# Appendix D1 East 2016

ITC Transmission Co. (ITCT) Michigan Electric Transmission Co. (METC) Michigan Public Power Agency (MPPA) Wolverine Power Supply Cooperative (WPSC) Northern Indiana Public Service Co. (NIPS)



# Transmission Owner: ITC Transmission Co. (ITCT)

# **Overview of ITCT Projects**

For the MTEP16 cycle there were 25 ITCT projects targeted for Appendix A with a total cost of \$241.7 million, of these 25 projects: ten have an estimated cost greater than \$5 million; five have estimated cost between \$1 million and \$5 million; and ten have an estimated cost lower than \$1 million.



Figure P-1: Cost range by project type and estimated in-service date by project type

# **Baseline Reliability Projects**

There are six Baseline Reliability projects moving to Appendix A for ITC Transmission Co. (ITCT) in the MTEP16 cycle.



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Figure P-2: Geographic transmission map of Baseline Reliability ITCT Projects

### Project 9994: Custer - Monroe 120 kV Line Rebuild

Transmission Owner: ITC Transmission Co.

### **Project Description**

Project will build Custer - Monroe 120 kV Line to 230 kV construction to facilitate possible future 230 kV expansion in southern Michigan. Replace all existing structures and conductor with new double-circuit structures that are designed for bundled 954 ACSR 54/7 conductor and install this conductor along with an OPGW path. Also, upgrade terminal equipment at Custer and Monroe. The estimated cost is \$14.5 million. The expected in-service date is December 31, 2019.





Figure P9994: Geographic map of project



Monroe to North Star Tap 120kV section is projected to become overloaded for P2, P4, and P7 contingencies in summer peak cases. The highest loading is 109% of 351MVA for P7 outage in 2021 SUM case with 1400 MW flow in from IESO.

Monroe to North Star Tap 120kV section is also projected to become overloaded for P6 contingencies in summer peak and summer shoulder cases. The highest loading is 135.6% of 351MVA for two 345kV lines in 2021 SUM case with 1400 MW flow in from IESO.

Custer to North Star Tap 120kV section is projected to become overloaded for P7 contingencies in summer peak case. The highest loading is 103% of 351MVA for P7 outage in 2021 SUM case with 1400 MW flow in from IESO.

Custer to North Star Tap 120kV section is projected to become overloaded for P6 contingencies in summer peak and summer shoulder case. The highest loading is 129% of 351MVA for loss of two 345kV lines in 2021 SUM case with 1400 MW flow in from IESO.

The ratings of Monroe to North Star Tap 120kV line will be upgraded to 576/698MVA SN/SE.

Limited facility	Contingency	Rating	2021SH 40	2021SH40 _1200MW	2021SH	2021SH40 _1LP_120 0MW_lp	2021SH	2021SH 90_120 0MW_I	2021SP	2021SP_ 1400MW
Monroe to North	Type	Hating	10		10_11		50		202101	
Star Tap 120kV	P23	351							101%	102%
Monroe to North										
Star Tap 120kV	P23	351								101%
Monroe to North										
Star Tap 120kV	P23	351							104%	105%
Monroe to North										
Star Tap 120kV	P23	351							104%	105%
Monroe to North										
Star Tap 120kV	P24	351							101%	103%
Custer to North										
Star Tap 120kV		351								103%
Monroe to North										
Star Tap 120kV	P71	351							105%	109%
Monroe to North										
Star Tap 120kV	P71	351							104%	105%
Custer to North										
Star Tap 120kV		351	113%	113%	114%	115%	117%	119%	129%	129%
Monroe to North										
Star Tap 120kV	P6	351	119%	119%	120%	121%	123%	125%	135%	136%
Custer to North										
Star Tap 120kV		351		102%	112%	116%	100%	107%	119%	121%
Monroe to North										
Star Tap 120kV	P6	351	105%	108%	118%	122%	106%	113%	125%	127%

The ratings of Custer to North Star Tap 120kV line will be upgraded to 605/698MVA SN/SE.

Table P9994 Project contingency drivers



### **Alternatives Considered**

Generation re-dispatch or Load shed is not feasible to eliminate thermal violations caused by P2, P4, and P7 contingencies without short-time emergency rating.

Project 4519 Reconfigure the Custer – Whiting 120 kV line into Monroe to create the Custer – Monroe 2 120 kV and Monroe – Whiting 120 kV lines. Utilize 954 ACSR conductor to terminate the new circuits at Monroe and acquire new ROW as necessary. Install one OPGW path on either the Custer – Monroe 1 120 kV line or the Custer – Monroe 2 120 kV line. Total Project Cost Estimate: \$11,400,000. This project is not feasible due to the unavailability of sufficient ROW at Monroe 120kV substation.

### **Cost Allocation**

This is a Baseline Reliability Project, which is not eligible for regional cost sharing.

### Project 9902: Sterling 120 kV Ring Bus

Transmission Owner: ITC Transmission Co.

### **Project Description**

Project will Install a new 120 kV bus and one 120 kV breaker to convert Sterling to a ring bus, and move the Sterling transformer #201 connection to the new bus. The estimated cost is \$1.1 million. The expected in-service date is December 31, 2018.



Figure P9902: Geographic map of project



Northeast - Ramville 120kV is projected to become overloaded for P2 contingency in 2021Summer peak case.

Limited facility	Contingency Type	Rating	2021_SUM	2021_SUM_1400MW_In	2026_SUM
Northeast - Ramville 120kV	P24	291	102%	101%	100%

### Alternatives Considered

### **Table P9902 Project Contingency Drivers**

Upgrading Northeast–Sloan–Sterling 120 kV line could be considered as an Alternative to selected proposal. In addition to the overload of Northeast to Ramville 120kV section, the other line sections are loaded above 75%. The selected project proposal will avoid the loss of Sterling 230kV transformer for the fault of breaker HF, which is more effective to decrease the line loading under this fault.

	Contingency		2021_SUM	2021_SUM	Line mileage
Limited Facility	type	Rating	Pre Project	Post Project	(Mile)
Northeast - Ramville 120kV		291	102%	14%	0.08
Ramville - Skylark 120kV		313	88%	5%	4.6
Logan-Skylark 120kV		313	78%	13%	2.74
Logan-Sloan 120kV	P24	313	75%	16%	0.3

### **Cost Allocation**

This is a Baseline Reliability Project, which is not eligible for regional cost sharing.

