APPLETON	NUP_3458_L81	365	5581-8	39.8	22585	22982	23065	23106	22759	22814	23313	LIX	2.58	2.31	0.8X	1.05	3.28	31.9	25.2	25.1	25.1	31.7	31.6	30.1
NORTH_APPLETON	NAP_3458_L12	345	BUS SECT 12-2	4)	22585	22982	23065	23106	22759	22814	23313	1.45	2.15	23	0.83	1.65	3.2%	4.5	422	42.1	Q.1	43.1	43	41.7
NORTH APPLETON	KUP_3458_L1	345	6581-1 8545-4	50	22585	22992	23065	23106	22259	22514	23313	1.85	2.11	2.11	0.83	1.05	328	54.8	51.7	53.6	53.6	54.5	54.4	53.4
NORTH APPLETON	NUP_3458_L4	345	85 67-6	50	22585	22532	23065	23106	22759	22814	23313	1.45	2.11	2.8	0.83	1.05	1.25	54.8	51.7	53.6	53.6	54.5	54.4	53.4
NORTH_APPLETON	NUP_3458_167	345	BS 67-7	50	22585	22912	23065	23106	22759	22814	23313	1.15	2.11	23	0.83	1.05	321	54.8	53.7	53.6	53.6	54.5	54.4	53.4
NORTH_APPLETON	K42_3458_L3	345	BS 34-3	38	22585	22912	23065	23106	22259	22814	23313	1.85	2.0	2.8	0.83	1.65	3.28	38.9	33.2	33	33	38.7	38.6	37.3
NORTH APPLETON	NJP_3458_17	345	8578-7 6578-8	50	22585	22982	23065	23106	22759	22814	23313	1.45	2.0	28	0.83	1.05	3.25	54.8	53.7	53.6	53.6	54.5	54.4	53.4
NORTH_APPLETON	NUP_3458_L2	345	EUS SECT 23-2	4	22585	22982	23065	23106	22759	22314	23313	1.35	2.11	2.38	0.8%	1.05	3.28	35.4	29.1	28.9	29	35.2	35.1	33.7
NORTH_APPLETON	KUP_3458_L23	345	EV/S SECT 23-3	4	22585	22982	23065	23106	22759	22814	23313	125	2.11	2.11	0.8%	1.05	3.28	35.4	29.1	28.9	29	35.2	35.1	33.7
POINT_BEACH	POINT_BCH_B1	345	ES 1-2	4)	18618	18875	19214	19383	19478	19502	21978	1.45	3.25	411	445	476	11.05	48.8	47.6	47.7	43.9	49.1	62.4	43 61.9
POINT_BEACH	POINT_BCH_B3	345	853-4	40	166.87	16755	17094	17106	17245	18077	19423	0.45	2.65	2.55	3.58	LB	16.45	56.1	55.8	56.4	56.4	56.3	54.5	51.2
POINT_BEACH	POINT_BCH_BA	345	BS 4-5	4)	18970	15153	19537	19706	19853	20651	21968	1.25	3.45	191	478	1.15	15.88	48	47	47.1	43.4	43.3	46.5	43.3
POINT_BEACH	POINT_BCH_B1	345	UNE 111	50	18518	11175	19214	19383	19478	19502	21978	1.65	3.28	418	4.65	4.78	11.04	59	58	58.2	59.1	59.2	59.2	51.4
POINT_BEACH	POINT_BOH_B2	345	LINE 123(Bir 123)	50	18935	19156	19504	19673	19840	20624	22212	1.28	3.05	3.95	4.15	8.55	17.38	58.4	57.5	57.7	58.7	58.6	57.1	54
POINT_BEACH	FOINT_BCH_B3	345	LINE Q303	50	16320	16530	16569	17037	16994	17843	19180	1.3%	3.45	4.6	4:18	9.35	17.5X	64	63.2	63.3	64.3	64.5	63	60.4
POINT_BEACH	POINT_BCH_BS	345	LINE 151	50	19069	19298	19635	19805	19952	20748	22064	1.25	3.05	11	4.45	1.E	15.76	58.2	57.3	57.5	58.5	58.4	55.9	54.4
SHEDOYGAN ENERGY C	EN SEC BUS 1	345	8112	50	10050	10065	10082	10090	10091	20139	22623	0.15	0.33	0.4	0.43	10.4	12.13	79.3	79.2	79.2	79.2	79.2	59	54.2
SHEBOYGAN ENERGY C	EN SEC_Bus 3	345	8T36	50	10050	10065	10082	10090	10091	20139	22623	0.18	0.33	0.43	0.43	10.45	125.15	79.3	79.2	79.2	79.2	79.2	59	54.2
EDGEWATER	EDG 138	138	470-S	20	16219	16220	16221	16222	16222	17501	22485	0.0%	80.0	0.0%	0.0%	7.9%	35.65	1	1	1	1	1	-7.4	-51.4
EDGEWATER	EDG 138 EDG 138	138	847-S 370-S	40	1/544	1/545	1/545	1/547	1/547	13663	18961	0.0%	0.0%	0.05	0.05	5.15	47.AS	61.5	61.5	61.5	61.5	61.5	59.4	41.9
EDGEWATER	EDG 133	138	861-S	49	19667	19668	19870	19871	19871	22104	26671	0.01	0.0%	0.05	0.0%	11.35	34.24	49	49	4)	40	40	33	20.6
EDGEWATER	EDG 138	138	843-S	40	19870	19871	19873	19874	19874	22107	26590	0.01	0.0%	0.0%	0.05	11.35	31.15	40	40	40	40	40	33	20.8
EDGEWATER	EDG 138 EDG 138	138	854-S	40	19870	19671	19873	19674	19874	19374	25091 23506	0.0%	0.05	0.05	0.0%	9.35	2.63	45.9	45.9	45.9	45.9	45.9	40.6	29.7
EDGEWATER	EDG 138	138	865-S	40	19667	19868	19870	19871	19871	22104	26671	0.0%	0.0%	0.0%	0.0%	11.18	34.24	40	49	40	40	40	33	20.6
EDGEWATER	EDG 138	138	\$26-S	40	22250	22291	22293	22234	22254	25060	28605	0.0%	0.0%	0.0%	0.0%	12.4	28.31	32.6	32.6	32.6	32.6	32.6	24	14.8
EDGEWATER	EDGEWATER	345	311-5	40	10893	10894	10894	10895	10406	16472	1/994	0.05	0.04	0.05	0.05	71.95	82.31	59.5	59.5	59.5	59.5	59.5	32.7	26.4
EDGEWATER	EDGEWATER	345	455-S	50	14743	14744	14747	14743	14745	19519	21804	0.01	0.0%	0.05	0.0%	32.G	9.98	68.8	68.7	68.7	68.7	68.7	59.1	54.8
EDGEWATER	EDGEWATER	345	2523-\$	50	14837	14539	14841	14543	14543	19615	21926	20.01	0.0%	0.05	0.0%	12.W	Ø.H	68.6	68.6	68.6	63.6	68.6	59	54.6
EDGEWATER	EDGEWATER	345	302-5	40	14837	14839	14541	14543	14543	19615	21926	0.0%	0.05	0.0%	0.0%	n n	0.8	49.3	49.3	49.3	49.3	49.3	33.8	26.8
EDGEWATER	EDGEWATER	345	304-5	40	14837	14839	14541	14343	14543	19615	21926	0.05	0.0%	0.05	0.0%	2.25	0.8	49.3	49.3	49.3	49.3	49.3	33.8	26.8
EDGEWATER	EDGEWATER	345	308-5	40	14837	14539	14541	14843	14543	19615	21926	0.05	0.0%	0.05	0.05	32.28	0.13	49.3	493	49.3	49.3	49.3	33.8	26.8
KEWAUNEE	NEW 138KV	138	F-84	37	10545	10857	10878	10889	20469	20639	20960	0.11	0.3%	0.6	11.51	14 CH	11.15	65.1	65	63.5	65.1	343	33.8	32.8
KEWAUNEE	KEW 135KV	138	10665	38.9	13820	13832	13658	13870	23143	23316	23660	0.11	0.31	0.0	67.5X	68.7%	71.20	59.2	59.2	59.2	59.3	30.6	30.1	29.1
KEWAUNEE	KEW 138AV	133	1066W	38.9	13820	13832	13658	13870	23143	23316	23560	0.1%	0.3%	0.43	\$7.5%	6.75	71.24	59.2	59.2	59.2	59.3	30.6	30.1	29.1
KEWAUNEE	KEW 135kV	133	22	40	13820	13832	13858	13870	23143	23316	23660	0.18	0.3%	0.41	67.5%	1.0	71.21	60.4	60.3	60.3	60.4	32.5	32.1	31.1
KEWALNEE	KEWAUNEE B1	345	R-304 3450	40	10413	13855	14065	14168	14514	15307	16140	0.7%	2.38	3.68	7.7%	11.3	17.45	56.6	56.1	56.1	56.8	52.6	51.3	49
KEWALNEE	KEWAUNEE B1	345	3451	40	16413	16518	15728	16832	17418	17652	15683	0.65	1.9%	2.65	6.11	1.85	13.85	45.1	417	44.6	45	47.2	45.1	43.8
KEWAUNEE	KEWAUNEE B2	345	G-303	40	12737	12839	13047	13149	13149	13661	14504	0.83	2.6	2.28	3.28	7.35	13.95	59.4	58.9	58.9	59.5	59.5	58.2	56
KEWAUNEE SEONDILLC	S FONDLE AD	345	1099	40	23124	18233	18450	18558	19613 23129	20045	20878	0.05	0.05	0.0%	0.05	2.65	411	39.6	31.2	39.2	31.1	30.6	29.4	28.5
SFONDULAC	S FONDULAC	138	314-5	40	22612	22614	22617	22618	22618	23334	24100	0.0%	0.0%	0.0%	0.0%	3.78	6.65	32.6	32.6	32.6	32.5	32.5	30.5	28.6
SFONDULAC	S FONDULAC	138	336-5	40	23153	23154	23187	25188	23168	23833	24386	0.05	0.0%	0.0%	0.04	2.88	5.28	31	31	31	31	31	29.1	27.8
S FONDULAC S FONDULAC	S FONDULAC	133	304-5	40	24512	24514	24517	24519	24519	25226	25953	0.05	0.0%	0.0%	0.0%	2.95	191	21.1	213	273	27.7	21.1	257	23.9
SFONDULAC	S FONDULAC	130	1979-5	40	24512	24514	24517	24519	24519	25226	25953	0.05	0.0%	0.05	0.0%	2.92	5.95	27.7	27.7	27.7	27.7	27.7	25.7	23.9
S FONDULAC	S FONDULAC	158	8 1809-S	40	24512	24514	24517	24519	24519	25226	25953	0.05	0.0%	0.0%	0.05	2.98	5.91	27.7	27.7	27.3	27.7	27.7	25.7	23.9
S FONDULAC S FONDULAC	S FONDULAC	13	320-5	40	24512	24514	24517	24519	24519	25226	25953	0.01	0.0%	0.05	0.0%	12.55	14.41	27.1	27.7	50.6	27.1	50.6	45.2	44.5
SFONDULAC	SFL 345	34	5 52-5	40	14942	14945	14051	14954	14954	16803	17096	0.05	0.18	0.13	0.18	12.58	14.4	53.7	53.7	53.7	53.7	53.7	48.7	47.9
S FONDULAC	SFL 345	34	5 74-5	40	14942	14945	14951	14954	14954	16503	17096	0.01	0.18	0.18	0.1%	12.58	14.0	53.7	53.7	53.7	53.7	53.7	43.7	47.9
S FONDULAC	SFL 345	34	5 85-5	40	14942	14945	14951	14954	14954	16803	17096	0.05	0.18	0.11	0.13	12.51	Inc	53.7	53.7	53.7	53.7	53.7	48.7	47.9

