

Chapter 7 - Appendix A

Transmission and Distribution Supplemental Information

Table 7A.1 MTEP Transmission Projects in Missouri¹

Project Approved	Project Title	Project Description	Category	Estimated Cost	Estimated In Service
MTEP19	New Hughes 345 kV Substation (J541) for wind Interconnection	Install new 4 position 345 kV ring bus for new generator interconnection	GIP	\$1,000,000	05/01/2020
MTEP19	Rebuild Fletcher-Cominco 161 kV line	Rebuild the Fletcher-Cominco-1 161 kV line to 2000A. Upgrade terminal equipment at Brushy Creek to 2000A.	Other Age and Condition	\$8,600,000	06/01/2020
MTEP19	Upgrade Lincoln 161 kV Substation	Install 2 161 kV breakers and 3 161 kV disconnect switches including 1 motor operated switch.	Other Age and Condition	\$2,700,000	06/01/2020
MTEP19	Rebuild Buick Smelter 161 kV Substation (Galena Substation)	Install new 6 position ring bus near the exiting Buick Smelter site on the FLET-CMCO-1 and CLK-CMCO-2 lines. Install 2 breakers on the tap lines to Buick Smelter and rebuild the supply lines.	Other Age and Condition	\$10,400,000	12/01/2020
MTEP19	Replace Marshall 138 kV Breakers	Replace the 138 kV Bus-Tie 3-4 circuit breaker and two (2) 138 kV bus disconnect switches. Replace the 138 kV Bus-Tie 2-3 circuit breaker and two (2) 138 kV bus disconnect switches. Replace the 138 kV Bus-Tie 1-2 disconnect switches (2). Replace	Other Reliability	\$4,700,000	12/01/2020

¹ 20 CSR 4240-22.045(3)(A)1; 20 CSR 4240-22.045(3)(A)6

		<p>the 138 kV line breaker in Marshall Substation on the MASN-MERAMEC-2 138 kV line and two (2) 138 kV line disconnect switches. Replace the 138 kV line breaker in Marshall Substation on the MRSL-TYSN-2 138 kV line and two (2) 138 kV line disconnect switches. Add a 138 kV line breaker in Marshall Substation on the MRSL-TYSN-1 138 kV line and two (2) 138 kV line disconnect switches. Replace the CNTL-WAT-1 138 kV line breaker in Marshall Substation and two (2) 138 kV line disconnect switches. Add a 138 kV line breaker in Marshall Substation on the MASN-MERAMEC-1 138 kV line and two (2) 138 kV line disconnect switches.</p>			
MTEP19	New Dillon 138 kV substation ring bus	<p>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</p>	Other Reliability	\$15,100,000	12/01/2020

		Alfermann (to be acquired by ATXI) from CLK-O-2 and terminate into the ring bus. Provide one position on the ring bus for AECI supply to Macedonia. Install minimum 2000 A, 138 kV bus tie breaker (to be owned by ATXI) at Rolla Municipal Utilities' Alfermann Substation.			
MTEP19	Rebuild Clark-Cominco 161 kV line	Rebuild the Clark-Cominco-2 161 kV line to 2000A. Upgrade the terminal equipment at Clark Substation to 2000A.		\$10,900,000	12/01/2020
MTEP19	Replace equipment at Montgomery 161 kV Substation	Replace bus-tie breaker 16102 and upgrade relays at Montgomery Substation.	Other Age and Condition	\$800,000	12/01/2020
MTEP18	New Beehive 345/138 kV substation (Dupo Area)	Build a new Beehive 345/138 kV substation including a 345 kV ring bus and a 138 kV Breaker and a Half (BAAH) bus arrangement with the initial transmission supply from the existing C-BLWN-4511 345 kV line (in and out). Install two 345/138 kV 700 MVA transformers at Beehive substation with outlet transmission to the existing Cahokia – Meramec – 1 & 2 138 kV lines (in and out) of Beehive substation. Re-conductor/Rebuild the Mississippi river	Other Reliability	\$98,930,000	12/01/2021

