

#### **Part IV: Transmission Planning Reliability Criteria**

Platte River subscribes to the Western Electricity Coordinating Council (WECC) Reliability Criteria which has been filed on our behalf by WECC as Basic Information.

Platte River submits the following Additional Information detailing the acceptable levels of service on Platte River's transmission system. Criteria for basic interconnection arrangements are defined in addition to limits on voltage magnitude, distortion and flicker, and limits on loading transmission lines and transformers.

---

#### **ACCEPTABLE LEVELS OF SERVICE ON PLATTE RIVER'S TRANSMISSION SYSTEM**

These guidelines are for establishing the typical levels of service on Platte River's transmission system. Each system element and application should be individually reviewed and may require deviations, either above or below, from these guidelines. These guidelines will be updated periodically as experience is obtained or additional information becomes available. The purpose of these guidelines is to guard against an individual customer/utility from adversely impacting another customer/utility. In addition, the operation of the transmission system shall not result in equipment damage or loss of load.

These guidelines will help communicate and coordinate the transmission system requirements between Platte River and each of the four cities in order to maintain, as equally as possible, the levels of service to each of the four cities. It should also be recognized that deviations from these acceptable levels and differences from one city to another may exist from time to time due to unforeseen or temporary circumstances, e.g., timing of large new customers, accelerated load growth, operating constraints, or the lead time required for the planning, design, and construction of new transmission facilities. These guidelines are meant to supplement, not replace, the requirements for joint system planning and new delivery points as stated in the "Transmission Facilities Agreement" between Platte River and each of the four cities.

These guidelines are applicable to any party requesting an interconnection with Platte River's transmission system. Platte River will conduct the necessary planning and operating studies in a coordinated effort with all parties affected by the proposed interconnection. Specific system requirements for design, equipment ratings, system protection, operation, and maintenance will be determined on an individual case basis in accordance with these guidelines and communicated to all affected parties.

The planning guidelines for determining acceptable levels of service are as follows:

- (1) The transmission system will be designed in accordance with the "WECC Reliability Criteria for Transmission System Planning" (Attachment 1).

- (2) The minimum acceptable steady state voltage is 0.95 Per Unit (P.U.) with the system intact and 0.92 P.U. under N-1 conditions. These limits coordinate with the distribution system minimum voltage limits in accordance with ANSI C84.1-1989, Voltage Ratings (60 Hz).
- (3) The maximum acceptable steady state voltage is 1.04 P.U. with the system intact and 1.06 P.U. under N-1 conditions. These limits coordinate with requirements for overvoltage of transformer windings in accordance with ANSI C57.12.00-1980, General Requirements for Transformer. These limits also coordinate with the distribution system maximum voltage limits in accordance with ANSI C84.1-1989, Voltage Ratings (60 Hz).
- (4) No system element shall exceed its steady state Rated Capacity with the system intact or its emergency Rated Capacity under N-1 conditions.
  - (4a) The emergency rating of transformers is 120% of the maximum nameplate rating. The loading must be reduced to 100% of nameplate within 60 minutes of the start of the overload condition. Loading beyond 120% of nameplate will not be permitted unless a detailed study is conducted by the manufacturer. In any event, the allowable loading must not exceed 140% of nameplate.
  - (4b) The use of emergency ratings will be permitted only when accompanied by specific operating procedures to reduce the loading back to the steady state Rated Capacity within the allotted time.
- (5) Connections to the transmission system shall be made with Full Breaker Isolation; however, connection of large power transformers may be made with circuit switchers when connected to a main bus in a breaker-and-a-half bus arrangement.
- (6) For the 115kV portion of the transmission system where the Full Breaker Isolation requirement has been waived, only one tapped transformer may be connected per 115kV line segment that has Full Breaker Isolation. For this case, the high side switching for the transformer shall be a circuit switcher. Although connections are permitted without Full Breaker Isolation, the preferred arrangement is to have Full Breaker Isolation.
- (7) The substations shall be arranged such that each line or transformer can be isolated by supervisory control.
- (8) Each transformer shall have backup protection. One method is to protect the transformer with a high side circuit switcher, tripping the local breakers in the event of a circuit switcher failure. Another method is to protect the transformer with line position breakers, initiating a trip of the remote line breakers in the event of a local line breaker failure. Refer to Figure 1.
- (9) When tapping a 115 kV transmission line to supply distribution type transformers, the preferred substation arrangement is a breaker sectionalized bus. However, the substations shall be designed for ultimate conversion to a ring bus. Refer to Figure 1.