### Baseline Reliability – Low-Cost Projects below \$1 Million

ID	Project Name	Description	Expected ISD	Cost \$
	Ironton 120 k)/ Install	Install two 120 kV breakers to terminate the two River Rouge–		
9883	Two Line Breakers	Ironton	12/31/2019	\$910,000
9900	River Rouge - Ironton #2 120 kV Sag Remediation	Raise the Sag Limit on River Rouge-Ironton #2 120 kV to 271 MVA (1304 Amps)	12/31/2018	\$340,000
9692	Seneca - Spokane 120 kV Sag Remediation	Remediate the Sag Limit on Seneca-Spokane 120 kV to 283 MVA (1362 Amp)	12/31/2018	\$339,000
9685	Jacob - St. Clair 120 kV Sag Remediation	Remediate the Sag Limit on Jacob- St. Clair 120 kV to 292 MVA (1405 Amp)	12/31/2019	\$139,000



# **Generation Interconnection Projects**

There are six Generation Interconnection projects moving to Appendix A for ITC Transmission Co. (ITCT) in the MTEP16 cycle. These projects are eligible for regional cost sharing.

ID	Project Name	Description	Expected ISD	Cost \$
10425	J340 Generation Interconnection	Rebuild 5.3 miles of the existing 120 kV Cosmo tap to double circuit steel poles, relocate the Harvest Wind tap point, and string 954 ACSR to create the new J340-Harvest Wind-Grassmere 120 kV line. Expand the Grassmere station and install 1-345 kV breaker, a 345/120 kV transformer, and a 120 kV breaker on the low side of the transformer to tie in the new line.	9/1/2017	\$15,150,000
11603	J321 Generation Interconnection	The J321 TOIFs and NUs include a new 345 kV, 3- breaker substation in a ring bus configuration, and loop the Greenwood-Rapson #2 345 kV line into the new substation.	9/1/2017	\$9,366,000
11583	J301 Generation Interconnection	TO Interconnection Facilities and Network Upgrades associated with the J301 generation interconnection project. This includes a new 345 kV, 3-breaker substation fed by looping the 345 kV Bauer-Ringle line.	9/1/2017	\$8,812,000
11604	J419 Generation Interconnection	Network Upgrades and TOIFs associated with the J419 project. These include extending bus 103 and installing a 120 kV breaker with associated disconnects at Milan substation.	6/30/2018	\$803,000
11584	J308 Generation Interconnection	345 kV, 3 Breaker Substation with relay upgrades and 0.1 miles of double ckt 345 kV to new substation (tapping greenwood-rapson)	9/1/2017	\$9,421,000
11043	Relay Modifications at Monroe to Accommodate PJM Y1-069 Lallendorf Generator Interconnection	Perform necessary relay modifications and install a new wave trap at Monroe in order to accommodate the PJM generator interconnection request ID# Y1-069 (in the PJM queue) which involves the construction of a new 799 MW natural gas generation facility in First Energy.	4/4/2016	\$250,000

# **Transmission Delivery Service Planning Projects**

There are no projects moving to Appendix A in this MTEP cycle for ITC Transmission Co. (ITCT) with network upgrades for transmission service, directly assigned to customer per Energy Markets Tariff (EMT).



# **Other Projects**

Projects that are not defined as Baseline Reliability, Generation Interconnection or Transmission Delivery Service Planning projects per Attachment FF, but are still needed for system reliability for various reasons, are categorized as Other projects. There are twelve Other projects moving to Appendix A in this MTEP cycle for ITC Transmission Co. (ITCT).

# **Other – Load interconnection Projects**

### **Project 11003: Mercury Interconnection**

Transmission Owner: ITC Transmission Co.

### **Project Description**

Project will construct a new 120 kV 3 breaker substation, install approx. 0.8 miles of new double circuit structures to loop the existing Artic-Crestwood 120 kV line into the new substation, and install approx. 4.7 miles of OPGW (fiber) on the Arctic-Ranger line and upgrade relaying at Crestwood and Ranger. The estimated cost is \$10.1 million. The expected in-service date is December 1, 2017.



Figure P11003: Geographic map of project



Project will accommodate a new load interconnection request from DTE in Dearborn, MI.

### Alternatives Considered

N/A

### **Cost Allocation**

This is an Other Project, which is not eligible for regional cost sharing.

### Project 10723: Skylark

Transmission Owner: ITC Transmission Co.

### **Project Description**

ITC will install 2-120 kV line breakers, 2-120 kV section breakers with associated disconnects at Skylark, and loop the 120 kV Northeast-Sloan line in and out. OPGW will be added on the new Northeast-Skylark and Sloan-Skylark 120 kV lines, and relay upgrades will occur at Sloan and Northeast. The estimated cost is \$5.4 million. The expected in-service date is December 1, 2017.



Figure P10723: Geographic map of project



Project will accommodate a load interconnection request submitted by DTE Energy.

### Alternatives Considered

N/A

### **Cost Allocation**

This is an Other Project, which is not eligible for regional cost sharing.

# Project 11443: Ranger Interconnection Request

Transmission Owner: ITC Transmission Co.

### **Project Description**

Install 2-3000 Å breakers, 120 kV/40 kA minimum interruption capability line breakers at existing Ranger Station. DTE will replace existing transformers with 40 MVA 120/13.2 kV transformers. Upgrades will support 50MW of new load at Ranger, and 37 MW of load relocated from Ford Engineering distribution station.

Trainers on the River Rouge - Warren #2 line will also be upgraded to prevent overload. The estimated cost is \$2.2 million. The expected in-service date is December 1, 2017.



Figure P11443: Geographic map of project



Project will accommodate a load interconnection request submitted by DTE Energy.

### Alternatives Considered

N/A

### **Cost Allocation**

This is an Other Project, which is not eligible for regional cost sharing.

