

*Table AR-1
Transmission System Additions – Asset Renewal Line Work*

System Additions	Projected In-Service Year	Planning Zone	Need Category
Partial rebuild Deer Trail - Whitcomb 69-kV line Y-86	2011	1	Improve condition and increase reliability performance of existing line
Partial rebuild Wautoma - Berlin 69-kV line Y-95	2011	1	Improve condition and increase reliability performance of existing line
Re-insulate Winneconne - Berlin 69-kV line Y-80	2012	1	Improve condition and increase reliability performance of existing line
Rebuild North Point - Rocky Run 115-kV line T-20	2016	1	Improve condition and increase reliability performance of existing line.
Rebuild Wautoma - Montello 69-kV line Y17	2017	1	Improve condition and increase reliability performance of existing line
Rebuild Whiting Avenue-Plover 115-kV line B-106	2019	1	Improve condition and increase reliability performance of existing line
Partial rebuild Coyne - Saratoga 115-kV line T-72	2020	1	Improve condition and increase reliability performance of existing line
Partial rebuild Petenwell - Saratoga 138-kV line X-43	2020	1	Improve condition and increase reliability performance of existing line
Partial rebuild Coyne - Plover 115-kV line J-114	2020	1	Improve condition and increase reliability performance of existing line
Re-insulate top phase and add additional arresters on Chandler - Forsyth 69-kV line (Chandler line)	2012	2	Improve condition and increase reliability performance of existing line
Partial rebuild Roberts - 9 Mile 69-kV line 6952	2012	2	Improve condition and increase reliability performance of existing line
Re-insulate Munising - Forsyth 138-kV line (Munising 138 line)	2012	2	Improve condition and increase reliability performance of existing line
Re-insulate Munising - Gwinn 69-kV line (Autrain line) – Double circuited portion with Munising 138	2012	2	Improve condition and increase reliability performance of existing line
Partial rebuild Munising-Gwinn 69-kV line (Autrain line) – Single circuit portion	2013	2	Improve condition and increase reliability performance of existing line

*Table AR-1
Transmission System Additions – Asset Renewal Line Work (Continued)*

System Additions	Projected In-Service Year	Planning Zone	Need Category
Rebuild Atlantic - M38 69-kV line (Atlantic 69 line)	2013	2	Improve condition and increase reliability performance of existing line
Partial rebuild Blaney Park-Munising 69-kV line (Inland line)	2014	2	Improve condition and increase reliability performance of existing line
Re-insulate Portage - 9 Mile 69-kV lines 6901/6902	2014	2	Improve condition and increase reliability performance of existing line
Re-insulate Sawyer-Gwinn 69-kV line (Sawyer line)	2014	2	Improve condition and increase reliability performance of existing line
Partial rebuild Rexton-Hiawatha 69-kV line ESE_6908	2015	2	Improve condition and increase reliability performance of existing line
Underground cable replacement Magazine-Nine Mile/Three Mile 69-kV line ESE_6903	2015	2	Improve condition and increase reliability performance of existing line
Partial rebuild Conover-Mass 69-kV line 6530	2018	2	Improve condition and increase reliability performance of existing line
Partial rebuild Powers-Chalk Hill 69-kV line 6910	2018	2	Improve condition and increase reliability performance of existing line
Underwater cable replacement McGulpin-Straits 138-kV line 9901	2020	2	Improve condition and increase reliability performance of existing line
Underwater cable replacement McGulpin-Straits 138-kV line 9903	2020	2	Improve condition and increase reliability performance of existing line
Partial rebuild Stage Coach - Spring Green 69-kV line Y-62	2011	3	Improve condition and increase reliability performance of existing line
Install anti-galloping and grounding improvements on Columbia-South Fond Du Lac 345-kV line W5	2011	3	Improve condition and increase reliability performance of existing line

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Transmission System Additions – Asset Renewal Line Work (Continued)*

