

**Reference Documents**

MISO Open Access Transmission Tarriff Attachment X, Appendix 6 (Generator Interconnection Agreement - GIA)  
 MISO Open Access Transmission Tarriff Attachment X (Generator Interconnection Procedures - GIP)  
 Entergy Facility Connection Requirements Website  
 Standard: AZ0203, latest rev. Transmission Facility Rating Methodology Guide  
 Voltage Schedules for Generating Facilities Interconnecting to the Entergy Transmission System  
 Standard: PM3901, latest rev. (Generator Interconnection Customer Requirements Standard)  
 Standard: AM3902, latest rev. (Power Quality Guide)  
 Standard: SF0201, latest rev. (Substation Grounding Design Guideline)  
 Standard: SF0202, latest rev. (Substation Grounding Specification & Design Guide)  
 Standard: SF010100 (Ground Grid Acceptance and Maintenance)  
 Standard: SL0003, latest rev. (Entergy Substation Design Guide)  
 Standard: SL0002, latest rev. (Customer-Built Substation Design Standard)  
 Standard: SL0001, latest rev. (Substation Design Parameters Standard)  
 Standard: SA0102, latest rev. (Substation Surge Arresters Purchase Specification)  
 Standard: TF0401, latest rev. (Shield Wire Application Guideline)  
 Standard: TF0501, latest rev. (Cathodic Protection Application Guideline)  
 Standard: AM3901, latest rev. (Guideline for Affected System Issues)

**FAC-001-4, Effective November 25, 2013**

				R1.1 Generation Facilities	R1.2 Transmission Facilities	R1.3 End User Facilities
R1	The Transmission Owner shall document, maintain, and publish facility connection requirements to ensure compliance with NERC Reliability Standards and applicable Regional Reliability Organization, subregional, Power Pool, and individual Transmission Owner planning criteria and facility connection requirements. The Transmission Owner's facility connection requirements shall address connection requirements for:	R1.1	Generation Facilities	<a href="#">Facility Connection Requirements Website</a>		
		R1.2	Transmission Facilities		<a href="#">Facility Connection Requirements Website</a>	
		R1.3	End User Facilities			<a href="#">Facility Connection Requirements Website</a>
				<b>GIP, Section 3.5</b>	Entergy follows the MISO Transmission Expansion Plan (MTEP) process to provide an open and transparent planning process and in order to coordinate studies of new transmission facilities and their impacts on the interconnected transmission system.	Entergy follows the MTEP process to provide an open and transparent planning process and in order to coordinate studies of new end-user facilities and their impacts on the interconnected Transmission System.

R2.1.1	Procedures for coordinated joint studies of new facilities and their impacts on the interconnected transmission systems.	<b>Standard: AM3901, latest rev.</b>	interconnected transmission system.	
			Changes to various types of transmission facilities are coordinated between Transmission (Transmission Planning and Transmission Policy) and either (1) major accounts staff and their retail customers or (2) wholesale customers. Changes are reflected in postings and models on the MISO OASIS site. Questions may be directed to the Manager of Transmission Project Development.*	Changes to various types of loads are coordinated between Transmission (Transmission Planning and Transmission Policy) and either (1) major accounts staff and their retail customers or (2) wholesale customers. Changes are reflected in postings and models on the MISO OASIS site. Questions may be directed to the Manager of Transmission Project Development.*
R2.1.2	Procedures for notification of new or modified facilities to others (those responsible for the reliability of the interconnected transmission systems) as responsible for the reliability of the interconnected transmission systems) as soon as feasible.	<b>MISO OATT Attachment X, Section 3.4</b>	<b>Standard: AM3901 latest rev., Section 1.2, and Section 6.1</b>	Changes to various types of loads are coordinated between Transmission (Transmission Planning and Transmission Policy) and either (1) major accounts staff and their retail customers or (2) wholesale customers. Changes are reflected in postings and models on the MISO OASIS site. Questions may be directed to the Manager of Transmission Project Development.*
		<b>Standard: AM3901 latest rev., Section 1.2, and Section 6.1</b>		
R2.1.3	Voltage level and MW and MVAR capacity or demand at point of connection.	<b>Standard: PM3901 latest rev., Section 5.10</b>	<b>Standard: SL0002, latest rev.</b>	The Electric Service Agreement or comparable agreement (MW capacity and MVAR billing).
		<b>Data submittal in the MISO Interconnection Request (GIP, Appendix 1)</b>		<b>Standard: SL0002, latest rev.</b>
		<b>Voltage Schedules</b>		<b>Standard: AM3902, latest rev.</b>
R2.1.4	Breaker duty and surge protection.	<b>Protection systems specified in Article 9.7.5 of the Standard GIA (Appendix 6 to the GIP)</b>	<b>Standard: SL0002, latest rev.</b>	<b>Standard: SL0002, latest rev.</b>

R2 The Transmission Owner's facility connection requirements shall address, but are not limited to, the following items:

R2.1 Provide a written summary of its plans to achieve the required system performance as described above throughout the planning horizon:

			Standard: PM3901 Rev 7, §5.8.2, 5.8.3, 5.8.7,		
R2.1.5	System protection and coordination.	Standard: PM3901 Rev 7, Section 5.8 (Page 12-16) As specified in Articles 9.7.4 and 9.7.5 of the Standard GIA (Appendix 6 to the GIP.)	Standard: SL0002, latest rev., Section 10	Standard: SL0002, latest rev., Section 10	
R2.1.6	Metering and telecommunications.	Standard: PM3901 latest rev., §5.10 and 5.11  Metering equipment as specified in Article 7 of the Standard GIA (Appendix 6 to the GIP), Telecommunication equipment as specified in Article 8 of the Standard GIA (Appendix 6 to the GIP)	Standard: SL0002, latest rev. §10.3, 10.5, 10.6	Standard: SL0002, latest rev. §10.3, 10.5, 10.6	
R2.1.7	Grounding and safety issues.	Standard: PM3901 latest rev., Section 5.3, 5.7, 5.8  Standard: SF0201, latest rev.  Standard: SL0002, latest rev.	Standard: SF0201, latest rev.  Standard: SL0002, latest rev.	Standard: SF0201, latest rev.  Standard: SL0002, latest rev.	
R2.1.8	Insulation and insulation coordination.	Standard: TA0503	Standard: TA0503	Standard: TA0503	
R2.1.9	Voltage, Reactive Power, and power factor control.	Standard: PM3901 latest rev., §5.7.8, 5.7.9  Reactive power requirements are set forth in Article 9.6 of the Standard GIA (Appendix 6 to the GIP)  Voltage Schedules	Voltage Schedules	Typical industrial customer rate schedule, Section IV  Voltage Schedules	
R2.1.10	Power quality impacts.	Article 9.7.6 of the Standard GIA (Appendix 6 to the GIP).  Standard: AM3902, latest rev.	Standard: AM3902, latest rev.	Standard: AM3902, latest rev.	
R2.1.11	Equipment Ratings	Standard: PM3901 latest rev.	Standard: SL0002 latest rev.	Standard: SL0002 latest rev.	

