FACILITY CONNECTION REQUIREMENTS

Henderson Municipal Power and Light

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0	08/05/08	J. Pasierb	Initial Document
1	10/27/08	J. Pasierb	Changed voltage from 138kV to 161kV.
2	3/9/10	J. Janes	General formatting issues.
3	8/4/10	J.Pasierb/ T. Konsler	Clarified study process Sections 1.3, 1.4 and 1.5. Updated internal section references throughout. Added Communications to Section 4.6.
4	11/1/11	B. Bickett	Consolidated, reordered, and updated sections with detail applicable to SERC Regional Criteria. Removed Interconnection Study Request Form at end of document.

1.0 INTRODUCTION

General Purpose and Goals

This document defines the requirements for connecting transmission, generation, or end user (load serving) facilities to the Henderson Municipal Power and Light (HMPL) Transmission System. The requirements established in this document are intended to establish a basis for maintaining reliability, power quality, and a safe environment for the general public, power consumers, maintenance personnel and the equipment. HMPL endeavors to maintain the highest level of reliability in electric service that satisfies the average customer's service requirements at a reasonable cost.

The North American Electric Reliability Corporation (NERC), and the ten (10) regional reliability councils, has established planning criteria which must be met to assure reliable service to all areas of the United States. More detailed criteria are needed within each operating system to satisfy the requirements specific to that area. It is recognized that while this document provides guidance on the technical issues that must be considered it should not be considered as an all-encompassing set of requirements. Specific projects must be reviewed on an individual case by case basis. This document should not be considered as a design specification manual and therefore all final designs are subject to the approval of HMPL.

Further, this document only covers the technical requirements of connecting facilities to the Transmission System. There is no attempt to address legal matters or liability issues. This Facility Connection Requirements document is revised from time to time to reflect changes or clarifications in planning, operating, or interconnection policies.

Application of this Document

The requirements set forth in this guide apply to HMPL as well as all other entities who wish to interconnect generation, transmission, or end-use facilities to the HMPL owned Transmission System. It applies only to facilities that are connected to the transmission grid at voltages 69 kV and above. Within this document, the entity requesting interconnection service is referred to as the "Customer".

1.1 Definitions and Abbreviations

Definitions:

Wherever used in this document with initial capitalization, the following terms shall have the meanings as specified below.

Capacity

The seasonal maximum generating capability of the Facility, measured in megawatts.

Customer

Any entity desiring to interconnect generation, transmission or end-use facilities to HMPL.

Distribution Facilities

The facilities rated at less than 69 kV which are operated by HMPL, and which are necessary to connect the Facility to the Transmission System.

Emergency Condition(s)

A condition or situation (i) that in the judgment of either Party is imminently likely to endanger life or property; (ii) that in the sole judgment of HMPL is imminently likely to affect adversely or impair the Transmission System or imminently will affect or impair the transmission systems of others to which the Transmission System is directly or indirectly connected; or (iii) that in the sole judgment of the Generator Owner is imminently likely to adversely affect or impair the Facility. Such a condition or situation includes, but is not limited to, overloading, or potential overloading of, excessive voltage drop, or other unusual operating conditions on the Transmission System or the Generator Owner's Facility such that the output of the Facility must be shutdown or curtailed to avoid damaging the Facility or the Transmission System.

<u>Facility(ies)</u>

The generator unit(s) and the equipment related to the operation of the unit(s) and the Interconnection Facilities on the Generator Owner's side of the Interconnection Point.

<u>Good Utility Practice</u>

Any of the applicable practices, methods, standards, guides or acts: required by any Governmental Authority, regional or national reliability council, or national trade organization, including NERC, SERC, or the successor of any of them, as they may be amended from time to time whether or not the Party whose conduct is at issue is a member thereof; otherwise engaged in or approved by a significant portion of the electric utility industry during the relevant time period which in the exercise of reasonable judgment in light of the facts known or that should have been known at the time a decision was made, could have been expected to accomplish the desired result in a manner consistent with law, regulation, good business practices, generation, transmission and distribution reliability, safety, environmental protection, economy and expediency. Good Utility Practice is intended to be acceptable practices, methods, or acts generally accepted in the region, or any other acts or practices as are reasonably necessary to maintain the reliability of the Transmission System, or of the Facility, and is not intended to be limited to the optimum practices, methods, or acts to the exclusion of all others.

Governmental Authority

Any federal, state, local or other governmental, regulatory or administrative agency, court, commission, department, board, or other governmental subdivision, legislature, rulemaking board, tribunal, arbitrating body, or other governmental authority.

Interconnection Facilities

All structures, facilities, equipment, devices and apparatus owned or leased by, or under contract to either Party presently in place or proposed to be installed, which facilities are necessary to interconnect and deliver energy from the Facility(ies) to the Transmission System pursuant to the terms and conditions of a Generator Interconnection & Operating Agreement.

Interconnection Point

The point at which the Facilities are physically connected to the Transmission System (including any Distribution Facilities required to facilitate the interconnection).

Metering Equipment

All metering equipment currently installed at the Facility and/or any other metering equipment to be installed at the metering points designated in the Interconnection Facilities, including Revenue Meters.

Transmission System

The facilities owned, controlled and operated by HMPL that are used to provide transmission service.

Abbreviations:

Wherever used in this document with initial capitalization, the following terms shall have the meanings as specified below.

HMPL	Henderson Municipal Power and Light
ANSI	American National Standards Institute
SIS	System Impact Studies

GSU	Generator Step-up Transformer
IEEE	Institute of Electrical and Electronic Engineers
NERC	North American Electric Reliability Corporation
PCC	Point of Common Coupling
PSS	Power System Stabilizer
SERC	SERC Reliability Corporation
THD	Total Harmonic Distortion

2.0 INTERCONNECTION PLANNING AND COORDINATED JOINT STUDIES

System Impact Studies (SIS) must be performed to determine the feasibility of proposed interconnection and requirements that will be needed to connect the facility to the Transmission System.

SIS(s) are conducted to determine the specific requirements for connecting to the Transmission System. The connection of the facility to the Transmission System may result in modifications at the location of the connection point as well as at remote locations due to changes in such things as load flow or short circuit capability. The effect of system stability and transfer capability will be reviewed in these studies. System interconnection studies are normally done by performing a detailed SIS.

The Customer is responsible for all costs associated with HMPL performing studies to determine the feasibility of proposed interconnection and requirements for connecting to the HMPL Transmission System. In general, a deposit may be required for a SIS. Should the cost of the studies exceed the deposit, the Customer shall reimburse HMPL for those costs that the Customer is responsible for paying. HMPL will refund any monies above the actual costs incurred. The cost of the studies can vary significantly depending upon the complexity of the proposed facility and the impact that it can have on the transmission grid.

If HMPL determines during the study process that Big Rivers Electric Corporation may be impacted by any addition to the HMPL Transmission System, they will be invited to participate in the study process.

2.1 System Impact Study/ Facility Study

A System Impact Study is performed to determine the requirements for connecting to the Transmission System. Prior to HMPL beginning the SIS, the Customer must submit a request for interconnection to HMPL with complete and accurate information. It is critical at this juncture that complete information is received.

Upon receipt of the interconnection request, HMPL will perform a SIS and if needed, a more thorough Facility Study (FS). These studies will identify all the requirements and conditions for the Customer to interconnect to HMPL's Transmission System including upgrades required on the existing system. A detailed review of short circuit (fault duty), stability, load flow, and transfer capability analyses will be required. HMPL will develop and provide cost estimates for the facilities required to interconnect with the Transmission System to the Customer.

The load flow and short circuit studies performed will use base cases from the annual regional model update process, while the stability analysis will utilize models that are developed for members of SERC. These studies will be conducted according to NERC Reliability Standards and will consider outages and impacts on HMPL and possibly to the surrounding interconnected transmission systems.

The typical time-line for a SIS completion is 90 days, but this can vary depending on the complexity of the project.

It is understood that the Customer is responsible for all costs associated with the impact studies and making the improvements identified by the studies if the project moves forward.

During the review process, if HMPL determines an impact to a neighboring system, HMPL will notify the impacted system and invite them to participate in the study process.

3.0 NOTIFICATION OF NEW OR MODIFIED FACILITIES

All potential interconnection Facility Connection inquiries shall be directed to the Transmission and Distribution Manager at HMPL. Following the initial contact regarding a proposed Interconnection or End-User facility connection, when the proposed location and power level are established, a plan of service will be prepared and system impact studies will be performed by HMPL. All specific information needed to develop a plan of service and to conduct the studies will be identified and provided to HMPL at this point.

