

**TABLE ZS-3
PERFORMANCE CRITERIA LIMITS EXCEEDED AND OTHER CONSTRAINTS – 2019 Summer Peak with Nelson Dewey and without Nelson Dewey**

Planning Zone	Criteria Exceeded/Need	2019 Summer Peak Case without Nelson Dewey		2019 Summer Peak Case with Nelson Dewey		Facility Outage(s)	Project or Mitigation
		% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage		
1	Berlin, River Run, Fountain Valley, Redgranite, ACEC Spring Lake, Silver Lake, Fox River 69-kV buses		86.8 - 91.9%		86.6 - 91.9%	Wautoma - Silver Lake Tap 69-kV line Silver Lake - ACEC Spring Lake 69-kV line ACEC Spring Lake - Redgranite 69-kV line Ripon - Northwest Ripon Tap 69-kV line Metomen - Ripon 69-kV line	Ripon capacitor bank expansion & Metomen transformer replacement
1	Dartford, Northwest Ripon, Industrial Park, Ripon, Southwest Ripon 69-kV buses		86.6 - 91.6%		86.5 - 91.8%	Ripon - Northwest Ripon Tap 69-kV line Metomen - Ripon 69-kV line Sunset Point - Winneconne 69-kV line Wautoma - Silver Lake Tap 69-kV line	Ripon capacitor bank expansion
1	Winneconne, Omro Industrial Park 69-kV buses		86.3 - 91.9%		85.7 - 91.9%	Sunset Point - Winneconne 69-kV line Ripon - Northwest Ripon Tap 69-kV line Metomen - Ripon 69-kV line Winneconne - Omro Tap 69-kV line	Ripon capacitor bank expansion, Metomen transformer replacement and Wautoma 2 nd transformer
1	Lincoln Pumping Station, Grand Marsh (PP&L), ACEC Brooks 69-kV buses		91.1 - 91.9%		90.7 - 91.8%	Necedah Tap - Big Pond 69-kV line Petenwell - Big Pond 69-kV line Petenwell 138/69 kV transformer	No project needed at this time
1	Sigel 138-kV bus		91.8%		91.8%	Sigel - Arpin 138-kV line	No project needed at this time
1	Petenwell, Council Creek 138-kV buses		94.6 - 95.0% 88.4 - 91.6%		94.5 - 94.8% 88.0 - 91.7%	System Intact Saratoga - Petenwell 138-kV line Sigel - Arpin 138-kV line	Monroe County – Council Creek 161-kV line
1	Baker, Saratoga 115-kV buses		91.6%		91.4%	Baker - Coyne 115-kV line	No project needed at this time
1	Petenwell, Big Pond, Necedah, Whistling Wings, ACEC Dellwood, Friendship, ACEC Friendship, Houghton Rock, McKenna 69-kV buses		84.0 - 91.1%		83.6 - 91.7%	Necedah Tap - Big Pond 69-kV line Petenwell - Big Pond 69-kV line Petenwell 138/69-kV transformer Necedah Tap – Whistling Wings Tap 69-kV line	McKenna capacitor expansion
1	ACEC Coloma 69-kV bus		--		91.9%	Chaffee Creek - Coloma Tap 69-kV line	No project needed at this time
1	Fairwater 69-kV bus		91.9%		91.8%	Metomen 138/69-kV transformer	No project needed at this time
1	Antigo, Aurora Street 115-kV buses		90.0 - 90.1%		90.0 - 90.2%	Antigo - Black Brook 115-kV line	No project needed at this time
1	Petenwell 138/69-kV transformer #31	98.1% 95.7%		99.8% 95.7%		System Intact McKenna - Houghton Rock 69-kV line	No project needed at this time
1	McKenna - ACEC Quincy 69-kV line Castle Rock - ACEC Quincy 69-kV line	97.8 - 113.8%		97.0 - 120.7%		Necedah Tap - Big Pond 69-kV line Petenwell - Big Pond 69-kV line Petenwell 138/69 kV transformer Necedah - Whistling Wings Tap 69-kV line Kilbourn - Winnebago ACEC 69-KV line	Uprate Castle Rock - McKenna 69-KV line
1	Caroline 115/69-kV transformer #61	109.0%		108.6%		Whitcomb 115/69-kV transformer #31	Reduce area capacitor banks and redispach area generation.