		R2.1.11 Equipment ratings.	Standard: PM3901 latest rev.	Standard: SL0002, latest rev.	Standard: SL0002, latest rev.
		R2.1.12 Synchronizing of facilities.	Standard: PM3901 latest rev., §5.9 Interconnection Customer is responsible for the proper synchronization of the Generating Facility to the Transmission or Distribution System, as applicable.	N/A	N/A
		R2.1.13 Maintenance coordination.	Maintenance coordination shall be completed according to Article 10 of the Standard GIA (Appendix 6 to the GIP.)	Network Operating Agreement, Transmission Tariff, Attachment G, Section 7.6 (Page 17)	Typical Interconnection Agreement Typical Operating Agreement for Customer Owned Substations
		R2.1.14 Operational issues (abnormal frequency and voltages).	Standard: PM3901 latest rev., Section 5.7.9 (Page 11) and Section 5.8.15 (Page 16) Conditions controlled according to Article 9.7.3 of the Standard GIA (Appendix 6 to the GIP)	Network Operating Agreement, Transmission Tariff, Attachment G, Section 7.1 (Page 13) and Section 7.3 (Page 13-14)	Standard: SL0002, latest rev. Typical industrial customer rate schedule, Section IV AM3902, Rev. 00, July 30, 1996, Voltage Fluctuations Operation Guideline, Section 3.1 (Page 2-3)
		R2.1.15 Inspection requirements for existing or new facilities.	Standard: PM3901 latest rev., §5.7.3, 5.7.7, 5.8.6, 5.8.9 Article 6.4 of the Standard GIA (Appendix 6 to the GIP)	Standard: SL0002, latest rev. Network Operating Agreement, Transmission Tariff, Attachment G, Section 7.6 (Page 17)	Standard: SL0002, latest rev. Typical Operating Agreement for Customer Owned Substations
		R2.1.16 Communications and procedures during normal and emergency operating conditions.	Standard: PM3901 latest rev., §5.11 Articles 8 and 13 of the Standard GIA (Appendix 6 to the GIP)	Typical Operating Agreement for Customer Owned Substations	Typical Operating Agreement for Customer Owned Substations
R3	The Transmission Owner shall maintain and update its facility connection requirements as required. The Transmission Owner shall make documentation of these requirements available to the users of the transmission system, the Regional Reliability Organization, and NERC on request (five business days).		Documents updated as necessary, placed on OASIS, and/or available to the RRO or NERC	Documents updated as necessary, placed on OASIS, and/or available to the RRO or NERC	Documents updated as necessary, placed on OASIS, and/or available to the RRO or NERC
<b>SERC Supplement (Facility Connection Requirements)</b>					
III	<b>Self Application:</b> Connection requirements for facilities (generation, transmission, and end-user) not presently connected and modifications of facilities already connected should be consistent in content and application to those requirements used by the Transmission Owners for connecting their own facilities.		<a href="#">Facility Connection Requirements Website</a>	<a href="#">Facility Connection Requirements Website</a>	<a href="#">Facility Connection Requirements Website</a>

Impact Study Requirements	1	Transmission Owners shall include a description of their procedures for study of new facilities and their impacts on the interconnected transmission system. The impact studies that should be considered include but are not limited to:	Fault Duty	<p>The GIP describes the process and series of generation interconnections studies which are to be performed. The Facilities Study is customer specific and contains short circuit equipment rating information.</p> <p>A summary of information on ratings methodology can be found in the Entergy Transmission Facility Rating Methodology document which is derived from a number of Entergy proprietary standards. <b>Standard: AZ0203, latest rev.</b></p> <p><b>Standard: PM3901 latest rev., §5.8.2, 5.8.3, 5.8.7,</b></p>	<a href="#">Facility Connection Requirements Website</a>	<a href="#">Facility Connection Requirements Website</a>
			Stability	GIP, Article 3.2.1.2, 3.2.3.2, 7.3		
			Loadflow	GIP, Article 3.2.1.2, 3.2.3.2, 7.3		
			Transfer Capability	<p>GIP, Article 3.2.1.2, 3.2.3.2, 7.3</p> <p><b>Standard: AM3901, latest rev., latest revision</b></p>	<p>Prior and approved transmission services are included in regional studies to prevent interconnections from harming existing transactions. Per good utility practice, transfer studies are done when warranted to identify any positive or negative impacts on transfer capabilities.</p>	<p>Prior and approved transmission services are included in regional studies to prevent interconnections from harming existing transactions. Per good utility practice, transfer studies are done when warranted to identify any positive or negative impacts on transfer capabilities.</p>
					<p>The TVA, Southern and Entergy Seams Working Group coordinate transmission studies through coordinated transmission planning and expansion, common generation interconnection processes, and interregional</p>	<p>Changes to various types of loads are coordinated between Transmission (Transmission Planning and Transmission Policy) and either (1) major accounts staff and their retail customers or (2) wholesale customers</p>
						GIP Article 3.5

