



10-Year Assessment

An annual report summarizing proposed additions and expansions to the transmission system to ensure electric system reliability.

2010

September 2010 10-Year Assessment
www.atc10yearplan.com

Asset Renewal

The Asset Management Department is focused on the life cycle management of ATC's transmission assets. The program objective is to ensure assets perform the required function in a sustainable manner, at the lowest whole life cost without compromising health, safety, reliability or environmental performance.

The coordination of design, commissioning, operation, maintenance and replacement strategy is necessary to achieve this objective. Asset renewal is the "replacement strategy" piece of the asset life cycle. Asset renewal is driven by public and worker safety, regulatory compliance, reliability performance as defined by importance, and environmental stewardship.

State of the System

ATC benchmarks its transmission line performance with 26 other transmission operators across the United States. This comprises 47 percent of the transmission grid based upon NERC bulk power mileage. In 2010, ATC lines rated 345 kV were in the second quartile for 2009 reliability performance. ATC lines operating at 115 kV and 138 kV were best in class and ATC 69-kV transmission lines were in the top 10 percentile for 2009 reliability performance. As evidenced by reliability data, our lines are generally performing well. However, targeted investment will be required to maintain reliability as a number of facilities have been identified as nearing end of life or having components at end of life.

ATC operates a fleet of 177 transformers, with approximately 40 percent of these installed prior to 1975. We have not experienced a high failure rate of these aging transformers but our assessment anticipates an investment to maintain reliability and manage risk.

Our protective relay systems are critical to the safe and reliable operation of the transmission system. We plan to continue to modernize our relay systems to improve operational information, minimize inadvertent operation, and increase the speed of restoration when an outage occurs.

ATC has a fleet of 2017 circuit breakers. Of these, 1292 use sulfur hexafluoride (SF₆) as an arc quenching and insulating medium. The remaining circuit breakers are oil circuit breakers. Asset renewal, as applied to circuit breakers will target units that have specific reliability problems and SF₆ circuit breakers that have environmental issues.

Our asset renewal plans for the 10-year horizon have an estimated cost of \$732 million. Please note that this dollar figure includes both asset renewal and protection projects. [Table AR-4](#) shows the changes to our asset renewal plans since the previous 10-Year Assessment was published.

Transmission Line Asset Renewal

Overhead Transmission Line Facilities

The Asset Maintenance group of ATC monitors the overhead line facilities through a maintenance and inspection program designed to assess the condition of line facilities to maintain public and worker safety and reliability performance. ATC Operations and Asset Management personnel monitor the reliability of all our lines. Aerial surveys are performed to improve the facility information



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and to confirm ratings capability. The inspection, reliability performance and aerial survey programs are the initial drivers for considering asset renewal upgrades to a facility.

Once a line shows condition or operational history indicating it may not perform the required function in a sustainable manner, discussions with Planning begin to determine what system reliability needs may exist for this line or geographic area. The line is analyzed for structural- and clearance-related issues to complete the list of possible drivers. If Planning and Asset Management both have drivers for a project, a primary need driver is agreed upon and the project progresses as a network (Planning driven) or asset renewal (Asset Management driven) project. Asset renewal transmission line project scopes will vary from complete rebuilds to replacements of problematic elements (poles, cross arms, insulators). The extent of renewal driven work is determined by line importance and customer impact. When a decision is made, net present value (NPV) analysis may be used to evaluate various options and determine the least cost means of maintaining the required reliability.

Underground Transmission Line Asset Renewal

Our underground transmission system consists of high pressure fluid filled cable systems (HPFF), High Pressure Gas Filled cable systems (HPGF), solid dielectric cable (SD) systems and self contained fluid filled system (SCFF) on numerous locations across our footprint.

Cable Type	69-kV Mileage	138-kV Mileage
High Pressure Fluid Filled (HPFF)	24.1	55.4
High Pressure Gas Filled (HPGF)	0	3.4
Solid Dielectric (SD)	12.6	4.7
Self Contained Fluid Filled (SCFF)	.4	8.2
Total Miles	37.1	71.7

The condition of high pressure fluid and high pressure gas filled systems is such that no investment is expected in the 10-year horizon. Several of the solid dielectric cable installations are approaching end of life and will require replacement and are included in the 10-year plan. The self-contained fluid filled cables between Upper and Lower Michigan are expected to reach end of life within the 10-year horizon.

Asset renewal investment is anticipated for the transmission line facilities identified in Table AR-1. Scopes described may be modified as the scope development is refined. Our plan to maintain safe



transmission line facilities and improve reliability performance over the 10-year horizon is approximately \$367 million.

Transformer Asset Renewal

The intent of the transformer asset renewal program is to make an assessment for each transformer in the fleet based upon condition, importance and the probability of failure. This assessment is used to determine a spare or renewal strategy such as a site spare, system spare, or renewal candidate (Please refer to [Figure AR-1](#)).