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1	Council Creek - Tomah Industrial Park Tap 69-kV line	103.5%		103.8%		System Intact	Monroe County – Council Creek 161-kV line
1	Harrison 138/69-kV transformer	--		99.9%		System Intact	No project needed at this time
1	Metomen - Ripon 69-kV line	98.4% 98.1 - 105.8%		93.0% 97.3 - 101.9%		System Intact Sunset Point - Winneconne 69-kV line North Randolph - Markesan Tap 69-kV line Winneconne - Omro Tap 69-kV line	Reconfigure the North Randolph-Ripon 69-kV line to form a second Ripon-Metomen 69-kV line and retire the circuit between Metomen and the Mackford Prairie tap
1	Metomen 138/69-kV transformer #31	113.6% 108.7 - 130.9%		111.7% 107.7 - 126.5%		System Intact Ripon - Southwest Ripon Tap 69-kV line Southwest Ripon - Mackford Prairie 69-kV line North Randolph - Markesan Tap 69-kV line North Fond du Lac - Rosendale 69-kV line	Metomen transformer replacement
1	Northwest Ripon - Ripon 69-kV line	101.3 - 113.4%		98.2 - 110.5%		Sunset Point - Winneconne 69-kV line Winneconne - Omro Tap 69-kV line	SW Ripon T-D interconnection
1	Omro - Winneconne 69-kV line Winneconne - Sunset Point 69-kV line	97.0 - 103.3%		95.4 - 107.5%		Ripon - Northwest Ripon Tap 69-kV line Metomen - Ripon 69-kV line	Load forecast variations
1	Rocky Run 345/115-kV transformer #4	95.9 - 97.1%		96.3 - 97.5%		Rocky Run 345/115-kV transformer #1 Rocky Run 345/115-kV transformer #2	No project needed at this time
1	Whitcomb 115/69-kV transformer #31	101.1%		101.6%		System Intact	Reduce area capacitor banks and redispach area generation
1	Wautoma 138/69-kV transformer #31	112.0% 95.6 - 99.8%		108.2% 95.2 - 99.2%		System Intact Portage - Lakehead Pipeline Portage 69-kV line Sand Lake Tap - Sand Lake 69-kV line Sand Lake 138/69-kV transformer #31 Endeavor - Lakehead Pipeline 69-kV line Ripon - Northwest Ripon Tap 69-kV line	Install a second 138/69-kV transformer at Wautoma Substation
2	Delta – Mead 69-kV line	101.0 – 158.1%		100.9 – 158.1%		System Intact Chandler-Lakehead Tap 69-kV line Lakehead Tap-Masonville 69-kV line Masonville-Gladstone 69-kV line Gladstone-North Bluff 69-kV line North Bluff-Bay Tap 69-kV line Bay Tap-Mead 69-kV line	Uprate Delta-Mead-North Bluff 69-kV line
2	Chandler-Delta 69-kV #1 line	109.5%		109.6%		Chandler-Delta 69-kV #2 line	Uprate Chandler-Delta 69-kV line #1
2	Chandler – Delta 69-kV #2 line	103.4%		103.4%		Chandler - Delta 69-kV #1 line	Uprate Chandler-Delta 69-kV line #2
2	Atlantic - M38 69-kV line	121.3 - 122.4%		121.9 - 122.0%		Atlantic - M-38 138-kV line Atlantic 138/69-kV transformer #1	Uprate Atlantic - M38 69-kV line

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Planning Zone	Criteria Exceeded/Need	2019 Summer Peak Case without Nelson Dewey		2019 Summer Peak Case with Nelson Dewey		Facility Outage(s)	Project or Mitigation