				GIP, Article 3.3	transmission planning and other coordination efforts among adjoining transmission organizations covering different regions. Questions may be directed to the Manager of Transmission Project Development.*	customers or (2) wholesale customers. Changes are reflected in postings and models on the MISO OASIS site. Questions may be directed to the Manager of Transmission Project Development.*
		The procedures should address coordinated joint studies with neighboring, interconnected Transmission Owners being necessary to completely evaluate the impact.			<a href="#">Facility Connection Requirements Website</a>	<a href="#">Facility Connection Requirements Website</a>
				<b>Standard: AM3901, latest rev., latest revision</b>	Studies associated with interconnections other than large generators will be evaluated within the basic guidelines of Standard AM3901, latest rev.. However, the depth of study may be reduced or eliminated when appreciable impact on neighboring systems clearly does not exist.	Studies associated with interconnections other than large generators will be evaluated within the basic guidelines of Standard AM3901, latest rev.. However, the depth of study may be reduced or eliminated when appreciable impact on neighboring systems clearly does not exist.
Provision for Future Changes	2	Planning requirements that should be addressed include:	Requirements for the facility owner or operator to notify the Transmission Owners when changes or modifications occur or are planned which may affect system operations or reliability	GIP, Article 4.4	<a href="#">Facility Connection Requirements Website</a>	Changes to various types of loads are coordinated between Transmission (Transmission Planning and Transmission Policy) and either (1) major accounts staff and their retail customers or (2) wholesale customers. Changes are reflected in postings and models on the MISO OASIS site. Questions may be directed to the Manager of Transmission Project Development.*
				<b>Standard: PM3901 latest rev., §5.7.2</b>		
			Requirements for conducting (or updating) system studies relating to facility changes/modifications, including the responsibility to furnish data to the Transmission Owner	GIP, Article 4.4	<a href="#">Facility Connection Requirements Website</a>	Changes to various types of loads are coordinated between Transmission (Transmission Planning and Transmission Policy) and either (1) major accounts staff and their retail customers or (2) wholesale customers. Changes are reflected in postings and models on the MISO OASIS site. Questions may be directed to the Manager of Transmission Project Development.*
				<b>Standard: PM3901 latest rev., §5.7.2</b>		

Voltage and Power Factor Control	3	Design requirements that should be addressed include:	Internal plant electrical system design (e.g., transformers, tap settings, motors & other loads, generator/exciter, voltage regulator) should not restrict any mode of project operation within the transmission system's allowable voltage range and regulation.	<b>Standard: PM3901 latest rev., §5.7.8 and 5.7.9</b>	<b>Voltage Schedules</b>	<b>Voltage Schedules</b>
				GIA, Article 5.10	<b>Standard: AM3902, latest rev.</b>	<b>Standard: AM3902, latest rev.</b>
			Transmission interconnected equipment should have the tap ranges and selfregulation necessary to operate within the transmission system's voltage range and regulation.	<b>Standard: PM3901 latest rev., §5.7.8 and 5.7.9</b>	<b>Voltage Schedules</b>	<b>Voltage Schedules</b>
				GIA, Article 5.10	<b>Standard: AM3902, latest rev.</b>	<b>Standard: AM3902, latest rev.</b>
			Voltage regulator load compensation, if required, to control voltage at a point beyond the generator terminals	<b>Standard: PM3901 latest rev., §5.7.8 dictates that voltage regulation to take place at POI regardless of location of generator terminals.</b>	<b>Voltage Schedules</b>	<b>Voltage Schedules</b>
			Voltage regulator droop compensation, if required, for generators whose terminals are directly connected (i.e., cross-compound, hydro)	No requirements for these settings are currently required. Compliance with reactive support capability and voltage schedule requirements are adequate for all facilities connected.	No requirements for these settings are currently required. Compliance with reactive support capability and voltage schedule requirements are adequate for all facilities connected.	No requirements for these settings are currently required. Compliance with reactive support capability and voltage schedule requirements are adequate for all facilities connected.
			Coordination of excitation system settings with the Transmission Owner	<b>Standard: PM3901 latest rev., §5.7.8 and 5.7.9</b>	<b>Standard: SL0002, latest rev.</b>	<b>Standard: SL0002, latest rev.</b>
				GIA, Article 5.10		
				<b>Voltage Schedules</b>	<b>Voltage Schedules</b>	<b>Voltage Schedules</b>
			Transmission interconnection impact on adjacent areas' voltage or reactive compensation devices	GIP, Section 7.3, 7.4	The TVA, Southern and Entergy Seams Working Group plans to publish procedures for coordinated joint studies; (Entergy will publish a standard based on the current draft of the Seams Groups documentation also). Questions may be directed to the Manager of Transmission Project Development.*	The TVA, Southern and Entergy Seams Working Group plans to publish procedures for coordinated joint studies; (Entergy will publish a standard based on the current draft of the Seams Groups documentation also). Questions may be directed to the Manager of Transmission Project Development.*

