MISO Identified Issues and Planned Solutions Near PJM Seam

4th Quarter Review - 2019

December 20, 2019

Notes:

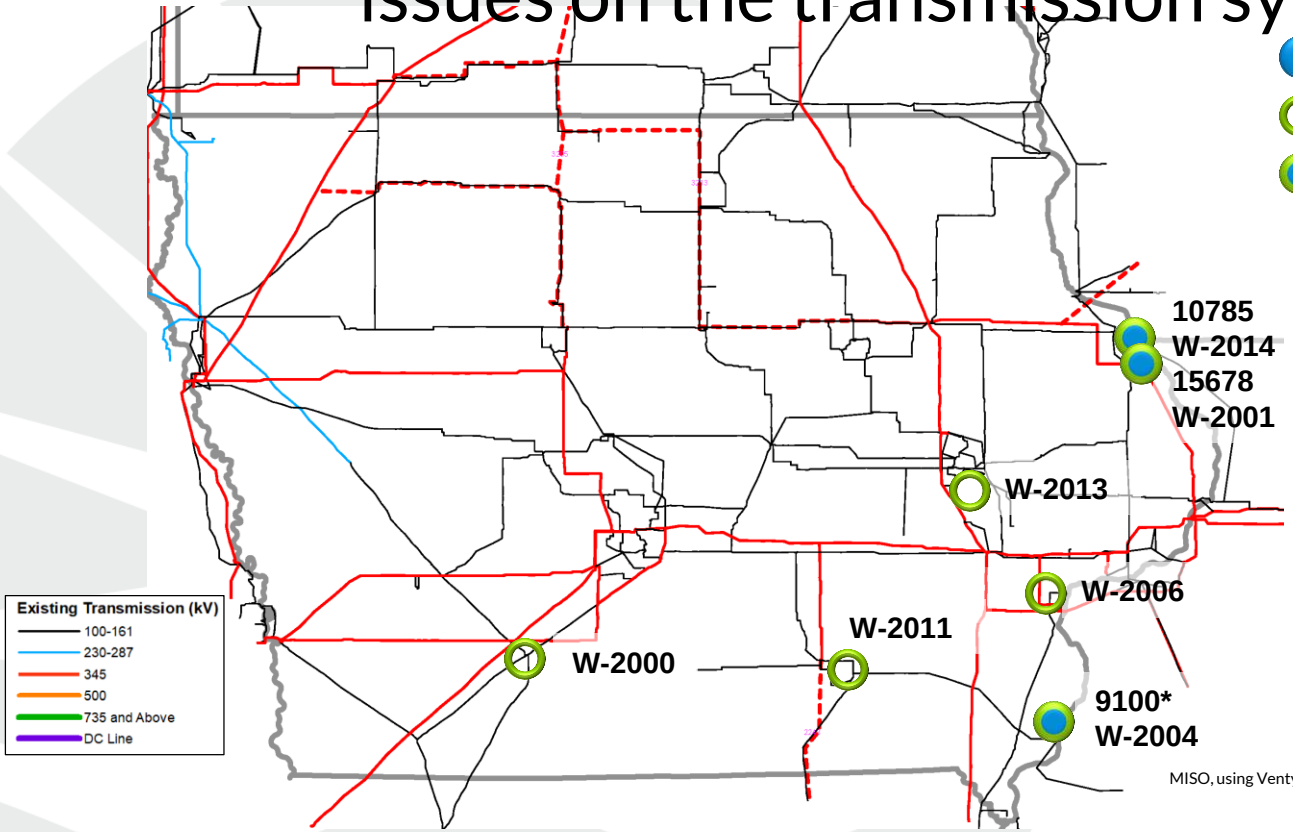
- This slide deck provides a summary of significant transmission projects near the PJM – MISO seam which have been added or modified in 2019 and are apart of MISO MTEP19
- It is not a comprehensive review of all planned projects
- For additional information:
  - See MTEP19 Report specifically Appendix A
    https://www.misoenergy.org/planning/planning/mtep-2019-/
  - See Planning Advisory Committee (PAC) Materials
    https://www.misoenergy.org/stakeholder-engagement/committees/planning-advisory-committee/
  - See Subregional Planning Meeting (SPM) Materials
    https://www.misoenergy.org/stakeholder-engagement/committees/subregional-planning-meeting/

Open Issues

- **MISO currently has no open issues for which potential solutions have not been identified**
- **New reliability issues will be identified in Q1, 2020**

ITC Midwest

ITCM: One BRP proposed to address reliability issues on the transmission system



A detailed list of needs is tabulated in spreadsheet Issues_Tracker_WEST_SPM3.xlsx

*appendix B

MISO identified two top thermal issues for ITCM facilities

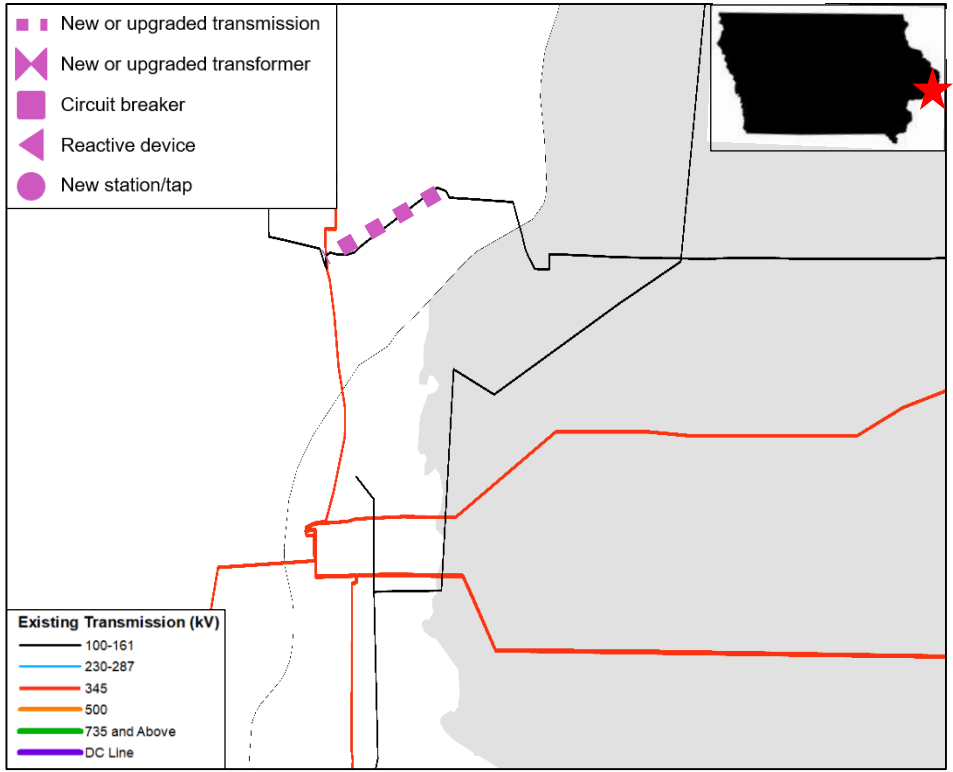
Thermal Violations					
Monitored Facility	**Owner(s)**	**Voltage Level (kV)**	**Contingency Category**	**Max Loading (%)**	**Comment**
Wapello – Rutledge	ITC Midwest	69	NB23	113%	Under investigation
Burlington – 4th St – Agency	ITC Midwest	69	P23	117%	Appendix B 9100 project proposed

MISO identified top voltage issue for ITCM facilities

Voltage Violations					
Substation	**Owner(s)**	**Voltage Level (kV)**	**Contingency Category**	**Voltage Violation (pu)**	**Comment**
SW Iowa 69 kV	ITCM	69	NB1, NB2	0.8 PU	Under investigation

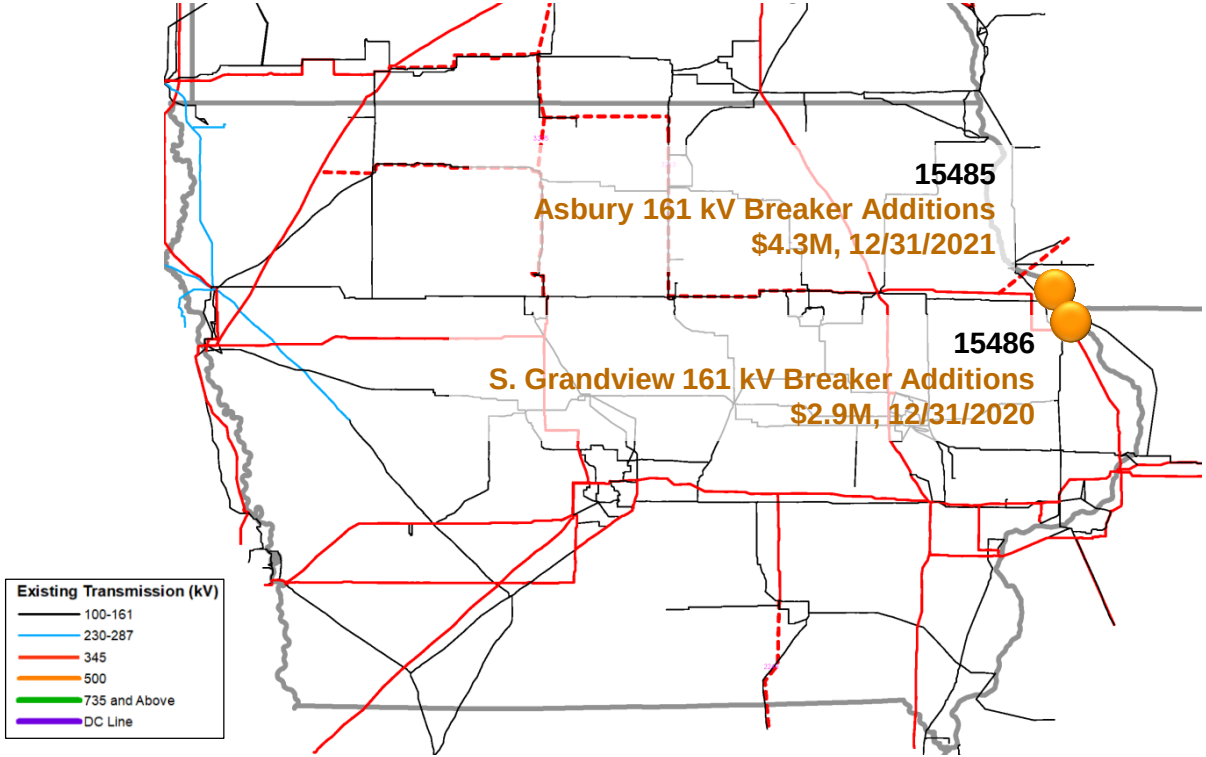
Beaver Channel – Rock Creek 161kV reconductor solves overloads associated with P6 events

- **Baseline Reliability Project**
- **MISO-identified W-2014 addressed by MTEP Project 10785**
  - Contingency Event: P6
  - Thermal Violation: Beaver Channel – Rock Creek
- **Project description**
  - Rebuild 3.7 miles of 161 kV transmission to 366 MVA
- **Estimated Cost:** $3.3 M
- **Expected ISD:** 12/31/2022
- **Target Appendix:** A in MTEP19
- **Alternatives:**
  - New line bypassing constraint



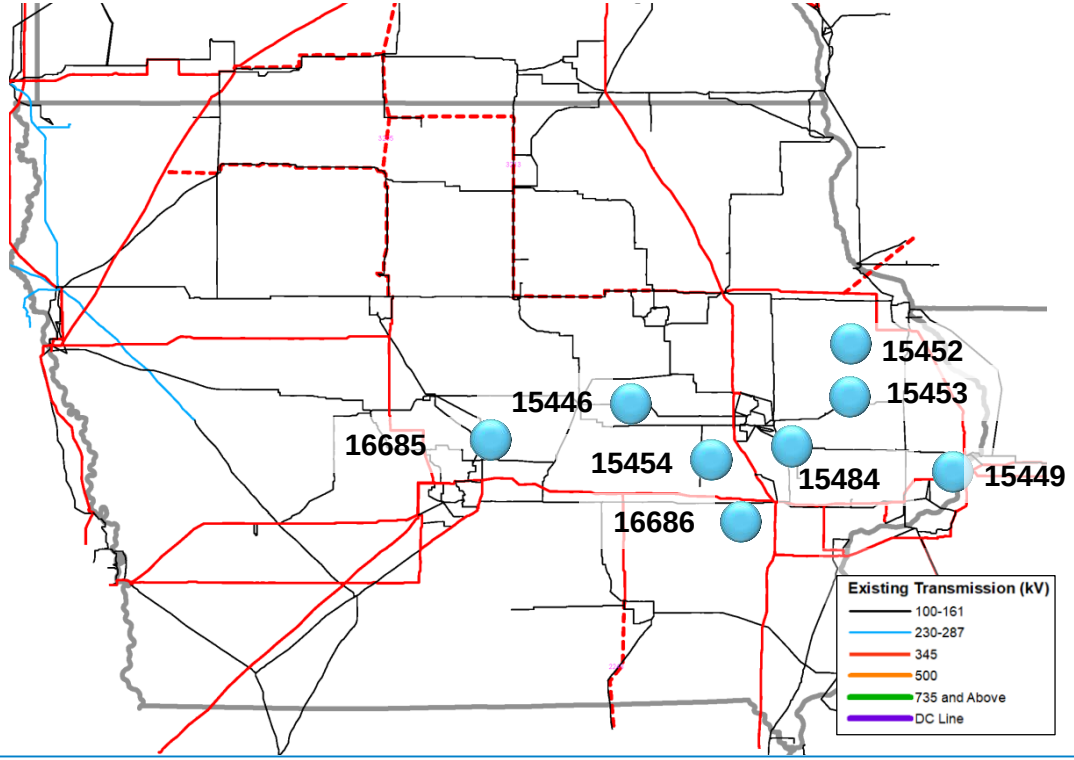
MISO, using Ventyx Velocity Suite © 2014

ITCM: Two Other projects address local reliability at an expected cost of $7.2M



Detailed project information is included in the Project Information Tables

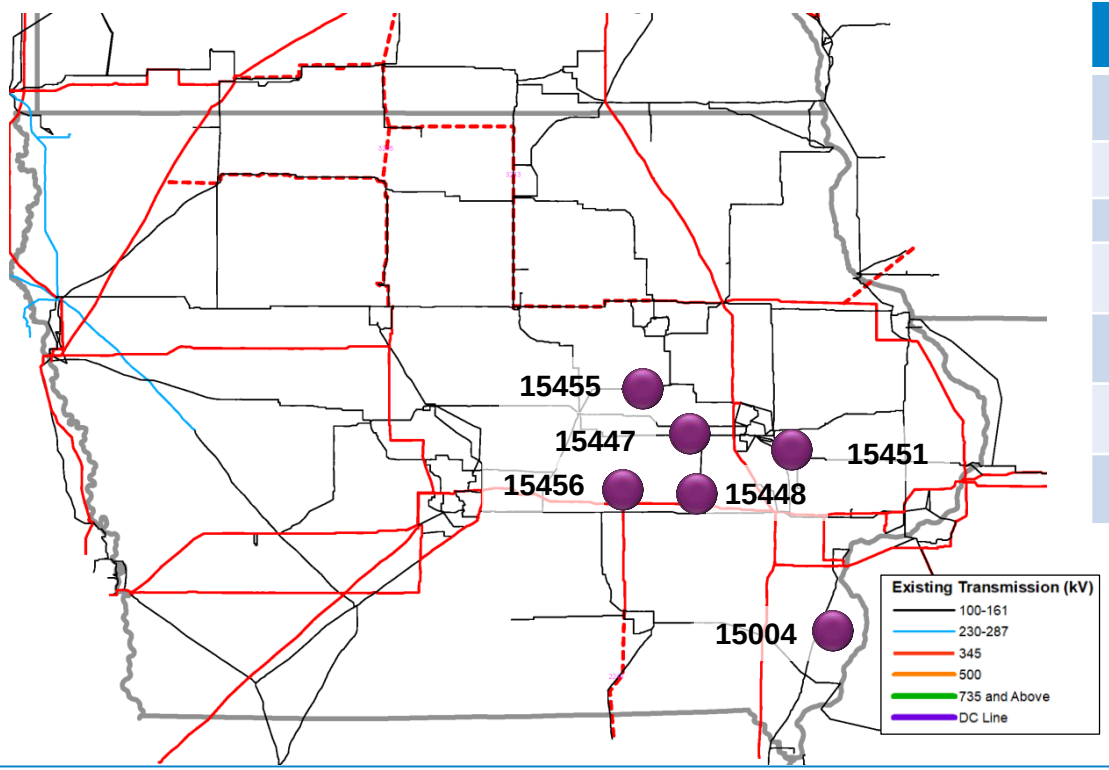
ITCM: Ten Other projects facilitate load growth at an expected cost of $30.1M



MTEP ID	Project Name	Expected ISD	Cost
15445	ITCM Customer Interconnects with short lead time 2022	12/31/2022	$2.4M
15446	Toledo Central 69kV Substation Interconnection	12/31/2022	$1.4M
15449	Ottumwa Heights 161kV Substation Interconnection	12/31/2021	$9.7M
15450	Beaver Rock 69kV Terminal Addition	12/31/2021	$0.3M
15452	Anamosa White Fawn Substation 69kV Interconnection	12/31/2019	$1.5M
15453	Clarence South 69kV Substation Interconnection	12/31/2022	$2.1M
15454	Walford Terry 69kV Substation Interconnection	12/30/2022	$2.7M
15484	Solon Big Grove 69kV Interconnection	12/31/2022	$2.4M
16685	Nevada 19th Street Expansion	4/1/2020	$2.3M
16686	Garner Galls Creek 161kV Interconnection	9/30/2020	$5.3M

Detailed project information is included in the Project Information Tables

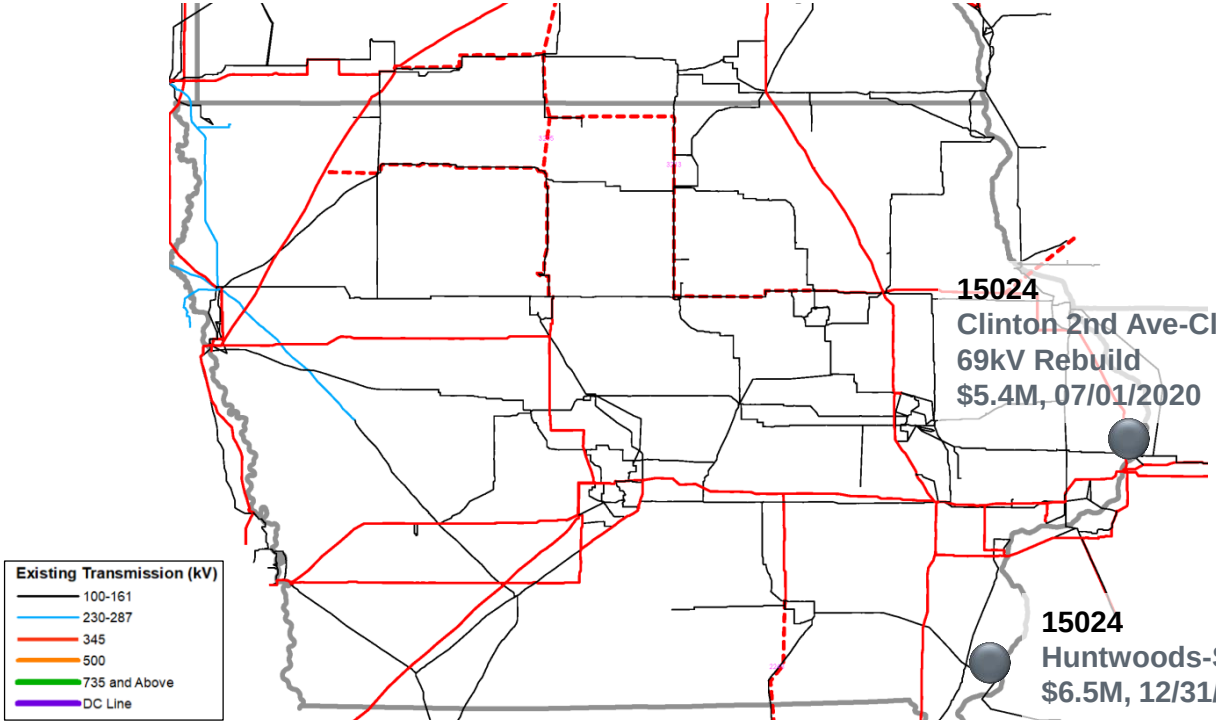
ITCM: Seven Other projects repairing and upgrading aging facilities $95.4M



MTEP ID	Project Name	Expected ISD	Cost
15444	ITCM Asset Replacement Program 2022	12/31/2022	$37.1M
15004	New London Tap 69kV Rebuild	12/31/2022	$6.1M
15455	Dysart-Traer 161kV Rebuild	12/31/2021	$26.5M
15447	Belle Plaine North 69kV Substation Interconnection	12/31/2023	$3.9M
15448	Williamsburg West 161kV Substation Interconnection	12/30/2022	$4.4M
15451	Mt Vernon 161-69kV Transformer Addition	6/1/2022	$6.7M
15456	Brooklyn-Malcom 69kV line & Grinnell 69kV Terminal	12/31/2026	$10.7M

Detailed project information is included in the Project Information Tables

ITCM: One Other project to reroute a line to improve maintenance accessibility



15024
Clinton 2nd Ave-Clinton North 6 mile 69kV Rebuild
$5.4M, 07/01/2020

15024
Huntwoods-Sawyer IAAP 69 kV Reroute
$6.5M, 12/31/2020

Detailed project information is included in the Project Information Tables

ITCM: One Baseline Reliability Project proposed

Project ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
10785	Beaver Channel-Rock Creek 161kV Reconductor	ITC will reconductor the Beaver Channel-Rock Creek 161kV 3.68 mile line to 366 MVA capacity and upgrade the Beaver Channel 161kV terminal 140 and the Rock Creek 161kV terminal 171. This will also require modifying the 69kV circuit that is on the same structures.	The 2018 retirement of the ML Kapp generation formerly served out of the Beaver Channel substation has impacted system flows in the Clinton, IA area. Several N-1-1 or P6 contingencies in the Clinton, IA area cause the Beaver Channel-Rock Creek 161kV line to overload.	December 31, 2022	$3.30M

ITCM: Two Other projects driven by local reliability

Project ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
15485	Asbury 161kV Breaker Additions	Add two 161kV line breakers, and a 161kV bus tie breaker, and a new control enclosure at the Asbury substation. Install OPGW from the Lore substation to the Asbury substation on the 2.95 mile Lore-Asbury 161kV line section.	The P1 loss of the Lore-Asbury-Center Grove 161kV line will outage both 161/13kV Asbury distribution transformers. Alliant Energy has requested ITC install 161kV breakers at the Asbury substation to increase the reliability of the Asbury distribution transformers.	December 31, 2021	$4.27M
15486	South Grandview 161kV Breaker Additions	Add two 161kV line breakers, a bus tie breaker, and a new control enclosure at the South Grandview substation.	Alliant Energy has requested that ITC install 161kV breakers at the South Grandview substation. A single initiating event P1 loss of the Salem-South Grandview-8th Street 161kV line will outage both 161/13kV South Grandview distribution transformers.	December 31, 2020	$2.93M

ITCM: Eight Other projects driven by load growth 1 of 2

Project ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
15445	ITCM Customer Interconnects with short lead time 2022	These projects are being done at the request of an interconnection customer in order to facilitate new load, re-distribute existing load, improve the performance of the sub-transmission and distribution systems, or to accommodate a new Transmission-to-Transmission connection request.	These projects are being done at the request of an interconnection customer in order to facilitate new load, re-distribute existing load, improve the performance of the sub-transmission and distribution systems, or to accommodate a new Transmission-to-Transmission connection request.	December 31, 2022	$2.40M
15446	Toledo Central 69kV Substation Interconnection	Two (2) 69kV breakers will be installed at the Toledo Central Substation. All the substation equipment will be rated for 1200A or greater. IPL will purchase the land for the Toledo Central Substation. IPL will install one 69-34.5/25kV 33MVA transformer at the substation.	Customer requested load interconnection needed to facilitate the conversion to 69kV operation.	December 30, 2023	$1.38M
15449	Ottumwa Heights 161kV Substation Interconnection	IPL and ITC will be building a 161:26.2/13.1kV substation near Rutledge substation. ITCMW will construct a 4-position ring bus. All terminal equipment should be capable of 2000A minimum. ITC will build two independent taps from Ottumwa Generation – Woody #1 to the Ottumwa Heights substation.	At the request of Alliant Energy, ITCM will interconnect a new 161kV distribution substation on the northeast side of Ottumwa, IA. The city of Ottumwa is expecting continued load growth and transmission is required to support this load growth. This new substation is the beginning of a multi-year plan to shift the load off the existing 69kV.	December 31, 2021	$9.77M
15450	Beaver Rock 69kV Terminal Addition	Construct a new line terminal at the Beaver Rock substation. CIPCO will construct a new 69kV line (~13.5 miles) from the Buffalo Bill REC substation to the Beaver Rock substation (potentially using existing lines/ structures). This will create a second networked line between Beaver Rock and Grand Mound.	Customer requested load interconnection.	December 31, 2021	$0.28M

ITCM: Eight Other projects driven by load growth 2 of 2

Project ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
15452	Anamosa White Fawn Substation 69kV Interconnection	ITCM will install one (1) 69 kV breaker and associated equipment and tap and re-route the Amber Creamery Ckt. 6270 to create an in and out transmission configuration with a conductor having a minimum rating of 640 Amps.	Customer requested load interconnection associated with the 34.5kV to 69kV conversion work.	December 31, 2019	$1.48M
15453	Clarence South 69kV Substation Interconnection	ITCM will install one (1) 69 kV breaker and associated equipment at IPL's Clarence South substation location and two ~0.02 mile tap lines. All 69 kV equipment needs to have a minimum rating of 1200A. Note: The 69 kV breaker needs to be installed on the Olin side of the Clarence South XFMR. Work with IPL to determine the location of the box structure.	Customer requested load interconnection associated with the 34.5kV to 69kV conversion.	December 31, 2022	$2.14M
15454	Walford Terry 69kV Substation Interconnection	The Walford Terry Substation will be a new substation with three (3) 69kV terminals capable of 1200A or greater. One (1) future capacitor position will be needed. Staging and size of the capacitor bank will be finalized in a future EI Sketch.	Customer requested load interconnection associated with the 3.45kV to 69kV conversion.	December 30, 2022	$2.72M
15484	Solon Big Grove 69kV Interconnection	ITC will install two new ~0.08 mile tap lines from the CIPCO owned 34.5kV line to the IPL owned Solon Big Grove (new) distribution substation. The tap line will be initially operated at 34.5kV but should be constructed to 69kV standards due to the future conversion from Eagle to Mt. Vernon.	Customer requested load interconnection.	December 31, 2020	$2.36M

ITCM: Seven Other projects address age and condition

Project ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
15004	New London Tap 69kV Rebuild	Rebuild the existing 69kV New London tap to current 69kV standards using T2(2-4/0) conductor along existing route.	The New London tap was constructed with long spans and no shield wire approximately 47 years ago. This has resulted in poor reliability of not only the tap but also the main line between Burlington North and Mediapolis as there is no breaker on the tap. This condition cannot be corrected with maintenance.	December 31, 2022	$6.14M
15444	ITCM Asset Replacement Program 2022	Replace equipment that is past its expected design life, utilizes outdated functionality or whose failure rates and maintenance have increased potential for misoperations and higher maintenance costs associated with their ongoing use.	Replace aging and outdated equipment on a cycle that will ensure each system is replaced near its expected end of life. Modern equipment can improve reliability, use state of the art technology, and typically will use longer maintenance intervals which reduces maintenance costs.	December 31, 2022	$37.08M
15447	Belle Plaine North 69kV Substation Interconnection	Build the 69kV portion of the new Belle Plaine North 69kV substation. The new substation will be a three breaker in-and-out design. The new substation will also require OPGW to be installed on the Belle Plaine Jct-Belle Plaine North line and the Belle Plaine North-River Valley line.	ITCM is working to upgrade the 34.5kV system to 69kV operation, which will greatly increase available capacity and decrease system losses. This project is to interconnect the new Belle Plaine North Substation as requested by Alliant Energy and is part of the overall plan to convert the area to 69kV operation.	December 31, 2023	$3.89M
15448	Williamsburg West 161kV Substation Interconnection	The Williamsburg West Substation will be a 161kV Five Position Ring Bus. All 161kV equipment will be capable of 2000A or greater. The Williamsburg Transmission Substation will be fed from Williamsburg West until the conversion to 69kV.	Long term plan to convert 34.5kV system to 69kV operation.	December 30, 2022	$4.43M
15451	Mt Vernon 161-69kV Transformer Addition	At Mount Vernon substation a 100 MVA 161/69 kV transformer will be installed. Also two 161 kV line breakers will be installed. The 161/34.5 kV transformer will remain until after all of the 34.5 kV loads are converted to 69 kV.	The 34.5 kV system is aged and in poor condition in many locations, as well as unable to adequately serve new loads that may want to connect in the area due to limited available capacity. ITCM is working to upgrade the 34.5 kV system to 69 kV operation, which will greatly increase available capacity and decrease system losses.	June 1, 2022	$6.75M
15455	Dysart-Traer 161kV Rebuild	ITC Midwest will rebuild the existing 15.93 mile 161kV circuit with T2 Hawk conductor, which will significantly decrease the susceptibility to galloping. ITC Midwest is also rebuilding the 34.5kV circuit from Dysart to Traer to 69kV which will generally follow the same route. Portions of these lines will be built to double circuit.	The existing Dysart – Traer 161kV circuit has had several operations and maintenance issues in the past. These issues have stemmed from the use of Pheonix SD conductor and the age/class of the poles. In the past couple years ITC has attached several different anti-galloping devices which hasn't eliminated the issues.	December 31, 2021	$26.47M
15456	Brooklyn-Malcom 69kV line & Grinnell 69kV Terminal	ITC Midwest will construct a new ~9 mile 69kV line from Brooklyn to the Malcom Tap, install new 69kV switches at the Malcom substation, and rebuild 1 mile of line from the Malcom Tap to the Grinnell Substation to double circuit 69kV. ITC Midwest will add a 69kV terminal and breaker at the Grinnell substation.	The 34.5 kV system is aged and in poor condition in many locations, as well as unable to adequately serve new loads that may want to connect in the area due to limited available capacity. ITCM is working to upgrade the 34.5 kV system to 69 kV operation, which will greatly increase available capacity and decrease system losses.	December 31, 2026	$10.69M

ITCM: One Other project is being initiated to relocate for access and condition

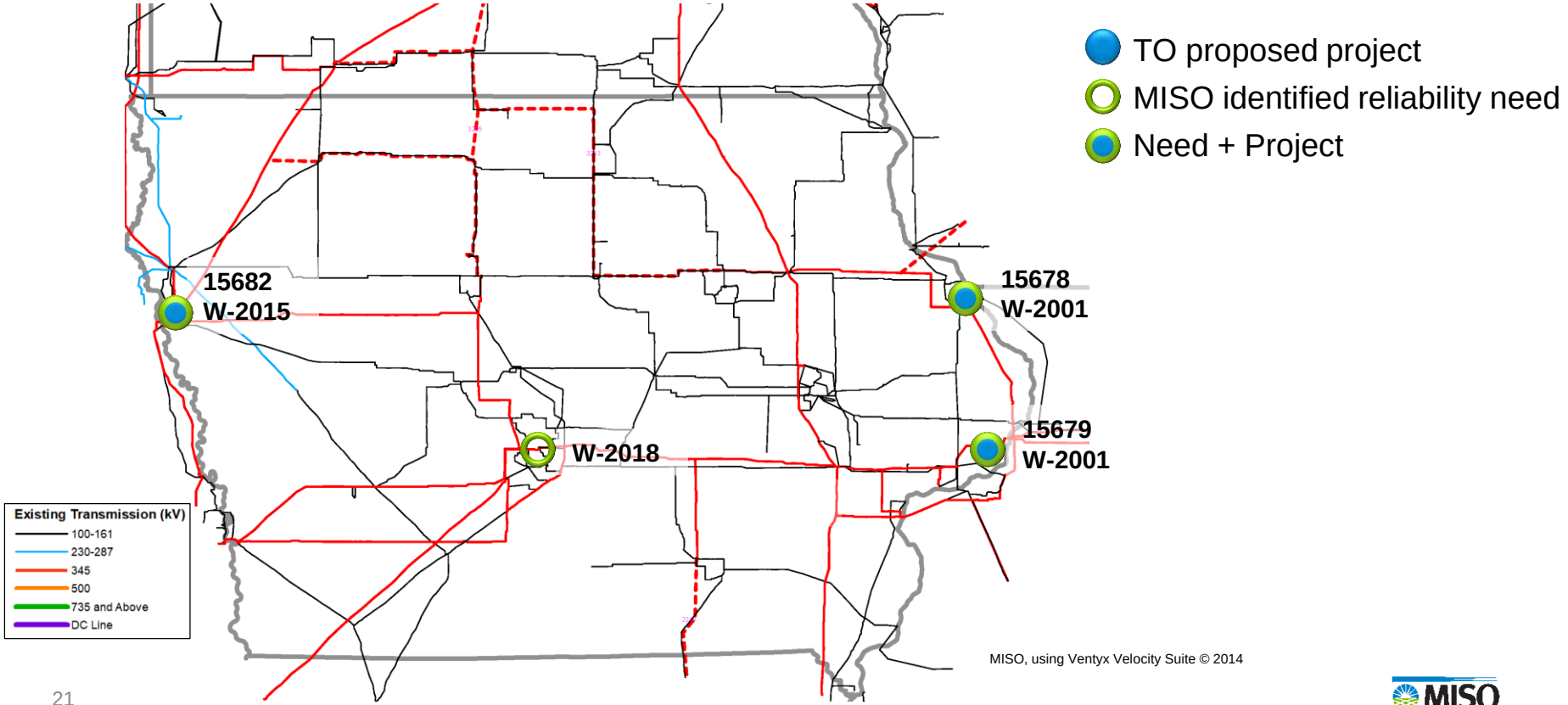
Project ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
15024	Huntwoods-Sawyer IAAP 69kV Rebuild	Re-route the line segment requiring maintenance by constructing approximately 4.4 new miles of T2(2-4/0) 69kV line beginning at Huntwoods and heading west and then south tying into the existing Huntwoods-Sawyer. Retire approximately 3.5 miles of existing 69kV line beginning at Huntwoods and heading southwest to the point where the new line will tie into the existing line.	A 3.5 mile segment of the Huntwoods-Sawyer 69kV line located on Iowa Army Ammunition Plant (IAAP) property is in poor condition and requires maintenance. A significant portion of this line segment cannot be accessed to replace poles and other equipment requiring replacement.	December 31, 2020	$6.46M
16687	Clinton 2nd Ave-Clinton North 6 mile 69kV Rebuild	Rebuild ~6.1 miles of old 4/0 ACSR line from the Clinton 2nd Ave sub to the Clinton North sub and retire the Clinton 2nd Street-Clinton South 69kV line.	Customer requested line removal. (see project justification document)	July 1, 2020	$5.41M

ITCM: Two projects proposed for inclusion in Appendix B

Project ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
13888	ITCM Walters 161/69kV Substation	Tap the Huntley - Freeborn 161kV line ~14 miles West of Freeborn and construct a ~7mi 161kV line and install a 100MVA 161-69kV transformer at the Walters Substation.	Voltage and Thermal overloads caused by separate P2.4 contingencies at Hayward and Huntley substations	December 31, 2021	$11.34M
15826	Lansing 161-69kV Transformer Upgrade	Move the Glenworth 161/69kV transformer to the Lansing substation and upgrade the terminal equipment to a minimum of 143MVA capacity.	The N-1-1 (P6) contingencies that outage multiple 161kV lines out of the Lansing substation will overload the existing Lansing 161/69kV 75MVA transformer. The only mitigation currently is to turn down the Lansing generation if any one of the 161kV lines at Lansing is out of service for any reason.	December 31, 2020	