- (10) The maximum permissible voltage fluctuation (flicker) on the transmission system is indicated in Figure 2. This flicker criteria generally conforms with the flicker limits defined in Section 10.5.1 of IEEE Std. 519-1992. Any expected flicker for new facilities beyond 50% of the allowable amount will be reviewed on an individual case basis.
- (11) The amount of voltage distortion that can be tolerated on the transmission system is defined in Section 11.5 of IEEE Std. 519-1992. The Total Harmonic Distortion (THD) limit is 1.5% at a 230 kV bus and 2.5% at a 115 kV bus. THD is equal to the square root of the sum of the squared harmonic voltages, divided by the magnitude of the fundamental voltage.
- (12) All 230 kV connections shall be made with Full Breaker Isolation utilizing either a ring bus or a breaker-and-a-half bus arrangement.
- (13) The maximum number of breaker positions preferred on a ring bus arrangement is six. If more than six breaker positions are desired, then the preferred design is a breaker-and-a-half bus arrangement.

Definitions:

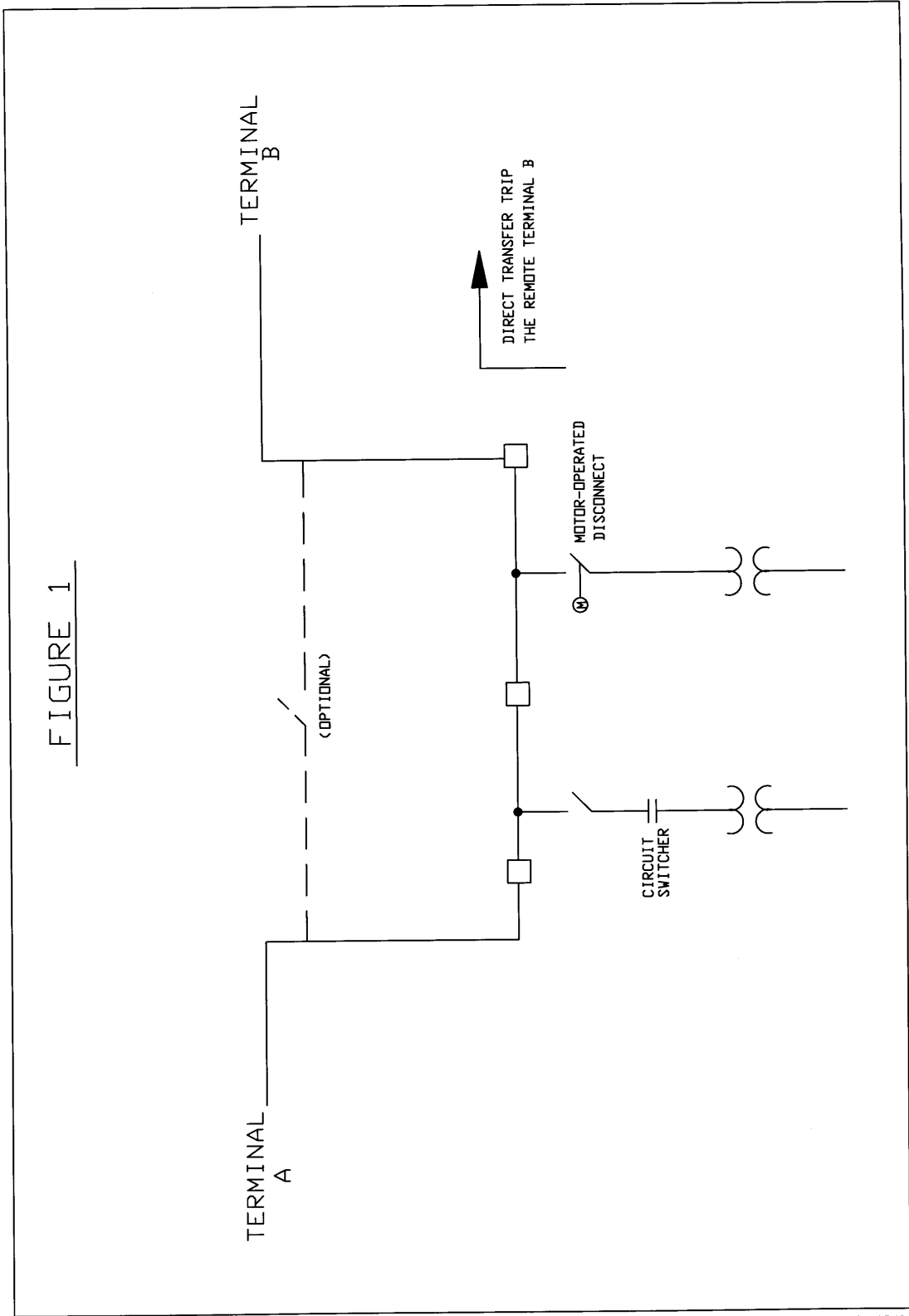
- (1) Per Unit (P.U.) - Per Unit is a proportional representation of the measurement quantity. One P.U. is 100% of the nominal value. One P.U. voltage on the power system is 100% of the nominal system voltage, (i.e., 115kV, 230kV, 345kV, etc.).
- (2) Rated Capacity - This is the maximum capacity in MW, MVA, or amps of a system element that can be sustained for a specified period of time. Each system element may have several different rated capacities (i.e., seasonal, steady state, emergency). Rated capacities shall be such that when operated at that level for the specified period of time there shall be no permanent damage to equipment or materials, no appreciable loss of useful life, and no violations of applicable safety codes.
- (3) Full Breaker Isolation - This requires that operation of all associated circuit breakers for the element to be removed from service will not interrupt service to any other system element. This assumes that the system is initially intact.
- (4) N-1 - This term refers to the condition that occurs when one element of the power system has been removed from service by either voluntary or involuntary means. Typical elements of the power system include, but are not limited to transmission lines, transformers, relays, protection and reclosing schemes, circuit breakers, and disconnects.