Breaker Fault Duty Analysis (Red Cell for >1% Increase in Fault Current, Pink Cell for <5% in Breaker Margin)

American Transmission Company

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					-		113.0	to the second se	-			1	Single Phi	ese Fault A	dat Analysis Amore Boular									
				Denled Broker	ded Symmetrical dar Fault Cancel							R		chu in F	ut.		-	Brater Karya						
				Rating	1	17.3		(anta)				17 12	C.	areat from Sca	erre 1 (Exelling	1002	12	E.L.			(%)	1	-	
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						Sonaio 2 Evident urb	Sonaio 3: With Call	Scaturio &	Scenario 12	Scenario E	(A223) with tree Knowstee	(1)	(1)	(1)	(1)	(1)	(%)		Scenario 2: Existence with	Scenario 1: With G834	Scenario & With G8334	Scenario 5: Hillin G8334	Scinario E With G8334	(JU223) with tere Konsumes
						new GSU d	(R23) and new	(#223) viti	(J3223) with	(A223) with	and potential								tere GSU d	(K23) and new	(0228) with	(#223) with	(022/3, with	and potential
					Saturia t	POB G2 Fal 2009-May	GSU di POB G1 May 2010-May	ecting Konstree May	New Kevauros (May	nd potential	EasiNorth sub with ine							Sonaio 1:	Fal 205-Way	May 213-May	Kavazon (Kaj	(Kay	and polerifial	white
Sitelan	BusKane	¥7	Bradar	(14)	Exiding system	2510)	2011)	2011-beyond	2011-beyond	Entsb	anerica						10	Existing system	200	2010	2011-beyond)	211-teyord	Entst	cinemin 45.7
FOREST_AINCTION	ForestJkt_4	138	BSK-45 (Transf 2) BSK-45 (Cransf 2)	50	36810	37008	37872	37100	37024	37060	35439	0.5%	0.7%	28.0	0.6%	0.7%	66	23.5	222	22.3	22.6	23.9	23.8	19.7
FOREST_JUNCTION	Forest.kt_2	138	BSC-23 (00371921)	50	36810	37008	37072	37100	37024	37060	38439	0.5%	0.7%	0.8%	0.6%	0.7%	4.6	23.5	22.2	22.3	22.6	23.9	23.8	19.7
FOREST_AINCTION	ForestUct_3	138	BSX-34 (0X971X31)	50	36810	37008	37072	37100	37024	37060	36439	0.5%	0.7%	28.0	24.0	0.7%	4.45	23.5	22.2	22.3	22.6	23.9	23.8	19.7
FOREST_AINCTION	ForestUct_5	138	856-56 (03222)	50	36510	37008	37072	37100	37024	37060	36439	0.5%	0.7%	0.8%	0.65	0.76	4.6	23.5	22.2	22.3	22.6	23.9	23.6	19.7
FOREST JUNCTION	ForestUct 8	138	89K-89 (Transf 1)	50	36810	37008	37072	37100	37024	37060	35439	0.5%	0.7%	28.0	0.6%	0.7%	4.65	23.5	22.2	22.3	22.6	23.9	23.8	19.7
FOREST_AINCTION	Forest.kt.9	138	85K-910 (10371K91)	50	36810	37006	37072	37100	37024	37060	38439	0.5%	0.7%	25.0	0.6X	0.7%	1.11	23.5	22.2	22.3	22.8	23.9	23.8	19.7
FOREST_JUNCTION	Forest.kt_10	138	BSK-1011 (VX4035)	50	36810	37008	37072	37100	37024	37060	38439	0.5%	0.7%	23.0	0.6%	0.7%	10	23.5	22.2	223	22.6	23.9	23.8	19.7
FOREST AINCTON	Forestict1	36	BS-L12 (Transf 2)	50	17347	18065	18129	15154	18081	15141	21668	0.7%	1.05	1.16	0.7%	LIS	20.7%	64.1	63.9	63.7	63.7	63.8	63.7	56.7
FOREST_AJACTION	ForestJct2	345	85-L23 (L121)	50	17347	18065	18129	18154	18081	18141	21668	0.7%	1.05	LH	0.7%	1.11	20.7%	64.1	63.9	63.7	63.7	63.8	63.7	58.7
FOREST_AINCTION	Forestuict3	345	BSL45 (Transf 1)	50	173-0	18065	18129	18154	15061	18141	21668	0.7%	105	121	0.7%	1.15	2071	64.1	63.9	63.7	63.7	63.8	63.7	56.7
FOREST_AINCTERN	ForestJct7	345	85421(97121)	50	173-0	18065	18129	18154	18061	18141	21668	0.7%	1.65	1.28	0.7%	Lff	20.75	64.1	63.9	63.7	63.7	63.8	63.7	58.7
FOX, RAER, SWITCH, Y	ARFOL(Bus_)	345	82-34	50	21507	21703	21784	21517	21582	21744	22847	0.5%	138	14	28.0	1.15	6.28	57	56.5	56.4	56.4	56.6	56.5	54.3
FOR AMER SWITCH, Y	ARFOLDESS	345	10.0	50	21507	21703	21784	21817	21582	21744	22647	0.9%	138	14	28.0	1.11	6.28	57	56.5	56.4	56.4	56.6	56.5	54.3
FOX_RIVER_SWITCH_Y	AR FOIL GSU1_311	345	12-6	50	21507	21703	21784	21817	21682	21744	22547	0.9%	1.11	1.4	0.85	1.15	6.28	57	56.5	56.4	56.4	56.6	56.5	54.3
FOX_RIVER_SWITCH_Y	AR FOX_G9/2_311	345	BQ.41	50	21507	21703	21784	21517	21682	21744	22647	0.9%	1.8	1,6	28.0	1.11	6.28	57	56.5	55.4	56.4	56.6	56.5	54.3
FOIL RIVER_SWITCH_Y	ARFOLEUS_2	345	19.13	50	21507	21703	21784	21817	21582	21744	22547	0.5%	138	1.41	28.0	0.0	1.85	37.8	36.1	36.4	36.2	39.6	39.6	38.7
NORTH APPLETON	NJP_Bus_G4	135	837	63	37924	39078	39135	39160	380-65	38077	36638	3.05	3.25	1.15	0.3%	0.45	1.35	39.8	33.6	35.6	35.7	39.6	39.6	38.7
NORTH APPLETON	KUP_Bus_G4	138	TRF 1, 138 KV	63	35313	36446	36490	36509	35410	3505	35929	3.25	H.L.	16	0.3%	0.33	1.71	40.9	4)	40	40.1	43.8	43.8	43
NORTH APPLETON	KW_Bus_GS	138	TRF 2, 138 KY	63	34332	35460	35501	35520	3403	34446	34926	3.38	3.94	1.2	0.35	0.31	141	45.5	35.5	41.9	35.6	45.4	33.3	44.5
NORTH APPLETON	KUP_BLS_G6	135	TRF 3, 138 KY	63	35370	36440	36484	36504	35467	35474	35923	3.65	3.18	3.28	0.35	0.3%	1.45	43.9	42.7	40.7	40.8	49.7	43.7	43
NORTH APPLETON	NUP_Bus_G4	138	024	63	39205	40358	40415	4040	31330	39362	30933	2.95	7.18	126	0.3%	0.6	1.85	37.8	33.9	33.9	34	37.6	37.5	38.6
NORTH APPLETON	NUP_Bus_G4	138	BUSSECT 4-5	63	31581	32532	32570	32587	31764	31785	32234	275	11	18	0.3%	0.31	1.0	49.7	45.8	45.7	36.1	49.6	19.5	46.8
NORTH APPLETON	NIP Bus_GS	138	CIP S	63	39205	40358	40415	4040	39330	38352	30933	2.95	11.1	18	0.3%	0.6	1.55	37.8	33.9	33.9	ы	37.6	37.5	36.6
NORTH APPLETON	KIP_Bus_G5	138	BUS SECT 54	63	32056	32147	32685	32902	12137	32158	32538	2.55	2.61	2.65	0.35	0.35	1.5	6.1	45.8	45.8	45.9	0	49	45.4
NORTH APPLETON	KIP_Bus_GS	138	LINE 6853	63	37354	38493	38549	38574	37484	37515	3/961	295	3.8	12	0.35	P.0	1.95	40.7	35.7	33.7	36.5	40.5	37.5	38.6
NORTH APPLETON	KUP_Bus_G6	138	6862 668	63	37859	39000	39055	39060	37978	38009	38573	3.05	3.26	116	0.3%	0.45	1.95	39.9	36.1	36.1	36.2	39.7	39.7	38.8
NORTH APPLETON	KUP_Bus_G6	138	LINE IT13	63	36922	38073	38127	38151	37036	37068	37593	14	3.18	11	0.3%	0.43	1.85	41.4	37.1	37	37.2	41.2	41.2	40.3
NORTH APPLETON	KJ2_368_L1	345	BUS SECT 12-1	4)	20755	21068	21141	21164	20873	20906	21258	145	1.95	20	0.65	0.7%	2.6	48.1	47.3	47.1	47.1	47.8	47.7	43.9
NORTH APPLETON	KUP_3458_L1	345	LINE RUCH	39.8	18925	19239	19263	19280	18984	19014	19343	1.75	1.85	1.4%	0.3%	0.5%	2.28	42.4	37.9	37.9	38	42.6	42.5	41.4
NORTH_APPLETON	NUP_3458_LB1	345	8581-8	39.8	20755	21068	21541	21164	20673	20906	21256	Lex	1.55	26	0.6%	0.7%	2.6	36.8	32.5	32.4	32.6	37.1	37	35.9
NORTH APPLETON	NJ2_3458_L12	345	BUS SECT 12-2	43	20755	21068	21141	21564	20873	20906	21258	1.65	1.95	2.0	20.0	0.7%	2.6	48.1	47.3	57.7	57.7	58.3	55.2	40.9
NORTH APPLETON	N/P_368_L4	345	85-6-4	50	20755	21088	21141	21164	20873	20906	21258	1.65	1.9%	2.05	0.6%	0.7%	2.4	58.5	57.8	57.7	57.7	58.3	58.2	57.5
NORTH APPLETON	K#2,3458,16	345	85 67-6	50	20755	21068	21141	21164	20873	20906	21258	1.65	1.91	265	0.6%	0.7%	2.6	58.5	57.8	57.7	57.7	58.3	58.2	57.5
NORTH_APPLETON	KIP_3658_L67	365	8567-7	50	20755	21068	21545	21164	20673	20906	21255	141	181	20	0.6%	0.7%	2.6	46.1	42.5	42.5	4.6	46.3	46.3	45.3
NORTH APPLETON	KW236810	345	BS 78-7	50	20755	21088	21141	21164	20873	20906	21258	1.65	1.95	2.05	0.6%	0.7%	2.6	58.5	57.8	57.7	57.7	58.3	58.2	57.5