MidAmerican Energy

MEC: Two BRPs proposed to address reliability issues on the transmission system



A detailed list of needs is tabulated in spreadsheet Issues_Tracker_WEST_SPM3.xlsx

MISO identified top thermal issue for MidAmerican facilities

Thermal Violations					
Monitored Facility	**Owner(s)**	**Voltage Level (kV)**	**Contingency Category**	**Max Loading (%)**	**Comment**
Sycamore - Delaware and Des Moines – Metro East 161 kV lines	MidAmerican	161	P6	135%	Proposed project to install a Bondurant 345/161 kV transformer
Sycamore 345/161 kV xfmr	MidAmerican	345/161	P6	102%	Redispatch as a system adjustment prior to event
Sycamore – Grimes 345 kV ckt 2	MidAmerican	345	P23	103%	Expected DPP upgrade
Monona 161/69 kV xfmr	MidAmerican	161/69	P1	115%	Resolved by 69 kV reconfiguration

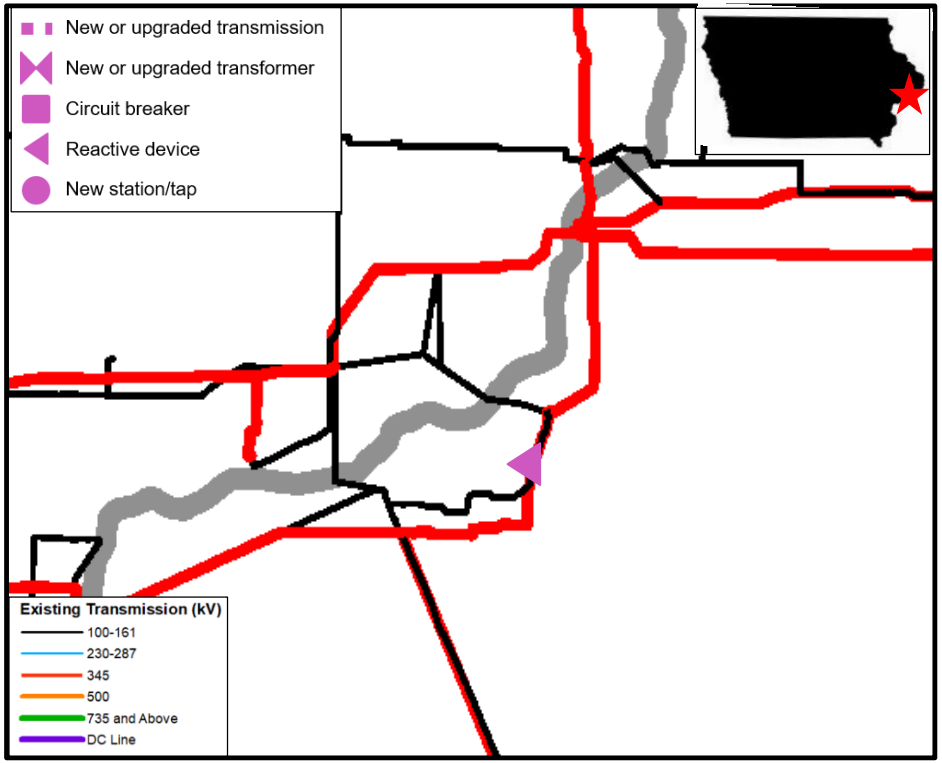
MEC: Summary of NERC-permissible system adjustments

NERC Contingency Type	Load Shed (MW)		Generation Redispatch (MW)		Reconfigure Events
	Count	Max	Count	Max	Count
P22 (Bus fault)	-	-	-	-	-
P23 (Breaker fault)	-	-	-	-	-
P24 (Bus-tie fault)	-	-	-	-	-
P3 (G1-N1)	-	-	-	-	-
P4 (Stuck breaker)	-	-	-	-	-
P5 (Non-redundant relay)	-	-	-	-	-
P6 (N-1-1)	68	118	-	-	-
P7 (Common tower)	-	-	-	-	-

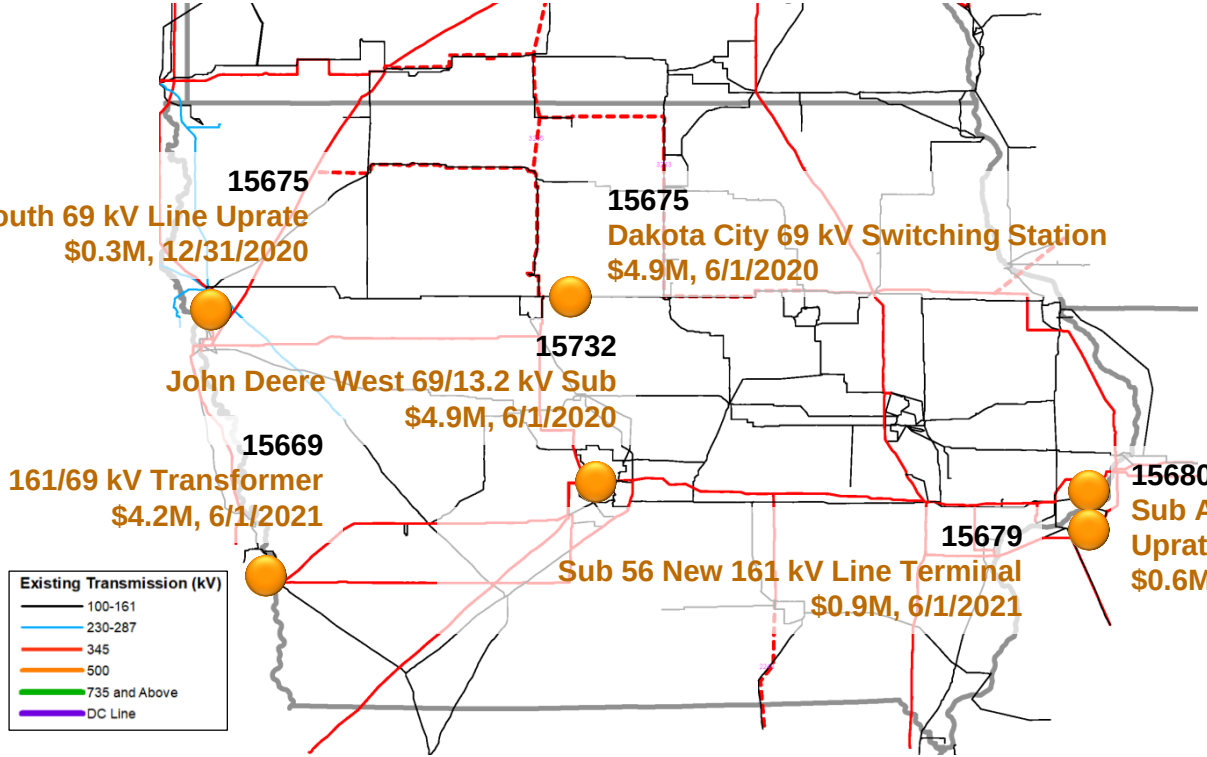
Notes:
- Table subject to change with input prior to finalization of MTEP report
- Count of specific events occurring across 7 planning scenarios
- Around 3.5 million total events were studied for each model

Sub 17 capacitor additions solve low voltages with P6 events

- **Baseline Reliability Project**
- **MISO-identified W-2001 addressed by MTEP Project 15679**
  - Contingency Event: P6
  - Low Voltage post event
- **Project description**
  - Install two 25 Mvar capacitors to the existing Sub 17
- **Estimated Cost:** $1.5 M
- **Expected ISD:** 6/1/2020
- **Target Appendix:** A in MTEP19
- **Alternatives:**
  - New 161 kV line to support the area
  - Cordova 345/161 kV connection to support area

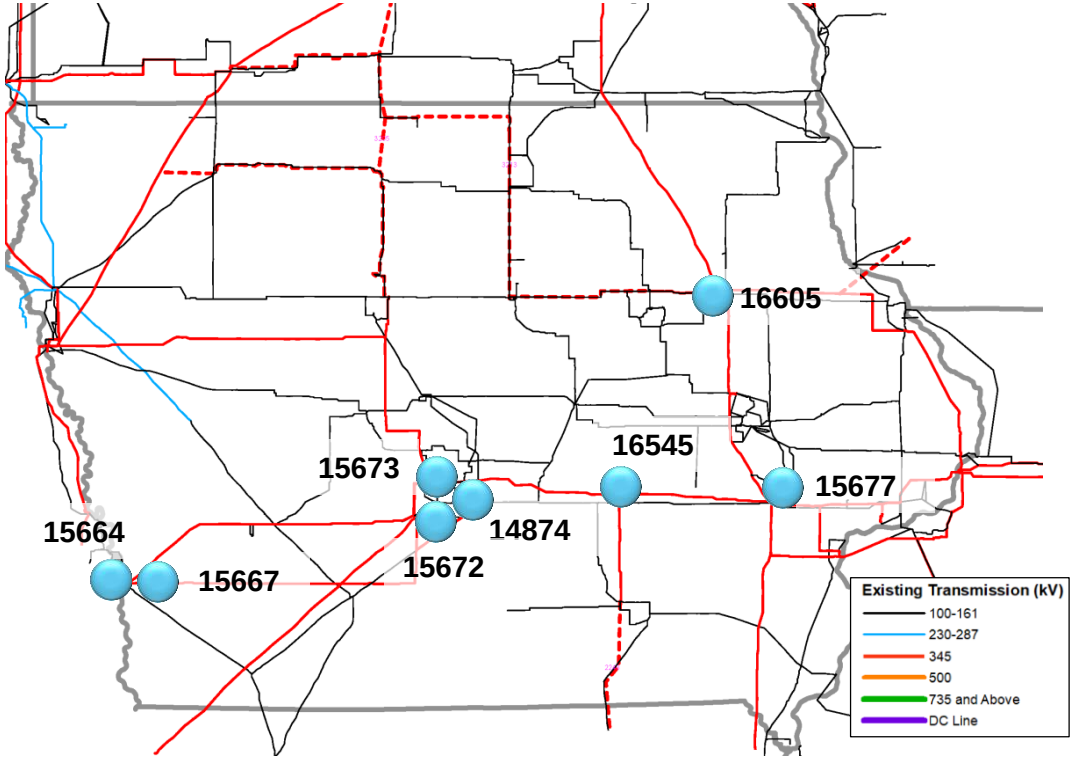


MEC: Five Other projects address local reliability at an expected cost of $15.75M



Detailed project information is included in the Project Information Tables

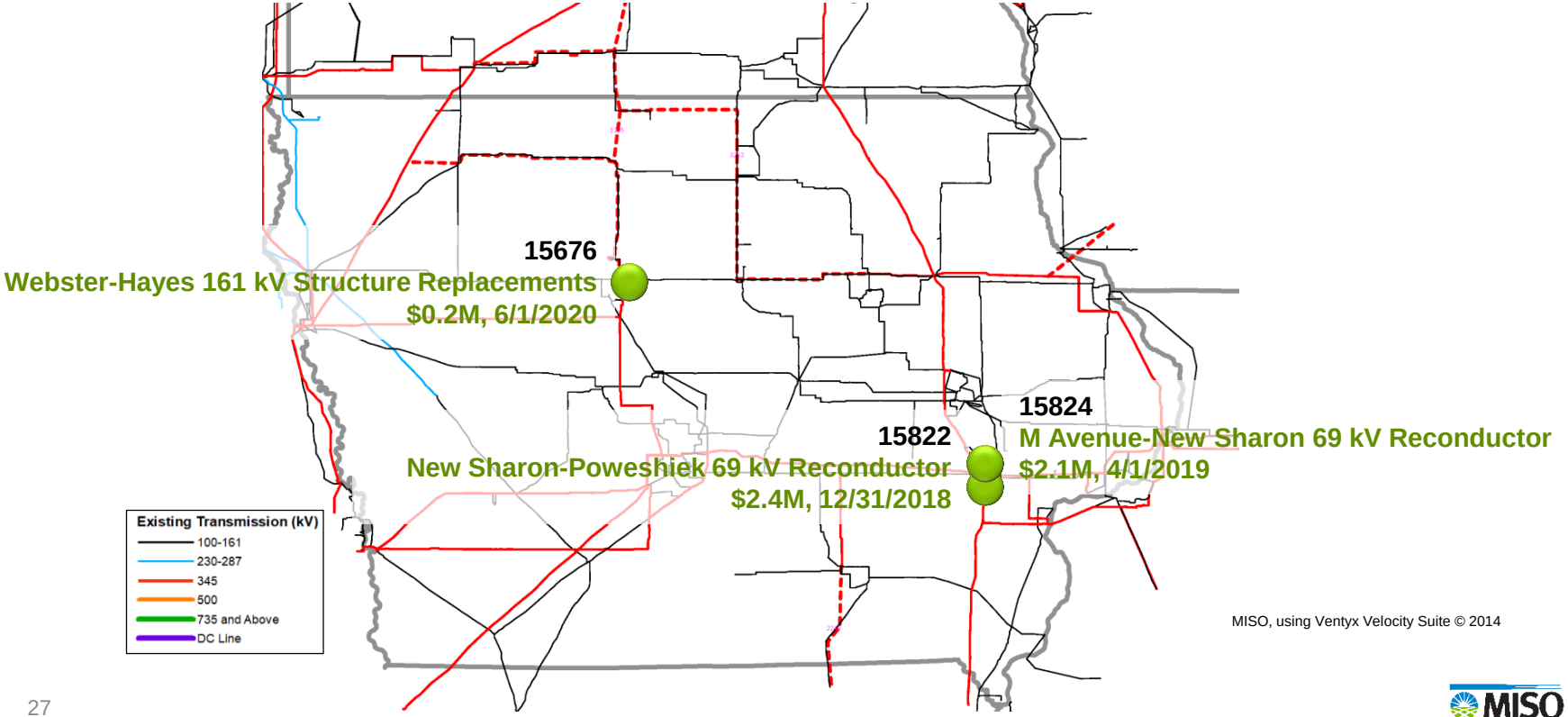
MEC: Five Other projects facilitate load growth at an expected cost of $48.3M



MTEP ID	Project Name	Expected ISD	Cost
14784	50th Ave NW Substation	8/15/2020	$11.8 M
15664	Indian Creek East 161 kV Substation Expansion	6/1/2019	$2.0 M
15667	Southland 345 kV Substation Expansion	12/1/2019	$3.8 M
15672	Maffitt Lake 161-13 kV Substation	9/1/2019	$23.7 M
15673	SE Magazine Road 161-13 kV Substation	6/1/2020	$1.1 M
15677	Prairie du Chien Road 161-13 kV Substation	12/1/2019	$1.9 M
16545	Ponderosa 161-13 kV Substation	6/1/2021	$2.8 M
16605	Gilbertville 161-13 kV Substation	6/1/2020	$1.3 M

Detailed project information is included in the Project Information Tables

MEC: Three projects enabling generation interconnection



Detailed project information is included in the Project Information Tables

MEC: Two Baseline Reliability Projects proposed

Project ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
15678	Sub 17: New 161 kV Capacitors	Install two new 161 kV 25 MVAr capacitor banks at Sub 17.	Needed to mitigate low voltages following Category P6 (N-1-1) contingencies.	June 1, 2020	$1.50M
15682	Neal South 161 kV Tap Lines	Bisect the Neal North-Salix Junction 161 kV line and construct a new double circuit 161 kV line into Neal South, Expand the Neal South substation and install two new 161 kV line terminals.	Mitigates potential low voltages after a P6 contingency.	June 1, 2020	$6.50M

MEC: Six Other projects driven by local reliability

Project ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
15669	Sub 701: Install 2nd 161-69 kV Transformer	Install a second 161-69 kV transformer and complete the 161 kV ring bus at Sub 701. Install two new 161 kV circuit breakers.	Reduces post-contingent loading on the existing Sub 701 161-69 kV transformer.	June 1, 2021	$4.20M
15674	John Deere West 69-13 kV Substation	Construct a new John Deere West 69-13 kV distribution substation adjacent to the existing John Deere Substation and retire the existing John Deere Substation.	Serve existing customer load. This reliability improvement project replaces the existing John Deere Substation.	June 1, 2020	$4.90M
15675	Dakota City 69 kV Switching Station	New Dakota City four-terminal 69 kV Switching Station tapping the MidAmerican Energy Humboldt East-Thor 69 kV line and the Corn Belt Power Cooperative Galbraith to Hope 69 kV line.	Mitigates low voltages and thermal overloads after maintenance outage and Category P1 contingencies during off-peak load conditions.	June 1, 2020	$4.90M
15679	Sub 56: New 161 kV Line Terminal	Add a new 161 kV line terminal at Sub 56 for a new CIPCO/MPW 161 kV line to Muscatine, Iowa.	The line terminal is needed to connect a new 161 kV line being built by Central Iowa Power Cooperative (CIPCO) and Muscatine Power & Water (MPW).	June 1, 2021	$0.90M
15680	Sub A-Sub 84-Sub 55 69 kV Line Uprate	Replace structures to increase the allowable operating temperature of the line conductor on the Sub A-Sub 84 and Sub 84-Sub 55 69 kV lines	Addresses post-contingent loading following local Category P6 (N-1-1) contingencies.	June 1, 2019	$0.60M
15684	Kellogg-Plymouth 69 kV Line Uprate	Replace structures on the Plymouth-Kellogg 69 kV line to increase the line rating.	The Kellogg-Plymouth 69 kV line can overload for a P1 contingency.	December 31, 2020	$0.25M

MEC: Seven Other projects driven by load growth

Project ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
14784	50th Avenue NW Substation	New 161 kV distribution substation and associated 161 kV line reconfiguration and construction.	Distribution substation is needed to serve increasing levels of customer load.	August 15, 2020	$11.77M
15664	Indian Creek East 161 kV Substation Expansion	Expand the 161 kV ring bus and install two 161 kV circuit breakers and one transformer terminal.	Provides a utility connection point to a newly installed customer-owned transformer.	June 1, 2019	$2.00M
15667	Southland 345 kV Substation Expansion	Add two new 345 kV circuit breakers and two transformer terminals.	Provides a utility connection point for customer-owned transformers.	December 1, 2019	$3.80M
15672	Maffitt Lake 161-13 kV Substation	Construct a new 161-13 kV substation and 9.5 miles of associated 161 kV line taps.	New large customer load.	September 1, 2019	$23.70M
15673	SE Magazine Road 161-13 kV Substation	Construct a new SE Magazine Road 161-13 kV distribution substation tapping the Ankeny to NE Ankeny 161 kV line.	Serves new customer load.	June 1, 2020	$1.10M

MEC: Eight Other projects driven by load growth

Project ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
15677	Prairie du Chien Road 161-13 kV Substation	Construct a new Prairie du Chien Road 161-13 kV distribution substation bisecting the Sub P-Northgate 161 kV line.	Serve growing customer load.	December 1, 2019	$1.85M
16545	Ponderosa 161-13 kV Substation	Construct a new Ponderosa 161-13 kV Substation.	The substation is needed to serve increasing distribution load near Lake Ponderosa in east-central Iowa.	June 1, 2021	$2.80M
16605	Gilbertville 161-13 kV Substation	Construct a new 10/13.3. MVA Gilbertville 161-13 kV distribution substation on the Washburn-Hazleton 161 kV line approximately 3.1 miles east of Washburn Substation	The existing 69-13 kV Gilbertville Substation is loaded to near its maximum 2.5 MVA capacity and is subject to flooding. The new Gilbertville 161-13 kV substation will provide increased load serving capability and will not be located in a flood plain.	June 1, 2020	$1.31M

MEC: Two Other projects address age and condition

Project ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
15670	Glenwood: Rebuild 69 kV Substation	Rebuild the Glenwood 69-13.2 kV Substation to improve reliability.	Previous equipment failures have affected service reliability at this older substation.	June 1, 2020	$0.40M
15683	Merrill North Substation Transformer and Line	Expand the Merrill North Substation 69 kV bus to install a second 69-12.47 kV transformer and second 69 kV line. Install two 69 kV line breakers and construct second 69 kV line into Merrill North Substation. Retire the existing Merrill Substation.	Failure of equipment at Merrill 69 kV Substation.	December 31, 2019	$0.90M

MEC: Two Other project is proposed to eliminate a failed equipment and uprate a line

Project ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
15681	Raun Substation: Retire Reactor and Install Reactor Switchers	Retire one 13 kV reactor connected to the tertiary of Raun 345-161 kV transformer AC and install new reactor switchers on the two remaining 13 kV reactors.	Needed to mitigate failed equipment and reduce switching transient overvoltages.	June 1, 2019	$0.55M
15690	Buena Vista: Replace CT on Wisdom 161 kV Line Terminal	Replace a CT (current transformer) on the Wisdom 161 kV line terminal at Buena Vista Substation.	This CT appears as a limiter in PROMOD studies.	December 31, 2020	$0.02M

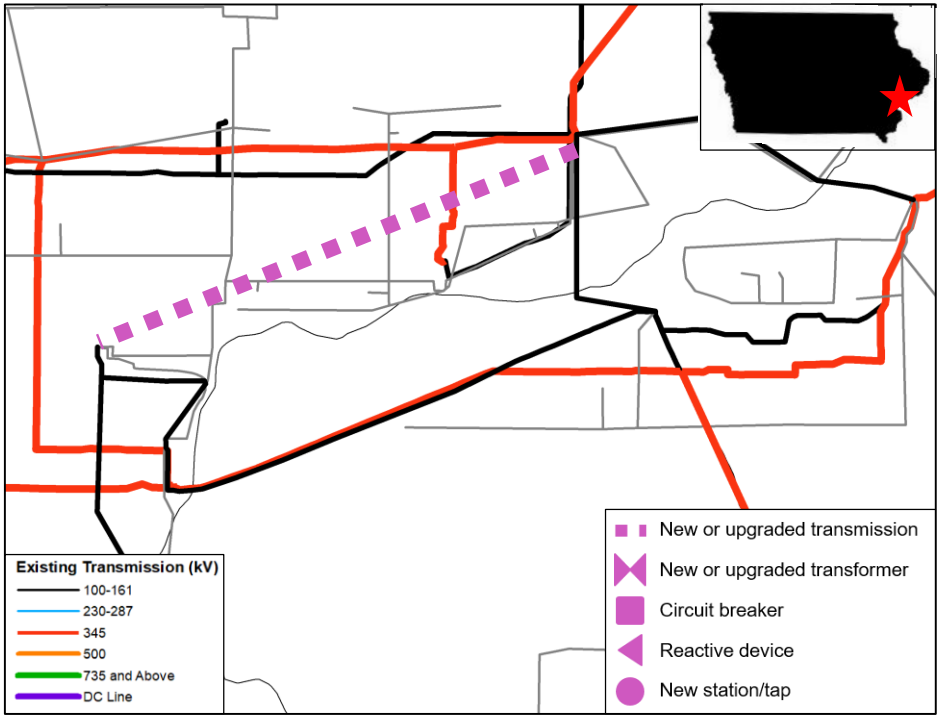
MEC: Three generation interconnection projects

Project ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
15676	Webster-Hayes 161 kV Structure Replacements	Replace structures on the Webster to Hayes 161 kV line to increase conductor clearances.	The line rating increase resulting from this project is required by a generator interconnection project.	June 1, 2020	$0.18M
15822	New Sharon-Poweshiek 69 kV Reconductor and Replace Structures	Reconductor and replace structures, as appropriate, on the New Sharon-Poweshiek 69 kV line.	MISO DPP 2015 August West Network Upgrade.	December 31, 2018	$2.40M
15824	M Avenue-New Sharon 69 kV Reconductor and Replace Structures	Reconductor and replace structures, as appropriate, on the M Avenue to New Sharon 69 kV line.	MISO DPP 2015 August West Network Upgrade.	April 1, 2019	$2.10M

Muscatine Power and Water

West Substation – Sub 56 new 161kV line solves overloads associated with P6 events

- **Other Reliability Project**
- **MISO-identified W-2017 addressed by MTEP Project 15495**
  - Contingency Event: P6
  - Voltage Violation: MPW service territory
  - Associated project 15679 by MEC at Sub 56
- **Project description**
  - Construct a new 161 kV line MPW's West substation and MEC's Substation 56
  - A portion of this project will be constructed by CIPCO
- **Estimated Cost:** $8.6 M
- **Expected ISD:** 9/15/2021
- **Target Appendix:** A in MTEP19
- **Alternatives:**
  - Capacitor installations and 69 kV rebuilds

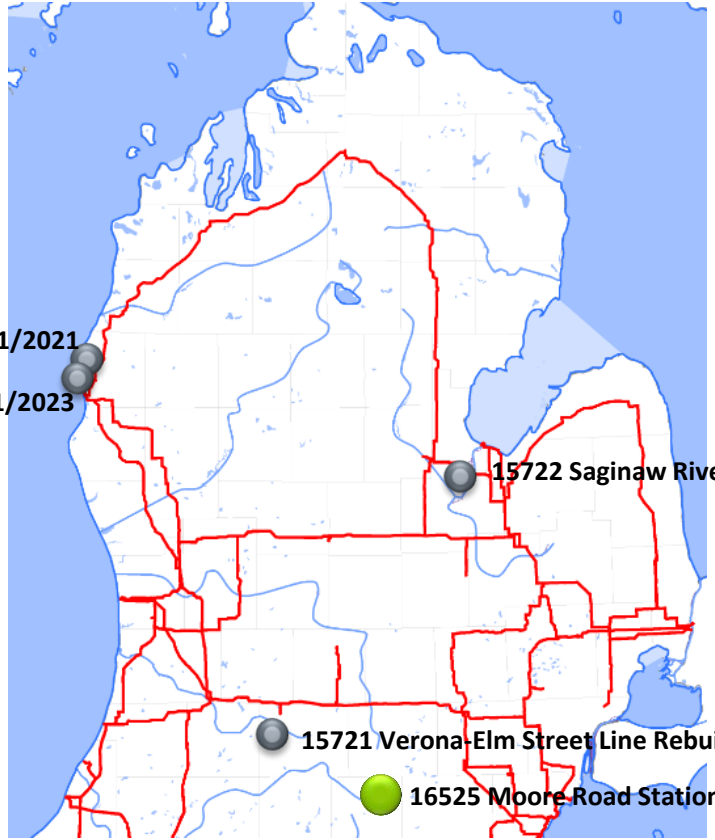


MPW: One Baseline Reliability Projects proposed

Project ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
15495	MPW West - CIPCO Muscatine Switch - MEC Sub 56 161 kV Line	New 161 kV line from MPW West Sub to Muscatine Switching Sub CIPCO – Chappel Sub CIPCO – Bluegrass Sub CIPCO – Sub 56 MEC is to be built. In addition to the line MPW will be adding a new 161/69 kV auto transformer at Muscatine Switching Sub rated for 134.4 MVA.	Prevent low voltages when MPW generation is off with a new 161 kV source into MPW local system.	September 15, 2021	$8.30M

Consumers Energy

CETO: 5Target Appendix A Projects are proposed as Other Reliability, Age and condition, local needs and GIP



CETO: 4 Target Appendix A Projects are proposed as Other local needs and Condition Projects

Project ID	Project Name	Project Description	Preliminary System Need	In-Service Date	Estimated Cost
15720	Muskegon Heights #1 Line Rebuild	Rebuild a portion of the Muskegon Heights #1 138 kV Line, approximately 1.8 miles, utilizing 138 kV single circuit construction	This portion of the line is constructed with towers installed in 1928. Experience with these vintage of towers has shown significant ground level rusting which will lead to tower failure and line outages.	12/31/2021	$790,000
15721	Verona-Elm Street Line Rebuild	Rebuild the Verona-Elm Street 138 kV Line, approximately 2.2 miles, utilizing 138 kV double circuit construction and 336.4 ACSR conductor	This portion of the line is constructed with towers installed in 1920. Experience with these vintage of towers has shown significant ground level rusting which will lead to tower failure and line outages.	12/31/2021	$1,000,000
15722	Saginaw River-Shale Line	Construct a new 138 kV line from Saginaw River Substation to the new Shale Substation	METC has identified a plan to install a new station named Shale, MISO MTEP#14824. METC's plan will require Consumers Energy to reconnect its Saginaw River Substation to the new station with a new transmission line.	12/31/2022	$200,000
16044	Cobb Rebuild - CETO 138 kV Lines	Construct new 138 kV lines from the existing Cobb & Muskegon Heights Substations to METC's rebuilt Cobb Station	METC has identified a plan to rebuild Cobb Station, MISO MTEP#15942. METC's plan will require Consumers Energy to reconnect its Cobb and Muskegon Heights Substations to the new station with new transmission lines as dictated by METC's project scope.	12/31/2023	$800,000

CETO: 1 Target Appendix A Projects is proposed as Other Generator Interconnection Project

Project ID	Project Name	Project Description	Preliminary System Need	In-Service Date	Estimated Cost
16525	Moore Road Station Upgrade (J538)	Replace existing relaying at Moore Road Substation on the Knowles (J538) line exit with dual pilot schemes	Need identified in studies, GIA, and FCA for generator interconnection J538	10/1/2020	$393,800

CETO: 2 Target Appendix A Projects are proposed as Other System wide Projects project

Project ID	Project Name	Project Description	Preliminary System Need	In-Service Date	Estimated Cost
15717	CE Substation Equipment Replacement Program - 2020	Replace damaged or defective substation equipment, not including breakers, with new equipment	Replace substation equipment that is defective, damaged, or fails testing parameters to improve system reliability and address safety concerns	12/31/2021	$840,000
15718	CE Pole & Line Equipment Replacement Program - 2020	Replace damaged or defective poles, towers, cross arms, insulators, guying, and switches, as needed, to maintain the lines' condition	Replace structures and line equipment that are defective or damaged to maintain line performance, reduce outages, address code clearance, and/or address safety concerns	12/31/2021	$570,000

ITC Transmission (ITCT)

ITCT-17164 Romeo 345 kV Project

Project Description:

- Close “HY” breaker at St. Clair to allow the 345/120kV step-down transformation at this station. Also, upgrade three 120 kV breakers at St. Clair due to the short-circuit impact.
- Cut the existing Jewell – St. Clair #1 into J793 POI (north of Belle River) form a tie between J793 and St. Clair station. This also relocates one of the sink paths (Jewell) to J793 POI station, making it more balanced to the area. The cut-in will require approximately 0.8 miles of 345 kV double-circuit with new right-of-way. Also, remediate the sag between J793 POI and Jewell up to the conductor’s limit.
- Construct a new 345 kV switching station (tentatively named Romeo) about 3 miles north of Jewell station.
- Cut the existing Belle River – Pontiac 345 kV line into Romeo station. Raise the sag on Belle River – Romeo and Pontiac – Romeo 345 kV lines up to the conductor’s limit.
- Construct a new 345 kV circuit between Romeo and Jewell using the available, de-energized 345 kV line that is on common structures with Jewell – St. Clair #1 345 kV line. This is new circuit is approximately 3.2 miles long.

System Need:

- See next slide for details

Estimated Cost:

$56.4 M

Expected ISD:

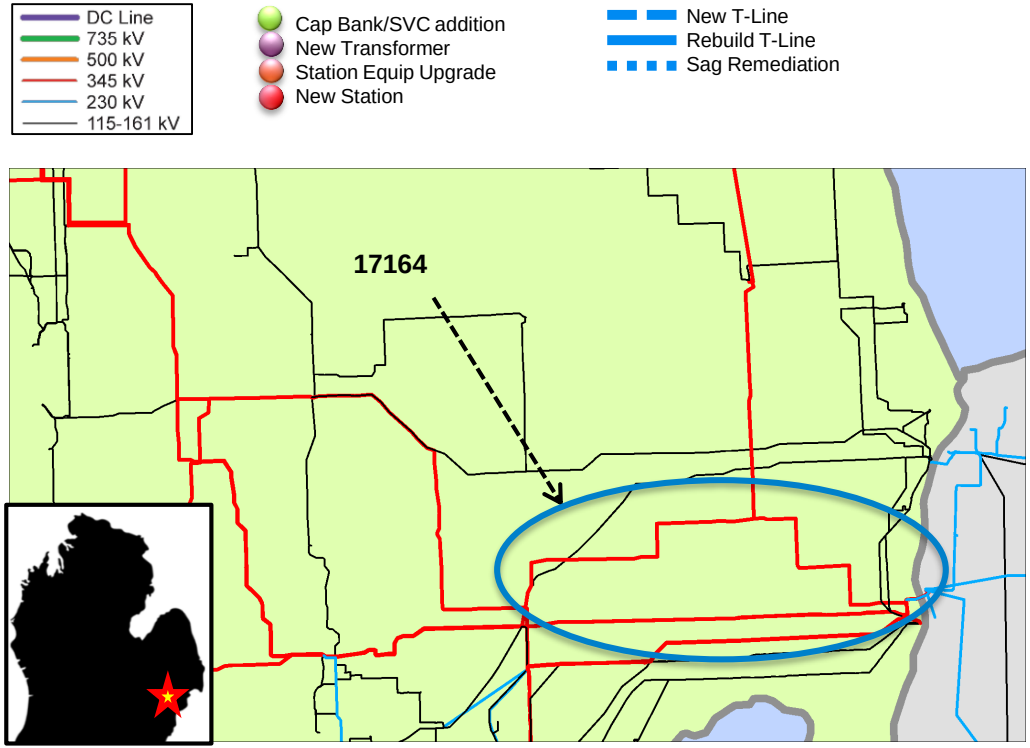
12/31/2023

Project Type:

Baseline Reliability Project

Target Appendix:

A in MTEP19



ITCT-17164 Romeo 345 kV Project: ITCT's Justification

System Need:

"The Belle River – St. Clair 345 kV, Belle River – Lenox 345 kV, Jewell – Lenox 345 kV, Jewell – St. Clair #1 345 kV, and St. Clair – Stephens 345 kV lines are projected to overload under various contingencies. The driving reason for these overloads in the area are due to the loss of generation on the 120 kV side of St. Clair plus the addition of J793 (Blue Water) on the 345 kV network in the same vicinity. Without the 120 kV source at St. Clair to help support the loads in the Oakland region, most of the output from Belle River and J739 are diverted toward the sinks southwest of them through the step-downs at Bismarck, Jewell, Stephens, and Lenox. The power flow path consequently stresses the Belle River – St. Clair 345 kV, Belle River – Lenox 345 kV, Jewell – Lenox 345 kV, Jewell – St. Clair #1 345 kV, and St. Clair – Stephens 345 kV lines and eventually overloads them under various contingencies. The overloaded scenarios are worse in models importing power from IESO to ITCT. According to ITC's internal models, this import adds another ~1,200 MW to the 345 kV side of St. Clair."