Generation Control	4	Operational requirements that should be addressed include:	Load and/or generation operation within the acceptable voltage range and regulation as specified by the Transmission Owner	<b>Standard: PM3901 latest rev., §5.7.8 and 5.7.9</b>	Typical Operating Agreement for Customer Owned Substations	Typical Operating Agreement for Customer Owned Substations
				GIA, Article 5.10	<b>Voltage Schedules</b>	<b>Voltage Schedules</b>
			Excitation system/voltage regulator allowable operating modes (e.g., automatic/manual)	<b>Standard: PM3901 latest rev., §5.7.8 and 5.7.9</b>	Typical Operating Agreement for Customer Owned Substations	Typical Operating Agreement for Customer Owned Substations
				GIA, Article 5.10, 9.6.2.1	<b>Standard: AM3902, latest rev.</b>	<b>Standard: AM3902, latest rev.</b>
			Generator voltage schedules	<b>Voltage Schedules</b>	Typical Operating Agreement for Customer Owned Substations	Typical Operating Agreement for Customer Owned Substations
				<b>Standard: PM3901 latest rev., §5.8</b>	<b>Voltage Schedules</b>	<b>Voltage Schedules</b>
			Coordination of any reactive compensation devices	<b>Standard: PM3901 latest rev., §5.7.8 and 5.7.9</b>	Typical Operating Agreement for Customer Owned Substations	Typical Operating Agreement for Customer Owned Substations
				GIA, Article 5.10	<a href="#">Facility Connection Requirements Website</a>	<a href="#">Facility Connection Requirements Website</a>
			Load following capability	<b>Standard: PM3901 latest rev., §5.10.8</b>	N/A	N/A
			AGC	<b>Standard: PM3901 latest rev., §5.10.8</b>	N/A	N/A
Design requirements that should be addressed include:	4		Reactive power output	<b>Standard: PM3901 latest rev., §5.7.8 and 5.7.9</b>	Typical Operating Agreement for Customer Owned Substations	Typical Operating Agreement for Customer Owned Substations
				GIA, Article 5.10	<a href="#">Facility Connection Requirements Website</a>	<a href="#">Facility Connection Requirements Website</a>
			Minimum operating capability	GIA	Typical Operating Agreement for Customer Owned Substations	Typical Operating Agreement for Customer Owned Substations
			Remote control functions	Facilities requesting remote control functions for any aspect of facility operations would be evaluated under Section 8 of the GIA and Appendix F §4.7 of the Facility Connection Requirements	Facilities requesting remote control functions for any aspect of facility operations would be evaluated under section 8 of the GIA and Appendix F §4.7 of the Facility Connection Requirements	Facilities requesting remote control functions for any aspect of facility operations would be evaluated under section 8 of the GIA and Appendix F §4.7 of the Facility Connection Requirements
			Coordination of generation control system settings	<b>Standard: PM3901 latest rev., §5.8.6</b>	<b>Standard: SL0002, latest rev.</b>	<b>Standard: SL0002, latest rev.</b>
			Load shedding	<b>Standard: PM3901 latest rev., §5.7.6, 5.8.15</b>	Typical Operating Agreement for Customer Owned Substations	Typical Operating Agreement for Customer Owned Substations
				GIA, Article 5.10		
				GIA, Article 13		

If Applicable, Black Start Requirements If Applicable, Black Start Requirements



			Black start capability	If Applicable, Black Start Requirements and Capabilities are Addressed in the Interconnection and Operating Agreement	If Applicable, Black Start Requirements and Capabilities are Addressed in the Interconnection and Operating Agreement	If Applicable, Black Start Requirements and Capabilities are Addressed in the Interconnection and Operating Agreement
		Operational requirements that should be addressed include:	Operation at 60Hz nominal	<b>Standard: PM3901 latest rev., §5.8.15</b>	<b>Standard: SL0002, latest rev.</b>	<b>Standard: SL0002, latest rev.</b>
			Mode of frequency control	GIA Article 5.10, 9.6.2.1 <b>Standard: PM3901 latest rev., §5.10.8</b>	<b>Standard: SL0002, latest rev.</b>	<b>Standard: SL0002, latest rev.</b>
			Operation of generators during frequency decline conditions	GIA Article 5.10, 9.6.2.1	N/A	N/A
			Coordination between generator controls and underfrequency load shedding programs	<b>Standard: PM3901 latest rev., §5.7.6, 5.8.15</b>	N/A	N/A
			Speed droop setting	N/A	N/A	N/A
			Responsibility for coordination with the appropriate operating entity.	<b>Standard: PM3901 latest rev., §5.7.6</b>	Typical Operating Agreement for Customer Owned Substations	Typical Operating Agreement for Customer Owned Substations
Short Circuit Conditions	5	Design requirements that should be addressed include:	Short circuit capabilities of current carrying elements	<b>Standard: PM3901 latest rev., §5.8</b>	<b>Standard: SL0002, latest rev.</b>	<b>Standard: SL0002, latest rev.</b>
			Ratings of interrupting devices	<b>Standard: PM3901 latest rev., §5.8</b>	<b>Standard: SL0002, latest rev.</b>	<b>Standard: SL0002, latest rev.</b>
			Relay and device coordination with existing system protection	<b>Standard: PM3901 latest rev., §5.8</b>	<b>Standard: SL0002, latest rev.</b>	<b>Standard: SL0002, latest rev.</b>
			Existing and planned future fault current levels	<b>Standard: PM3901 latest rev., §5.8</b>	<b>Standard: SL0002, latest rev.</b>	<b>Standard: SL0002, latest rev.</b>
			Responsibility for required changes in existing facilities due to increased fault currents (Generator and Transmission Projects only)	<b>Standard: PM3901 latest rev., §5.8</b>	<b>Standard: SL0002, latest rev.</b>	N/A
			Safety of the general public	<b>Standard: PM3901 latest rev., §5.2, 5.3, 5.4, 5.5, 5.7.6, 5.8</b> <a href="#">Facility Connection Requirements Website</a>	<b>Standard: SL0002, latest rev. §4.0</b> <a href="#">Facility Connection Requirements Website</a>	<b>Standard: SL0002, latest rev. §4.0</b> <a href="#">Facility Connection Requirements Website</a>
			Dynamic stability and the use of power system stabilizers - SERC recommends that power system stabilizers be utilized for certain conditions identified in Attachment 2.	<b>Standard: PM3901 latest rev., §5.7.10</b>	N/A	N/A
			Prevention/minimization of equipment damage	<b>Standard: PM3901 latest rev., §5.7, 5.8</b>	<b>Standard: SL0002, latest rev. §6 and 10</b>	<b>Standard: SL0002, latest rev. §6 and 10</b>