2	Chandler-Lakehead Tap 69-kV line Lakehead Tap-Masonville 69-kV line Masonville-Gladstone 69-kV line Gladstone-North Bluff 69-kV line North Bluff-Bay Tap 69-kV line Bay Tap-Mead 69-kV line	121.6 - 162.2%		121.4 - 162.0%		Delta - Mead 69-kV line	Uprate Chandler-Masonville, Masonville-Gladstone, Gladstone-North Bluff, Delta-Mead-North Bluff 69-kV lines
2	Pine River - Straits 69-kV line Straits-Evergreen 69-kV line Pine River-Evergreen 69-kV line	98.0 - 109.2%		96.1 - 106.5%		Brevort - Straits 138-kV line Brevort - Lakehead 138-kV line Hiawatha - Lakehead 139-kV line Straits - Evergreen 69-kV line	Rebuild Straits-Pine River 69 kV lines
2	Pine River-Rudyard 69-kV line Rudyard-Tone 69-kV line	97.3%		99.8% - 103.9%		Hiawatha - Engadine 69-kV line, Pine River - 9 Mile 69-kV line	Uprate or rebuild Pine River - Rudyard - Tone 69-kV line
2	Nordic - Mountain 69-kV line	111.4%		--		Chandler 138/69-kV transformer #1	Uprate Nordic-Mountain 69-kV line
2	New Quinnesec – Kingsford Tap 69-kV line	100.0% - 100.3%		99.7% - 99.9%		Twin Falls North -Twin Falls South 69-kV line Twin Falls South - Bass Lake 69-kV line	Uprate New Quinnesec - Kingsford Tap 69-kV line
2	Lakota 69-kV bus		117.1%		117.2%	Conover - Lakota 69-kV line	Adjust 138/69-kV transformer taps at Lakota Road
2	Chandler, Cornell Tap, Delta, Escanaba 1, Escanaba 2, Masonville, Mead, Gladstone, West, Lakehead, Bay View, North Bluff, Cornell, Harris 69-kV buses		88.4% - 91.4%		88.2% - 91.2%	Chandler 138/69-kV transformer #1	Increase generation at Escanaba/Mead/Gladstone
2	Hulbert, Eckerman, Newberry Village, Louisiana Pacific, Newberry, Newberry Hospital, Roberts, Raco 69-kV buses		78.9% - 91.9%		76.0% - 92.0%	Hiawatha-Engadine, Engadine-Newberry, Newberry-Newberry Hospital Tap, Newberry Hospital Tap-Roberts 69-kV lines	Increase generation at Newberry, Dafter, DeTour, US Hydro, Edison Sault
2	Atlantic 138-kV bus Keweenaw 69-kV bus		86.1 - 91.8%		86.0%	Atlantic-M-38 138-kV line ATC_B2_ATLAN	increase generation at Portage
2	Munising 138-kV bus		91.8%		91.8%	Forsyth-Munising 138-kV line	Adjust 138/69-kV transformer taps at Munising
2	Aspen, Iron Grove 138-kV buses		91.1% - 91.5%		91.0% - 91.3%	Aspen-Plains 138-kV line	Adjust 138/69-kV transformer taps at Aspen, Iron Grove
2	Iron Grove 138-kV bus		91.0%		91.3%	Aspen-Iron Grove 138-kV line	Adjust 138/69-kV transformer taps at Iron Grove
2	Lakehead 69-kV bus		91.9%		--	Iron Grove 138/69-kV transformer	Add second Iron Grove 138/69-kV transformer
3	Artesian - Rock Springs 138-kV line Rock Springs - Kirkwood 138-kV line	100.3 - 104.4%		99.0 - 103.4%		Trienda - Lewiston ACEC 138-kV line Lewiston - Kilbourn ACEC 138-KV line	Construct a Lake Delton-Birchwood 138-kV line