Alternative Notes:

"The Romeo 345 kV project mitigates the need to do approximately $210M worth of corrective action plans recently submitted into the MTEP19 cycle. They are the following projects:

- *Belle River – St. Clair 345 kV Rebuild (MTEP# 16021)*
- *Belle River – Lenox 345 kV Rebuild (MTEP# 16019)*
- *Jewell – Lenox 345 kV Rebuild (MTEP# 16018)*
- *Jewell – St. Clair 345 kV Rebuild (MTEP# 16017)*
- *Benson – Stephens 120 kV Rebuild (MTEP# 16068)*
- *Pontiac – Colorado Tap 120 kV Rebuild (MTEP# 16066)*
- *Pontiac – Joslyn 120 kV Rebuild (MTEP# 16016)*
- *Lenox 2nd 345/120 kV Transformer (MTEP# 16011)*
- *Pontiac 120 kV – Upgrade HC & GQ Station Equipment (MTEP# 16007)*
- *Bunce Creek – Fitz 120 kV Rebuild (MTEP# 15861)*
- *Burns 2 Tap – Fitz 120 kV Sag Remediation (MTEP# 15844)*
- *Fitz 345/120 kV Transformer #2 (MTEP# 15751)*
- *Lee – Lake Huron Pumping 1 Tap 120 kV Rebuild (MTEP# 15843)"*

ITCT-17164 Romeo 345 kV Project: ITCT's Justification
MISO's Project Justification: Steady-State Analysis

Row Labels	MTEP Project Name	ISD	Original Cost	Monitored Element	Rate Cont (MVA)	Cont Group	Max loading (%)	Max loading (MVA)	Appen Rec.	Cost	Max loading (%)	Max loading (MVA)	Appen Rec.	Cost	MISO Comment
17164	Romeo 345 kV Project	12/31/2023	$56,400,000							0.0			A	$56,400,000	The alternative project itself (Romeo)
15751	Fitz 345/120 kV Transformer #2	12/31/2027	$7,300,000	264746 19FITZ 345 265228 19FITZ 120 1	739.0	N-1-1	103.4	763.9	A	$7,300,000			B	$0	
15861	Bunce Creek – Fitz 120 kV Rebuild	12/31/2027	$18,676,000	264536 19BUNCE1 120 265228 19FITZ 120 1	314.0	N-1-1	130.3	409.2	A	$18,676,000			B	$0	
15843	Lee – Lake Huron Pumping 1 Tap 120 kV Rebuild	12/31/2027	$2,600,000	264588 19LEE1 120 264732 19LHPMPT 120 1	128.0	N-1	94.9	121.5	A	$2,600,000			B	$0	
						N-1-1	109.6	140.3							
15862	Adams – Burns 2 120 kV Rebuild	6/1/2024	$1,130,000	264520 19ADAMS 120 264556 19BURNS2 120 1	289.0	N-1	97.4	281.5	A	$1,130,000	93.2	269.3	A	$1,130,000	Significant reduction in N-1-1 overloading;
						N-1-1	123.0	355.4			103.6	299.4			
16013	Thetford – Jewell 345 kV Sag Remediation	6/5/2020	$5,490,000	256026 18THETFD 345 264580 19JEWEL 345 1	871.0	N-1	99.4	866.0	A	$5,490,000	97.0	844.5	A	$700,000	Project scope/cost reduced
						N-1-1	140.6	1224.2			105.8	921.9			
16017	Jewell – St. Clair #1 345 kV Rebuild	12/31/2027	$77,800,000	264580 19JEWEL 345 264656 19STCPP 345 1	1328.0	N-1	123.8	1643.5	A	$77,800,000			B	$0	
						N-1-1	121.7	1616.4							
16018	Jewell – Lenox 345 kV Rebuild	12/31/2029	$20,031,000	264580 19JEWEL 345 264888 19LENOX 345 1	1277.0	N-1	110.4	1409.6	A	$20,031,000			A	$1,500,000	Project # 17545 (sag remediation) will replace the re-build project with Romeo in-service (ISD 12/31/2023)
						N-1-1	123.2	1573.6							
16019	Belle River – Lenox 345 kV Rebuild	12/31/2029	$52,100,000	264604 19BLRPP 345 264888 19LENOX 345 1	1517.0	N-1	116.4	1765.3	A	$52,100,000			A	$1,500,000	Project # 17544 (sag remediation) will replace the re-build project with Romeo in-service (ISD 12/31/2023)
						N-1-1	125.4	1902.9							
16021	Belle River – St. Clair 345 kV Rebuild	12/31/2028	$7,700,000	264604 19BLRPP 345 264656 19STCPP 345 1	1983.0	N-1	90.4	1791.8	A	$7,700,000			B	$0	
						N-1-1	110.8	2196.2							
16068	Benson – Stephens 120 kV Rebuild	12/31/2028	$1,614,000	264535 19BENSN 120 264663 19STEPH 120 1	248.0	N-1	92.0	228.1	A	$1,614,000	91.2	226.2	B	$0	
						N-1-1	115.4	286.2			95.2	236.1			
15844	Burns 2 Tap – Fitz 120 kV Sag Remediation	12/31/2028	$198,000	264556 19BURNS2 120 265228 19FITZ 120 1	339.0	N-1-1	110.0	372.9	A	$198,000			B	$0	
16007	Pontiac 120 kV – Upgrade HC & GQ Station Equipment	12/31/2027	$40,000	264635 19PONTC 345 264634 19PONTC1 120 1	624.0	N-1-1	97.1	605.8	A	$40,000	90.3	563.3	B	$0	
						N-1-1	93.8	585.3							
16016	Pontiac - Joslyn 120 kV Rebuild	12/31/2028	$1,192,000	264634 19PONTC1 120 264794 19JSLYN 120 1	375.0	N-1	97.0	363.8	A	$1,192,000	91.7	343.9	B	$0	
						N-1-1	100.4	376.5			94.1	352.8			
16011	Lenox 2nd 345/120 kV Transformer	12/31/2028	$8,400,000	264888 19LENOX 345 264749 19LENOX1 120 1	739.0	N-1-1	98.7	729.1	B	$0			B	$0	Project found to not be urgently needed without Romeo
16066	Pontiac – Colorado Tap 120 kV Rebuild	12/31/2028	$2,533,000	264903 19CLRDT1 120 264940 19PONTC2 120 1	289.0	N-1	90.7	262.2	B	$0			B	$0	Project found to not be urgently needed without Romeo
						N-1-1	97.4	281.4			92.5	267.2			
Total cost for relevant MTEP19 projects										**$195,871,000**				**$61,230,000**	**$134,641,000 (saving)**

For more details, please refer to the Excel workbook: *(1) MTEP19_ITCT_Impact_of_Romeo_Projects_2019-08-21.xlsx*

Microsoft Excel Worksheet

ITCT-17164 Romeo 345 kV Project: ITCT's Justification
MISO's Project Justification: Transient Stability Analysis

Analysis Dynamic Case:
2024 Summer Peak case with J793 (Blue Water) online, Romeo project in-service, all TA projects expected to be approved in-service, and 0 MW imports from Ontario.
(2)_24_SP_Zero_U5_W15_G6_J1_T0_Rm_DCP2_TA_dynamic.sav

Simulation Tool:
TSAT version 19

Dynamic Disturbances Studied:
Typical MTEP19 dynamic disturbances with minor modifications to include Romeo projects

Analysis files:
FTP location **/mtepro/mtep/mtep19/Michigan_TSTF_SPM/Aug_8_TSTF/DynamicSimulations/**

Analysis Results Summary:
- MISO identified one extreme event (3-phase fault with delayed clearing) that may cause 4093 MW of non-consequential generation tripping and 1227 MW load at risk.
- This issue can be mitigated by utilizing the IPO (Independent Pole Operation) built-in feature in the impacted 345 kV breakers; this feature can reduce the likelihood of the consequences of the identified extreme event.

Next Steps:
- MISO will proceed with Romeo 345 kV project for recommendation for Appendix A.
- ITCT will conduct additional analysis (around J793 area) using the above case while following the assumptions for dynamic simulations used in DPP analysis.
- If ITCT identified additional issues, they can be addressed in MTEP20, if needed.

ITCT-17164 Romeo 345 kV Project: ITCT's Justification
MISO's Project Justification: Analysis Summary

Analysis Summary:

- This project can be a successful alternative to a number of MTEP19 projects or can at least reduce the scope and hence the estimated cost of these projects. The estimated cost saving is **at least** $134.6 million.
- Two projects (16011 and 16066) are not currently needed in MTEP19, however, Romeo 345 kV will significantly reduce the loading of these two facilities.
- There are a number of other thermal issues with no proposed mitigations and Romeo 345 kV project can mitigate these thermal issues as well.
- Romeo 345 kV project created one transient stability issue but this issue can be mitigated utilizing the IPO built-in feature in the impacted 345 kV breakers (at no additional cost).
- MISO recommends moving this project to Appendix A as alternative for projects: 15751, 15861, 15843, 15862, 16013, 16017, 16018, 16019, 16021, 16068, 15844, 16007, 16016, 16011, and 16066.
- MISO considered this project as a base case assumption in analyzing the need for other projects (e.g. Detroit Area projects).

Detroit Area Projects

- ITCT-15981 Detroit Cable Project
- ITCT-17630 120 kV Cable Reactors
- ITCT-17631 Mack - Northeast 120 kV Reconductor and Station Work
- ITCT-16029 Caniff 120 kV – Upgrade KU & LBX Station Equipment

ITCT-15981 Detroit Cable Project
ITCT-17630 120 kV Cable Reactors
ITCT-17631 Mack - Northeast 120 kV Reconductor and Station Work
ITCT-16029 Caniff 120 kV – Upgrade KU & LBX Station Equipment

Project Description:

These three projects were originally proposed as one big project known as the Detroit Cable Project ("DCP") – Project # 15981. Upon MISO's request this project was split into three projects to deal with each issue separately. Currently, project #15981 represents only the load interconnection at the new Promenade and Island View 120 kV stations. See next slides for details of each project.

Additionally, project 16029 was studied in conjunction with the above 3 projects.

System Need:

See next slides for details

Estimated Cost:

15981: $138.4 million
17630: $4.5 million
17631: $47.0 million
16029: $0.36 million

Expected ISD:

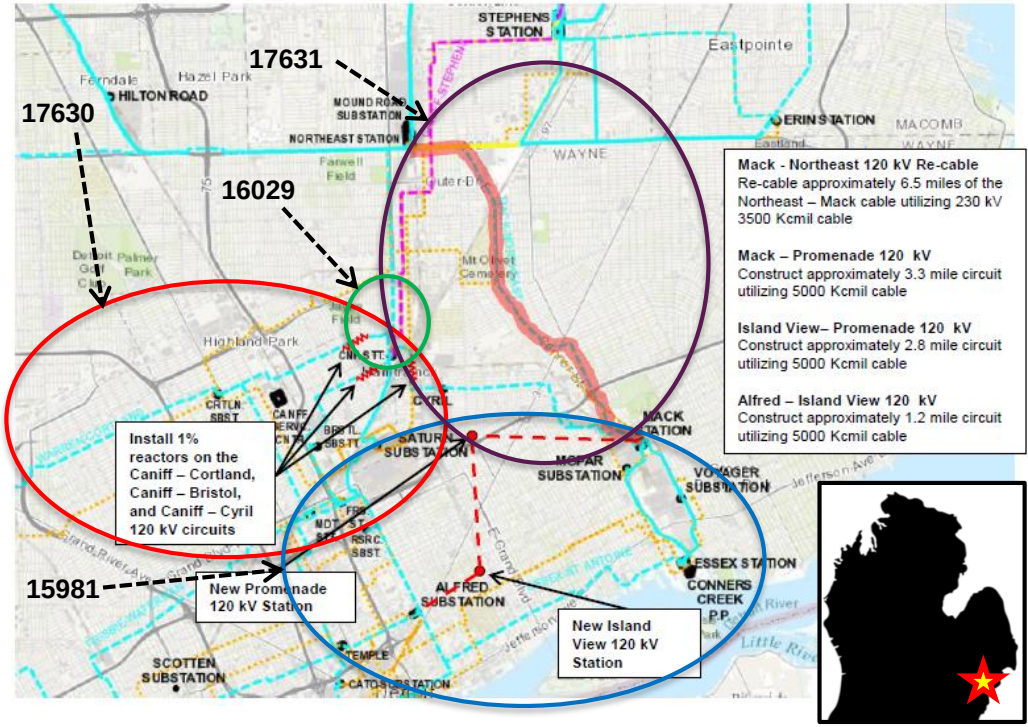
06/01/2023 (for 15981, 17630, and 17631)
12/31/2021 (for 16029)

Project Type:

15981: Other - Load Growth
17630: Baseline Reliability Project
17631: Baseline Reliability Project
16029: Baseline Reliability Project

Target Appendix:

A in MTEP19



ITCT-15981, ITCT-17630, ITCT-17631, and ITCT-160029: Project Descriptions

ITCT-15981 Detroit Cable Project:

"Construct two new 120kV stations named Promenade and Island View and approximately 7 miles of new underground cable from Alfred 120 kV to Island View 120kV, from new Island View 120kV to Promenade 120kV, and from Promenade 120kV to Mack 120 kV."

ITCT-17630 120 kV Cable Reactors:

"Install 1% reactors on the Caniff – Cortland, Caniff – Bristol, and Caniff – Cyril 120 kV lines"

ITCT-17631 Mack - Northeast 120 kV Reconductor and Station Work:

"Reconductor approximately 6.5 miles of the Northeast – Mack cable utilizing 230 kV 3500 Kcmil cable. Un-parallel the Northeast reactors by removing breaker GB and replace reactor HC with a new 5% 400 MVA SE reactor (replacing reactor KD with existing reactor HC)."

ITCT-16029 Caniff 120 kV – Upgrade KU & LBX Station Equipment:

"Upgrade the station equipment at Caniff 120 kV positions "KU" and "LBX".

ITCT-15981, ITCT-17630, ITCT-17631, and ITCT-160029: ITCT's Justification

System Need

ITCT-15981 Detroit Cable Project:

"DTE submitted interconnection requests to ITCT to interconnect two new loads (Promenade & Island View) in the Northeast Detroit area. Some of this load is added to the Mack/Essex load pocket area. As the system exist today, there is little margin for load growth in the area before circuits become overloaded for N-1-1 conditions."

ITCT-17630 120 kV Cable Reactors:

"High flows and overloads were seen on the Caniff – Bristol 120 kV, Caniff – Cortland 120 kV, and Caniff – Cyril 120 kV lines for normal, N-1 and N-1-1 contingencies at peak and shoulder peak conditions. These three underground cables are in parallel with each other and a 120 kV overhead line. Because of the significantly lower impedances on the cables compared to the overhead conductor, most of the power flows through the cables instead of the overhead path creating an unbalanced system flow in the area. This project creates a better balance of system flows in the area by re-directing more power to flow down the 120 kV overhead path and relieves the overloads on the cables."

ITCT-17631 Mack - Northeast 120 kV Reconductor and Station Work:

"Un-paralleling the Northeast reactors and re-cabling the Mack – Northeast 120 kV circuit mitigates the following overloads and future projects;

- *Underground cable rebuild portion and 3.5 miles of overhead rebuild of MTEP19 project #16023 (Lincoln-Northeast-Northwest 120 kV Rebuild)*
- *Mitigates a base case marginal overload (~98% SN) on the Northeast end of the Lincoln-Northeast-Northwest 120 kV circuit*
- *Mitigates marginal overloads (~99% SE) on the overhead portion of the Northeast – Hilton Road 120 kV circuit*
- *Mitigates a marginal overload (~99% SE) on the Cato – Waterman 120 kV circuit"*

ITCT-16029 Caniff 120 kV – Upgrade KU & LBX Station Equipment:

"The 345/120kV transformer and phase shifter at Caniff are projected to be overloaded in the basecase, G-1, T-1, and numerous contingencies in the 2018 assessment. The limiting elements on this transformer branch are the equipment at Caniff 120 kV station."

ITCT-15981, ITCT-17630, ITCT-17631, and ITCT-160029
MISO's Project Justification: Analysis Summary

Analysis Assumptions:

To determine the optimal MTEP19 project selection of these 4 proposed projects, MISO conducted steady-state analysis considering 4 different incremental project changes (options). While doing so, MISO identified the impact of each option on other projects within the vicinity (e.g., projects # 16023, 16028, and 16009). MISO also observed that each option can create or resolve other thermal issues with out projects proposed in MTEP19.

MISO considered that the optimal option is the one that resolves all the identified reliability issues while maintaining the least possible cost.

Study Options:

Option 0: Project # 16029 only was modelled in-service (the need for this project was identified in TSTF # 1). This option do not meet the load interconnection needs and hence it was not considered as an actual option; it was just used for reference.

Option 1: Projects # 16029 and 15981 only were modelled in-service.

Option 2: Projects # 16029, 15981, and 17630 only were modelled in-service.

Option 3: skipped intentionally as it was invalid. The option nomenclature kept to avoid creating confusion with the steady-state models already created.

Option 4: Projects # 16029, 15981, 17630, and 17631 were modelled in-service.

Conclusion:

Option 2 resolved most of the identified thermal issues while maintaining the least possible cost.

Detailed analysis can be found in the Excel workbook: *(2) MTEP19_ITCT_Selection of Detroit_Area_Projects_2019-08-06.xlsx*

located on MTEP FTP location: **/mtep/mtep19/Michigan_TSTF_SPM/Aug_8_TSTF/**

Microsoft Excel Worksheet

ITCT-15981, ITCT-17630, ITCT-17631, and ITCT-160029
MISO's Project Justification: Recommendations

Recommendations:

Based on the optimal selection (**Option 2**)::

MISO recommends the following projects for MTEP19 – Appendix A:

ITCT-15981 Detroit Cable Project

ITCT-17630 120 kV Cable Reactors

ITCT-16029 Caniff 120 kV – Upgrade KU & LBX Station Equipment

MISO recommends the following project for MTEP19 – Appendix B:

ITCT-17631 Mack - Northeast 120 kV Reconductor and Station Work

ITCT: Target Appendix B Projects: Baseline Reliability Projects/Other-Reliability. ITCT-15917 Fermi 345 kV SVC and ITCT-15923 SVC for Import at Fermi

ITCT-15917 Fermi 345 kV SVC

Project Description:

Install a +250/-50 MVAR SVC near the Fermi 345kV switchyard. The SVC will be installed at a new switchyard outside Fermi property, tentatively named Leroux. One 345kV circuit (length TBD based on station siting, but approximately 2 miles in total) will be installed on the vacant side of either Fermi-Brownstown #2 or Fermi-Brownstown #3 345kV structures from the new station into the existing Fermi switchyard.

System Need:

The 2018 Fermi 2 Nuclear Plant NPOA Transmission study demonstrated an inability of the system to adhere to ITC's transient voltage recovery criteria for all tested contingencies. In addition, voltages lower than the bus specific criteria at the Fermi 345kV bus were identified in an ongoing MISO attachment Y study. This project is being proposed by ITC as a mitigation for that constraint.

Estimated Cost:

$40.0M

Expected ISD:

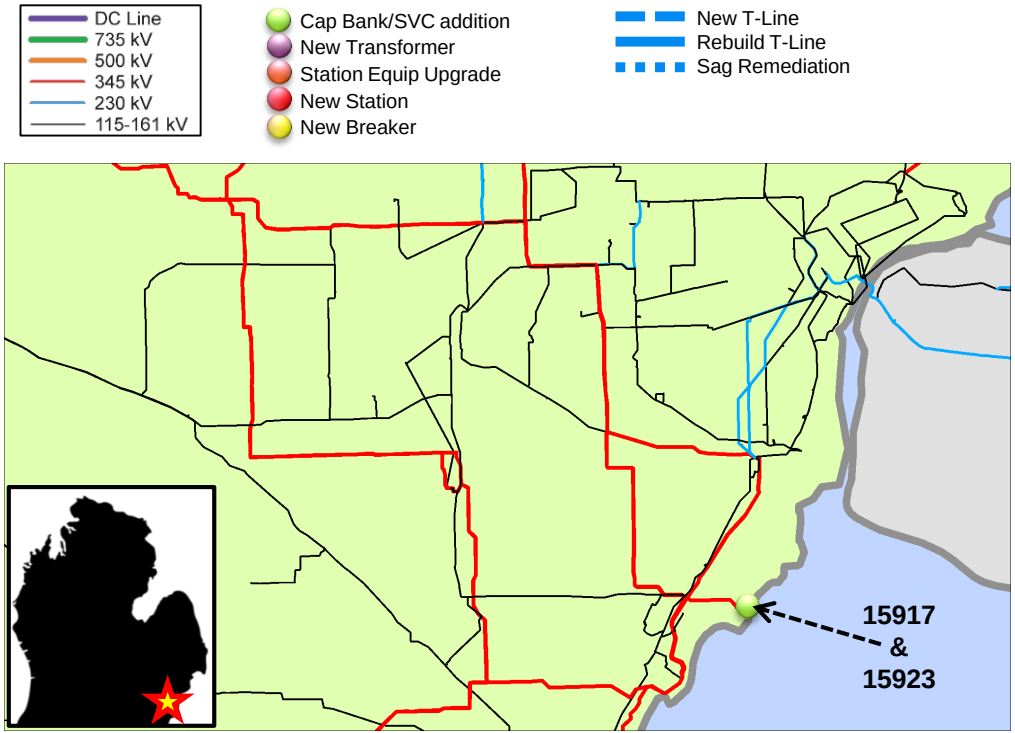
6/1/2022

Project Type:

Baseline Reliability Project

Target Appendix:

B in MTEP19 (tentatively until a decision is made by June 1, 2020)



ITCT: Target Appendix B Projects: Baseline Reliability Projects/Other-Reliability. ITCT-15917 Fermi 345 kV SVC and ITCT-15923 SVC for Import at Fermi

ITCT-15923 SVC for Import at Fermi

Project Description: (scope to be revised if needed**)**

Increase the total SVC capability of the Fermi 345kV SVC project (MTEP #15917) by 300 MVAR (for a total of +900 MVAR) for import capability into the LP of Michigan. Each SVC at Fermi would be a -50/+450 MVAR range SVC. The additional 300 MVAR would be all Mechanically Switched Capacitor Banks, controlled by the SVC controls.

System Need:

Import capability into the LP of Michigan.

Estimated Cost:

$2.0 M

Expected ISD:

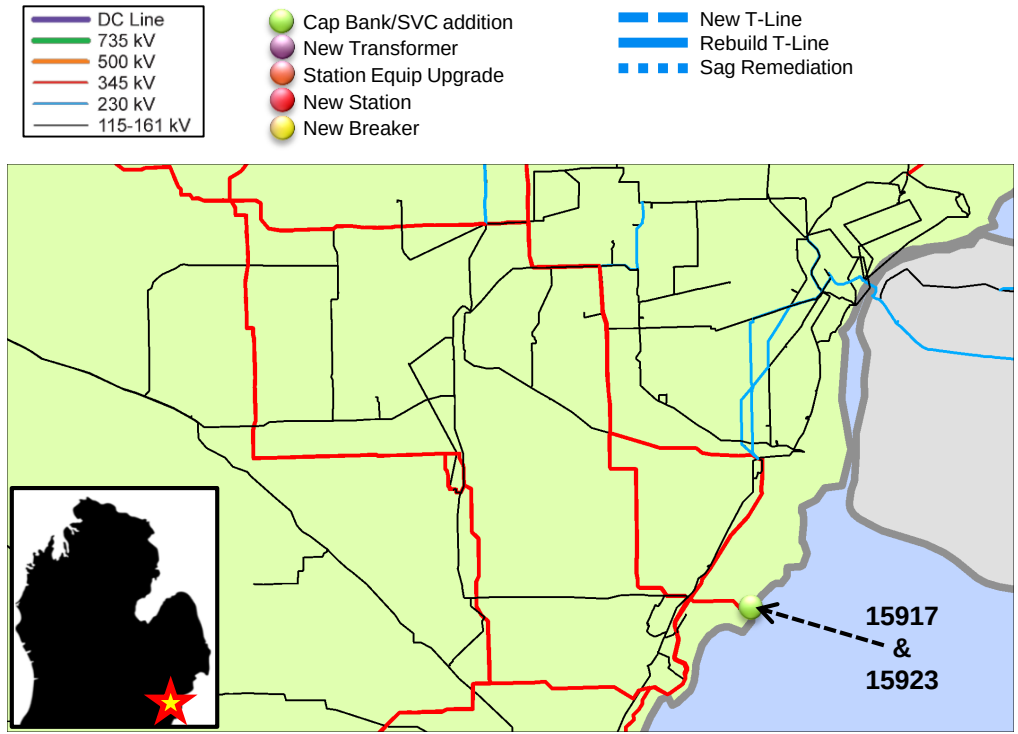
6/31/2023

Project Type:

Other - Reliability

Target Appendix:

B in MTEP19



ITCT-15917 Fermi 345 kV
MISO's Project Justification: Analysis Summary

Voltage Violations

Monitored Facility			worst voltage violation in %										
Bus #	Bus Name	Base kV	N-1						N-1-1				No of Cases
			P11		P2		P7		P3		P6		
			Volt	Volt. Dev.	Volt	Volt. Dev.	Volt	Volt. Dev.	Volt	Volt. Dev.	Volt	Volt. Dev.	
264621	19ENFPP	345	99	3.254	98.97	3.279	98.6	3.65	95.51				11

Analysis Summary:

- MISO identified multiple open issues (voltage drop below voltage limit and/or voltage deviation limit stipulated in the current Fermi 2 Nuclear Power Plant Interface Requirement ("NPIR") in single initiating events and double contingency events seen in multiple summer and shoulder cases
- MISO conducted its independent steady-state analysis and reviewed ITCT's preliminary steady-state and dynamic stability revised analysis conducted by ITCT for its 2019 NPOA study and agrees that a single SVC with a size of +250/-50 MVAR (considering the nearby capacitor bank projects) can mitigate all identified issues (steady-state and voltage recovery).

ITCT-15917 Fermi 345 kV
MISO's Project Justification: Alternatives

DTE proposed an alternative in its revised NPOA to loosen the Fermi 345 kV bus voltage requirements [NPIR voltage requirements].

MISO's analysis confirmed that the revised NPIR voltage requirements (the new wider range) can address all the identified steady-state and voltage recovery issues.

ITCT-15917 Fermi 345 kV
MISO's Project Justification: Recommendation

MISO and ITC have determined that the SVC project is required to maintain nuclear plant reliability. DTE has proposed to replace Fermi's station service transformers 65 (SS # 65) and 69 (SS # 69) with LTC type transformers before the planned retirement of the Trenton Channel Unit 9 scheduled for June 1, 2022 as an alternative solution. ITC must commence construction of the SVC project by June, 2020 in order to meet in-service-date requirements to maintain reliability. Accordingly, ITC and MISO have agreed that in the event that DTE cannot provide assurances of installation of the necessary plant LTC transformers by June 1, 2020, the SVC project will be included as an Appendix A MTEP19 project for immediate construction. Specifically, a purchase order for the transformers would be an adequate demonstration of firm commitment to install.

For the time being, MISO will include project ITCT-15917 Fermi 345 kV in Appendix B for MTEP19. If DTE cannot provide the requested confirmations by June 1, 2020, MISO will move this project to Appendix A for MTEP19 and it will seek the Board of Directors' approval in their June 2020 meeting.

ITCT-15923 SVC for Import at Fermi
MISO's Project Justification: Analysis

MISO was unable to determine the import assumptions that triggers the need for this project. For the time being, MISO will recommend this project for MTEP19-Appendix B.

If the need for project ITCT-15917 is confirmed, MISO may then conduct the necessary analysis to determine the need for the project (15923) provided that ITCT provides more information about the import assumptions.

Project Description and System Needs as provided by ITCT

ITCT: Target Appendix A Projects: Baseline Reliability Projects.
ITCT-15751 Fitz 345/120 kV Transformer #2
ITCT-16011 Lenox 2nd 345/120 kV Transformer

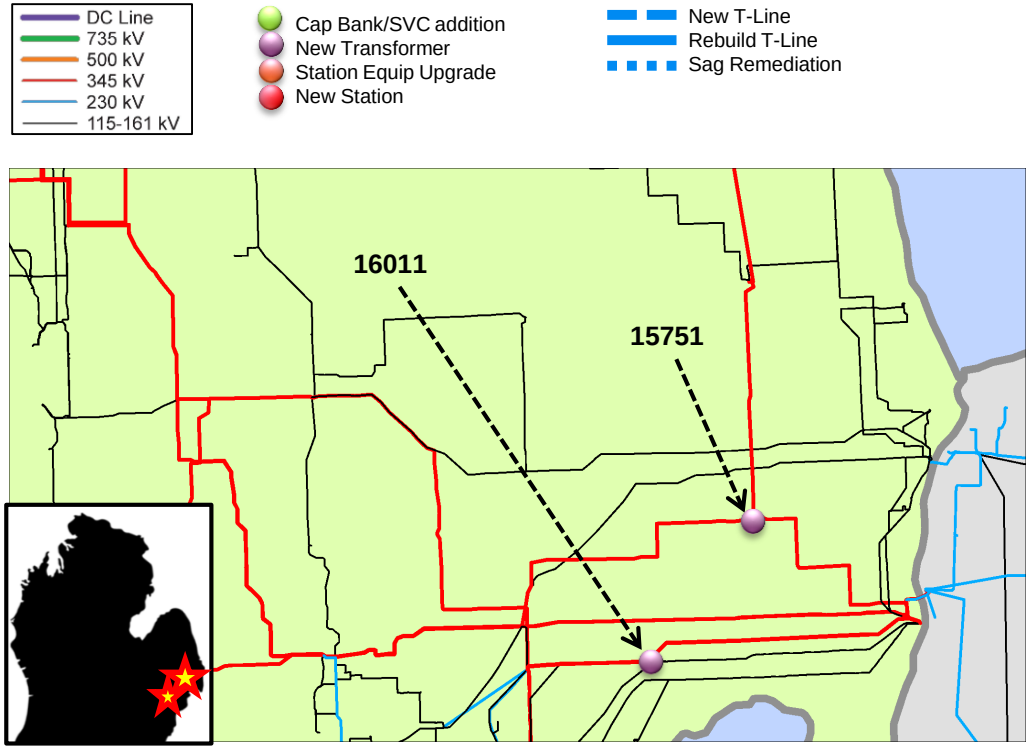
MTEP ID	Project Name	Description	Expected ISD	Cost
15751	Fitz 345/120 kV Transformer #2	Install a second 345/120 kV transformer at Fitz.	12/31/2027	$7.3M
16011	Lenox 2nd 345/120 kV Transformer	Install a second 345/120 kV transformer at Lenox	12/31/2028	$8.4M

System Need for 15751:

"Transformer #1 at Fitz is projected to become overloaded for the shutdown plus contingency scenario involving the Belle River – Lenox 345 kV and Belle River – St. Clair 345 kV lines. The overloads were identified in the 2023 near-term peak load and 2028 long-term peak and off-peak load models with the Ludington units generating with flow to IESO across the Michigan-Ontario interface."

System Need for 16011:

"The 345/120kV transformer #301 at Lenox is projected to overload for a shutdown-plus-contingency that takes out the Belle River – St. Clair 345 kV and Jewell – Lenox 345 kV lines. The limiting element on this branch is the transformer, breaker and station equipment at Lenox 120 kV position "HD".



MTEP19 Baseline Reliability Projects (BRP)

Line Rebuild Projects

ITCT: Target Appendix A Projects Baseline Reliability Projects. ITCT-16023 Lincoln-Northeast-Northwest 120 kV Rebuild

Project Description:

Rebuild approximately 3.3 miles of underground cable on the Lincoln – Northeast – Northwest 120 kV circuit to 3500KCMIL, rebuild about 7.1 miles of overhead conductor to 1431 ACSR, and upgrade station equipment at Northeast and Northwest.

System Need:

Multiple sections of the Lincoln – Northeast – Northwest 120 kV circuit are protected to overload for shutdown-plus-contingency and double-circuit-tower that take out the Pontiac – Placid 345 kV and Pontiac – Wixom 345 kV lines. The overloaded elements are 477 ACSR and 795 ACSR conductors, 1500 KCMI underground cables, and equipment at Northeast and Northwest 120 kV stations.

Estimated Cost:

$44.16 M

Expected ISD:

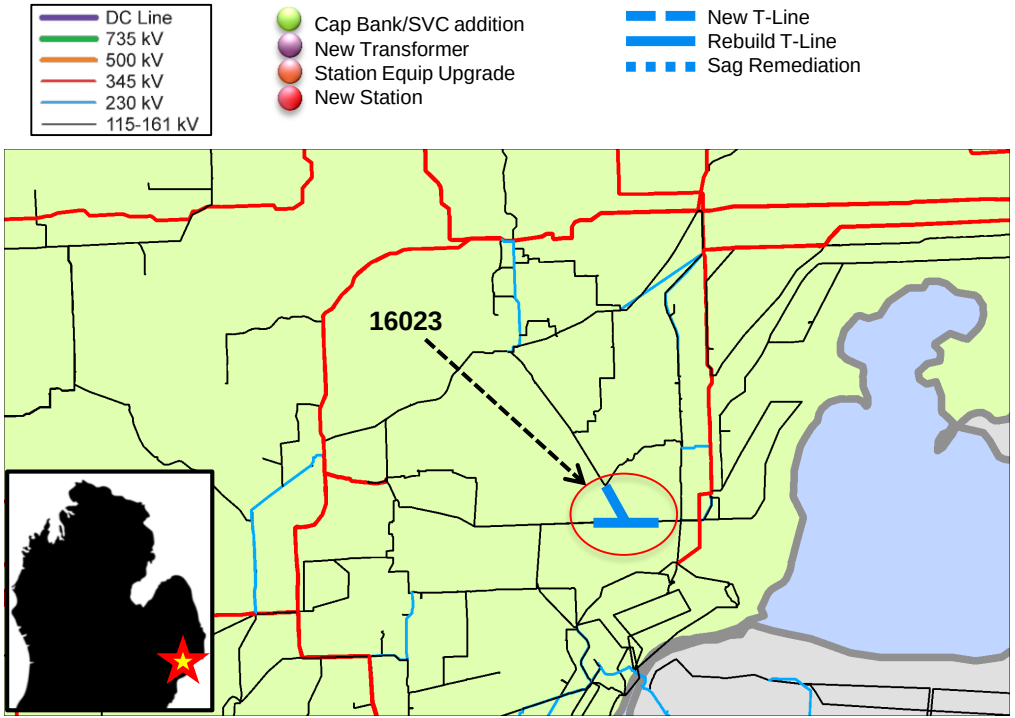
6/1/2024

Project Type:

Baseline Reliability

Target Appendix:

A in MTEP19



ITCT: Target Appendix A Projects: Baseline Reliability Projects. ITCT-16017 Jewell – St. Clair #1 345 kV Rebuild

Project Description:

Rebuild approximately 30.2 miles of the Jewell – St. Clair #1 345 kV line to 2-2156 ACSR. Also, upgrade station equipment at Jewell and St. Clair 345 kV stations.

System Need:

The Jewell – St. Clair 345 kV circuit is projected to overload for several shutdown-plus-contingency and double-circuit tower contingencies that involve the loss of St. Clair – Stephens #2 345 kV and or Belle River – Lenox 345 kV lines. The overloaded facilities are the 2-954 ACSR conductor, sag limit, and equipment at Jewell and St. Clair 345 kV stations.

Estimated Cost:

$77.8 M

Expected ISD:

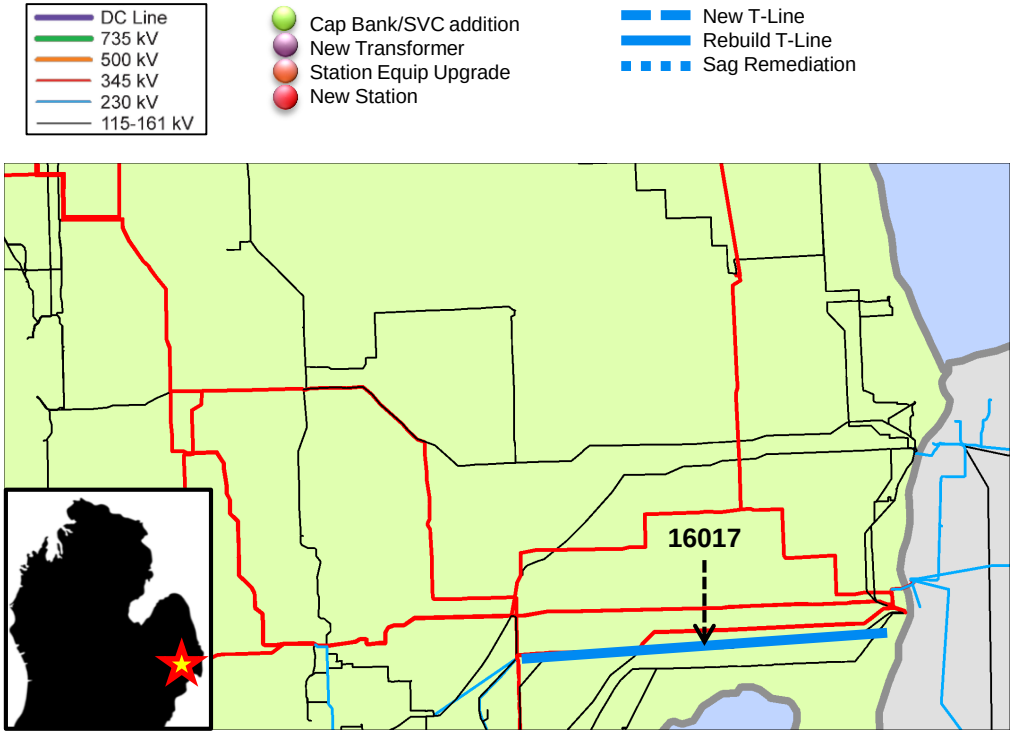
12/31/2027

Project Type:

Baseline Reliability

Target Appendix:

B in MTEP19



ITCT: Target Appendix A Projects: Baseline Reliability Projects. ITCT-16018 Jewell – Lenox 345 kV Rebuild

Project Description:

Rebuild approximately 8.3 miles of the Jewell – Lenox 345 kV line to 2-1431 ACSR. Also, upgrade station equipment at Jewell and Lenox 345 kV stations.

