

TABLE UP-4-C															
PERFORMANCE CRITERIA LIMITS EXCEEDED AND OTHER CONSTRAINTS – Overloaded Facilities, U.P. Central Zone															
U.P. Zone	Map Item #	Criteria Exceeded/Need	Facility Outage	Robust Economy		High Retirements		High Environmental		Slow Growth		DOE 20% Wind		Fuel & Invest. Limit.	
				2018 % of Facility Rating	2024 % of Facility Rating	2018 % of Facility Rating	2024 % of Facility Rating	2018 % of Facility Rating	2024 % of Facility Rating	2018 % of Facility Rating	2024 % of Facility Rating	2018 % of Facility Rating	2024 % of Facility Rating	2018 % of Facility Rating	2024 % of Facility Rating
Central	1	Chandler 138/69kV	Base Case, Nordic-Mountain 69 kV, Mountain-Harris Tap 69 kV, Forsyth 138/69kV, Munising 138/69 kV, Nordic 138/69 kV, Plains-Nordic 138 kV	96%	99-105%	150%-211%	149%-201%	110%-135%	112%-137%			157%-218%	152%-211%		
Central	2	Chandler-Delta 69 kV #1	Chandler-Delta 69 kV #2, Base Case, Mead-Bay View Tap 69 kV, Bay View Tap-North Bluff 69 kV	97%-117%	151%	208%-260%	195%-365%	119%-199%	123%-200%			211%-250%	381%		
Central	3	Chandler-Delta 69 kV #2	Chandler-Delta 69 kV #1, Base Case, Mead-Bay View Tap 69 kV, Bay View Tap-North Bluff 69 kV	113%	145%	151%-188%	141%-200%	99%-188%	99%-193%			152%-181%	208%		
Central	4	Gwinn-Sawyer 69 kV	Base Case	206%	429%								112%		
Central	5	Forsyth 138/69 kV	Chandler 138/69kV, Munising 138/69 kV		100%	Did not solve, 152%	Did not solve	102%	104%			153%	177%		
Central	6	Chandler-Cornell Tap 69 kV, Cornell Tap-Watson 69 kV, Watson-Forsyth 69 kV	Chandler 138/69kV	106%-121%	159%-181%	Did not solve	Did not solve	Did not solve	Did not solve			Did not solve	Did not solve		
Central	7	Forsyth-Gwinn 69 kV	Forsyth-Munising 138 kV, Munising 138/69 kV		149%-194%	166%	Did not solve	105%	108%-109%			172%	222%	102%	110%
Central	8	Munising-Alger 69 kV, Alger-AD Hiawatha 69 kV, AD Hiawatha-Forest Lake 69 kV, Forest Lake-Chatham 69kV, Chatham-Gwinn 69 kV	Forsyth-Gwinn 69 kV, Munising 138/69 kV, Munising-Forsyth 138 kV	122%-135%	121%-297%	123%-162%	133%-158%, Did not solve	100%-111%	103%-115%			140%-169%	154%-214%	103%	98-113%
Central	9	Munising 138/69 kV	Forsyth-Gwinn 69 kV		95%	103%	110%					107%	133%		
Central	10	North Lake 138/69 kV #1	North Lake 138/69 kV #2	128%	159%							123%	137%		
Central	11	Delta-Mead 69 kV, Chandler-Delta 69 kV #1, Chandler-Delta 69 kV #2, Masonville-Lakehead Tap 69 kV, Masonville-Gladstone 69 kV, Gladstone-North Bluff 69 kV, Chandler-Lakehead Tap 69 kV, Delta-West Side Tap 69 kV	Base Case, Chandler-Lakehead Tap 69 kV, Lakehead Tap-Masonville 69 kV		104%	242%-350%	370%, Did not solve	113%-197%, Did not solve	114%-200%, Did not solve			98%-244%	95%-211%		
Central	12	Nordic 138/69 kV	Plains-Aspen 138 kV, Peavy Falls-Sagola Tap 69 kV		114%	101%-112%	101%-107%					112%	120%		
Central	13	Plains W-Big Q Tap 69 kV	Plains E-Big Q 69 kV		101%	102%	106%					106%	114%		
Central	14	Presque Isle-Empire 6 138 kV #1	Empire2-3 138kV, Presque Isle-North Lake 138 kV			95%	98%						103%		
Central	15	Big Q-KFM T 69 kV	Twin Falls N-S 69kV, Twin Falls S-Bass Lake 69 kV, Plains-Twin Falls N 69 kV	98%									106%		
Central	16	North Lake-Barnum Tap 69 kV	Base Case		112%										

TABLE UP-4A-C														
PERFORMANCE CRITERIA LIMITS EXCEEDED AND OTHER CONSTRAINTS – Low Voltages, U.P. Central Zone														
U.P. Zone	Criteria Exceeded/Need	Facility Outage	Robust Economy		High Retirements		High Environmental		Slow Growth		DOE 20% Wind		Fuel & Invest. Limit.	