System Protection and Other Controls	6	Design and Operational requirements that should be addressed include:	Minimization of equipment outage time	Standard: SL0002, latest rev. §6 and 10	Standard: SL0002, latest rev. §6 and 10	Standard: SL0002, latest rev. §6 and 10
			Minimization of system outage area	Standard: SL0002, latest rev. §6 and 10	Standard: SL0002, latest rev. §6 and 10	Standard: SL0002, latest rev. §6 and 10
			Minimization of system voltage disturbances	Standard: SL0002, latest rev. §6 and 10	Standard: SL0002, latest rev. §6 and 10	Standard: SL0002, latest rev. §6 and 10
			Maintenance of protective system coverage for abnormal conditions	GIA, Article 10	Typical Operating Agreement for Customer Owned Substations	Typical Operating Agreement for Customer Owned Substations
			Performance of all appropriate studies: grounding, short circuit, stability, power quality, and coordination of protective devices	The GIP describes the process and series of generation interconnections studies which are to be performed. The Facilities Study is customer specific and contains short circuit equipment rating information.	<a href="#">Facility Connection Requirements Website</a>	<a href="#">Facility Connection Requirements Website</a>
				Standard: PM3901 latest rev., §5.8		
			Specification of RTU protocols and other communication channels	Standard: SL0002, latest rev. §10	Standard: SL0002, latest rev. §10	Standard: SL0002, latest rev. §10
			Coordination of remote trip schemes, underfrequency load shedding schemes, undervoltage load shedding schemes and special protective systems should be required whether in the same Balancing Authority Area or different Balancing Authority Areas.	Standard: PM3901 latest rev., §2, 5.8.11	Standard: SL0002, latest rev.	Standard: SL0002, latest rev.
				GIA, Article 9.6.2.1, 9.7.3, 9.7.5	<a href="#">Facility Connection Requirements Website</a>	<a href="#">Facility Connection Requirements Website</a>
				Determined through good engineering judgement and good utility practice during the Project Scoping and Project Execution Phases of PM&C's project management process.	Determined through good engineering judgement and good utility practice during the Project Scoping and Project Execution Phases of PM&C's project management process. Interconnecting parties may be subject to load interruption schemes including frequency, voltage, or other special schemes. Such participation is agreed to and discussed during scoping meetings.	Determined through good engineering judgement and good utility practice during the Project Scoping and Project Execution Phases of PM&C's project management process. Interconnecting parties may be subject to load interruption schemes including frequency, voltage, or other special schemes. Such participation is agreed to and discussed during scoping meetings.
Synchronizing with the transmission system	Standard: PM3901 latest rev., §5.9	N/A	N/A			
Generation specific facility requirements that should be	Parallel operation with the transmission		<a href="#">Facility Connection Requirements Website</a>	<a href="#">Facility Connection Requirements Website</a>		
		Standard: PM3901 latest rev., §1.1	Typical Interconnection Agreement	Typical Interconnection Agreement		

		addressed include:	system		Typical Operating Agreement for Customer Owned Substations Standard: SL0002, latest rev.	Typical Operating Agreement for Customer Owned Substations Standard: SL0002, latest rev.	
			Islanding	Standard: PM3901 latest rev., §5.8.11	N/A	N/A	
Telemetry and Metering	7	Typical metering data requirements could include the following:	kW	Standard: PM3901 latest rev., §5.10	Standard: SL0002, latest rev. §10	Standard: SL0002, latest rev. §10	
			kWh				
			kVAR, leading and lagging				
			kVAR-hour				
			kV2-hour				
			voltage (to monitor voltage schedule compliance)				
			Design requirements that should be addressed include:	Loss compensation	Standard: PM3901 latest rev., §5.10	Standard: SL0002, latest rev. §10	Standard: SL0002, latest rev. §10
		Bi-directionality					
		Metering accuracy					
		Ancillary equipment specifications (e.g., CT's, PT's)					
		Design requirements that should be addressed include:	Provisions for maintenance and calibration	Standard: PM3901 latest rev., §5.10	Standard: SL0002, latest rev. §10	Standard: SL0002, latest rev. §10	
	Data protocol						
	Mode of data transmission (e.g. fiber optic cable, phone line)						
	Provisions for maintaining continuity and meeting reliability criteria						
Supervisory Control and Data Acquisition (SCADA)	8	Typical data requirements could include the following:	Status of interrupting devices	Standard: PM3901 latest rev., §5.11	Standard: SL0002, latest rev.	Standard: SL0002, latest rev.	
			MW flow				
			MVAR flow				
			Voltage at interconnection point				
		Design requirements that should be addressed include:	Communication protocol	Standard: PM3901 latest rev., §5.11	Standard: SL0002, latest rev.	Standard: SL0002, latest rev.	
			Mode of data transmission (e.g. fiber optic cable, phone line)				
	Design requirements that should be addressed include:	Control functionality (breakers, switches, etc.)	Standard: PM3901 latest rev., §5.11	Standard: SL0002, latest rev.	Standard: SL0002, latest rev.		
		Provisions for maintaining continuity and meeting reliability criteria (e.g., dual DC sources, dual port RTUs)					
			Grounding study	Standard: SL0002, latest rev.	Standard: SL0002, latest rev.	Standard: SL0002, latest rev.	
			Compatibility with Transmission Owner's system	Standard: SF0201, latest rev.	Standard: SF0201, latest rev.	Standard: SF0201, latest rev.	

