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Asset Renewal

The Asset Management Department is focused on the life cycle management of ATC's transmission assets. The objective is to ensure assets perform the required function in a sustainable manner while managing life cycle cost.

Coordination of design, commissioning, operation, maintenance and replacement strategy is crucial 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 and operational performance.

The ATC Asset Renewal plan captures the balance between life cycle cost and reliable performance of the ATC transmission system. ATC's Asset Renewal plan calls for an estimated spend of $ 1.5 billion over the 10-year plan horizon. The projects associated with these costs can be found in tables AR-1 (Line Work), AR-2 (Underground Line Work), and AR-3 (Substation and Other Work).

State of Existing Facilities

ATC operates 784 lines with a total of 9540 circuit miles. A number of facilities have been identified as nearing end of life or having components at end of life during the 10 year assessment period.

Due in large part to our asset management efforts, our reliability has remained best-in-class in several industry benchmarking studies. For 2016, we scored in the top decile for 69-kV and 100-kV to 161-kV performance and 1st quartile for 345- to 500-kV performance with our peer transmission operators.

ATC operates a fleet of 198 in service transformers, with approximately 40 percent of these being more than 35 years old. Fortunately, ATC has not experienced a high failure rate of these aging transformers but the assessment anticipates that ongoing investment is required to maintain reliability and manage operational and financial risk.

ATC's operates a fleet of 9328 protective relays. Relay systems are critical to the safe and reliable operation of the transmission system. The plan is to modernize the relay systems to meet compliance requirements, improve reliability, minimize inadvertent operation, and provide additional information to ATC System Operations to improve restoration time when an outage does occur.

ATC has a fleet of 2212 circuit breakers in service. Of these, 1816 use sulfur hexafluoride (SF_6) as an arc quenching and insulating medium. There are 395 oil circuit breakers and 1 vacuum circuit breaker. Asset Renewal, as applied to circuit breakers will target units that have specific reliability and performance concerns and SF_6 circuit breakers with environmental concerns.

Transmission Line Asset Renewal

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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. Aerial and ground inspections of ATC facilities are performed periodically to identify issues for repair. The goal is to maintain reliable performance as well as public and worker safety. ATC System Operations and Asset Management personnel monitor performance and track the reliability of all ATC lines. Particular attention is paid to lightning withstand performance and improvements that can be targeted at poor performing lines. The inspection and reliability performance programs are considered the initial drivers for asset renewal upgrades to a facility. The line design is further analyzed by Asset Management for structural and clearance-related issues to complete the list of possible drivers.

ATC has a multi-year assessment program to verify the actual field conditions match design assumptions for line and substation facilities. Aerial surveys and other engineering analysis means were used to evaluate line facility ratings.

Transmission line facilities categorized to have inadequate condition or poor operational performance history are brought to ATC Planning for consideration. Planning may have specific system reliability needs for the line or geographic area. If Planning and Asset Management both have drivers for a project, a primary need driver is agreed upon and the project progresses as either a network (Planning driven) or asset renewal (Asset Management driven) project. The scope of an asset renewal project can vary from complete rebuilds to replacements of problematic components such as poles, cross arms or insulators. The extent of renewal driven work may be further impacted by importance of the line to the end customer. Net present value (NPV) analysis is used to evaluate various options and determine the least cost means of obtaining the desired 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), XLPE or EPR insulated solid dielectric cable (SD) systems and self-contained fluid filled system (SCFF).

Cable Type	69-kV Mileage	115,138 & 161-kV Mileage
High Pressure Fluid Filled (HPFF)	24.7	53.8
High Pressure Gas Filled (HPGF)	0	3.4
Solid Dielectric (SD)	10.4	7.0
Self-Contained Fluid Filled (SCFF), Submarine	0.3	8.2
Total Miles	35.3	72.0

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 over the 10 year horizon.

