SECTION 1 - PEC Transmission Planning Reliability Criteria

The transmission planning reliability criteria used at PEC are as follows:

Regional Transmission Reliability Criteria

- The PEC transmission system shall be planned so as to comply with the requirements of the NERC Planning Standards and the SERC Supplements to the NERC Planning Standards. NERC Planning Standards are available from the NERC office (http://www.nerc.com). The SERC Supplements to the NERC Planning Standards are available from the SERC office (http://www.serc1.org).

Additional Criteria Used By PEC

- Voltage on the transmission side of transmission-to-distribution substations and at transmission level delivery points at 230 kV and below shall be maintained between 90% and 105% of nominal voltage during normal and contingency conditions. Transmission buses at 500 kV shall be maintained between 100% and 108% of nominal voltage during normal and contingency conditions. Voltage during contingencies shall not vary more than 0.08 per unit from the pre-contingency voltage.

- No PEC bulk power facility, such as transmission lines, transmission-to-transmission transformers, transmission breakers, etc., is to exceed the facility's thermal rating under normal and contingency conditions.

- The nuclear units will be operated within the applicable switchyard voltage limits in accordance with the appropriate regulatory requirements.

- At non-nuclear plants, minimum and maximum voltage levels are followed to either provide support to a nearby nuclear plant or to the transmission system during the different operating conditions.

- Electromagnetic transients experienced during the energization or switching of capacitor banks or similar devices must be below the equipment BIL.

- Harmonic voltages shall not exceed the following limits:

    1. Below 69 kV, the maximum individual harmonic component and maximum total harmonic distortion should be less than 3.0% and 5.0%, respectively.
    2. Between 69 kV and 138 kV, the maximum individual harmonic component and maximum total harmonic distortion should be less than 1.5% and 2.5%, respectively.

    3. Above 138 kV, the maximum individual harmonic component and maximum total harmonic distortion should be less than 1.0% and 1.5%, respectively.

- Customer equipment connected to the PEC system shall not be operated in a manner that

adversely impacts the PEC system or service to other PEC customers. IEEE Standard 519-1992 should be used as a guideline for adding harmonics producing loads. Load additions causing flicker will be examined on an individual basis due to the lack of widely accepted utility standards.

- The transmission system shall be planned such that it does not excessively rely on or cause an undue burden on neighboring systems.

- Stability shall be maintained in accordance with NERC Planning Standards I.A.

SECTION 2 - PEC Transmission Planning Assessment Practices

The following transmission planning assessment practices are used by PEC:

Regional Transmission Assessment Practices

- The PEC transmission system is tested in accordance with the SERC Supplements to the NERC Planning Standards. This document is available from the SERC Office.

- PEC currently participates in several regional bulk transmission studies. These include studies performed by the VACAR (Virginia-Carolinas Subregion of SERC), VAST (VACAR-AEP-Southern-TVA-Entergy), VST (VACAR-Southern-TVA-Entergy), and VEM (VACAR-ECAR-MAAC) study groups. These studies evaluate the bulk transmission system to ensure that the interconnected system is capable of handling both normal and emergency transactions.

Additional Assessment Practices Used By PEC

- The ability of the transmission system to meet the planning criteria is assessed for specified contingencies. Contingencies are assumed to occur at the time of the summer, or winter, coincident peak load without interruptible load management. The following contingencies are assessed:

  (1) the loss of any single generating unit, in combination with the loss of any bulk power transmission system component or two transmission lines which are built on common structures. This includes examining the effect of remaining generation being scaled back for a total reduction equal to the PEC TRM requirement (approximately 1820 MW), or

  (2) the loss of any single transmission component or two transmission lines which are built on common structures.

  A transmission system component can be a transmission line, circuit breaker, transformer, or any other facility or piece of equipment which might open a circuit. This component may be

located within PEC, on a foreign system, or on a PEC interface.

- The ability of the transmission system to meet the planning criteria while delivering a plant's maximum generating output is assessed for normal and single contingency conditions. For selected baseload plants, the system is assessed during double contingency conditions.

- Generator unit stability is assessed in accordance with NERC Planning Standard I.A. Certain generating plants on the PEC system are tested for 3-phase faults with delayed clearing.

Considerations for Transmission Planning Studies to Address NERC Standards TPL-003 and TPL-004, Table 1 Categories C & D

- For Powerflow Studies:

  PEC annually performs powerflow screening studies to identify thermal overload and voltage problems for contingencies in excess of those required by the NERC Table 1 Category C contingencies. This includes examining the effect of contingency outages of transmission lines/transformers with any one major unit down and the remaining generation scaled back for a total reduction approximately equal to the PEC TRM requirement (approximately 1820 MW). The contingencies studied include common tower outages. PEC also assesses the impact of worst case two-unit outages with contingency outages of transmission lines/transformers. Using this methodology, PEC believes this adequately envelopes the Category C type contingencies, with the possible exception of Categories C.1 and C.9.