System Need:

The Jewell – Lenox 345 kV circuit is projected to overload for numerous contingencies, including a T-1 that takes out Belle River – St. Clair 345 kV line. The overloaded facilities are the 2-954 ACSR conductor, sag limit, and equipment at Jewell and Lenox 345 kV stations.

Estimated Cost:

$20.03 M

Expected ISD:

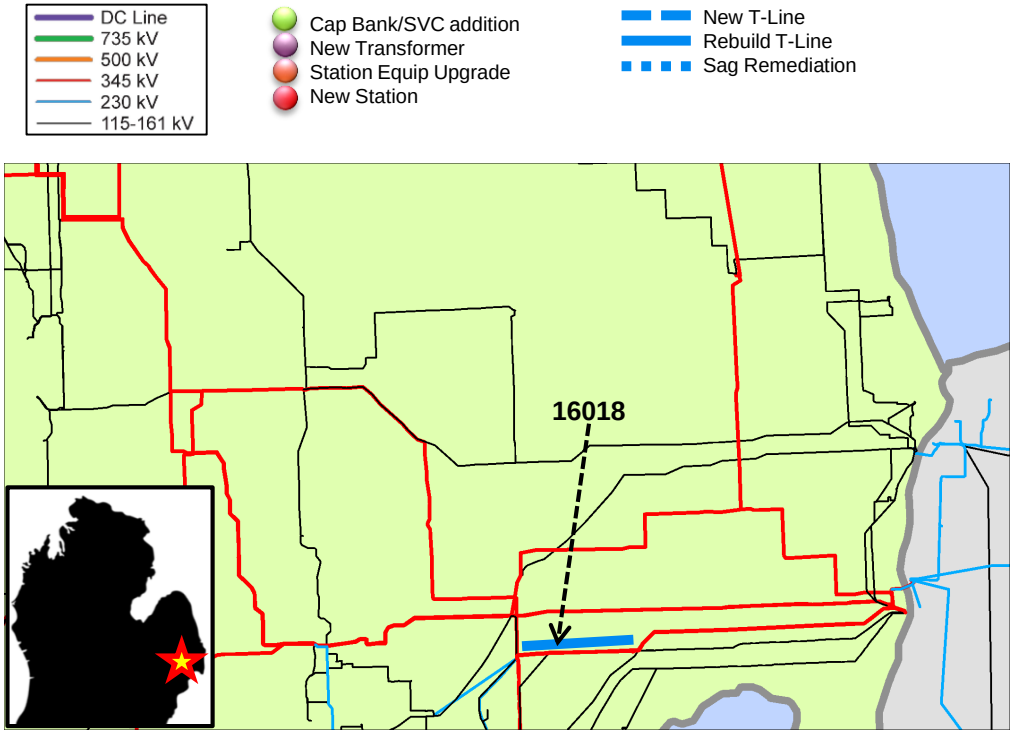
12/31/2029

Project Type:

Baseline Reliability

Target Appendix:

B in MTEP19



ITCT: Target Appendix A Projects: Baseline Reliability Projects. ITCT-16019 Belle River – Lenox 345 kV Rebuild

Project Description:

Rebuild approximately 19.6 miles of the Belle River – Lenox 345 kV line to 2-T2 795 ACSR. Also, upgrade station equipment at Belle River 345 kV.

System Need:

The Belle River – Lenox 345 kV circuit is projected to overload for numerous contingencies, including a T-1 that takes out Belle River – St. Clair 345 kV line. The overloaded facilities are the 2-954 ACSR conductor, sag limit, and station equipment at Belle River 345 kV.

Estimated Cost:

$55.46 M

Expected ISD:

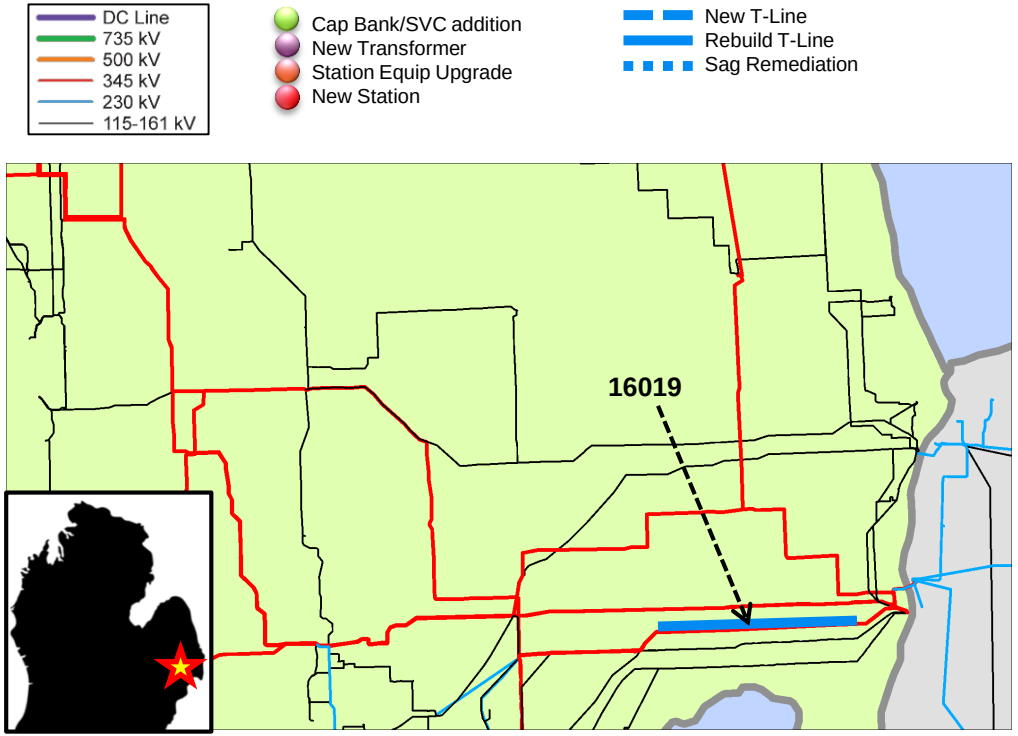
12/31/2029

Project Type:

Baseline Reliability

Target Appendix:

B in MTEP19



ITCT: Target Appendix A Projects: Baseline Reliability Projects. ITCT-15861 Bunce Creek – Fitz 120 kV Rebuild

Project Description:

The proposed solution is to rebuild ~12.5 miles of the Bunce Creek – Fitz 120 kV line that is comprised of 795 ACSR and six-wired 477 ACSR conductor only utilizing 2156 ACSS conductor and reterminate the line from Bus 101 to Bus 104 at Bunce Creek.

System Need:

The Bunce Creek – Fitz 120 kV line is projected to become overloaded for numerous contingency types with the most severe loadings caused by shutdown plus contingencies involving the Belle River – St. Clair 345 kV line plus one of a number of other transmission facilities. The overloads were identified in the 2023 and 2028 peak load models with the Ludington units generating and the flow is mainly to IESO across the Michigan-Ontario interface.

Estimated Cost:

$18.7 M

Expected ISD:

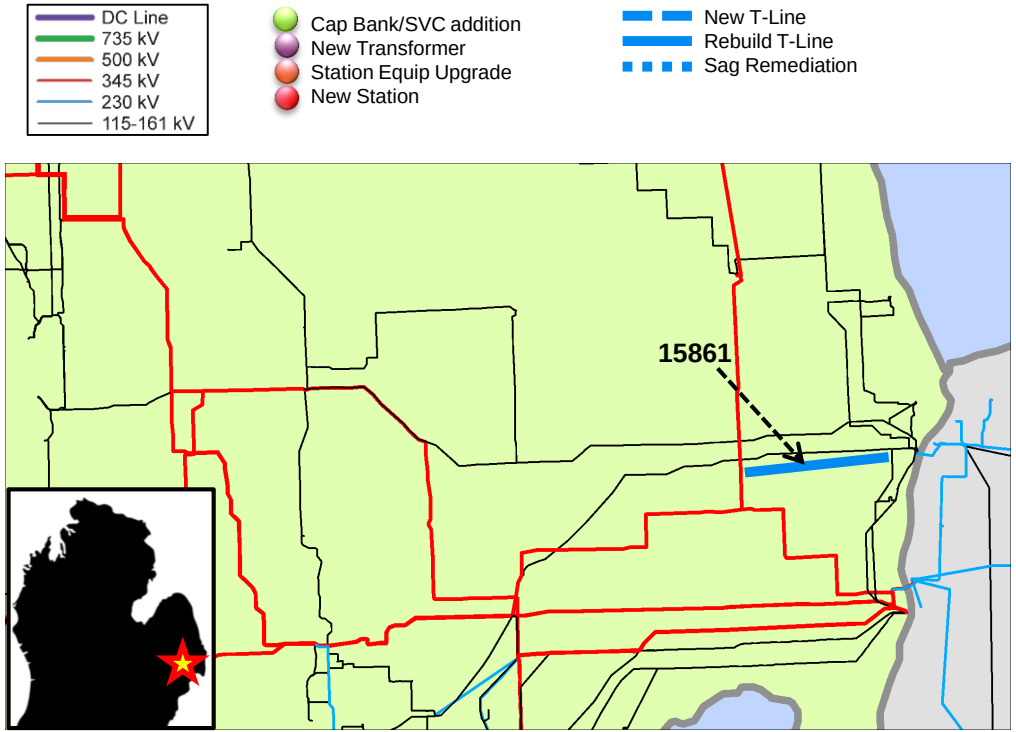
12/31/2027

Project Type:

Baseline Reliability

Target Appendix:

B in MTEP19



ITCT: Target Appendix A Projects: Baseline Reliability Projects
ITCT-15867 Brownstown – Elm #2 230 kV Rebuild
ITCT-15871 Brownstown-Monroe #1 345 kV Rebuild

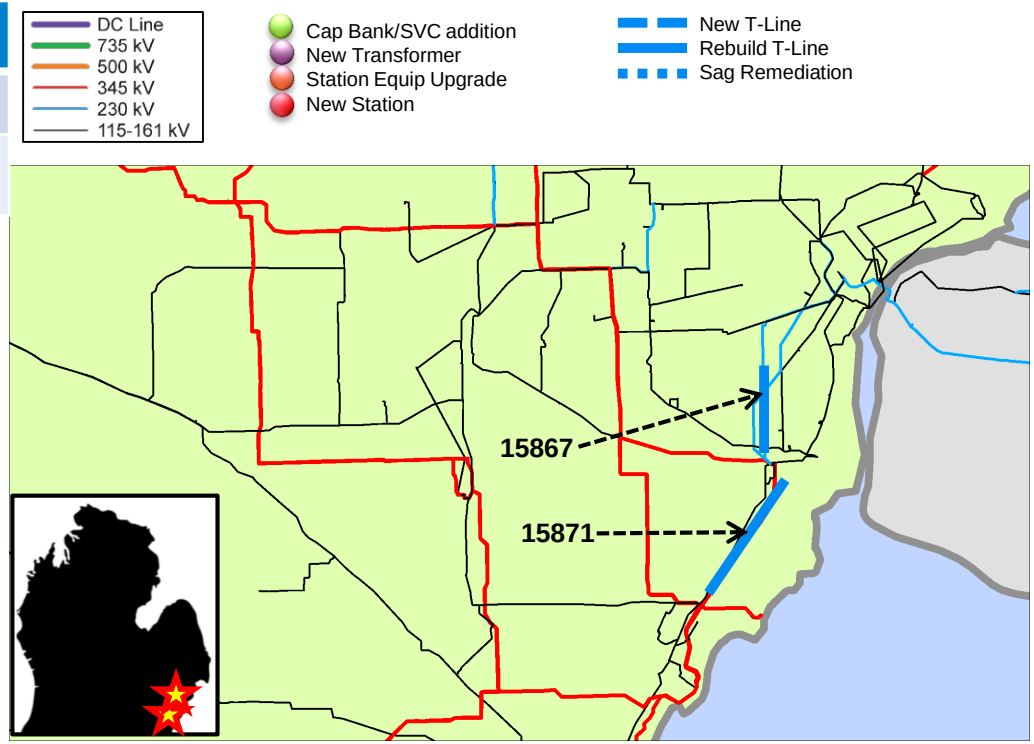
MTEP ID	Project Name	Description	Exp. ISD	Cost
15867	Brownstown – Elm #2 230 kV Rebuild	Rebuild 10.9 miles to 2156 ACSR . Upgrade the station equipment at both ends.	12/31/2028	$15.8M
15871	Brownstown-Monroe #1 345 kV Rebuild	Rebuild 7.3 miles to 2-1431 ACSR. Raise the sag to at least 2061 MVA. Upgrade station equipment at both Brownstown and Monroe 345 kV stations.	12/31/2028	$18.9M

System Need for 15867:

"The Brownstown – Elm #2 230 kV circuit is projected to overload for shutdown-plus-contingency that takes out Brownstown – Fermi #2 345 kV and Brownstown-Wayne #2 345 kV lines. The limiting elements on this circuit are the 1431 ACSR conductor and station equipment at both stations."

System Need for 15871:

"The Brownstown – Monroe 345 kV circuit is projected to be heavily overloaded for G-1, T-1, and many other contingencies that take out the Monroe – Wayne #1 345 kV line. The identified overloaded facilities are the 2-954 ACSR conductor, sag limits, and equipment at Brownstown and Monroe 345 kV stations."



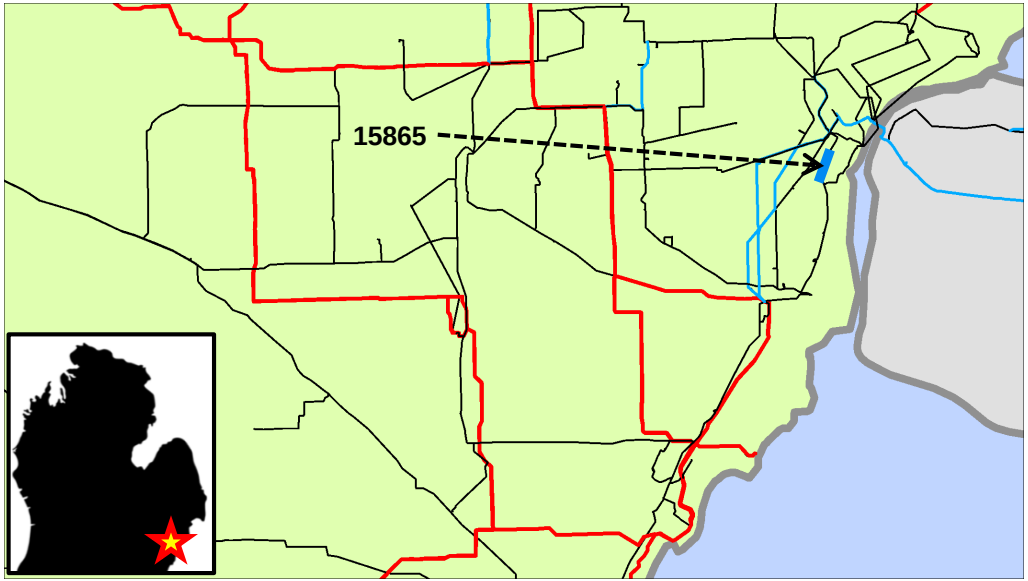
ITCT: Target Appendix A Projects: Baseline Reliability Projects. ITCT-15865 Navarre – A-I-N – Ironton 120 kV Rebuild

MTEP ID	Project Name	Description	Exp. ISD	Cost
15865	Navarre – A-I-N – Ironton 120 kV Rebuild	Rebuild approximately 7.7 miles from Navarre to Adelaide-Ironton-Navarre junction to Ironton with 1431 ACSR conductor. Also upgrade station equipment at both ends.	12/31/2024	$18.2M

DC Line
735 kV
500 kV
345 kV
230 kV
115-161 kV

Cap Bank/SVC addition
New Transformer
Station Equip Upgrade
New Station

New T-Line
Rebuild T-Line
Sag Remediation



System Need for 15865:

"The Navarre – Adelaide-Ironton-Navarre 120 kV and Adelaide-Ironton-Navarre – Ironton 120 kV sections are projected to overload for many T-2 contingencies in the 5 and 10 year cases. Most of the T-2 contingencies that cause this thermal violation involve the loss of Navarre – River Rouge 120 kV circuit. When the Navarre – River Rouge 120 kV circuit is out, the Navarre – Adelaide – Ironton 120 kV line carries extra weight to deliver power from Navarre into the River Rouge region (through Ironton). Taking another feed that supplies power to this River Rouge area will cause the Navarre – Adelaide – Ironton 120 kV circuit to overload its thermal limit."

ITCT: Target Appendix A Projects: Baseline Reliability Projects. 23 line rebuild/reconductor projects below $10 million (1/4)

ID	Project Name	Description / ITCT's Justification	ISD	Cost
15843	Lee – Lake Huron Pumping 1 Tap 120 kV Rebuild	Rebuild 5.4 miles utilizing 954 ACSR conductor and upgrade the 266 ACSR line entrance at Lee.	12/31/2027	$2.6M
15862	Adams – Burns 2 120 kV Rebuild	Rebuild 0.3 mile of 795 ACSR conductor to 1431 ACSR	12/31/2027	$1.13M
16021	Belle River – St. Clair 345 kV Rebuild	Rebuild 1.13 miles of the Belle River – St. Claire 345 kV line using 2-T2 795 ACSR conductor. Also, upgrade station equipment at Belle River and St. Clair 345 kV stations.	12/31/2028	$9.3M

System Need for 15843:

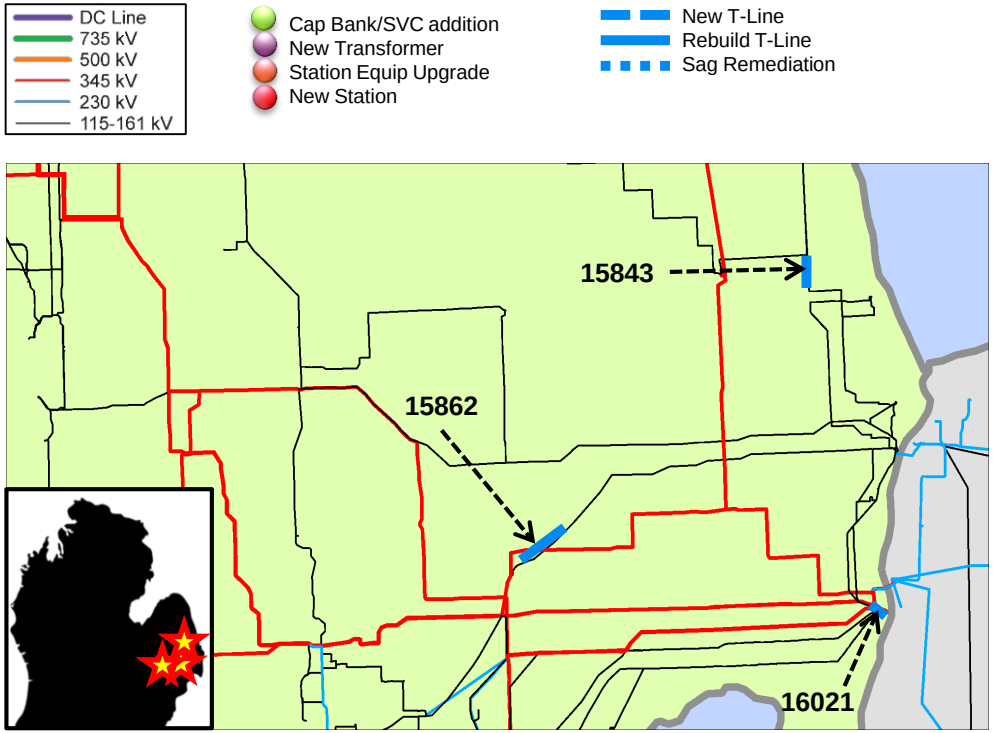
"The Lee – Lake Huron Pumping 1 Tap 120 kV section of the Lee – Menlo 120 kV line is projected to become marginally overloaded in the five year out models for shutdown plus contingencies involving either the Belle River – St. Clair 345 kV line. This line is significantly overloaded in the 10 year out models. The overloads were identified peak and off-peak load models with the Ludington units generating and flow out of ITCT across the Michigan-Ontario interface."

System Need for 15862:

"The 120 kV section between Adams and Burns 2 tap is projected to overload for various contingencies, including T-1, for the 2, 5, and 10 year cases in the 2018 assessment. The overloaded facility is the 795 ACSR conductor and the sag limit on this section."

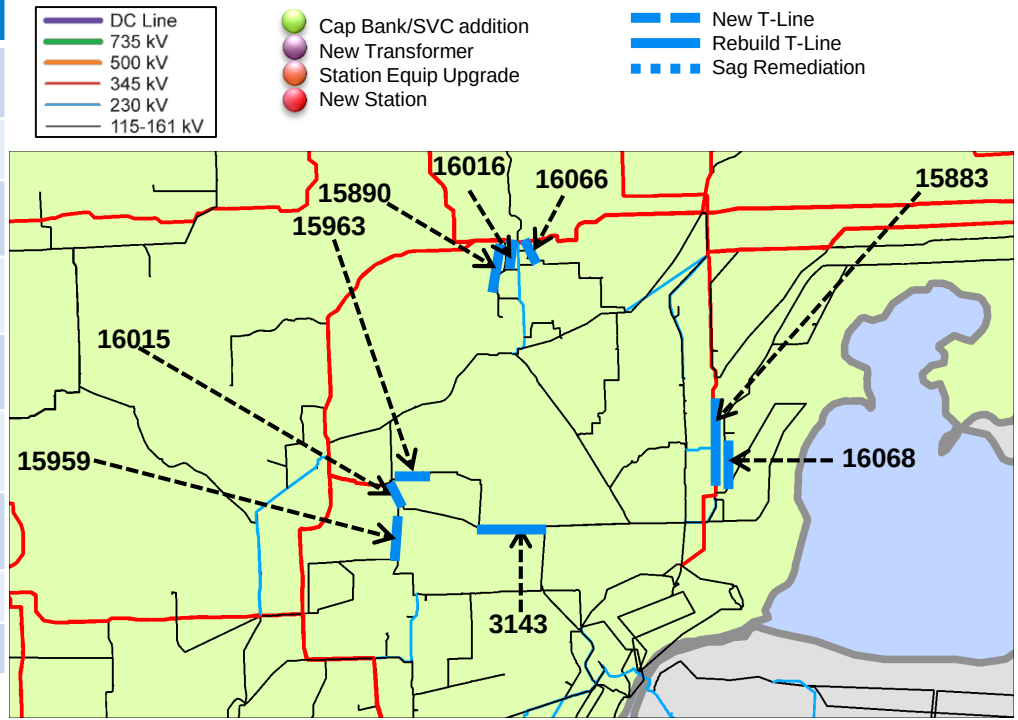
System Need for 16021:

"The Belle River – St. Claire 345 kV circuit is projected to be heavily overloaded for numerous contingencies, including basecase, G-1, and T-1 contingencies. The overloaded facilities are all the conductors on this circuit and most of the station equipment at Belle River 345 kV and St. Claire 345 kV stations, including 345 kV breakers."



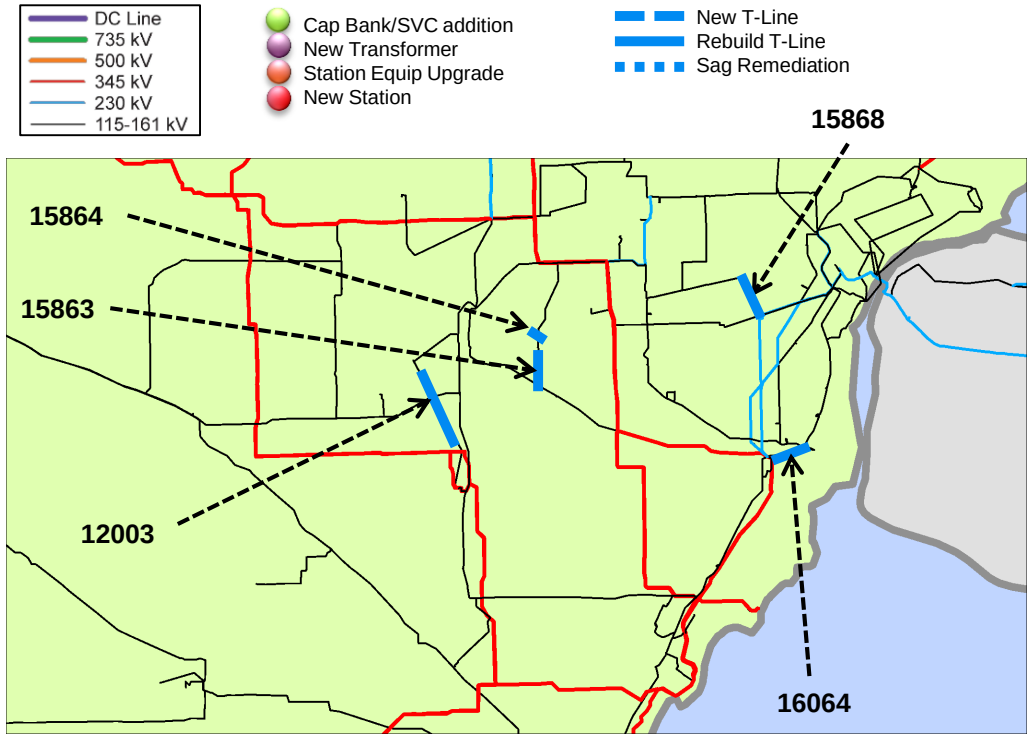
ITCT: Target Appendix A Projects Baseline Reliability Projects. 23 line rebuild/reconductor projects below $10 million (2/4)

MTEP ID	Project Name	Description	Exp. ISD	Cost
3143	Northwest - Southfield 120 kV	Rebuild 0.13 mile of 477 ACSR conductor to 1431. Upgrade the station equipment at Northwest 120 kV.	12/31/2029	$207k
15883	Bismarck-Stephens #2 120 kV Rebuild	Rebuild 3.61 miles of 795 ACSS and 954 ACSR conductors to 2156 ACSR.	12/31/2027	$9.1M
15890	Pontiac - Walton 120 kV Rebuild	Rebuild 4.8 miles of 477 ACSR X2 and 1431 ACSR conductors using 2156 ACSR. Upgrade station equipment at Pontiac 120kV and Walton 120 kV.	12/31/2025	$10.8M
15959	Hager - Sunset 120 kV Rebuild	Rebuild 4.33 miles using 1431 ACSR conductor with single circuit steel structures and replace equipment at Hager Pos HD.	12/31/2026	$9.3M
15963	Quaker-Drexel Tap 120 kV Rebuild	Rebuild 2.6 miles of 954 ACSR conductor to 2156 ACSR. Upgrade the station equipment at Quaker 120 kV.	12/31/2028	$2.7M
16015	Sunset - Quaker 120 kV Rebuild	Rebuild 0.259 mile using 2156 ACSR conductor with single circuit steel structures and replace equipment at Quaker Pos HD and Sunset Pos HN.	12/31/2025	$482k
16016	Pontiac - Joslyn 120 kV Rebuild	Rebuild 0.797 using 2156 ACSR conductor with single circuit steel structures and replace t equipment at Joslyn Pos HI.	12/31/2028	$2.5M
16066	Pontiac – Colorado Tap 120 kV Rebuild	Rebuild 1.9 miles of 954 ACSR conductor to 1431 ACSR and upgrade equipment at Pontiac 120 kV.	12/31/2028	$2.5M
16068	Benson – Stephens 120 kV Rebuild	Rebuild 1.17 miles of 795 ACSR conductor to 1431 ACSR and upgrade equipment at Stephens 120 kV.	12/31/2028	$1.6M



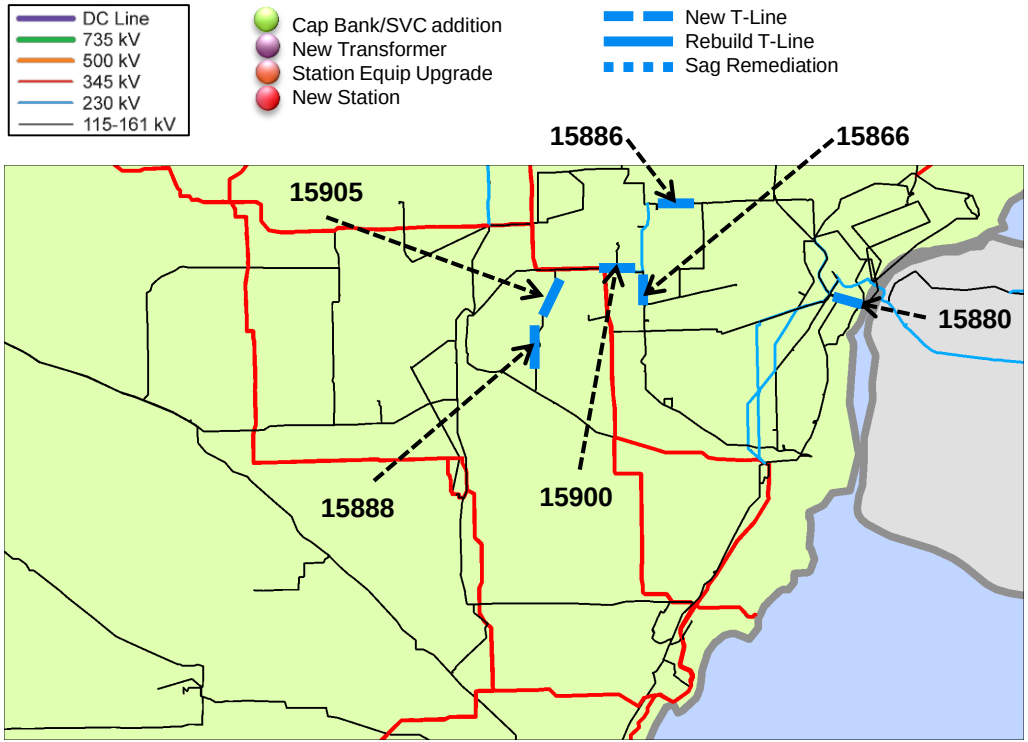
ITCT: Target Appendix A Projects: Baseline Reliability Projects. 23 line rebuild/reconductor projects below $10 million (3/4)

MTEP ID	Project Name	Description	Exp. ISD	Cost
15863	Arizona – Dayton 120 kV Rebuild	Rebuild 2.7 miles using 954 ACSR conductor. Upgrade station equipment at Arizona.	12/31/2022	$7.0M
15864	Arizona – Scottsdale 120 kV Rebuild	Rebuild 1.0 mile using 954 ACSR conductor and upgrade station equipment at both ends.	12/31/2022	$2.7M
15868	Brock - Elm 120 kV Rebuild	Rebuild 1.0 mile to 1431 ACSR. Upgrade station equipment at Elm 120 kV.	12/31/2023	$3.5M
16064	Brownstown - Trenton Channel #1 120 kV Rebuild	Rebuild 3.9 to 2156 ACSR. Upgrade the equipment at Brownstown 120 kV and Trenton Channel 120 kV stations.	12/31/2022	$10.3M
12003	Milan - Pioneer 120 kV Rebuild	Rebuild 4.0 with new 120 kV double-circuit structures that are designed for 954 ACSR conductor, installing this new conductor along with OPGW for the Milan – Pioneer 120 kV line only, and reattaching the existing 477 ACSR conductor of the Noble – Superior 120 kV line to the other side of the new structures.	12/31/2023	$6.0M



ITCT: Target Appendix A Projects: Baseline Reliability Projects. 23 line rebuild/reconductor projects below $10 million (4/4)

MTEP ID	Project Name	Description	Exp. ISD	Cost
15880	Navarre - River Rouge 120 kV Rebuild	Rebuild the 2.9 miles of 954 ACSR conductor to 2156 ACSR on the Navarre – River Rouge 120 kV line and upgrade station equipment at both ends.	12/31/2025	$9.7M
15866	Newburgh – Peru 120 kV Rebuild	Rebuild approximately 2.2 miles of 477 ACSR conductor to 1431 ACSR on the Newburgh – Sport 2 120 kV section to match with the rest of the circuit.	12/31/2023	$2.9M
15888	Scottsdale - Willow Run 120 kV Rebuild	Rebuild approximately 0.4 mile of 120 kV line from Scottsdale to Willow Run using 954 ACSR conductor and upgrade station equipment at both ends.	12/31/2022	$578k
15900	Wayne - Newburgh #1 120 kV Rebuild	Rebuild approximately 2.7 miles of 795 ACSS conductor to 2156 ACSS on the Wayne – Newburgh #1 120 kV circuit. Also, upgrade station equipment at both Wayne and Newburgh 120 kV.	12/31/2025	$4.8M
15905	Willow Run - Zebra 120 kV Rebuild	Rebuild approximately 4.6 miles of 120 kV line from Willow Run to Zebra using 954 ACSR conductor and upgrade station equipment at both ends.	12/31/2022	$6.2M
15886	Ottawa - Yost 120 kV Reconductor	Reconductor one span to 1431 ACSR at each end. Upgrade the equipment at both stations.	12/31/2021	$500k

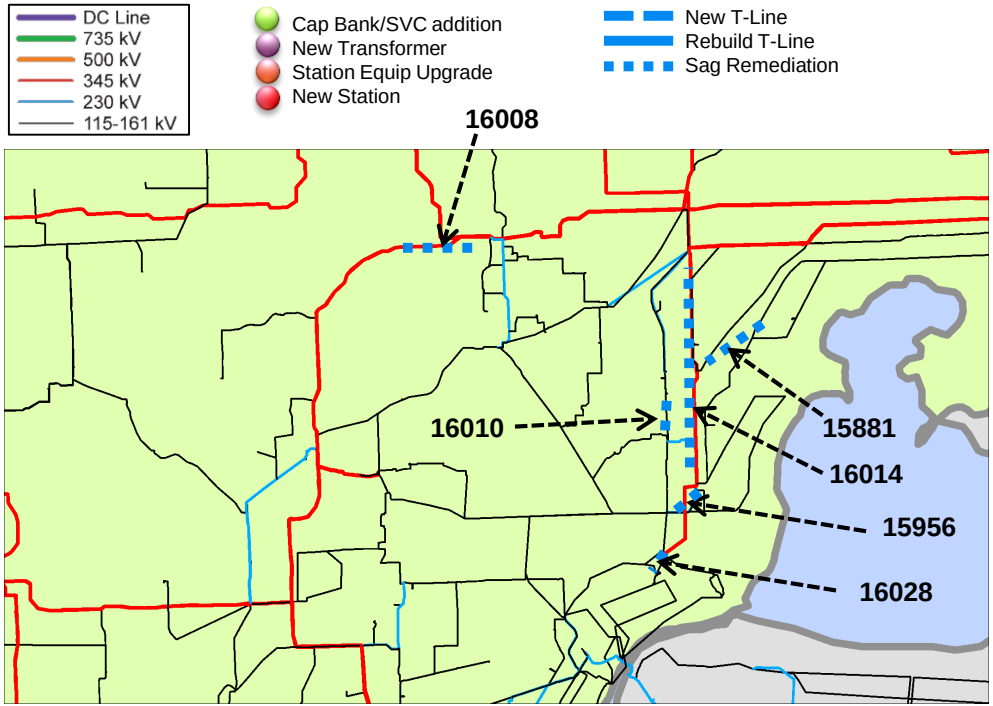


MTEP19 Baseline Reliability Projects (BRP)