Instrument Transformer and Surge Arrester Renewal

Instrument transformers used for monitoring voltages and currents on the ATC system are key to reliable performance. The goal of asset renewal efforts is to manage maintenance costs and avoid end of life failures on the ATC system. Instrument transformers at end of life or with poor operational history are targeted for replacement.

Arresters are installed to prevent outages and protect equipment from lightning and over voltage surges. The goal of asset renewal efforts is to manage maintenance costs and avoid end of life failures on the ATC system. Arresters at end of life or with poor operational history are targeted for replacement in conjunction with other capital work at the station.

Relay and Battery Asset Renewal

Relays and station batteries are the cornerstone of a reliable transmission system. The goal of the ATC relay and battery asset renewal effort is to improve relay performance, provide information for Operations, and reduce maintenance cost. ATC is able to improve line and equipment capabilities with microprocessor based relays by eliminating over-reaching misoperations and increasing capacity load limits. The improved performance of the microprocessor relays allows ATC to address stability issues and increase system reliability and security with the use of carrier and fiber optic communication systems. The new technology has additional benefits of better factory support, improved spare part availability, software upgrades and technical support to ATC staff.

Microprocessor based relays offer valuable information for ATC Operations. New relay systems are able to be used to direct field resources to the problem area and verify which component of the transmission system has failed. Additionally, fault location information is used with the geographic lightning detection network to correlate lightning strikes with line outages. This enables ATC to historically track performance of specific sections of the line to aid in determining transmission line Asset Renewal prioritization.

Relay and battery renewals are being made to satisfy NERC reliability standard requirements and recommendations.

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

Approximately 9328 in service relays with 292 associated station batteries protect the ATC network. The asset renewal program is prioritized by replacing the least reliable relays by type, relays at end-of-life and, relays with schemes that have a history of inadvertent operations. This includes single relays that require remote back-up and electromechanical relays that do not provide fault location or self-alarm.

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ATC plans renew approximately 60 relay panels per year in the 10 year horizon.

Circuit Breaker Asset Renewal

Circuit breakers are essential to the reliability and safety of the network. ATC has a fleet of 2212 gas, oil, vacuum circuit breakers and 292 circuit switchers used for fault interrupting, equipment isolation and capacitor bank switching. The goal of the circuit breaker renewal program is to improve reliability and environmental performance. This includes reducing maintenance outage requirements and reducing the number of unplanned outages while reducing environmental impacts.

Power Transformer Asset Renewal and Sparing Strategy

The intent of the ATC power transformer asset renewal program is to make a risk assessment of each transformer in the fleet based upon health, operational importance and the probability of failure. This assessment is used to determine a spare or renewal strategy. The strategy options are either an on-site spare, system wide spare that can be relocated, or a proactive renewal replacement for the subject transformer. ATC has a spare transformer plan and also participates in an industry spare equipment program.

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

The operational importance of a particular transformer to the transmission network is based upon a series of planning studies that look at the severity of the contingencies following the failure of the specific transformer. Given the high cost, specialty design and logistical challenges of moving a large power transformer, double-contingency studies provide guidance for the operational impact and prioritization.

Power transformer condition is monitored as part of the asset maintenance program through off-line electrical tests, visual inspection and tracking of maintenance history. On line tests include dissolved-gas-analysis-oil tests, infrared inspection, vibration analysis and partial discharge condition assessment.

The expected investment to maintain reliability will require replacement of approximately two 138/69-kV transformers per year and one 345/138-kV transformer every two years in the 10-year horizon. Actual replacement of a specific transformer in the fleet will be based on the results of the ATC condition monitoring program and assessments of importance captured in the ATC Transformer Health Index.

Control Buildings

Control buildings contain the protective relaying and control components of the substation including relays, SCADA, AC/DC sources and batteries. Life cycle of a building is estimated at 50 years. Consideration of replacement is give at times of major work in the control building. Major work may include relay renewal or substation expansion. Economies are gained if the control building is replaced when new relaying or a building expansion is required. The new building design is an effective upgrade to physical security at the site.