NORTH_APPLETON	KJ2_3458_L78	345	6578-8	50	20755	21068	21141	21164	20873	20906	21258	24.5	1.5%	2.04	24.0	0.7%	2.6	58.5	57.8	57.7	57.7	58.3	58.2	57.5
NORTH APPLETON	NJP_368_12	345	BUS SECT 23-2	9	20755	21068	21141	21164	20873	20906	21258	5.65	1.95	200	24.0	0.7%	24	40.1	35.9	35.9	36.1	40.4	40.3	39.2
POINT_BEACH	POINT_BOH_B1	345	ES 1-2	40	20835	21412	22044	22189	22332	21307	24545	2.85	5.65	6.56	7.15	7.65	9.K	44.7	42.5	42.4	44.5	44.2	44.2	38.6
POINT_BEACH	POINT_BCH_B2	345	BS 2-3	40	15060	15677	15587	15822	15054	16060	18224	4.05	4.05	48	8.58	22.4	7.44	61.1	58.7	58.7	60.4	59.9	59.8	59.4
POINT_BEACH	POINT_BCH_B3	345	8534	4)	20995	21544	18159	22318	15375	23255	24454	2.6%	5.65	6.35	7.25	10.65	16.55	43.8	41.8	4	44.2	43.7	4	38.8
PONT_BEACH	POINT_BCH_BI	345	LINE 111	50	20990	21561	22158	22335	22475	22415	24548	2.7%	5.7%	6.6	7.18	6.85	17.45	55.4	53.7	53.7	55.3	55	55.2	50.7
POINT_BEACH	POINT_BCH_B2	345	LINE 121(Bir 121)	50	21054	21598	22219	22367	22572	23275	24657	2.65	5.58	6.28	7.28	10.55	11.15	54.9	53.2	53.3	55.3	54.9	53.4	50.3
POINT_BEACH	POINT_BOH_B2	345	LINE 123(5kr 123)	50	21054	21598	19156	19303	19265	23275	24557	3.65	100	7.8	7.18	11.15	8.25	60.8	59.3	59.3	61.4	61.5	60	57.5
POINT_BEACH	POINT_BOH_BS	345	LINE IST	50	21192	21734	22356	22504	22692	23404	24654	2.65	5.58	6.25	7.18	10.45	16.35	54.6	53	53.1	55	54.6	53.2	50.7
SHEROYGAN ENERGY C	DISEC_Bas_1	345	8112	50	9077	\$602	\$100	\$104	\$105	18379	20492	0.15	110	0.35	0.3%	102.55	105.55	\$1.5	81.4	81.5	81.5	81.5	63.1	53
SHERONGAN ENERGY C	DISEC_Bus_1	345	8115	50	9077	9068	\$100	9104	9105	16379	20492	0.15	0.31	0.35	250	102.55	05.05	81.5	81.4	81.5	81.5	81.5	63.2	59
EDGEWATER	EDG 138	138	475-5	20	18100	15101	18102	18102	18102	19266	23518	0.05	0.0%	0.05	0.05	8.6	29.85	-54	-54	-16	-54	-54	-21.6	-45
EDGEWATER	EDG 138	138	647-S	4)	20229	20230	20231	20232	20232	22261	24505	0.0%	0.0%	0.05	0.05	10.15	22.45	38	38	36	38	38	29.5	223
EDGEWATER	EDG 133 EDG 133	138	370-5	40	14314	22423	14315	22428	14315	24508	26432	0.05	0.05	0.05	0.05	1.1	27.15	30.1	30	30	30	30	23.4	12
EDGEWATER	EDG 138	138	643-5	40	22473	22450	22451	22432	22482	24570	26457	0.05	0.0%	0.05	0.0%	9.3K	26.65	29.9	29.9	29.9	29.9	23.9	23.3	121
EDGEWATER	EDG 138	138	854-5	40	22483	22484	22485	22458	22458	24578	26491	0.05	0.05	0.05	0.0%	9.8	26.7%	29.9	29.9	29.9	29.9	29.9	23.3	12.1
EDGEWATER	EDG 138 EDG 138	138	604-S	40	19230	19239	19240	19241	19241	20653	25092	0.05	0.05	0.05	0.05	9.8	27.11	30.1	30.1	30	30	30	23.4	12
EDGEWATER	EDG 138	13	828-S	40	24451	24451	24453	24454	24454	28000	30091	0.0%	0.0%	0.0%	0.05	10.6	22.15	23.8	23.8	23.7	23.7	23.7	15.7	72
EDGEWATER	EDGEWATER	345	311-5	40	13030	13031	13032	13033	13033	18277	19643	0.05	0.05	0.0%	20.0	40.H	50.81	49.2	492	492	49.2	49.2	20	18.7
EDGEWATER	EDGEWATER	345	455-5	40	16476	12/73	16480	16451	16451	21021	23068	0.05	0.0%	0.05	0.05	27.65	40.01	63.8	63.8	63.8	63.8	63.8	54.5	50.5
EDGEWATER	EDGEWATER	34	2523-5	50	16671	18672	16874	16875	18675	21235	23310	0.05	0.0%	0.01	0.0%	27.45	MAS	83.3	803	63.3	83.3	83.3	54	49.8
EDGEWATER	EDGEWATER	34	302.5	40	16871	18672	16674	16875	18675	21235	23310	0.0%	0.0%	0.05	0.0%	27.6	23.00	40.7	407	40.7	40.7	40.7	25.6	19
EDGEWATER	EDGEWATER	34	3.0-5	40	16871	16672	16674	16675	16675	21235	23310	0.05	0.05	0.05	0.05	2.6	N.IS	40.7	407	40.7	40.7	40.7	25.6	19
EDGEWATER	EDGEWATER	34	308-5	40	16671	16672	16674	16575	18675	21235	23310	0.05	0.0%	0.05	0.0%	2.4	31.85	49.7	40.7	40.7	40.7	40.7	25.6	19
KEWALNEE	NEW 138KV	13	F-64	37	10827	10641	10863	10870	21876	22008	22260	0.15	0.3%	0.4	12.0	101.11	18.61	65.1	65	63.9	64.2	317	312	303
KEWAUNEE	KEW 138KV	13	1000E	38.9	1335	13304	13328	13336	24273	24401	24563	0.18	0.38	0.4	82.7%	0.0	85.65	60.5	60.4	60.5	60.8	20	28.6	27.7
KEWAUNEE	KEW 138AV	13	8 1000W	38.9	13267	13304	13328	13338	24273	24401	24663	0.18	0.3%	0.4	12.75	8.65	15.65	60.5	60.4	60.5	60.8	29	28.6	27.7
KEWALNEE	KEW 138AV	13	22	40	13287	13304	13328	13338	24273	24401	24663	0.1%	0.3%	0.4	547	2.00	11.54	61.6	61.5	61.6	61.9	407	30.5	37.5
KEWAUNEE	KEWAUNEE BI	34	5 3450	40	12752	12363	13202	13261	14206	14514	15053	1.65	3.58	105	11.6	0.65	18.05	64	63.4	63.2	63.9	57.9	57	55.5
KEWAUNEE	KEWAUNEE B	34	5 3451	40	17270	17442	17676	17753	18252	16628	19268	0.9%	2.8	2.78	5.45	7.85	11.55	43.7	43.2	43.4	45.2	43.7	42.6	40.7
KEWAUNEE	KEWAUNEE B	34	5 Q-303	40	11572	11779	12029	12065	12065	12382	12890	1.85	3.45	18	4.45	7.05	11.45	68.9	68.4	68	68.3	68.3	67.8	34.6
S FONDULAC	S FONDULAC	134	8 382-5	40	26259	26260	26262	26263	26263	20705	27141	0.05	0.05	0.05	0.0%	2.2%	1.6	17.5	17.5	17.5	17.5	17.5	15.8	14.9
S FONDULAC	S FONDULAC	13	8 314-5	40	25858	25858	25880	25881	25861	28552	27220	0.0%	0.05	0.0%	0.0%	2.7%	5.16	19.3	19.3	19.3	19.3	19.3	17.2	15.4
S FONDULAC	S FONDULAC	13	338-5	40	26222	26224	26226	26227	28227	26680	27375	0.0%	0.05	0.0%	0.0%	2.55	48	17.6	17.6	17.6	17.6	17.6	15.6	14.3
S FONDULAC S FONDULAC	S FONDULAC	13	8 1772.5	40	27573	27574	27577	27578	27578	28282	28909	0.05	0.05	0.05	0.05	2.55	4.85	13.9	13.9	13.9	13.9	13.9	11.9	10.1
SFONDULAC	S FONDULAC	13	8 1979-5	40	27573	27574	27577	27578	27578	26262	28909	0.05	0.05	0.05	0.0%	2.98	48	13.9	13.9	13.9	13.9	13.9	11.9	10.1
S FONDULAC	S FONDULAC	13	8 1809-S	49	27573	27574	27577	27578	27578	28282	28909	0.05	0.05	0.05	0.05	2.58	48	13.9	13.9	13.9	13.9	13.9	11.9	10.1
S FONDULAC	SFL 345	34	5 92-5	37.5	12163	12165	12167	12169	12169	13221	13376	0.05	0.05	0.0%	0.05	1.75	10.05	57.7	57.6	57.6	57.6	57.B	54.5	54
S FONDULAC	SFL 345	34	5 52-5	40	12163	12165	12187	12160	12169	13221	13376	0.05	0.05	0.05	0.05	1.7%	10.05	60.3	60.3	60.3	60.3	60.3	\$7.3	58.9
S FONDULAC	SFL 345	34	5 74-5 5 M-5	40	12163	12165	12157	12189	12169	13221	13376	0.05	0.05	0.05	0.0%	175	10.05	60.3	60.3	60.3	60.3	60.3	57.3	58.9

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Appendix F: Study Criteria

Study Criteria

F.1 Contingencies

For stability analysis, a set of branches in the vicinity of the generator/power plant of concern is selected as contingencies, based on engineering judgment. Fault analysis is performed for the following six categories of contingency conditions:

- 1. Three-phase fault cleared in primary time with an otherwise intact system.
- 2. Three-phase fault cleared in delayed clearing time (i.e. breaker failure conditions) with an otherwise intact system.
- 3. Three-phase fault cleared in primary clearing time with a pre-existing outage of any other transmission element.
- 4. Single Line Ground (SLG) bus section fault cleared in primary clearing time with an otherwise intact system.
- 5. SLG internal breaker fault cleared in primary clearing time with an otherwise intact system.
- 6. SLG fault of double circuits on common tower cleared in primary time with an otherwise intact system.