- Healthy units with high importance and high probabilities of failure based upon age may warrant site spares or a system spare in the area to minimize transport times.
- Units with poor health, high importance and high or low probability of failure based upon age are candidates for renewal.
- Healthy units with low importance and a low or high probability of failure based upon age will be backed up with a system spare.
- Units with poor health and low importance will be backed up with system spares regardless of the probability of failure based upon age.

Condition is monitored as part of the Asset Maintenance program through off-line electrical tests, on-line oil tests, infrared inspection, vibration analysis and acoustic condition assessments.

The importance of a particular transformer to the network is based upon a series of planning studies that look at the severity of the contingencies following the failure of a unit. Given the long lead and transportation times for auto transformers of the size used by ATC, these double-contingency studies provide guidance for the operation impact.

A fleet approach has been taken to estimate the investment in the 10-year horizon and for consideration in determining the number of system spares. The fleet approach uses a curve that represents 50 percent of transformers will fail by age 50 years. A probability of failure for each unit is determined from the curve and aggregated for each year in the 10-year horizon. Assuming a level aggregate probability of failure equates to the existing level of reliability, the expected investment will be approximately two 138/69-kV transformers per year in the 10-year horizon. For 345/138-kV transformers, the expected investment will be one transformer every two years. The cost estimate for this program over the 10 year horizon is \$118 million. Actual replacement will be based on the results of our condition monitoring program and assessments of importance. Please refer to [Table AR-2](#) for details.

Relay Asset Renewal

Relays are the cornerstone of a reliable transmission system. The goal of the ATC relay asset renewal effort is to improve relay performance, provide information for operations, and reduce maintenance cost. We are able to improve relay performance with microprocessor based relays by eliminating over-reaching while maintaining adequate back up protection. The improved performance of the microprocessor relays allows us to increase system reliability and security via the expanded use of carrier and fiber optic communication. The newer technology has better factory support and we are able to minimize the risk of relay failure due to availability of spare parts



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and minimize repair times due to lack of factory support or software upgrades. Additionally, we are able to replace relay systems that limit line ratings.

Microprocessor based relays offer valuable information for operations. System Operations is able to direct field resources to the problem area of a line based upon fault location information provided by the microprocessor based relays. Additionally, fault location information is used with the lightning detection network to correlate lightning strikes with line outages. This enables us to direct patrols to sites of potentially damaging lightning strikes and detect problems that occur during lightning storms that are not lightning related.

The self check and remote monitoring capabilities of microprocessor based relays allow longer maintenance cycles and reduce costs.

Approximately 12,000 relays protect our network. The asset renewal program is prioritized by replacing the least reliable relays by type and relays at end-of-life and relay locations with schemes that have a higher inadvertent operation history. This includes single relays that require remote back-up, electromechanical relays that do not provide fault location, do not self alarm and have a higher tendency of inadvertent operation than microprocessor relays. In addition, obsolete schemes without spare parts availability and/or no technical support from the vendor are targeted. Other asset renewal candidates are relay schemes that limit loading or use only directional over current elements that increase coordination complexity and raise the likelihood of inadvertent operation.

ATC plans to spend approximately \$118 million for relay renewal in the 10 year horizon. This equates to about 40 relay panels per year. Please refer to [Figure AR-2](#) for details.

Circuit Breaker Asset Renewal

Circuit breakers are essential to the reliability and safety of the network. We own and operate over 2017 gas and oil circuit breakers. The goal of the circuit breaker renewal program is to improve reliability and environmental performance by reducing maintenance outage requirements (duration, # of outages) thereby increasing availability, reducing SF₆ emissions, and increasing safety by reducing the number of unplanned eventful outages. Our plan to maintain the safety and improve the environmental performance of our circuit breaker fleet over the 10 year horizon is approximately \$81 million. Please refer to [Table AR-3](#) for details.

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

System Additions	Projected In-Service Year	Planning Zone	Need Category	Cost Estimate - Refer to Funding Project and Sum of Total (2010-2019) in Asset Renewal Financial Table
Rebuild Plainfield-Chaffee Creek 69-kV line Y-90	2010	1	Improve condition and increase reliability performance of existing line	F1699
Rebuild Auburndale-Sigel 69-kV line Y-107	2010	1	Improve condition and increase reliability performance of existing line	F1732
Rebuild Mauston-Hilltop 69-kV line Y-89	2010	1	Improve condition and increase reliability performance of existing line	F2345
Rebuild Deer Trail-Whitcomb 69-kV line Y-86	2011	1	Improve condition and increase reliability performance of existing line	F2410
Rebuild Wautoma-Berlin 69-kV line Y-95	2011	1	Improve condition and increase reliability performance of existing line	F2386
Re-insulate Winneconne-Berlin 69-kV line Y-80	2012	1	Improve condition and increase reliability performance of existing line	TBD
Re-insulate Harrison-Iola 69-kV line Y56 CWEC Iola Tap	2013	1	Improve condition and increase reliability performance of existing line.	F2999
Rebuild North Point-Rocky Run 115-kV line T-20	2016	1	Improve condition and increase reliability performance of existing line.	TBD
Rebuild Wautoma-Portage 69-kV line Y17	2017	1	Improve condition and increase reliability performance of existing line	TBD