Remote Terminal Units (RTUs)

The RTUs provide the interface between the substation equipment and the Energy Management System (EMS) for remote monitoring and control of ATC substation facilities. The RTUs provide a communication link between all intelligent electronic devices in the substation and the EMS. Thus allowing the Operators to monitor all data in the substation. These equipment data links are also important to the Asset Management group by providing real time equipment data like; dissolved gas, GIC values, harmonic values and other equipment data. This data allows the Operators and Asset Management to operate the system and monitor performance of important substation assets.

The RTU asset renewal program is prioritized by replacing the older least reliable RTUs with modern equipment that can meet ATC's ever increasing communication and security needs. The program will replace the obsolete hardware followed by replacing hardware with slow speed processors. With the upgrades, the station alarms will be modified to meet the current ATC standard.

ATC plans to renew about 18 RTUs panels per year in the 10 year horizon.

Physical Security

ATC has developed a risk based physical security program to address the risk of physical attack. The program is designed to provide increased resiliency for intentional attacks and weather events. Substations and facilities have been prioritized and evaluated for importance to the bulk electric system. Implementation has begun and build out will take place over the next ten years.

Table AR-1
Asset Renewal Line Work[1]

System Additions	Projected In-Service Year	Project Status	Planning Zone	MISO MTEP Appendix Status	MTEP PRJiD	Need Category
Wild Rose - Harrison 69-kV line (Y19) Partial Rebuild	2020	Planned	1	Targeted A 18	12147	Improve condition and increase reliability performance of existing line
Wautoma – Wild Rose 69-kV line (Y180) Partial rebuild	2020	Planned	1	Targeted A 18	13770	Improve condition and increase reliability performance of existing line
Coyne - Saratoga 115-kV line (T-72) Rebuild	2020	Planned	1	A	12178	Improve condition and increase reliability performance of existing line
Lincoln Pump Sta. - Chaffee Creek 69-kV line (Y18) Rebuild	2023	Planned	1	Targeted A 18	10486	Improve condition and increase reliability performance of existing line
Wautoma – Chaffee Creek 69-kV line (Y49) Rebuild	2023	Planned	1	Targeted A 18	7764	Improve condition and increase reliability performance of existing line
Lincoln Pump Sta. - McKenna 69-kV line (Y145) Rebuild	2025	Proposed	1	Targeted A 18	7765	Improve condition and increase reliability performance of existing line
McKenna - Castle Rock 69-kV line (Y47) Rebuild	2025	Proposed	1	Targeted A 18	7763	Improve condition and increase reliability performance of existing line
Munising-Blaney Park 69-kV line (Inland) Partial rebuild	2019	Planned	2	A	3096	Improve condition and increase reliability performance of existing line
Pine River-Hiawatha 69-kV line (ESE_6908) Partial rebuild	2020	Planned	2	Targeted A 18	13773	Improve condition and increase reliability performance of existing line
North Lake – M-38 138-kV line (NLKG31) Partial Rebuild	2020	Planned	2	Targeted A 18	15284	Improve condition and increase reliability performance of existing lines

[1]Project Costs Shown in MTEP

Table AR-1
Asset Renewal Line Work[1] (Continued)