ID	Project Name	Description	Expected ISD	Cost \$
10000	2019 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	12/31/2019	\$53,310,000
9999	2018 ITCT Asset Replacement Program	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	12/31/2018	\$53,250,000
9998	2017 ITCT Asset Replacement Program	alarming functionality giving improved remote supervision. All of this will help to reduce overall maintenance costs.	12/31/2017	\$47,970,000
10923	ITCT Pole Top Switch Additions/Replacement Program 2017	Installing, or replacing as appropriate, pole- top switches at tap points of circuits will provide the operational flexibility to	12/31/2016	\$2,400,000
10924	ITCT Pole Top Switch Additions/Replacement Program 2018	sectionalize parts of the line to isolate faults or perform maintenance work on it without having to shut down the entire circuit.	12/31/2018	\$2,400,000
10010	ITCT Customer Interconnections - Year 2019	Customer interconnection requests and retirements.	12/31/2019	\$2,000,000

# Other – System Wide Projects above \$1 Million



ID	Project Name	Description	Expected ISD	Cost \$
	Belle River - Pontiac 345	Raise the Sag Limit on Belle River-Pontiac		
9884	kV Sag Remediation	345 kV to 1414 MVA (2366 Amp)	12/31/2019	\$340,000
	Pontiac - Wixom 345 kV	Raise the Sag Limit on Pontiac-Wixom 345		
9887	Sag Remediation	kV to 1185 MVA (1983 Amp)	12/31/2019	\$305,000
		Ungrade the existing Navarre 120 kV		
	Navarre 120 kV Breakers	breaker HX to have an interrupting		
10243	HX Replacement	capability of 50 kA.	6/30/2018	\$70,000

# Other – Low-Cost Projects below \$1 Million



# Transmission Owner: Michigan Electric Transmission Co. (METC)

### **Overview of METC Projects**

For the MTEP16 cycle there are 24 projects targeted for Appendix A with a total cost of \$272.13 million, of these 24 projects: 9 have an estimated cost greater than \$5 million; six have an estimated cost between \$1 million and \$5 million; and 9 have an estimated cost lower than \$1 million (Figure P-1).





### **Baseline Reliability Projects**

There are thirteen projects moving to Appendix A for Michigan Electric Transmission Co. (METC) in MTEP16 cycle (Figure P-2).



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### **Project 11243: Verona – Barnum Creek Jct. 138 kV Rebuild** Transmission Owner: Michigan Electric Transmission Co.

### **Project Description**

Project will rebuild the Verona – Barnum Creek Jct. section of the Verona – Batavia 138 kV circuit using 954 ACSR and OGPW on new 230 kV future double circuit structures, replace PTS 3186, upgrade terminal equipment at the Verona station, and reconductor approximately 0.6 miles of the Verona – Foundry 138 kV circuit where it shares common structures with the Verona – Batavia 138 kV circuit. The estimated cost is \$13.3 million. The expected in-service date is May 31, 2018.





Figure P11243-1: Geographic map of the project

The Verona – Barnum Creek Jct. 138 kV line is projected to become overloaded for multiple outages in summer peak cases. The highest loading on this line is 122% of 174MVA summer emergency rating for a P6 event in 2021 summer peak case.

The ratings of Verona – Barnum Creek Jct. 138 kV will be upgraded to 287/287MVA SN/SE.



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Limited facility	Rating	Loading	Contingency type	case
	174	102%	P12	
	174	102%	P23	
Verona -	174	103%	P23	
Barnum	174	111%	P24	
Creek	174	102%	P42	2021Summer
JCL. 138	174	103%	P42	
κv	174	111%	P46	
	174	102%	P71	
	174	122%	P6	

#### Table P11243-1: Project contingency drivers

#### **Alternatives Considered**

Generation Re-dispatch or Load Shed is not feasible for thermal violations due to P1, P2, P4 and P7 contingencies if there is no applicable short-time emergency rating.

#### **Cost Allocation**

This is a Baseline Reliability Project, which is not eligible for regional cost sharing.

### Project 2809: Garfield Avenue – Hemphill 138 kV Rebuild Transmission Owner: Michigan Electric Transmission Co.

### **Project Description**

Project will rebuild approximately 9.5 mile-long portion of 336 ACSR conductor utilizing 1431 ACSR conductor on double-circuit 138 kV structure design, and relocate a portion of the Weadock – Hemphill 138 kV line to the other side of the new structures. The estimated cost is \$11 million. The expected inservice date is December 31, 2019.





Figure P2809-1: Geographic map of the project

The Garfield Avenue – Hemphill 138 kV line is projected to become overloaded for planned plus forced outages and double-circuit tower outages in summer peak cases. The highest loading on this line is more than 130% of 173MVA summer emergency rating for P7 event in 2021SP case.

The ratings of Garfield Avenue – Hemphill 138kV will be upgraded to 277/308MVA SN/SE.





Figure P2809-2: 2021 summer pre-project tower outage

line	Contingency Type	Rating	2021SUM	2021SUM_ 1400MW_In	2026SUM
Garfield - Hemphil 138kV	P71	173	116%	111%	120%
Garfield - Hemphil 138kV	P71	173	131%	127%	135%

Table P280	9-1: Proje	ect continger	ncy drivers
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### Alternatives Considered

Generation Re-dispatch or Load Shed is not feasible for thermal violations due to P7 contingency if there is no applicable short-time emergency rating.

### **Cost Allocation**

This is a Baseline Reliability Project, which is not eligible for regional cost sharing.



### Project 9932: Karn - Saginaw River 138 kV Line Rebuild

### Transmission Owner: Michigan Electric Transmission Co.

### **Project Description**

Project will rebuild approximately 2.7 mile-long portion of six-wired 3/0 copper conductor utilizing 1431 ACSR conductor on single-circuit 138 kV structure design, remediate the sag limit on the existing 1431 ACSR conductor to a minimum of 412 MVA / 1724 Amps., and upgrade terminal equipment at both Karn and Saginaw River stations. The estimated cost is \$8.5 million. The expected in-service date is December 31, 2019.



Figure P9932-1: Geographic map of the project

### **Project Need**

The Karn - Saginaw River 138 kV line is projected to become overloaded for one P6 event in various cases. The highest loading is 118% of 287MVA SE in 2021 Light load case.

The Karn - Saginaw River 138 kV line is projected to become marginal overloaded for one P7 event in 2021 Summer Shoulder with 90% wind and 1200 MW flow in from IESO case.