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

System Additions	Projected In-Service Year	Planning Zone	Need Category	Cost Estimate - Refer to Funding Project and Sum of Total (2010-2019) in Asset Renewal Financial Table
Planning to reconfigure with Fairwater/Ripon to North Randolph, 69-kV line Y26	2018	1	Improve condition and increase reliability performance of existing line	TBD
Rebuild Whiting Avenue-Plover 115-kV line B-106	2019	1	Improve condition and increase reliability performance of existing line	TBD
Replace select poles on Coyne-Saratoga 115-kV line T-72	2020	1	Improve condition and increase reliability performance of existing line	TBD
Replace select Poles Petenwell – Saratoga 115-kV line X-43	2020	1	Improve condition and increase reliability performance of existing line	TBD
Replace select Poles Coyne-Plover 115-kV line J-114	2020	1	Improve condition and increase reliability	TBD
Re-insulate top phase and add additional arresters on Chandler-Forsyth 69-kV line (Chandler line)	2010	2	Improve condition and increase reliability performance of existing line	F2786
Improve clearances, install arresters on portions of line, replace select components on Roberts-9 Mile 69-kV line 6952	2011	2	Improve condition and increase reliability performance of existing line	F3007
Re-insulate and improve grounding on Munising-Forsyth 138-kV line (Munising 138 line)	2012	2	Improve condition and increase reliability performance of existing line	F2985

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

System Additions	Projected In-Service Year	Planning Zone	Need Category	Cost Estimate - Refer to Funding Project and Sum of Total (2010-2019) in Asset Renewal Financial Table
Reinsulate, add arresters, replace select poles on Munising-Gwinn 69-kV line (Autrain line)	2013	2	Improve condition and increase reliability performance of existing line	F2986
Reinsulate, add arresters, replace select poles on Blaney Park-Munising 69-kV line (Inland line)	2014	2	Improve condition and increase reliability performance of existing line	TBD
Re-insulate Portage-9 Mile 69-kV lines 6901/6902	2014	2	Improve condition and increase reliability performance of existing line	TBD
Re-insulate and install arresters on KI Sawyer-Gwinn 69-kV line (Sawyer line)	2014	2	Improve condition and increase reliability performance of existing line	TBD
Install new cross arms on Atlantic-M38 69-kV line (Atlantic 69 line)	2014	2	Improve condition and increase reliability performance of existing line	TBD
Replace select poles and cross arms on Rexton-Hiawatha 69-kV line ESE_6908	2015	2	Improve condition and increase reliability performance of existing line	TBD
Replace underground cable on Magazine-Nine Mile/Three Mile 69-kV line ESE_6903	2015	2	Improve condition and increase reliability performance of existing line	TBD
Replace select poles and re-insulate Conover-Mass 69-kV line 6530	2018	2	Improve condition and increase reliability performance of existing line	TBD
Replace select poles and re-insulate Powers-Chalk Hill 69-kV line 6910	2018	2	Improve condition and increase reliability performance of existing line	TBD
Replace one circuit with new 3C XPLE submarine cable on McGulpin-Straits 138-kV line 9901	2020	2	Improve condition and increase reliability performance of existing line	TBD

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

System Additions	Projected In-Service Year	Planning Zone	Need Category	Cost Estimate - Refer to Funding Project and Sum of Total (2010-2019) in Asset Renewal Financial Table
Replace one circuit with new 3C XPLE submarine cable on McGulpin-Straits 138-kV line 9903	2020	2	Improve condition and increase reliability performance of existing line	TBD
Rebuild Miner-Hillman 69-kV line Y-130	2010	3	Improve condition and increase reliability performance of existing line	F2346
Rebuild Forward-Rock Branch 69-kV line Y-135	2010	3	Improve condition and increase reliability performance of existing line	F1715
Rebuild Boscobel-Gran Grae 69-kV line Y-40	2010	3	Improve condition and increase reliability performance of existing line	F1444
Install "Bird-be-Gone" Dam Heights – Portage 69-kV line Y16	2010	3	Improve condition and increase reliability performance of existing line	F2949
Rebuild Stage Coach-Spring Green 69-kV line Y-62	2011	3	Improve condition and increase reliability performance of existing line	F1656
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	F2994
Rebuild Pardeeville Tap-North Randolph/Rio 69-kV line Y-64	2011	3	Improve condition and increase reliability performance of existing line	F2389
Rebuild Dane-Dam Heights 69-kV line Y-8	2012	3	Improve condition and increase reliability performance of existing line	F1602
Replace underground cable on East Towne-Sycamore 69-kV line 6987	2012	3	Improve condition and increase reliability performance of existing line.	F2995