3	Dane - Lodi Tap 69-kV line	100.6%		100.9%		Island Street - Kirkwood 69-kV line	Rebuild Dane-Dam Heights 69-KV line
3	Portage – Trienda 138-kV line	96.1%		--		Portage – Trienda1 138-kV line	No project needed at this time.
3	Lake Geneva – South Lake Geneva 69-kV line	126.3% 104.7%		126.3% 104.8%		Cobblestone–Brick Church 69-kV line Cobblestone–Zenda Tap 69-kV line	North Lake Geneva – South Lake Geneva 138-kV line
3	Katzenberg - South Lake Geneva 69-kV line	96.7%		96.7%		Cobblestone–Brick Church 69-kV line	Spring Valley – Twin Lakes line
3	Colley Road 138/69-kV transformer #31	103.6%		103.2%		Paddock 138/69-kV transformer #31	Install Bass Creek transformer
3	Enzyme – RC3 69-kV line	95.4%		--		Brick Church 138/69-kV transformer #31	Rebuild Y-32 Colley Road-Brick Church 69-kV line
3	Colley Road – Marine 138-kV line			99.6%		Paddock-Northwest Beloit 138-kV line	Upgrade Colley Road – Marine 138-kV line
3	Cobblestone – Brick Church 69-kV line	102.2%		102.2%		North Lake Geneva – Lake Geneva 69-kV line	North Lake Geneva – South Lake Geneva 138kV line

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3	Cobblestone – Zenda Tap 69-kV line	123.3%		123.4%	95.0%	North Lake Geneva – Lake Geneva 69-kV line Lake Geneva – South Lake Geneva 69kV line	Spring Valley – Twin Lakes line
3	Katzenberg – Zenda Tap 69-kV line	109.5%		109.5%		North Lake Geneva – Lake Geneva 69-kV line	North Lake Geneva – South Lake Geneva 138-kV line
3	Cobblestone 69-kV bus		89.9%		89.8%	Cobblestone–Brick Church 69-kV line	North Lake Geneva – South Lake Geneva 138-kV line
3	Zenda 69-kV bus		91.4%		91.3%	North Lake Geneva-Lake Geneva 69-kV line Cobblestone–Brick Church 69-kV line	North Lake Geneva – South Lake Geneva 138-kV line
			90.9%		90.8%		
3	Brick Church 138-kV bus		91.2%		91.2%	Beloit Gateway–Dickinson 138-kV line Colley Road–Dickinson 138-kV line	Brick Church capacitors or Spring Valley – Twin Lakes line
			90.4%		90.5%		
3	Williams Bay 138-kV bus		91.9%		91.9%	Colley Road–Dickinson 138-kV line	Brick Church caps or Spring Valley – Twin Lakes line
3	Lake Geneva 69-kV bus		83.5%		83.5%	North Lake Geneva–Lake Geneva 69-kV line	North Lake Geneva – South Lake Geneva 138-kV line
3	Katzenberg 69-kV bus		85.1%		85.1%	North Lake Geneva–Lake Geneva 69-kV line	North Lake Geneva – South Lake Geneva 138-kV line
3	Twin Lakes 69-kV bus		84.4%		84.3%	North Lake Geneva–Lake Geneva 69-kV line	North Lake Geneva – South Lake Geneva 138-kV line
3	South Lake Geneva 69-kV bus		84.2%		84.2%	North Lake Geneva–Lake Geneva 69-kV line	North Lake Geneva – South Lake Geneva 138-kV line
3	Dickinson 138-kV bus		89.4%		89.4%	Colley Road–Dickinson 138-kV line	Brick Church caps or Spring Valley – Twin Lakes line
3	Concord 138-kV bus		90.2%		89.7%	Concord 138-kV 4-5 bus tie	Install Concord capacitors
3	Butler Ridge 138-kV bus		--		91.7%	Concord 138-kV 4-5 bus tie	Install Concord capacitors
3	Rubicon 138-kV bus		91.9%		91.4%	Concord 138-kV 4-5 bus tie	Install Concord capacitors
3	Academy – Columbus Muni #3 Tap 69-kV line	--		106.7 – 112.2%		North Randolph – Fox Lake 138-kV line Fox Lake – North Beaver Dam 138-kV line	Horicon – East Beaver Dam 138-kV line project