System Additions	Projected In-Service Year	Planning Zone	Need Category
Partial rebuild Pardeeville Tap - North Randolph/Rio 69-kV line Y-64	2011	3	Improve condition and increase reliability performance of existing line
Partial rebuild Dane - Dam Heights 69-kV line Y-8	2012	3	Improve condition and increase reliability performance of existing line
Underground cable replacement East Towne - Sycamore 69-kV line 6987	2012	3	Improve condition and increase reliability performance of existing line.
Underground cable replacement East Towne to Sycamore 69-kV line 6988	2012	3	Improve condition and increase reliability performance of existing line.
Replace underground with overhead cable on Pheasant Branch - West Middleton 69-kV line 6963	2012	3	Improve condition and increase reliability performance of existing line
Partial rebuild Kirkwood - Trienda 138-kV line X-52	2012	3	Improve condition and increase reliability performance of existing line
Rebuild Doylestown - Rio Pumping station 69-kV line Y20	2013	3	Improve condition and increase reliability performance of existing line
Rebuild Rubicon - Concord 138-kV line 9061	2016	3	Improve condition and increase reliability performance of existing line
Rebuild Rubicon - Butler Ridge 138-kV line RUBG11	2016	3	Improve condition and increase reliability performance of existing line
Rebuild Butler Ridge - Hartford 138-kV line HTFG51	2016	3	Improve condition and increase reliability performance of existing line
Rebuild Darlington - Hillman 138-kV X-14	2016	3	Improve condition and increase reliability performance of existing line
Rebuild Portage - Dam Heights 69-kV line Y16	2016	3	Improve condition and increase reliability performance of existing line
Rebuild Eden - Hillman 69-kV line Y105	2018	3	Improve condition and increase reliability performance of existing line
Rebuild Boscobel - Lone Rock 69-kV line Y-124	2018	3	Improve condition and increase reliability performance of existing line
Underground cable replacement Stagecoach - West Middleton 69-kV line 6927	2019	3	Improve condition and increase reliability performance of existing line

*Table AR-1
Transmission System Additions – Asset Renewal Line Work (Continued)*

System Additions	Projected In-Service Year	Planning Zone	Need Category
Rebuild Colley Road – Brick Church 69-kV line Y-32	2022	3	Improve condition and increase reliability performance of existing line
Partial rebuild Glenview - New Holstein 69-kV line J-140	2011	4	Improve condition and increase reliability performance of existing line
Shield wire replacement Stiles - Pulliam 138-kV lines KK64441-64451	2013	4	Improve condition and increase reliability performance of existing line
Underwater cable replacement First Avenue - Redwood 69-kV line T-46	2015	4	Improve condition and increase reliability performance of existing line
Rebuild Neevin - Butte Des Morts 138-kV line 43021	2015	4	Improve condition and increase reliability performance of existing line
Rebuild Custer - New Holstein 69-kV line P-68	2015	4	Improve condition and increase reliability performance of existing line
Rebuild Sawyer - Dykesville 69-kV line DYKY21	2016	4	Improve condition and increase reliability performance of existing line
Rebuild Sunset Point-Mears-Woodenshoe-Neevin 138-kV lines A-79, MCRG21 and 80952	2016	4	Improve condition and increase reliability performance of existing line
Rebuild Highway V - Oak Street 69-kV line Z-26	2016	4	Improve condition and increase reliability performance of existing line
Rebuild Manrap - Wesmark 69-kV line R-44	2016	4	Improve condition and increase reliability performance of existing line
Rebuild Danz - Finger Road 69-kV line L-64	2016	4	Improve condition and increase reliability performance of existing line
Rebuild Finger Road - Highway V 69-kV line U-47	2016	4	Improve condition and increase reliability performance of existing line
Underground cable replacement University - Danz Avenue 69-kV line O-15	2017	4	Improve condition and increase reliability performance of existing line
Rebuild Butte des Morts - North Appleton 138-kV line 6853	2017	4	Improve condition and increase reliability performance of existing line
Rebuild Pioneer - Sobieski 69-kV line E-83 Tap	2018	4	Improve condition and increase reliability performance of existing line