During the review process for any additions or modifications to existing facilities, HMPL will notify Big Rivers Electric Corporation as soon as feasible. Other neighboring transmission system owners/operators may be included as appropriate. Any change in the Customer's transmission and substation facilities interconnected to the Transmission System made subsequent to the in-service date of the generation, transmission, or end use interconnection must be reviewed and approved by HMPL.

HMPL or the Customer shall notify the other in advance of any changes in their respective facilities, which reasonably can be expected to affect the proper coordination of protective devices of either party.

In no event shall HMPL be obligated to pay all or any part of the costs resulting from any relocation or rearrangement of the Interconnection Facilities, which is initiated by the Customer. HMPL and Customer shall discuss proposed relocation and rearrangement of the Interconnection Facilities prior to the commencement of such relocation or rearrangement.

4.0 VOLTAGE LEVEL AND MW/MVAR CAPACITY OR DEMAND

HMPL and the Customer will discuss, in specific detail, the available voltages, MW & MVAR capacity at the point of interconnection and this information shall be included on the preliminary request form.

4.1 System Stability

The Generator shall operate its Facility(ies) with the appropriate safeguards and stabilization systems and other protective equipment necessary to protect and prevent damage to HMPL's Transmission System, including operating the Facility generator unit with its speed governors and voltage regulators in service at all times. Should automatic functions not be available or should they fail to operate, including any voltage regulator, the Generator shall immediately notify HMPL. The Generator shall repair these same systems as quickly as it is reasonably possible to do so, dependent upon the availability of replacement systems or parts and the stability of the Transmission System. The Generator shall accept any operating restrictions necessary during the outage of automatic function of such equipment. The Generator shall be responsible to protect its own facilities against instability resulting from disturbances on the Transmission System.

A stability analysis is required for all proposed generating units to be connected with the Transmission System. The NERC Reliability Standards related to Transmission Planning describe various requirements and are summarized in the "TPL" standards. The unit modeling data and equipment testing requirements are covered under the NERC Reliability Standards that pertain to Modeling, Data, and Analysis. HMPL has accepted these NERC Reliability Standards, and the follow-up measures defined by SERC, as minimum requirements.

A Power System Stabilizer (PSS) is required on all units 50 MVA and larger to ensure positive damping of power oscillation resulting from a Disturbance. It would be the Interconnecting Customer's responsibility to have PSS tuning study performed to determine gain and lead/lag time constants along with commissioning.

HMPL will provide standard model/data sheets for the vendor to supply various generator equipment data during the initial stages of a project. It is recognized that this type of detail data may not be readily available in the final form during preliminary stages of a project. In that case, estimated, typical or preliminary data is acceptable for a preliminary study. However, unit specific data is necessary to determine Customer's requirements and the preliminary study must be updated when appropriate data is made available. Operating restrictions may be placed based on the final, updated study results. Also, it is the generator owner's responsibility to perform required tests to verify various generating equipment models and data as required by the NERC Reliability Standards.

4.2 Reactive Power Output

Generator facilities connecting directly to the Transmission System at 69 kV or higher voltages will comply with all applicable NERC Reliability Standards, and the generator's Interconnection Agreement, as such documents may be amended from time to time, with regard to voltage support and supply of reactive power to the Transmission System. All generator facilities connecting to the Transmission System at 69 kV or higher voltages shall operate in automatic voltage regulation. A generator voltage regulator is required to be in service and in automatic mode whenever the generator is synchronized to HMPL's Transmission System. Unless otherwise directed by HMPL, the automatic voltage regulator shall, within the reactive capabilities of the generator, control the voltage output pursuant to the voltage schedule prescribed by HMPL. HMPL shall have the right to alter the voltage schedule as the system operating conditions may require from time to time.

When HMPL declares an Emergency Condition on its Transmission System or on an adjacent transmission system, HMPL shall have the authority to direct the Generator to increase or decrease real power production (measured in MW) and/or reactive power production (measured in MVAr), within the design and operational limitations of the Facility equipment in service at the time, in order to maintain Transmission System security. In the event of a declaration of an Emergency Condition, a determination: (i) that the Transmission System security is in jeopardy, and (ii) that there is a need to increase or decrease reactive power production, even if real power production is adversely affected, will be made solely by HMPL. The Facility operator will honor HMPL's orders and directives concerning Facility real power and/or reactive power output within the design limitations of the Facility's equipment in service at the time, such that the security of the Transmission System is maintained. HMPL shall restore Transmission

System conditions to normal as quickly as possible to alleviate any such Emergency Condition. HMPL will take all reasonable steps to allocate among all generating units and other reactive power supply resources the responsibility to provide reactive power support to the Transmission System.

4.2.1 Reactive Power Generation

The Generator Facility shall supply reactive power to the Transmission System or absorb reactive power from the Transmission System in accordance with Good Utility Practice, the generator's Interconnection Agreement, applicable operational and/or reliability criteria, protocols, and directives, including those of the applicable reliability council, laws, and regulations. The Facility operator shall respond to requests from HMPL to increase or decrease generator reactive power output in a manner consistent with Generator's obligation to operate and control the Facility. The Generator Facility shall operate in accordance with the voltage schedule or reactive levels prescribed by HMPL but not in excess of the amount available from the Facility's equipment in operation at the time and within the manufacturer's design limitations of the Facility.

Unless otherwise agreed, the Generation Customer is required to maintain a power factor within the same range as HMPL pursuant to Good Utility Practices which is between 0.95 leading and 0.95 lagging.

4.3 Generation Controls

All generators connected to the Transmission System shall operate in automatic voltage regulation; power factor limits are described in the generator's Interconnection Agreement. A generator voltage regulator is required to be in service and in automatic mode whenever the generator is synchronized to the system. Unless otherwise directed by HMPL, the automatic voltage regulator shall control the voltage output within the reactive capabilities of the generator to maintain the nominal voltage of the connected Transmission System.

To satisfy NERC Reliability Standards, HMPL requires all generator owners/operators to keep detailed records as to when each on-line generating unit does not operate in the automatic voltage control mode. The generator owner/operator shall be responsible for providing detailed reports and summary report for a specified time period when requested by HMPL, the respective NERC region or NERC (within 30 business days of the request).

A speed governor system is required on all generators to regulate the output of the generator as a function of the system frequency. The speed governor system must respond to system frequency changes to help maintain the stability of the power system. The speed governor system shall have a speed regulation (droop) characteristic settable between three and seven percent and typically set to five percent.

HMPL shall have the right to temporarily disconnect, without notice, the Interconnection Facilities from the Transmission System if, in HMPL's opinion, a hazardous condition exists and such disconnection appears reasonably necessary to protect HMPL's customers, employees, agents, or property. HMPL shall use its best efforts to reconnect with the Interconnection Facilities as soon as reasonably possible after it has determined that the hazardous condition no longer exists.

HMPL, with reasonable notice to the Customer, shall not be obligated to accept, and may require the Customer to temporarily curtail, interrupt, or reduce deliveries of net electrical output or dependable Capacity when it is necessary for HMPL to construct, install, maintain, repair, replace, remove, investigate, inspect, or test any part of the Interconnection Facilities or any of HMPL's Interconnection Facilities, equipment, or any other relevant part of the Transmission System. The Parties will coordinate such activities to limit the adverse impact on each other.

HMPL requires the customer to address the following design requirements described in NERC Reliability Standard FAC-001 and the SERC Regional Criteria:

- Load following capability
- AGC
- Reactive power output
- Remote control functions
- Coordination of generation control system settings
- Load shedding
- Black start capability
- Dynamic stability and the use of power system stabilizers
- Internal plant systems design – Support continuous reactive capability requirements at the point of transmission interconnection.
- Transmission interconnected equipment should have the tap ranges and self-regulation necessary to accommodate the Transmission System's reactive power flow requirements.
- Load power factor
- Generator power factor
- Load equivalent sources of reactive power; if acceptable
- Generator equivalent sources of reactive power; if acceptable
- Transmission interconnections impact on adjacent areas' voltage and reactive power flow requirements

5.0 BREAKER DUTY AND SURGE PROTECTION

All Facilities must equal or exceed the fault duty capability necessary to meet system short circuit requirements as determined through short circuit analyses and should fully comply with the latest ANSI/IEEE standards for circuit breakers, switch gear, substations, and fuses.

HMPL requires the Customer to meet the following design requirements described in NERC Reliability Standard FAC-001 and the SERC Regional Criteria:

- Each Party is responsible for the short circuit capabilities of their own current carrying elements.
- Each Party is responsible for the ratings of their own interrupting devices. It is the responsibility of the Customer to coordinate their relays and devices with the HMPL Transmission System.
- Each Party shall supply the other existing and planned future fault current levels when requested.
- It is the responsibility of the Customer to notify HMPL of any changes in their facilities that may cause an increase in fault currents (Generation and Transmission Customers).