		crossing and Beehive – Watson – 1351 138 kV line and Beehive – Mackenzie section of Beehive – Lakeshire – 1468 138 kV line with conductor having a minimum summer emergency capability of 2000 Amps. Install +/- 250 Mvar STATCOMs at both the new Beehive Substation and the Meramec switchyard			
MTEP19	Mason Breaker Replacement	Replace overstressed Bus-Tie 1-2 138 kV breaker.	Other Reliability	\$1,000,000	12/01/2021
MTEP19	Re-energize Miller-Zion 161 kV line	Install new breaker station at Zion. Install new 138/161 kV transformer, New breaker station to tie-in Bland-Osage-6030 and Gasco-Osage-2 138 kV lines at Miller. Restore the Miller-Zion 161 kV line to operation.	Other Reliability	\$26,300,000	12/01/2021
MTEP19	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.	Other Age and Condition	\$4,900,000	12/01/2021
MTEP19	Replace Sioux 345/138 kV transformer	Replace the existing 345-138 kV transformer with a new unit	Other Age and Condition	\$5,000,000	12/01/2021
MTEP19	Upgrade Maline 138 kV Substation	Replace bus tie 3-4 OCB, and pos S OCB.	Other Age and Condition	\$1,900,000	12/01/2021
MTEP19	Replace Warson 161 kV Substation equipment	Replace Bus tie 1-2 and 3-4 breakers	Other Age and Condition	\$4,400,000	12/01/2021

MTEP19	Rebuild Mason-Wildwood 138 kV lines 1 & 2	Rebuild Conway-Clarkson section to 2000A. 7 structure replacements required on the Mason-Conway section.	Other Age and Condition	\$18,300,000	06/01/2022
MTEP19	Replace Marion Tap-Marion 161 kV Structures	Replace structures on the Marion Tap-Marion section of the Peno-Creek-Spalding-2 line.	Other Age and Condition	\$600,000	12/01/2022
MTEP19	Rebuild Huster-Belleau 138 kV line	Rebuild HUST-BELU-3 to 1600A. Upgrade 2 138 kV switches and bus conductor at Huster to achieve 1600A capability.	Other Age and Condition	\$3,800,000	06/01/2023
MTEP19	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.	Other Age and Condition	\$18,700,000	12/01/2023
MTEP12	Wallen Creek Substation High-Side Transfer	Install 2-2000 A, 138 kV PCBs	Other Reliability	\$2,635,000	12/01/2025

Table 7A.2 Transmission Projects under Consideration²

Project	Description	Status
Upgrade Selma-Buck Knob 138 kV line (1302)	Upgrade the DPFE-SEL-1302 138 kV line from Selma Substation to the old Buck Knob substation location with conductor capable of 1600A under summer emergency conditions. Upgrade terminal equipment at Selma to 1600A minimum capability.	In service approximately 2021
New Blue Bird Solar (J817) interconnection	Add terminal facilities at Warrenton 161 kV substation to interconnect J817,	In service approximately 2021
Rebuild Sioux-Meppen North 138 kV line (4)	Rebuild existing river crossing (structures 173-179).	In service approximately 2021
Upgrade Tyson 138 kV substation	Replace overstressed 138 kV breakers	In service approximately 2021
Replace Stoddard 161 kV breakers	Replace 1-161 kV breaker at Stoddard	In service approximately 2021
Rebuild Sioux-Meppen-4, Page-Sioux-4, Sioux-Huster-1 138 kV lines	Sioux-Huster-1/Sioux-Meppen North-4: Rebuild ~9 miles of triple circuit 138 kV lattice tower line to double-circuit steel poles.	In service approximately 2021
Reconfigure Viburnum 161/34 kV Substation	Install 2 161 kV line breakers and 1 161 kV circuit switcher on the transformer to split the CLK-CMCO-2 line and create 2 circuits into Viburnum Substation.	In service approximately 2021
Rebuild Sioux-Meppen 138 kV Line (4)	Rebuild 3.7 mile Missouri side section (Str. 146-173) of the old Page-Keokuk line w/ T2 conductor. Page-Sioux-4: Rebuild Missouri River crossing (Str. 112-117) w/ 2000A rated conductor.	In service approximately 2021
Upgrade Tegeler 138 kV substation	Install a new 2000 A circuit breaker and associated disconnect switches in the TGLR-BLAN-6756 138 kV line terminal. Replace the existing 1600 A circuit breaker and associated 1200 A disconnect switches and 1590 kcmil AAC bus conductor at position H5 with equipment capable of carrying 2000 A during summer emergency conditions.	In service approximately 2021