Sag Remediation Projects

ITCT: Target Appendix A Projects: Baseline Reliability Projects. 14 sag remediation projects (1/3)

MTEP ID	Project Name	Description	Expected ISD	Cost
15881	Bismarck - Golf 120 kV Sag Remediation	Raise the sag limit on the Bismarck – Golf 120 kV line to at least 253 MVA.	12/31/2021	$630k
15956	Northeast – Stephens 230 kV Sag Remediation	Raise the sag limit on the Northeast – Stephens 230 kV line to at least 686 MVA and upgrade station equipment at Northeast 120 kV position "HE".	12/31/2022	$403k
16008	Pontiac – Placid 345 kV Sag Remediation	Raise the sag on the Pontiac – Placid 345 kV line to at least 1318 MVA.	12/31/2021	$2.5M
16010	Chestnut – Logan 1 Tap 120 kV Sag Remediation	Raise the sag limit on the Chestnut – Logan 1 tap 120 kV section to at least 250 MVA.	12/31/2027	$612k
16014	Jewell – Stephens 345 kV Sag Remediation	Completely remove the sag limit on the Jewell – Stephens 345 kV line and upgrade equipment at Stephens 345 kV station.	12/31/2022	$5.7M
16028	Caniff – Saturn 120 kV Sag Remediation	Raise the sag on the Caniff – Saturn 120 kV line to at least 218 MVA.	12/31/2021	$60k

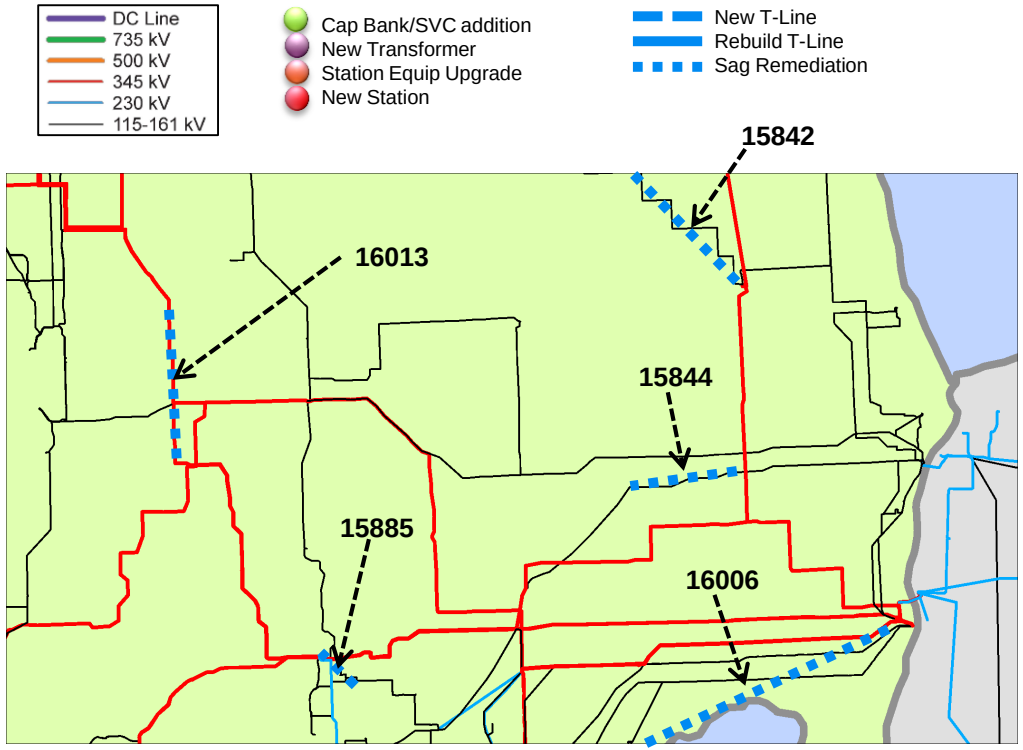


System Need for these project, provided by ITCT, can be found in Appendix 1

ITCT: Target Appendix A Projects: Baseline Reliability Projects. 14 sag remediation projects (2/3)

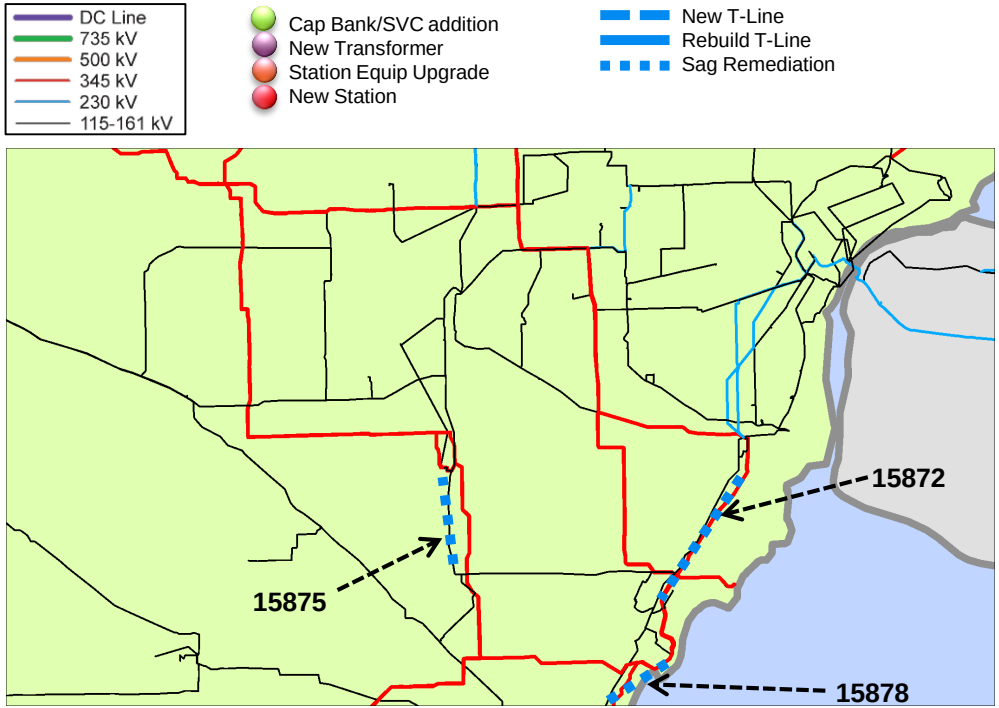
MTEP ID	Project Name	Description	Exp. ISD	Cost
15842	Bennett - Greenwood 120 kV Sag Remediation	Remediate the sag limit on the entire ~29.9 mile-long length of 954 ACSR conductor of the Bennett – Greenwood 120 kV line to at least the planned target summer normal/summer emergency rating of 170 MVA/816 Amps.	12/31/2028	$600k
15844	Burns 2 Tap – Fitz 120 kV Sag Remediation	The proposed solution is to remediate the sag limit on the Burns 2 Tap – Fitz 120 kV section of the Adams – Fitz 120 kV line to increase its summer emergency rating to a minimum of 377 MVA/1814 Amps. The in-service date of the proposed project is December 31, 2022.	12/31/2028	$198k
15885	Giddings - Colorado 120 kV Sag Remediation	Raise the sag limit on the Giddings – Colorado 120 kV section to at least 272 MVA.	12/31/2021	$222k
16006	St. Clair - Stephens #2 345 kV Sag Remediation and Station Equipment Upgrade	Completely remove sag limit on the St. Clair – Stephens #2 345kV to conductor limit and replace station equipment at Stephens and St. Clair substations.	12/31/2021	$3.6M
16013	Thetford – Jewell 345 kV Sag Remediation	Raise the sag limit on the Thetford – Jewell 345 kV line to at least 1537 MVA and upgrade equipment at Thetford 345 kV station.	6/5/2020	$700k*

All project justifications provided by ITCT can be found in Appendix 1



ITCT: Target Appendix A Projects: Baseline Reliability Projects. 14 sag remediation projects (3/3)

MTEP ID	Project Name	Description	Expected ISD	Cost
15872	Brownstown-Monroe #2 345 kV Sag Remediation	Raise the sag limit on Brownstown – Monroe #2 345 kV line to at least 1361 MVA.	12/31/2028	$650k
15875	Kentucky - Luzon 120 kV Sag Remediation	Completely remove the sag limit on the Kentucky – Luzon 120 kV line.	12/31/2028	$500k
15878	Monroe - Lallendorf 345 kV Sag Remediation	Completely remove the sag limit on the Monroe – Lallendorf 345 kV line (ITCT side).	12/31/2021	$1.2M



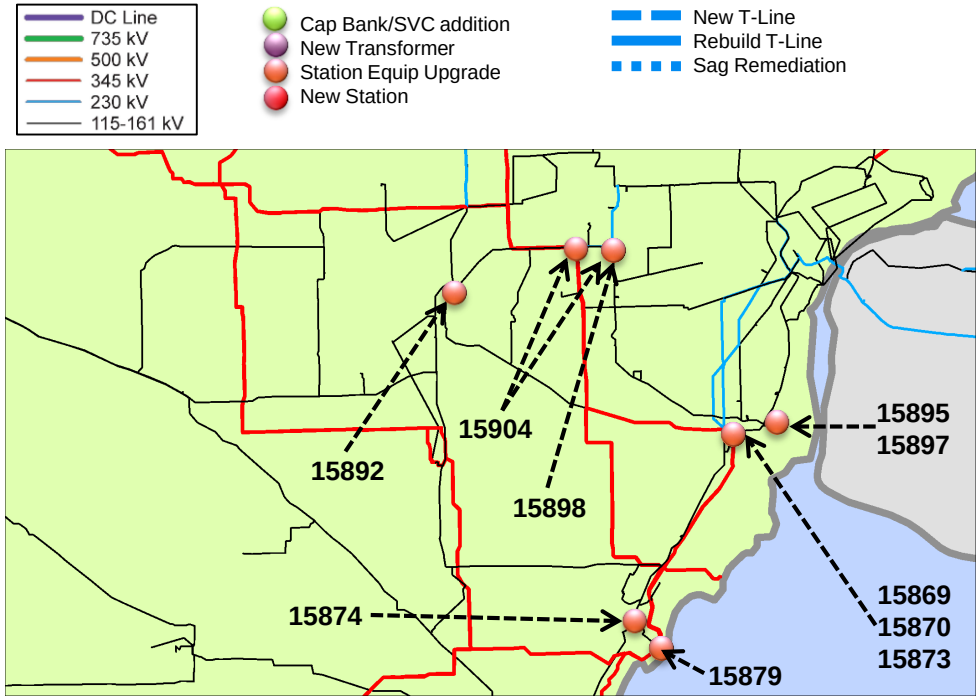
System Need for these project, provided by ITCT, can be found in Appendix 1

MTEP19 Baseline Reliability Projects (BRP)

Terminal/Station Equipment Projects

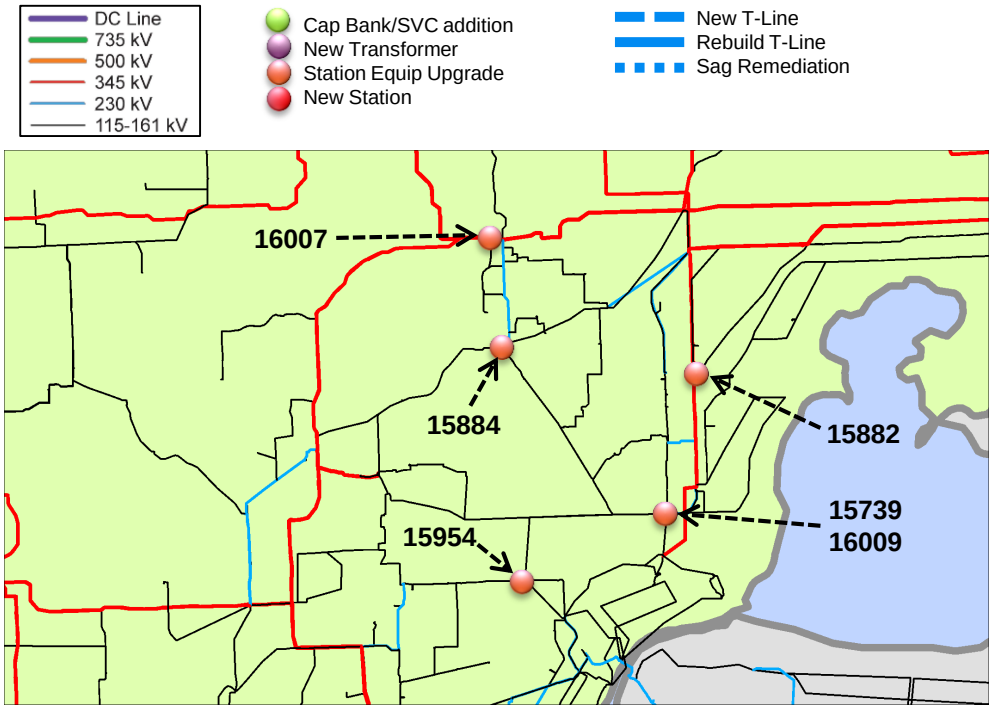
ITCT: Target Appendix A Projects: Baseline Reliability Projects. 16 terminal/station equipment upgrade (1/2)

MTEP ID	Project Name	Description	Exp. ISD	Cost
15869	Brownstown 120 kV - Upgrade GB Station Equipment	Upgrade the station equipment at Brownstown 120 kV position “GB”.	12/31/2021	$325k
15870	Brownstown 120 kV – Upgrade JA Station Equipment	Upgrade the station equipment at Brownstown 120 kV position “JA”.	12/31/2025	$20k
15873	Brownstown - Wayne #2 345 kV Station Equipment Upgrade	Upgrade the station equipment at Brownstown 345 kV positions “FM” and “FT”.	12/31/2026	$560k
15874	Custer 120 kV – Upgrade GA Station Equipment	Upgrade the station equipment at Custer 120 kV position “GA”.	12/31/2027	$90k
15879	Monroe - Lulu 345 kV Station Equipment Upgrade	Upgrade the station equipment at Monroe 345 kV positions “MF” and “MM”.	12/31/2021	$970k
15892	Superior 120 kV – Upgrade HJ Station Equipment	Upgrade the station equipment at Wayne 120 kV position “HJ”.	12/31/2021	$330k
15895	Trenton Channel 120 kV – Upgrade JP Station Equipment	Upgrade the station equipment at Trenton Channel 120 kV position “JP”.	12/31/2021	$252k
15897	Trenton Channel - Taurus 120 kV Station Equipment Upgrade	Upgrade the station equipment at Trenton Channel 120 kV position “JR”.	12/31/2021	$45k
15898	Wayne 120 kV – Upgrade GQ Station Equipment	Upgrade the station equipment at Wayne 120 kV position “GQ”.	12/31/2021	$75k
15904	Wayne - Newburgh #2 120 kV Station Equipment Upgrade	Upgrade the station equipment at Wayne 120 kV position “GP” and Newburgh 120 kV position “HQ”.	12/31/2021	$520k



ITCT: Target Appendix A Projects: Baseline Reliability Projects. 16 terminal/station equipment upgrade (2/2)

MTEP ID	Project Name	Description	Exp. ISD	Cost
15882	Bismarck 120 kV – Upgrade JC Station Equipment	Upgrade the station equipment at Bismarck 120 kV position "JC".	12/31/2021	$25k
15884	Bloomfield - Hood Station Equipment Upgrade	Upgrade the station equipment at Bloomfield 120 kV position "HE".	12/31/2021	$86k
15954	Evergreen 120 kV – Upgrade HG Station Equipment	Upgrade the station equipment at Evergreen 120 kV position "HG".	12/31/2026	$75k
16009	Northeast 120 kV Upgrade KD Reactor	Upgrade the Northeast 120 kV reactor at position "KD".	12/31/2022	$1.2M
16007	Pontiac 120 kV – Upgrade HC & GQ Station Equipment	Upgrade the station equipment at Pontiac 120 kV positions "HC" and "GQ".	12/31/2027	$40k
15739	Northeast 120 kV Breaker HE Replacement	Replace the existing Northeast 120 kV circuit breaker HE with a circuit breaker capable of interrupting at least 50 kA (short circuit limitations).	12/31/2020	$254k



System Need for these project, provided by ITCT, can be found in Appendix 1

MTEP19 Baseline Reliability Projects (BRP)

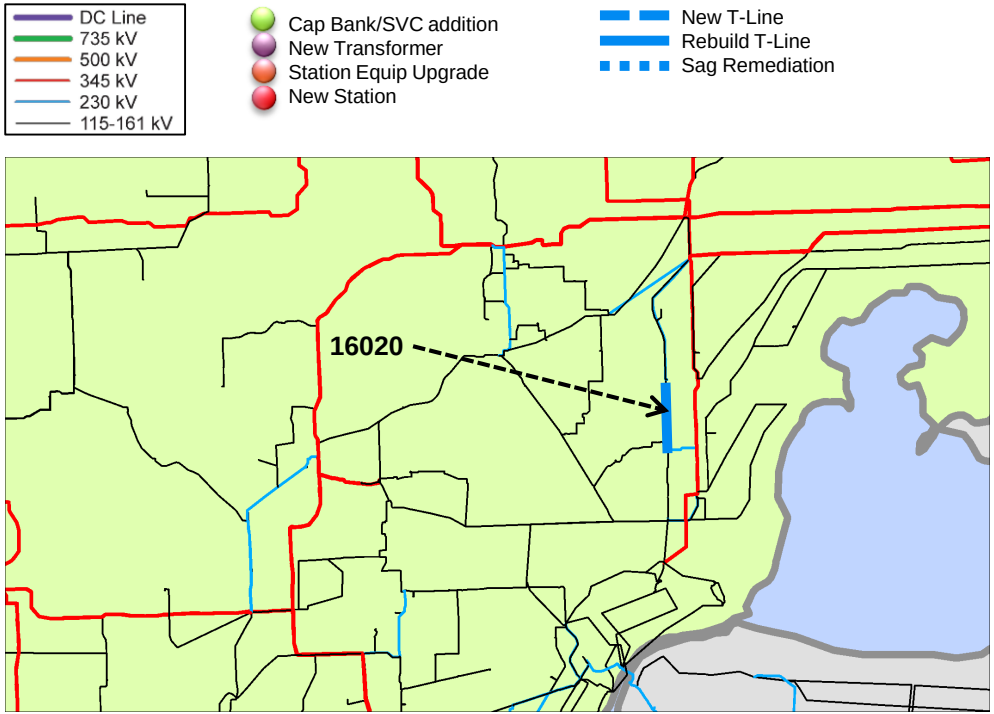
Capacitor Banks and Other Voltage Remediation Projects

ITCT: Target Appendix A Projects: Baseline Reliability Projects
ITCT-16020 Cut Skylark – Sloan 120 kV into Redrun

MTEP ID	Project Name	Description	Exp. ISD	Cost
16020	Cut Skylark – Sloan 120 kV into Redrun	Cut the Skylark – Sloan 120 kV line into Redrun station with the installation of two new 120 kV breakers. Also, upgrade station equipment at Sterling and rebuild approximately 1.6 miles of 795 ACSR conductor on the 120 kV sections from Sterling to Mustang2 to Van Dyke2 tap with 1431 ACSR as part of this project.	12/31/2022	$5.0M

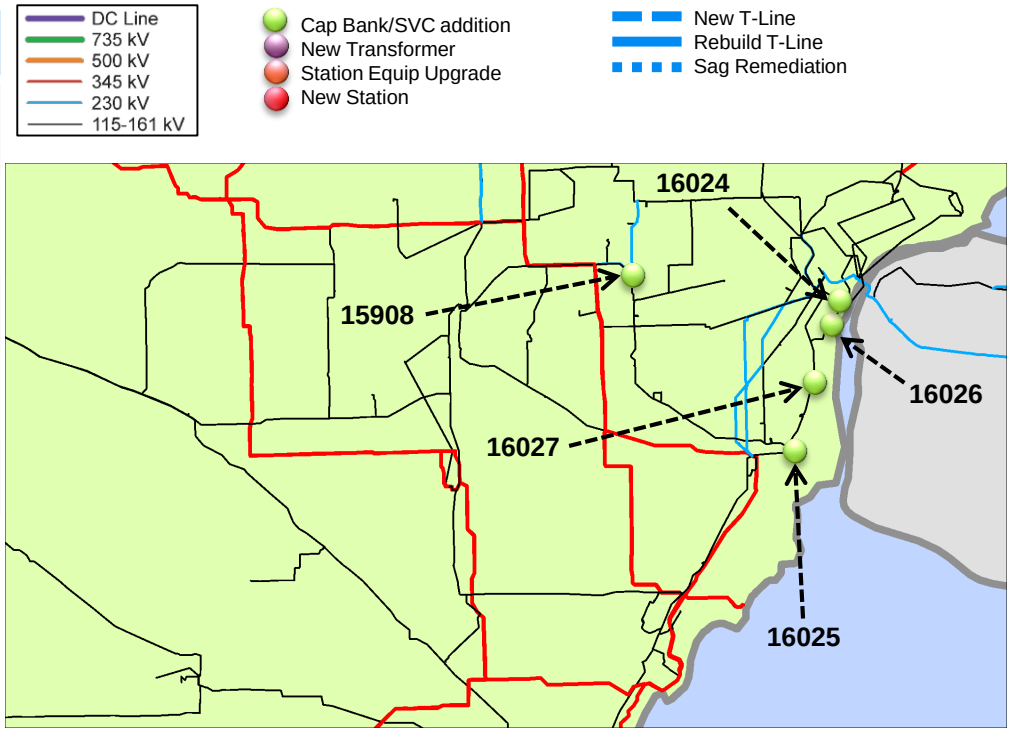
System Need:

"The 2018 assessment identified many buses in region between Skylark and Sterling 120 kV stations that are projected to experience low voltages in shutdown-plus-contingency combinations that would take out the 120 kV feed from Northeast to Skylark and 230 kV feed from Jewell to Sterling."



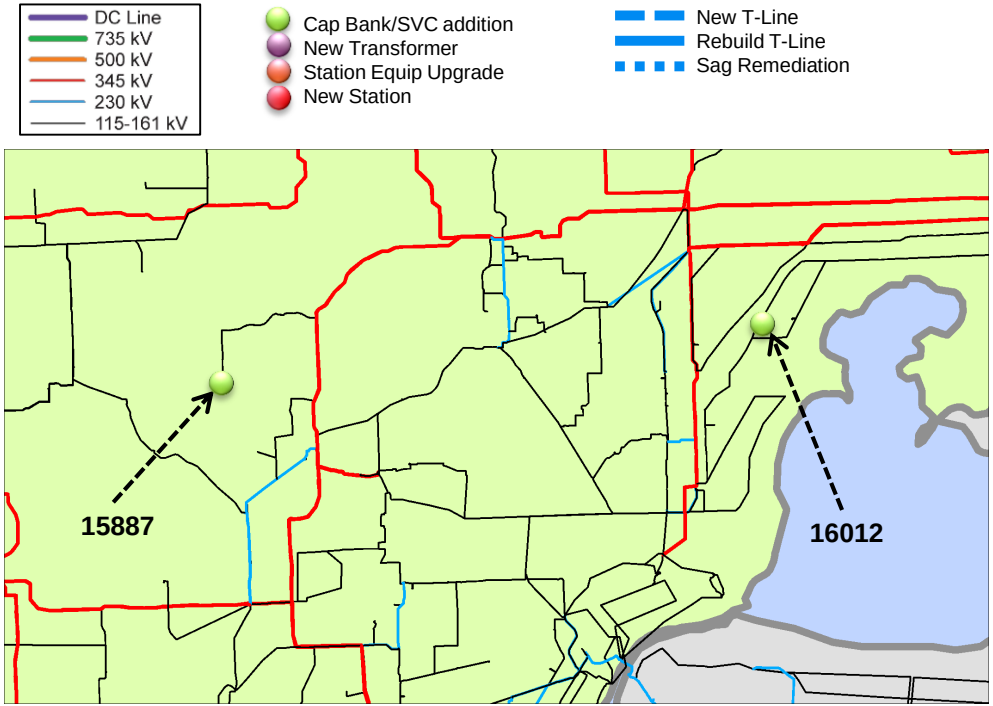
ITCT: Target Appendix A Projects: Baseline Reliability Projects. 8 new capacitor bank projects (1/3)

MTEP ID	Project Name	Description	Exp. ISD	Cost
15908	Newburgh 120 kV 33.3 MVAR Capacitor	Install a 33.3 MVAR capacitor at Newburgh 120 kV on bus 101.	12/31/2022	$850k
16024	River Rouge 120 kV Capacitor	Install three 18 MVAR capacitors at River Rouge 120 kV station.	12/31/2021	$1.0M
16025	Trenton Channel 120 kV Capacitor	Install three 18 MVAR capacitors at Trenton Channel 120 kV station.	12/31/2021	$1.0M
16026	Ironton 120 kV Capacitor	Install three 18 MVAR capacitors at Ironton 120 kV station.	12/31/2021	$1.0M
16027	Riverview 120 kV Capacitor	Install three 18 MVAR capacitors at Riverview 120 kV station.	12/31/2021	$1.0M



ITCT: Target Appendix A Projects: Baseline Reliability Projects. 8 new capacitor bank projects (2/3)

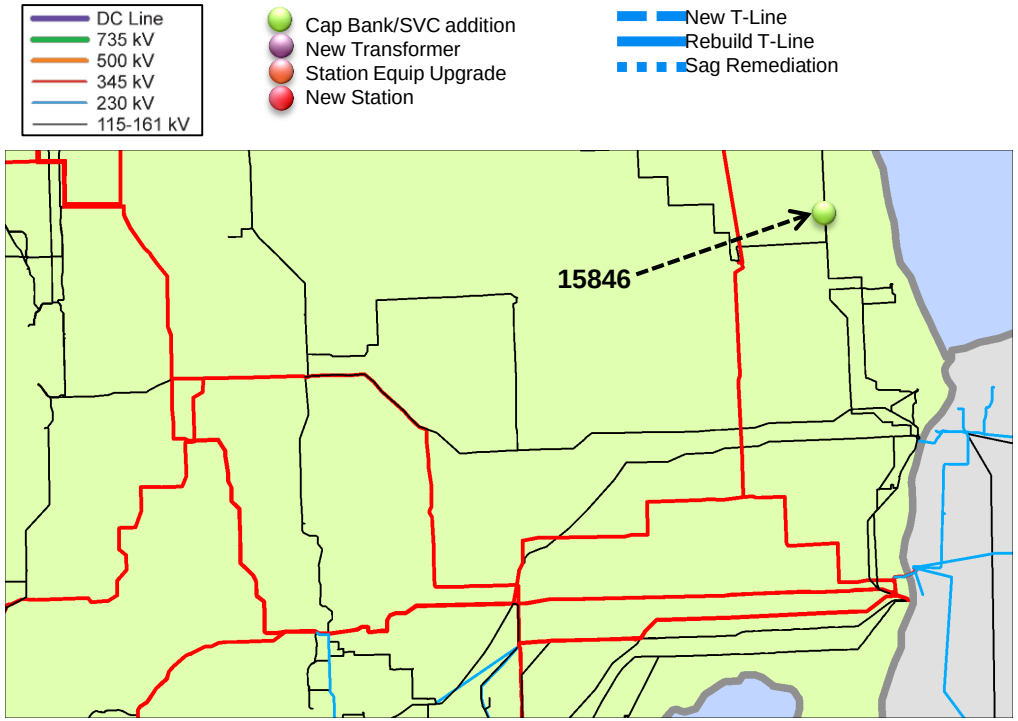
MTEP ID	Project Name	Description	Exp. ISD	Cost
15887	Durant Capacitor	Install a 33.3 MVAR capacitor at Durant 120 kV station.	12/31/2022	$850k
16012	Golf Capacitor	Install a 54 MVAR capacitor at Golf station to maintain acceptable voltage levels within this region of the Oakland area.	12/31/2022	$1.0M



System Need for these project, provided by ITCT, can be found in Appendix 1

ITCT: Target Appendix A Projects: Baseline Reliability Projects. 8 new capacitor bank projects (3/3)

MTEP ID	Project Name	Description	Exp. ISD	Cost
15846	Lee Capacitor	Install an 18 MVAR capacitor at Lee station to maintain acceptable voltage levels within this region of the Thumb area.	12/31/2028	$900k



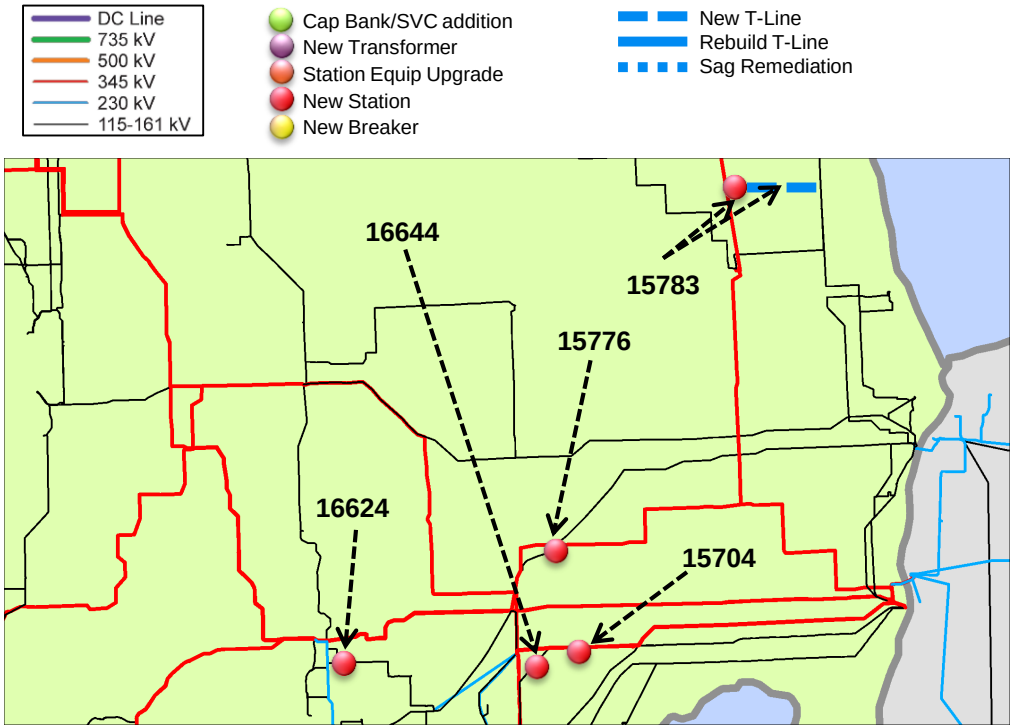
System Need for these project, provided by ITCT, can be found in Appendix 1

MTEP19 Other Projects

Load Growth Projects

ITCT: Target Appendix A Projects: Other Projects.
9 load growth and age condition projects (1/3)

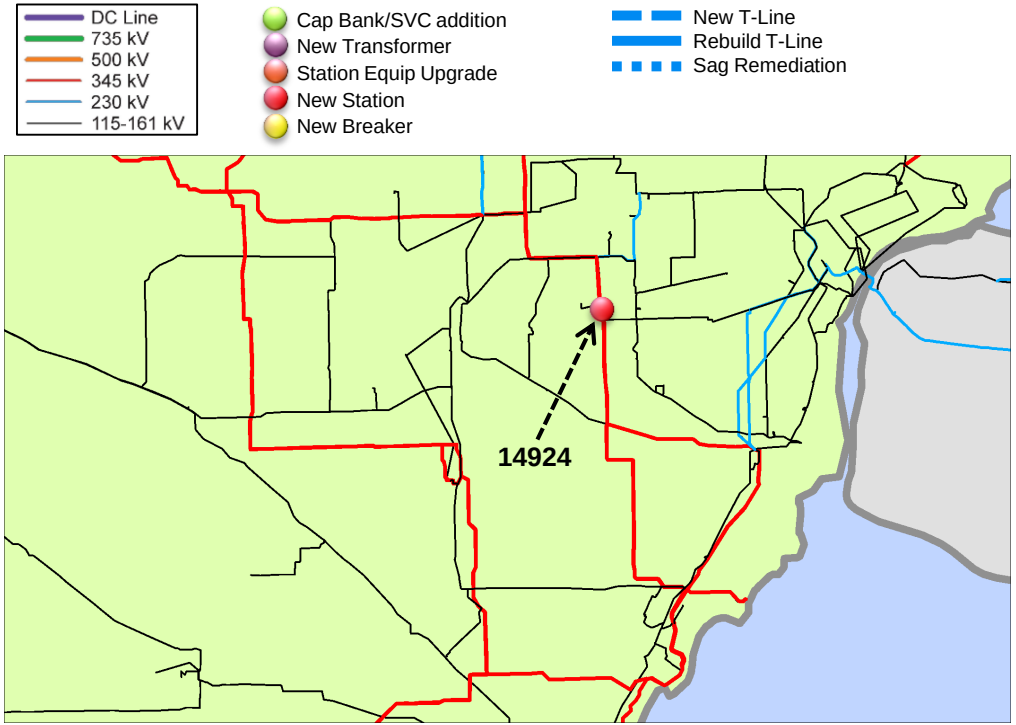
MTEP ID	Project Name	Description	Exp. ISD	Cost
15704	Gramer Interconnection (EPR Approved in February PAC)	Gramer 120kV is a straight bus station with 1 section breaker and 2 line breakers. This will require 2 miles of new 120kV DCT to loop in the Jewel - St.Clair #2 120kV line for transmission service. DTE will have 2 120/40kV transformer which will be networked with DTE's existing 40kV system.	3/31/2020	$10.2M
15776	Juliet Interconnection	ITCT will construct a new straight bus 120kV substation tentatively named Juliet. ITCT will loop in the Adams – Fitz 120kV circuit into the new substation. ITCT will install OPGW between Adams and new substation.	12/31/2020	$4.2M
15783	Croswell Interconnection	ITCT will install a new 120 kV breaker with associated disconnects at the Lee substation. ITCT will construct approximately 7.5 miles of a new 120 kV circuit between Lee and the new substation in Croswell.	12/31/2021	$8.7M
16624	Mountain Interconnection	ITC will need to tap the Pontiac - Sunbird 120kV line and the Bloomfield - Sunbird 120kV line to provide transmission service to DTE's new Mountain station. DTE will install 2 120/13.2kV transformers to serve about 12.5 MVA of load.	3/31/2021	$1.9M
16644	Sigma Interconnection	Sigma is a 120kV station in a straight bus configuration with two line breakers and a section breaker. ITCT will cut in the Bismarck - Lenox 120kV line for transmission service. DTE will install two 120/13.2 kV transformers with circuit switchers for high side protection. DTE bus 11 and bus 12 will be tied via an A.T.O. Sigma will serve about 28.7 MVA of load relocated from Grayling and Jewell.	4/1/2022	$4.5M



System Need for these project, provided by ITCT, can be found in Appendix 1

ITCT: Target Appendix A Projects: Other Projects.
9 load growth and age condition projects (2/3)