System Additions	Projected In-Service Year	Project Status	Planning Zone	MISO MTEP Appendix Status	MTEP PRJiD	Need Category
Portage - 9 Mile 69-kV lines (6901/6902) Re-insulate	2023	Provisional	2	Targeted B 18	14909	Improve condition and increase reliability performance of existing lines
Gwinn- KI Sawyer 69-kV line (Sawyer) Re-insulate	2023	Provisional	2	--	--	Improve condition and increase reliability performance of existing line
Chandler-Delta (UPPCO) 69-kV line (Delta 1) Partial rebuild	2023	Provisional	2	--	--	Improve condition and increase reliability performance of existing line
Conover-Mass 69-kV line (6530) Partial rebuild	2025	Provisional	2	Target B 19	--	Improve condition and increase reliability performance of existing line
9 Mile SW STA - Pine River 69-kV lines (6921/23) Partial rebuild	2025	Provisional	2	Target B 19	--	Improve condition and increase reliability performance of existing line
Blaney Park SW STA – Mich. Limestone Quarry Tap 69-kV line (6914) Partial rebuild	2025	Provisional	2	--	--	Improve condition and increase reliability performance of existing line
Boscobel - Lone Rock 69-kV line (Y124) Rebuild	2019	Planned	3	A	7583	Improve condition and increase reliability performance of existing line
Portage – Staff 138-kV (X6) Rebuild	2020	Planned	3	A	9968	Improve condition and increase reliability performance of existing line
Staff – North Randolph 138-kV (X98) Rebuild	2020	Planned	3	A	9974	Improve condition and increase reliability performance of existing line
Sheepskin – Stoughton 69-kV line (Y12) Rebuild	2021	Planned	3	A	7600	Improve condition and increase reliability performance of existing line

[1]Project Costs Shown in MTEP

Table AR-1
Asset Renewal Line Work[1] (Continued)

System Additions	Projected In-Service Year	Project Status	Planning Zone	MISO MTEP Appendix Status	MTEP PRJiD	Need Category
Rebuild Dane - Waunakee 69-kV line (Y143)	2022	Planned	3	A	12177	Improve condition and increase reliability performance of existing line
Academy – North Randolph 138-kV line (X5) Re-insulate	2023	Planned	3	Target A 19	13822	Improve condition and increase reliability performance of existing line
Hillman – Falcon 138-kV line (X14) Rebuild	2025	Proposed	3	Targeted A 18	4726	Improve condition and increase reliability performance of existing line
Falcon – Darlington 138-kV line (X101) Rebuild	2025	Proposed	3	Targeted A 18	4726	Improve condition and increase reliability performance of existing line
Academy – Columbus 69-kV line (Y21) Rebuild	2023	Provisional	3	B	10590	Improve condition and increase reliability performance of existing line
South Beaver Dam - Horicon 69-kV line (Y134) Rebuild	2026	Provisional	3	--	--	Improve condition and increase reliability performance of existing line
Darlington – Rock Branch 69-kV line (Y109) Rebuild	2026	Provisional	3	--	--	Improve condition and increase reliability performance of existing line
Ohmstead - Cedar Ridge Wind Generation 138-kV line (X2) Rebuild	2019	Planned	4	A	12150	Improve condition and increase reliability performance of existing line
Cedar Ridge Wind Generation - Mullet River 138-kV line (X97) Rebuild	2020	Planned	4	A	12148	Improve condition and increase reliability performance of existing line
Goodman - Caldron Falls 69-kV line (J-88) Rebuild	2020	Planned	4	A	9977	Improve condition and increase reliability performance of existing line

Table AR-1
Asset Renewal Line Work[1] (Continued)

System Additions	Projected In-Service Year	Project Status	Planning Zone	MISO MTEP Appendix Status	MTEP PRJiD	Need Category
Finger Road -Canal 69-kV line (J-10) Rebuild	2020	Planned	4	A	8841	Improve condition and increase reliability performance of existing line
Neevin - Butte Des Morts 138-kV line (43021) Rebuild	2021	Planned	4	A	12185	Improve condition and increase reliability performance of existing line
Sunset Point - Mears - Woodenshoe - Neevin 138-kV lines (A-79), (MCRG21) and (80952) Rebuild	2021	Planned	4	A	12185	Improve condition and increase reliability performance of existing line
Danz - Finger Road 69-kV line (L-64) Rebuild	2022	Planned	4	Targeted A 18	12141	Improve condition and increase reliability performance of existing line
Finger Road - Highway V 69-kV line (U-47) Rebuild	2022	Planned	4	Targeted A 18	12140	Improve condition and increase reliability performance of existing line
Highway V - Oak Street 69-kV line (Z-26) Rebuild	2025	Planned	4	Targeted A 18	12137	Improve condition and increase reliability performance of existing line
Custer - New Holstein 69-kV line (P-68) Rebuild	2025	Proposed	4	Targeted A 18	7584	Improve condition and increase reliability performance of existing line
Wesmark - Rapids 69-kV line (R-44) Rebuild	2024	Proposed	4	Targeted A 18	12135	Improve condition and increase reliability performance of existing line
Finger Road SW STA – Wesmark 69-kV line (FIRY11) Rebuild	2023	Proposed	4	Targeted A 18	12134	Improve condition and increase reliability performance of existing line
Norwich – Barland 138-kV line (NWHG41) Re-insulate	2020	Planned	5	Targeted A 18	13821	Improve condition and increase reliability performance of existing line