3	Columbus Muni #3 Tap – Columbus 69-kV line	--		104.9 – 100.4%		North Randolph – Fox Lake 138-kV line Fox Lake – North Beaver Dam 138-kV line	Horicon – East Beaver Dam 138-kV line project
3	South Beaver Dam – Center Street 69-kV line	--		98.3%		North Randolph – Fox Lake 138-kV line	
3	South Fond du Lac – Koch Oil Tap 69-kV line	--		97.3 – 102.2%		North Randolph – Fox Lake 138-kV line Fox Lake – North Beaver Dam 138-kV line	Horicon – East Beaver Dam 138-kV line project
3	Koch Oil Tap – Waupun 69-kV line	--		97.9 – 103.1%		North Randolph – Fox Lake 138-kV line Fox Lake – North Beaver Dam 138-kV line	Horicon – East Beaver Dam 138-kV line project
3	Hubbard and Hustisford 138-kV buses		--		96.0 – 96.2%	System Intact Rubicon – Hustisford 138-kV line Hustisford – Hubbard 138-kV line Concord 138-kV 4-5 bus tie	Horicon – East Beaver Dam 138-kV line project
					85.0 – 90.6%		
3	Fox Lake, North Beaver Dam and East Beaver Dam 138-kV buses		--		90.2 – 90.4%	North Randolph – Fox Lake 138-kV line	Horicon – East Beaver Dam 138-kV line project
3	Koch Oil 69-kV bus		--		92.0%	South Fond du Lac – Koch Oil Tap 69-kV line	No project identified. Additional study needed.
3	Horicon Industrial Park 69-kV bus		--		91.9%	Hubbard – Horicon Ind. Park 69-kV line	No project identified. Additional study needed.
3	McCue – Harmony - Lamar 69-kV line	--		104.1 - 101%		System Intact	Construct double-circuit line between McCue and Lamar substations
3	Hillman 138/69-kV transformer #31	101.3 - 98.5%		105.5 - 96.7%		DPC Galena - Pilot 69-kV line Pilot -Terr Tap 69-kV line Terr Tap-LNGHLLW8 69-kV line	Replace the existing 46 MVA Hillman 138/69-kV transformer with a 100 MVA transformer
3	McCue – Harmony - Lamar 69-kV line	102.5 - 95.0%		123.0 - 96.0%		Various outages	Y61 McCue-Lamar line uprate and 2017 Construct double-circuit line between McCue and Lamar substations

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3	North Monroe – Idle Hour 69-kV line	103.1 - 95.8%		107.2 - 97.4%		Darlington- Gratiot 69-kV line; Darlington 138/69-kV transformer; Browntown -Jennings Rd 69-kV line; Gratiot - Wiota 69-kV line; Wiota – Jennings Road 69-kV line; Brodhead - Newark 69-kV line; Paddock -Newark 69-kV line; Paddock 138/69-kV transformer #31	Install a 138/69-kV transformer at Bass Creek Substation
3	Dana – Sheepskin 69-kV line	115.2 - 110.8%		133.4 - 127.4%		McCue - Harmony 69-kV line Harmony -Lamar 69-kV line	Sheepskin substation project which will uprate Y-61 Sheepskin-Dana 69-kV line to 95 MVA and 2017 Construct double-circuit line between McCue and Lamar substations
3	Stoughton - Sheepskin 69-kV line	--		114.9 - 110.1%		McCue - Harmony 69-kV line Harmony-Lamar 69-kV line	Construct double-circuit line between McCue and Lamar substations
3	Spring Green 138/69-kV transformer #31	--		95.2%		Gran Grae-Wauzeka 69-kV line	Install a second 138/69-kV transformer at Spring Green with a 100 MVA summer normal rating
3	Gran Grae – Wauzeka - Boscobel 69-kV line	100 - 96.2%		105.6 - 100.4%		Spring Green 138/69-kV transformer #31; Lone Rock-Spring Green 69-kV line; Nelson Dewey-Lancaster 138-kV line; Lancaster-Eden 138-kV line; Eden-Wyoming Valley 138-kV line; Spring Green-Wyoming Valley 138-kV line	Uprate Y-40 Gran Grae-Boscobel 69-kV line to achieve a 99 MVA summer emergency rating