6.0 SYSTEM PROTECTION AND COORDINATION

The Customer is responsible for providing a protection system that will protect its equipment against disturbances on the system and minimize the effects of disturbances from its facilities on HMPL's equipment and Transmission System. The resulting protection system must provide the highest level of public safety possible and prevent or minimize equipment damage with existing and future fault levels. The protection system should be designed to minimize equipment outage time, outage area, and system voltage disturbances.

Operating voltage and proximity to a generating unit will be major considerations in the selection of the basic type of protection system relay units that will be required for protecting a transmission line that connects to HMPL's Transmission System. These considerations, in conjunction with the particular stability classification determined during facility tests, will determine the extent to which protection schemes are to be incorporated in a transmission line's protection scheme.

HMPL substation transmission buses should be provided with differential protection wherever a high-speed fault-clearing scheme is not already in place. Such differential relaying may be either voltage-based or current-based; however, voltage-based relaying may not be feasible where equipment with differing full winding CT ratios is applied. Fault clearing times for bus faults are not to exceed 0.2 seconds.

6.1 Protection for 161 kV System

A minimum protection scheme for the 161 kV Transmission System shall include one primary set and one secondary set of protective relays. Each set of relays should have 3 forward impedance zones of phase and ground distance elements. It should also have instantaneous phase and ground elements for instantaneous trip plus a ground time overcurrent element. The ground time overcurrent element must be a very inverse type for proper coordination with other HMPL protection. The primary scheme may incorporate with pilot scheme to achieve high speed fault clearing if the SIS identifies the scheme is critical to the system operation. If the transmission line is extremely short and the pilot scheme is not suitable, an alternate scheme, such as current differential scheme may be required. In addition, transfer trip installation may be required if stability studies indicates that a local breaker failure may impact system stability.

6.2 System Protection – Generation

The type, size, and location of the generation will determine the specific requirements for system protection. The intent of the requirements is to promote the safe and reliable operation of the Transmission System. There are many individual steps required to assess the viability of a given generation connection request (interconnect). Further evaluation, as in the case of the Facilities Study, will require a greater detail of generator and Generator Step-up Transformer (GSU) data.

These requirements apply to generation facilities that connect directly to the Transmission System through the Customer's GSU and/or generator breaker. In addition to the review of the transmission connection, protection and control circuit requirements will include the interconnect protection scheme and the possibility of transfer trip logic. Since the size and variety of generation interconnections are so varied, each proposed protection scheme would be reviewed by HMPL under its specific conditions. Generator protection will generally follow the requirements of the industrial standards and practice. Standard relay functions include:

- Frequency – To detect under frequency and over frequency operation
- Overvoltage – To detect overvoltage operation.
- Undervoltage – To detect undervoltage operation.
- Ground Detector – To detect a circuit ground on the Transmission System (applicable to three-phase circuits only).
- Directional Overcurrent – To detect the directional flow of current in excess of a desired limit.
- Transfer Trip Receiver – To provide tripping logic to the generation for isolation of the generation upon opening of the HMPL supply circuits.
- Directional Power – To detect under all system conditions, a loss of HMPL primary source. The relay shall be sensitive enough to detect transformer magnetizing current supplied by the generation.

The Customer will own the Generator Step-up (GSU) transformer and will be responsible for synchronizing its facility to HMPL's Transmission System.

Should the generator connect to a transmission line having other tapped load, there will be an additional requirement to prevent islanding. For the purpose of this document, islanding is defined as a generator being isolated such that it is the only source of power to a utility Customer. Customer's protection system should be responsible for sensing abnormal frequency and trip its own generator to isolate from the Transmission System.

When connecting generation facilities to HMPL, operating in parallel to HMPL's Transmission System, specified utility-grade relays will be provided by the customer for protection of the Transmission System.

6.3 Protection System Components

The "protection system" arrangement selected by the Customer must be compatible with the protection system used by HMPL to protect the transmission grid. HMPL will specify settings as appropriate to ensure relay and device coordination with existing system protection. Compatibility will include protection philosophy, operating speed, types of communication media (power line carrier or fiber optic) and communication (carrier) frequency. Specific RTU protocols and communication details can be found in section 7.0.

7.0 METERING AND TELECOMMUNICATIONS

7.1 Supervisory Control and Data Acquisition (SCADA)

A HMPL supplied Remote Terminal Unit ("RTU") will be required for gathering Customer load and equipment status information that will be telemetered back to HMPL. The Customer will reimburse HMPL for the required RTU and HMPL shall own and maintain the SCADA devices. The RTU will have the ability to translate most protocols to the HMPL required DNP 3.0 Level 2 compliance; however, it is the responsibility of the Customer to provide the data in the required protocol. Instantaneous voltage data plus bi-directional analog real power and reactive power flow information must be telemetered directly to the location(s) specified by HMPL. A point assignment sheet will be provided to the Customer showing expected data type at a particular terminal point. It is the responsibility of the Customer to insure accurate translation of the point assignment sheet. The RTU or equivalent data collection and transfer equipment acceptable to both the Customer and HMPL shall be installed by the customer or HMPL at the Customer's expense, to gather accumulated and instantaneous data to be telemetered to a location(s) designated by HMPL through use of a dedicated point to point data circuit(s).

The communication protocol for this data circuit(s) shall be specified by HMPL. The requester shall provide at its expense a telecommunication data circuit to the operations center of HMPL. The telecommunications data circuit shall be an Ethernet based network. As a minimum, the bandwidth and throughput shall be a committed information rate of 1 Mbps.

Typical data requirements include the following:

- Status of interrupting devices
- MW flow
- MVAR flow
- Amps – three phase and per phase
- Power factor
- Voltage at interconnection point

7.2 Metering

At the Customer's expense, HMPL shall specify, install, own, operate, and maintain all meters and metering devices (including remote terminal units) used to measure the delivery and receipt of energy for payment purposes. The related equipment shall include potential and current transformers, and any of the associated communications links needed. The information provided by the metering facilities shall meet the reasonable needs and approvals of all Parties, consistent with Good Utility Practice.

The revenue metering package consists of a primary revenue meter and a secondary revenue meter as a backup. The secondary revenue meter will be polled in case of failure of the primary revenue meter and utilized for billing purposes. If both meters should fail, HMPL will use a metering translation process to determine the usage. This process Meter accuracy will be maintained within +/- 0.3%. The metering instrument transformers used to measure the Facility's net output shall be installed on or compensated to the high side (transmission voltage side) of the generator step-up transformer, unless otherwise agreed by the Parties.

All Metering Equipment installed pursuant to this document shall be routinely tested by HMPL in accordance with Good Utility Practice, and such results reported to the Customer. HMPL, at the expense of the customer, will test all Revenue Meters and analog equipment at least once every two years. The Customer may request any number of additional meter tests and will compensate HMPL for the actual cost incurred to test such meters. If the Metering Equipment is found to be inaccurate by more than one-third of one percent (0.3%) of full meter registration or are otherwise defective, they shall be repaired, adjusted, or replaced by HMPL at the expense of the Customer. No adjustment shall be made for meter readings made prior to the point in time halfway between the time of the last test that showed the Revenue Meters and analog equipment in question to be functioning accurately and the time the subsequent inaccuracy is corrected, except by agreement of the Parties. In any case, all Revenue Meters and analog equipment shall be tested at least once every two (2) years.

Three metering elements will be used to measure all real and reactive power crossing the metering point. Bi-directional energy flows will be separately measured on an hourly basis. The meters will have a separate register for loss compensation. Generator and load metering data requirements may include the following:

- kW
- kWh
- kVAr, leading and lagging
- kVAr-hour
- kV^2 -hour
- Voltage (to monitor voltage schedule compliance)

HMPL will provide KQ and kVar data pulses to the Customer upon request. The preferred method of data transfer is digitally through a LAN port on the meter or a solid state pulse initiator.

Unless otherwise mutually agreed, all meters shall be sealed, and the seals shall be broken only by HMPL upon occasions when the meters are to be inspected, tested, adjusted or re-calibrated in accordance with Good Utility Practice.

All metering instrument transformers installed must be strictly in accordance with the latest version of IEEE Standard C57.13 and, if applicable, ANSI Standard C93.1. The Metering Equipment installed must be capable of providing the minimum data specified by HMPL.

8.0 SYSTEM GROUNDING

A bus is considered to be "effectively grounded" when the following relationships are true:

- Xo/X1 ≤ 3
- Ro/X1 ≤ 1

This relationship assumes $R_1/X_1 = 0$, which is a worst case condition. If one or both of these relationships are not true, the effective grounding should be checked more precisely by referring to the curves found in the "*Westinghouse Transmission and Distribution Reference Book*". The proper curve to use should be based on the actual R_1/X_1 ratio. Any set of ratios lying below the appropriate curve marked 80% will provide effective grounding for 80% lightning arresters used on the Transmission System.