The ratings of Karn - Saginaw River 138 kV line will be upgraded to 382/412MVA SN/SE.





Figure P9932-2: 2021\_SH40\_1200MW\_In pre-project P6 event

Limited facility	Rating	Case	Loading after P6 Event	Loading after P7 event
		2021_70P_40Wind_4LP_1100MW_In	111%	
		2021_70P_40Wind_4LP_300MW_Out	110%	
		2021_SH40	112%	
		2021_SH40_1200MW_In	116%	
		2021_SH40_1LP	108%	
		2021_SH40_1LP_1200MW_In	110%	
Karn - Saginaw River 138 kV	287	2021_SH90	112%	
		2021_SH90_1200MW_In	115%	98%
		2021_SUM	106%	
		2021_SUM_1400MW_In	107%	
		2021_WIN	112%	
		2026_SUM	107%	
		2021_LL	118%	

### Table P9932-1: Project contingency drivers

### Alternatives Considered

Generation re-dispatch is allowed for thermal violations due to P6 contingency. The decrease of 80MW of Karn unit output could help to eliminate the P6 violation. Generation re-dispatch or load shed is not feasible for thermal violations due to P7 contingency if there is no applicable short-time emergency rating.



### **Cost Allocation**

This is a Baseline Reliability Project, which is not eligible for regional cost sharing.

### **Project 3133: Bell Road - Cornell 138 kV Rebuild** Transmission Owner: Michigan Electric Transmission Co.

### **Project Description**

Project will rebuild approximately 4.3 mile-long portion of the Claremont – Cornell 2 line between Bell Road and Cornell. The estimated cost is \$4.35 million. The expected in-service date is December 31, 2019.



Figure P3133-1: Geographic map of the project

### **Project Need**

The Bell Road – Cornell 138 kV line is projected to become overloaded for one P6 event in summer peak cases. The highest loading is 111% of 114MVA SE on Bell Road - N. Corunna 138kV line section in 2026 summer peak case. Marginal overload with 99.3% for Planned plus forced outage in 2021 summer shoulder case with 40% wind dispatched and 1 Ludington unit pumping.

The new ratings of Bell Road - North Corunna J138 kV will be 271/358MVA SN/SE. The new ratings of Cornell- North Corunna J138 kV will be 199/264MVA SN/SE.





### Figure P3133-2: 2021 summer pre-project P6 event

Limited facility	Rating	Contingency type	2021_70P_40 Wind_4LP_ 300MW_Out	2021SH40_ 1LP	2021SU M	2021_SUM_ 1400MW_In	2026SUM
Poll Poad	114	P6					100%
North Corunna	114	P6					98%
J138 kV	114	P6	98%	99.3%	100%	100%	111%

### Table P3133-1: Project contingency drivers

### Alternatives Considered

Generation re-dispatch allowed for P6 contingency in off peak case and Load shed is allowed for P6 violation in summer peak case.

Unit	Change	GSF	Impact(MW)	Estimated Loading decrease
Karn U1A	-127	0.056	-7.15264	-6.60%
Zeeland 2	127	-0.004	-0.52705	-0.49%

Project 3133 could improve the summer emergency rating of Bell Road – Cornell 138kV line (27 mile) more effective.



### **Cost Allocation**

This is a Baseline Reliability Project, which is not eligible for regional cost sharing.

### **Project 10384: Verona - Barnum Creek Jct. 138 kV Sag Remediation** Transmission Owner: Michigan Electric Transmission Co.

### **Project Description**

Project will fully remediate the sag limit on the 266.8 ACSR conductor from the Verona – Barnum Creek Jct. section of the Verona – Batavia 138 kV circuit to the conductor rating of 730 Amps / 174 MVA (summer emergency) using new future double circuit (FDC) structures capable of supporting 954 ACSR in order to facilitate a rebuild of this circuit in the near future. The estimated cost is \$1.07 million. The expected in-service date is June 1, 2017.



Figure P10384-1: Geographic map of the project

**Project Need** 



The branch is projected to become overloaded during various contingencies after the retirement of the Project 1 generating unit.

The ratings of Verona - Barnum Creek Jct. 138 kV will be upgraded to 154/174MVA SN/SE.

# Alternatives Considered NA

### **Cost Allocation**

This is a Baseline Reliability Project, which is not eligible for regional cost sharing.

## Baseline Reliability – Low cost projects below \$1M

ID	Project Name	Description	Expected ISD	Cost \$
9984	Tittabawassee 345 kV Breaker 38H9 Replacement	The proposed solution is to replace the Tittabawassee 345 kV breaker 38H9 with a breaker that has a continuous rating of 3000 amp and a minimum interrupting capability of 40 kA.	6/30/2018	\$790,000
9978	Eureka 138 kV Breaker Replacement	Replace the Eureka 138 kV circuit switcher 256 with a synchronous breaker that has a continuous rating of 3000 amp and a minimum interrupting capability of 40 kA.	6/30/2018	\$510,000
9876	Karn - Manning 138 kV Sag Remediation	Remediate the sag limit on the Karn - Manning 138 kV line to a minimum of 396 MVA / 1657 Amps and upgrade terminal equipment at Karn	12/31/2018	\$620,000
9695	Bullock 138 kV Terminal Equipment Upgrade (Dow Corning Line)	Upgrade terminal equipment at Bullock on the Dow Corning 138 kV line	12/31/2018	\$300,000
9705	Alma - Regal #2 138 kV Sag Remediation	Remediate the sag limit on the Alma – Regal 2 138 kV line to a minimum of 208 MVA / 871 Amps	12/31/2018	\$200,000
11683	Barnum Creek–Alder Creek 138kV Sag Remediation	Remediate Sag on the Barnum Creek Jct. – Alder Creek 138 kV section up to the conductor rating of 174 MVA (730 Amp.).	5/31/2018	\$400,000



11684	Alder Creek–Wagner 138kV Sag Remediation	Remediate Sag on the Alder Creek – Wagner 138 kV section up to the conductor rating of 174 MVA (730 Amp.).	5/31/2018	\$365,000
11704	Denso J.–Vrooman 138kV Sag Remediation	Remediate the sag limit on the Denso J.–Vrooman 138 kV section to at least 150 MVA (628 Amp).	5/31/2018	\$195,000

# **Generation Interconnection Projects**

There are two Generation Interconnection project moving to Appendix A for Michigan Electric Transmission Co. (METC) in the MTEP16 cycle. These projects are eligible for regional cost sharing.