3	Boscobel - Blue River 69-kV line	--		96.3 - 95.2%		Spring Green 138/69-kV transformer #31 Nelson Dewey-Lancaster 138-kV line	No project identified
3	West Middleton - Timberlane 69-kV line	106.5%		97.9%		Spring Green 138/69-kV transformer #31	Install a second 138/69-kV transformer at Spring Green with a 100 MVA summer normal rating
3	Waunakee Industrial Park - Huiskamp 69-kV line	95.3%		94.0%		North Madison 138/69-kV transformer #31	Potential Y132 line switch replacement project at Waunakee Industrial Park to achieve 170 MVA SE out of ten years
3	Waunakee Switching Station - Waunakee 2 69-kV line	101.3%		101.5%		West Middleton - Pheasant Branch 69-kV line	Potential Waunakee Switching Station-Waunakee 2 69-kV 0.58 miles of line (Y-131) and terminal uprate to achieve 115 MVA SE
3	Fitchburg-Syene - Ninesprings 69-kV line	126.2 - 107.9%		129.2 - 107.7%		Royster - AGA Tap 69-kV line AGA Tap - Pflaum 69-kV line	Uprate Fitchburg-Nine Springs line, uprate Pflaum - Royster line, install 2-16.33 MVAR 69 kV capacitor banks at Nine Springs and move the AGA load onto Femrite - Royster line
3	Royster - AGA Tap - Pflaum 69-kV line	126.5 - 102.8%		126.5 - 103%		Fitchburg - Syene 69-kV line Ninesprings - Syene 69-kV line	Uprate Fitchburg-Nine Springs line, uprate Pflaum - Royster line, install 2-16.33 MVAR 69 kV capacitor banks at Nine Springs and move the AGA load onto Femrite - Royster line
3	West Middleton - West Town 69-kV line	--		95%		West Middleton - Pleasant View 138-kV line	Potential 1.98 miles West Middleton-West Town 69-kV line (6997) uprate and terminal uprate to achieve 106 MVA SE out of ten years
3	Royster - Sycamore 69-kV line	96.5%		96.8%		Femrite 138/69-kV transformer #31	Uprate the 6986 Royster to Sycamore 69-kV line to 115 MVA
3	Verona, Oak Ridge, Fitchburg and Cross Country 138-kV buses		95 - 95.7%		94.6 - 95.9%	System intact	Verona 1-16.33 Mvar 69-kV cap bank and potential 2-49 Mvar 138kV cap banks at Oak Ridge
3	Harmony, Lamar, Fulton, Saunders Creek , Dana, Sheepskin, Bass Creek, Footville, Center, Union Townline, Orfordville and Evansville 69-kV buses		88.9 - 90.6%		76.2 - 91.3%	McCue-Harmony 69-kV line Harmony-Lamar 69-kV line	Lamar 2-16.33 Mvar 69-kV cap banks; 2017 Construct double-circuit line between McCue and Lamar substations
3	Verona 138-kV bus		86.3%		85.5%	Verona-Oak Ridge 138-kV line	Verona 1-16.33 Mvar 69-kV cap bank / Adjust Verona 138/69-kV transformer setting
3	Verona 138-kV bus		--		91.9%	Rockdale-West Middleton 345-kV line	Verona 1-16.33 Mvar 69-kV cap bank and potential 2-49 Mvar 138kV capacitor banks at Oak Ridge
3	Southwest Verona 69-kV bus		90.4%		90%	Verona-Southwest Verona 69-kV line	Potential Mount Horeb capacitor bank upgrade or addition
3	Brodhead Muni 3, Brodhead Muni 2, Brodhead Muni 1, Brodhead, RCEC Orfordville, Bass Creek, Footville, Center, Union Townline and Evansville 69-kV buses		--		87 - 91.8%	Brodhead Switching Station-Brodhead Muni 3 69-kV line; Brodhead Muni 3-Brodhead Muni 2 69-kV line	Install a 138/69-kV transformer at Bass Creek Substation