The substation grounding system in general shall provide for personnel safety and enable coordinated system protection.

The substation grounding design shall meet ANSI/IEEE STD 80, ANSI/IEEE STD 81, ANSI/IEE STD 142, and 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 measured soil resistivity values (two-layer model) for the substation site, calculated and measured resistance of the substation to remote earth, available fault current and maximum substation ground grid current, calculated ground potential rise to remote earth and maximum allowable and calculated step and touch potentials shall be noted on the grounding plan drawing(s). 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.

This procedure references IEEE 80 and NESC and specifies requirements for:

- Safety criteria: Calculated step and touch potentials shall be less than the maximum allowable voltages calculated in accordance with IEEE 80.
- Design output: Maximum and allowable touch and step potentials, ground potential rise, soil model, maximum fault and grid current, and calculated grid resistance.
- Connections: Only exothermic welds below grade and bolted connections above grade.

When the interconnecting facility is within the HMPL substation fence, the interconnecting facility will be incorporated into the design and construction of the HMPL ground grid. When the facility is outside of the HMPL substation fence, the interconnecting facility shall have its own independent ground grid. When the HMPL substation and the interconnecting facility are adjacent to each other, the grids shall be connected together. The specifics for coordination of the interties between ground grids are discussed at pre-design meetings. The ground grid to be interconnected with the HMPL ground grid shall be of compatible design.

The required structure ground resistance on all new HMPL transmission construction is 20 ohms.

Grounding and shielding designs have been standardized to protect the system against most normal over current events common to Kentucky. All shielding designs meet Rural Utilities Service (RUS) minimums guidelines for lightning protection.

9.0 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 (BSLs), surge arrester, conductor spacing and gap application, substation and transmission line insulation strength, protection, and shielding shall be documented and submitted for evaluation as part of the interconnection plan.

HMPL's standard is to shield substations and transmission lines from direct lightning strikes and to provide line entrance arresters at transmission line terminals. Surge arresters are also applied at major components and systems.

Interconnection facilities to be constructed in areas with contamination shall be properly designed to meet or exceed the performance of facilities not in a contamination area with regard to contamination caused outages. All designs and specification shall be submitted to HMPL for review.

10.0 VOLTAGE, REACTIVE POWER, AND POWER FACTOR CONTROL

The interconnection shall not result in any condition where the voltage excursion shall exceed NERC, SERC, or HMPL requirements. Table 1 below shows the HMPL voltage criteria.

		161kV
No Contingency	High Side of Generator GSU Bus	0.95-1.05
	Switching Station	0.95-1.05
	Regulated Load Bus	0.95-1.05
	Non-Regulated Load Bus	0.95-1.05
Planning Contingency in Effect	High Side of Generator GSU Bus	0.95-1.05 and generator should maintain Voltage Schedule
	Switching Station	0.95-1.05
	Regulated Load Bus	0.95-1.05
	Non-Regulated Load Bus	0.95-1.05 and not to exceed 0.05 p.u. deviation from pre-contingency level

Table 1

10.1 Network Schedule Voltage

All generators are expected to maintain the voltage schedule as required by the Transmission System Operator within the reactive capability of the generating units. To satisfy applicable NERC Reliability Standard(s), all generator owners/operators will keep detailed records as to when each generating unit does not comply with the Transmission System Operator's voltage schedule. The generator owner/operator shall be responsible for providing detailed reports on voltage deviations from the acceptable voltage ranges for a specified time period when requested by HMPL, SERC or NERC (within 30 days of the request).

10.2 Tap Settings of Generator Step-up and Auxiliary Transformers

Generator step-up and auxiliary transformers shall have their tap settings coordinated with the HMPL's Transmission System voltage requirements. Anytime the generator plans to replace any of the step-up or auxiliary transformers, the generator shall supply data relating to the transformer (e.g. size and type, available tap settings, impedance data, loss data, etc.) to HMPL for the purpose of determining the optimum tap setting. When tap changes are necessary, HMPL shall provide the generator owner/operator with a report that justifies the required tap setting changes and technical justification for these changes.

As required by applicable NERC Reliability Standards, the generator owner/operator shall maintain detailed records of each generator step-up transformer and auxiliary transformer that shall include type of transformer, rating, nominal voltages, existing and available taps, impedance and loss data. It shall be the responsibility of the generator owner/operator to provide the above information on step-up and auxiliary transformers (within five business days) when requested by HMPL, the Transmission System Operator, SERC or NERC.

10.3 Design and Operational Requirements

HMPL requires generators to meet the design and operational requirements described in NERC Reliability Standard FAC-001 and its corresponding SERC Regional Criteria. Design requirements include the following:

- The 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 HMPL's Transmission System's voltage range and regulation.

- Transmission interconnected equipment should have the tap ranges and self-regulation necessary to operate within HMPL's Transmission System's voltage range.
- Voltage regulator load compensation, if required, to control voltage at a point beyond the generator terminals.
- Voltage regulator droop compensation, if required, for generators whose terminals are directly connected (i.e., cross-compound, hydro).
- Coordination of excitation system settings with HMPL.
- Consideration of the interconnection impact on adjacent areas' voltage or reactive compensation devices.

The following operational requirements must be adhered to:

- Load and/or generation operation to be within the acceptable voltage range and regulation as specified by HMPL.
- Generator voltage regulator to be operated in automatic modes.
- Generator to maintain voltage schedules on transmission as required by HMPL.
- Any reactive compensation devices to be coordinated with HMPL.

10.4 Power Factor Range

For loads:

Distribution entities and customers connected directly to the Transmission System should plan and design their systems to operate at close to unity power factor to minimize the reactive power burden on the Transmission System. The power factor of the connected load should be within the range of 0.90 lagging to 0.90 leading.

For generators:

Generators usually have voltage schedules and these policies and practices indicate the power factor and reactive support required at each location. The generating facility power factor design limitation minimum requirement shall be a reactive power capability sufficient to maintain a composite power delivery at the

Points of Interconnection at a power factor between 0.95 leading and 0.95 lagging.

11.0 POWER QUALITY IMPACTS

Any connection of a generator, transmission facility or end user load to HMPL should not compromise or degrade the power quality of HMPL or its existing customers. A permanent digital fault recorder or other monitoring equipment may be deemed necessary and installed by the transmission owner at the point of common coupling to insure that Power Quality standards are met and maintained, and Power Quality events are captured and measured. The connection facility shall also meet any FERC, NERC or SERC reporting and reliability standards.

Power quality may include but not be limited to the following:

- Voltage Unbalance
- Voltage Flicker
- Voltage Fluctuation
- Harmonic Distortion
- Transient over voltage
- Temporary over voltage
- Temporary under voltage
- Insulation Coordination
- Operating frequency
- Power factor range
- Interruption / Outage frequency as may be required by regulatory standards

11.1 Voltage Flicker

Flicker will be assessed at the Point of Common Coupling (PCC) using an instrument in compliance with IEC 1000-4-15, except that the weighting curve used to represent the response of the light bulb shall be based on the 120 volt lamp characteristics as recommended in UIE 96-10.

The flicker measured at the PCC shall be 0.8 or less for the short-term flicker (Pst) and 0.6 or less for the long- term Flicker (Plt). The Pst and Plt values measured shall not be exceeded more than 1% of the time based on a probability distribution calculated for a one-week period.

11.2 Harmonic and Inter-Harmonic Requirements

Harmonic levels will be assessed at the PCC with an instrument that can take individual samples of voltage and current waveforms and determine the probability distribution of the individual harmonic levels for both the current and the voltage.

Harmonic distortion levels at the PCC shall meet the requirements of IEEE Standard 519-1992 with respect to the harmonic current components. Background harmonic voltage distortion levels at the PCC should be in compliance with the recommendations in IEEE 519-1992.

In addition, the individual inter-harmonic currents shall be limited to 25% of the values in IEEE 519-1992 and the THD calculation shall include the inter-harmonic components. The Inter-harmonics shall be calculated in 10 Hz increments. The current distortion levels specified in IEEE 519-1992 shall not be exceeded by more than 5% of the time based on a probability distribution calculated for a one-week period.

12.0 EQUIPMENT RATINGS

HMPL uses an internal “Transmission Facility Ratings Methodology” document to address equipment ratings. The Facility Ratings are determined using the most limiting applicable element that comprises the facility, such as a circuit breaker or autotransformer. A facility rating shall equal the most limiting applicable equipment rating of the individual equipment that comprises that facility. Planned loading on autotransformers, during normal or contingency conditions shall be limited to 100 percent of the auto-transformer’s maximum megavolt-ampere (MVA) rating as specified by the manufacturer. Planned transmission line loading will be such that National

Electrical Safety Code line-to-ground clearances will be maintained for all anticipated normal and contingency conditions (category A, B, C, and D). Transmission system power flows shall not exceed 100 percent of the conductor thermal rating.

