Nashville Electric Service

NES

FACILITY CONNECTION REQUIREMENTS

(FAC-001-3 Compliance)

April 01, 2021

Owner: Planning and Reliability Engineering

Approved by:	Engineering Supervisor - Reliability Compliance	3/17/21 Date
Approved by:	Engineering Manager - Planning and Reliability Engineering	3/18/21 Date
Approved by:	Vice President Operations – Engineering	3/18/2021 Date
Approved by:	Vice President Operations – Power System Operations	3/22/21 Date
Approved by:	Utility Compliance Manager	3/24/21 Date
Approved by:	President & CEO – Reliability Compliance Officer	3-22-2021 Date

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1.0 INTRODUCTION

The purpose of this document is to describe Nashville Electric Service's Facility Interconnection Requirements for End-User, Transmission, and Generation Facilities in compliance with NERC Reliability Standard FAC-001-3 and any associated SERC Supplements. Nashville Electric Service (NES) provides electrical power to its customers within the Davidson County and surrounding areas via a 69kV and 161kV transmission system. NES is registered with NERC under the functions of Transmission Operator, Transmission Planner, and Distribution Provider.

All types of facility connections and modifications are subject to funding justification, cost responsibilities, and approval procedures. This document will address the technical and operational coordination of new and modified connections to the NES transmission system.

It is recognized that while this document provides guidance on the technical issues that must be considered, it should not be considered an all-encompassing set of requirements or as a design specification manual. Specific projects must be reviewed on an individual basis, and final approval of any connection is at the discretion of NES.

This document only addresses the technical requirements of connecting or modifying facilities on the NES system or to adjacent transmission systems when such interconnections have a material impact on the NES system. There is no attempt to address legal matters or liability issues related to connection and/or operation of said facilities.

Prospective customers should also be aware that TVA, which is physically and contractually the electrical supplier to NES' system, will require project specifications to study the project's potential impacts on the TVA system. NES and TVA may communicate during the course of their independent studies, but it is the responsibility of the Customer to provide all necessary data to each organization.

2.0 SCOPE

This document covers the Facility Interconnection Requirements on the NES transmission system for Generation, Transmission and End-user facilities, 100kV and above, in order to promote the safe operation, integrity, and reliability of the NES transmission system as well as ensure compliance with NERC Reliability Standards, SERC Supplements, and NES planning criteria. The material contained in this document is consistent in content and application to those requirements used by NES for connecting its own new or modified generation, transmission, or end-user facilities.

TVA is contractually the electric supplier to NES. Therefore, all Generation Facility interconnections must be coordinated with TVA and adhere to their latest Facility Interconnection Requirements for Generation and Transmission document. This document applies to all generation and transmission facilities which connect to the TVA/NES Bulk Electric System (BES). The facility interconnection requirements for generation and transmission facilities not presently connected, and for modifications of

facilities already connected, are consistent in content and application, whether the facility is owned by TVA/NES or another party. TVA's facility interconnection requirements comply with all applicable codes, standards, federal and state regulations, environmental regulations, siting requirements, contracts, operating agreements, and FERC tariff requirements. Generation and transmission facility interconnections shall comply with all reporting requirements as specified in NERC reliability standards, SERC regional criteria, Interconnection Agreements, and other applicable standards, contracts, and documents. TVA/NES reserves the right to take such actions as deemed necessary to ensure the reliability of the TVA/NES BES.

3.0 PLANNING NEW OR MODIFIED FACILITIES

3.1 Notification

Requestors of new or modified facilities on the NES transmission system should notify NES as early as possible to allow time for appropriate studies and facilitate coordination with area plans. Contact shall be initiated with the NES Energy Services Engineering Section. Formal request should be made in writing by completing the NES "Interconnection Study Request Form" found in Appendix A. Upon receipt of the form, NES will contact the customer within 10 business days.