For power flow analysis, contingencies include:

- 1. N-1 contingencies all lines and transformers operated at 69kV and above in the following control areas/zones: ATC Planning Zones 1-5 and ties to those zones and all branches of voltage level 69kV and above in the Dairyland Power Cooperative, Northern States Power Control Area, Commonwealth Edison, and Alliant Energy West control areas.
- 2. Selected N-2 and multiple contingencies that ATCLLC has determined to be significant.

F.2 Monitored Elements

F.2.1 Intact System, N-1, N-2 and Special Multiple Contingency Evaluation Using Linear Transfer Analysis Methods

All load carrying elements operated at 69kV and above in the following control areas/zones were studied: ATCLLC Planning Zones 1-5 and ties to those zones, and all branches of voltage level 69kV and above in the Dairyland Power Cooperative, Northern States Power Control Area, Commonwealth Edison, and Alliant Energy West control areas.

A Transmission Reliability Margin (TRM) of 5% must be applied to the MVA ratings of each monitored ATCLLC element. Violations reported will be based upon the adjusted MVA rating.

F.3 <u>Thermal Loading Criteria</u>

F.3.1 Injection Violations

Generation injection violations include: 1) thermal violations of the transmission elements that connect the Generator to the rest of the transmission network (outlet congestion); 2) thermal violations of the transmission elements that have a transfer distribution factor (TDF) \geq 5% for NERC Category A (system intact) conditions and TDF \geq 20% for NERC Category B contingencies anywhere in the studied system in relation to real power injected at the Point of Interconnection (POI) when delivered to all of MISO; or 3) thermal violations created by the loss of a transmission element connected to the generator interconnection substation.

F.3.2 Operating Restriction Calculation

Allowable Output = <u>Equipment Rating – [Line Flow – (Generation Output * TDF)]</u> TDF

F.4 Steady State Under Voltage Criteria

F.4.1 Intact System, N-1 and Special Multiple Contingency Evaluation Using ACCC

Under intact system conditions, the voltage magnitude of all transmission system buses with a decrease of 0.01 per unit due to the Generator must not be lower than 0.95 per unit. Under contingency conditions, the voltage magnitude of all transmission system buses with a decrease of 0.01 per unit, due to the Generator, must not be lower than 0.90 per unit.

F.4.2 N-2 Contingency Evaluation

Power flow solutions must converge for a selected number of N-2 contingencies in the electrical proximity of the studied Generator. Divergence of a power flow solution indicates potential voltage collapse. A "fix" must be identified for any non-converging power flow simulation and may include generator operating restrictions. [Note: Non-convergence may be due to solution settings such as switched shunt operation and/or LTC action.]

F.5 Angular Stability Criteria

Critical Clearing Time (CCT) is a period relative to the start of a fault, within which all generators in the system remain stable (synchronized). CCT is obtained from simulation. Maximum Expected Clearing Time (MECT) determines a period of time that is needed to clear a fault using the existing system facilities. MECT is dictated by the existing system facilities. In any contingency, if the computed CCT is less than the MECT plus a margin determined by ATC (1.0 cycle for studies using estimated generator data and 0.5 cycles for studies using confirmed generator data), it is considered an unstable situation and is unacceptable. Otherwise, it is considered acceptable transient stability performance.

Longer time-domain simulations must be performed on faults cleared at the CCT to examine dynamic stability. Simulations will typically cover 20 seconds of system dynamics and machine angle oscillations must meet the damping criteria in the ATC Planning Criteria.

Note that ATC stability criteria and NERC stability criteria differ on the study assumptions used for breaker failure analysis. ATC study criterion models breaker failure by modeling a threephase fault during the primary time, reduced to SLG fault if the failed breaker is an Independent Pole Operated (IPO) breaker during delayed clearing and cleared at the end of the delayed clearing time. On the other hand, NERC study criterion assumes a single line-to-ground fault for the entire breaker failure analysis. Hence, the CCT computed from ATC stability criteria is always less than or equal to the value computed using the NERC study criteria. This report assumes ATC stability criteria unless otherwise stated.

The time-domain simulations must also be reviewed for compliance with the transient and dynamic voltage standards in the ATC Planning Criteria. Voltages of all transmission system buses must recover to be at least 70% of the nominal system voltages immediately after fault removal and 80% of the nominal system voltages in 2.0 second after fault removal.

Appendix G: Estimated Allowable MW Output from G834 or G833 under Spring/Fall or Winter Emergency Ratings

Allowable output from G834/J023 between May 2010 and April 2011 (before G833/J022 in service) with Spring/Fall emergency ratings considered

Limiting	Spring/Fall Existing	Contingency	PRE	POST		REQ'D	Allowable
Element	Rating (MVA)		MVA ¹	MVA ¹	DF	RATING	MW
Point Beach-Sheboygan Energy Center 345-kV line	968	Cypress-Arcadian 345-kV line	516.2	540.5	23.37%	568.94	1726.145
Cypress-Arcadian 345-kV line	968	Point Beach-Sheboygan Energy Center 345- kV line	498.7	519.3	19.80%	546.61	2125.758

Allowable output from G834/J023 between May 2010 and April 2011 (before G833/J022 in service) with Winter emergency rating considered

Limiting	Winter Existing	Contingency	PRE MVA ¹	POST MVA ¹	DF	REQ'D RATING	Allowable MW
Element	Raung (INIVA)		INI VI V	WIV/ V	5.	1011110	
Point Beach-Sheboygan Energy Center 345-kV line	1311	Cypress-Arcadian 345-kV line	516.2	540.5	23.37%	568.94	3120.454
Cypress-Arcadian 345-kV line	1076	Point Beach-Sheboygan Energy Center 345- kV line	498.7	519.3	19.80%	546.61	2643.939

1. The Pre and Post MVA flow were re-estimated from the previous interim operations study report in order to calculate new required ratings and new allowable MW output. The old values in the previous study report was obtained from Table A.5

New Pre MVA = old Pre MVA New Post MVA = old Post MVA + 6 MW x DF

 Allowat 	le output from G833/J022 b	eyond May 2011	(w/ G834/J023 assumed in service)) with Spring/Fall e	mergency ratings considered
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Limiting	Spring/Fall Existing	Contingency	PRE	POST		REQ'D	Allowable
Element	Rating (MVA)		MVA ²	MVA ³	DF	RATING	MW
Point Beach-Sheboygan Energy Center 345-kV line	968	Cypress-Arcadian 345-kV line	540.6	566.0	24.90%	595.77	1522.112
Cypress-Arcadian 345-kV line	968	Point Beach-Sheboygan Energy Center 345- kV line	520.1	543.2	22.71%	571.81	1759.302

Allowable output from G833/J022 beyond May 2011 (w/ G834/J023 assumed in service) with Winter emergency rating considered

Limiting	Winter Existing	Contingency	PRE	POST		REQ'D	Allowable
Element	Rating (MVA)		MVA ²	MVA ³	DF	RATING	MW
Point Beach-Sheboygan Energy Center 345-kV line	1311	Cypress-Arcadian 345-kV line	540.6	566.0	24.90%	595.77	2830.747
Cypress-Arcadian 345-kV line	1076	Point Beach-Sheboygan Energy Center 345- kV line	520.1	543.2	22.71%	571.81	2211.085

2. The Pre MVA flow was re-estimated from the previous interim operations study report in order to calculate new required ratings and new allowable MW output. The old values in the previous study report was obtained from Table A.5

New Pre MVA = old Pre MVA + 6 MW x DF

3. The Post MVA flow was re-estimated from the previous interim operations study report in order to calculate new required ratings and new allowable MW output. The old value in the previous study report was from the case (Scenario 5 with G833/834 and all wind 100%, with 2011 Kewaunee modeled) New Post MVA = old Post MVA + 12 MW x DF

Note: The results shown in the above tables are based on 50% peak load cases.