All current carrying equipment and devices shall be designed to carry the maximum loads that are predicted and used in load flow analysis. Facility loading exceeding "nameplate" or "normal" design capacities is only acceptable when allowed by manufacturer's design documentation or standard industry practices. HMPL shall have the right to review Customer design and specifications to verify that equipment ratings are consistent with HMPL criteria.

Equipment ratings must meet requirements identified in system studies, latest industry standards (ANSI, NEMA, IEEE), and HMPL equipment specifications. Specific requirements are listed below.

12.1 Power Transformers

Power transformers shall be designed, built, and tested in accordance with the latest version of ANSI 57 series, IEEE, NEMA, or any other applicable industry standard, except any specific requirements stated below.

12.1.1 Coolant

The transformer shall contain a dielectric fluid (mineral oil) that has less than one (1) ppm polychlorinated biphenyl (PCB). This shall be certified on the transformer test report, and on a label permanently affixed to the transformer, near the nameplate.

12.1.2 Taps

De-energized tap voltages shall be in accordance with the following:

Voltage Class	Tap Voltage				
69 kV	63,400	65,200	67,000	68,800	70,600
161 kV	152,950	156,975	161000	165,025	169,050

12.1.3 CT Ratios

The current transformers shall have 5 taps as follows:

600:5		1200:5		2000:5	
X2-X3	50/5	X2-X3	100/5	X3-X4	300/5
X1-X2	100/5	X1-X2	200/5	X1-X2	400/5
X1-X3	150/5	X1-X3	300/5	X4-X5	500/5
X4-X5	200/5	X4-X5	400/5	X2-X3	800/5
X3-X4	250/5	X3-X4	500/5	X2-X4	1100/5
X2-X4	300/5	X2-X4	600/5	X1-X3	1200/5
X1-X4	400/5	X1-X4	800/5	X1-X4	1500/5
X3-X5	450/5	X3-X5	900/5	X2-X5	1600/5
X2-X5	500/5	X2-X5	1000/5	X1-X5	2000/5
X1-X5	600/5	X1-X5	1200/5		

These current transformers ratios shall have 4 taps as follows:

3000:5		4000:5	
X3-X4	500/5	X3-X4	1000/5
X1-X2	1000/5	X1-X2	2000/5
X2-X3	1500/5	X1-X3	3000/5
X2-X4	2000/5	X1-X4	4000/5
X1-X3	2500/5		
X1-X4	3000/5		

12.1.4 Accessories

- Liquid level indicator
- Top oil thermometer
- Winding hot spot thermometer
- Pressure/vacuum gauge
- Cooling equipment

12.2 Circuit Breakers

Circuit breakers shall be designed, manufactured, and tested in accordance with the latest revision of ANSI C37.12 or any other applicable industry standard.

12.3 Current Transformers

The current transformers shall have 5 taps as follows:

600:5		1200:5		2000:5	
X2-X3	50/5	X2-X3	100/5	X3-X4	200/5
X1-X2	100/5	X1-X2	200/5	X1-X2	400/5
X1-X3	150/5	X1-X3	300/5	X4-X5	600/5
X4-X5	200/5	X4-X5	400/5	X2-X3	800/5
X3-X4	250/5	X3-X4	500/5	X2-X4	1000/5
X2-X4	300/5	X2-X4	600/5	X1-X3	1200/5
X1-X4	400/5	X1-X4	800/5	X1-X4	1400/5
X3-X5	450/5	X3-X5	900/5	X2-X5	1600/5
X2-X5	500/5	X2-X5	1000/5	X1-X5	2000/5
X1-X5	600/5	X1-X5	1200/5		

12.4 High Voltage Switches Standards

High voltage switches shall be designed, manufactured, and tested in accordance with the latest revision of ANSI C37.35-1976.

12.5 Instrument Transformers Standards, Testing, and Accuracy

Test reports and certification records shall be maintained and made available to HMPL upon request. Instrument transformers include wound type voltage and current transformers, and capacitive coupled voltage transformers.

Instrument transformers shall be designed, manufactured and applied in accordance with IEEE Std. C57.13.

The burdens placed on instrument transformers shall be within the limits required to ensure the accuracy required by the application. Metering accuracy shall be 0.3%.

12.6 Surge Arrestors Connections and Sizing

The high voltage terminal of the surge arrestor is to be connected to the terminal of the protected equipment by the shortest and most direct path possible. The ground terminal of the surge arrestor is to be connected to the grounded portion of the protected equipment by the shortest and most direct path. The grounded portion of the protected equipment is to be connected directly to the grounding electrode.

All grounding conductors and connectors shall be of low impedance and ample current carrying capacity.

12.7 D.C. System Standards and Reliability

The D.C. system shall be comprised of an appropriately sized station battery (125 Volts D.C. nominal), a battery charger, electrical disconnect devices, and a D.C. distribution panel.

Batteries shall be sized, installed, and maintained in accordance with the latest version of IEEE Std. 485, ANSI/IEEE Std. 450, and ANSI/IEEE Std. 484.

Batteries shall be maintained in the fully charged state by being continuously connected to a suitably sized charger that derives its energy from a highly reliable AC source.

12.7.1 Distribution Panel

The D.C. distribution panel shall be included that provides coordinated overcurrent protection from the battery to each individual D.C. load. The protective devices shall be rated for D.C. use. There shall be no cross connections between D.C. circuits.

12.8 Capacitor Bank Standards

The capacitor bank, and all its components, shall be designed, installed, and maintained in accordance with the latest versions of:

- IEEE Std 18, IEEE Standard for Shunt Power Capacitors

- IEEE Std 1036, IEEE Guide for Application of Shunt Power Capacitors
- IEEE C37.99, IEEE Guide for the Protection of Shunt Power Capacitor Banks
- ANSI C2, National Electrical Safety Code

12.8.1 Connections

Capacitor banks installed on the Transmission System, whether utilized for VAR support or voltage control, shall be connected wye or double-wye, and may be grounded or ungrounded.

12.8.2 Fuses

Individual capacitor units can be of either the externally fused, internally fused or fuseless type.

12.8.3 Insulation

The basic impulse insulation levels (BIL) of standard capacitor bank installation on the Transmission System shall be as follows:

Voltage Class	Capacitor Bank BIL (kV)	
Phase-to-Phase	Ungrounded Units	Grounded Units
161 kV	650	650

12.8.4 Sizing

The capacitor shall be sized so that when energized, the maximum voltage rise on the bus to which the capacitor bank is connected shall be limited to the value for that voltage class as approved by HMPL.

12.8.5 Monitoring

Capacitor banks will be monitored by suitable protective devices that will provide a trip output to the disconnecting device when the voltage applied to any constituent unit of the bank exceeds 10 percent of its rating. If

SCADA is installed, an alarm output will be provided to the SCADA system that will operate before the 10 percent limit is exceeded.

12.8.6 Switching Devices

Capacitor bank switching devices shall have either pre-insertion resistors or synchronized closing, in order to provide an effective means of reducing transients associated with switching operations of capacitor banks.

12.9 Insulation Levels

The following chart provides minimum insulation levels for material and equipment for the various system voltages on the Transmission System:

Voltage Class (kV)	BIL Level (kV)
69	140
161	650

13.0 SYNCHRONIZING FACILITIES

Transmission breakers are closed to connect two energized lines only after the phase angle across the breaker is verified. This is accomplished by one of two methods. In the first method, manual closing utilizes a sync permissive switch. The switch must be turned on to allow breaker closing. Turning on the switch energizes a synchroscope, which shows the phase angle between the lines to be tied together. This method requires the Operator to determine that the angle is within limits. The Customer shall be responsible for the synchronization of generation with the Transmission System.

If a transmission outage occurs that does not separate the generation from the Transmission System, then a second method of synchronization is used that will allow automatic reclosing relays to re-connect. The control scheme initiates a close only after a synchro-verifier relay determines that the angle and voltage are within preset limits.

Communication procedures for synchronization between HMPL and the generation/transmission Customer will be consistent with procedures outlined in section 17.0. Test plans must be consistent with NERC and other regulatory standards and provided to HMPL for review and approval.