3.2 System Impact Study

NES will perform a system impact study to assess the impacts of any proposed new or modified facility on the NES transmission system. The study may include, but is not limited to, power flow analysis, short circuit calculations, dynamic stability, and transient studies. System impact studies will determine if the proposed connection or modification will cause a violation of NES planning criteria in accordance with NERC TPL standards regarding thermal overload of transmission facilities or excessive voltage variations.

If violations of the NES planning criteria are identified in the impact study, improvements to the transmission system will be identified as part of the technical coordination phase of the new or modified facility connection point.

At the point in which NES determines that there is, or could be, an impact to a neighboring system, NES will notify the neighboring utility and invite them to participate in the study process.

NES and neighboring utilities may communicate during their independent studies, but it is the responsibility of the Customer to provide all necessary data.

3.3 Information Required

Customers are required to furnish information during the planning phase of a new or modified facility regarding the nature of the load to be supplied as well as certain design parameters of the proposed connected or modified facilities. Information required will include, but is not limited to:

- Customer name and subsequent Substation name if different
- Contact person (name, address, telephone, email)
- Proposed location of facility interconnection or modification
- Project schedule supply voltage
- A One-line diagram of proposed facility interconnection or modification
- Transformer manufacturer test data
- Transmission line configuration, impedance, and thermal ratings
- Peak load anticipated (Initial and 10-year projection)
- Power factor
- Future/ultimate plans
- Special requirements (e.g., motor starting)
- Characteristics of harmonic- or flicker-producing loads
- Preferred connection configuration
- On-site generation plans

Additional information may be required during the technical scoping phase of the proposed new or modified interconnected facilities or modifications.

3.4 Facility Location

NES must agree with the actual physical location of any new or modified facility. The site of the proposed facility should be coordinated with NES. A joint site visit by NES and the Customer is recommended to review location specific issues. Customers are advised not to make actual purchase of property until the site is reviewed by NES for suitability.

3.5 Facility Configuration

New or modified facilities may be connected to the NES transmission system in a variety of configurations. This will be generally based on the location, size, and type of load. Customers at new facilities or desiring to modify their facility interconnection may request enhanced facilities for improved reliability at their cost.

A typical new facility interconnection to the NES transmission system could involve the tapping of a transmission line. The configuration of tapped stations will be determined on a case by case basis. NES will typically provide three manually-operated sectionalizing switches at tapped substations, however, enhanced switching devices, such as motor operated switches, circuit switchers, or circuit breakers may be provided at the Customer's cost if desired. Alternately, NES may provide enhanced switching facilities under certain conditions. Enhanced switching configurations may include remote or automatic control of the switching devices.

A transmission line may be looped through the facility, such that the transmission line's power flow travels across the through bus of the facility. Under this

configuration, the through bus will need to be appropriately sized to handle system power flows. Any switching devices (circuit breakers, interrupters, switches, etc) included in the through bus facilities must be operated and dispatched by NES. Also, NES will require unrestricted use of the through bus, if owned by the Customer, for system load flows.

Any new or modified transmission lines shall meet or exceed the existing transmission line rating per the NES Facility Rating Methodology.

Other new facilities may involve connection to existing substations or involve new switching substations and will be coordinated with the Customer as needed.

4.0 TECHNICAL COORDINATION

NES and Customer will coordinate the various technical issues related to the new and modified facilities as follows:

4.1 Scoping Workshop

For all new or modified facilities, NES will conduct a Scoping Workshop to initiate the design and construction phases of the project. Coordination, review, and approval of the technical scope of the new or modified facilities is performed and documented in the workshop activities. A project schedule is also determined. NES will provide the customer with a One-line and Communications Planning Sheet depicting the power and telecommunications facilities agreed upon in the Scoping Workshop. The Scoping Workshop will not be conducted until after the Customer completes any required property purchase and provides a station one-line diagram.