Appendix H: Summary Table of Stability Study Result

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	_			_												
with New KEW)		Comments	9.0 tested clearing time is needed to avoid C2 restriction. Per ATC Protection, 9.0 tested clearing time can be achieved with the relay upgrade			W/ Kewaunee project, breaker failure clearing time becomes 8.5 cycles (i.e. 9.5 cycle with 1 cycle margin)										
42.96 MW gross.		tested clearing time with potential solutions	3.5/9.25/4.5	3.5/9.5/4.5	3.5/9.25/4.5	3.5/9.5/4.5										4.5/4.5
d 2 (G834-3/J022-3 - each 6	Potential Solutions	Otther Upgrade Required	SEL 352 and SEL 421 relay (see comments)	SEL 352 and SEL 421 relay	SEL 352 and SEL 421 relay	Replace R-304 breaker at NAP										Replace R-304 breaker at NAP
Interim Perio		Generation Restriction (MW gross)	G2 620 at all times (see comments)													G2 600
		System Problem	КР	ҚР	КP	КР							none			K,P,F
with existing KEW)		Comments	9.0 tested clearing time is needed to avoid G2 restriction. Per ATC Protection, 9.0 tested clearing time can be achieved with the relay upgrade		P2 tripped even at 8.0 cycle tested clearing time. To avoid G2 restriction, install a series breaker. With 9.0 cycle tested clearing time, G2 600 MM at all times						5.0 cycle tested clearing time to avoid G2 restriction		C3, testendor prime avoid C2, restriction, A15,54,5, tested dearning fime with C2, strill output DPB trips due voltage sag P1 1,515,8 for 196X, P2 1,515 for 1,575,9, Tuts, fur medelay can be read/stack, only fitmy eneads to be onois replacing P33U breaker st MAP		4.014.5 tested clearing time to avoid G2 restriction. At 4.54.5 with G2 620 MW gross, 345.KV and criteria is violated: B1: 1583s and B2: 1.583s. Readisting time delay is meeded for 620 MW.	Even 4.5/4.5 tested clearing time trips gen. See also the restriction w/
2.96 MW gross,		Tested Clearing Time with potential solutions	3.5/9.25/4.5	3.5/9.5/4.5	3.5/9.25/6.5				5.5/4.5	6.0/8.5	5.5/4.5	6.0/8.5	5.5/4.5	6.0/8.5	4.5/4.5	5.5/4.5
G834-3 /J022-3 - each 64	otential Solutions	Other Upgrade Required	SEL 352 and SEL 421 relay (see comment)	SEL 352 and SEL 421 relav	SEL 352 and SEL 421 relay (see comment)				Replace R-304 breaker at NAP	None. 5.0 cycle is existing dearing time per ATC Protection.	Replace R304 breaker at NAP	None. 5.0 cycle is existing cleaning time per ATC Protection.	Replace R304 breaker at NAP	None. 5.0 cycle is existing clearing time per ATC Protection.		Replace R-304 breaker at NAP
Interim Period 2 (ď	Generation Restriction (MW gross)	G2 620 at all times (see comments)		G2 580 at all times (see comments)						G2 620		G2 620		G2 600	Both G1 and G2 at 540
		System Problem	КР	ҚР	КЪ		none		K,P,F	٩	K,P	۵.	Ч,Х	٩	Қ,Р,F	K,P,F,S
Carl and and		Comments														
gross)		Tested Clearing Time with potential solutions														5.5/4.5
eriod 1 (G834/J023 - 642.96 MW	Potential Solutions	Other Upgrade														Replace R-304 breaker at NAP
Interim P		Generation Restriction (MW gross)														G1 560
		System Problem								none						K,P,F,S
		Prior Outage							111	111	161	121	Ş	151	and a start	0000
		Fault causing problems	0	1151.00	0-303 @	R-304 @			R-304 @	710 @ H	R-304 @	T10.@H	R-304 @	710 GH	6832 @ Fov	R-304 @
		Type of Fault			Breaker failure		Intact	Intact system double rout fault	Fault	prior						

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				Interim F	Period 1 (G834/J023 - 642.96 MW	gross)			Interim Period 2	2 (G834-3 /J022-3 - each 6	42.96 MW gros	s, with existing KEW)	n	Interim Perio	od 2 (G834-3/J022-3 - each)	642.96 MW gross	, with New KEW)
					Potential Solutions					Potential Solutions					Potential Solutions		
Type of Fault	Fault causing problems	Prior Outage	System Problem	Generation Restriction (MW gross)	Other Upgrade	Tested Clearing Time with potential solutions	Comments	System Problem	Generation Restriction (MW gross)	Other Upgrade Required	Tested Clearing Time with potential solutions	Comments	System Problem	Generation Restriction (MW gross)	Other Upgrade Required	tested clearing time with potential solutions	Comments
	T10@H	6832	P,F		None. 5.0 cycle is existing clearing time per ATC Protection.	6.0/8.5		P,F	G2 580	5.0 cycle is existing clearing time per ATC Protection	6.0/8.5	5.0/8.5 tested clearing time to avoid G2 restriction					
	R-304 @ K	L- SEC31	K,P,F,S		Replace R-304 breaker at NAP	5.5/4.5		K,P,F,S	G2 580	Replace R-304 breaker at NAP	5.5/4.5						
	T10@H	L- SEC31	K,P,S,F,TH23		None. 5.0 cycle is existing clearing time per ATC Protection	6.0/8.5		K,P,F,S	G2 580	5.0 cycle is existing clearing time per ATC Protection	6.0/8.5	5.5/8.5 tested clearing time to avoid G2 restriction	none				
	R-304 @ K	POB12						K,P,Fs		Replace R-304 breaker at NAP	5.5/4.5						
	T10 @ H	POB12	none					Р		None. 5.0 cycle is existing clearing time per ATC Protection	6.0/8.5						
	121 @ P	POB23	P1	G1 580		4.5/4.5	Open bus tie during G1 refueling outage	P1	G1 580		4.5/4.5	Open bus tie during G1 refueling outage	P1	G1 580		4.5/4.5	Open bus tie during G1 refueling outage
	R-304 @ K	POB45	none					K,P	G2 620	Replace R-304 breaker at NAP	5.5/4.5						
	T10@H	POB45						Р		None. 5.0 cycle is existing clearing time per ATC Protection	6.0/8.5						
POB SLG Bus Fault with breaker failure	82, 838F							P2		relay setting change	4.75/12.0		none				
	AUX 1	121		-				K,P				CCT - 5.5/6.0					
	AUX 1	R-304						K,P				CCT - 5.5/6.0	K,P				CCT - 5.5/6.0
	AUX 1	6832						K,P,F				CCT - 5.0/6.0	K,P,F			-	CCT - 5.0/6.0
	AUX 1	L- CYP31						K,P,F				CCT - 5.0/6.0	K,P,F				CCT - 5.0/6.0
	AUX 1	NAPL71						K,P,F				CCT - 5.5/6.0	K,P,F				CCT - 5.5/6.0
	AUX 1	Y-311						K,P,F				CCT - 5.5/6.0	K,P,F				CCT - 5.5/6.0
Primary Aux Fault	AUX 2	111						K,P				CCT - 5.5/6.0	Ρ				At 5.75/6.1 tested clearing time - UV trip P (19kV 1.521s, 345kV 1st 1.096s, 345kV 2nd 1.562s) CCT - 5.5/6.0
	AUX 2	121						K,P				CCT - 5.0/6.0	K,P				CCT - 5.0/6.0
1.40	AUX 2	R-304						K,P				CCT - 5.0/6.0	K,P				CCT - 5.0/6.0
0.4	AUX 2	L- SEC31						K,P,S				CCT - 5.0/6.0	K,P,S				CCT - 5.0/6.0
	AUX 2	B12						K,P				CCT - 5.5/6.0	K,P				CCT - 5.5/6.0
Primary Aux Fault with breaker failure								none					none				
Primary GSU fault														_			
GSU breaker failure	an spa																

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													A CONTRACT OF A		
		Interim P	eriod 1 (G834/J023 - 642.96 MW	gross)			Interim Period 2 (G834-3 /J022-3 - each 64	2.96 MW gross, w	ith existing KEW)		Interim Period	2 (G834-3/J022-3 - each 64	42.96 MW gross, wi	h New KEW)
			Potential Solutions				•	otential Solutions				1	otential Solutions		
Type of Fault Prior Fault problems Outlage	System Problem	Generation Restriction (MW gross)	Other Upgrade	Tested Clearing Time with potential solutions	Comments	System Problem	Generation Restriction (MW gross)	Other Upgrade Required	Tested Clearing Time with potential solutions	Comments	System Problem	Generation Restriction (MW gross)	Other Upgrade Required	tested clearing time with potential solutions	Comments
Unit Trip															
Nomenclature K: Kewaunee P: Point Beach (Pt, P2) S: Sheboygan Energy F: Fox Energy Th: Thilmany	L111: Point L121: Point Q303: Point L151: Point R304: Kewa	Beach-Sheboygan Energy L Beach-Forest Junction 34. L Beach-Kewaunes 345 kV L Beach-Fox Energy 345 kV Baunee-North Appleton 345 l	Center 345 KV line NAAP 5 KV line CY line 6 line 6 Vine SE	L71: North A P31: Cypress 832: North A T10: Kewaun C31: Sheboy	ppleton-Werner West 3- -Arcadian 345 kV line ppleton-Fox Energy Cer ee T10 345/138 kV trar gan Energy Center-Gra	5 kV line iter 345 kV line sformer wille 345 kV lir	H: POBX: CCT:	High side Point Beach bus tie xy Critical dearing time (see note below)						

Note: Tested clearing times noted in the table includes 1.0 cycle margin. The Planning margin is added to the local primary clearing time for primary clearing simulations and the local breaker failure time for breaker failure simulations.

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Appendix I: Minimum Excitation Limits at Point Beach and Kewaunee during Interim Periods

Minimum Excitation Limits at Point Beach and Kewaunee during Interim Periods

As noted in this G833/J022-G834/J023 Interim Operations Re-Study Report, Point Beach and Kewaunee units need to maintain certain reactive power output in anticipation of critical contingency conditions. Reactive power output from a synchronous machine has an impact on the transient stability of the unit. Typically, when a unit produces relatively small reactive power output or absorbs reactive power from transmission system (underexcitation), the unit tends to be less stable under a fault condition. The results of the interim operation study indicate that a certain level of reactive power output (overexcitation) needs to be maintained to ensure generation stability in anticipation of critical fault conditions. This is primarily due to too many generators with few outlets out of Fox Valley area.

The minimum excitation limiter, which may also be referred to as the under-excited reactive ampere limit or under-excitation limiter, settings are an effective mechanism to ensure a minimum level of unit excitation. However, limiting the amount of under-excited operation can negatively affect the ability to control system and plant voltages under lighter system load conditions where transmission line charging may result in higher system voltages. Therefore, any minimum excitation limits need to be coordinated with voltage control requirements.

The "interim" solutions described in the Interim Operations Re-Study Report would be followed by the completion of the necessary Network Upgrades identified in the G833/J022-G834/J023 System Impact Re-Study Report, which has yet to be posted. The Network Upgrades would be the long-term solutions which ensure a wider operating envelope for the local transmission system and the interconnected generators by permitting generating unit operation at near unity or leading power factor, or at least provide a foundation to achieve the wider operating envelop through additional transmission reinforcement in the area that may be needed in the future.