### Project 10744: J392 Generation Interconnection

Transmission Owner: Michigan Electric Transmission Co.

### **Project Description**

Wolverine will construct the Stand Alone Network Upgrades which include the new 4 row, 11 breaker, 138 kV Van Tyle substation, laid out in a breaker and a half design. Ownership of these upgrades will be transferred to METC upon completion of the construction.

METC will loop the 138 kV Livingston-Stover line into Van Tyle, and rebuild the new Livingston-Van Tyle line to double circuit structure design with OPGW added to the new poles. 1431 ACSR conductor will be installed on both sides of the new structures to create Livingston-Van Tyle #1 and #2.

A duel pilot relaying scheme will be installed on the Livingston-Emmett 138 kV line, and the Livingston substation will be expanded to include 2 new rows, and 5 additional breakers on the 138 kV breaker and a half substation. Relaying upgrades will also occur at Gaylord.

The estimated cost is \$18.1 million. The project is in service.





Figure P10744-1: Geographic map of the project

The J392 generation interconnection was studied in the MI-Feb15 DPP cycle. This project represents the METC owned Network Upgrades required interconnecting the new gas plant to the METC system.

### **Alternatives Considered**

N/A

### **Cost Allocation**

This is a Generation Interconnection Project, which is eligible for regional cost sharing.

### Project 10743: Covert Gen Interconnection (PJM-T94)

Transmission Owner: Michigan Electric Transmission Co.

### **Project Description**

Phase 1 to construct a new control house at Palisades substation and replace the relaying associated with positions RH25 and FH27. Install OPGW on the new Palisades-Segreto #1 345 kV line and remove the METC SCADA equipment at Covert. The estimated cost is \$3.6 million. The project is in service.





Figure P10743-1: Geographic map of the project

The existing Covert Plant has submitted an Interconnection Request to PJM to move from the METC footprint to ITCI in the PJM service territory. These facilities are in service. But it was determined by MISO that these facilities are eligible for 10% reimbursement under Attachment FF of the Tariff since they are 345 kV facilities required for a generator interconnection project.

### **Alternatives Considered**

N/A

### **Cost Allocation**

This is a Generation Interconnection Project, which is eligible for regional cost sharing.

# **Transmission Delivery Service Planning Projects**

There are no projects moving to Appendix A in this MTEP cycle for Michigan Electric Transmission Co. (METC) with network upgrades for transmission service, directly assigned to customer per Energy Markets Tariff (EMT).

### **Other Projects**

Projects that are not defined as Baseline Reliability, Generation Interconnection or Transmission Delivery Service Planning projects per Attachment FF, but are still needed for system reliability for various reasons, are categorized as Other projects.



There are nine Other projects moving to Appendix A in this MTEP cycle for Michigan Electric Transmission Co. (METC).

# Other – Load interconnection project

### **Project 9422: Coldwater Interconnection phase 1** Transmission Owner: Michigan Electric Transmission Co.

# Project Description

METC to construct a new 138 kV 4-breaker substation (Newton) configured into a ring bus. METC will build a 3 mile 138 kV single circuit line on new right-of-way between Michigan Ave and Newton substations. Add an 18 MVAR switched capacitor bank at the new Newton Substation with a 138 kV synchronizing breaker. The estimated cost is \$12.31 million. The minimum expected in-service date is April 1, 2017.



Figure P9422-1: Geographic map of the project

### **Project Need**

The City of Coldwater made an official interconnection request on June 26, 2015 for 20 MW of new and relocated load to be few from a new 138 kV substation in Coldwater. Further discussions with Coldwater revealed plans to serve up to an additional 16-18 MW of load by 2021. The interconnection customer has requested 2 independent 138 kV feeds to the new substation with at least 1 feed being available by 4/1/17 to serve the existing and new customers.

### Alternatives Considered

N/A

### **Cost Allocation**



This is an Other Project, which is not eligible for regional cost sharing.

### Project 10323: Coldwater phase 2 Wagner

# Transmission Owner: Michigan Electric Transmission Co.

### Project Description

Install a new 138 kV, 3 breaker substation (tentatively named Wagner) in a ring bus configuration in Union City, MI. Loop the existing 138 kV Alder Creek-Batavia line into Wagner, and modify relaying at Batavia to accommodate the new substation. Construct approximately 13 miles line between Wagner and Newton on 138 kV single circuit steel poles. The estimated cost is \$34.41 million. The expected in-service date is May 31, 2018.



Figure P10323-1: Geographic map of the project

### **Project Need**

The City of Coldwater made an official interconnection request on June 26, 2015 for 20 MW of new and relocated load to be few from a new 138 kV substation in Coldwater. Further discussions with Coldwater revealed plans to serve up to an additional 16-18 MW of load by 2021. The interconnection customer has requested 2 independent 138 kV feeds to the new substation with at least 1 feed being available by 4/1/17 to serve the existing and new customers.

### **Alternatives Considered**



1. Construct the new 138 kV 3 breaker Chicago substation fed by looping the existing Coldwater-Project 1 138 kV circuit into Chicago. METC will construct 5.5 miles a single 138 kV line between Newton substation and Chicago substation on new ROW. Estimated cost: \$16,078,000

While this proposal could provide Coldwater with a second feed to the new load, it would continue to have the Coldwater system subject to multiple N-2 contingencies that outage the entire city and drop above 100MW load.

2. Construct a 15 mile 138kV circuit between Project One and Newton. Construct a new 20 mile 138kV circuit from Project One to Vrooman. Expand breaker positions at Project One to accommodate the two new 138kV circuits. Expand the Michigan Avenue station and modify relaying at Coldwater on the Coldwater to Michigan Avenue circuit. The estimated cost: \$55,539,000- \$72,944,000.

This proposal is more expensive than selected proposal.

### **Cost Allocation**

This is an Other Project, which is not eligible for regional cost sharing.