4.2 System Protection and Other Controls

The proposed new or modified facility shall not adversely affect NES' or TVA's ability to protect its transmission system as well as not unduly impact the reliability of other area customers. The following relay and protective issues shall be coordinated as needed:

1. Review of the relay settings for a facility by NES will be required to ensure compatibility of NES and Customer protection schemes.

2. The Customer shall provide NES a copy of the manufacturer's test report (including zero sequence data) for any power transformer it plans to install in its facilities. NES and Customer shall coordinate proposed transformation impedance, and winding configuration to ensure no adverse impact to the NES protective scheme for the transmission system. Customer's use of an autotransformer must be approved by NES. When grounded-wye connected transformers are to be installed, NES shall determine need and size of neutral reactors if required.

3. Standard protection requirements for Customer's Facilities may include backup protection of the high-side tripping. This is typically provided in the form of a circuit breaker or circuit switcher. NES will review the plans for new or modified facilities to ensure that appropriate backup protection is provided as well as compatibility with the NES protective schemes in effect for the specific location. Although NES will point out any discrepancies in protection, the NES review should not be construed as an endorsement for adequacy for the Customer's own needs. It should be noted that NES does not provide backup protection from remote line terminals for Customer transformer banks.

4. In accordance with NERC Reliability Standards and the associated SERC Supplements, TVA (Tennessee Valley Authority) expects customers of its transmission system to participate in the TVA under-frequency load-shed (UFLS) program. If participation in the load-shed program is deemed needed at the Customer's Facility, TVA will provide the UF relay and associated gang-trip lockout auxiliary relay and Customer shall install. Customer-owned relays shall not be used as part of the TVA UF load shed program due to difficulties in program oversight and maintenance activities.

5. At new or modified facilities where NES has line circuit breakers or other automatic devices and the Customer has step-down transformation, an exchange of secondary circuits and trip circuits between NES and Customer may be required.

6. If end user, transmission, or generation facilities sources are installed or modified on existing TVA facilities, then requestor will have to follow TVA Facility Interconnection Requirements. These documents can be found at http://www.oatioasis.com/tva or from NES upon request.

7. On NES transmission lines that are protected with high-speed pilot protection, it is possible especially with large wye-connected grounded or autotransformers, that the remote pilot tripping elements protecting the transmission line will detect faults on or near the distributor's sub-transmission and/or distribution buses, which would result in erroneous relay operation of NES transmission lines. In these cases, NES may need to install a blocking relay and communications equipment in the Customer's Facility.

4.3 Drawing Requirements

Customer shall provide to NES a one-line diagram and general arrangement plan for the new or modified Facility. A relay plan may also be needed if sufficient relay information is not included in the one-line diagram. The drawings provided should depict equipment data, breaker and switch configuration, and protective relay zones. The transformation planned needs to be appropriately described by

including capability ratings, winding configuration, voltage levels and available tap ranges.

4.4 Equipment Ratings
Customer should determine equipment ratings such as load carrying capacity and insulation ratings for its Facility in accordance with Good Utility Practice. NES does not dictate the ratings of Customer-owned equipment except as they directly affect the performance of the NES transmission system. Through Bus facilities must be of appropriate capability to handle anticipated transmission line flows and/or be of equivalent capacity as the connected transmission line.

4.5 System Grounding
Customer shall design its Facility grounding in accordance with Good Utility Practice to ensure safe operation. Interface of NES and Customer grounding such as substation ground mats, fencing, or overhead static wire systems shall be coordinated as appropriate.

The Substation grounding design shall meet ANSI/IEEE Std 80, ANSI/IEEE Std 81, ANSI/IEEE Std 142, ANSI C2. Calculated step and touch potentials shall be less than the maximum allowable values calculated per ANSI Std 80. The calculations should include allowances for system load growth as well as load growth at this facility.

The ground grid shall extend a minimum of 3 feet outside the fenced area.

All below ground connections shall be exothermically welded. All above ground connections shall be bolted.