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

System Additions	Projected In-Service Year	Planning Zone	Need Category	Cost Estimate - Refer to Funding Project and Sum of Total (2010-2019) in Asset Renewal Financial Table
Replace underground cable on East Towne to Sycamore 69-kV line 6988	2012	3	Improve condition and increase reliability performance of existing line.	F2995
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	TBD
Rebuild Kirkwood – Trienda 138-kV line X-52	2012	3	Improve condition and increase reliability performance of existing line	F2726
Rebuild Doylestown – Rio Pumping station 69-kV line Y20	2013	3	Improve condition and increase reliability performance of existing line	TBD
Rebuild Rubicon-Concord 138-kV line 9061	2013	3	Improve condition and increase reliability performance of existing line	TBD
Rebuild Darlington-Hillman 138-kV line X-14	2016	3	Improve condition and increase reliability performance of existing line	TBD
Rebuild Portage-Dam Heights 69-kV line Y16	2018	3	Improve condition and increase reliability performance of existing line.	TBD
Rebuild Eden-Hillman 69-kV line Y105	2018	3	Improve condition and increase reliability performance of existing line.	TBD
Replace underground cable on Stagecoach-West Middleton 69-kV line 6927	2019	3	Improve condition and increase reliability performance of existing line	TBD
Re-insulate South Fond du Lac-Edgewater 345-kV line W1	2010	4	Improve condition and increase reliability performance of existing line	F2765

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

System Additions	Projected In-Service Year	Planning Zone	Need Category	Cost Estimate - Refer to Funding Project and Sum of Total (2010-2019) in Asset Renewal Financial Table
Install “Bird-Be-Gone” Crivitz – Pioneer 69-kV line E-83	2010	4	Improve condition and increase reliability performance of existing line	F3020
Replace shield wire on Stiles-Pulliam 138-kV lines KK64441-64451	2011	4	Improve condition and increase reliability performance of existing line	F2383
Reconductor project Glenview – New Holstein 69-kV line J-140	2012	4	Improve condition and increase reliability performance of existing line	TBD
Rebuild Finger Road-Highway V 69-kV line U-47	2014	4	Improve condition and increase reliability performance of existing line	TBD
Replace the submarine cable on First Avenue-Redwood 69-kV line T-46	2015	4	Improve condition and increase reliability performance of existing line	TBD
Rebuild Neevin-Butte Des Morts 138-kV line 43021	2015	4	Improve condition and increase reliability performance of existing line	TBD
Rebuild Sawyer-Dykesville 69-kV line DYKY21	2016	4	Improve condition and increase reliability performance of existing line	F2801
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	TBD
Rebuild Highway V-Oak Street 69-kV line Z-26	2016	4	Improve condition and increase reliability performance of existing line	TBD

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

System Additions	Projected In-Service Year	Planning Zone	Need Category	Cost Estimate - Refer to Funding Project and Sum of Total (2010-2019) in Asset Renewal Financial Table
Rebuild Manrap-Wesmark 69-kV line R-44	2016	4	Improve condition and increase reliability performance of existing line	TBD
Rebuild Danz-Finger Road 69-kV line L-64	2016	4	Improve condition and increase reliability performance of existing line	TBD
Replace underground cable on University-Danz Avenue 69-kV line O-15	2017	4	Improve condition and increase reliability performance of existing line	TBD
Rebuild Butte des Morts-North Appleton 138-kV line 6853	2017	4	Improve condition and increase reliability performance of existing line	TBD
Rebuild Pioneer-Sobieski 69-kV line E-83 Tap	2018	4	Improve condition and increase reliability performance of existing line	TBD
Rebuild Sobieski-Bayport 69-kV line T-98	2018	4	Improve condition and increase reliability performance of existing line	TBD
Rebuild Custer-New Holstein 69-kV line P-68	2019	4	Improve condition and increase reliability performance of existing line	TBD
Rebuild Goodman-Caldron Falls 69-kV line J-88	2019	4	Improve condition and increase reliability performance of existing line	TBD
Replace select poles on Howard-Pulliam 138-kV line D-82	2019	4	Improve condition and increase reliability performance of existing line	TBD