# Other –System wide projects above \$1M

ID	Project Name	Description	Expected ISD	Cost \$
9945	2017 METC 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	12/31/2017	\$54,276,000
9956	2018 METC Asset Replacement Program	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.	12/31/2018	\$49,398,000
9960	2019 METC Asset Replacement Program		12/31/2019	\$49,398,000
9959	METC Customer Interconnections - Year 2019	Distribution Interconnection Request	12/31/2017	\$2,500,000
9972	METC Four Mile Control Relocation Project	Replace METC relaying and controls at Four Mile Substation. Locate the new relaying and controls in a new dedicated METC control center. Install dedicated METC AC and DC systems.	12/31/2017	\$3,520,000
9975	METC Verona Control Relocation	Replace METC relaying and controls at Verona Substation. Locate the new relaying and controls in a new dedicated METC control center. Install dedicated METC AC and DC systems.	12/31/2017	\$2,940,000



# Other – System wide projects below \$1M

ID	Project Name	Description	Expected ISD	Cost \$
10286	Campbell 138 kV Remove Circuit Breaker 588 Sparing Capability	Remove the Campbell 508 disconnect switch. Modify the relaying to remove 588 breaker sparing capability.	12/31/2017	\$88,000



# **Transmission Owner: Consumers Energy (CETO)**

## **Overview of CETO Projects**

For the MTEP16 cycle there were 19 CETO projects targeted for Appendix A with a total cost of \$22.1 million. Of these 19 projects: Six have estimated cost between \$1 million and \$5 million; and thirteen have estimated cost lower than \$1 million.



Figure P-1: Cost range by project type and estimated in-service date by project type

# **Baseline Reliability Projects**

There is one Baseline Reliability projects moving to Appendix A for Consumers Energy in the MTEP16 cycle

ID	Project Name	Description	Expected ISD	Cost \$
9543	Stamping Plant 138 kV Circuit Breaker Replacement	Increase short-circuit capacity of the 177 and 188 circuit breakers	6/30/2016	\$560,000

### **Generation Interconnection Projects**

There is one Generation Interconnection project moving to Appendix A for Consumers Energy in the MTEP16 cycle.



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ID	Project Name	Description	Expected ISD	Cost \$
10763	J392 Generation Upgrades- CE	Add a wavetrap and upgrade relaying at Emmet Substation to accommodate the addition of a dual-pilot relay scheme on the Emmet-Livingston 138 kV Line.	6/17/2016	\$874,000

### **Transmission Delivery Service Planning Projects**

There are no projects moving to Appendix A in this MTEP cycle for Consumers Energy with network upgrades for transmission service, directly assigned to customer per Energy Markets Tariff (EMT).

### **Other Projects**

Projects that are not defined as Baseline Reliability, Generation Interconnection or Transmission Delivery Service Planning projects per Attachment FF, but are still needed for system reliability for various reasons are categorized as Other projects.

There are seventeen Other projects moving to Appendix A in this MTEP cycle for Consumers Energy.

### Project: 9871 Edenville - Edenville Jct. 138kV Line Rebuild - North Transmission Owner: Consumers Energy

### **Project Description**

The project will rebuild the approximate 9.8 miles north portion of the Edenville - Edenville Jct 138 kV Line utilizing 138 kV single circuit construction and 336.4 ACSR conductor. The Estimated cost is 4.17 Million. The expected in-service date is December 31, 2017.





Figure P9871-1: Geographic map of project

The north portion of the Edenville - Edenville Jct 138 kV Line is constructed with KK71 towers and copper line conductor that date to the early 1920's. This line has experienced below average outage performance over the last 5 years. Experience with these style and vintage of tower has shown significant ground level rusting which will lead to tower failure and line outages. This project will also remediate numerous sag limits identified by LiDAR studies.

### **Alternatives Considered**

N/A

### **Cost Allocation**

This is an Other Project, which is not eligible for regional cost sharing.

### Project: 10046 Beaver Creek Customer Interconnection Transmission Owner: Consumers Energy

**Project Description** 



Consumers Energy has received a request to connect a new load near Grayling. Project will construct a 138 kV three breaker ring bus at Beaver Creek Substation. In addition, project will replace relaying at Higgins Substation. The estimated cost is 3.5 Million. The expected in-service date is March 1, 2018.



### **Project Need**

Project will accommodate new customer load. Due to the need to maintain high-speed clearing on the Higgins-Beaver Creek 138 kV Line, a 138 kV line tap cannot be accommodated; circuit breakers at Beaver Creek are required. Additionally, relays at Higgins Substation need replaced to accommodate the new configuration.

### **Alternatives Considered**

N/A

### **Cost Allocation**

This is an Other Project, which is not eligible for regional cost sharing.

### **Project: 9875 Chase 138 kV Bus Rebuild** Transmission Owner: Consumers Energy



### **Project Description**

Rebuild the 138 kV portion of Chase Substation to a three breaker ring bus. The estimated cost is 3.2 Million. The expected in-service date is December 31, 2017.



# Project Need

Chase Substation is designed as a single bus, single breaker station. A ring bus configuration will improve reliability, allowing for breaker maintenance without interruption of the transmission network.

Chase-Snyder J and Chase-Mecosta 138kV lines are projected to become overloaded in summer peak cases for P6 events. The highest loading on Chase-Snyder J 138kV is 126% of 122MVA summer emergency rating in 2021 summer peak case. The project will upgrade the line rating to 287 MVA SN/SE.



			Pre-	Pre-	Post-	
		Con	Project	Project	Project	Con
Study Case	Limiting Element	MVA	Rating	Loading	Rating	Туре
2021_SUM	Chase-Snyder 138kV 1	135.9	122	111%	287	
2021_SUM_1400MW_In	Chase-Snyder 138kV 1	135.9	122	111%	287	P6
2021_SUM	Chase-Mecosta 138kV 1	121.8	121	101%	287	
2021_SUM	Chase-Snyder 138kV 1	153.5	122	126%	287	
2021_SUM_1400MW_In	Chase-Mecosta 138kV 1	121.9	121	101%	287	
2021_SUM_1400MW_In	Chase-Snyder 138kV 1	153.5	122	126%	287	
2026_SUM	Chase-Mecosta 138kV 1	122.7	121	101%	287	
2026_SUM	Chase-Snyder 138kV 1	157.1	122	129%	287	P6
2021_SUM	Chase-Snyder 138kV 1	127.1	122	104%	287	
2021_SUM_1400MW_In	Chase-Snyder 138kV 1	127.2	122	104%	287	
2026_SUM	Chase-Snyder 138kV 1	130.4	122	107%	287	P6

Table P9875-1: Project contingency drivers

### **Alternatives Considered**

N/A

### **Cost Allocation**

This is an Other Project, which is not eligible for regional cost sharing.