4.6 Insulation and Insulation Coordination
Insulation coordination is the selection of insulation strength. Insulation coordination must be done properly to ensure electrical system reliability and personnel safety. Basic Surge Level (BSL), surge arrester, conductor spacing and gap application, substation and transmission line insulation strength, protection, and shielding for Customer's Facility shall be in accordance with industry standards, documented and available for NES review.

4.7 Standards and Review
Customer's Facility system shall meet standards of Good Utility Practice, shall be capable of continuous supply from the NES transmission system, and shall include one or more switching devices capable of disconnecting the Facility from NES Interconnection Facilities. Said switching devices must allow a means to physically and visibly isolate the new facility from the NES transmission system. The Facility shall be capable of satisfactory coordination with any protective, monitoring, and control equipment installed by NES and shall be consistent with Customer's one-line diagram as reviewed and approved by NES.

NES installed Interconnection Facilities shall likewise be designed and constructed in accordance with Good Utility Practice and plans and specifications will be consistent with the NES System Planning Sheets and Communications Planning sheets as reviewed and coordinated with the Customer.

Any proposed variation of agreed upon scope of the new facilities by either Customer or NES shall be appropriately coordinated. Reasonable notice for changes must be provided or schedule delay may result.

4.8 Provisions for Future Change

Both NES and Customer shall recognize that future changes in the NES interconnection Facilities and the Customer's Facility may be required. Reasonable notice and adequate time should be provided to ensure proper coordination of plans. Initial development of New Facilities should consider an ultimate configuration to as much extent as possible. In cases in which NES is making modifications to new or existing facilities or becomes aware of customer's modifications to new or existing facilities, NES will notify its neighboring utilities as soon as possible.

4.9 Telecommunications and Metering

Revenue metering shall be required as appropriate for new facilities. The customer is responsible for installing instrument transformers, test boxes, and control cable.

Typical metering data requirements include MW, MWh, MVAR, MVARh and kV. NES shall inform the facility owner of the design requirements including loss compensation, bi-directionality, metering accuracy, ancillary equipment specification, provisions for maintenance and calibration, data protocol, mode of data transmission, and provisions for maintaining continuity and meeting reliability criteria.

A voice telephone extension for the purpose of accessing NES' dial-up metering equipment and for communicating with NES' System Operation Center shall be provided by the Customer at its expense.

4.10 Voltage, Reactive, and Power Factor Control

New facilities shall be designed to operate within reasonable voltage variations provided by the NES transmission system. NES makes every effort to operate its transmission system to conform to contractual facility voltage levels, which are as follows: Under normal operating conditions, facility voltages should fall within five percent above or below the normal operating delivery voltage for deliveries of 69-kV and higher. Under emergency operating conditions, facility voltages should fall within seven percent above or below the normal operating voltage. New facilities should have tap ranges and regulation equipment necessary to operate within these voltage limits. However, these voltage levels do not apply to temporary abnormal system conditions, which can result in much lower or higher

voltages. Consequently, the facilities should be designed for protection outside these contractual voltage levels. NES makes every effort to limit its transmission voltages to no less than 95 percent of nominal voltage during single contingency events and 93% during multiple contingency events.

Customers at new facilities should operate their facilities such that the power factor at the facility is never less than 0.95 lagging at all times. During the lowest 60-minute consecutive demand period of each month, Customer's power factor should not go leading. Minimum demand periods of less than 25 percent of the monthly peak demand are excluded from leading power factor requirements. Any operation outside of these power factor limits will result in reactive billing penalties.

4.11 Generation Control

New or modified facilities may involve some form of distributed generation or co-generation. Generation Facility connections at 100kV and above must be coordinated with TVA and adhere to their Facility Interconnection Requirements documents found at http://www.oatioasis.com/tva or from NES upon request.