14.0 MAINTENANCE COORDINATION

The Customer shall be responsible for the design, construction, installation, maintenance, synchronization of generation with the Transmission System, and ownership of all Interconnection Facilities located on its side of the Interconnection Points. HMPL shall be responsible for the design, construction, installation, maintenance, and ownership of all Interconnection Facilities located on the HMPL's side of the Interconnection Points. The maintenance practices of an entity connected to the HMPL Transmission System should be at a level that ensures the reliability and continuity of service to the interconnected transmission system. Relevant maintenance records must be maintained. This may include circuit breakers, generation equipment, power transformers, protective relays, revenue metering, communication equipment, trip circuits, interrupters, DC power sources, grounding system, and transmission facilities.

In order to perform certain maintenance, testing, and repair activities, HMPL's transmission line(s) must be de-energized. Under this condition, station service power may be interrupted to the Customer. HMPL will require periodic transmission line(s) outages to perform protective relay maintenance. HMPL will coordinate protective system checks during these outages with the Customer.

HMPL's circuit breaker(s) are required to be opened periodically in order to exercise the breaker mechanism. In instances where the breaker has not been operated for an extended period, HMPL may manually operate the breaker. HMPL will coordinate this and any other circuit breaker maintenance with the Customer.

HMPL or the Customer may request, from time to time, routine switching of each other's equipment. In such cases, HMPL and the Customer will provide reasonable notice to the other Party of any equipment switching that affects electrical service to the other Party.

14.1 Planning

Complete, precise, and timely communication is an essential element for maintaining reliability and security of a power system. Under normal operating conditions, the major link of communication with various interconnects shall be by telephone lines. HMPL and its Customer shall maintain communications which shall include, but not be limited to, system paralleling or separation, scheduled or unscheduled shutdowns, equipment clearances, periodic load reports, maintenance schedules, tagging of interconnection interrupting devices, meter tests, relay tests, billing, and other routine communication.

The Parties shall coordinate inspections, planned outages, and maintenance of their respective equipment, facilities and systems so as to minimize the impact on the availability, reliability and security of both Parties' systems and operations.

Each Party shall provide the other with reasonable notification for routine maintenance, operational tests, inspection activities and Revenue Meter tests. For such activities that do not require major equipment or system outages, the Party performing the maintenance shall provide the other Party with at least twenty-four (24) hours prior written notice. For such activities that will require major equipment or system outages, the Party performing the maintenance shall provide the other Party with no less than ten business days prior written notice. All transmission switching will be done through HMPL for scheduled and unscheduled maintenance.

15.0 ABNORMAL FREQUENCY AND VOLTAGE OPERATION

HMPL requires its Customers to meet the design requirements described in NERC FAC-001 Planning Standard and the SERC Regional Criteria. Considerations include, but are not limited to abnormal voltage and frequency conditions, generators connected through a tapped transmission line, relay coordination, and load shedding implementation.

When a Customer desires to interconnect a generating facility to the HMPL facility, the general protection settings must be submitted to HMPL for review. HMPL reviews and ensures that the proper coordination between HMPL and Customer protection exists. HMPL also ensures that Customer frequency protection meets HMPL requirements and that the proper metering is in place to monitor abnormal voltage conditions.

In order to assure the continued reliability of the Transmission System, the connecting entity will be requested to adhere to operating requirements as applicable. Such requirements will include provisions for abnormal voltage and frequency conditions, load shedding, and special procedures for coordination.

16.0 INSPECTION REQUIREMENTS

Before a connecting entity owned facility can be energized, if must pass a final inspection by HMPL personnel. Certain pre-operational test reports may be requested by HMPL for specific equipment such as protection system elements. The Facility Owner/Operator shall grant HMPL right of access to their facility for purposes of conducting inspections, observing tests, and auditing records required by NERC Reliability Standards and established reporting procedures.

The Facility Owner/Operator shall perform routine inspection and testing of its facilities and equipment, including secondary low voltage control systems, in accordance with Good Utility Practice as may be necessary to ensure the continued interconnection of the Facility with HMPL's Transmission System in a safe and reliable manner. The Facility Owner/Operator may be required to modify operations to reasonably comply with necessary testing requirements by HMPL. However, HMPL will coordinate such tests in a manner that minimizes the impact on actual operations.

HMPL and the Customer shall, at their own expense, have the right to observe the testing of any of the other Party's facilities and equipment whose performance may reasonably be expected to affect the reliability of the observing Party's facilities and equipment. Each Party shall notify the other Party in advance of its performance of tests of its facilities and equipment, and the other Party may have a representative attend and be present during such testing. If a Party observes any deficiencies or defects on, or becomes aware of a lack of scheduled maintenance and testing with respect to, the other Party's facilities and equipment that might reasonably be expected to adversely affect the observing Party's facilities and equipment, the observing Party shall provide notice to the other Party that is prompt under the circumstance, and the other Party shall make any corrections required in accordance with Good Utility Practice.

17.0 COMMUNICATIONS DURING NORMAL AND EMERGENCY CONDITIONS

Complete, precise, and timely communication is an essential element for maintaining reliability and security of a power system. HMPL and the Customer shall establish a point of contact that shall have the authority and capability to operate Customer facilities according to the instructions of HMPL or the appropriate operating entity. Under normal operating conditions, the major link of communication with various interconnects shall be by telephone lines. HMPL and its Customer shall maintain communications on issues which shall include, but not be limited to, system paralleling or separation, scheduled or unscheduled shutdowns, equipment clearances, periodic load reports, maintenance schedules, tagging of interconnection interrupting devices, meter tests, relay tests, billing, and other routine communication. All Customers who are interconnecting generation facilities shall have provisions to obtain approval from HMPL prior to starting generation and connecting it to the HMPL Transmission System. All Customers who are interconnecting transmission facilities shall have provisions to obtain proper clearances from HMPL prior to commencing work on the Customer facility. Emergency phone numbers must be agreed upon by both parties prior to the actual connect date.

HMPL may, consistent with Good Utility Practice, take whatever action or inaction with regard to its Transmission System it deems necessary during an Emergency Condition in order to: (i) preserve public health and safety; (ii) preserve the reliability of the Transmission System; (iii) limit or prevent damage; and (iv) expedite restoration of service. HMPL shall use reasonable efforts to minimize the effect of such action or inaction on connecting facilities.

HMPL shall provide the Customer with notification that is prompt under the circumstances of an Emergency Condition that may reasonably be expected to affect the Customer's operation of the Facility, to the extent HMPL is aware of the Emergency Condition. The Customer shall provide HMPL with notification that is prompt under the circumstances of an Emergency Condition which may reasonably be expected to affect HMPL's Transmission System, to the extent the Customer is aware of the Emergency Condition. To the extent the Party becoming aware of an Emergency Condition is aware of the facts of the Emergency Condition, such notification shall describe the Emergency Condition, the extent of the damage or deficiency, its anticipated duration, and the corrective action taken and/or to be taken, and shall be followed as soon as practicable with written notice.

In the event of an Emergency Condition, the Party becoming aware of the Emergency Condition may, in accordance with Good Utility Practice and using its reasonable judgment, take such action as is reasonable and necessary to prevent, avoid, or mitigate injury, danger, and loss. In the event the Customer has identified an Emergency Condition involving HMPL's Transmission System, the Customer shall obtain the consent of HMPL personnel prior to manually performing any switching operations unless, in the Customer's reasonable judgment, immediate action is required.

Facility Owner/Operator may be called upon by HMPL during a potential or actual Emergency Condition to mitigate such Emergency Condition by, but not limited to, requesting the Facility to start-up, shutdown, increase or decrease the output of the Facility.

18.0 TRANSMISSION CONNECTIONS

Transmission interconnections are planned such that the Transmission System will be adequate to withstand the most severe single contingency condition and maintain an acceptable level of reliability. The North American Electric Reliability Corporation (NERC), and the Regional Reliability Councils, has established planning criteria which must be met to assure reliable electric service to all areas of the United States.

The transmission connection should be planned to meet NERC Reliability Standard TPL-001 through TPL-004 with (i) all transmission facilities in service or (ii) with one transmission circuit or transformer out of service and one generator out of service.

Under these conditions, the maximum continuous rating of any remaining transmission facility should not be exceeded.

Operating voltage and proximity to a generating unit will be major considerations in the selection of the basic type of primary and backup relay units that will be required for protecting a transmission line that connects to HMPL's Transmission System. These considerations, in conjunction with the particular stability classification (critical or non-critical) determined during the Facility Tests, will determine the extent to which backup coverage is to be incorporated in a transmission line's protection scheme.

19.0 GENERATOR CONNECTIONS

This section addresses issues that are specific to connecting generating facilities to HMPL operating in parallel to HMPL's Transmission System. In those cases where the generation is standby only it is assumed that appropriate interlocks and/or switches have been installed to prevent parallel operation.

System configurations vary depending upon the location and size of the generation that is to be connected to the Transmission System. Often, the installation of large generation will require a transmission substation to be built due to the short circuit contribution and associated effects that it has on the performance of protective relaying.