Table AR-1
Asset Renewal Line Work[1] (Continued)

System Additions	Projected In-Service Year	Project Status	Planning Zone	MISO MTEP Appendix Status	MTEP PRJiD	Need Category
St. Martins - Edgewood 138-kV line (3013) Rebuild	2019	Planned	5	A	3510	Improve condition and increase reliability performance of existing line
Edgewood - Mukwonago 138-kV line (671K61) Rebuild and add breaker	2019	Planned	5	A	3510	Improve condition and increase reliability performance of existing line
Paris – Burlington 138-kV line (8962) Rebuild	2021	Planned	5	Targeted A 18	13732	Improve condition and increase reliability performance of existing line
St. Lawrence – Barton 138-kV line (8032) Partial rebuild	2023	Planned	5	Targeted A 18	13735	Improve condition and increase reliability performance of existing line
Barton – Auburn 138-kV line (9752) Partial rebuild	2024	Planned	5	Targeted A 18	13743	Improve condition and increase reliability performance of existing line
Summit -Cooney 138-kV line (6431) Rebuild	2023	Proposed	5	Target A 19	15457	Improve condition and increase reliability performance of existing line
University-Whitewater 138-kV line (UNIG51) Rebuild	2027	Provisional	5	--	--	Improve condition and increase reliability performance of existing line
University - Mukwonago 138-kV line (UNIG52) Rebuild	2027	Provisional	5	--	--	Improve condition and increase reliability performance of existing line
Line Clearance Mitigation Projects Current Cycle	2018 - 2020	Planned	--	Targeted A 18	13824	Improve condition and increase reliability performance of existing line
Line Clearance Mitigation Projects 2019	2019 - 2021	Planned	--	Targeted A 18	13825	Improve condition and increase reliability performance of existing line

[1]Project Costs Shown in MTEP

Table AR-1
Asset Renewal Line Work[1] (Continued)

System Additions	Projected In-Service Year	Project Status	Planning Zone	MISO MTEP Appendix Status	MTEP PRJiD	Need Category
Line Clearance Mitigation Projects 2020	2020 - 2022	Proposed	--	Target A 19	14912	Improve condition and increase reliability performance of existing line
Line Clearance Mitigation Projects 2021	2021 - 2023	Provisional	--	Target B 18	14913	Improve condition and increase reliability performance of existing line
Line Clearance Mitigation Projects 2022	2022 - 2024	Provisional	--	Target B 18	14966	Improve condition and increase reliability performance of existing line

[1]Project Costs Shown in MTEP

Table AR-2
Asset Renewal Underground Line Work[1]