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

System Additions	Projected In-Service Year	Planning Zone	Need Category	Cost Estimate - Refer to Funding Project and Sum of Total (2010-2019) in Asset Renewal Financial Table
Replace underground cable on Erdman-Lodestar 138-kV line X-48	2019	4	Improve condition and increase reliability performance of existing line	TBD
Rebuild Finger Road – Canal 69-kV line J-10	2020	4	Improve condition and increase reliability performance of existing line	TBD
Replace underground cable on Edgewater-Erdman 69-kV line Y-31	2021	4	Improve condition and increase reliability performance of existing line	TBD
Re-insulate Racine-Somers 138-kV line 1645	2012	5	Improve condition and increase reliability performance of existing line	F2697
Re-insulate Racine-Kenosha 138-kV line 1651	2012	5	Improve condition and increase reliability performance of existing line	F2693
Replace shield wire on Tosa - Butler 138-kV line 5061	2013	5	Improve condition and increase reliability performance of existing line	TBD
Replace shield wire on Tosa – Bluemound 138-kV line 5041	2013	5	Improve condition and increase reliability performance of existing line	TBD
Replace shield wire on Butler – Tower#4291 138kV line 3443	2013	5	Improve condition and increase reliability performance of existing line	TBD
Rebuild St. Martins-Edgewood 138-kV line 3013	2014	5	Improve condition and increase reliability performance of existing line	TBD
Rebuild and add breaker on Edgewood-Mukwonago 138-kV line 671K61	2014	5	Improve condition and increase reliability performance of existing line	TBD

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

System Additions	Projected In-Service Year	Planning Zone	Need Category	Cost Estimate - Refer to <i>Funding Project and Sum of Total (2010-2019)</i> in Asset Renewal Financial Table
Rebuild Hartford-St. Lawrence 138-kV line 8031	2014	5	Improve condition and increase reliability performance of existing line	TBD
Rebuild Cooney-Concord 138-kV line 9042	2015	5	Improve condition and increase reliability performance of existing line	TBD
Rebuild Summit -Waukesha 138-kV line 7021	2015	5	Improve condition and increase reliability performance of existing line	TBD
Rebuild Albers-Paris 138-kV line 3124	2016	5	Improve condition and increase reliability performance of existing line	TBD
Rebuild Summit-Merrill Hills 138-kV line 3551	2017	5	Improve condition and increase reliability performance of existing line	TBD

Table AR-2
Asset Renewal Transformer Replacements

System Upgrade	Projected In-Service Year	Voltage	Planning Zone	Need Category	Cost Estimate – Refer to <i>Funding Project</i> and Sum of Total (2010-2019) in Asset Renewal Financial Table
Council Creek T31	2010	138/69-kV	1	Improve condition, reliability	F2340
North Fond du Lac T31 and T32	2010	138/69-kV	4	Improve condition, reliability	F2343
Ellinwood T2	2011	138/69-kV	4	Improve condition, reliability	F2024
Aurora T3	2011	138/69-kV	1	Improve condition, reliability	F2419
Bluemound T3	2011	230/138-kV	5	Improve condition, reliability	F2604
Bluemound T1	2012	230/138-kV	5	Improve condition, reliability	F2799
Edgewater T31 and T32	2012	138/69-kV	4	Improve condition, reliability	TBD
Atlantic T1	2013	138/69-kV	2	Improve condition, reliability	TBD
Lancaster T31	2013	138/69-kV	3	Improve condition, reliability	TBD
Fitzgerald SS – relocate system spare	2013	345/138-kV	4	Reliability	TBD
Replace two transformers	2014	138/69-kV	various	Improve condition, reliability	TBD
Replace one transformer	2014	345/138-kV	various	Improve condition, reliability	TBD
Replace two transformers	2015	138/69-kV	various	Improve condition, reliability	TBD
Replace two transformers	2016	138/69-kV	various	Improve condition, reliability	TBD
Replace one transformer	2016	345/138-kV	various	Improve condition, reliability	TBD
Replace two transformers	2017	138/69-kV	various	Improve condition, reliability	TBD
Replace two transformers	2018	138/69-kV	various	Improve condition, reliability	TBD
Replace one transformer	2018	345/138-kV	various	Improve condition, reliability	TBD
Replace two transformers	2019	138/69-kV	various	Improve condition, reliability	TBD

*Table AR-2
Asset Renewal Transformer Replacements*

System Upgrade	Projected In-Service Year	Voltage	Planning Zone	Need Category	Cost Estimate – Refer to <i>Funding Project</i> and Sum of Total (2010-2019) in Asset Renewal Financial Table
Replace two transformers	2020	138/69-kV	various	Improve condition, reliability	TBD
Replace one transformer	2020	345/138-kV	various	Improve condition, reliability	TBD