² 20 CSR 4240-22.045(6)

	Increase relay load limit. Replace the existing 1200 A disconnect switches and 1590 kcmil AAC bus conductor in position H9 to match the capability of the 2000 A circuit breaker. Install 2 circuit switchers on the high-side of the new and existing 138/34.5 kV transformers, having a minimum continuous current rating of 600 A.	
Upgrade Berkeley 138 kV Substation	Replace 138 kV bus tie 1-2 and 2-3 breakers. Upgrade position to 2000A.	In service approximately 2021
Rebuild Campbell-Maline 138 kV lines 1/2	Replace existing conductor with composite core conductor on branches 93 and 94.	In service approximately 2021
Upgrade Spencer Creek 345 kV substation	Replace switches on 345kv pos V3, V5, V6, V7 and reactor position.	In service approximately 2021
New Loose Creek 345 kV shunt reactor	Install 345 kV shunt reactor at Loose Creek	In service approximately 2021
Upgrade Gasconade-Osage 161 kV line	Replace both shield wires and replace structures as needed.	In service approximately 2021
Upgrade Campbell-Euclid 161 kV line	Replace shield wires on the Campbell-Euclid-4 circuit. Replace structures and crossarms as needed.	In service approximately 2021
Upgrade Frederickstown-Heritage 161 kV line (7011)	Replace poles for OPGW installation. Structure replacements will increase the rating to 120 degrees C.	In service approximately 2021
New Hull 161/138 kV transformer	Install new 161 kV Finn ring bus (Hannibal area). Convert the Spalding Substation to a ring bus configuration adding a position for a line to the Hannibal area Substation. Double circuit the PENO-SPLD-2 line from Spalding to the Marion tap and rebuild the Marion Tap 161 kV section of the PENO-SPLD-2 line to the Mississippi River, through the new Hannibal area Substation and the existing Marion Substation. Install new 161 kV bus-tie breaker at Marion Substation. Install new 161-138 kV transformer at Hull substation. Operate the HULL-MRN-1690 line at 161kV.	In service approximately 2022

Reconductor Meramec-Joachim 138 kV line 2	Reconductor to 1600 A summer emergency capability	In service approximately 2022
Reconductor Bland-Tegeler 138 kV line	Reconductor line to 1200 A summer emergency capability	In service approximately 2022
Replace Tyson 345/138 kV Transformer	Replace XFMR 1 with a hardened unit and replace the 138kV XFMR 1 breaker and Replace XFMR 3 breaker.	In service approximately 2022
Upgrade Kelso 345/161 kV substations	Install new 3000 A circuit breaker and motor-operated disconnect switch on 345 kV position V3. Replace the existing Kelso substation 336 MVA auto transformer #1 with a 560 MVA transformer. Replace the existing Kelso substation 161 kV bus tie 1-2 position H7 circuit breaker and bus disconnect switches. Replace the existing Kelso substation 161 kV position H6 circuit breaker and disconnect switch, upgrade the bus conductor of position H6 to achieve a minimum current carrying capability of 3000 A. Replace the existing Kelso substation H3 and H4 161 kV circuit breakers and disconnect switches in the CAPE-KEL-2 and KEL-MINR-2 terminals. Upgrade Kelso substation positions H3 and H4 bus conductors to achieve a minimum current carry capability of 2000 A. Replace the existing Kelso substation 161 kV disconnect switch on position H10. Replace the existing Kelso substation H11 and H12 161 kV disconnect switches (line and bus) in the CAPE-KEL-3) and KEL-MORLEY-3 terminals.	In service approximately 2022
Upgrade Rivermines 138 kV substation	Replace 138kV breakers on bus tie 1-2 and bus tie 2-3	In service approximately 2022
Reconductor Page-Berkeley 138 kV lines 1/2	Reconductor the Page-Berkeley-1&2 circuits with ACCR conductor	In service approximately 2022
Upgrade McClay 138 kV Substation	Add breakers to each of the 138 kV lines and upgrade relays.	In service approximately 2022