System Additions	Projected In-Service Year	Project Status	Planning Zone	MISO MTEP Appendix Status	MTEP PRJiD	Need Category
Mackinac – McGulpin 138-kV line (9901) Rebuild	2021	Proposed	2	Targeted A 18	15145	Improve condition and increase reliability performance of existing line
Mackinac – McGulpin 138-kV line (9903) Rebuild	2021	Proposed	2	Targeted A 18	15145	Improve condition and increase reliability performance of existing line
Redwood – First Ave line 69-kV line (T-46) Rebuild	2020	Planned	4	Targeted A 18	8444	Improve condition and increase reliability performance of existing line
Lodestar – Erdman line 138-kV line (X-48) Rebuild	2022	Proposed	4	Targeted A 19	15926	Improve condition and increase reliability performance of existing line
Edgewater – Erdman line 69kV line (Y-31) Rebuild	2022	Proposed	4	Targeted A 19	15925	Improve condition and increase reliability performance of existing line
Danz Ave – University (WPS) 69-kV line (O-15) Rebuild	2023	Proposed	4	Targeted A 19	15924	Improve condition and increase reliability performance of existing line

[1]Project Costs Shown in MTEP

Table AR-3
Asset Renewal Substation and Other Work[1]

Substation Projects	Projected In-Service Year	Project Status	Planning Zone	MISO MTEP Appendix Status	MTEP PRJiD	Need Category
Eastom SS, Relay and Circuit Switcher Replacement	2018	Planned	1	Targeted A 18	13722	Asset Renewal – Breaker & Relay
Winneconne SS, Relay and Breaker Replacement	2019	Planned	1	Targeted A 18	13243	Asset Renewal – Breaker & Relay
Caroline SS – Transformer (T31) Breaker and Relay Asset Renewal	2021	Planned	1	Targeted A 18	14986	Asset Renewal - Transformer
Whitcomb SS – Transformer (T31) Breaker and Relay Asset Renewals	2021	Planned	1	Targeted A 18	14987	Asset Renewal - Transformer
Victoria SS, Relay and RTU Replacements	2017	Planned	2	Targeted A 18	13737	Asset Renewal – Breaker & Relay
Osceola SS. Breaker Replacements	2019	Planned	2	Targeted A 18	13755	Asset Renewal – Breaker & Relay
Straits SS, Replace 3 138kV Breakers	2019	Planned	2	Targeted A 18	13758	Asset Renewal – Breaker & Relay
Tilden SS, Asset Renewal	2023	Provisional	2	Target B 19	--	Asset Renewal/Reconfiguration
Empire SS, Asset Renewal	2023	Provisional	2	Target B 19	--	Asset Renewal/Reconfiguration
Lone Rock SS, Replace Relays and Breaker	2017	Planned	3	Targeted A 18	13760	Asset Renewal – Breaker & Relay
Baraboo SS, Bus Uprate and RTU Replacement	2018	Planned	3	Targeted A 18	13766	Asset Renewal - Substation
Huiskamp SS, Relay and Breaker Replacement	2018	Planned	3	Targeted A 18	13717	Asset Renewal – Breaker & Relay
N Monroe SS, Relay Replacements	2018	Planned	3	Targeted A 18	13733	Asset Renewal – Breaker & Relay
West Towne SS, Relay Replacements	2019	Planned	3	Targeted A 18	13749	Asset Renewal – Breaker & Relay
Hillside SS, Relay and Breaker Replacement	2019	Planned	3	Targeted A 18	13802	Asset Renewal – Breaker & Relay

Table AR-3
Asset Renewal Substation and Other Work[1] (Continued)