System Grounding	9	Design requirements that should be addressed include:	Construction techniques and inspection requirements (if any) of the Transmission Owner	<b>Standard: SF0202, latest rev.</b>	<b>Standard: SF0202, latest rev.</b>	<b>Standard: SF0202, latest rev.</b>
			Testing	Testing conducted as needed or when operational data suggests testing is warranted	Testing conducted as needed or when operational data suggests testing is warranted	Testing conducted as needed or when operational data suggests testing is warranted
				<b>Standard: SF0101, latest rev.</b>	<b>Standard: SF0101, latest rev.</b>	<b>Standard: SF0101, latest rev.</b>
			Periodic maintenance	Testing conducted as needed or when testing suggests maintenance is warranted	Testing conducted as needed or when testing suggests maintenance is warranted	Testing conducted as needed or when testing suggests maintenance is warranted
				<b>Standard: SF0101, latest rev.</b>	<b>Standard: SF0101, latest rev.</b>	<b>Standard: SF0101, latest rev.</b>
			Personnel safety considerations	<b>Standard: SL0002, latest rev.</b>	<b>Standard: SL0002, latest rev.</b>	<b>Standard: SL0002, latest rev.</b>
			Interconnection of grounding system to Transmission Owner grounding system(s)	<b>Standard: SF0201, latest rev.</b>	<b>Standard: SF0201, latest rev.</b>	<b>Standard: SF0201, latest rev.</b>
				<b>Standard: SF0202, latest rev.</b>	<b>Standard: SF0202, latest rev.</b>	<b>Standard: SF0202, latest rev.</b>
			Transmission line shielding provisions	<b>Standard: TF0401, latest rev.</b>	<b>Standard: TF0401, latest rev.</b>	<b>Standard: TF0401, latest rev.</b>
Arrester applications	<b>Standard: SA0102, latest rev.</b>	<b>Standard: SA0102, latest rev.</b>	<b>Standard: SA0102, latest rev.</b>			
Cathodic protection	<b>Standard: TF0501, latest rev.</b>	<b>Standard: TF0501, latest rev.</b>	<b>Standard: TF0501, latest rev.</b>			
Equipment Ratings	10	Design requirements that should be addressed include:	Identification of general design parameters and practices of Transmission Owner (e.g., shielding, attachment details, surge protection, current-carrying elements, basic insulation levels, etc.)	<b>Standard: PM3901, latest rev.</b>	<b>Standard: SL0002, latest rev.</b>	<b>Standard: SL0002, latest rev.</b>
				<b>Standard: SL0002, latest rev.</b>		
				<b>Standard: SF0201, latest rev.</b>	<b>Standard: SF0201, latest rev.</b>	<b>Standard: SF0201, latest rev.</b>
				<b>Standard: SF0202, latest rev.</b>	<b>Standard: SF0202, latest rev.</b>	<b>Standard: SF0202, latest rev.</b>
				<b>Standard: TF0401, latest rev.</b>	<b>Standard: TF0401, latest rev.</b>	<b>Standard: TF0401, latest rev.</b>
				Other applicable Standards	Other applicable Standards	Other applicable Standards
			Provision for Transmission Owner review of facility design and specifications	GIA, Article 5.2	<b>Standard: SL0002, latest rev. §3</b>	<b>Standard: SL0002, latest rev. §3</b>
References to applicable industry standards (e.g., ANSI/IEEE) for equipment provided by applicant in connection with project	GIA, Article 5.2	<b>Standard: SL0002, latest rev. §3</b>	<b>Standard: SL0002, latest rev. §3</b>			
Special requirements due to atmospheric, geological, seismic, or environmental conditions	Determined through good engineering judgement and good utility practice during the Project Scoping and Project Execution Phases of PM&C's project management and EPC processes.	Determined through good engineering judgement and good utility practice during the Project Scoping and Project Execution Phases of PM&C's project management and EPC processes.	Determined through good engineering judgement and good utility practice during the Project Scoping and Project Execution Phases of PM&C's project management and EPC processes.			

			<a href="#">Facility Connection Requirements Website</a>	<a href="#">Facility Connection Requirements Website</a>	<a href="#">Facility Connection Requirements Website</a>	
		Responsibility for changes to existing transmission system made necessary by the project	GIA, Article 5	Typical Interconnection Agreement Typical Operating Agreement for Customer Owned Substations	Typical Interconnection Agreement Typical Operating Agreement for Customer Owned Substations	
Reactive Power Requirements	11	Design requirements that should be addressed include:	Internal plant systems design (e.g., transformer rating/taps/impedance, cooling systems, generator/exciter rating) should not limit continuous reactive capability.	<b>Standard: PM3901 latest rev., §5.7.8 and 5.7.9</b> GIA, Article 5.10	<b>Standard: SL0002, latest rev.</b> <b>Standard: AM3902, latest rev.</b>	<b>Standard: SL0002, latest rev.</b> <b>Standard: AM3902, latest rev.</b>
			Transmission interconnected equipment should have the tap ranges and selfregulation necessary to accommodate the transmission system's reactive power flow requirements.	<b>Standard: PM3901 latest rev., §5.7.8 and 5.7.9</b> GIA, Article 5.10	<b>Standard: SL0002, latest rev.</b> <b>Standard: AM3902, latest rev.</b>	<b>Standard: SL0002, latest rev.</b> <b>Standard: AM3902, latest rev.</b>
			Load power factor	The Electric Service Agreement or comparable agreement (MW capacity and MVAR billing).	The Electric Service Agreement or comparable agreement (MW capacity and MVAR billing).	The Electric Service Agreement or comparable agreement (MW capacity and MVAR billing).
			Generator power factor	GIA, Article 9.6.1	N/A	N/A
			Load equivalent sources of reactive power, if acceptable	Load equivalent sources are addressed during facility studies and evaluated for effectiveness and compliance with NERC and SERC reliability standards.	Load equivalent sources are addressed during facility studies and evaluated for effectiveness and compliance with NERC and SERC reliability standards.	Load equivalent sources are addressed during facility studies and evaluated for effectiveness and compliance with NERC and SERC reliability standards.
			Generator equivalent sources of reactive power, if acceptable	Generator equivalent sources are addressed during facility studies and evaluated for effectiveness and compliance with NERC and SERC reliability standards.	Generator equivalent sources are addressed during facility studies and evaluated for effectiveness and compliance with NERC and SERC reliability standards.	Generator equivalent sources are addressed during facility studies and evaluated for effectiveness and compliance with NERC and SERC reliability standards.
			Transmission interconnections impact on adjacent areas' reactive power flow requirements	GIP, Section 7.3 <b>Standard: AM3901, latest rev.</b>	<a href="#">Facility Connection Requirements Website</a>	<a href="#">Facility Connection Requirements Website</a>