  With respect to Categories C.1 and C.9 (for outages of Bus Sections), PEC periodically perform assessments of those substations on our system where a bus outage would result in the loss of multiple other transmission elements (i.e., lines, transformers, etc.). Assessments are performed to determine situations where the resulting loss would be particularly problematic (i.e. would result in significant other overloads or possible cascading outages). As a result, a number of substations/buses have been identified for upgrades to minimize the consequences of a bus outage.

  The above noted PEC assessment of substations also addresses Category D.8 or D.9 type events (loss of substation/switching station at one voltage level plus transformers). Additionally, PEC participates in the VACAR Powerflow Working Group studies, which address selected Category D events as part of the short-term assessments, performed biannually.

  With respect to Category D.10 (loss of all generating units at a station), we assess our system for the loss of two Brunswick units. These are our two largest units and they are located at a single station. The primary purpose of this assessment is to understand what our risk is, should this event occur.

  Using this methodology, PEC believes this adequately envelopes the Category D type contingencies.

- For Dynamic Studies:

For dynamic studies, PEC uses a double line to ground (DLG) fault with delayed clearing as a minimum criteria for stability. PEC considers the DLG Delayed Clearing fault to be a Category D type fault which, in virtually all cases, is more severe than any of the Category C contingencies of Table 1 (which are 3-phase normal clearing or SLG delayed clearing type faults).

Additionally, actual system breaker configuration is appropriately simulated during dynamic studies. For example, in a breaker-and-a-half scheme substation, delayed clearing is simulated by assuming the tie breaker (middle breaker) of the scheme fails to operate. This results in tripping of the faulted element (line, transformer, etc.) plus tripping of the adjacent element in that breaker-and-a-half string. Automatic reclosing is also simulated, where judged to be material to the simulation results.

With respect to Category D events, as stated above PEC considers the DLG Delayed Clearing fault to be a Category D type fault. Three-phase faults are relatively rare and a three-phase fault with delayed clearing is extremely rare. This is supported by a review of recent fault history which indicates that less than 7% of faults on the PEC system are 3-phase faults and an extremely small number of any type of fault involves a breaker failure (i.e. delayed clearing). Therefore, the DLG Delayed Clearing fault is judged to be of sufficient severity to address reasonably expected system events.

SECTION 3 - Evaluation of Transmission System Performance

The PEC transmission system consists of approximately 6,000 miles of 69, 115, 138, 161, 230, and 500 kV transmission lines and just over 100 transmission-class switching stations in its North and South Carolina service areas. The primary purpose of this transmission system is to provide the electrical path necessary to accommodate the transfer of bulk power as required to ensure safe, reliable, and economic service to control area customers.

Transmission planning efforts normally take into consideration a 10-year planning horizon. This time span is sufficient to identify projects and provide a reasonable estimate of the financial requirements. Required engineering, scheduling, and construction lead-times can be satisfactorily accommodated within this planning period. Planning is based on the Company's long-range system peak load forecast, which includes all territorial load and contractual obligations; the Company's resource plan; and local area forecasts for retail, wholesale, and industrial loads.

Transfer Capability Discussion

PEC has direct interconnections with American Electric Power, Duke Power Company, South Carolina Electric & Gas Company, South Carolina Public Service Authority, Tennessee Valley Authority, and Dominion Virginia Power. PEC has coordinated its transmission planning and operations to assure the continued safety, reliability, and economy of its power system. PEC actively participates in inter- and intra-regional studies. Detailed near-term operating studies and longer-range planning studies are made on a regular basis to ensure that transmission capacity will continue to be adequate. These studies involve representatives from the Virginia-Carolinas Subregion (VACAR) and adjacent subregions and regions to provide interregional coordination.

PEC actively participated on the VACAR-Southern-TVA-Entergy (VST), the VACAR-AEP-Southern-TVA-Entergy (VAST), the VACAR-ECAR-MAAC (VEM), and the VACAR inter-regional reliability committees and participated in the following studies during the 2004-2005 time frame:

2004 VAST Summer Reliability Study
2004/05 VAST Winter Reliability Study
2011 VST Summer Study
2005 VACAR Summer Reliability Study
2004/05 VACAR Winter Stability Study
2004 VEM Summer Reliability Study
2004/05 VEM Winter Reliability Study

These studies are required to comply with contractual obligations associated with the VACAR, VEM, and VST agreements. These studies are being filed by SERC for the region. Copies of these study reports are available from the SERC Administrative Office.

Results of these studies indicate that existing facilities, along with those planned to meet the future reliability needs, will provide limited economy and emergency transfer capability between the subregions and regions.