Marshall 230 kV Substation: Install dual reactors and expand existing ring bus

General Information

Proposing entity name	Company specific
Does the entity who is submitting this proposal intend to be the Designated Entity for this proposed project?	Yes
Company proposal ID	Company specific
PJM Proposal ID	745
Project title	Marshall 230 kV Substation: Install dual reactors and expand existing ring bus
Project description	At Marshall 230 kV Substation: Install dual reactors and expand the existing ring bus. Relocate Moshannon line terminal. - Relocate the Moshannon (Lobo) 230 kV line, wire to be 1033 ACSR or larger - Install one 3000 A breaker and relaying - Install three 2000 A substation switches - Install one line exit 2000 A disconnect switch - Install two reactive switching devices/breakers - Install two 46.4 MVAR shunt reactors - Adjust relaying as necessary
Email	Company specific
Project in-service date	06/2026
Tie-line impact	Yes
Interregional project	No
Is the proposer offering a binding cap on capital costs?	No
Additional benefits	Expanding the ring bus at Marshall Substation and staggering the sources allows for generation at the Marshall substation and the proposed reactors to remain active for stuck breaker contingencies that would otherwise outage the entire Marshall Substation by outaging both sources or line exits to the substation simultaneously.

Project Components

1. Marshall Substation

2. East Towanda – Marshall 230 kV Line

3. Marshall – Moshannon 230 kV Line

Substation Upgrade Component

Component title	Marshall Substation
Project description	At Marshall 230 kV Substation: Install dual reactors and expand the existing ring bus. Relocate Moshannon line terminal.
Substation name	Marshall
Substation zone	Penelec
Substation upgrade scope	PN-S-2922: Marshall Below Grade: Install (1 lot) foundations, conduit, and grounding for new equipment. Install conduit for in sub fiber runs to reactors. Above Grade Relocate (1) 230kV A-frame. Install (2) 230kV, 46.4MVAR shunt reactors. Install (1) 230kV, 3000A 50kAIC circuit breaker. Install (2) 230kV, 3000A 63kAIC breaker with independent pole operation and point on wave switching controller for reactor switching. Install (2) 230kV, 3000A manual, GOAB disconnect switches. Install (2) 230kV, 2000A manual, GOAB disconnect switches. -Switch stands are existing -Install (1) 230kV, 2000A MOAB line disconnect switch -Replace limiting 1033.5 ACSR Moshannon line drops with new conductor that meets or exceeds ratings of 536/666/619/790MVA SN/SSTE/WN/WSTE -Relocate (1) 230kV, 2000A wideband wave trap and tuners (including stand) -Relocate (3) 230kV CVTs (including stand) -Relocate (3) 180kV (144kV MCOV) surge arresters (locate on A-frame) -Install (1-lot) rigid bus, cable, fittings, insulators, and bus support structures as shown on the proposed layout. Relay & Control -For the Moshannon (AA1-111) 230kV line, replace existing line relaying with: (1) line relaying panel with (1) SEL421, (1) SEL411L, (1) SEL501 BFT, (1) SATEC Meter, and (1) breaker maintenance control switch -Reuse the existing carrier panel and install (1) PCM5350. -For the Laural Hill (AA1-144) 230kV line, install: -Rewire relaying for new breaker in the ring bus. -Install (2) Reactor panels with (1) SEL587Z relay, (1) SEL487E relay, (1) SEL501 BFT, and (1) Bitronics M871 meter for reactors No 1 & 2. -Install (2) Reactor bus panels with (2) SEL487B relays. -Revise existing breaker failure schemes to incorporate new breakers. -Replace the existing SEL2020 with (1) SEL3530 RTAC communications processor. Additional Equipment to be Removed None

Transformer Information

None

New equipment description	Install (2) 230kV, 46.4MVAR shunt reactors. Install (1) 230kV, 3000A 50kAIC circuit breaker. Install (2) 230kV, 3000A 63kAIC breaker with independent pole operation and point on wave switching controller for reactor switching.