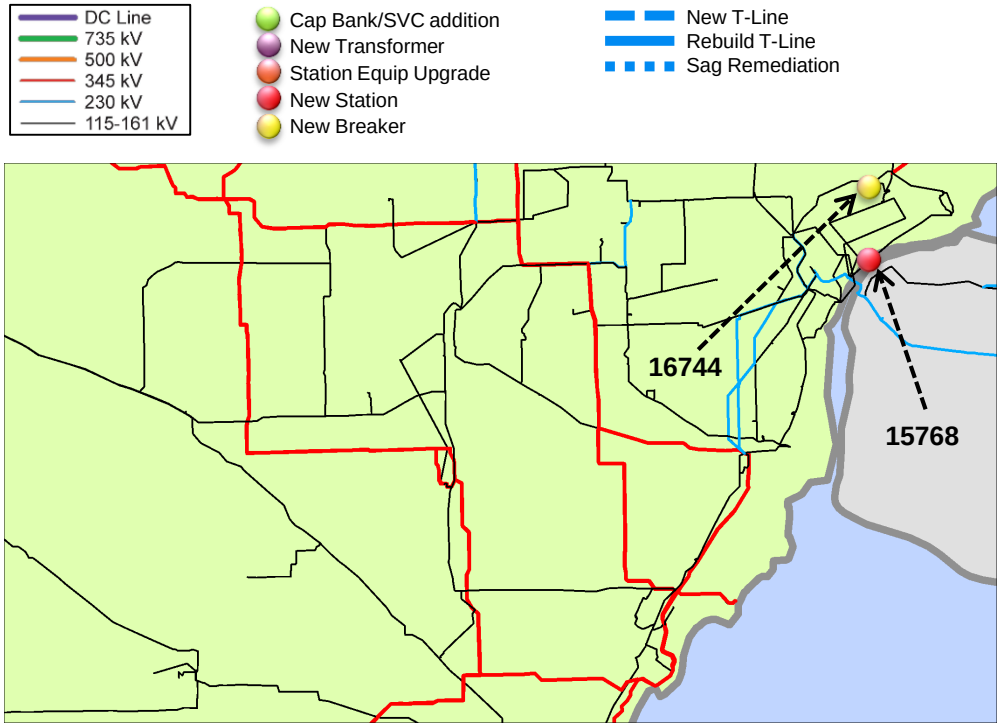
MTEP ID	Project Name	Description	Exp. ISD	Cost
14924	Morton Interconnection	Morton is a new 120kV interconnection. Station will be a straight bus with a section breaker and two line breakers. Morton will be fed by cutting in the Douglass - Visteon 120kV line.	12/31/2021	$3.5M



System Need for these project, provided by ITCT, can be found in Appendix 1

ITCT: Target Appendix A Projects: Other Projects.
9 load growth and age condition projects (3/3)

MTEP ID	Project Name	Description	Exp. ISD	Cost
15768	Corktown Interconnection * (EPR on hold)	ITCT will construct a new 5 breaker ring bus 120kV substation, named Corktown. ITCT will loop the St. Antoine - Waterman 120kV circuit into the new station and build a new underground 120kV cable from the Cato into the new substation. ITCT will upgrade Cato to a 4 breaker ring bus 120kV substation to accommodate for the new Cato – Corktown circuit.	3/31/2022	$28.9M
16744	Midtown Expansion (EPR Approved in April PAC)	ITCT will expand the Midtown 120kV GIS from the existing 4-breaker ring bus to a 5-breaker ring bus. This will enable DTE to add another 120/13.2 kV transformer to feed 7.3 MW load (new) and 4.4 MW (relocated)	12/31/2020	$7.9M



MTEP19 Other Projects

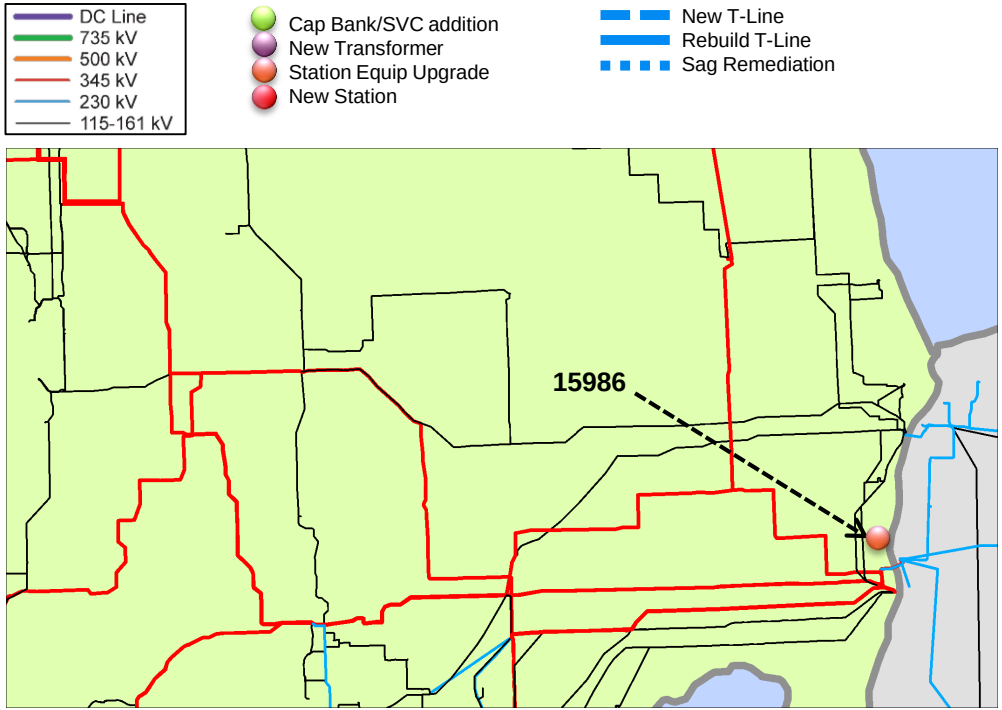
Other-Reliability Projects

ITCT: Target Appendix A Projects: Other Projects.
ITCT-15986 Remer 120 kV Breakers (Other – Reliability)

MTEP ID	Project Name	Description	Exp. ISD	Cost
15986	Remer 120 kV Breakers	Install three new breakers at the Remer 120 kV station to tie buses 101 and 102 together and to terminate Remer to St. Clair circuits 1 & 2 at positions “HD” and “HI” respectively.	12/31/2021	$1.2M

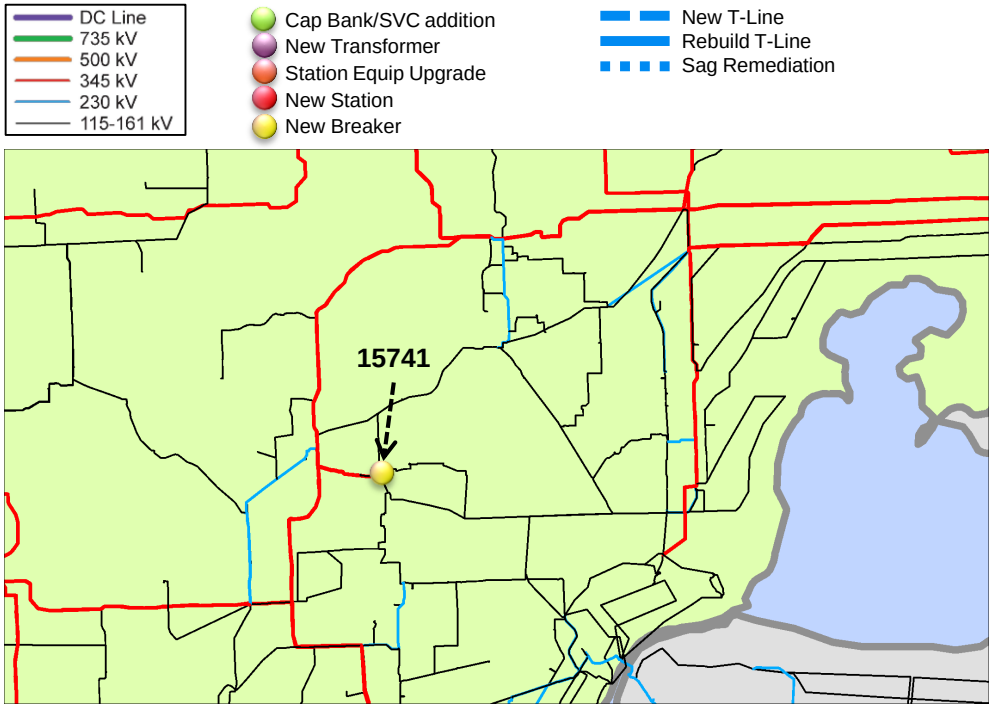
System Need:

“The Remer 120 kV station currently does not have a section breaker connecting buses 101 and 102 together or line breakers on Remer to St. Clair circuits 1 & 2. The two Remer 120 kV buses are connected on the 40 kV sub-transmission via a 120/40 kV transformer at each bus. When either the St. Clair breaker “HO” or St. Clair breaker “KG” is opened, flow from the Dean generation is forced down one of the Remer transformers, across the 40 kV system, then back up the other Remer transformer resulting in dynamic instability in the area. The transformers themselves are also exposed to potential overloads as the full capacity of the Dean generation exceeds the rating of each 120/40 kV transformer.”



ITCT: Target Appendix A Projects: Other Projects.
ITCT-15741 Quaker 230kV Breaker Installation Project (Other – Reliability)

MTEP ID	Project Name	Description	Exp. ISD	Cost
15741	Quaker 230kV Breaker Installation Project	Install a 230kV breaker on the high side of T251 at Quaker for the Quaker – Wixom line. The new breaker would have a dedicated breaker control relay.	12/31/2021	$508k



System Need:

- Adds local tripping for the Quaker 230/120 kV Transformer #251 resulting in:
- 25% faster fault clearing.
- Increased reliability of transformer protection as primary fault clearing does not rely on power line carrier scheme to trip the remote end breakers.
- Less sensitive protection settings by eliminating in line transformer, resulting in:
- Faster backup clearing times without risk of miscoordination.
- Eliminate risk of overtrip caused by transformer inrush.
- Install redundant ITC standard protection design, resulting in the following benefits:

- Redundant high-speed line protection with modern microprocessor line relays and power line carrier units.
- Redundant transfer trip for breaker failure.

MISO recommends moving this project to Appendix A

System Need for these project, provided by ITCT, can be found in Appendix 1

ITCT: Target Appendix A Projects: Other Projects
3 load growth, other-reliability, and age condition projects

MTEP ID	Project Name	Description	Exp. ISD	Cost	Recommendation
15976	2022 ITCT Asset Replacement Program	Replace aging and outdated equipment on a cycle that will ensure each piece of equipment is replaced near its expected end of life. Modern equipment can improve reliability, use state of the art technology, and typically will allow for longer maintenance intervals. New equipment is also commonly equipped with better monitoring and alarming functionality giving improved remote supervision. All of this will help to reduce overall maintenance costs.	12/31/2022	$49.0M	Move to Appendix A
15891	ITCT Customer interconnections - Year 2022	Customer interconnection requests and retirements less than $1 million with in service date in year 2022.	12/31/2022	$2.0M	Move to Appendix A
16004	ITCT Pole Top Switch Additions/Replacement Program 2021	Installing, or replacing as appropriate, pole-top switches at tap points of circuits will provide the operational flexibility to sectionalize parts of the line to isolate faults or perform maintenance work on it without having to shut down the entire circuit.	12/31/2021	$2.4M	Move to Appendix A

ITC - (METC)

METC 15810 – Roosevelt – Tallmadge 345 kV Rebuild

METC's Project Justification

Project Description:

Rebuild 16.41 miles of the Roosevelt-Tallmadge 345kV circuit using 2x1431 ACSR conductor with double circuit steel structures. Replace terminal equipment at Tallmadge and Roosevelt stations. Also replace station equipment at Tallmadge station.

System Need:

- Facilities are overloaded for numerous shutdown plus contingency scenarios.

Estimated Cost:

$45.90 M

Expected ISD:

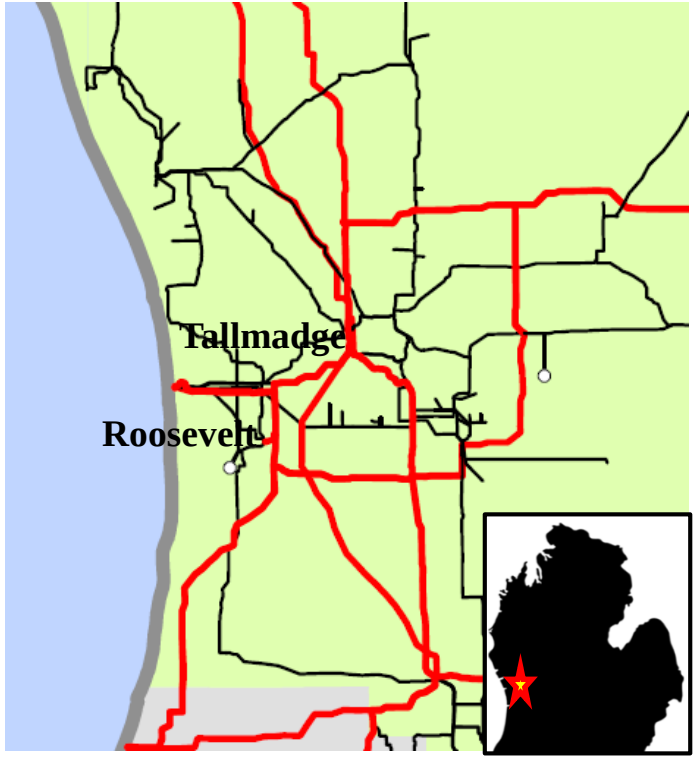
12/31/2025

Project Type:

Baseline Reliability Project

Target Appendix:

A in MTEP19



METC 15810 – Roosevelt – Tallmadge 345 kV Rebuild

MISO's Project Justification

Thermal Violations				
Monitored Facility	**Voltage Level (kV)**	**Contingency Category**	**Max Loading (%)**	**Comment**
Roosevelt – Tallmadge 345 kV	345	P6	100.4	Double contingency event (P6) seen for Ludington Pumping case

Analysis Summary:

- Loaded to 100.4% on pumping sensitivity case for double contingency (P6) event
- MISO found the re-dispatch solution that satisfies TPL-001-4 and ITC planning criteria to address the issue.
- MISO recommends this project for MTEP19 Appendix B.

METC 15942 – Cobb 138 kV Station Rebuild

METC's Project Justification

Project Description:

Rebuild Cobb 138 kV station at a new site approximately 3.9 miles to the east (Pine Creek) utilizing new equipment in a six-row, breaker-and-a-half scheme configuration.

System Need:

- Facilities violates thermal and voltage criteria for breaker failure event

Estimated Cost:

$23.10 M

Expected ISD:

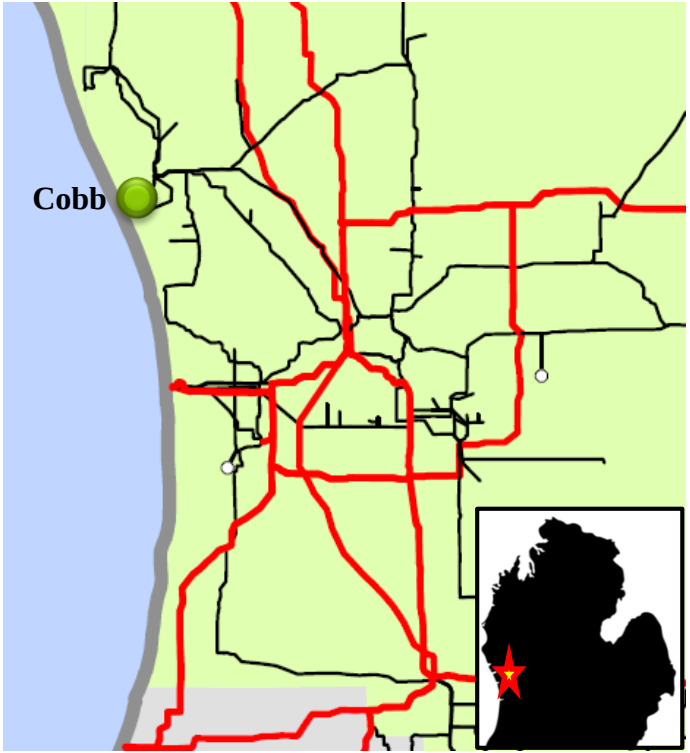
12/31/2023

Project Type:

Baseline Reliability Project

Target Appendix:

A in MTEP19



METC 15942 – Cobb 138 kV Station Rebuild

MISO Project Justification

Voltage Violations				
Substation	**Voltage Level (kV)**	**Contingency Category**	**Voltage Violation (Min pu)**	**Comment**
Cleveland	138	P2	0.91	P24 issue seen on 2 year out case
Ellis	138	P2	0.87	P24 issue seen on multiple cases
Savidge	138	P2	0.91	P24 issue seen on 2 year out case
Latimer	138	P2	0.71	P24 Issue seen on multiple cases
Savannah	138	P2	0.71	P24 issue seen on multiple cases
Muskegon Heights	138	P2	0.71	P24 issue seen on multiple cases
Sternberg	138	P2	0.88	P24 issue seen on multiple cases
Hill Road	138	P2	0.87	P24 issue seen on multiple cases

METC 15942 – Cobb 138 kV Station Rebuild

MISO Project Justification

Thermal Violations				
Monitored Facility	**Voltage Level (kV)**	**Contingency Category**	**Max Loading (%)**	**Comment**
Bass Creek to Cleveland Junction	138	P2	105.09	Issue from singe initiating event seen on 2 year out case
Savidge to Sternberg	138	P6	111.52	Double contingency P6 event seen on 2 cases

Analysis Summary:

- MISO identified thermal and voltage issues for breaker failure event at cobb station
- MISO recommends the project for MTEP19 Appendix A

METC 15911 – Verona – Foundry 138 kV Rebuild

METC's Project Justification

Project Description:

Rebuild 16.1 miles of the Brewster Jct. – Convis Jct. and Convis Jct. – Calhoun sections of the Verona – Foundry 138 kV circuit using 954 ACSR conductor with future double-circuit (FDC) steel structures.

System Need:

- Facilities are overloaded for numerous shutdown plus contingency scenarios.

Estimated Cost:

$24.30 M

Expected ISD:

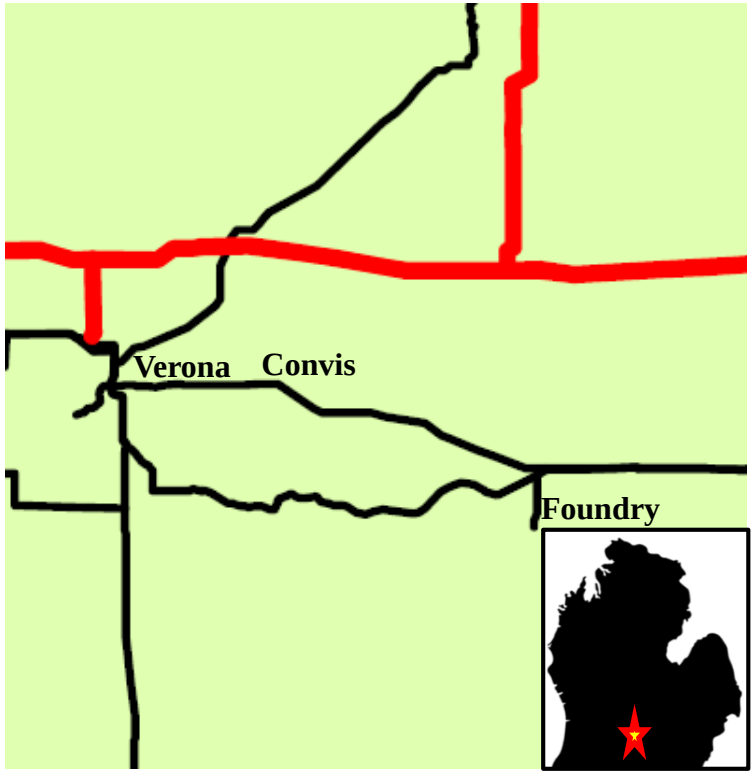
12/31/2028

Project Type:

Baseline Reliability Project

Target Appendix:

A in MTEP19

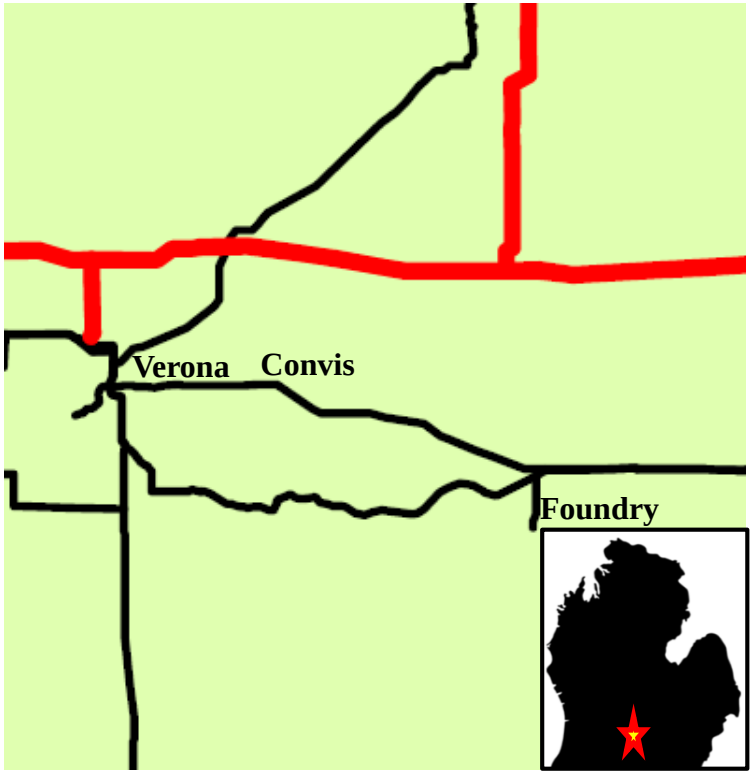


METC 15911 – Verona – Foundry 138 kV Rebuild

MISO's Project Justification

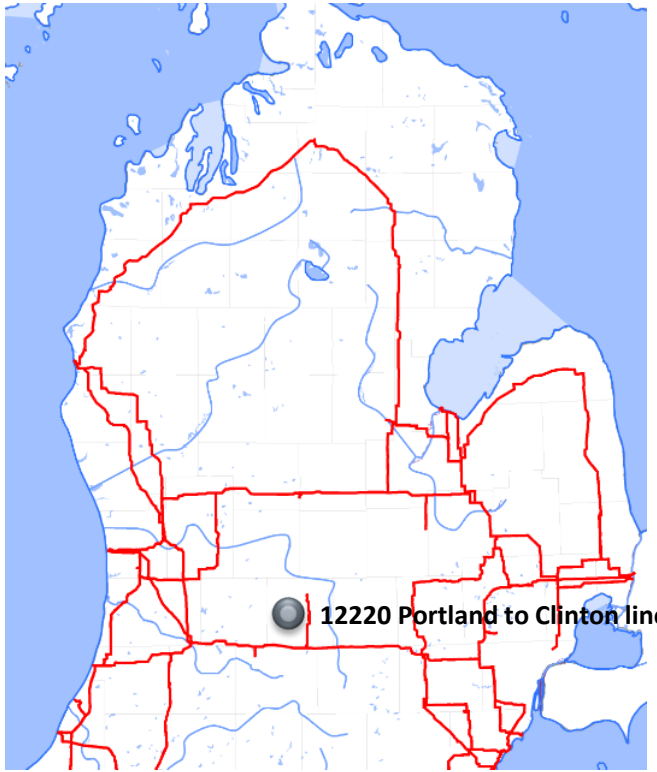
Analysis Summary

- MISO did not observe overloading on any cases.
- MISO recommends this project for MTEP19 Appendix B.



Michigan – (WPSC)

WPSC: 1 Target Appendix A Projects are proposed as Baseline Reliability Projects to address reliability issues



WPSC 12220 – Portland to Clinton line rebuild

WPSC's Project Justification

Project Description:

Rebuild line to 138kV design with 795ACSS conductor

System Need:

- Overloads identified in MTEP18 cycle
- Condition based- Replace aging infrastructure with 31% condemned or damaged poles

Estimated Cost:

$7.5 M

Expected ISD:

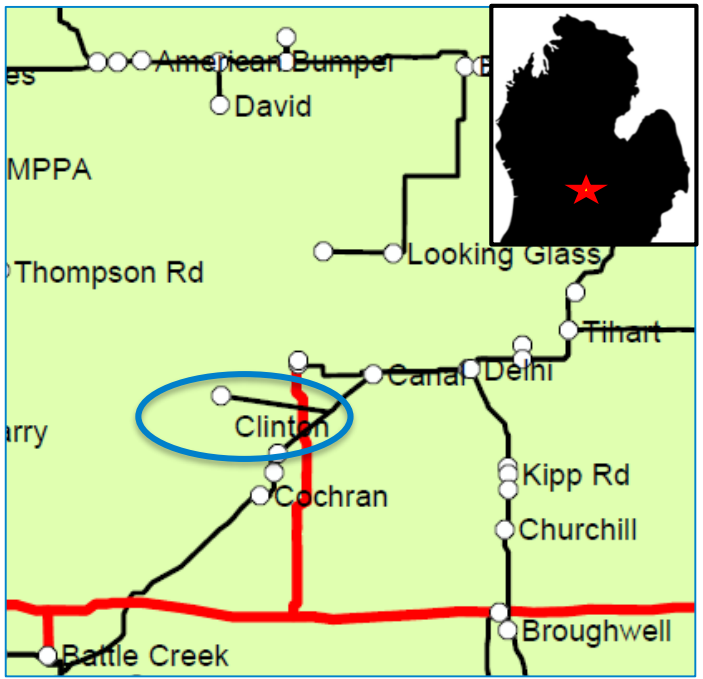
12/31/2022

Project Type:

Baseline Reliability Project

Target Appendix:

A in MTEP19



WPSC 12220 – Portland to Clinton line rebuild

MISO's Project Justification

Limiting_Element	Contingency type	Rating	Loading %
263385 18MULLIKEN X - 263390 18PORTLAND 1	P71	30 MVA	107.50%
	P12		105.50%
	P23		105.40%
	P23		105.40%
	P24		113.60%
	P71		129.30%
	P71		105.90%
	P71		110.10%

- **Analysis Summary:**
  - This line is over loaded upto 129% for P7 event.
  - This Issue was also observed on previous MTEP cycle.
  - Based on the analysis this project is needed to resolve the thermal issues.

WPSC 15651 – Clinton to Wayland Rebuild

WPSC's Project Justification

Project Description:

Rebuild and upgrade 41 miles of 69 kV line to 138 kV design, 795ACSS conductor and OPGW.

System Need:

- Replace aging infrastructure
  - Oldest line section built in 1971
  - 40 condemned and 210 damaged poles
  - 37% of poles in need of replacement

Estimated Cost:

$23.70 M

Expected ISD:

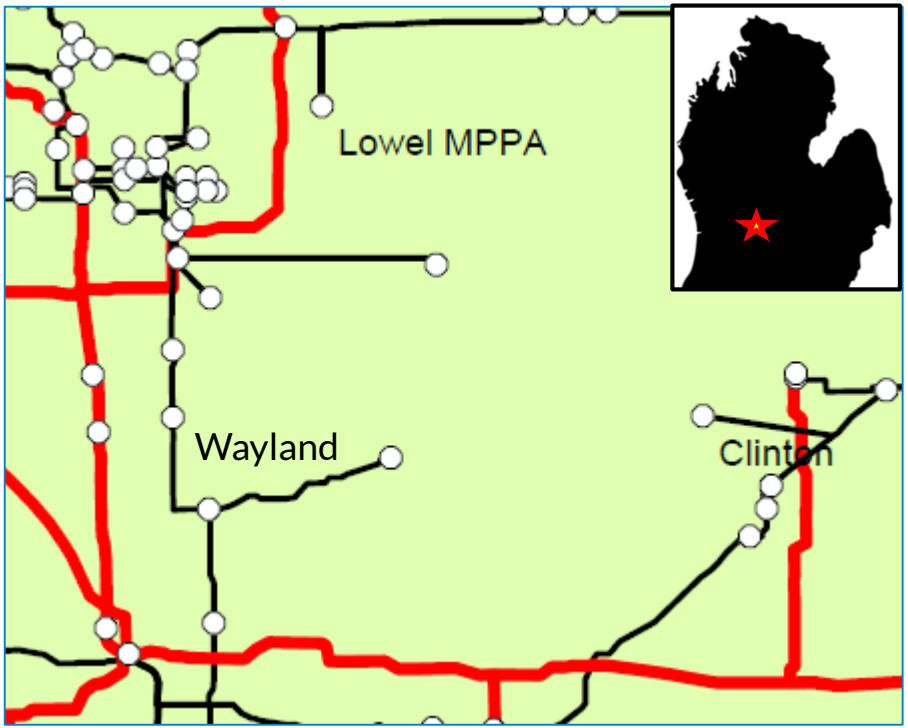
12/31/2022

Project Type:

Other – Age and Condition

Target Appendix:

A in MTEP19



WPSC 16104 – Altona to Pierson Rebuild

WPSC's Project Justification

Project Description:

Rebuild and upgrade 14 miles of 69 kV line to 138 kV design, 795ACSS conductor and OPGW..

System Need:

- Replace aging infrastructure
  - Line section built in 1953
  - 16 condemned and 37 damaged poles
  - 35% of poles in need of replacement

Estimated Cost:

$7.30 M

Expected ISD:

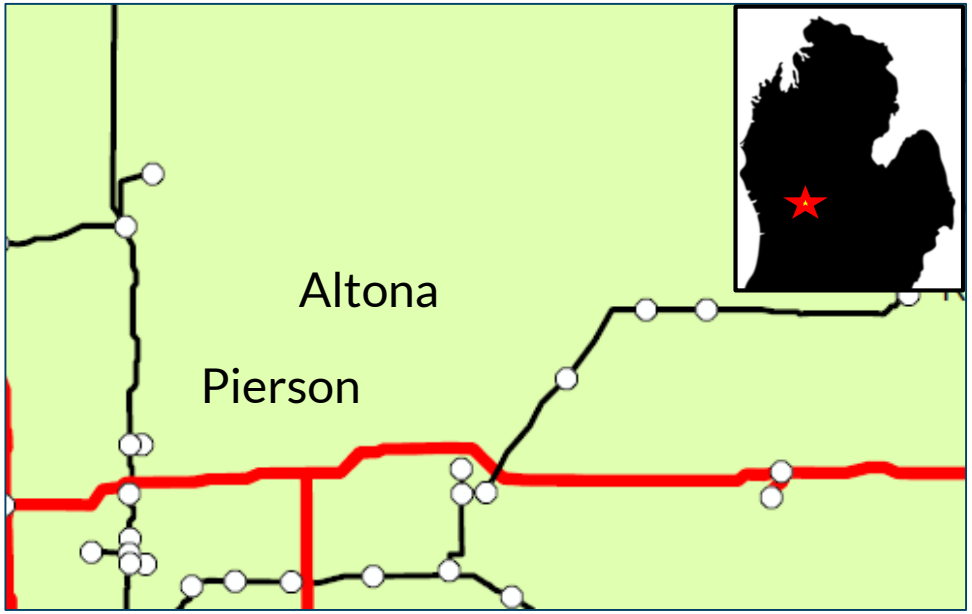
12/31/2022

Project Type:

Other – Age and Condition

Target Appendix:

A in MTEP19



WPSC: 2 Target Appendix A Projects are proposed as Other Reliability Project to address aging and reliability issues

Project ID	Project Name	Project Description	Preliminary System Need	In-Service Date	Estimated Cost
9895	Graves Crossing to Central Lake Rebuild	Rebuild the Graves Crossing to Central Lake 69kV line, install new poles and hardware with 336ACSR conductor	This 69kV transmission line segment was built in 1975. This line segment has 42% condemned, rotten tops, or damaged structures. Because there are so many poles in need of replacing, it falls within our condition based transmission line rebuild criteria to demolish the existing line and rebuild to our new standard configuration.	12/31/2022	$4,080,000
16344	Weidman 69kV Bus rebuild	Rebuild 69kV Bus at Weidman station	Rebuild the existing 69kV bus to accommodate additional capacity at station.	12/31/2020	$170,000

WPSC: 1 Target Appendix A Projects are proposed as Other system wide Projects (Battery Replacement)

Project ID	Project Name	Project Description	Preliminary System Need	In-Service Date	Estimated Cost
16345	2022 Battery Bank Replacement	This project will replace one battery bank at a Transmission Station.	Aging infrastructure. End of its maintainable life cycle.	12/31/2022	$35,000

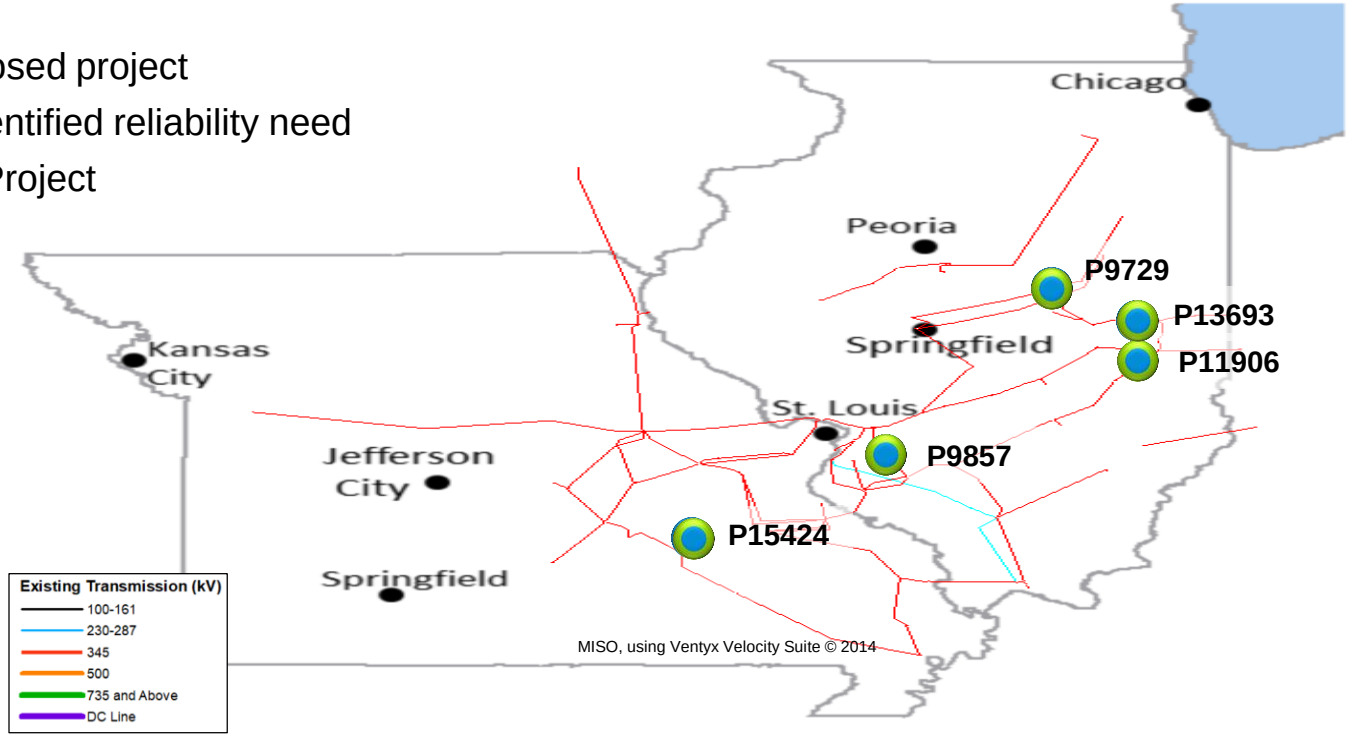
WPSC: 1 Target Appendix B Projects is proposed as Other Projects

Project ID	Project Name	Project Description	Preliminary System Need	In-Service Date	Estimated Cost
15652	Atlanta to Gaylord 138kV Rebuild	Rebuild 22 miles to Wolverine's 138 kV standard	Condition Based - Replace aging infrastructure. • Built in 1978, current age 40 years • 36 damaged poles • 15% of poles in need of replacement	12/31/2021	$11,300,000

Ameren

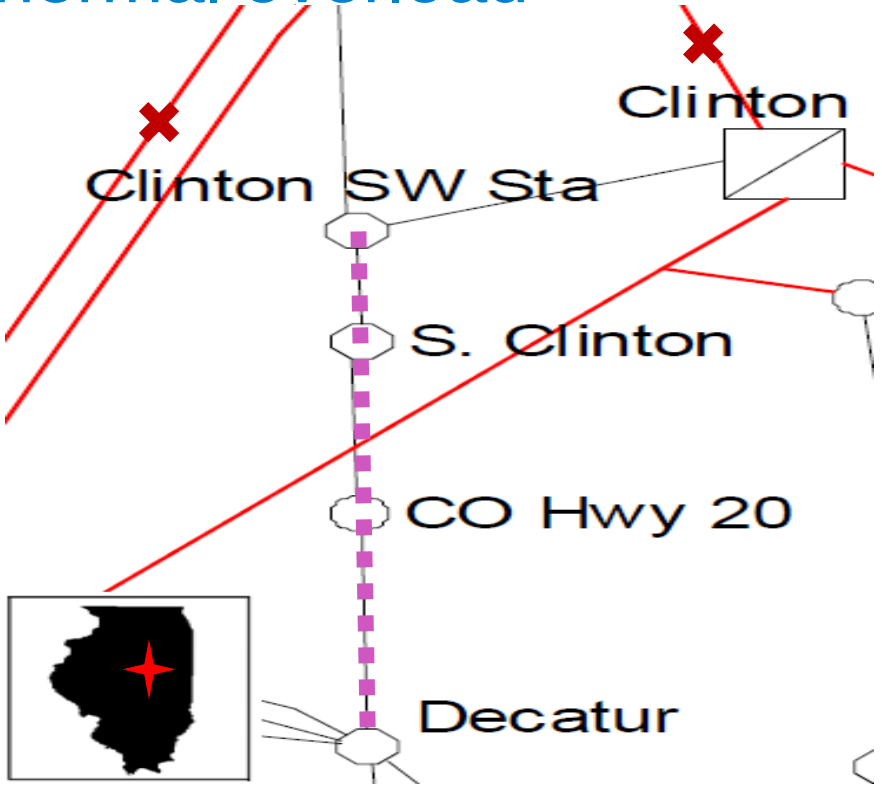
Ameren: Five (5) BRPs to address reliability issues on bulk energy system

- TO proposed project
- MISO identified reliability need
- Need + Project



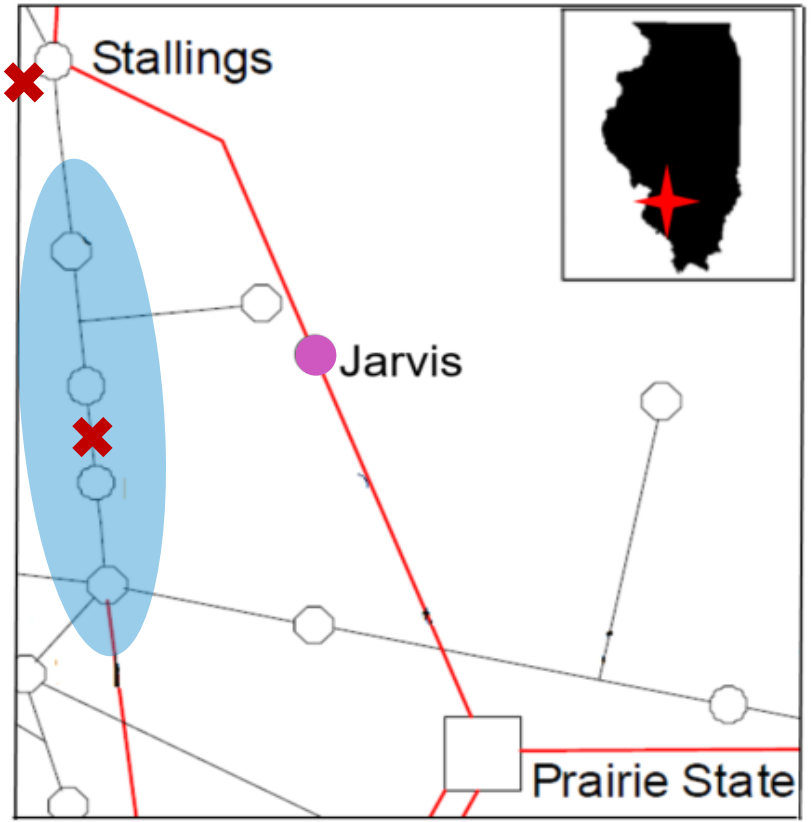
Reconductor [AMIL] N Decatur-[AMIL] Clinton SS 138 kV line solves P6-1-1 thermal overload

- **Baseline Reliability Project**
- **Project P9729 will mitigate…**
  - Thermal Violation: **[AMIL] Decatur—[AMIL] Clinton SS 138 kV line**
- **Project description**
  - Reconductor to 1200 A summer emergency capability.
- **Estimated Cost:** $29 M
- **Expected ISD:** December 1, 2019
- **Target Appendix:** A in MTEP19
- **Alternatives:** This upgrade is the best and cheapest option to address this reliability issue, no other alternatives considered.