Table AR-3
Transmission System Additions – Asset Renewal Circuit Breakers

System Additions	Projected In-Service Year	Planning Zone	Need Category	Cost Estimate - Refer to Funding Project and Sum of Total (2010-2019) in Asset Renewal Financial Table
Circuit breaker replacements	2010	Various	CT deficiency, Control scheme incompatibility (2 units) 69 kV	Various
Circuit breaker replacements	2010	Various	End of life, parts obsolescence (1 unit) 69 kV	Various
Circuit breaker replacements	2010	Various	Mechanism design issues (2 units) 69 kV	Various
Circuit breaker replacements	2010	Various	Type S bushings (1 unit) 69 kV	Various
Circuit breaker replacements	2010	Various	Type U bushings (22 units) 69 kV	Various
Circuit breaker replacements	2010	Various	End of life, part obsolescence (4 units) 138 kV	Various
Circuit breaker replacements	2010	Various	Type U bushings (15 units) 138 kV	Various
Circuit breaker replacements	2010	Various	CT deficiency, control scheme incompatibility (3 unit) 230 kV	Various
Circuit breaker replacements	2010	Various	Type U bushing (5 units) 230 kV	Various

*Table AR-3
Transmission System Additions – Asset Renewal Circuit Breakers (continued)*

System Additions	Projected In-Service Year	Planning Zone	Need Category	Cost Estimate - Refer to Funding Project and Sum of Total (2010-2019) in Asset Renewal Financial Table
Circuit breaker replacements	2010	Various	EPA SF6 emission reduction (2 units) 345 kV	Various
Circuit breaker replacements	2011	Various	Mechanism design issues (5 units) 69 kV	Various
Circuit breaker replacements	2011	Various	Type U bushings (17 units) 69 kV	Various
Circuit breaker replacements	2011	Various	End of life, parts obsolescence (2 unit) 138 kV	Various
Circuit breaker replacements	2011	Various	Type U bushings (15 units) 138 kV	Various
Circuit breaker replacements	2011	Various	Ratings (5 units) 69 kV	Various
Circuit breaker replacements	2011	Various	End of life, parts obsolescence (4 units) 69 kV	Various
Circuit breaker replacements	2012	Various	Type U bushings (37 units) 69 kV	Various
Circuit breaker replacements	2012	Various	Ratings (6 units) 69 kV	Various
Circuit breaker replacements	2012	Various	Mechanism design issues (1 units) 69kV	Various

System Additions	Projected In-Service Year	Planning Zone	Need Category	Cost Estimate - Refer to <i>Funding Project</i> and <i>Sum of Total (2010-2019)</i> in Asset Renewal Financial Table
Circuit breaker replacements	2012	Various	Type U Bushings (9 units) 138kV	Various
Circuit breaker replacements	2012	Various	Planning stability issues (3 units) 138 KV	Various
Circuit breaker replacements	2012	Various	Ratings (2 units) 138kV	Various
Circuit breaker replacements	2013	Various	Type U Bushings (12 units) 69kV	Various
Circuit breaker replacements	2013	Various	Planning stability issues (1 units) 69 KV	Various
Circuit breaker replacements	2013	Various	Type S bushings (1 unit) 69 kV	Various
Circuit breaker replacements	2013	Various	Type U Bushings (4 units) 138kV	Various
Circuit breaker replacements	2013	Various	End of life, part obsolescence (6 units) 138 kV	Various
Circuit breaker replacements	2013	Various	EPA SF6 emission reduction (2units) 345 kV	Various

*Table AR-3
Transmission System Additions – Asset Renewal Circuit Breakers (continued)*

System Additions	Projected In-Service Year	Planning Zone	Need Category	Cost Estimate - Refer to Funding Project and Sum of Total (2010-2019) in Asset Renewal Financial Table
Circuit breaker replacements	2014-2020	Various	End of life, parts obsolescence (8 units) 69 kV	TBD
Circuit breaker replacements	2014-2020	Various	Mechanism design issues (53 units) 69 kV	TBD
Circuit breaker replacements	2014-2020	Various	End of life, parts obsolescence (17 units) 138 kV	TBD
Circuit breaker replacements	2014-2020	Various	Over duty rating (8 units) 138 kV	TBD
Circuit breaker replacements	2014-2020	Various	Type U Bushings (1 units) 138kV	TBD
Circuit breaker replacements	2014-2020	Various	Bushing flange oil leak (27 units) 345 kV	TBD
Circuit breaker replacements	2014-2020	Various	EPA SF6 emission reduction (5units) 345 kV	TBD
Circuit breaker replacements	2014-2020	Various	End of life, parts obsolescence (8 units) 345 kV	TBD

Table AR-4**Summary of Cancellations, Deferrals, Changes, Possible Changes and New Projects for the 2010 10-Year Assessment**