Substation assumptions	Assumptions New switches can be installed on existing structures. The AC/DC system is adequate The SCADA RTU has an adequate number of available points. There is adequate space in the control house for the new panels. Cabinets located against the wall might be required. Line MOAB can be installed on A-frame.
Real-estate description	
Construction responsibility	Company specific
Benefits/Comments	

Component Cost Details - In Current Year $

Engineering & design	This information is considered confidential and proprietary
Permitting / routing / siting	This information is considered confidential and proprietary
ROW / land acquisition	This information is considered confidential and proprietary
Materials & equipment	This information is considered confidential and proprietary
Construction & commissioning	This information is considered confidential and proprietary
Construction management	This information is considered confidential and proprietary
Overheads & miscellaneous costs	This information is considered confidential and proprietary
Contingency	This information is considered confidential and proprietary
Total component cost	$4,434,823.98
Component cost (in-service year)	$5,061,134.37

Transmission Line Upgrade Component

Component title	East Towanda – Marshall 230 kV Line
Project description	At Marshall 230 kV Substation: Install dual reactors and expand the existing ring bus. Relocate Moshannon line terminal.
Impacted transmission line	East Towanda – Marshall 230kV
Point A	East Towanda

Point B	Marshall
Point C	
Terrain description	The terrain here is relatively flat with little elevation change. The terrain is overgrown field and has been deforested.

Existing Line Physical Characteristics

Operating voltage	230 kV
Conductor size and type	1033.5 ACSR 54/7
Hardware plan description	This line is only being altered due to it currently having a shared structure with the Marshall - Moshannon 230 kV line. New hardware will be used to complete the relocation. The age of the hardware on the existing line is not available to FirstEnergy at this time.
Tower line characteristics	This is not applicable as the line is being relocated to change the substation topology not for health or condition assessment.

Proposed Line Characteristics

	Designed	**Operating**
Voltage (kV)	230.000000	230.000000
	Normal ratings	**Emergency ratings**
Summer (MVA)	546.000000	666.000000
Winter (MVA)	619.000000	790.000000
Conductor size and type	1033 ACSR 54/7	
Shield wire size and type	3/8" 7 Strand Steel	
Rebuild line length	0.1 miles	

Rebuild portion description	Description of Work The Moshannon terminal within the Marshall Substation will be relocated (PN-T-736). The loop structure, 677A consists of two wood monopoles #677Aa and #677Ab, right outside of the Marshall Substation. The structures support both the East Towanda-Marshall 230 kV Line and Marshall-Moshannon 230 kV Line and will undergo alterations to support one sided loading.
Right of way	No anticipated ROW changes.
Construction responsibility	Company specific
Benefits/Comments	

Component Cost Details - In Current Year $

Engineering & design	This information is considered confidential and proprietary
Permitting / routing / siting	This information is considered confidential and proprietary
ROW / land acquisition	This information is considered confidential and proprietary
Materials & equipment	This information is considered confidential and proprietary
Construction & commissioning	This information is considered confidential and proprietary
Construction management	This information is considered confidential and proprietary
Overheads & miscellaneous costs	This information is considered confidential and proprietary
Contingency	This information is considered confidential and proprietary
Total component cost	$353,342.04
Component cost (in-service year)	$403,065.97

Transmission Line Upgrade Component

Component title	Marshall – Moshannon 230 kV Line
Project description	Relocate the existing Moshannon terminal within the existing Marshall-Moshannon 230 kV Line and East Towanda-Marshall 230 kV Line loop at the Marshall Substation to account for additional substation equipment.
Impacted transmission line	Marshall – Moshannon 230 kV

Point A	Marshall
Point B	Moshannon
Point C	
Terrain description	The terrain here is relatively flat with little elevation change. The terrain is overgrown field and has been deforested.

Existing Line Physical Characteristics

Operating voltage	230 kV
Conductor size and type	1033 ACSR 54/7
Hardware plan description	Only two spans of the line need to be relocated to accommodate the new desired topology. The hardware on the relocated line will be new. The vintage of the hardware of the existing line is not available to FirstEnergy at this time.
Tower line characteristics	The condition of the existing towers is not applicable for this project being that the line is being changed due to substation topology rather than condition assessment. -With the new substation equipment additions, the Moshannon terminal will be relocated to the south-west corner of the substation. This will require the installation of: • (2) single circuit wood 3-pole deadend structures (TR-230075) • 0.1 miles of 1033.5 ACSR conductor shielded by 7#8 Alumoweld.