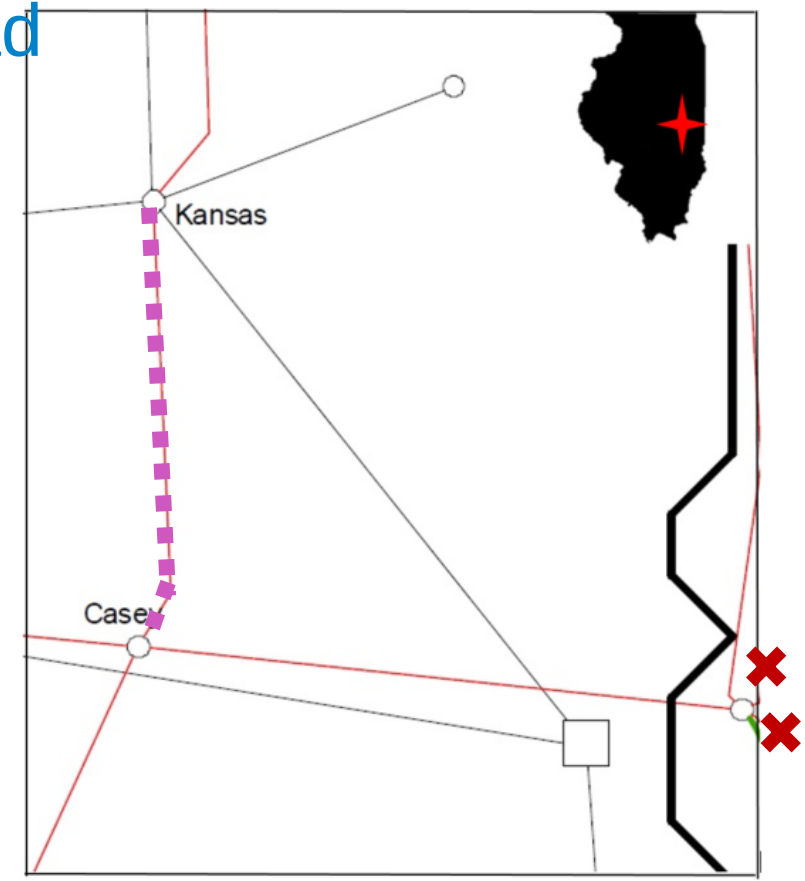
New [AMIL] Jarvis 345/138 kV substation solves P6-1-1 local low voltages

- **Baseline Reliability Project**
- **Project P9857 will mitigate…**
  - Local low voltages on BES
- **Project description**
  - Jarvis Substation (Formerly Highway 50 & Liberty) 345/138 kV - Install 560 MVA, 345/138 kV Transformer at new Jarvis Substation.
- **Estimated Cost:** $32 M
- **Expected ISD:** June 1, 2019
- **Target Appendix:** A in MTEP19
- **Alternatives:** This upgrade is the best and cheapest option to address this reliability issue.



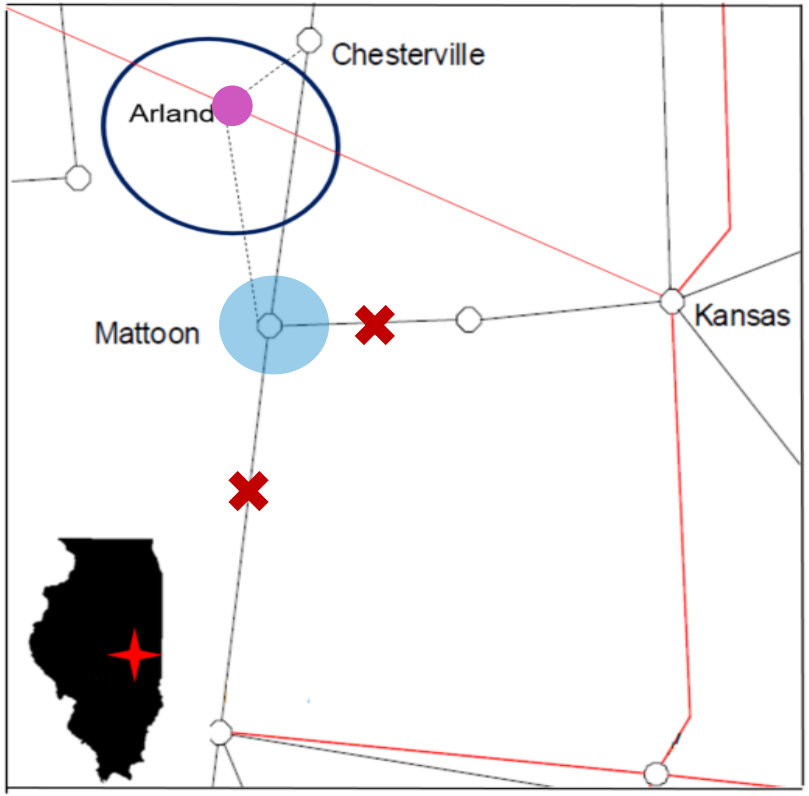
Upgrade [AMIL] Casey-[AMIL] Kansas 345 kV line solves P6-1-1 thermal overload

- **Baseline Reliability Project**
- **Project P11906 will mitigate…**
  - Thermal Violation: **[AMIL] Casey West—[AMIL] Kansas 345 kV line**
- **Project description**
  - Increase clearance to ground to allow higher MOT.
- **Estimated Cost:** TBD
- **Expected ISD:** June 1, 2022
- **Target Appendix:** A in MTEP19
- **Alternatives:** This upgrade is the best and cheapest option to address this reliability issue, no other alternatives considered. (see notes)



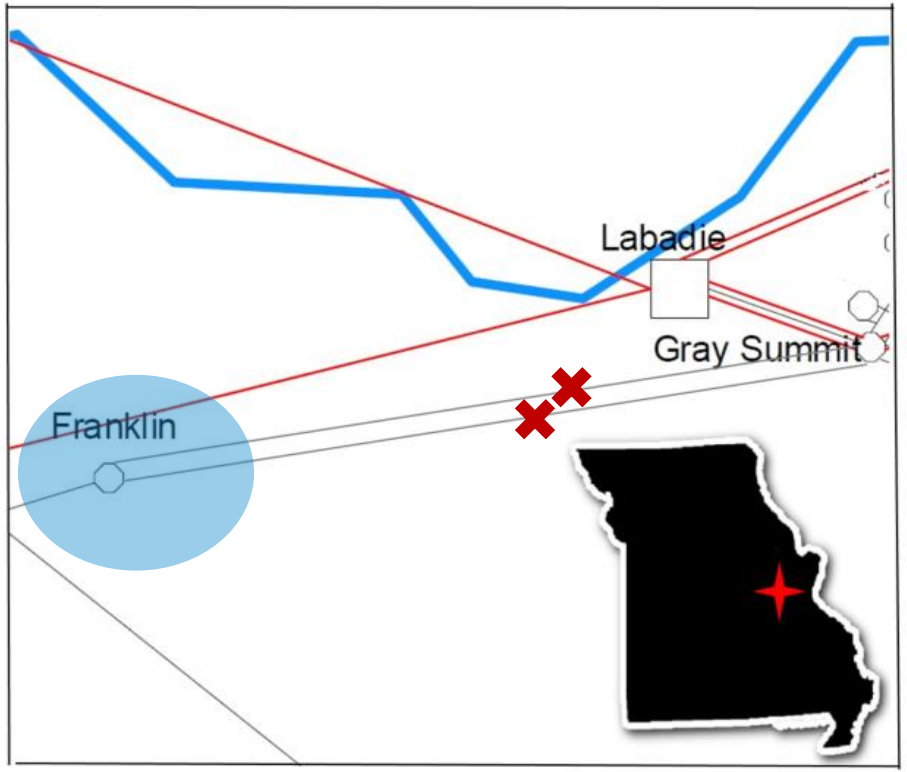
New [AMIL] Arland 345/138 kV substation solves P6-1-1 low voltages in and around Mattoon IL

- **Baseline Reliability Project**
- **Project P13693 will mitigate…**
  - Local low voltages on BES
- **Project description**
  - Install new Arland substation at intersection of Mattoon West-Chesterville 138 kV line and the Faraday-Kansas 345 kV line.
- **Estimated Cost:** $19 M
- **Expected ISD:** December 1, 2022
- **Target Appendix:** A in MTEP19
- **Alternatives:** This upgrade is the best and cheapest option to address this reliability issue, no other alternatives considered.

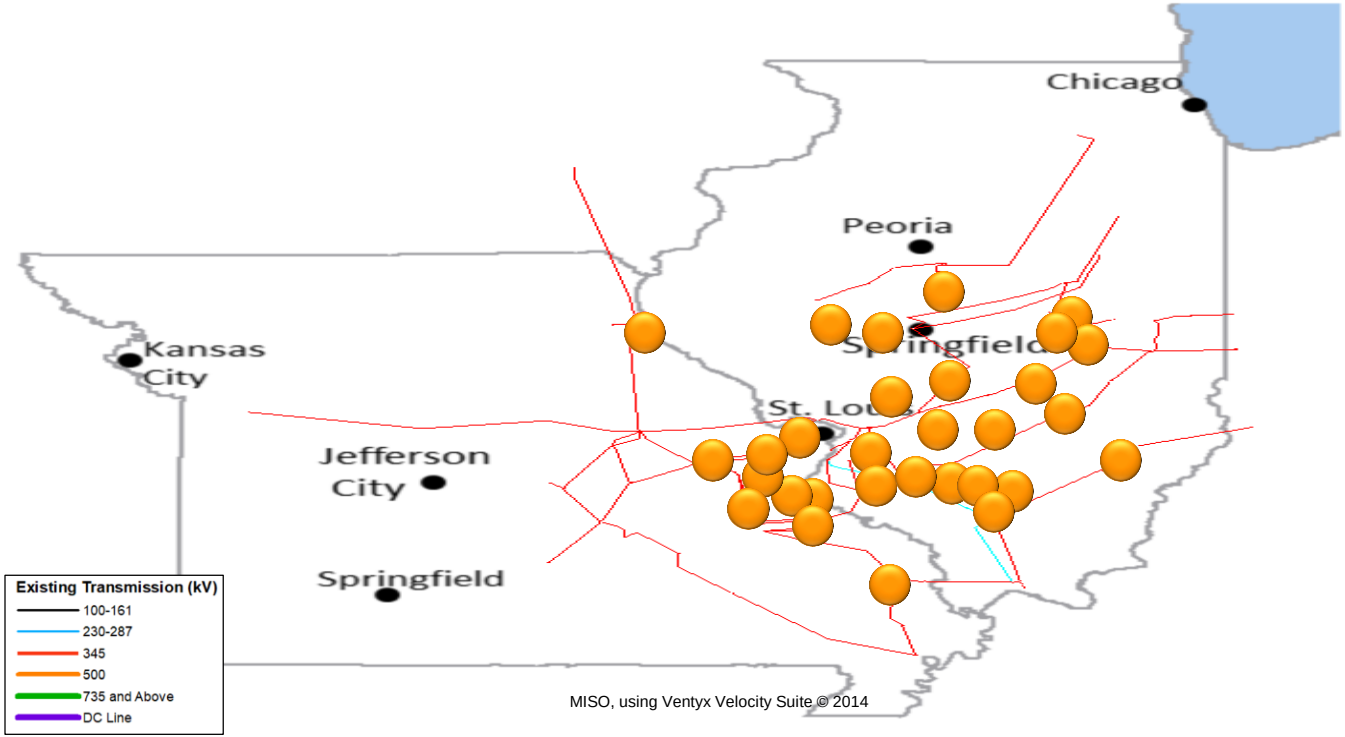


New Franklin 138 kV substation breakers solves P6-1-1 thermal overload

- **Baseline Reliability Project**
- **Project P15424 will mitigate…**
  - Local low voltages on the BES
- **Project description**
  - Install new breakers at the Franklin terminals of the Gray-Franklin-1 and -2 138 kV lines.
- **Estimated Cost:** $2 M
- **Expected ISD:** June 1, 2019
- **Target Appendix:** A in MTEP19
- **Alternatives:** This upgrade is the best and cheapest option to address this reliability issue, no other alternatives considered.

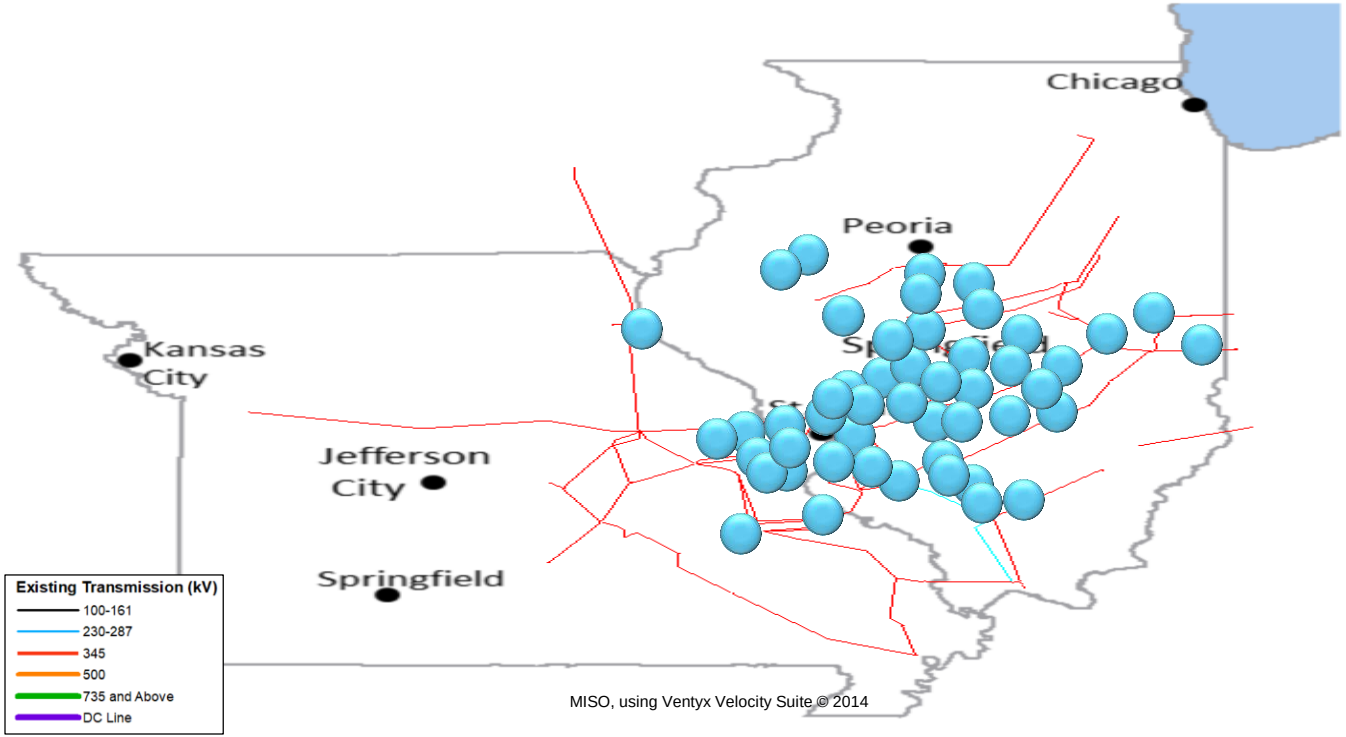


Ameren: Other, age and condition projects



Detailed project information is included in the Project Information Tables

Ameren: Other, increase reliability projects



Detailed project information is included in the Project Information Tables

Ameren: Other, age and condition projects

ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
7862	Rebuild Buick Smelter 161 kV Substation (Galena Substation)	Install new six (6) position ring bus near the exiting Buick Smelter site on the FLET-CMCO-1 and CLK-CMCO-2 lines. Install two (2) breakers on the tap lines to Buick Smelter and rebuild the supply lines.	Condition of existing substation	December 1, 2020	$10M
15207	Rebuild Albion South-Olney North 138 kV line	Rebuild 28 miles of the Albion South to Olney North 138 kV line. Replace existing 556 ACSR conductor with conductor having a minimum capability of 2000A under summer emergency conditions. The rebuild will consist of replacing 229 structures. Install OPGW.	A field condition review of the line revealed the need for structure replacements. Due to the age and condition of the remaining structures and the requirement to add OPGW, the decision was made to perform a total rebuild.	May 17, 2018	$11.00M
15269	Rebuild North 27th St. Decatur-ADM North 138 kV line (1604)	Rebuild the North 27th Street Decatur-ADM North-1604 138 kV line with conductor capable of 2000A under summer emergency conditions. Replace 2500 Kcmil AAC bus at ADM North with bus capable of 2000A	Age and condition of the existing structures and conductor necessitated the need to rebuild the line.	December 1, 2019	$0.75M
15329	Rebuild St. Francios-Rivermines 138 kV lines 2 & 3	Replace structures in order to permit and operating temperature of 110 degrees C from structure 254 to 307.	A field condition review revealed the need for structure replacements.	December 1, 2021	$4.90M
15330	Rebuild Gifford-Rantoul 138 kV line (1500)	Rebuild Gifford-Rantoul-1500 138 kV line to 1200A with T-2 conductor	A field review of the line revealed the need for structure replacements on the majority of the line due to age and condition. T-2 conductor was used due to galloping concerns in the area.	May 25, 2018	$3M
15491	Upgrade North Decatur-East Main Street 138 kV line (1522)	Increase rating to 100C. Rebuild the segment from str. 39 to Decatur North 27th St. with 954 Cardinal ACSS. OPGW required. Jumper replacements at Decatur North 27th St.	Structure replacements required to age and condition.	December 1, 2020	$2.10M
15492	Upgrade North Decatur-North 27th Street 138 kV line (1602)	Structure replacements required. Replace 1272 Jumpers on either side of wavetrap at N. Decatur.	Structure replacements required due to age and condition. Jumpers replaces to increase line capacity for future growth.	December 1, 2020	$0.50M

Ameren: Other, age and condition projects

ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
15494	Rebuild Rising-N Champaign-Leverett Road 138 kV line (1592)	Rebuild Champaign-Leverett Road section to 954 T-2 conductor.	A field evaluation revealed the need for structure replacements due to age and condition.	December 1, 2020	$6M
15498	Rebuild Crab Orchard-Muddy 138 kV line	Rebuild line to 2000A capability.	Rebuild necessary due to age and condition.	December 1, 2019	$17.80M
15499	Rebuild Jerseyville NW-Austin 138 kV line	Rebuild line 10 1600A	Aging infrastructure and clearance issues require the line to be rebuilt.	June 1, 2020	$39.30M
15500	Upgrade Troy-Pike 161 kV line	Upgrade clearances on the 161 kV TROY-PIKE-1 line for the sections from Auburn tap to Cyrene tap and Cyrene tap to Pike substation, to allow for a maximum operating temperature during summer conditions of 100°C.	A field condition review of the line revealed the need for structure replacements.	June 1, 2019	$4.10M
15502	Rebuild Mt. Vernon West-Mt. Vernon 42nd St. 138 kV line	Rebuild MTVS-MTVW-1336 between Mt. Vernon West and Mt. Vernon 42nd St. Provide a double circuit between Mt. Vernon West and Mt. Vernon World Color Press to eliminate the current World Color Tap on the MTVS-MTVW-1336 line.	A field condition review of the line revealed the need for structure replacements on the 138 kV MTVS-MTVW-1336 line for the sections from Mt. Vernon West to Mt. Vernon World Color Tap, and Mt. Vernon World Color Tap to Mt. Vernon 42nd St.	Sept. 15, 2019	$7.30M
15503	Rebuild Mason-Wildwood 138 kV lines 1 & 2	Rebuild Conway-Clarkson section to 2000A. 7 structure replacements required on the Mason-Conway section.	Structure replacements required due to age and condition as well as clearance issues.	December 1, 2020	TBD
15526	Rebuild Mason–Meramec 1 & 2 138 kV lines	Replace six (6) steel lattice structures to permit operation of the existing conductor to 120°C in the 13.97 mile section from Marshall to Meramec in the Mason – Meramec – 1 and Mason – Meramec – 2 138 kV double-circuit line. Modify underbuild in 39 spans. Install OPGW from Marshall to Rudder.	A field condition review of the line revealed the need for structure replacements.	December 1, 2023	$10.20M

Ameren: Other, age and condition projects

ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
16547	Relocate Mapleridge-Tazewell 345 kV line (4528)	Relocation of approximately 0.4 miles of Ameren's existing Mapleridge-Tazewell-4528 345 kV line at the Edwards Power Plant.	Eliminate limiting section of failed 345 kV cable located at Edwards Substation.	June 1, 2021	$4M
16553	Rebuild Cat 2-Hines 138 kV line	Rebuild a 3.7 mile section of CAT2-Hines-1357 to 1200A minimum	Age and condition of existing structures and conductor requires a rebuild of the line.	December 1, 2019	$6.93M
16554	Upgrade Maline 138 kV Substation	Replace bus tie 3-4 OCB, and pos S OCB.	Breakers to be replaced due to age and condition.	December 1, 2020	$0.51M
16564	Rebuild Prest-Steelville 138 kV line (1476)	Rebuild Prest-Steelville-1476 line to 1600 minimum.	Age and condition of existing structures require the rebuild of the line.	December 1, 2020	$12M
16584	Rebuild Cat 2 138 kV substation	Upgrade existing 138 kV ring bus, replacing breakers, switches and wave traps with new equipment having a minimum 2000 amp capability.	Ameren is purchasing the substation and will upgrade the equipment due to age and condition.	December 1, 2020	$5M
16784	Rebuild Pana-Midway 138 kV line (1466)	Rebuild 27.68 miles the Pana-Midway-1466 138 kV line from Pana to structure 237 (Schram Tap) using T-2 conductor with a capable of carrying 2000 amps under summer emergency conditions.	Age and condition of existing structures necessitated the rebuild of the line	December 1, 2020	$21.24M
16785	Rebuild North Decatur-Latham 138 kV line (1350)	Rebuild the North Decatur-Latham-1350 line from Latham to structure 586.	Age and condition of existing structures necessitated the rebuild of the line.	December 1, 2020	$8.62M

Ameren: Other, age and condition projects

ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
16786	Replace Warson 161 kV Substation equipment	Replace Bus tie 1-2 and 3-4 breakers	Age and condition of existing breakers.	June 1, 2020	$2M
16787	Rebuild SJRL-INTR 138 kV line (1318)	Rebuild line from New Holland to Kickapoo. Replace 2 switches at Mason Substation. Replace 2 structures between Mason and New Holland. Replace 5 structures between New Holland and Interstate.	Age and condition of existing structures necessitated the rebuild of the line.	December 1, 2020	$11.11M
16788	Rebuild MTVW-SCNT 138 kV line (1546)	Rebuild line to 110 degrees C.	Age and condition of existing facilities required the need for structure replacements.	December 1, 2020	$2.31M
16789	Rebuild Ashley-West Frankfort 138 kV line (1536)	Rebuild line from Ashley to West Frankfort	Age and condition of existing structures requires the rebuild of the line.	December 1, 2020	$26.03M
16790	Rebuild Grand Tower-Steelville 138 kV line (1636)	Rebuild line from Grand Tower to Steelville	Age and condition of existing structures requires the rebuild of the line.	December 1, 2020	$26.06M

Ameren: Other, age and condition projects

ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
16791	Rebuild OREA -ADMIN 138 kV line (1606)	Rebuild line from Oreana to ADM North	Age and condition of existing structures requires the need to rebuild the line.	December 1, 2020	$0.65M
16792	Rebuild Sidney-SW Campus 138 kV line (1312)	Rebuild line from Sidney to Southwest Campus	Age and condition requires the rebuild of the line.	December 1, 2020	$7.18M
16793	Replace equipment at Montgomery 161 kV Substation	Replace bus-tie breaker 16102 and upgrade relays at Montgomery Substation.	Age and condition of existing equipment.	December 1, 2020	$0.73M
16794	Replace Cahokia-Meramec 1&2 138 kV Structures	Replace structures on the Cahokia-Meramec 1 & 2 line	Age and condition requires the need for structure replacements.	December 1, 2020	$2.50M
16795	Replace Marion Tap-Marion 161 kV Structures	Replace structures on the Marion Tap-Marion section of the Peno-Creek-Spalding-2 line.	Age and condition requires the need to replace the existing structures.	December 1, 2020	$0.55M
16796	Rebuild Oreana-ADM North 138 kV line (1610)	Rebuild line from Oreana to ADM North	Age and condition of existing structures necessitated the rebuild of the line.	December 1, 2020	$0.42M

Ameren: Other, increased reliability projects

ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
4483	New Fargo 345/138 kV transformer No. 2	Install 2nd. 345/138 kV, 560 MVA Transformer	Required due to anticipated retirement of coal units in the area.	June 1, 2021	$8.00M
7826	Reconfigure Turkey Hill 138 kV into Ring Bus	Convert existing 138 kV straight bus to a ring bus. Initial 4 positions with an ultimate of 6 positions.	Increased reliability	December 1, 2019	$7.50M
7863	Reconfigure Prest (FormerlyTilden) 138 kV Substation into a Ring Bus	Establish a 5 position 138 kV ring bus for 4-138 kV lines and 1-138/34.5 kV transformer.	Increased reliability	December 1, 2018	$11.10M
9728	Upgrade Adair 161 kV Substation	Upgrade terminal equipment	Increase system reliability	September 1, 2018	$3.00M
9731	Replace Marshall 138 kV Breakers	Replace the Marshall 138 kV substation Bus-Tie 3-4 circuit breakers.	Increase system reliability	December 1, 2020	$4.70M
9732	Mason Breaker Replacment	Replace overstressed Bus-Tie 1-2 138 kV breaker.	Existing breaker is overstressed.	December 1, 2021	$0.90M
9851	Reconductor Edwards-Kewanee 138 kV line (7423)	Reconductor Ameren portion to 1200 A summer emergency capability	Age and condition of facilities	June 1, 2019	$0.60M
11907	New Mackinaw (Lilly) 138/34.5 kV substation ring bus	Establish 138 kV ring bus.	Increased reliability	December 1, 2021	$8.80M

Ameren: Other, increased reliability projects

ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
11908	New Towerline (Formerly Powerton Tap) 138 kV breaker 138 kV substation	Establish 138 kV ring bus at the intersection of Havana-Danvers-1352 and Tazewell-San Jose Rail-1367 138 kV Lines.	Increased reliability	December 1, 2019	$18.30M
11910	Reconductor Page-Mason 138 kV lines (1-2 lines)	Reconductor 138 kV lines.	Age and condition	December 31, 2019	$6.00M
11923	New Ridge 138 kV substation ring bus	Establish New Ridge 138 kV ring bus.	Increased reliability	December 1, 2021	$15.30M
11928	Convert Commodore 230 kV substation to 345 kV substation	Install spare 345/230/138 kV transformer. Install second 345/230 kV, 375 MVA transformer. Rebuild Commodore-North Coulterville 230 kV line for 345 kV	Increased reliability	December 1, 2022	$42.80M
11929	Convert North Coulterville 230 kV substation to 345 kV substation	Install 345/138 kV, 560 MVA transformer, 345 kV and 138 kV ring bus on a new Aster Substation site near North Coulterville Substation. Rebuild North Coulterville-Tilden (Prest) 138 kV Line to double circuit with 2000A emergency capability. Rebuild 7 miles of the existing Cahokia – Pinckneyville – 1 230 kV line to 345 kV 3000 A capability between the Prairie State 345 kV ..	Increased reliability	December 1, 2021	$25.00M
11933	Expand Prairie State 345 kV substation for BAAH configuration	Expand the Prairie State switchyard as a breaker-and-a-half configuration, and relocate Prairie State-Mt. Vernon West-4541 and Prairie State-Stallings-4531 345 kV lines to separate bays. Construct new Prairie State-Gateway 345 kV line.	Increased reliability	December 1, 2021	$60.20M
11935	New North LaSalle 138 kV ring bus	Establish 138 kV ring bus	Increased reliability	June 1, 2019	$9.20M
11944	Rebuild Mt. Vernon West 138 kV bus	Rebuild 138 kV bus as a breaker-and-a-half arrangement.	Increased reliability	December 1, 2019	$19.20M

Ameren: Other, increased reliability projects

ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
11947	New Greenback (formerly Monsanto) 138 kV substation ring bus	Construct 6-position 138 kV ring bus.	Increased reliability	June 1, 2022	$17.50M
11948	New Miles 345/138 kV substation	Establish 345/138 kV Substation near the tap point to Alton Steel in the Wood River-Stallings-1456 and Wood River-North Staunton-1456 Lines.	Increased reliability	December 1, 2021	$44.80M
11950	New Greenville McCord 138 kV ring bus	Establish 138 kV ring bus	Increased reliability	December 1, 2018	$12.40M
11951	New Crossville West 138 kV ring bus	Establish 138 kV ring bus	Increased reliability	December 1, 2022	$10.80M
11952	New Barrel (formerly Aviston Tap) 138 kV substation	Establish 138 kV ring bus	Increased reliability	December 1, 2021	$12.40M
11953	New Bureau (Formerly Princeton Tap) 138 kV substation	Establish 138 kV ring bus	Increased reliability	December 1, 2019	$7.90M
11955	New Otego (formerly Bluff City) 138 kV substation ring bus	Establish 138 kV ring bus	Increased reliability	December 1, 2021	$17.30M
11956	New Jasper 138 kV substation ring bus	Establish 138 kV ring bus	Increased reliability	December 1, 2021	$13.10M

Ameren: Other, increased reliability projects

ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
11966	New Gateway 345/138 kV substation	New 345-138 kV Substation, 5-345 kV breakers, new 345/138 kV transformer, 138 kV, 3000 A transformer PCB, two new 138 kV buses with 4 138 kV positions each. Install 345 kV ring bus. Reconfigure exisitng 138 kV Venice buses. Connect to Cahokia-Roxford-4 345 kV Line.	Increased reliability	December 1, 2021	$114.50M
11971	Reconfigure Jenkins (Formerly Grand Tower) 138 kV substation to BAAH	Establish a Breaker-and-a Half 138 kV bus arrangement	Increased reliability	December 1, 2023	$22.10M
11972	Reconfigure Redhawk (formerly Midway) 138/34.5 kV substation to BAAH	Establish a Breaker-and-a Half 138 kV bus arrangement	Increased reliability	December 1, 2022	$20.60M
12173	Re-energize Miller-Zion 161 kV line	Install new breaker station at Zion. Install new 138/161 kV transformer,	With Osage generation offline and the Maries-Osage 138 kV line out, area voltage support is needed, based on 2016 analysis work.	June 1, 2021	$16M
12425	Replace Cape 161 kV breakers	Replace 3-161 kV Breakers	Replace due to fault duty	December 1, 2019	$1.50M
12846	Reconfigure Kickapoo 138 kV substation to BAAH	Rebuild Kickapoo Substation 138 kV bus as a Breaker-and-a-Half.	Age and condition of existing facilities.	December 1, 2021	$12.40M
12964	New Boar 138 kV breaker substation	Install 138 kV breaker station at the Kewanee South Street tap. Needed: 3-2000 A PCB's.	Increased reliability	September 1, 2021	$8.50M
13545	New Oakley 138 kV breaker substation	Construct a 3-position initial/4-position ultimate 138 kV ring bus at the Schram City Tap in the Pana-Midway-1466 138 kV Line. Utilize 2000 A equipment.	Increased reliability and operating flexibility in the area.	December 1, 2021	$10.90M
13704	New FACTS Device at Fargo 138 kV substation	Install 138 kV +250/-100 Mvar FACTS device. Install new breaker H5 on 138 kV BAAH to provide connection.	Dynamic reactive support in the Peoria Area.	December 1, 2019	$30.30M