4.12 Supervisory Control and Data Acquisition (SCADA)

NES typically does not require remote control ability or remote indication of Customer's facilities. However, where NES installs or has operational control of line breakers or motorized switching devices, SCADA will be provided by NES. In such cases, remote control and/or indication by NES of Customer facilities may be desirable. Also, for large industrial loads, SCADA facilities may be required for coordination of loading issues.

4.13 Short Circuit Conditions

New facilities and modified must be designed to withstand maximum short circuit conditions provided by the NES transmission system. During the scoping phase for a new facility, NES will provide both present and future fault current data anticipated.

4.14 Power Quality

New loads connected to the TVA transmission system must not adversely affect TVA's ability to provide an acceptable level of power quality to other connected loads. Voltage unbalance, flicker, voltage change, harmonic distortion, temporary over or under-voltages and transient over-voltages can adversely impact other loads. New loads must adhere to the following power quality criteria. A general summary of these requirements includes:

Voltage Flicker – Customer facilities shall limit voltage fluctuations (flicker) at the Point of Common Coupling (PCC) to acceptable levels consistent with IEEE 1453 entitled "Recommended Practice for Analysis of

Fluctuating Installations on Power Systems", as such standard may be revised, modified, or replaced from time to time.

Voltage Change – Customers shall limit rapid voltage changes (RVC) due to infrequent events such as motor starting, capacitor switching, transformer energization, etc. to levels consistent with Table 3 of IEEE 1453 entitled "Recommended Practice for Analysis of Fluctuating Installations on Power Systems", as such standard may be revised, modified, or replaced from time to time.

Harmonic Distortion – Customer facilities shall limit production of total harmonic current distortion (THCD) and individual harmonic current distortion injected into the NES transmission system to the levels specified in Tables 2 through 5 as applicable in IEEE Standard 519 entitled "Recommended Practice and Requirements for Harmonic Control in Electric Power Systems", as such standard may be revised, modified, or replaced from time to time.

5.0 CONSTRUCTION OF NEW FACILITIES

Construction of New facilities should conform to Good Utility Practice and be implemented in a safe manner.

5.1 Customer Responsibilities

During the construction phase of the new facility, NES expects the Customer to:

1. Install metering CTs, VTs, test boxes, control cable (all of which are provided by NES except in the case of metal-clad switchgear)

2. Provide and install all conduit required by NES for metering, SCADA, and/or automatic control schemes

3. Cooperate in the installation of NES-provided sectionalizing switches on substation pull-off structures or other structures as deemed appropriate

4. Install TVA-provided under-frequency relays and associated auxiliary relays

5. Provide 120 VAC service to NES revenue metering, monitoring, SCADA, and switching facilities as required

6. Provide 125 VDC service to NES motorized switching devices as required

7. Participate in the connection between NES transmission system ground (static) wire and Facility's overhead static wire if appropriate

Other participation in the construction of the facilities by the Customer may be needed for special situations.

5.2 Point of Interconnection

The typical transition point between NES Interconnection Facilities and Customer Facilities will be at the jumper connection of the station's pull-off structure if the new facilities are supplied by a NES transmission line connection. NES will provide and install the new transmission line connection, including the complete dead-end assembly and all hardware to attach to the Customer's pull-off structure. The jumper between the transmission line and the facility represents the beginning of the substation facilities and where the facility ownership by the Customer begins. For facilities where the ownership transition is made within a switchyard, such transition point shall be mutually agreed upon between NES and Customer.

5.3 NES Equipment Located on Customer's Facility

Customer is required to allow permission to NES for locating any required transmission line, static wire, or switch structures and associated guys on Customer's property. NES will coordinate the plans for any such facilities with Customer for its review and approval.

5.4 Inspection Requirements

Prior to energization, NES will inspect and review all NES-provided and NES-installed interconnection Facilities and the Customer's Facility in accordance with NES' Construction Standards. Customer shall inspect and review its Facility in accordance with Good Utility Practice.

