

Table UP-5-RE: U.P. Robust Economy Future –U.P. Preliminary Solutions Groups

Individual Solutions Not Common To All Solutions Groups

U.P. Zone	Solutions Group A		Solutions Group B	
	Map Item #	Solutions Description	Map Item #	Solutions Description
Western	W1	Lakota Rd-Mass-Winona 138 kV rebuild (68 mi) , new Mass 138/69 kV transformer	W1a	Lakota Rd-Mass-Winona 138/69 kV rebuild (68 mi), new Mass 138/69 kV transformer
Western	W10	Rebuild M38-Atlantic 69 kV line at 138 kV (22 mi), add 2 nd Atlantic 138/69 kV transformer	W12	Winona-Atlantic 138 kV rebuild (22 mi) , add 2 nd Atlantic 138/69 kV transformer
Central	C1	New Lakehead-Rapid River 138/69 kV 150 MVA + reconductor 69 kV line to Lakehead Tap	C3a	Add a 2 nd identical Chandler 138/69 kV transformer
Central	C12	Rebuild Gwinn-Munising 69 kV line @ 69 kV (45 mi)	C15	Rebuild Munising-Seney 69 kV line, new Seney-Roberts 69 kV line (34 mi, 24 mi)
Eastern	E3	Add a 138 kV phase-shifting transformer at Straits (10° shift)	E3	Add a 138 kV phase-shifting transformer at Straits (30° shift)
Eastern	E4	Pine River-Straits 2x69 kV rebuild at 69/69 kV (25 mi)		
Eastern	E2	Uprate the overhead portions of Straits-McGulpin 138 kV circuits #1 & #3 to 230° F		
Eastern	E20	Add a 2 nd 8.16 MVAR 138 kV capacitor bank at Hiawatha		
Eastern	E6	Uprate Pine River-9 Mile 69 kV line 6923 to 167° F		

All solutions groups assume the retirement of the Munising 69 kV voltage regulator

Solutions Common to All Solutions Groups

U.P. Zone	Map Item #	Solutions Description
Western	W16	Adjust the Iron Grove/Aspen 138/69 kV transformer no-load tap ratios to unity
Western	W15	Add a 2 nd Iron Grove 138/69 kV transformer
Western	W19	Uprate the Atlantic-Henry St. 69 kV line to 167° F
Western	W24	Uprate the Ontonagon-UPPSCO Tap 69 kV line to 185° F
Western	W14	Add a 2 nd M38 138 kV 8.16 MVAR capacitor bank
Western	W22	Reconductor the Atlantic-Elevation St. Tap #2-Osceola 69 kV line
Western	W23	Add 100% power factor correction to the Keweenaw point load
Western	W25	Replace the Ontonagon 138/69 kV transformer with 60 MVA unit
Western	W27	Adjust the Atlantic 138/69 kV transformer(s) LTC Vhigh/Vlow settings to 1.03/1.01 pu
Central	C2a	Uprate Escanaba-area 69 kV loop to 167°/200° F SE
Central	C18a	Reconductor Gwinn-Sawyer 69 kV line with 336 ACSR conductors
Central	C21	Arnold 345 kV SS, 345/138 kV 500 MVA xfmr
Central	C30	Uprate North Lake-Barnum Tap 69 kV line to 120° F
Central	C22	New Escanaba 69 kV substation
Central	C27	Uprate the North Lake 138/69 kV transformer #1 to 50 MVA
Central	C28	Uprate the Big Q-Kingsford Metals Tap 69 kV line to 84 MVA (SS limiters)
Central	C29	Uprate the Plains-Bluff View Tap 69 kV line to 46 MVA (SS limiters)
Central	C31	Add 100% distribution power factor correction to the Harris point load addition
Central	C32	Increase the Nordic 138/69 kV transformer LTC voltage settings by 1%
Eastern	E14	Adjust the Hiawatha 138/69 kV transformer no-load tap ratios to unity