Transient Stability Studies

To estimate minimum excitation limits (MVAR output levels), it is assumed that the stability upgrades identified for each interim period are in-service (see G833/J022-G834/J023 Interim Operation Re-Study Report). Various MVAR output levels at Point Beach and Kewaunee 345 kV buses were evaluated using two different generation dispatch scenarios during the three interim periods. Critical faults under system intact condition identified in the interim operation study were applied, which are:

- Fault on L111 with breaker failure at Point Beach
- Fault on L151 with breaker failure at Point Beach
- Fault on Q-303 with breaker failure at Point Beach (post-May 2010 until May 2011 only since a series breaker is proposed to be installed by May 2011)
- Fault on R-304 with breaker failure at Kewaunee (post Kewaunee bus reconfiguration project period only)

With stability upgrades for each interim period in-service and based on the study results shown in Table I.1 through I.4, the Point Beach and Kewaunee units would need to maintain the following minimum excitation levels to ensure synchronism of these and nearby generators:

- For May 2010 May 2011 (With Point Beach Unit #1 upgraded and with the existing Kewaunee bus configuration)
 - Point Beach G1 and G2: 48 MVAR or higher per unit
 - Kewaunee G1: 41 MVAR or higher
- For May 2011 until completion of the Kewaunee bus reconfiguration project (With both Point Beach Units #1 and #2 upgraded),
 - Point Beach G1 and G2: 70 MVAR or higher per unit
 - Kewaunee G1: 58 MVAR or higher
- Post completion of the Kewaunee bus reconfiguration project (With both Point Beach Units #1 and #2 upgraded)
 - Point Beach G1 and G2: 68 MVAR or higher per unit
 - Kewaunee G1: 49 MVAR or higher

These minimum excitation limits were estimated by testing the critical system faults. Additional study for all other relevant system faults was not performed because of the following reasons:

- For Interim 1 period (see Table I.1), the critical faults under system intact conditions are more severe at the low generation scenario, and the estimated minimum excitation limits of Kewaunee and Point Beach units are either same or higher than their MVAR outputs at the 352 kV voltage schedule where all other faults under system intact conditions were proven to be stable in the interim operation study. Therefore, additional study for all other relevant system faults under system intact conditions was not performed. For prior outage conditions, it is recommended to maintain at least 354 kV at the Point Beach and Kewaunee 345 kV buses (note: 354 kV is high-end of the preferred voltage range at Point Beach) in anticipation of critical faults. This is to ensure stable system even with faults under prior outage conditions which appear to be more severe at high generation scenario and were proven to be stable at the 352 kV voltage level with interim upgrades and operating restrictions implemented.
- As mentioned above, the critical faults under system intact conditions appear to be more severe at the low generation scenario according to the results of the interim operation study, and the estimated minimum excitation limits of Kewaunee and Point Beach units are higher than their MVAR outputs at the 352 kV voltage schedule of low generation scenario (see Table 2.4.1) where all other faults under system intact conditions were proven to be stable in the interim operation report. Therefore, additional study for all other relevant system faults under system intact conditions was not performed. For prior outage conditions, it is also recommended to maintain at least 354 kV (high-end of the preferred voltage range at Point Beach) in anticipation of critical faults. This is to ensure stable system even with faults under prior outage condition which appear to be more severe at high generation scenario and were proven to be stable at 352 kV.

Steady State Voltage Control Studies at Minimum System Load Conditions

Using a minimum load case with 40% of 2010 summer peak load condition, three scenarios were built and studied to confirm if any high voltages occur at Point Beach 345 kV and Kewaunee 345/138 kV buses under various conditions. The scenarios are:

- Scenario 1: Minimum load case with G834-J023 added
- Scenario 2: Minimum load case with G834/J023 G833/J022 added
- Scenario 3: Minimum load case with Scenario 2 and with Point Beach G2 and Kewaunee G1 offline.

The minimum reactive power outputs of Point Beach and Kewaunee units in each case were adjusted to match with the estimated minimum excitation limits as follows:

- For Scenario 1:
 - Point Beach G1 and G2: 48 MVAR
 - Kewaunee G1: 41 MVAR
- For Scenario 2:
 - Point Beach G1 and G2: 70 MVAR
 - Kewaunee G1: 58 MVAR

No study was performed using the minimum excitation limits of Interim 2B period since no significant impact is expected due to the Kewaunee bus reconfiguration project.

For the study, the following critical contingencies were tested.

- System Intact
- Open Line-end
 - i. Open North Appleton end of R-304
 - ii. Open Granville end of L-SEC31
 - iii. Open Arcadian end of L-CYP31
 - iv. Open Forest Junction end of L121
 - v. Open Fox River end of L151
- N-1 or multiple contingency analyses are not performed since these conditions will lower voltages due to increased system impedances.

Monitored elements are Point Beach 19 kV and 345 kV, and Kewaunee 345 kV and 138 kV bus voltages. The following criteria are assumed for the monitored elements.

- Point Beach 19 kV bus voltage: 95 percent to 105 percent of nominal voltage
- Point Beach 345 kV bus voltage: Not exceed 358 kV (high end of normal voltage range) under system intact condition. Not exceed 360 kV (slightly lower than high end of absolute voltage range) under a line end open
- Kewaunee 345 kV bus voltage: 95 percent to 105 percent of nominal voltage
- Kewaunee 138 kV bus voltage: 140 kV and 143 kV under system intact and contingency conditions

In conclusion, no high voltage conditions were found as shown in Table I.4. Sensitivity analysis was performed by turning on some of the capacitor banks in the area such as New Holstein, Glenview, Howard and Shoto. As a result, high voltage at Kewaunee 138 kV bus is identified with the Granville end of L-SEC31 open. However, the voltage issue

can be addressed by remedial actions such as turning off some of the capacitor banks in the area as described in Table I.5.

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Interim 1 (KV	and MVAR level at POB	and KEW for stable syste	m under critical faults)
Critical Fault under Intact (tested clearing times)	High Gen Scenario ¹	Low Gen Scenario ¹	Comment
L111 BF @ POB (3.5/10.0/4.5)	350 kV or higher (POB G1: 43.4 POB G2: 43.4 KEW G1: 40.9)	351 kV or higher (POB G1: 42.7 POB G2: 42.7 KEW G1: 26.1)	
L151 BF @ POB (3.5/10.0/4.5)	348 kV or higher (POB G1: 12.0 POB G2: 12.0 KEW G1: 20.1)	349 kV or higher (POB G1: 33.3 POB G2: 33.3 KEW G1: 17.5)	Thus, minimum excitation limits are: POB G1: 47.4 POB G2: 47.4
Q303 BF @ POB (3.5/10.0/6.5)	350 kV or higher (POB G1: 43.4 POB G2: 43.4 KEW G1: 40.9)	352 kV or higher (POB G1: 47.4 POB G2: 47.4 KEW G1: 30.4)	KEW G1: 40.9
R304 BF @ KEW	N	/A	

Table I.1. Minimum Excitation Limit Study Resultsfor Interim 1 (May 2010 – May 2011)

Table I.2. Minimum Excitation Limit Study Resultsfor Interim 2A (May 2011 until Kewaunee Reconfiguration Complete)

Interim 2A	A (KV level at POB and K	EW for stable system une	der critical faults)
Critical Fault under Intact (tested clearing times)	High Gen Scenario ¹	Low Gen Scenario ¹	Comment
L111 BF @ POB (3.5/ 9.0 /4.5)	351 kV or higher (POB G1: 69.6 POB G2: 69.6 KEW G1: 57.5)	352 kV or higher (POB G1: 60.1 POB G2: 60.1 KEW G1: 35.8)	
L151 BF @ POB (3.5/ 9.5 /4.5)	350 kV or higher (POB G1: 53.7 POB G2: 53.7 KEW G1: 46.9)	352 kV or higher (POB G1: 60.1 POB G2: 60.1 KEW G1: 35.8)	Thus, minimum excitation limits are: POB G1: 69.6 POB G2: 69.6
Q303 BF @POB	N	/A	KEW 01: 57.5
R304 BF @ KEW	N	/A	

Interim 21	B (KV level at POB and K	EW for stable system und	der critical faults)
Critical Fault under Intact (tested clearing times)	High Gen Scenario ¹	Low Gen Scenario ¹	Comment
L111 BF @ POB (3.5/ 9.0 /4.5)	351 kV or higher (POB G1: 67.2 POB G2: 67.2 KEW G1: 48.9)	352 kV or higher (POB G1: 58.6 POB G2: 58.6 KEW G1: 27.3)	
L151 BF @ POB (3.5/9.5/4.5)	349 kV or higher (POB G1: 35.6 POB G2: 35.6 KEW G1: 27.1)	352 kV or higher (POB G1: 58.6 POB G2: 58.6 KEW G1: 27.3)	Thus, minimum excitation limits are:
Q303 BF @ POB	N	/A	POB G1: 67.2 POB G2: 67.2 KEW G1: 48.9
R304 BF @ KEW (3.5/9.5/4.5)	348 kV or higher (POB G1: 20.1 POB G2: 20.1 KEW G1: 16.4)	351 kV or higher (POB G1: 53.4 POB G2: 53.4 KEW G1: 22.9)	

Table I.3. Minimum Excitation Limit Study Results for Interim 2B (Post Kewaunee Reconfiguration)

1. Approximate MVAR change at Point Beach and Kewaunee:

High generation scenario:

- o 1kV change at Point Beach for every 16 MVAR change
- 1kV change at Kewaunee for every 11 MVAR change
- Low generation scenario:
 - o 1kV change at Point Beach for every 5 MVAR change
 - o 1kV change at Kewaunee for every 4.5 MVAR change

		(Interim	1 - Minimum I	Voltages a Load Case With	it Point Beach : G834 (J023) ir	and Kewaunee 1-service, load	under Key lin level at 6462 l	e-end open- MW (40% of 20	010 peak load	condition))			
							مالي محمل مالي. محمل مو			Conce Econot	dition of the second		ior and af
Monitored Bus	Bus Number	System	ו Intact	Kewaunee-No (R30	orth Appleton)4)	Granville-2 Energy Cent	sheboygan ter (SEC31)	Arcadian-Cyp	dian end or ress (CYP31)	or Point Be: Junction	acn-rorest (L121)	Foint beach	-rox Kiver i1)
PT BCH1 345.0	0 699433	1.0203 PU	352.02 KV	1.0203 PU	352.01 KV	1.0205 PU	352.08 KV	1.0203 PU	352.01 KV	1.0203 PU	352.01 KV	1.0203 PU	352.01 KV
PT BCH2 345.0	0 698898	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV
PT BCH3 345.0	0 699211	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV
PT BCH4 345.0	0 698900	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV
PT BCH5 345.0	0 698901	1.0203 PU	351.99 KV	1.0202 PU	351.96 KV	1.0202 PU	351.98 KV	1.0203 PU	351.99 KV	1.0202 PU	351.96 KV	1.0204 PU	352.03 KV
PT BHG1 19.00	0 699434	1.0008 PU	19.01 KV	1.0060 PU	19.11 KV	0.9971 PU	18.95 KV	0.9999 PU	19.00 KV	0.9987 PU	18.98 KV	0.9988 PU	18.98 KV
PT BHG2 19.00	0 699435	1.0018 PU	19.03 KV	1.0071 PU	19.13 KV	0.9982 PU	18.97 KV	1.0010 PU	19.02 KV	0.9998 PU	19.00 KV	0.9999 PU	19.00 KV
KEWAUNEE 345.	00 699630	1.0203 PU	352.00 KV	1.0214 PU	352.37 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV
KEWAUNEE 138.	00 699620	1.0256 PU	141.54 KV	1.0257 PU	141.54 KV	1.0254 PU	141.50 KV	1.0259 PU	141.57 KV	1.0247 PU	141.41 KV	1.0251 PU	141.46 KV