6.0 OPERATION AND MAINTENANCE OF NEW FACILITIES

Customer shall operate and maintain its Facility so as not to impact the reliability of the transmission system. Customer shall grant NES access to NES facilities (e.g., revenue meters, underfrequency relays, etc.) located in its Facility to allow operation and maintenance activities as required by NES.

6.1 Synchronizing Facilities

If Customer's Facility involves a source of electric power by way of connection to generation or other transmission, then synchronizing of TVA's Interconnection Facilities and the Customer's Facility shall be guided by "TVA's Facility Connection Requirements Document - Generation and Transmission."

6.2 Maintenance Coordination

The Customer at a new delivery point should maintain its Facility in accordance with Good Utility Practice in a safe and reliable manner so as not to adversely impact the NES transmission system. Special emphasis should be placed on Through Bus facilities as the performance of that equipment directly impacts the transmission system. NES will be responsible for maintaining the transmission facilities connecting the Customer's facilities with the transmission system.

Maintenance activities by either party may require an outage to the delivery point. Customer shall coordinate any needed outages as well as any maintenance issues with NES System Operations.

6.3 Abnormal Frequency and Voltage Operation

During periods of abnormal frequency, load interruption may occur at facilities where Customers participate in the TVA under-frequency load shed (UFLS) program. Resetting the lockout relay following a UF trip is not allowed until permission is received from TVA. Customers may install under-frequency or under-or over-voltage protection if needed to protect its Facility and loads supplied.

6.4 Communications and Responsibilities during Normal and Emergency Conditions

Customers shall develop a working relationship with NES Transmission System Operators and System Operations to coordinate operating and maintenance needs. In case of failure of communication or in an emergency involving hazard to life or property, Customers shall take the necessary prompt action. Reporting of such actions shall be made to NES System Operations as soon as possible. Customer shall supply NES with at least one phone number for normal and off-hours contact.

All NES customers that are connected to the 161 kV and 69 kV systems are considered Platinum or Platinum Plus Customers. All customers in these classes are assigned an Account Manager who works in Energy Services Engineering. These customers are given business and cell phone numbers, as well as, an email address for their Account Managers. These customers can contact their Account Manager at any time to report any problems they are experiencing including operating issues. The NES Account Managers have at least one face to face meeting with their respective Platinum and Platinum Plus customers each year to go over contract issues and outage reporting procedures.

In addition to customers connected to the 161 kV and 69 kV systems in this customer class having access to their Account Manager, they are given a means to contact System Operations directly if they are experiencing power operating problems.

7.0 MAKING AN OFFICIAL REQUEST

To initiate a System Impact Study and/or Interconnection Cost Estimate, the Customer must provide the requested information in its entirety on the NES Interconnection Study Request Form found in Appendix A. NES will not proceed with an interconnection study or a project cost estimate until all data is received.

Interconnection study results are dependent on study data provided by the customer. Notification of any changes to data must be provided as promptly as possible. Any

change in the study data can impact the length of time required for the study and the study results.

The Request Form should be mailed to:

Nashville Electric Service, Attention: Energy Services
1214 Church Street, Nashville, TN 37246

Alternative methods may be suggested on the form

Upon receipt of the request, the customer will be contacted by NES within 10 business days to initiate communication and confirm receipt. The Request Form should designate a subject matter expert who can adeptly answer questions about the proposed project and technical equipment specifications.

8.0 DEFINITIONS OF TERMS

Terms used in this document include:

1. Customer – the requestor of a facility. In this document, it is assumed that the Customer will also be the owner and operator of the facilities to be connected to NES' transmission system; however, in some cases this may not be so.

2. Facility – the Customer's facilities to be provided as its part in developing the new facilities for supplying load from the NES transmission system.

3. NES Interconnection Facilities – facilities provided and owned by NES to provide a connection point for Customer's Facility from NES' transmission system as part of developing a facility for supplying load.
4. New Facilities – includes both NES Interconnection Facilities and the Customer's Facilities.