*Table AR-1
Transmission System Additions – Asset Renewal Line Work (Continued)*

System Additions	Projected In-Service Year	Planning Zone	Need Category
Rebuild Sobieski - Bayport 69-kV line T-98	2018	4	Improve condition and increase reliability performance of existing line
Rebuild Goodman - Caldron Falls 69-kV line J-88	2019	4	Improve condition and increase reliability performance of existing line
Partial rebuild Howard - Pulliam 138-kV line D-82	2019	4	Improve condition and increase reliability performance of existing line
Underground cable replacement Erdman - Lodestar 138-kV line X-48	2019	4	Improve condition and increase reliability performance of existing line
Rebuild Finger Road – Canal 69-kV line J-10	2020	4	Improve condition and increase reliability performance of existing line
Underground cable replacement Edgewater - Erdman 69-kV line Y-31	2021	4	Improve condition and increase reliability performance of existing line
Shield wire replacement Tosa - Butler 138-kV line 5061	2013	5	Improve condition and increase reliability performance of existing line
Shield wire replacement Tosa - Bluemound 138-kV line 5041	2013	5	Improve condition and increase reliability performance of existing line
Shield wire replacement Butler - Tower#4291 138kV line 3443	2013	5	Improve condition and increase reliability performance of existing line
Rebuild Hartford - St. Lawrence 138-kV line 8031	2014	5	Improve condition and increase reliability performance of existing line
Rebuild Cooney - Concord 138-kV line 9042	2015	5	Improve condition and increase reliability performance of existing line
Partial rebuild Merrill Hills - Waukesha 138-kV line 7021	2015	5	Improve condition and increase reliability performance of existing line
Rebuild Albers - Paris 138-kV line 3124	2016	5	Improve condition and increase reliability performance of existing line
Rebuild St. Martins - Edgewood 138-kV line 3013	2017	5	Improve condition and increase reliability performance of existing line
Rebuild and add breaker on Edgewood - Mukwonago 138-kV line 671K61	2017	5	Improve condition and increase reliability performance of existing line

*Table AR-1
Transmission System Additions – Asset Renewal Line Work (Continued)*

System Additions	Projected In-Service Year	Planning Zone	Need Category
Partial rebuild Summit - Merrill Hills 138-kV line 3551	2017	5	Improve condition and increase reliability performance of existing line
Rebuild Oak Creek SW YD – Hayes 138-kV line 811	2019	5	Improve condition and increase reliability performance of existing line

*Table AR-2
Asset Renewal Transformer Replacements*

System Upgrade	Projected In-Service Year	Voltage	Planning Zone	Need Category
Aurora T3	2011	138/69-kV	1	Improve condition, reliability
Bluemound T3	2011	230/138-kV	5	Improve condition, reliability
Bluemound T1	2012	230/138-kV	5	Improve condition, reliability
Edgewater T31 and T32	2012	138/69-kV	4	Improve condition, reliability
Atlantic T1	2013	138/69-kV	2	Improve condition, reliability
Lancaster T31	2014	138/69-kV	3	Improve condition, reliability
Fitzgerald SS – relocate system spare	2014	345/138-kV	4	Reliability
Paddock T22 Spare	2014	345/138-kV	3	Reliability
Replace one transformer	2014	138/69-kV	various	Improve condition, reliability
Replace two transformers	2015	138/69-kV	various	Improve condition, reliability
Replace two transformers	2016	138/69-kV	various	Improve condition, reliability
Replace one transformer	2016	345/138-kV	various	Improve condition, reliability
Replace two transformers	2017	138/69-kV	various	Improve condition, reliability
Replace two transformers	2018	138/69-kV	various	Improve condition, reliability
Replace one transformer	2018	345/138-kV	various	Improve condition, reliability
Replace two transformers	2019	138/69-kV	various	Improve condition, reliability
Replace two transformer	2020	138/69-kV	various	Improve condition, reliability
Replace one transformer	2020	345/138-kV	various	Improve condition, reliability

*Table AR-3
Asset Renewal Instrument Transformer and Arrester Replacements*

System Upgrade	Projected In-Service Year	Voltage	Planning Zone	Need Category
Replace Instrument Transformers and Arresters	2011	various	various	Improve condition, reliability
Replace Instrument Transformers and Arresters	2012	various	various	Improve condition, reliability
Replace Instrument Transformers and Arresters	2013	various	various	Improve condition, reliability
Replace Instrument Transformers and Arresters	2014	various	various	Improve condition, reliability
Replace Instrument Transformers and Arresters	2015	various	various	Improve condition, reliability
Replace Instrument Transformers and Arresters	2016	various	various	Improve condition, reliability
Replace Instrument Transformers and Arresters	2017	various	various	Improve condition, reliability
Replace Instrument Transformers and Arresters	2018	various	various	Improve condition, reliability
Replace Instrument Transformers and Arresters	2019	various	various	Improve condition, reliability
Replace Instrument Transformers and Arresters	2020	various	various	Improve condition, reliability