Substation Projects	Projected In-Service Year	Project Status	Planning Zone	MISO MTEP Appendix Status	MTEP PRJiD	Need Category
Kilbourn SS, Bus Reconfiguration and Relay Replacement	2019	Planned	3	Targeted A 18	13789	Asset Renewal - Substation
Pflaum SS, Replace Failed 69kV Underground Cable	2025	Planned	3	Targeted A 18	13768	Asset Renewal - Substation
Pulliam SS, Relay Upgrades and Replacements	2019	Planned	4	Targeted A 18	13727	Asset Renewal – Breaker & Relay
Wesmark SS, Relay and Breakers	2019	Planned	4	Targeted A 18	13747	Asset Renewal – Breaker & Relay
Dyckesville SS Relay, Breaker and Switch Replacement	2019	Planned	4	Targeted A 18	13762	Asset Renewal – Breaker & Relay
Cloverleaf SS, Replace Dead End and Switches	2019	Planned	4	Targeted A 18	13728	Asset Renewal – Substation
Edgewater SS, 345kV Asset Renewal and Bus Reconfiguration	2020	Planned	4	Targeted A 18	13756	Asset Renewal - Substation
Shoto SS – Transformer (T1) and Breaker Asset Renewal	2021	Planned	4	Targeted A 18	14988	Asset Renewal - Transformer
Pulliam SS, Transformer Retirement and Asset Renewal	2021	Provisional	4	Target A 19	15930	Asset Renewal – Transformer
Erdman SS, Transformer Addition and Asset Renewal	2021	Provisional	4	Target A 19	15931	Asset Renewal - Transformer
St. Lawrence SS, Breaker Replacements	2018	Planned	5	Targeted A 18	13746	Asset Renewal – Breaker & Relay
Lincoln SS, Relay and Breaker Replacements	2019	Planned	5	Targeted A 18	13738	Asset Renewal – Breaker & Relay
Waukesha SS, Relay and Breaker Replacements	2019	Planned	5	Targeted A 18	13742	Asset Renewal – Breaker & Relay
Bain SS, Asset Renewal	2021	Provisional	5	Target A 19	15932	Asset Renewal - Substation

Table AR-3
Asset Renewal Substation and Other Work[1] (Continued)

Substation Projects	Projected In-Service Year	Project Status	Planning Zone	MISO MTEP Appendix Status	MTEP PRJiD	Need Category
Range Line Switchyard, Asset Renewal	2022	Provisional	5	Target A 19	15828	Asset Renewal - Substation
Arcadian SS, Asset Renewal	2023	Provisional	5	Target B 19	--	Asset Renewal/Reconfiguration
Granville SS, Asset Renewal	2023	Provisional	5	Target B 19	--	Asset Renewal/Reconfiguration
Small Capital Project and Asset Renewal Current Cycle	2018-2020	Planned	--	Targeted A 18	13821	Reliability/Asset Renewal
Communications Reliability Upgrades Current Cycle	2018-2020	Planned	--	Targeted A 18	13823	Communication
Physical Security Current Cycle	2018 -2020	Planned	--	Targeted A 18	13826	Physical Security
Small Capital Project and Asset Renewal 2019	2019-2021	Planned	--	Targeted A 18	13822	Reliability/Asset Renewal
Communications Reliability Upgrades 2019	2019-2021	Planned	--	Targeted A 18	13829	Communication
Physical Security 2019	2019-2021	Planned	--	Targeted A 18	13828	Physical Security
Small Capital Project and Asset Renewal 2020	2020-2022	Provisional	--	Target A 19	14908	Asset Renewal/Reliability
Communications Reliability Upgrades 2020	2020-2022	Provisional	--	Target A 19	14910	Communications
Physical Security 2020	2020-2022	Provisional	--	Target A 19	14914	Physical Security
Small Capital Project and Asset Renewal 2021	2021-2023	Provisional	--	Targeted B 18	14909	Asset Renewal/Reliability
Communications Reliability Upgrades 2021	2021-2023	Provisional	--	Targeted B 18	14911	Communications

Table AR-3
Asset Renewal Substation and Other Work[1] (Continued)

Substation Projects	Projected In-Service Year	Project Status	Planning Zone	MISO MTEP Appendix Status	MTEP PRJiD	Need Category
Physical Security 2021	2021-2023	Provisional	--	Targeted B 18	14915	Physical Security
Small Capital Project and Asset Renewal 2022	2022-2024	Provisional	--	Targeted B 18	14964	Asset Renewal/Reliability
Communications Reliability Upgrades 2022	2022-2024	Provisional	--	Targeted B 18	14965	Communications
Physical Security 2022	2022-2024	Provisional	--	Targeted B 18	14967	Physical Security