5. Good Utility Practice - Good, modern practices and procedures for generally accepted by the electric utility industry designing, operating, and maintaining utility facilities

6. Scoping Workshop - A meeting to develop the technical scope of a capital project prior to design and construction. The workshop is a part of the scoping process that may include a site visit and other coordination before and after the scoping meeting between the parties involved.

7. Through Bus - substation facilities related to the loop supply of a station where the power flow on the connected transmission system can flow across. Circuit breakers and switches are considered part of Through Bus.

9.0 Revision and Review Statement and Tables

This standard shall be reviewed by the Planning and Reliability Engineering Section and approved by the Reliability Compliance Engineering Supervisor, Planning and Reliability Engineering Manager, Vice President of Operations-Engineering, Vice President Operations-Power System Operations, Utility Compliance Manager and the Reliability Compliance Officer on a periodic basis or as conditions change. This document will be made available publicly through the NES website, http://nespower.com, under the "myBusiness" tab and "Apply for Service" link.

Revision History

Rev	Author	Date	Description of Change(s)
1	Andy Foster - Senior Engineer	9-1-2010	Created
2	Bruce Mackie – Engineering Supervisor	9-17-2010	Revised per mock audit to include process and self-application statement
3	Andy Foster – Engineering Supervisor	11-12-2012	Updated to include references to NERC TPL standards and TVA documentation
4	William Allen – Senior Engineer	11-8-2013	Revised for FAC-001-1
5	Shane Ford – Senior Engineer	4-22-2015	Updated per NES 2014 Mock Audit
7	Bruce Fennell – Senior Engineer	8-12-2020	Updated for FAC-001-3 and referenced TVA's FIR Gen and Transmission document
8	Bruce Fennell – Sr. Engineer	4-1-2021	Updated for FAC-003-3 and TVA Interconnection Documentation

Review History

Rev	Reviewer	Date	Comments
4	Andy Foster – Engineering Supervisor	12-18-2014	No Comments
7	Andy Foster – Engineering Supervisor	8-12-2020	

Appendix A

NES Interconnection Study Request Form

Prospective Interconnection Customers must fully complete the following form. NES will not proceed with an interconnection study until all data is received.

The Request Form should be mailed to:

Nashville Electric Service,
Attention: Energy Services Engineering Manager
1214 Church Street, Room 200
Nashville, Tennessee 37246

Please contact Energy Services Engineering, 615-747-3775, for questions concerning the form.

1. Requestor of Interconnection Study

Customer Name: _____

Address: _____

_____

Phone Number: _____

Application Submitted By: _____

Position: _____

Phone Number: _____

E-mail Address: _____

Date: _____

2. Description of Request

a) Type of Request (check one)

Transmission Connection _____

Generation Connection _____

End-User Connection _____

b) Capacity (MW): Initial _____ 10 Year _____

3. Details of Request

a) Location of Interconnection _____

b) Single Line Diagram

Attach a single line diagram and general site plan dimensioned in miles, illustrating the proposed Customer switchyard and the distance of the proposed point of interconnection from the nearest substation or transmission line.

c) Expected In Service Date (ISD): _____

d) Does customer expect to build a tap line?_____

4. Generator Specifications (if applicable)

a) Type of Generator (simple cycle, combined cycle, co-generation, etc)

_____

b) Generator Rating: _____ MW at _____ °F

c) Expected Load Factor of Generation: _____

d) Generator Base MVA: _____

e) Generator Active Power Output (full load MVA): _____

f) Generator Reactive Power Output (MVAR): _____

i. Maximum Reactive Power Output: _____

ii. Minimum Reactive Power Output: _____

g) Generator Rated Terminal Power Factor:

i. Lagging: _____

ii. Leading: _____

h) Generator Rated Terminal Voltage in kV: _____

i) Provide all applicable Generator reactances in per unit on specified MVA base:

i. Xd (direct axis synchronous reactance): _____

ii. Xd' (direct axis synchronous transient reactance):