### Project: 9874 Cole Creek Spur 138 kV Line Rebuild Transmission Owner: Consumers Energy

### **Project Description**

Project will rebuild the approximate 4.7 miles Cole Creek-Cole Creek Jct 138 kV Line utilizing 138 kV single circuit construction and 795 ACSR conductor. The estimated cost is 1.96 Million. The expected inservice date is December 1, 2017.





Figure P9874-1: Geographic map of project

Cole Creek Spur 138 kV Line is constructed with KK71 towers and copper line conductor that date to the early 1920's. This line has experienced below average outage performance over the last 5 years. Experience with these style and vintage of tower has shown significant ground level rusting which will lead to tower failure and line outages. This project will also remediate numerous sag limits identified by LiDAR studies.

### **Alternatives Considered**

N/A

### **Cost Allocation**

This is an Other Project, which is not eligible for regional cost sharing.



Other - Syst	em wide	<b>Projects</b>	above \$	1 Million
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ID	Project Name	Description	Expected ISD	Cost \$
9545	CE Annual Breaker Replacement Program - 2016	Breaker Replacement Program for 2016	12/31/2016	\$1,380,000
9544	CE Annual Breaker Replacement Program - 2017	CE Breaker Replacement Program - 2017	12/31/2017	\$1,240,000

# Other – Low-Cost Projects Below \$1 Million

ID	Project Name	Description	Expected ISD	Cost \$
10763	J392 Generation Upgrades- CE	Add a wavetrap and upgrade relaying at Emmet Substation to accommodate the addition of a dual-pilot relay scheme on the Emmet-Livingston 138 kV Line.	6/17/2016	\$874,000
9872	Edenville-Edenville Jct 138 kV Line Rebuild - South	Rebuild the south portion of the Edenville-Edenville Jct 138 kV Line, approximately 2.0 miles, utilizing 138 kV single circuit construction and 336.4 ACSR conductor.	12/31/2016	\$850,000
9878	Vrooman - Complete 138 kV Bus	Complete the 138 kV bus as a ring by adding one 138 kV breaker	6/1/2018	\$800,000
9862	CE Pole Replacement Program - 2017	Replace damaged or defective poles with new poles	12/31/2017	\$680,000
9543	Stamping Plant 138 kV Circuit Breaker Replacement	Increase short-circuit capacity of the 177 and 188 circuit breakers	6/30/2016	\$560,000
9868	CE Substation Equipment Replacements - 2016	Replace damaged or defective substation equipment, not including breakers or relays, with new equipment	12/31/2016	\$560,000



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ID	Project Name	Description	Expected ISD	Cost \$
9870	CE Substation Equipment Replacements - 2017	Replace damaged or defective substation equipment, not including breakers or relays, with new equipment	12/31/2017	\$500,000
9866	CE Relay Replacement Program - 2017	Replace electromechanical and/or defective relays	12/31/2017	\$480,000
9863	CE Line Sag Remediation - 2016	Install poles or replace spans of conductor to remediate sag limits	12/31/2016	\$400,000
9861	CE Pole Replacement Program - 2016	Replace damaged or defective poles with new poles	12/31/2016	\$360,000
9865	CE Relay Replacement Program - 2016	Replace electromechanical and/or defective relays with new digital relays	12/31/2016	\$240,000
9859	CE Line Equipment Replacement Program - 2016	Replace cross arms, insulators, guying, and switches as needed to maintain the lines' condition	12/31/2016	\$160,000
9860	CE Line Equipment Replacement Program - 2017	Replace cross arms, insulators, guying, and switches as needed to maintain the lines' condition	12/31/2017	\$160,000



# Transmission Owner: Michigan Public Power Agency (MPPA)

### **Baseline Reliability Projects**

There are no Baseline Reliability projects moving to Appendix A in this MTEP cycle for MPPA.

### **Generation Interconnection Projects**

There are no Generation Interconnection projects moving to Appendix A in this MTEP cycle for MPPA.

### **Transmission Delivery Service Planning Projects**

There are no projects moving to Appendix A in this MTEP cycle for MPPA with network upgrades for transmission service, directly assigned to customer per Energy Markets Tariff (EMT).

### **Other Projects**

Projects that are not defined as Baseline Reliability, Generation Interconnection or Transmission Delivery Service Planning projects per Attachment FF, but are still needed for system reliability for various reasons, are categorized as Other projects.

There are no Other projects moving to Appendix A in this MTEP cycle for MPPA.



# Transmission Owner: Wolverine Power Supply Cooperative Inc. (WPSC)

There are five projects moving to Appendix A with a total cost of \$28.1 million for Wolverine Power Supply Cooperative (WPSC) in the MTEP16 cycle, of these five projects: two have an estimated cost greater than \$5 million, one has an estimated cost between \$1 million and \$5 million, and two have an estimated cost lower than \$1 million.



Figure P-2: Graphs of cost range by project type and estimated in-service date by project type

# **Baseline Reliability Projects**

There are no BRP projects moving to Appendix for Wolverine Power Supply Cooperative in the MTEP16 cycle.

### **Generation Interconnection Projects**

There is one GIP projects moving to Appendix for Wolverine Power Supply Cooperative in the MTEP16 cycle.

### Project 11023: J392 Generator Interconnection

Transmission Owner: Wolverine Power Supply Cooperative Inc.

### **Project Description**

WPSC will construct the following:

- Advance 138kV station and 138/69kV transformer.

-Gaylord 138kV 4 breaker ring bus to accommodate 3rd line into the station (2016).

-Gaylord 138kV 6 breaker ring bus and 2nd 138/69KV transformer (2018).