Generation that is connected to a delta-wye transformer can cause neutral shifts resulting in high voltage after breakers open to isolate high side faults. For this reason connecting generation to transformers with this configuration is discouraged.

19.1 Transmission Line Connections

T/L Tap – Less than 500MW of Generation Located Adjacent to T/L

A transmission line tap as shown in Figure 6 can be used to interconnect 500 MW or less of generation capacity to the Transmission System. This applies to generating facilities that are constructed adjacent to a transmission line. With this arrangement, loss of generation does not interrupt flow on the Transmission System and loss of a transmission line does not result in loss of generation. Because of the close proximity, Customer owned GSU transformer relay protection can direct trip HMPL's tie breakers for the purpose of clearing a fault on the Customer's equipment. The Customer should reserve property for construction of the HMPL owned interconnect station.

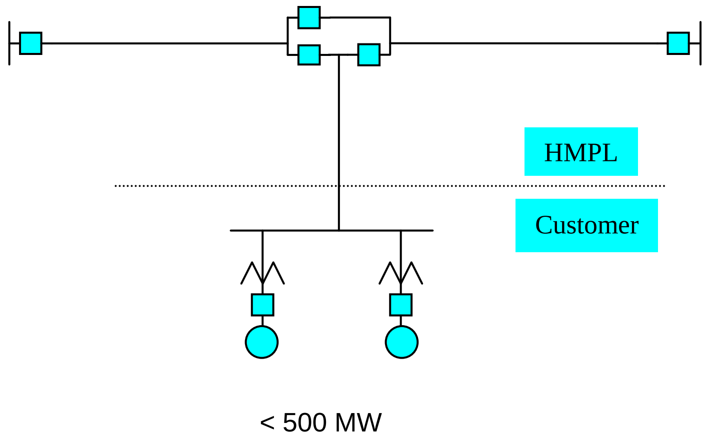

Figure 6: Line Tap – Generation Adjacent to Transmission Line

T/L Tap – Less than 500 MW of Generation Located Remote from T/L

A single transmission line with a ring bus at the tap point and a Customer owned interconnect breaker at the generating station as shown in Figure 7 can be used to interconnect less than 500 MW of generation capacity to the Transmission System. This arrangement is used if the generating station is located remote from the transmission line. With this arrangement, loss of generation or the tap line does not interrupt flow on the Transmission System and loss of a transmission line does not result in loss of generation.

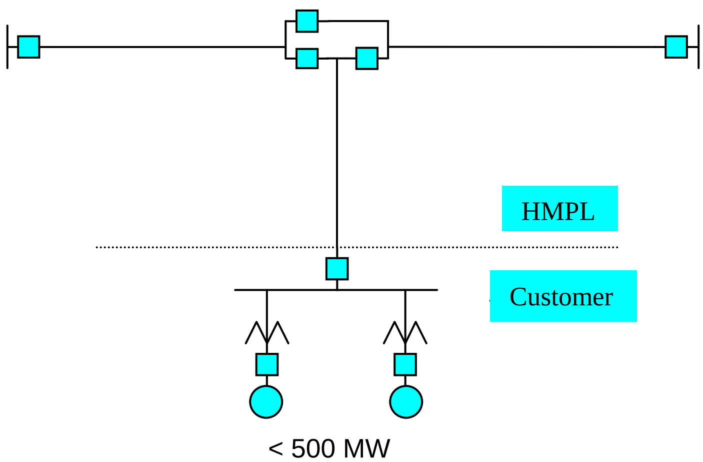

Figure 7: Line Tap – Generation Located Remote from Transmission Line

As an alternative to constructing a switching station at the tap point, the transmission line can be cut and looped in and out to a switching station located adjacent to the generating station as shown in Figure 8. This arrangement can have its advantages since acquiring land and permitting a new station at the tap point would not be required. Other advantages include no requirement for a Customer owned interconnect breaker as well as simplifying several protection and communication interface requirements between the plant and the interconnect site. Because of the close proximity, Customer owned GSU transformer relay protection can direct trip HMPL's tie breakers for the purpose of clearing a fault on the Customer's equipment. The Customer should reserve property for construction of HMPL owned station for interconnection.

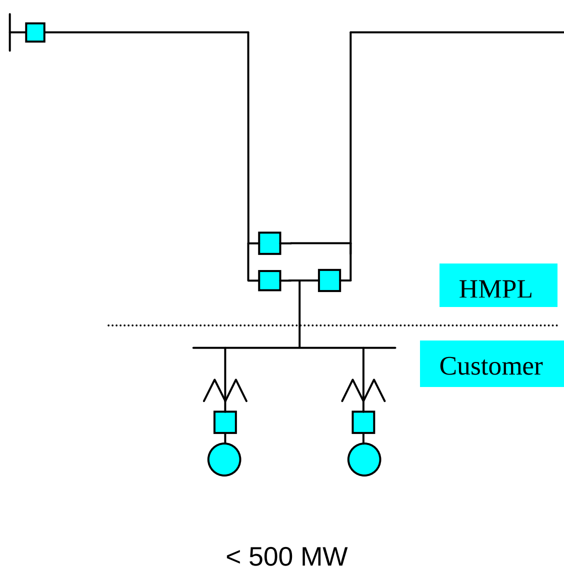

Figure 8: Looped Tap – Generation Located Adjacent to Transmission Line

Multiple Circuits – Generation Located Adjacent to T/L

Aggregate generation capacity of 500 MW or more will normally require at least two circuits for interconnection to the Transmission System as shown in Figure 9. This arrangement applies to generating facilities that are constructed adjacent to a transmission line. With this arrangement, loss of generation does not interrupt flow on the Transmission System and loss of a transmission line does not result in loss of generation. Because of the close proximity, Customer owned GSU transformer relay protection can direct trip HMPL's tie breakers for the purpose of fault clearing on the Customer's equipment. The Customer should reserve property and easements for construction of HMPL owned interconnect station.

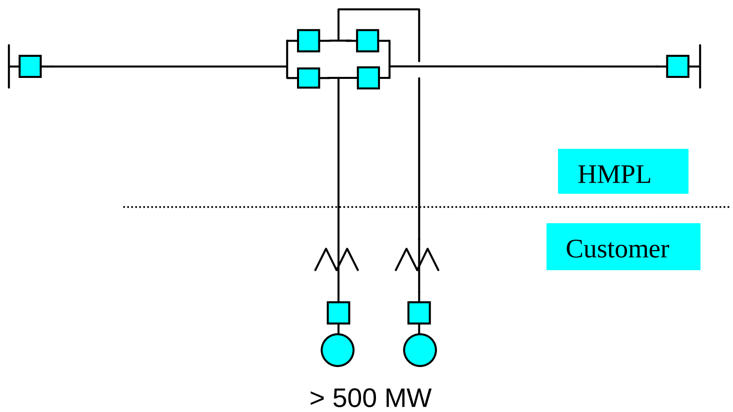

Figure 9: Multiple Circuits - Generation Located Adjacent to Transmission Line

Multiple Circuits - Generation Located Remote from T/L

Aggregate generation capacity of 500 MW or more will normally require at least two circuits for interconnection to the Transmission System as shown in Figure 10. Typically, 4 to 6 breaker switching station would be constructed at the tap point to cut the existing line and double circuit transmission would be constructed into the plant. This arrangement is used if the generating station is located remote from the transmission line. With this arrangement, loss of generation does not interrupt flow on the Transmission System and loss of a transmission line does not result in loss of generation.

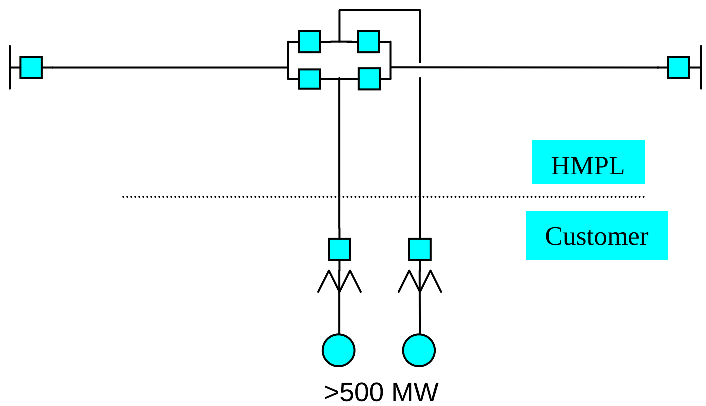

Figure 10: Multiple Circuits - Generation Located Remote from Transmission Line

As an alternative to constructing a switching station at the tap point, the transmission line can be cut and looped in and out to a switching station located adjacent to the generating station as shown in Figure 11. This arrangement can have its advantages since acquiring land and permitting a new station at the tap point would not be required. Other advantages include no requirement for Customer owned interconnect breakers as well as simplifying several protection and communication interface requirements between the plant and the interconnect site. Because of the close proximity, Customer owned GSU transformer relay protection can direct trip HMPL's tie breakers for the purpose of clearing a fault on the Customer's equipment. The Customer should reserve property for construction of HMPL owned interconnect station.