PROJECTS CANCELED	Former In-Service Date	Planning Zone	Reason for Removal
Shield Wire Replacement Norwich - 43rd St. Terminal 138-kV NWHG61	2012	5	Project no longer needed.
Shield Wire Replacement Tosa- Granville 138-kV 3452	2013	5	Project no longer needed.
PROJECTS DEFERRED	New Date	Planning Zone	Reason for Deferral
Rebuild and reconductor 20th Street - Sauk Trail 138-kV line X-37	2010	4	Project scheduling. Original date 2009.
Rebuild Whitcomb - Deer Trail 69-kV line Y-86	2011	1	Project scheduling. Original date 2010.
Rebuild Stage Coach - Spring Green 69-kV line Y- 62	2011	3	Project scheduling. Original date 2010.
Rebuild Dam Heights - Dane 69-kV line Y-8	2012	3	Project scheduling. Original date 2010.
Re-insulate Iola-Harrison 69-kV line Y-56 CWEC Iola Tap	2013	1	Project scheduling. Original date 2012. Possible earlier in service date.
Rebuild Concord- Cooney 138-kV line 9042	2015	5	Asset condition. Original date 2014.
Rebuild Paris – Albers 138-kV line 3124	2016	5	Asset condition. Original date 2018.
Rebuild Woodenshoe - Mears 138-kV line A-79	2016	4	Condition assessment. Original date 2012.
Rebuild Mears- Sunset Point 138-kV line MCRG21	2016	4	Condition assessment. Original date 2012.
Rebuild Oak St. - Hwy V 69-kV line Z-26	2016	4	Project scheduling. Original date 2013.
Rebuild West Mark - Manrap 69-kV line R-44	2016	4	Project scheduling. Original date 2013.
Rebuild Dykesville - Sawyer 69-kV line DYKY21	2016	4	Project scheduling. Original date 2015.
Rebuild Dam Heights - Portage 69-kV line Y-16	2018	3	Project scheduling. Original date 2013.
Rebuild Sobieski - Pioneer 69-kV E-83 Tap	2018	4	Project scheduling. Original date 2016.
Rebuild Bayport – Sobieski 69-kV line T-98	2018	4	Project scheduling. Original date 2016.

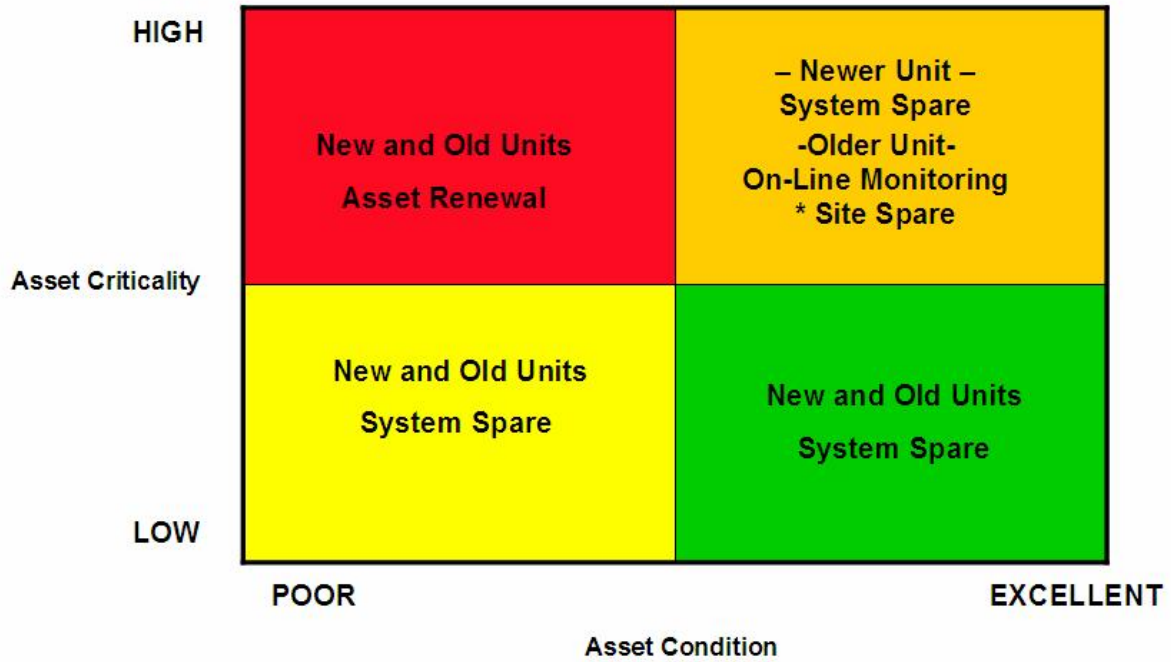
Table AR-4**Summary of Cancellations, Deferrals, Changes, Possible Changes and New Projects for the 2010 10-Year Assessment**