Revised and approved  
Joint Technical Advisory Committee

October, 1999

---

Platte River generates and transmits electricity for its four Member Cities – Estes Park, Fort Collins, Longmont, and Loveland. The Cities are responsible for the distribution system on which they distribute the electricity to their retail customers. Each City has its own criteria for its distribution system including, but not limited to, distribution transformer and feeder loading limits.

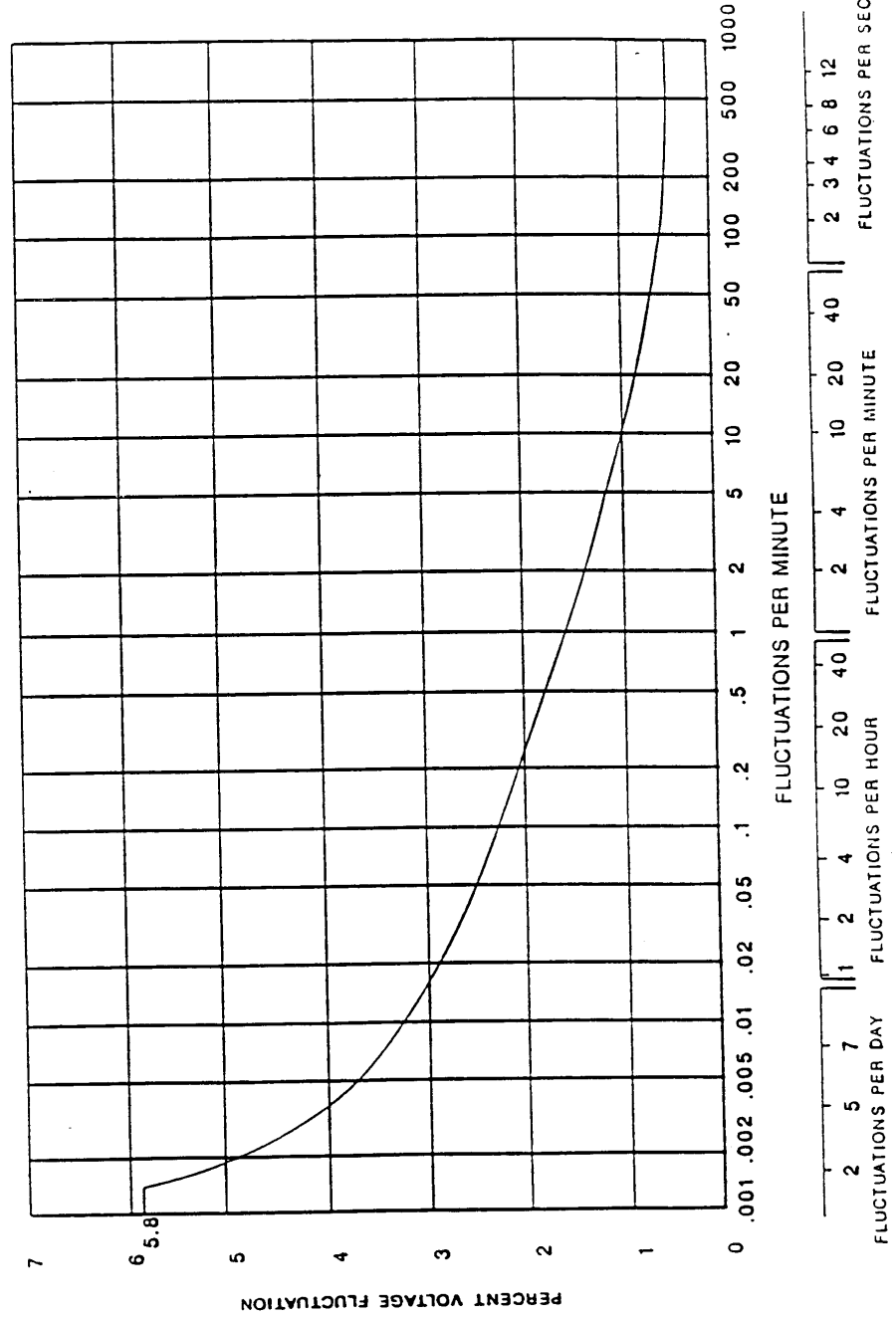


PRS-176 10/6/99

FIGURE 2  
 PLATTE RIVER POWER AUTHORITY



MAXIMUM PERMISSIBLE VOLTAGE FLUCTUATION



H-5