*Table AR-4
Asset Relay Replacements*

System Upgrade	Projected In-Service Year	Voltage	Planning Zone	Need Category
Replace 40 Relay Panels	2011	various	various	Improve condition, reliability
Replace 40 Relay Panels	2012	various	various	Improve condition, reliability
Replace 66 Relay Panels	2013	various	various	Improve condition, reliability
Replace 50 Relay Panels	2014	various	various	Improve condition, reliability
Replace 50 Relay Panels	2015	various	various	Improve condition, reliability
Replace 50 Relay Panels	2016	various	various	Improve condition, reliability
Replace 50 Relay Panels	2017	various	various	Improve condition, reliability
Replace 50 Relay Panels	2018	various	various	Improve condition, reliability
Replace 50 Relay Panels	2019	various	various	Improve condition, reliability
Replace 50 Relay Panels	2020	various	various	Improve condition, reliability

*Table AR-5
Transmission System Additions – Asset Renewal Circuit Breakers*

System Additions	Projected In-Service Year	Planning Zone	Need Category
Circuit breaker replacements	2011	Various	Mechanism design issues (5 units) 69 kV
Circuit breaker replacements	2011	Various	Type U bushings (17 units) 69 kV
Circuit breaker replacements	2011	Various	End of life, parts obsolescence (2 unit) 138 kV
Circuit breaker replacements	2011	Various	Type U bushings (15 units) 138 kV
Circuit breaker replacements	2011	Various	Ratings (5 units) 69 kV
Circuit breaker replacements	2012	Various	End of life, parts obsolescence (4 units) 69 kV
Circuit breaker replacements	2012	Various	Type U bushings (37 units) 69 kV
Circuit breaker replacements	2012	Various	Ratings (6 units) 69 kV
Circuit breaker replacements	2012	Various	Mechanism design issues (1 units) 69kV
Circuit breaker replacements	2012	Various	Type U Bushings (9 units) 138kV
Circuit breaker replacements	2012	Various	Planning stability issues (3 units) 138 KV

System Additions	Projected In-Service Year	Planning Zone	Need Category
Circuit breaker replacements	2012	Various	Ratings (3 units) 138kV
Circuit breaker replacements	2013	Various	Type U Bushings (12 units) 69kV
Circuit breaker replacements	2013	Various	Planning stability issues (1 units) 69 KV
Circuit breaker replacements	2013	Various	Type S bushings (1 unit) 69 kV
Circuit breaker replacements	2013	Various	Type U Bushings (4 units) 138kV
Circuit breaker replacements	2013	Various	End of life, part obsolescence (6 units) 138 kV
Circuit breaker replacements	2013	Various	EPA SF6 emission reduction (7units) 345 kV
Circuit breaker replacements	2014	Various	End of life, parts obsolescence (7 units) 138 kV
Circuit breaker replacements	2014	Various	Mechanism design issues (11 units) 69 kV
Circuit breaker replacements	2014	Various	Type U Bushings (4 units) 138kV
Circuit breaker replacements	2014	3	Type U Bushings (1 unit) 69kV

System Additions	Projected In-Service Year	Planning Zone	Need Category
Circuit breaker replacements	2014	5	Over duty rating (1 unit) 138 kV
Circuit breaker replacements	2015-2020	Various	Mechanism design issues (30 units) 69 kV
Circuit breaker replacements	2015-2020	Various	End of life, parts obsolescence (7 units) 69 kV
Circuit breaker replacements	2015-2020	Various	Mechanism design issues (3 units) 138 kV
Circuit breaker replacements	2015-2020	Various	End of life, parts obsolescence (5 units) 138 kV
Circuit breaker replacements	2015-2020	Various	Bushing flange oil leak (21 units) 345 kV
Circuit breaker replacements	2015-2020	Various	End of life, parts obsolescence (8 units) 345 kV