-Upgrades to Elmira, Deer Lake and Alpine distribution subs from 69kV to 138kV operation.



-Conversion of existing Gaylord - Advance 69kV line to 138kV operation, new lines will be Gaylord - Van Tyle and Van Tyle to Advance.

-Rebuild of Gaylord - Livingston 138kV line to 795ACSS.

The estimated cost is \$14 million. The project is under construction. The max expected in-service date is October 31, 2018.



Figure P11023-1: Geographic Map of project

### **Project Need**

The transmission upgrades of project 11023 were determined in the FEB2015 DPP studies required to connect J392.

#### **Alternatives Considered**

No alternatives were considered.

#### **Cost Allocation**

This is a GI project, which is not eligible for regional cost sharing.



# **Transmission Delivery Service Planning Projects**

There are no Transmission Delivery projects moving to Appendix for Wolverine Power Supply Cooperative in the MTEP16 cycle.

### **Other Projects**

Projects that are not defined as Baseline Reliability, Generation Interconnection or Transmission Delivery Service Planning projects per Attachment FF transmission project definitions but are still needed for various other system reliability reasons are categorized as Other projects.

There are four Other projects moving to Appendix A for Wolverine Power Supply Cooperative in the MTEP16 cycle.

### **Other – Reliability Projects**

### Project 9899: Redwood to Scottville Rebuild

Transmission Owner: Wolverine Power Supply Cooperative Inc.

### **Project Description**

The project will rebuild the Redwood to Scottville 69kV line and install new poles and hardware with 795ACSS conductor. The estimated cost is \$10.5 million. The expected in-service date is December 31, 2018.





### Figure P9899-1: Geographic Map of project

### **Project Need**

The Redwood to Scottville 69kV line segment was being evaluated for a future rebuild based on condition. The line was built in 1967 and has 45% condemned or damaged structures.

In addition the Redwood to Scottville 69kV line is projected to become overloaded for multiple contingencies involving single line outage at Amber in various cases. The violations were identified in both MTEP15 and MTEP16 MISO steady state reliability study. The highest loading is above 150% of 30MVA summer emergency rating on Eden-Riverton section in 2021 summer peak case for a P6 contingency. The line rating will be upgraded to 143.4MVA SN/SE.

	Contingency					
Bus Number	type	Rating	2020SUM	2021SH40	2021SH90	2021SUM
EDEN-RIVERTON X 69	P12	30				101%
CRYSTAL X-EDEN 69	P12	34.2				101%
EDEN-RIVERTON X 69		30	105%			121%
SCOTTVILLE-RIVERTON X 69		34.2				112%
CRYSTAL X-EDEN 69	P21	34.2				101%
EDEN-RIVERTON X 69		30	106%			122%
SCOTTVILLE-RIVERTON X 69		34.2				113%
CRYSTAL X-EDEN 69	P23	34.2	103%			115%
CRYSTAL X-REDWOOD 69		34.2				107%
EDEN-RIVERTON X 69		30	123%	110%	106%	137%
SCOTTVILLE-RIVERTON X 69		34.2	114%	102%		126%
CRYSTAL X-EDEN 69	P42	34.2	103%			115%
CRYSTAL X-REDWOOD 69		34.2				107%
EDEN-RIVERTON X 69		30	123%	110%	106%	137%
SCOTTVILLE-RIVERTON X 69		34.2	114%	102%		126%
EDEN-RIVERTON X 69	P55	30	112%			116%
SCOTTVILLE-RIVERTON X 69		34.2	105%			108%
EDEN-RIVERTON X 69	P71	30	101%			113%
SCOTTVILLE-RIVERTON X 69		34.2				105%
EDEN-RIVERTON X 69	P3 (P11 +P12)	30				101%
EDEN-RIVERTON X 69		30	110%			119%
SCOTTVILLE-RIVERTON X 69		34.2	103%			111%
CRYSTAL X-EDEN 69	P6 (P12+P12)	34.2	117%			127%
CRYSTAL X-REDWOOD 69		34.2	109%			119%
EDEN-RIVERTON X 69		30	139%	117%	105%	151%
SCOTTVILLE-RIVERTON X 69		34.2	128%	108%		139%

Table P9899-1: Project contingency drivers



### **Alternatives Considered**

No alternatives were considered.

### **Cost Allocation**

This is an Other project, which is not eligible for regional cost sharing.

### Project 4385: Burnips to Fairview

Transmission Owner: Wolverine Power Supply Cooperative Inc.

### **Project Description**

The project will rebuild Burnips to Fairview 69 kV line. The estimated cost is \$3.5 million. The expected inservice date is December 31. 2018.



Figure P4385-1: Geographic Map of project

### **Project Need**

Burnips to Fairview 69kV line is projected to become overloaded for P2 (breaker fault), P4 (fault plus stuck breaker) and P5 (fault plus relay failure) contingencies in summer peak cases. The highest loading



is above 150% of 47MVA summer emergency rating. The line rating will be upgraded to 143.4MVA SN/SE.

Bus Number	Contingency Type	Rating	2020SUM	2021_SUM
BURNIPS - DRENTHE X 69		47	150%	155%
DRENTHE X - FAIRVIEW 69	P24	47	142%	146%
BURNIPS - DRENTHE X 69		47	150%	155%
DRENTHE X - FAIRVIEW 69	P46	47	142%	146%
BURNIPS - DRENTHE X 69		47	150%	157%
DRENTHE X - FAIRVIEW 69	P55	47	141%	147%

### Table P4385-1: Project contingency drivers

### **Alternatives Considered**

No alternatives were considered.

### **Cost Allocation**

This is an Other project, which is not eligible for regional cost sharing.



ID	Project Name	Description	Expected ISD	Cost
9913	2017 Battery Bank Replacement Project	This project replaces battery banks and chargers that have reached the end of their useful life at transmission stations.	12/31/2017	\$70,000
9915	Oden Relay Upgrade	Upgrade the relaying on the Oden-Emmet terminal	12/31/2017	\$35,000

# Other – Low cost projects below \$1M



# Transmission Owner: Northern Indiana Public Service Company (NIPSCO)

Northern Indiana Public Service Company does not have any projects targeting board's approval in MTEP16 cycle.