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tiver end of	h-Fox River	51)	352.01 KV	352.00 KV	352.00 KV	352.00 KV	352.03 KV	19.02 KV	19.02 KV	352.00 KV	141.44 KV
Open Fox F	Point Beacl	(L1	1.0203 PU	1.0203 PU	1.0203 PU	1.0203 PU	1.0204 PU	1.0008 PU	1.0008 PU	1.0203 PU	1.0249 PU
Junction end	ach-Forest	i (L121)	352.00 KV	352.00 KV	352.00 KV	352.00 KV	351.95 KV	19.01 KV	19.01 KV	352.00 KV	141.39 KV
Open Forest	of Point Be	Junction	1.0203 PU	1.0203 PU	1.0203 PU	1.0203 PU	1.0201 PU	1.0007 PU	1.0007 PU	1.0203 PU	1.0246 PU
	dian end of	ress (CYP31)	352.01 KV	352.00 KV	352.00 KV	352.00 KV	351.99 KV	19.04 KV	19.04 KV	352.00 KV	141.56 KV
	Open Arcat	Arcadian-Cypi	1.0203 PU	1.0203 PU	1.0203 PU	1.0203 PU	1.0203 PU	1.0019 PU	1.0019 PU	1.0203 PU	1.0258 PU
ville end of	sheboygan	ter (SEC31)	352.11 KV	352.03 KV	352.03 KV	352.03 KV	352.00 KV	18.99 KV	18.99 KV	352.00 KV	141.49 KV
Open Gran	Granville-S	Energy Cen	1.0206 PU	1.0204 PU	1.0204 PU	1.0204 PU	1.0203 PU	0.9995 PU	0.9995 PU	1.0203 PU	1.0253 PU
pleton end of	rth Appleton)4)	352.01 KV	352.00 KV	352.00 KV	352.00 KV	351.96 KV	19.14 KV	19.14 KV	352.51 KV	141.55 KV
Open North Ap	Kewaunee-No	(R3(1.0203 PU	1.0203 PU	1.0203 PU	1.0203 PU	1.0202 PU	1.0074 PU	1.0074 PU	1.0218 PU	1.0257 PU
		Intact	352.01 KV	352.00 KV	352.00 KV	352.00 KV	351.99 KV	19.05 KV	19.05 KV	352.00 KV	141.53 KV
		System	1.0203 PU	1.0203 PU	1.0203 PU	1.0203 PU	1.0202 PU	1.0026 PU	1.0026 PU	1.0203 PU	1.0256 PU
		Bus Number	699433	698898	699211	698900	698901	699434	699435	699630	699620
		Bus	345.00	345.00	345.00	345.00	345.00	19.000	19.000	345.00	138.00
		Monitored	PT BCH1	PT BCH2	PT BCH3	PT BCH4	PT BCH5	PT BHG1	PT BHG2	KEWAUNEE	KEWAUNEE
	Open North Appleton end of Open Granville end of Open Forest Junction end Open Forest Junction end	Open North Appleton end of Kewaunee-North Appleton Open Granville end of Granville-Sheboygan Open Arcadian end of Open Arcadian end of Open Forest Junction end of Point Beach-Forest Point Beach-Forest	Monitored Bus Bus Number System Intact (R304) Copen Granville end of Granville-Sheboygan Open Arcadian end of Open Arcadian end of Arcadian-Cypress (CYP31) Open Forest Junction end of Point Beach-Forest Open Forest Junction end Point Beach-Forest Monitored Bus Bus Number System Intact (R304) Energy Center (SEC31) Arcadian-Cypress (CYP31) Junction (L121) (L151)	Monitored Bus Bus Number System Intact R304) Energy Center (SEC31) Arcadian -Cypress (CYP31) Junction end of Point Beach-Forest Open Forest Junction end Point Beach-Forest Open Forest Point Beach-Forest Point Beach-Forest <t< td=""><td>Monitored Bus Bus Number System Intact Cpen North Appleton end of Kewaunee-North Appleton Open Granville end of Granville-Sheboygan Open Forest Junction end of Point Beach-Forest Open Forest Junction end Point Beach-Forest Point Bach-Forest Point Bea</td><td>Monitored Bus Bus Number System Intact Open North Appleton end of Kewaunee-North Appleton Open Granville end of Granville-Sheboygan Open Forest Junction end of Point Beach-Forest Open Forest Junction end Point Beach-Forest Point Bach Bach Bach Bach Bach Bach Bach Bach</td><td>Monitored Bus Bus Number System Intact Open North Appleton end of Kewaunee-North Appleton Open Granville end of Granville-Sheboygan Open Accadian end of of Point Beach-Forest Open Forest Junction end Point Beach-Forest Open Forest Junction end Point Beach-Forest Open Forest Junction end Point Beach-Forest Open Forest Junction end of Point Beach-Forest Open Forest Junction end Point Beach-Forest Point Bach-Forest Point Bach-Forest Point Bach-Forest Point Bac</td><td>Monitored Bus Bus Number System Intact Open North Appleton end of Kewaunee-North Appleton Open Granville-Sheboygan Open Arcadian end of Granville-Sheboygan Open Arcadian end of Granville-Sheboygan Open Arcadian end of of Point Beach-Forest Open Forest Junction end Point Beach-Forest Open Forest Junction end Point Beach-Forest Open Forest Junction end Point Beach-Forest Open Forest Junction end of Point Beach-Forest Point Beach-Forest</td><td>Monitored Bus Bus Number System Intact Open North Appleton end of Kewaunee-North Appleton Open Granville end of Granville-Sheboygan Open Accadian end of of Point Beach-Forest Open Forest Junction end Point Beach-Forest Point Beach-Forest Point</td><td>Monitored Bus Bus Number System Intact Open North Appleton end of Kewaunee-North Appleton Open Granville-Sheboygan Open Accadian end of Granville-Sheboygan Open Accadian end of Granville-Stado end end Accadian end of Granville-Stado end en</td><td>Monitored Bus Bus Number System Intact Open North Appleton end of Kewaunee-North Appleton Open Granville end of Granville Sheboygan Open Arcadian end of of Point Beach-Forest Open Forest Junction end of Point Beach-Forest Open Forest Junction end of Point Beach-Forest Point Beach-Forest Lunction Curl 151 PT BCH1 352.01 KV 1.0203 PU 352.01 KV 1.0203 PU 352.01 KV 1.0203 PU 352.01 KV 1.0203 PU 352.00 KV 1</td></t<>	Monitored Bus Bus Number System Intact Cpen North Appleton end of Kewaunee-North Appleton Open Granville end of Granville-Sheboygan Open Forest Junction end of Point Beach-Forest Open Forest Junction end Point Beach-Forest Point Bach-Forest Point Bea	Monitored Bus Bus Number System Intact Open North Appleton end of Kewaunee-North Appleton Open Granville end of Granville-Sheboygan Open Forest Junction end of Point Beach-Forest Open Forest Junction end Point Beach-Forest Point Bach Bach Bach Bach Bach Bach Bach Bach	Monitored Bus Bus Number System Intact Open North Appleton end of Kewaunee-North Appleton Open Granville end of Granville-Sheboygan Open Accadian end of of Point Beach-Forest Open Forest Junction end 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Kewaunee-North Appleton Open Granville-Sheboygan Open Accadian end of Granville-Sheboygan Open Accadian end of Granville-Stado end end Accadian end of Granville-Stado end en	Monitored Bus Bus Number System Intact Open North Appleton end of Kewaunee-North Appleton Open Granville end of Granville Sheboygan Open Arcadian end of of Point Beach-Forest Open Forest Junction end of Point Beach-Forest Open Forest Junction end of Point Beach-Forest Point Beach-Forest Lunction Curl 151 PT BCH1 352.01 KV 1.0203 PU 352.01 KV 1.0203 PU 352.01 KV 1.0203 PU 352.01 KV 1.0203 PU 352.00 KV 1

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American Transmission Company

	(Interim 24	with Point Be	ach G2 and Ke	ewaunee G1 o	Voltages ffline - Minimum	at Point Beach Load Case with	and Kewaunee h G834 (J023)	under Key lir and G833 (JC	ne-end open-)23) in-service,	load level at 6	462 MW (40%	of 2010 peak	load condition)
					Open North A Kewaunee-N	ppleton end of orth Appleton	Open Grar Granville-S	wille end of Sheboygan	Open Arca	dian end of	Open Forest of Point Be	Junction end ach-Forest	Open Fox F Point Beac	River end of h-Fox River
Monitore	d Bus	Bus Number	Systen	n Intact	(R3	04)	Energy Cer	ter (SEC31)	Arcadian-Cyp	ress (CYP31)	Junctio	n (L121)	(L1	51)
PT BCH1	345.00	699433	1.0203 PU	352.01 KV	1.0203 PU	352.02 KV	1.0242 PU	353.35 KV	1.0203 PU	352.01 KV	1.0203 PU	352.02 KV	1.0203 PU	352.02 KV
PT BCH2	345.00	698898	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0240 PU	353.27 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV
PT BCH3	345.00	699211	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0240 PU	353.27 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV
PT BCH4	345.00	698900	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0240 PU	353.27 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV
PT BCH5	345.00	698901	1.0203 PU	352.00 KV	1.0203 PU	351.99 KV	1.0239 PU	353.26 KV	1.0203 PU	352.00 KV	1.0202 PU	351.98 KV	1.0204 PU	352.03 KV
PT BHG1	19.000	699434	1.0046 PU	19.09 KV	1.0018 PU	19.03 KV	1.0030 PU	19.06 KV	1.0026 PU	19.05 KV	1.0011 PU	19.02 KV	1.0021 PU	19.04 KV
PT BHG2	19.000	699435	0.9911 PU	18.83 KV	0.9911 PU	18.83 KV	0.9947 PU	18.90 KV	0.9911 PU	18.83 KV	0.9911 PU	18.83 KV	0.9911 PU	18.83 KV
KEWAUNEE	345.00	699630	1.0196 PU	351.75 KV	1.0208 PU	352.17 KV	1.0230 PU	352.92 KV	1.0196 PU	351.77 KV	1.0192 PU	351.62 KV	1.0192 PU	351.62 KV
KEWAUNEE	138.00	699620	1.0239 PU	141.30 KV	1.0247 PU	141.41 KV	1.0260 PU	141.59 KV	1.0241 PU	141.32 KV	1.0231 PU	141.19 KV	1.0234 PU	141.23 KV