OTHER PROJECT CHANGES AND POSSIBLE CHANGES	Date	Planning Zone	Nature of Change or Update
Rebuild Darlington – Hillman 138-kV line X-14	2016	3	Asset condition assessed in 2010.
NEW PROJECTS	In-Service Date	Planning Zone	Reason for Project
Install Bird-be -Gone Dam Heights - Portage 69-kV line Y-16	2010	3	Project identified due to unknown forced outages.
Install Bird-be -Gone Crivitz - Pioneer 69-kV line E-83	2010	4	Project identified due to unknown forced outages.
Rebuild Kirkwood - Trienda 138-kV line X-52	2012	3	Asset condition and reliability.
Thermal Re-rate Project Glenview - New Holstein 69-kV line J-140	2012	1	Asset reliability.
Shield Wire Replacement Butler - Str#4291 138-kV line 3443	2013	5	Asset condition. May be part of Smart Grid Initiative.
Rebuild Doylestown – Rio Pumping Station 69-kV line Y20 (Doylestown - Str#320)	2013	3	Asset condition and reliability.
Rebuild Finger Road – Canal 69-kV line J-10	2020	4	Possible asset renewal project.
Replace select poles Petenwell – Saratoga 138-kV line X-43	2020	1	Possible asset renewal project.
Replace select poles Coyne – Plover 115-kV line J-114	2020	1	Possible asset renewal project.

ATC 2010 10-Year Assessment
 Summary of Asset Renewal Capital Expenditures (2010-2019)
 10-Year Assessment Asset Renewal Project Detail

FP	10-Year Assessment Asset Renewal Project Description	Sum of Future Expenditures 2010-2019
F1444	Rebuild Boscobel-Gran Grae 69-kV line Y-40	\$4,960,988
F1602	Rebuild Dane-Dam Heights 69-kV line Y-8	\$6,482,534
F1656	Rebuild Stage Coach-Spring Green 69-kV line Y-62	\$5,696,054
F1699	Rebuild Plainfield-Chaffee Creek 69-kV line Y-90	\$2,242,359
F1715	Rebuild Forward-Rock Branch 69-kV line Y-135	\$1,177,704
F1732	Rebuild Auburndale-Sigel 69-kV line Y-107	\$602,105
F2024	Replace Ellinwood transformer T2	\$4,289,001
F3007	Improve clearances, install arresters on portions of line, replace select components on Roberts-9 Mile 69-kV line 6952	\$15,560,468
F2340	Replace Council Creek transformer T31	\$2,093,893
F2343	Replace North Fond du Lac transformers T31 and T32	\$2,471,144
F2345	Rebuild Mauston-Hilltop 69-kV line Y-89	\$513,097
F2346	Rebuild Miner-Hillman 69-kV line Y-130	\$1,113,584
F2383	Replace shield wire on Stiles-Pulliam 138-kV lines KK64441-64451	\$4,303,383
F2386	Rebuild Wautoma-Berlin 69-kV line Y-95	\$2,805,243
F2389	Rebuild Pardeeville Tap-North Randolph/Rio 69-kV line Y-64	\$2,130,779
F2410	Rebuild Deer Trail-Whitcomb 69-kV line Y-86	\$3,313,647
F2419	Replace Aurora transformer T3	\$2,140,955
F2604	Replace Bluemound transformer T3	\$4,892,358
F2693	Re-insulate Racine-Kenosha 138-kV line 1651	\$1,084,015
F2697	Re-insulate Racine-Somers 138-kV line 1645	\$0
F2726	Rebuild Kirkwood – Trienda 138-kV line X-52	\$1,257,747
F2765	Re-insulate South Fond du Lac-Edgewater 345-kV line W1	\$708,829
F2786	Re-insulate top phase and add additional arresters on Chandler-Forsyth 69-kV line (Chandler line)	\$1,298,423
F2799	Replace Bluemound transformer T1	\$4,378,990
F2801	Rebuild Sawyer-Dykesville 69-kV line DYKY21	\$11,143,982
F2949	Install "Bird-be-Gone" Dam Heights – Portage 69-kV line Y16	\$61,523
F2985	Re-insulate and improve grounding on Munising-Forsyth 138-kV line (Munising 138 line)	\$3,990,716
F2986	Reinsulate, add arresters, replace select poles on Munising-Gwinn 69-kV line (Autrain line)	\$2,277,477
F2994	Install anti-galloping and grounding improvements on Columbia-South Fond Du Lac 345-kV line W5	\$768,773
F2995	Replace underground cable on East Towne-Sycamore 69-kV line 6987	\$5,278,606
F2999	Re-insulate Harrison-Iola 69-kV line Y56 CWEC Iola Tap	\$163,361
F3020	Install "Bird-Be-Gone" Crivitz – Pioneer 69-kV line E-83	\$67,405
2009 TYA Asset Renewal Projects Reported		\$99.3M
Plus other Asset Renewal projects (includes Protection)		\$632.7M
Total 10-Year Asset Renewal Capital Expenditures		\$732M

Figure AR-1
Transformer Asset Renewal Methodology



* Under Development

Figure AR-2
Relay Renewal Plans by Zone