3	Muscoda, Lone Rock, Avoca, and Blue River 69-kV buses		90.3 - 91.8%		90 - 91.8%	Lone Rock-Spring Green 69-kV line Spring Green 138/69-kV transformer #31	Install 1-8.16 MVAR capacitor bank at Boscobel 69-kV Substation and upgrade existing 5.4 MVAR bank with an 8.16 MVAR bank

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		% of Facility Rating	% of Nominal bus voltage	% of Facility Rating	% of Nominal bus voltage		
3	Burke, Reiner and Colorado 69-kV buses		91.9%		91.5 - 91.6%	Reiner 138/69-kV transformer #31 Reiner-Burke Tap 69-kV line	Install 2-16.33 Mvar 69-kV capacitor banks at Sun Prairie
3	AGA, Pflaum 69-kV buses		90.5 - 90.7%		90.6 - 90.8%	Royster-AGA Tap 69-kV line	Uprate Fitchburg-Nine Springs line, uprate Pflaum - Royster line, install 2-16.33 MVAR 69 kV capacitor banks at Nine Springs and move the AGA load onto Femrite - Royster line
3	Lancaster, Wyoming Valley and Eden 138-kV buses		90.9 - 91.9%		89.8 - 90.8%	Nelson Dewey-Lancaster 138-kV line Lancaster-Eden 138-kV line	Install 2-16.33 Mvar 69-kV capacitor banks at Eden Substation
3	Pleasant View, Hawk, Fitchburg and Cross Country 138-kV buses		91.5 - 91.9%		91.2 - 91.6%	West Middleton-Pleasant View 138-kV line	Verona 1-16.33 Mvar 69-kV cap bank and potential 2018 2-49 Mvar 138kV cap banks at Oak Ridge
4	Bluestone 69-kV bus		--		91.4%	Finger Road – Bluestone 69-kV line	???
4	Sister Bay 69-kV bus		--		95.9%	System Intact	Canal – Dunn Road 138-kV line project
5	Bain 345/138-kV transformer #5	159.1%		159.1%		Pleasant Prairie 345-kV 3-4 bus tie	Reduce Pleasant Prairie generation
5	Albers – Kenosha 138-kV line	97.8%		95.9%		Bain – Kenosha 138-kV line	Increase Paris generation
5	Arcadian4- Waukesha1 138-kV line	113.6%		115.2%		Arcadian 6 – Waukesha3 138-kV line	Upgrade Arcadian – Waukesha 138-kV lines or investigate other alternatives
5	Arcadian 345/138-kV transformer #3 Arcadian 345/138-kV transformer #2	108.7% 97.6%		109.7% 98.8%		Arcadian 345/138-kV transformer #1	Replace Arcadian transformers or investigate other alternatives
5	Branch – Kansas 138-kV line	100.5%		100.5%		Oak Creek – Pennsylvania 138-kV line	Load shift – investigate future projects to resolve loading on the Branch – Kansas 138kV line.
5	Arcadian 6 – Waukesha3 138-kV line	112.6%		114.3%		Arcadian 4- Waukesha1 138-kV line	Upgrade Arcadian – Waukesha 138-kV lines or investigate other alternatives
5	Bark River 138-kV bus		95.8% 91.8%		95.7% 91.7%	System Intact Bark River–Sussex 138-kV line	Increase Germantown generation
5	Hartford 138-kV bus		--		91.9%	Concord 138-kV 3-4 bus tie	Install Concord capacitors
5	Tichigan 138-kV bus		91.4%		91.3%	Split Burlington 138-kV bus	Load shift – Investigate future projects for voltage support at Tichigan
5	Cottonwood 138-kV bus		--		95.3% 91.9%	System Intact Bark River–Sussex 138-kV line	Install Summit & Concord capacitors
5	Germantown 138-kV bus		95.5% 88.7%		95.4% 88.6%	System Intact Maple – Saukville 138-kV line	Increase Germantown generation
5	Maple 138-kV bus		95.7% 88.2%		95.6% 88.1%	System Intact Maple – Saukville 138-kV line	Increase Germantown generation