		Testing to verify reactive support capability per NERC Reliability Standards	GIA, Article 6	N/A	N/A	
	Operational requirements that should be addressed include:	Generator step-up transformer (GSU) tap changes as necessary to meet voltage schedule and reactive support requirements	<b>Standard: PM3901 latest rev., §5.7.8 and 5.7.9</b>	<b>Standard: AM3902, latest rev.</b>	<b>Standard: AM3902, latest rev.</b>	
GIA, Article 5.10						
Range of generator continuous rated MW output associated with reactive support capability (e.g., > 10 MW)		GIA	Typical Interconnection Agreement	Typical Interconnection Agreement		
				Typical Operating Agreement for Customer Owned Substations	Typical Operating Agreement for Customer Owned Substations	
				<b>Standard: SL0002, latest rev.</b>	<b>Standard: SL0002, latest rev.</b>	
	Design requirements that should be addressed include:					
Power Quality	12	Power quality studies to define acceptable operating ranges and limits. Studies may include, but not be limited to:	Voltage Unbalance	<b>Standard: AM3902, latest rev.</b>	<b>Standard: AM3902, latest rev.</b>	<b>Standard: AM3902, latest rev.</b>
			Voltage Flicker	<b>Standard: AM3902, latest rev.</b>	<b>Standard: AM3902, latest rev.</b>	<b>Standard: AM3902, latest rev.</b>
			Voltage Fluctuation	<b>Standard: AM3902, latest rev.</b>	<b>Standard: AM3902, latest rev.</b>	<b>Standard: AM3902, latest rev.</b>
			Harmonic Distortion	GIA, Article 9.7.6	<b>Standard: AM3902, latest rev.</b>	<b>Standard: AM3902, latest rev.</b>
			Transient Overvoltage	GIA, Article 9.7.6	<b>Standard: AM3902, latest rev.</b>	<b>Standard: AM3902, latest rev.</b>
			Temporary Overvoltage	<b>Standard: AM3902, latest rev.</b>	<b>Standard: AM3902, latest rev.</b>	<b>Standard: AM3902, latest rev.</b>
			Temporary Undervoltage	<b>Standard: AM3902, latest rev.</b>	<b>Standard: AM3902, latest rev.</b>	<b>Standard: AM3902, latest rev.</b>
			Insulation Coordination	<b>Standard: SA0102, latest rev.</b>	<b>Standard: SA0102, latest rev.</b>	<b>Standard: SA0102, latest rev.</b>
			Operating Frequency	<b>Standard: PM3901 latest rev., §5.10.8</b>	<b>Standard: SL0002, latest rev.</b>	<b>Standard: SL0002, latest rev.</b>
			Power Factor Range	GIA, Article 5.4	<b>Standard: SL0002, latest rev.</b>	<b>Standard: SL0002, latest rev.</b>
				<b>Standard: PM3901 latest rev., §5.7</b>		
			Interruption/Outage Frequency	GIA, Article 9.7.1, 9.7.2	Typical Interconnection Agreement	Typical Interconnection Agreement
Typical Operating Agreement for Customer Owned Substations	Typical Operating Agreement for Customer Owned Substations					
Studies may identify additional equipment necessary to meet power quality standards.		Feasibility, Impact, or Facilities Studies, or Operating History May Suggest Equipment to be Necessary	Feasibility, Impact, or Facilities Studies, or Operating History May Suggest Equipment to be Necessary	Feasibility, Impact, or Facilities Studies, or Operating History May Suggest Equipment to be Necessary		

			Operational requirements that should be addressed include:	Connection of a generator, transmission facility, or end-user load to a Transmission Owner's system should not unacceptably compromise or degrade the power quality of existing customers.	GIA, Article 9.7.6		
					<b>Standard: AM3902, latest rev.</b>	<b>Standard: AM3902, latest rev.</b>	<b>Standard: AM3902, latest rev.</b>
				Installation of power quality monitoring equipment by the Transmission Owner to verify facility owner/operator compliance with power quality performance requirements	If Feasibility, Impact, or Facilities Studies, or Operating History Suggest Equipment May Be Necessary	If Feasibility, Impact, or Facilities Studies, or Operating History Suggest Equipment May Be Necessary	If Feasibility, Impact, or Facilities Studies, or Operating History Suggest Equipment May Be Necessary
Synchronizing Facilities	13	Design and Operational requirements that should be addressed include:		The responsibility associated with synchronizing generation and transmission facilities to the power system.	<b>Standard: PM3901 latest rev., §5.7</b>	N/A	N/A
				Required communications necessary between the Transmission Owner/Operator and the generation/transmission facility operator.	<b>Standard: PM3901 latest rev., §5.7.6</b>	N/A	N/A
				Synchronizing equipment	<b>Standard: PM3901 latest rev., §5.9</b>	N/A	N/A
				Test plans	GIA, Article 6	Operating Agreements for Customer Owned Substations would include testing requirements, if necessary	Operating Agreements for Customer Owned Substations would include testing requirements, if necessary
				Applicable reclosing requirements and prohibitions for generation and transmission facilities	<b>Standard: PM3901 latest rev., §5.8.14</b>	<b>Standard: SL0002, latest rev.</b>	<b>Standard: SL0002, latest rev.</b>
				Remote synchronizing capability for facilities	<b>Standard: PM3901 latest rev., §5.8.13</b>	<b>Standard: SL0002, latest rev.</b>	<b>Standard: SL0002, latest rev.</b>
				Definition of maintenance programs, responsibilities and performance objectives	GIA, Article 6 <b>Standard: PM3901 latest rev., §5.7.7</b>	Typical Operating Agreement for Customer Owned Substations	Typical Operating Agreement for Customer Owned Substations
	Authorization, notification and clearances for work	GIA, Article 9.8	Typical Operating Agreement for Customer Owned Substations	Typical Operating Agreement for Customer Owned Substations			
		Generation: Such planning should take into account unit commitment obligations, replacement power, and / or contractual obligations.	SOC coordinates maintenance activities of all generation within the Balancing Authority per GIA Articles 9.7.1 and 10.3. <b>Application: AORS</b>	N/A	N/A		

Maintenance Coordination	14	Operational requirements that should be addressed include:	End-Users: The maintenance practices of the end-user on their transmission connected equipment should be performed at a level that ensures the reliability of the interconnected transmission system.	N/A	N/A	<b>Application: AORS</b>	
				N/A	N/A	Typical Operating Agreement for Customer Owned Substations	
			Transmission Interconnections: Requirements (if any) for advanced publication of maintenance schedules, including any need to observe limitations imposed by generation maintenance and dispatch schedules, maintenance of associated facilities, transmission transaction schedules, area protection or voltage requirements.	N/A	<b>Application: AORS</b>	N/A	
					Typical Operating Agreement for Customer Owned Substations		
Maintenance Requirements	15	Operational requirements that should be addressed include:	The facility owner/operator is responsible for the regularly scheduled calibration and/or maintenance of its equipment, including, but not limited to:	Circuit breakers	GIA, Article 10	Typical Operating Agreement for Customer Owned Substations	Typical Operating Agreement for Customer Owned Substations
				Generators			
				Power transformers			
				Protective relays			
Revenue metering							
Communications							
Trip circuits							
Interruption							
Power DC sources							
Grounding system							
Transmission facilities							
		The maintenance practices of the generator and transmission facility owner/operator, and end-user on their transmission-connected equipment shall be performed at a level that ensures the reliability and continuity of service of the interconnected transmission system. Relevant maintenance records should be maintained.	<b>Standard: PM3901 latest rev., §5.7.7</b>	Typical Operating Agreement for Customer Owned Substations	Typical Operating Agreement for Customer Owned Substations		
		Consideration for abnormal voltage conditions	GIA, Articles 9.6, 9.7	Typical Operating Agreement for Customer Owned Substations	Typical Operating Agreement for Customer Owned Substations		
		Consideration for abnormal frequency conditions	GIA, Articles 9.6, 9.7	Typical Operating Agreement for Customer Owned Substations	Typical Operating Agreement for Customer Owned Substations		
		Design requirements that should	Consideration for generators connected through a tapped transmission line (e.g., islanding)	<b>Standard: PM3901 latest rev., §5.8.11</b>	N/A	N/A	