Upgrade Lakeshire 161 kV substation	Replace 40 kA breakers on positions H and U for cap banks 2A and 2B with 50 kA breakers.	In service approximately 2022
Upgrade Gray Summit 345/161 kV substation	Replace the Bus-Tie 1-2 breaker at Gray Summit with a symmetrically rated 40 kA circuit breaker.	In service approximately 2022
Replace Mason 345/138 kV Transformer	Replace 345/138 kV, 560 MVA Transformer #2 with a 700 MVA unit	In service approximately 2022
Upgrade Labadie 345 kV substation	Upgrade switches and CTs to 3000A. Labadie 345 kV bus-tie 2-3 Upgrade	In service approximately 2022
New Fredericktown 138 kV substation	Install 138 kV ring bus at Fredericktown Substation	In service approximately 2022
Reconductor Sioux-Huster 138 kV line	Reconductor 5.9 miles of 954 kcmil ACSR with conductor capable of carrying 1600 A under summer emergency conditions. Replace 1200 A terminal equipment (disconnect switches, CT's, bus conductor) at Huster with equipment capable of carrying 1600 A or better.	In service approximately 2023
Relocate Page 138 kV substation to new Bugle 138 kV Substation	Relocate the existing 138 kV Page substation to the new Bugle site. 138 kV to be built as breaker and a half arrangement.	In service approximately 2023
Rebuild Pike 161 kV Substation	Rebuild the Pike 161 kV substation to a Ring bus configuration.	In service approximately 2023
Rebuild Lutesville-St. Francois 345 kV line	Rebuild 63 miles of 345kV wood H-frame circuit.	In service approximately 2023
Reconductor Berkley South 161 kV lines 1/2	Reconductor BERK-S-1 & 2 on branches 1004 and 1005 with composite core conductor.	In service approximately 2023

New Mason 138 kV shunt reactive device	Install a shunt Reactive device to control voltages at Mason 3 138 kV bus	In service approximately 2023
Rebuild Page-Sioux 138 kV line (4)	Rebuild existing Missouri River crossing (Str. 112-117)	In service approximately 2023
Rebuild Bland-Franks 345 kV line	Rebuild approximately 44 miles 345kV line to 3000A.	In service approximately 2024
New Montgomery 345 kV shunt reactor	Install 50 Mvar shunt reactor at Montgomery 345 kV substation.	In service approximately 2025

Table 7A.3 Transmission and Distribution Avoided Costs³

\$/kW-yr	Avoided Transmission	Avoided Distribution	Total T&D
2020	\$2	\$18	\$20
2021	\$2	\$18	\$20
2022	\$2	\$18	\$21
2023	\$2	\$19	\$21
2024	\$2	\$19	\$22
2025	\$2	\$20	\$22
2026	\$2	\$20	\$22
2027	\$2	\$20	\$23
2028	\$2	\$21	\$23
2029	\$3	\$21	\$24
2030	\$3	\$22	\$24
2031	\$3	\$22	\$25
2032	\$3	\$23	\$25
2033	\$3	\$23	\$26
2034	\$3	\$23	\$26
2035	\$3	\$24	\$27
2036	\$3	\$24	\$27
2037	\$3	\$25	\$28
2038	\$3	\$25	\$28
2039	\$3	\$26	\$29
2040	\$3	\$26	\$30

³ 20 CSR 4240-22.045(2); 20 CSR 4240-22.045(3)(A)3; 20 CSR 4240-22.050(5)(A)1

Compliance References

20 CSR 4240-22.045(2)	11
20 CSR 4240-22.045(3)(A)1	1
20 CSR 4240-22.045(3)(A)3	11
20 CSR 4240-22.045(3)(A)6	1
20 CSR 4240-22.045(6)	6
20 CSR 4240-22.050(5)(A)1	11