Proposed Line Characteristics

	Designed	**Operating**
Voltage (kV)	230.000000	230.000000
	Normal ratings	**Emergency ratings**
Summer (MVA)	546.000000	666.000000
Winter (MVA)	619.000000	790.000000
Conductor size and type	1033 ACSR 54/7	
Shield wire size and type	3/8"	
Rebuild line length	0.1 miles	

Rebuild portion description	There is only a less than 0.1 mile section that is going to be built to accommodate the new topology change. The overall line is not being rebuilt.
Right of way	-A rights and restrictions review by Real Estate will be required. -Georeferenced ROW extents will be required to be provided to engineering. Survey of parcel boundaries will be required. 0.1 miles of ROW will be required along the substation to route the 230 kV line in a horizontal configuration, 125’ width will be needed.
Construction responsibility	Company specific
Benefits/Comments	

Component Cost Details - In Current Year $

Engineering & design	This information is considered confidential and proprietary
Permitting / routing / siting	This information is considered confidential and proprietary
ROW / land acquisition	This information is considered confidential and proprietary
Materials & equipment	This information is considered confidential and proprietary
Construction & commissioning	This information is considered confidential and proprietary
Construction management	This information is considered confidential and proprietary
Overheads & miscellaneous costs	This information is considered confidential and proprietary
Contingency	This information is considered confidential and proprietary
Total component cost	$1,043,535.77
Component cost (in-service year)	$1,189,378.65

Congestion Drivers

None

Existing Flowgates

FG #	From Bus No.	From Bus Name	To Bus No.	To Bus Name	CKT	Voltage	TO Zone	Analysis type	Status
N1-WVM2	200908	26CHAPMAN+	200908	26CHAPMAN+	0	230	226	Winter Baseline Voltage Magnitude	Included
N2-WVM5	200908	26CHAPMAN+	200908	26CHAPMAN+	0	230	226	Winter N-1-1 Voltage Magnitude	Included
N2-WVM1	200908	26CHAPMAN+	200908	26CHAPMAN+	0	230	226	Winter N-1-1 Voltage Magnitude	Included
N2-SVM1	200908	26CHAPMAN+	200908	26CHAPMAN+	0	230	226	Summer N-1-1 Voltage Magnitude	Included
N1-SVM2	200701	26GROVER	200701	26GROVER	0	230	226	Summer N-1 Voltage Magnitude	Included
N1-WVM4	200701	26GROVER	200701	26GROVER	0	230	226	Winter Baseline Voltage Magnitude	Included
N2-WVM4	200701	26GROVER	200701	26GROVER	0	230	226	Winter N-1-1 Voltage Magnitude	Included
N2-WVM8	200701	26GROVER	200701	26GROVER	0	230	226	Winter N-1-1 Voltage Magnitude	Included
N2-SVM2	200701	26GROVER	200701	26GROVER	0	230	226	Summer N-1-1 Voltage Magnitude	Included
N2-SVM3	200701	26GROVER	200701	26GROVER	0	230	226	Summer N-1-1 Voltage Magnitude	Included
N1-WVM1	200909	26LOBO+	200909	26LOBO+	0	230	226	Winter Baseline Voltage Magnitude	Included
N2-WVM2	200909	26LOBO+	200909	26LOBO+	0	230	226	Winter N-1-1 Voltage Magnitude	Included
N2-WVM6	200909	26LOBO+	200909	26LOBO+	0	230	226	Winter N-1-1 Voltage Magnitude	Included
N2-SVM4	200909	26LOBO+	200909	26LOBO+	0	230	226	Summer N-1-1 Voltage Magnitude	Included
N2-SVM5	200909	26LOBO+	200909	26LOBO+	0	230	226	Summer N-1-1 Voltage Magnitude	Included
N1-SVM1	200857	26MARSHALL	200857	26MARSHALL	0	230	226	Summer N-1 Voltage Magnitude	Included
N1-WVM3	200857	26MARSHALL	200857	26MARSHALL	0	230	226	Winter Baseline Voltage Magnitude	Included
N2-WVM7	200857	26MARSHALL	200857	26MARSHALL	0	230	226	Winter N-1-1 Voltage Magnitude	Included
N2-WVM3	200857	26MARSHALL	200857	26MARSHALL	0	230	226	Winter N-1-1 Voltage Magnitude	Included
N2-SVM6	200857	26MARSHALL	200857	26MARSHALL	0	230	226	Summer N-1-1 Voltage Magnitude	Included
N2-SVM7	200857	26MARSHALL	200857	26MARSHALL	0	230	226	Summer N-1-1 Voltage Magnitude	Included

New Flowgates

None

Financial Information

Capital spend start date 06/2024

Construction start date	12/2025
Project Duration (In Months)	24

Additional Comments

None