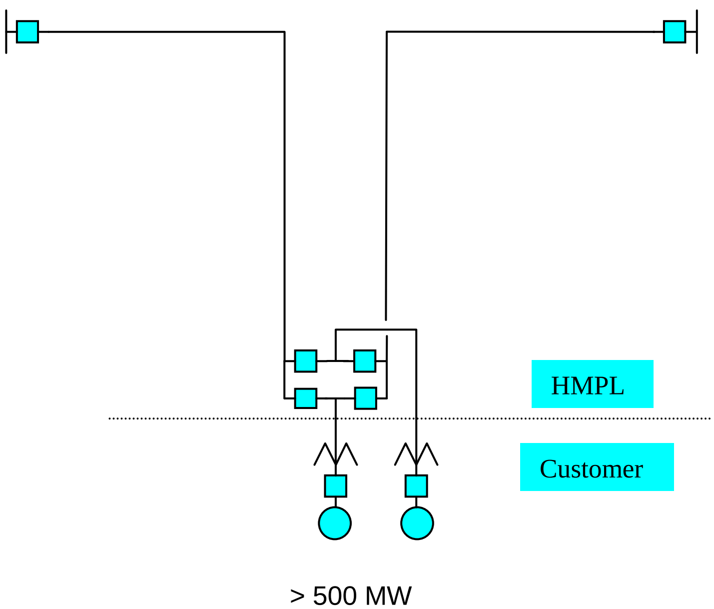

Figure 11: Multiple Circuits - Generation Located Adjacent to Transmission Line

19.2 Substation Interconnection Requirements

All generation interconnection substation designs will include all switches and devices required to permit maintenance of all breakers and transmission lines without the loss of the ability to use the generation capacity when required.

Small units can be bussed together behind breakers if the aggregate generation behind each breaker does not exceed 500 MW.

19.3 Transmission Interconnection Breakers

If new transmission lines are required by the addition of generator capacity at a new or existing power station, the breaker arrangement at the existing substation will determine both the number of breakers and the breaker arrangement required for the interconnection. Line terminations that result in a six breaker or less ring bus are acceptable. If more than a six breaker ring bus is required, a breaker and a half arrangement would be used for reliability considerations.

20.0 ELECTRICITY END USER CONNECTIONS

Transmission facilities may be used for providing service to commercial, industrial, municipal, cooperative and cogeneration Customers when the use of distribution feeders is not practicable. Generally, the use of transmission facilities should be considered for the following conditions:

- All loads and generation over 20 MVA
- Locations remote from distribution facilities
- Remote locations where distribution facilities are not adequate
- Loads with nonstandard voltage requirements
- Loads having large surge requirements

The feasibility of serving Customers direct from transmission requires a comprehensive study and coordination. Factors to be considered prior to agreeing on a Customer connection is as follows:

- Economics of alternates
- Customer parallel generation
- Transmission line tap or loop length
- Customer transformer characteristics
- Customer switching

- Effect on protective relaying at remote terminals
- Problems of large through power on looped lines
- Extent of Customer facilities

The following diagrams indicate the facilities arrangement for normal service 100 kV and above.

20.1 Tapping Line Below 100 MW Demand

If the tap line is long enough to require a circuit breaker, a single breaker with an air break switch bypass will be considered for 161 kV or below. Above 161 kV, two breakers in parallel or a three-breaker ring may be used. If a breaker is required solely by extensive Customer facilities, the Customer provides the breaker.

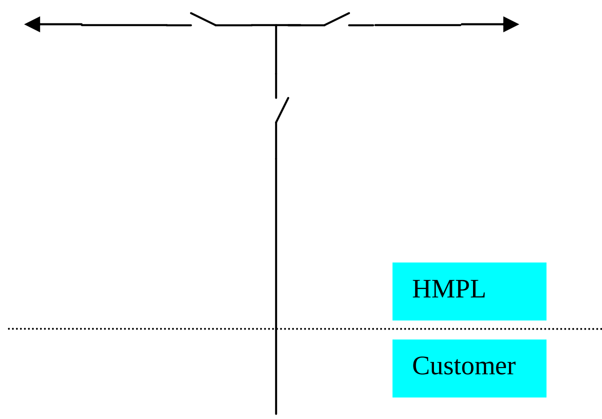

Figure 13: Tapping Line Below 100 MW Demand

Where two circuits are available, a preferred-alternate scheme may be applied. HMPL will conduct a review and determine the need for equipping switches with vacuum attachments for breaking parallel or line charging currents.

The typical preferred minimum load demand for connecting to existing 161 kV transmission lines is 20 MW.

20.2 Tapping Line 100 MW Demand and Above

The addition of Customer load in excess of 100 MW's should be connected to HMPL's Transmission System as shown in Figure 14 below.

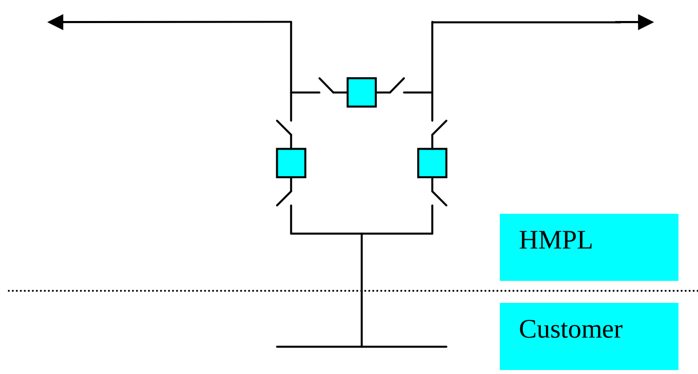

Figure 14: Tapping Line 100 MW Demand and Above

20.3 Connecting to HMPL's Existing Bus

In those cases where it may be practicable to connect to an existing transmission substation bus to serve a Customer, the following diagrams indicate the facilities arrangement for normal service:

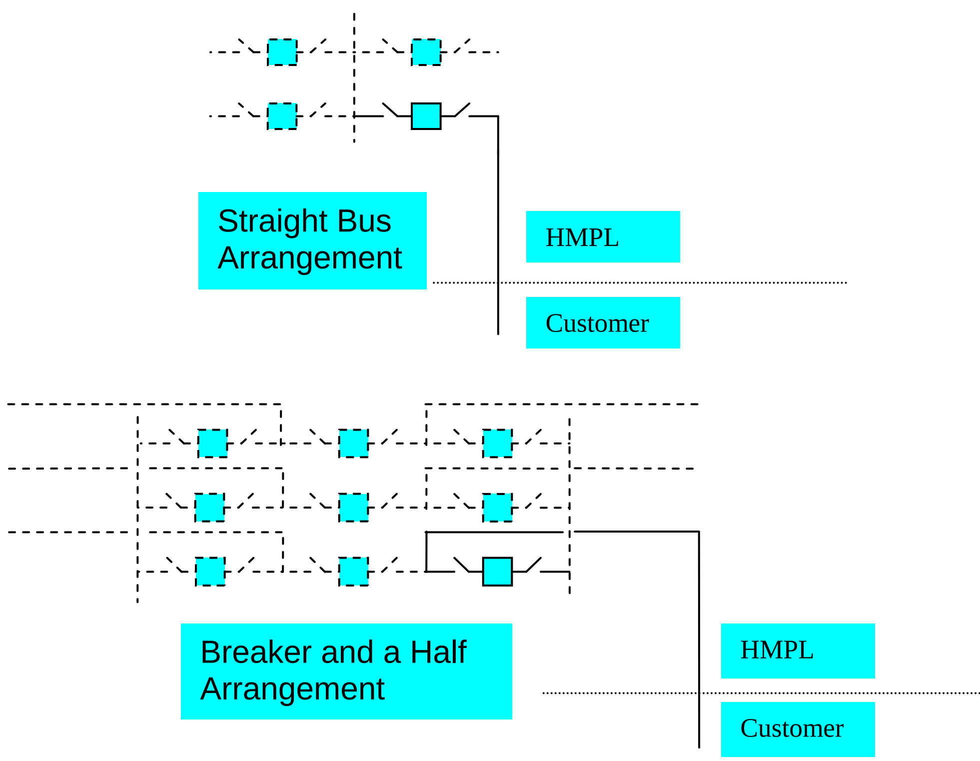

Figure 15: Tapping Existing Substation Bus Below 100 MW Demand