_____

iii. Xd" (direct axis synchronous sub-transient reactance:

_____

iv. Xq (quadrature axis synchronous reactance):

_____

v. Xq' (quadrature axis synchronous transient reactance):

_____

vi. Xq" (quadrature axis synchronous sub-transient reactance):

_____

vii. Xl (leakage reactance): _____

j) Positive sequence reactance in per unit: _____

k) Negative sequence reactance in per unit: _____

l) Zero sequence reactance in per unit: _____

m) Neutral grounding resistor in ohms (if applicable): _____

n) RPM: _____

o) Frequency: _____

p) Phase (check one): single phase _____ three phase _____

5. Circuit Breaker Data (if applicable)

a) Rated voltage in kV: _____ (max line-to-line RMS at 60 Hz)

b) Rated Amps: _____ (max continuous RMS at 50 Hz)

c) Interrupting current rating: _____

d) Rated interrupting time: _____

e) BIL rating: _____

f) Interrupting and insulating media: _____

g) Tripping and closing control voltages: _____

h) Relay accuracy class: _____

i) Cycles required for interrupting: _____

6. Transformer Data (if applicable)

A. Two-winding step-up transformer

1) Base MVA: _____

2) Full Load Ratings (OA/FA/FOA): _____

3) Sequence Impedances (R + jX) in per unit:

Positive: _____

Negative: _____

Zero: _____

4) Available Tap positions: _____

5) Rated Voltage in kV:

High Side: _____

Low Side: _____

6) X/R ratio: _____

7) Neutral Grounding Resistor in Ohms (if applicable): _____

8) BIL Rating: _____

9) Impedance to Ground: _____

10) Load losses in watts: _____

B. Three-winding step-up transformer (provide connection and winding information on a one-line diagram)

1) Provide the following:

a. H-winding data

i. Full Load MVA Rating (OA/FA/FOA): _____

ii. Rated kV Base: _____

iii. Grounding Data: _____

iv. BIL Rating: _____

b. X-winding data

i. Full Load MVA Rating (OA/FA/FOA): _____

ii. Rated kV Base: _____

iii. Grounding Data: _____

iv. BIL Rating: _____

c. Y-winding data

i. Full Load MVA Rating (OA/FA/FOA): _____

ii. Rated kV Base: _____

iii. Grounding Data: _____

iv. BIL Rating: _____

2) Provide Sequence Impedances (R + jX) in per unit:

a. H-X winding data for _____ base MVA:

i. Positive: _____

ii. Negative: _____

iii. Zero: _____

iv. Tap Positions: _____

b. H-Y winding data for _____ base MVA:

i. Positive: _____

ii. Negative: _____

iii. Zero: _____

iv. Tap Positions: _____

c. X-Y winding data for _____ base MVA:

i. Positive: _____

ii. Negative: _____

iii. Zero: _____

iv. Tap Positions: _____

7. Required Information Concerning Large Motors (if applicable)

a) Size: _____

b) Motor Type: _____

c) 1 or 3 phase: _____

d) Voltage: _____

e) Maximum Locked Rotor kVA: _____

f) Starting Power Factor: _____

g) Full Load Power Factor: _____

h) Frequency of Starting or putting motor under extreme load: _____

8. Required Information Concerning Large Welders (if applicable)

a) Size: _____

b) Welder Type: _____

c) 1 or 3 phase: _____

d) Voltage: _____

e) Maximum Instantaneous Demand: _____

Power Factor at Maximum Instantaneous Demand: _____

f) Frequency of Operation: _____

g) Are any other welders or large motors in this operation? _____

h) If more than one large welder is installed, will more than one be welding at the same time? _____

General description of operation:

_____

9. Additional Information: