OG&E Criteria for Planning Transmission Projects

OG&E's bulk electric system (BES) is designed to meet the requirements for system performance as set by NERC Standard TPL-001-5. This entails that the transmission system shall be capable of performing reliably under a wide variety of expected system conditions while continuing to operate within equipment and electric system thermal, voltage, and stability limits. The transmission system, at a minimum, shall be planned to withstand all single element contingencies and maintenance outages over the load conditions of all applicable seasonal models as required for each planning process. Extreme event contingencies which measure the robustness of the electric systems should be evaluated for risks and consequences. The NERC Reliability Standards define specific requirements where adherence provides a measurable degree of reliability for the BES. Transmission Planning is responsible for recognizing the need for, and the initiation of, projects so that the BES system will continue to meet the TPL-001-5 performance criteria.

1.0.0 Base Case Analysis (NERC TABLE 1 PLANNING EVENT "P0")

- Facility loadings within normal ratings
- Voltage levels shall be maintained within plus or minus 5% of nominal voltage for all buses 69kV and above
- Stability (dynamic and steady state) of the network shall be maintained

1.0.1 Loss of Single Component Analysis

Transmission Planning will perform single contingency studies under the following conditions:

- Initiating incident results in a single element out of service as outlined in Table 1 of TPL-001 (see P1-5 contingency definitions).
- Line and equipment loadings shall be within emergency rating limits
- Voltage levels shall be maintained within plus 5% or minus 8% of nominal voltage for all busses
- No loss of customer electric demand (except as allowed through Attachment 1 of TPL-001-5)
- Stability (angular and voltage) of the network shall be maintained

1.0.2 Loss of Two or More Transmission Components.

Transmission Planning will perform contingency studies under the following conditions:

- Initiating incident results in a single element out of service, followed by an additional single element out of service as outlined in Table 1 of TPL-001 (see P6 contingency).
- TPL-001-5 allows for system adjustments following the first contingency and before the second contingency for P6 events. These adjustments will be used when appropriate.
- Line and equipment loadings shall be within emergency rating limits
- Voltage levels shall be maintained within plus 5% or minus 10% of nominal voltage for all busses
- No loss of customer electric demand (except as allowed through Table 1 of TPL-001-5)
- No curtailment of contracted firm (non-recallable reserved) transfers shall be required
- Stability (angular and voltage) of the network shall be maintained

1.0.3 Post-Contingency Voltage Deviation

Post-contingent voltage deviation is allowed unless the voltage falls outside applicable limits as outlined in Sections 1.0.1 through 1.0.2 above.

1.0.4 Extreme Contingency Events

OG&E will perform contingency studies where extreme contingency events could lead to uncontrolled cascading outages or system instability. OG&E shall document the measures and procedures to mitigate or eliminate the extent and effects of those events.

2.0.1 Transmission Facilities - General Requirements

- OG&E's electrical facilities include transmission lines operating at voltage levels of 60 kV and higher. Higher voltage levels require stringent standards of security, reliability, quality, and controllability of the electrical facilities.
- Any electrical structure or equipment utilized for high-voltage service shall be

connected to an earth-ground grid that measures no more than 0.6 ohms resistance to earth. Such value shall be measured with equipment and techniques approved by OGE and shall be certified by a measuring contractor qualified for this service. The connectors and components of the grounding grid shall be adequate for the anticipated short-circuit current magnitude and duration.

- Supervisory remote control and electrical metering shall be provided using devices and communications paths specified by OGE. Such equipment shall be proven operational before electrical operation begins.
- If a new substation is to be built along a double circuit line owned by OGE to interconnect new generation, both existing circuits must be tied into the new substation at the point of interconnection.
- If reactive power compensation is determined during the study process to be needed, it is required to be installed on the bus at the appropriate OGE facility. It will not be installed in series with any gen-tie lines.
- All new substations shall be built and designed to allow for future expansion
- New taps of the transmission system should be designed in a way that allows for switching at the point of tapping.
    - Similarly, rebuilds of existing tap locations shall incorporate this recommendation
- No new three terminal lines shall be installed within zone 7. Exceptions can be made on a case-by-case basis as a temporary solution until a permanent solution can be installed, which removes the three-terminal condition.

2.0.2 Transmission Facilities - 60 kV through 138 kV Requirements

- Multiple remotely controllable line-sectionalizing switches or circuit breakers with protective relays may be required at Facility Connection.
- Transformers capable of serving load greater than 14.0 MVA shall be controlled by a primary circuit switcher or circuit breaker with appropriate protective relaying.
- Structures at the Facility Connection may be required to be of steel construction.
- New construction shall be built in consideration of future voltage insulation requirements
- Sectionalizing devices may require load breaking and/or fault interrupting capability.
- Protective relay schemes of interconnection owner shall be integrated to operate with protective relay schemes on OGE facilities.
- Protective relaying shall include both primary and backup schemes.
- New substations with five or greater transmission facility connections shall be ring-bus or

breaker-and-a-half configuration.

- The seventh breaker on the substation bus of the same voltage will require conversion to breaker-and-a-half configuration

2.0.3 Transmission Facilities - 161 kV and Higher Requirements

- All requirements for lower-voltage connection shall apply. In addition, the following requirements shall apply:
- Substation design shall be ring-bus or breaker-and-a-half configuration.
- Protective relaying shall include dual primary schemes. New line construction shall include single or dual optical ground wires (OPGW)
- In the event that a generation Point of Interconnection is a new substation on OG&E's system, the new substation must not be closer than 22-line miles from any existing OG&E substation. If the desired POI is within a 22-line mile radius of an existing substation, the generation will be required to interconnect into existing facility.
- All 345kV substation designs are custom designs.

3 Primary Source

- When the load on an individual substation containing multiple trans- former banks exceeds 20 MVA, a second source is recommended. Implementation of this recommendation is at the discretion of the applicable Transmission Owner.
- When the total substation loading of multiple substations exceeds 30 MVA on a single radial transmission line, a second source is recommended. Implementation of this recommendation is at the discretion of the applicable Transmission Owner.
- Loads in excess of 40 MVA must be planned for restoration by automatic or supervisory control. To limit the number of series motorized sectionalizing switches, no more than 160 MVA of total capacity may be tapped between circuit breakers.
  - ❖ Large industrial loads which do not have the same redundancy requirements of other loads may be excluded from this requirement

4. SYSTEM PROTECTION AND COORDINATION

4.1 The interconnecting party shall provide protective relaying systems consistent with the guidelines listed below. Proposed protective relaying requirements for each interconnection will be subject to review and approval by OG&E for proper coordination after receipt of a preliminary single-line drawing of the proposed interconnection and a single-line drawing and drawings of the party's interconnected system.

4.2 Interconnecting parties shall make every effort to ensure proper and adequate coordination of protection systems with OG&E consistent with NERC Reliability Standard PRC-001, PRC-024, PRC-027, and any successor NERC Standards.

4.3 The interconnecting party shall provide recloser and fuse ratings, relaying data, relay bill of materials, and line and transformer impedances in coordination with OG&E.

4.4 High-speed pilot primary relaying, high-speed non-pilot secondary relaying and breaker failure relaying are required for 138 kV and higher interconnections. Specialized relaying, such as direct transfer trip, may be required to provide automatic load or generation shedding, or interconnected system separation.

4.5 High-speed pilot primary relaying, high-speed pilot secondary relaying, high speed dual-channel transfer trip and breaker failure relaying may be required at certain interconnections. The primary and secondary pilot channels and direct transfer trip channels shall be on separate systems such as power line carrier and fiber optics. Specialized relaying, such as direct transfer trip, may be required to provide automatic load or generation shedding, or interconnected system separation.

4.6 Transformer protection may include the following: differential relay, sudden pressure relay, pressure relief devices, high side overcurrent backup, neutral overcurrent, and a low oil level lockout. High side protection shall be a fuse, circuit breaker or fault interrupting switch (FIS), with adequate interrupting capability.

5. System Power Factor Limits:
   - The transmission system peak load is limited to a minimum of 97.5 percent power

factor. For OG&E's facilities, our annual capacitor program maintains this limit, and thereby defers much larger expenditures in the form of system improvement projects