Abnormal Frequency and Voltage Operation	16	be addressed include:	Relay coordination to maintain stability	GIA, Articles 5.10.1, 9.7.5, 24.2	<b>Standard: SL0002, latest rev.</b>	<b>Standard: SL0002, latest rev.</b>
				<b>Standard: PM3901 latest rev., §5.6, 5.7.10, 5.8.5</b>	<b>Standard: SL0002, latest rev.</b>	<b>Standard: SL0002, latest rev.</b>
		Load shedding implementation	GIA, Articles 9.6, 9.7	Typical Operating Agreement for Customer Owned Substations	Typical Operating Agreement for Customer Owned Substations	
		Operational requirements that should be addressed include:	Provisions for abnormal voltage conditions	GIA, Articles 9.6, 9.7	Typical Operating Agreement for Customer Owned Substations	Typical Operating Agreement for Customer Owned Substations
			Provisions for abnormal frequency conditions	GIA, Articles 9.6, 9.7	Typical Operating Agreement for Customer Owned Substations	Typical Operating Agreement for Customer Owned Substations
			Provisions for load shedding	GIA, Articles 9.6, 9.7	Typical Operating Agreement for Customer Owned Substations	Typical Operating Agreement for Customer Owned Substations
			Special procedures for coordination	If during study phase, scoping phase, or execution phase, conditions are discovered which may require special procedures for coordination of protection or control systems, such agreements are adopted into the operating agreement	If during study phase, scoping phase, or execution phase, conditions are discovered which may require special procedures for coordination of protection or control systems, such agreements are adopted into the operating agreement	If during study phase, scoping phase, or execution phase, conditions are discovered which may require special procedures for coordination of protection or control systems, such agreements are adopted into the operating agreement
Inspection Requirements	17	Operational requirements that should be addressed include:	Initial (pre-operational) inspection and approval by the Transmission Owner and/or copies of pre-operational test reports to be provided to the Transmission Owner. Include any requirements for approval by the Transmission Owner prior to commercial operation and options of the Transmission Owner to specify additional testing.	<b>Standard: PM3901 latest rev., §5.7.3, 5.7.7, 5.8.9</b>	<b>Standard: SL0002, latest rev.</b>	<b>Standard: SL0002, latest rev.</b>
				GIA, Articles 5.2, 6, 7, 10		
			If applicable, required right of access to the facility by the Transmission Owner for purposes of conducting inspections, observing tests, and auditing records required by NERC standards and established reporting procedures.	<b>Standard: PM3901 latest rev., §5.7.3, 5.7.7, 5.8.9</b>	<b>Standard: SL0002, latest rev.</b>	<b>Standard: SL0002, latest rev.</b>
				GIA, Articles 5.2, 6, 7, 10		

			Requirements for facility owner/operator to modify operations to reasonably comply with Transmission Owner testing requirements.	GIA, Articles 5.12, 6.2, 6.4	Typical Operating Agreement for Customer Owned Substations	Typical Operating Agreement for Customer Owned Substations
Communications During Normal and Emergency Conditions	18	Operational requirements that should be addressed include:	Provision for a point of contact Each generation and transmission facility operator and end-user facility shall include a provision for establishing a contact person for communications with the appropriate operating entity. This contact person shall have the authority and capability to operate the facilities according to the instructions of the appropriate operating entity.	GIA, Article 15.4	Typical Operating Agreement for Customer Owned Substations	Typical Operating Agreement for Customer Owned Substations
				<b>Standard: PM3901 latest rev., §5.7.6</b>		
			Provision to obtain required approval All Generator Operators shall have provisions to obtain required approval from the appropriate operating entity prior to starting generation and connecting to the transmission system. All Transmission Operators shall obtain proper clearances from the appropriate operating entity before commencing any work on the transmission facilities.	<b>Standard: PM3901 latest rev., §5.7.6</b>	N/A	N/A
			Provision for reliable communication All Generator Operators and all Transmission Operators shall have a provision for reliable communications with the appropriate operating entity. In addition, all Transmission Operators shall have provisions for reliable communications with other Transmission Operators as appropriate.	GIA, Article 8	<b>Standard: SL0002, latest rev.</b>	<b>Standard: SL0002, latest rev.</b>
			Switching operations	GIA, Articles 9.8, 13.4		
			VAR support	GIA, Articles 13.5.1		

Responsibilities During Emergency Conditions	19	The generation and transmission facility operators and end-users shall communicate with and shall cooperate with the appropriate operating entity to support the recovery efforts during emergency conditions. This may include, but may not be limited to (as appropriate):	var support	GIA, Articles 13.5.1	Typical Operating Agreement for Customer Owned Substations	Typical Operating Agreement for Customer Owned Substations
			Adjustments in real or reactive generation net output	GIA, Articles 13.5.1		
			Tripping of generating unit(s)	GIA, Articles 13.5.1, 13.5.2		
			Starting of generating unit(s) including black start units	GIA, Articles 13.5.1		
			Implementation of emergency communication procedures	<b>Standard: PM3901 latest rev., §5.2</b>		
				GIA, Article 8		
Transmission facility restoration efforts	GIA, Articles 9.7.1.3, 13.5					



