			2018 % of Nominal Bus V	2024 % of Nominal Bus V	2018 % of Nominal Bus V	2024 % of Nominal Bus V	2018 % of Nominal Bus V	2024 % of Nominal Bus V	2018 % of Nominal Bus V	2024 % of Nominal Bus V	2018 % of Nominal Bus V	2024 % of Nominal Bus V	2018 % of Nominal Bus V	2024 % of Nominal Bus V
Central	Chandler, Delta, Escanaba1, Escanaba2, West Side, Lakehead Tap, Lakehead, Masonville, Gladstone, North Bluff, Bay View, Mead, Harris, Cornell, Watson 69 kV bus voltages	Chandler 138/69 kV	81.3%-89.6%	61.2%-76.0%	Did not solve	Did not solve	Did not solve	Did not solve			Did not solve	Did not solve		
Central	Sawyer, Gwinn, Chatham, Forest Lake, AD-Hiawatha, Alger 69 kV bus voltages; Munising 138 kV bus voltage	Forsyth-Gwinn 69 kV		77.9%-89.0%	60.9%-83.5%	55.4%-81.4%					58.9%-82.9%	37.2%-74.1%	87.2%-89.5%	83.5%-86.1%
Central	West Side, Escanaba1, Escanaba2, Harris, North Bluff, Bay View, Gladstone, Mead, Delta, Masonville, Chandler, Lakehead 69 kV bus voltages	Delta-West Side Tap 69 kV, Delta-Escanaba1 69 kV, Chandler-Delta 69 kV #1, Chandler-Delta 69 kV #2, Chandler-Lakehead Tap 69 kV, Delta-Mead 69 kV, Mead-Bay View Tap 69 kV, Masonville-Gladstone 69 kV		80.0%-81.1%	Did not solve, 63.8%-76.2%	Majority did not solve	82.7%-91.9%	81.2%-91.7%			Did not solve	Did not solve		
Central	Munising 138 kV bus voltage; Munising, Alger, AD-Hiawatha, Forest Lake, Chatham, Gwinn, Sawyer, Forsyth 69 kV bus voltages	Forsyth-Munising 138 kV, Munising 138/69 kV	87.5%-92.0%	73.2%-87.5%	53.9%-79.6%	Did not solve	80.1%-88.9%	79.4%-88.5%			Did not solve, 55.7%-79.4%	Did not solve, 41.0%-88.9%	88.2%	85.0%-91.8%
Central	Mead, Bay View, North Bluff, Delta, Sawyer, Harris, Gwinn, Forsyth, Chatham, West Side 69 kV bus voltages; Munising, Chandler, Perkins, Forsyth 138 kV bus voltages	Base Case	95.6%	93.1%-95.9%	69.7%-94.0%	76.7%-94.7% (Mead Synch Condenser)	95.8%-95.9%	95.1%-95.9%			69.7%-95.0%	67.6%-94.5%		
Central	Sawyer, Gwinn, Forsyth, Chatham, Forest Lake, Alger, AD-Hiawatha, Munising, Watson, Harris, West Side, North Bluff, Gladstone, Bay View, Lakehead, Masonville, Mead 69 kV bus voltages; Munising 138 kV bus voltage	Forsyth 138/69 kV			Did not solve	Did not solve					Did not solve	Did not solve		
Central	Harris, Mountain, West Side, North Bluff, Gladstone, Mead 69 kV bus voltages; Chandler 138 kV bus voltage	Nordic 138/69 kV, Nordic-Mountain 69 kV, Mountain-Harris Tap 69 kV, Harris Tap-Cornell 69 kV, Chandler-Cornell 69 kV	89.6%-91.1%	88.4%-91.0%	65.7%-91.2%	Did not solve					66.3%-90.3%	68.6%-85.2%		
Central	Kingsford Metals, Iron Mt. East, Grede, Armory 69 kV bus voltages	Big Q-KFM Tap 69 kV, KFM Tap-Iron Mt. East 69 kV		91.2%-91.5%								91.2%-91.5%		
Central	Sawyer, Harris, Mead, Gladstone, West Side 69 kV bus voltages; Chandler, Perkins, Munising, Arnold 138 kV bus voltages	Plains-Arnold 138 kV, Plains-Morgan 345 kV, Morgan-Hwy22 345 kV, Empire-Forsyth 138 kV, Dead River-Plains 345 kV		89.9%-91.7%	Did not solve	Did not solve					Did not solve, 64.6%-89.6%	Did not solve, 65.9%-87.3%		