Ameren: Other, increased reliability projects

ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
13706	Reconfigure Mt. Vernon 42nd Street 138 kV substation to ring bus	Install initial 4-position (ultimate 6-position) 138 kV ring	Increase reliability and operating flexibility in the area	December 1, 2021	$8.40M
13707	New Merlot 345 kV substation ring bus	Install 3000A 138 kV Ring bus at the Campbell Hill Junction. Add breaker at Steelville on 1636 line.	Increase reliability and operating flexibility in the area.	June 1, 2021	$10.30M
13795	Rebuild Cahokia-Roxford to 345 double circuit	Rebuild from Gateway to Roxford as double ckt 345kV. Install 345kV, 3000A SE capable conductor on each side of the tower. Replace structure 161 at Gateway Substation. OPGW required between Gateway to Roxford.	A field review of the structures from the new Gateway 345/138 kV Substation site (near Tower 160) to Roxford Substation revealed the need to replace the Cor-Ten steel towers.	December 1, 2020	$32.70M
14224	Rebuild Woodhall-Spring Bay 138 kV line 1648	Rebuild 636 ACSR Rook to 477 ACSR T2 capability.	Structures to be replaced due to age and condition.	December 15, 2018	$7.20M
14884	New Dillon 138 kV substation ring bus	Install initial 5 position ring bus near the west tap to Alfermann Substation. Split the Clark-Osage-2 line and route in and out of the ring bus. Split the Rivermines-Maries-1 138 kV line and terminate the western section (from Maries) into the ring bus and connect the eastern section to a 28 MVAR capacitor bank to be located at Dillon. Disconnect the line to Alfer..	Requested by Rolla Municipal Utilities (RMU). Provides increased reliability and operational flexibility for Ameren Missouri by segmenting the CLK-0-2 and RIV-MRES-1 double-circuit 138 kV lines.	June 1, 2020	$10.40M
14885	Reconfigure Mahomet 138 kV substation	Install initial 5-position (ultimate 6-position) ring bus at Mahomet Substation. Double circuit the Mahomet tap section of the RIS-NCMP-1592 line (1.55 miles) to create an in/out supply.	Increase system reliability.	June 1, 2023	$12.00M
15204	Rebuild Muddy-West Frankfort East 138 kV line to 2000A	Rebuild the MUDY-WFRE-1 circuit using conductor capable of 2000A under summer emergency conditions.	A field condition review of the line revealed the need for structure replacements. Conductor capable of carrying 2000A under summer emergency conditions was chosen to provide sufficient 138 kV outlet from the 345 kV hub at West Frankfort East under contingency conditions.	June 1, 2019	$19.10M
15206	Rebuild Gilman South-Watseka 138 kV line 1388 to 1800A	Rebuild the GILS-WATK-1388 line from Gilman South Substation to Watseka Substation using conductor capable of 1800A under summer emergency conditions. Relay upgrades required at Gilman South and Watseka Substations. Install OPGW.	A field condition review of the line revealed the need to replace approximately 30% the structures and conductors. In addition, NERC violations to 3rd party low-voltage underbuild were detected on over 60% of the line.	December 1, 2019	$12.00M

Ameren: Other, increased reliability projects

ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
15267	Reconfigure Herrin East 138 kV substation to ring bus	Install initial 4-position ring bus at the existing Herrin East substation location	Increased reliability on the area distribution system and increased operating flexibility on the transmission system.	December 31, 2023	TBD
15488	Sheldon South - Morrison Ditch 138 kV line: Rebuild	Rebuild line from Sheldon South to Morrison Ditch	Structures required to be replaced due to age and condition.	December 31, 2020	$3.00M
15489	Reconfigure Meppen North Ring 138 kV substation	At the Meppen North 138 kV substation, construct a 4-position (6-ultimate) ring bus having a minimum continuous capability of 2000A	The project is needed to facilitate the proposed addition of a 138/69 kV transformer by PPI. The construction of this ring bus would provide a reliable source for the planned interconnection, and improve operating flexibility of the existing system.	June 1, 2022	$8.94M
15490	New Radnor Ring 138 kV bus addition	Install 4 position 138 kV ring bus	Request from distribution to increase reliability and operating flexibility in the area.	TBD	TBD
15501	Upgrade Belleau-Troy 161 kV line	Upgrade the 161 kV BELU-TROY-1 line for the section from Dardenne substation to Troy substation, section 53, to allow for a maximum operating temperature during summer conditions of 100°C.	A field condition review revealed the need for structure replacements.	June 1, 2019	$2.40M
15524	Replace Sioux 345/138 kV transformer	Replace the existing 345-138 kV transformer with a new transformer	Age and condition of the existing unit.	December 1, 2021	$5.00M
15525	Rebuild RS Wallace-Spring Bay 138 kV line	Rebuild 10 miles of the RSWA-SPBA-1344 line, from Str 12 to Spring Bay with conductor capable of 1300 Amp minimum under summer emergency conditions. A 3.7 mile section of CAT2-Hines-1357 will also be reconductored with the same conductor because it occupies the other position on the double circuit. Reconductor 1.6 miles of the RSWA-SPBA-1344 line fr..	A field condition review of the line revealed the need for structure replacements.	December 1, 2019	$15.30M
15527	New Heath 138 kV Substation (Robinson Marathon North)	Install new 6 position ring bus with 3 transformer positions and 3 line positions. Install new 0.8 mile 138 kV line from the Robinson Marathon substation to the new ring bus. Reconductor the existing 138 kV tap off the HUTY-ROBM line.	Customer requested for increased reliability.	December 1, 2020	$12.72M
15528	New Dirksen (East Springfield) 138 kV substation	Construct 6-position Ring Bus	Improve reliability and operating flexibility of Ameren transmission system.	December 1, 2021	$17.30M

Ameren: Other, increased reliability projects

ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
xxxxx	Upgrade Bunsonville-Tilton 138 kV line	Replace limiting 1272 kcmil ACSR (.05 Miles) with 2156 kcmil ACSR	During work in the field a limiting section of wire was replaced with larger conductor which increased the rating.	December 1, 2018	$40M
16549	Upgrade Lincoln 161 kV Substation	Install 2 161 kV breakers and 3 161 kV disconnect switches including 1 motor operated switch.	Project needed to facilitate an AECI planned project to extend the Troy-Lincoln line to serve their Meister sub.	June 1, 2020	$2.70M

Ameren: Late Submittal projects

Project ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
9840	Reconfigure Washington Street 138 kV Substation into ring bus			May 1, 2020	$13M
9844	New Normal East-McLean 138 kV Line			December 1, 2021	$23M
12173	Re-energize Miller-Zion 161 kV line			June 1, 2021	$16M
16547	Relocate Mapleridge-Tazewell 345 kV line (4528)			June 1, 2021	$4M
16551	New Cincinnati 138 kV substation			June 1, 2021	$8M
16564	Rebuild Prest-Steelville 138 kV line (1476)			December 1, 2020	$12M
16584	Rebuild Cat 2 138 kV substation			December 1, 2020	$5M
16684	Rebuild Huster-Belleau 138 kV line			December 1, 2020	$3M
16786	Replace Warson 161 kV Substation equipment			June 1, 2020	$2M

Ameren: Late Submittal projects

- MISO and Ameren have been working together in Central Region to avoid current MTEP cycle projects that have ISDs prior to the MISO BoD having a chance to approve.
- MTEP19 is Ameren taking strides at submitting future proposed projects with farther lead times and ISDs; hence 102 project proposals.
- After MTEP19, MISO will no longer accept late projects submittals.
- A Stakeholder can move an existing project from Target B to Target A of the current MTEP cycle, but they will not be allowed to change the MTEP cycle.

PPI Projects

PPI: Four (4) Other, age and condition projects

ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
15786	Rebuild Naples 69 kV River Crossing	Rebuild Naples 69 kV Illinois River crossing which will include OPGW.	Age and condition Original line was built in 1953.	December 31, 2020	$0.90M
15814	Rebuild Kampsville 69 kV River Crossing	Rebuild Kampsville 69kV Illinois River crossing which will include OPGW.	Age and condition Original line was built in 1954 and modified in 1996.	December 31, 2020	$0.90M
15827	Rebuild Nortonville Tap-Murrayville Jct 69 kV Line	Rebuild and Reconductor Murrayville Jct-Nortonville Tap 69 kV line. Change Line from 3/0 ACSR to 336.4 MCM ACSR with OPGW.	Age and condition	December 31, 2020	$1.34M
15828	Rebuild Nortonville Tap-Jacksonville 69 kV Line	Rebuild and Reconductor Nortonville Tap-Jacksonville 69 kV line. Replace 4/0 conductor with 336.4 MCM ACSR with OPGW.	Age and condition	December 31, 2020	$2.98M

PPI: Six (6) Other, load serving needs

ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
15769	New Disco 138/69/12.47 kV Substation	1) New (Ameren) Bueller-(PPI) Disco 138 kV substation 2) New Disco 138/69 kV and 69/12.47 kV substation	Distribution Reliability Provides independent source for Western Illinois Power Cooperative (WIEC). Allows WIEC to backup Lomax, Carthage and Powellton substations.	December 31, 2023	$4.00M
15774	New Pleasant View 138/69 kV Substation	1) New (Ameren) Dempsey-(PPI) Pleasant View 138 kV line 2) New Pleasant View 138/69-34.5 kV Substation	Distribution Reliability Provide an alternate source to feed Shelby Electric Cooperative's Blue Mound, Taylorville and Grove City substations. Existing 34.5 kV system is inadequate to accommodate new load or backup existing substations.	December 31, 2023	$4.70M
15815	New Fancy Creek-Middletown Tap 69 kV Line	New Athens-Middletown Tap 69 kV line	Distribution Reliability Provide alternative feed to Middletown substation	December 31, 2022	$7.15M
15817	New Grand Island-Oakford 69 kV Line	New Grand Island-Oakford 69 kV line	Distribution Reliability Provide alternative feed to Oakford substation	December 31, 2022	$6.35M
15825	New Mechanicsburg-Taylorville 69 kV Line	New Mechanicsburg-Taylorville 69 kV line	Distribution Reliability Provide alternative feed to Mechanicsburg and Taylorville substations	December 31, 2023	$7.05M

IN/KY Projects

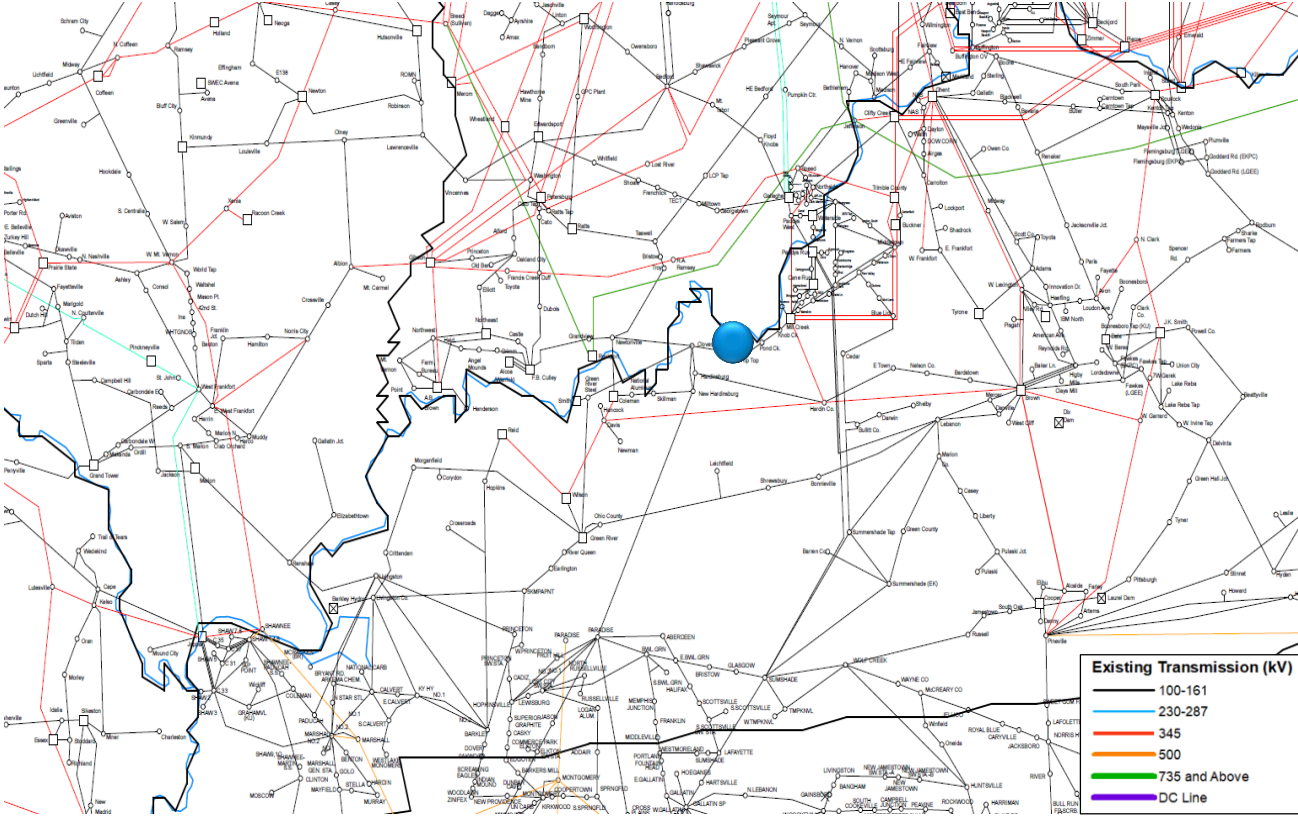
MISO identified two (2) open issues in single initiating events (non-P3/P6) for IN/KY facilities

Thermal Violations				
Monitored Facility	**Voltage Level (kV)**	**Contingency Category**	**Max Loading (%)**	**Comment**
[DEI] Wabash River-[DEI] Water St. 138 kV line (13845)	138	P2	122	New MTEP20 project recommended by DEI as a result
[DEI] Purdue NW-[DEI] W. Lafayette Airport 138 kV line (13820)	138	P2	113	New MTEP20 project recommended by DEI as a result

Big Rivers Project

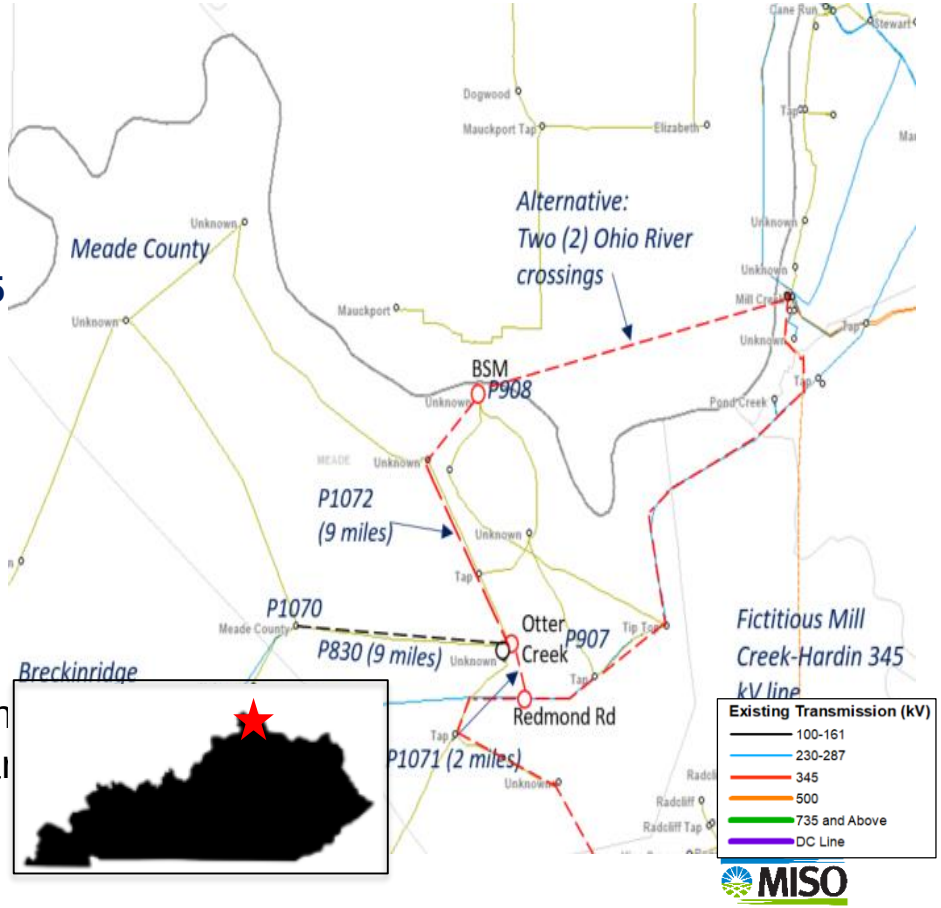
BREC (KY): One (1) Other, load interconnection

- TO proposed project
- MISO identified reliability need
- Need + Project



New Brandenburg Steel Mill (200 MW)

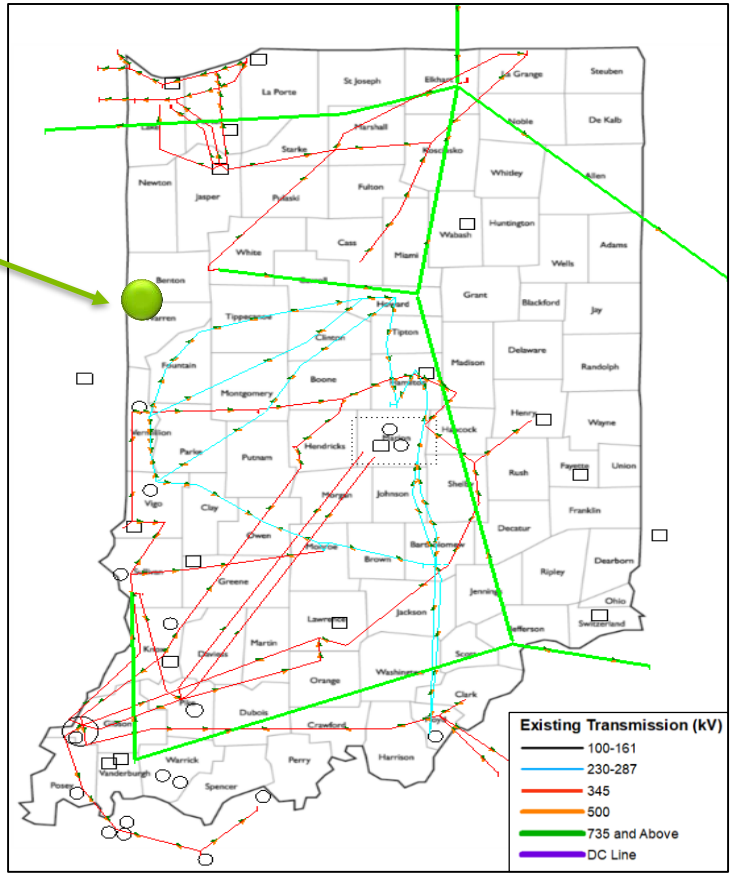
- **Other, Load Interconnection Project**
- **Project P17765 will POI…**
  - **[LGE-KU] Mill Creek—[LGE-KU] Harden 345 kV line**
- **Project description**
  - Service Plan for 200 MW Steel Mill.
- **Estimated Cost:** $80 M
- **Expected ISD:** December 1, 2022
- **Target Appendix:** A in MTEP19
- **Alternatives:** This connection was the best an cheapest option to connect customer with near unity pf, two-river crossing option was considered.



Duke Projects

Duke: One (1) Generation Interconnection project w/ signed GIA

P15760
Clinton 230 kV Substation for
(J446) Clinton County Wind Farm (200 MW)
A in MTEP19
ISD: 12/31/2020



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DEI Projects

ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
15757	New West Lafayette Airport 138 kV Substation	West Lafayette Airport Substation: Add 138/12kv sub in the 13820 circuit	Distribution load growth	June 1, 2020	$0.95M
15760	New Generation: J446 Gen. Interconnect	J446 Clinton Wind Farm - Gen. Interconnect: 23010 ckt. - 145MW Wind farm; 3-breaker ring	J446 Gen Queue - IA executed	December 31, 2020	$7.58M
15765	Upgrade Brownstown Switching Station 69kV Ring Bus	Brownstown Switching Station 69kV Ring Bus: install (4) breaker ring bus	The assets being addressed in this project fall under one or more of the system programs as outlined in TDSIC Plan filed with Indiana Utility Regulatory Commission on 12/7/2015.	December 31, 2020	$3.77M
15766	Upgrade Columbus-Bedford line (34517)	Columbus to Bedford 34517 Structural Improvements: install 8 self-supporting steel intermediate dead-end structures	The assets being addressed in this project fall under one or more of the system programs as outlined in TDSIC Plan filed with Indiana Utility Regulatory Commission on 12/7/2015.	December 31, 2020	$4.00M
15767	Upgrade Staunton 230 kV Ring Bus	Staunton 230kV Ring Bus: install (3) breaker ring bus	The assets being addressed in this project fall under one or more of the system programs as outlined in TDSIC Plan filed with Indiana Utility Regulatory Commission Exhibit 3-B - Substation Programs Summary.	December 31, 2020	$10.44M
15770	New WVPA Brookston 69/12 kV Sub	WVPA Brookston 69/12kV Sub and 69kV source lines	WVPA distribution load growth	June 1, 2021	$2.34M
15779	Upgrade Bedford 345 kV substation	Bedford 345 Ring Bus Expansion - add 2 breakers; replace/upgrade 345/138 Bk 5 to address P2 contingency - can't lose both 34517 and Bk 7 together	Separates Banks 5 and 7 from the 34506 and 34521 lines to increase operating flexibility and reliability of the transformers.	December 31, 2021	$5.00M
15816	New Marathon Petroleum 69 kV Sub	Marathon Petroleum 69kV Sub: tap the 6938 ckt to feed new customer sub	Distribution load growth	June 1, 2019	$0.25M

DEI Projects

ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
15820	New WVPA Jackson Township 69/12 kV Sub	WVPA Jackson Township 69/12kV Sub and 69kV source	WVPA distribution load growth	June 1, 2020	$10.60M
15829	New Greenfield 69/12 kV Substation	Greenfield 69/12kV Sub: build new sub to replace existing Greendfield sub with similar source configuration to existing via the 69166 and 6962 ckts	Distribution load growth	December 31, 2020	$0.25M
15834	New Mitchell Lehigh 138/12 kV Sub	Mitchell Lehigh 138/12kV Sub: new sub in the 13822 ckt with ATO	Distribution load growth - large new customer load	July 1, 2021	$10.00M
15835	New Delphi Wells St. 69 kV Ring Bus	Delphi Wells St. 69kV Ring Bus: 5 breaker positions	The assets being addressed in this project fall under one or more of the system programs as outlined in TDSIC Plan filed with Indiana Utility Regulatory Commission on 12/7/2015.	December 31, 2020	$6.36M
15840	New Tetersburg 69/12 kV Sub	Tetersburg 69/12kV Sub: install new sub in the 69191 ckt	Distribution load growth	June 1, 2020	$0.71M
15927	Convert WVPA Parke Co. 34.5 kV to 69 kV	WVPA Parke Co. 34.5kV Conversion to 69kV: extend new 69204 ckt (established on MTEP 13849) from Clinton to Carbon West and reconfigure 6905 ckt.	WVPA plan to increase reliability to several 34kV substations	December 31, 2021	$0.10M
16364	New WVPA Avon North 138/12 kV Sub	WVPA to build 138/12 sub and 138kV looped lines in the 13853 ckt. between Brownsburg and Avon East	WVPA distribution load growth	December 31, 2019	$4.83M
16384	Rebuild WVPA 69 kV line (69130 Loop)	WVPA to build / rebuild 69130 line sections to loop feed McCordsville and Lee Hanna 69/12kV subs	69kV supply line reliability improvement to two WVPA substations	June 1, 2021	$7.03M
16404	New WVPA Enterprise South 69/12 kV Sub	WVPA to build 69/12 sub and 69kV tap line from the 6943 ckt. along with a new N.O. alternate feed from WVPA Anson N. in the 69186 ckt.	WVPA distribution load growth	December 31, 2020	$11.57M

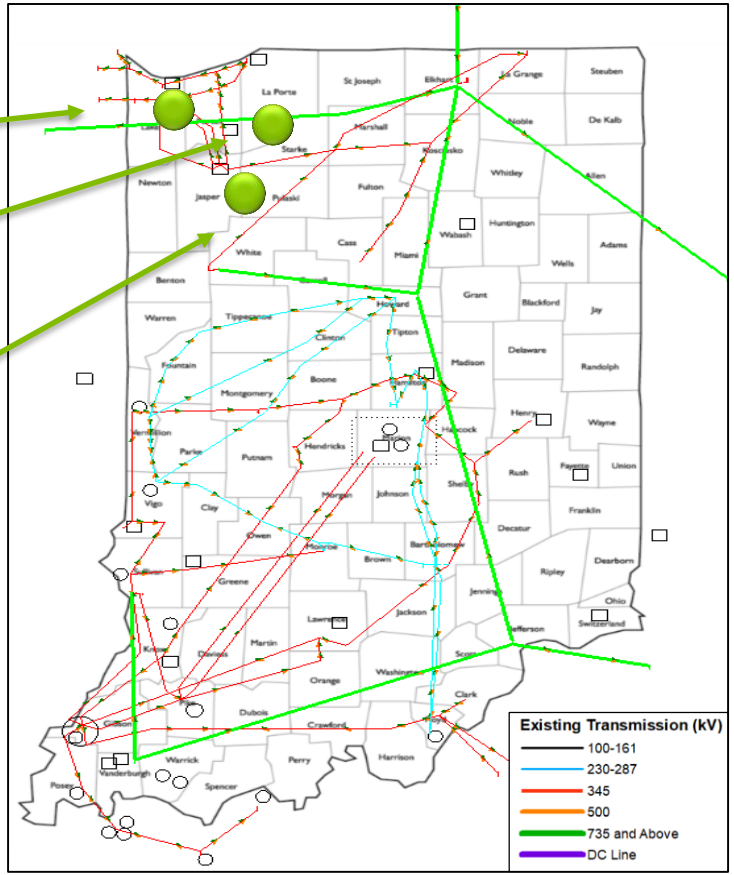
NIPSCo Projects

NIPSCo: Three (3) Generation Interconnection projects w/ signed GIAs

P16084
Stillwell 345 kV Substation for
(J351) Stillwell Generation (700 MW)
A in MTEP19
ISD: 3/31/2020

P16444
Schahfer 138 kV Substation for
(J643) Schahfer Solar Farm (175 MW)
A in MTEP19
ISD: 09/1/2021

P16085
Reynolds 138 kV Substation for
(J513) Reynolds Wind Farm (100 MW)
A in MTEP19
ISD: 08/15/2020



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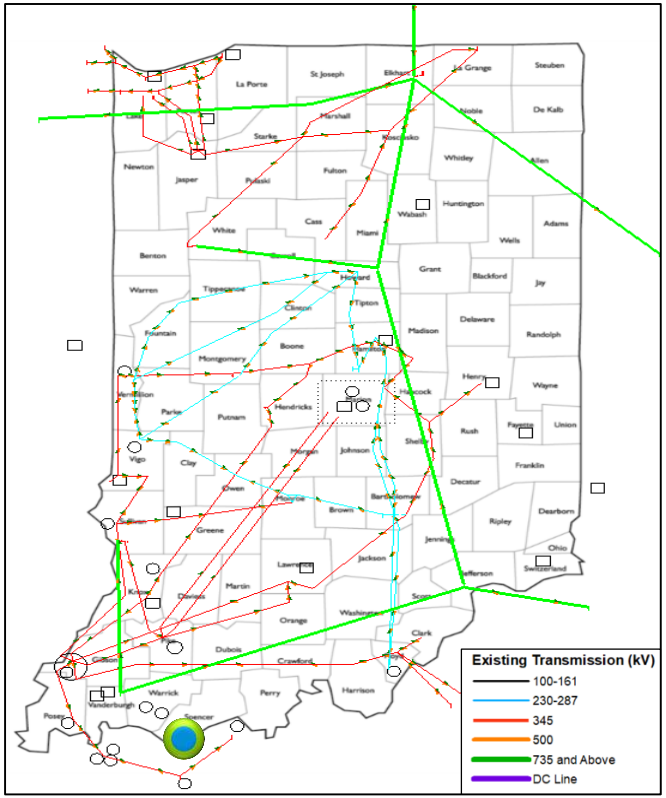
Vectren Projects

SIGE: One (1) BRP to address reliability issues on bulk energy system

- TO proposed project
- MISO identified reliability need
- Need + Project



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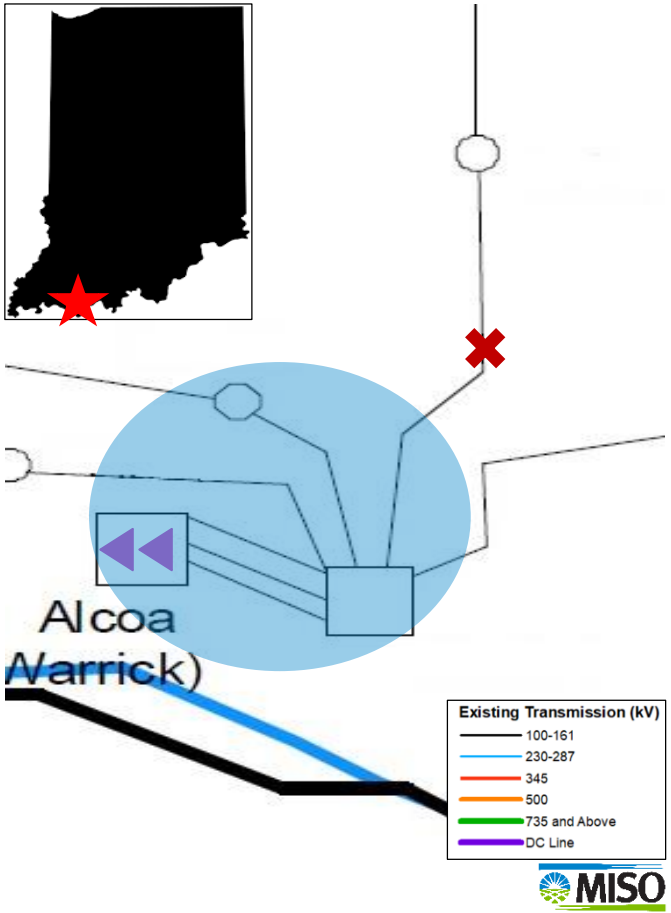
New Capacitor Banks at Warrick North substation solves P1-1 low voltage issues

- **Baseline Reliability Project**
- **Project P15943 will mitigate…**
  - Local low voltages on the BES
- **Project description**
  - Install two (2) new 138 kV Capacitor banks (20 Mvar each) at the Warrick North substation for post-contingent voltage support.
- **Estimated Cost:** $7.4 M
- **Expected ISD:** December 1, 2023
- **Target Appendix:** A in MTEP19
- **Alternatives:** Studies showed that dynamic response time of a synchronous condenser, SVC, or STATCOM was not needed hence caps banks are selected for cost reasons.



Vectren Projects

ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
4395	Convert NE cap bank tertiary winding	Remove existing cap banks from the tertiary winding of the 138/69 kV transformer at Northeast sub, and install equivalent cap banks on the 69 kV bus with breakers	To remove old cap banks from the transformer tertiary winding	December 31, 2020	$0.45M
4396	New Scott-Toyota 138 kV line (Z71)	Install new approx. 13 mile 138 kV line designate Z71 (not Z75).	138 kV line designate Z71 (not Z75). Provide another 138 kV feed to a large customer (Toyota), provide another path for post contingent flows through the Francisco 345/138 transformer and 138 kV line from Francisco - Elliott (a top congested flowgate), and to provide additional post-continge	December 31, 2021	$13.00M
4398	Rebuild Y52-1 NE-Sunbeam 69 kV line	Rebuild and reconductor approx. 3 miles of 69 kV	Aging Infrastructure.	December 31, 2019	$2.25M
15821	Replace Civic Center UG Exits 69 kV	Replace two 69 kV underground circuit exits, ~0.5 miles each.	Aging infrastructure.	December 31, 2021	$2.75M
15823	Replace Civic Center 69/12 kV distribution transformer #2	Replace Civic Center 69/12 kV distribution transformer #2	Aging infrastructure (from Vectren risk model).	December 31, 2021	$1.65M
15851	Replace 138/69 kV 100 MVA transformer T2 at Dubois station with new 100 MVA unit	Replace 138/69 kV 100 MVA transformer T2 at Dubois station with new 100 MVA unit	Aging infrastructure (using Vectren's risk model).	December 31, 2020	$2.72M
15853	Replace 69/12 kV distribution transformer T2 at the Givens Rd. substation	Replace 69/12 kV distribution transformer T2 at the Givens Rd. substation	Aging infrastructure (using Vectren's risk model).	December 31, 2021	$1.20M
15854	Replace 138/12 kV distribution transformer T2 at the Grimm Rd. substation	Replace 138/12 kV distribution transformer T2 at the Grimm Rd. substation	Aging infrastructure (using Vectren's risk model).	December 31, 2021	$1.20M

Vectren Projects

ID	Project Name	Project Description	System Need	Expected ISD	Estimated Cost
15855	Replace three 69 kV oil circuit breakers at the Pelzer station (breakers 177, 277, and 188)	Replace three 69 kV oil circuit breakers at the Pelzer station (breakers 177, 277, and 188)	Aging infrastructure (using Vectren's risk model).	December 31, 2021	$0.50M
15856	Replace three 138 kV oil circuit breakers at the Northeast substation	Replace three 138 kV oil circuit breakers at the Northeast substation	Aging infrastructure (using Vectren's risk model).	December 31, 2021	$0.90M
15857	Replace the 69/12 kV distribution transformer T1 at the St. Wendell substation	Replace the 69/12 kV distribution transformer T1 at the St. Wendell substation	Aging infrastructure (using Vectren's risk model).	December 31, 2021	$1.20M
15858	Replace the 69/12 kV distribution transformer T2 at the Sunbeam substation	Replace the 69/12 kV distribution transformer T2 at the Sunbeam substation	Aging infrastructure (using Vectren's risk model).	December 31, 2021	$1.20M
15859	Replace both 69/12 kV distribution transformers T1 & T2 at the Tekoppel substation	Replace both 69/12 kV distribution transformers T1 & T2 at the Tekoppel substation	Aging infrastructure (using Vectren's risk model).	December 31, 2021	$2.40M
15941	New East-West 138 kV Line	Install new 138 kV line from AB Brown to Pigeon Creek to Warrick North substations in order to increase transfer capability and relieve post-contingent loading concerns.	Increased transfer capability and local reliability.	May 1, 2022	$42.27M
15946	Replace two existing underground 69 kV circuit exits at the Court St. substation	Replace two existing underground 69 kV circuit exits at the Court St. substation to increase the facility rating (0.21 miles total)	Local reliability	November 1, 2023	$0.70M
15955	Replace and upgrade 69/12 kV distribution transformer T1 at the Kings substation	Replace and upgrade 69/12 kV distribution transformer T1 at the Kings substation due to load growth and an existing customer's planned load expansion.	Load growth and customer load expansion	December 31, 2019	$1.00M
15957	Replace and upgrade 69/12 kV transformer at Berry plastics.	Replace and upgrade 69/12 kV transformer at Berry plastics. This transformer is dedicated to Berry Plastics and is being upgraded to accommodate their load expansion.	Customer load expansion	December 31, 2019	$1.00M