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Table I.5. Voltages at Point Beach and Kewaunee Under System Intact and Contingencies(With Capacitor Banks at New Holstein, Glenview, Howard and Shoto online)

			(Interim 1 - v	- Minimum Lo vith New Hols	Voltages a bad Case With stein (16.8 mv:	at Point Beac 1 G834 (J023) ar), Glenview	h and Kewau in-service, lo (16.2 mvar),	nee under Ke ad level at 64 Howard (32 n	y line-end ope 162 MW (40% nvar), Shoto (en- of 2010 pea 16.2 mvar) ba	k load conditio ack online	on))		
Monitored	d Bus	Bus Number	Syster	n Intact	Open North / of Kewau Appletor	Appleton end nee-North n (R304)	Open Grar Granville-S Energy Cen	iville end of Sheboygan ter (SEC31)	Open Arca Arcadian (CY	dian end of -Cypress P31)	Open Fore end of Po Forest Jun	est Junction int Beach- ction (L121)	Open Fox F Point Beac (L1	River end of h-Fox River 51)
PT BCH1	345.00	699433	1.0203 PU	352.02 KV	1.0203 PU	352.01 KV	1.0206 PU	352.10 KV	1.0203 PU	352.01 KV	1.0203 PU	352.01 KV	1.0203 PU	352.01 KV
PT BCH2	345.00	698898	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0204 PU	352.03 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV
PT BCH3	345.00	699211	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0204 PU	352.03 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV
PT BCH4	345.00	698900	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0204 PU	352.03 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV
PT BCH5	345.00	698901	1.0203 PU	352.00 KV	1.0202 PU	351.97 KV	1.0203 PU	352.01 KV	1.0203 PU	352.00 KV	1.0202 PU	351.96 KV	1.0204 PU	352.03 KV
PT BHG1	19.000	699434	0.9992 PU	18.98 KV	1.0038 PU	19.07 KV	0.9960 PU	18.92 KV	0.9983 PU	18.97 KV	0.9980 PU	18.96 KV	0.9979 PU	18.96 KV
PT BHG2	19.000	699435	1.0003 PU	19.00 KV	1.0048 PU	19.09 KV	0.9971 PU	18.95 KV	0.9994 PU	18.99 KV	0.9991 PU	18.98 KV	0.9989 PU	18.98 KV
KEWAUNEE	345.00	699630	1.0203 PU	352.00 KV	1.0216 PU	352.46 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV
KEWAUNEE	138.00	699620	1.0301 PU	142.16 KV	1.0297 PU	142.10 KV	1.0295 PU	142.08 KV	1.0305 PU	142.21 KV	1.0286 PU	141.94 KV	1.0290 PU	142.01 KV
		(Interir	n 2A - Minimi	um Load Cas	Voltages : e with G834 (. tein (16.8 m)	at Point Beac J023) and G8 ar) Glenview	h and Kewau 33 (J023) in-s (16 2 myar)	nee under Ke service, load I Howard (32 m	y line-end ope evel at 6462 l	en- ∕IW (40% of 2 16 2 myar) ba	2010 peak loa	id condition))		
					Open North	Appleton end	Open Grar	wille end of	Open Arca	dian end of	Open Fore	est Junction	Open Fox F	River end of

Monitored Bus		Bus Number	System Intact		Open North Appleton end of Kewaunee-North Appleton (R304)		Open Granville end of Granville-Sheboygan Energy Center (SEC31)		Open Arcadian end of Arcadian-Cypress (CYP31)		Open Forest Junction end of Point Beach- Forest Junction (L121)		Open Fox River end of Point Beach-Fox River (L151)	
PT BCH1	345.00	699433	1.0203 PU	352.02 KV	1.0203 PU	352.01 KV	1.0210 PU	352.24 KV	1.0203 PU	352.01 KV	1.0203 PU	352.01 KV	1.0203 PU	352.01 KV
PT BCH2	345.00	698898	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0208 PU	352.17 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV
PT BCH3	345.00	699211	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0208 PU	352.17 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV
PT BCH4	345.00	698900	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0208 PU	352.17 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV
PT BCH5	345.00	698901	1.0203 PU	351.99 KV	1.0202 PU	351.96 KV	1.0207 PU	352.14 KV	1.0203 PU	352.00 KV	1.0202 PU	351.96 KV	1.0204 PU	352.03 KV
PT BHG1	19.000	699434	1.0011 PU	19.02 KV	1.0053 PU	19.10 KV	0.9999 PU	19.00 KV	1.0001 PU	19.00 KV	1.0000 PU	19.00 KV	0.9999 PU	19.00 KV
PT BHG2	19.000	699435	1.0011 PU	19.02 KV	1.0053 PU	19.10 KV	0.9999 PU	19.00 KV	1.0001 PU	19.00 KV	1.0000 PU	19.00 KV	0.9999 PU	19.00 KV
KEWAUNEE	345.00	699630	1.0203 PU	352.00 KV	1.0220 PU	352.59 KV	1.0203 PU	352.00 KV	1.0204 PU	352.03 KV	1.0203 PU	352.00 KV	1.0203 PU	352.00 KV
KEWAUNEE	138.00	699620	1.0300 PU	142.14 KV	1.0297 PU	142.10 KV	1.0293 PU	142.05 KV	1.0305 PU	142.20 KV	1.0283 PU	141.91 KV	1.0288 PU	141.97 KV

Voltages at Point Beach and Kewaunee under Key line-end open- (Interim 2A with Point Beach G2 and Kewaunee G1 offline - Minimum Load Case with G834 (J023) and G833 (J023) in-service, load level at 6462 MW (40% of 2010 peak load condition) - with New Holstein (16.8 mvar), Glenview (16.2 mvar), Howard (32 mvar), Shoto (16.2 mvar) back online														
Monitored	Bus Monitored Bus Number System Intact		Open North Appleton end of Kewaunee-North Appleton (R304)		Open Granville end of Granville-Sheboygan Energy Center (SEC31)		Open Arcadian end of Arcadian-Cypress (CYP31)		Open Forest Junction end of Point Beach- Forest Junction (L121)		Open Fox River end of Point Beach-Fox River (L151)			
PT BCH1	345.00	699433	1.0212 PU	352.30 KV	1.0237 PU	353.18 KV	1.0324 PU	356.18 KV	1.0233 PU	353.05 KV	1.0236 PU	353.16 KV	1.0230 PU	352.93 KV
PT BCH2	345.00	698898	1.0211 PU	352.29 KV	1.0237 PU	353.17 KV	1.0322 PU	356.10 KV	1.0233 PU	353.05 KV	1.0236 PU	353.15 KV	1.0230 PU	352.92 KV
PT BCH3	345.00	699211	1.0211 PU	352.29 KV	1.0237 PU	353.17 KV	1.0322 PU	356.10 KV	1.0233 PU	353.05 KV	1.0236 PU	353.15 KV	1.0230 PU	352.92 KV
PT BCH4	345.00	698900	1.0211 PU	352.29 KV	1.0237 PU	353.17 KV	1.0322 PU	356.10 KV	1.0233 PU	353.05 KV	1.0236 PU	353.15 KV	1.0230 PU	352.92 KV
PT BCH5	345.00	698901	1.0211 PU	352.29 KV	1.0236 PU	353.16 KV	1.0321 PU	356.08 KV	1.0233 PU	353.05 KV	1.0236 PU	353.13 KV	1.0230 PU	352.94 KV
PT BHG1	19.000	699434	1.0002 PU	19.00 KV	1.0027 PU	19.05 KV	1.0110 PU	19.21 KV	1.0024 PU	19.05 KV	1.0027 PU	19.05 KV	1.0020 PU	19.04 KV
PT BHG2	19.000	699435	0.9919 PU	18.85 KV	0.9944 PU	18.89 KV	1.0027 PU	19.05 KV	0.9940 PU	18.89 KV	0.9943 PU	18.89 KV	0.9937 PU	18.88 KV
KEWAUNEE	345.00	699630	1.0208 PU	352.17 KV	1.0244 PU	353.42 KV	1.0312 PU	355.77 KV	1.0229 PU	352.91 KV	1.0227 PU	352.85 KV	1.0221 PU	352.64 KV
KEWAUNEE	138.00	699620	1.0293 PU	142.05 KV	1.0318 PU	142.39 KV	1.0377 PU	143.20 KV	1.0313 PU	142.33 KV	1.0302 PU	142.17 KV	1.0301 PU	142.15 KV

Appendix J: Unit Restriction Due to Stability under Prior Outage Conditions in Table ES-3 during One of Point Beach Units offline

			Scen With POB with POB G2	ario 1: G1 off-line, 2 at full output	Scenario 2: With POB G1 at full output, With POB G2 off-line		
Interim Periods	Fault	Prior Outage	Simulated Clearing Time	High Gen	Low Gen	High Gen	Low Gen
Interim 1	R304 at KEW	6832	5.5/4.5	ОК	ОК	ок	ОК
existing Kewaunee)	L121 at POB	POB Bus tie 2-3	4.5/4.5	ок ок		P1*	P1*
	R304 at KEW	L121	5.5/4.5	ОК	ок	ОК	ОК
	R304 at KEW	L151	5.5/4.5	ОК	ОК	ОК	ОК
	6832 at FOX	R-304	4.5/4.5	ок	ОК	ОК	ОК
Interim 2A (With G833/4-J022/3, With existing Kewaunee)	R-304 at KEW	6832	5.5/4.5	ОК	ОК	ОК	ОК
	R-304 at KEW	L-SEC31	5.5/4.5	ОК	ОК	ОК	ОК
	L121 at POB	POB Bus tie 2-3	4.5/4.5	ок ок		P1*	P1*
	R-304 at KEW	POB Bus tie 4-5	5.5/4.5	ОК	ОК	OK	ОК
Interim 2B	R-304 at KEW	6832	4.5/4.5	ОК	ОК	ОК	ОК
new Kewaunee)	L121 at POB	POB Bus tie 2-3	4.5/4.5	ОК	OK	P1*	P1*

* POB G1 tripped. The outage of Point Beach Bus tie 2-3 followed by L121 fault isolates Point Beach G1 to the remaining line L111. Therefore, taking the Point Beach Bus tie 2-3 out of service during Point Beach G2 refueling outage window does not eliminate the POB G1 stability issue for L121 fault under Point Beach Bus tie 2-3 out of service. Thus, follow the operating restriction for the fault condition described in the G833/4-J022/3 Interim Operation Re-study Report.

American Transmission Company