

IB.3 Planning Standards for Transmission Voltage

I. Scope

This chapter documents and defines PacifiCorp's standards and responsibilities for various transmission voltage levels delivered to customers. These standards are used in studies to identify any deficiencies in the transmission system. These standards are also useful in investigations of actual conditions, to determine PacifiCorp's response to customers who are concerned about voltage level.

2. Voltage Conditions and Ranges

2.1. Voltage Conditions

Outage condition voltages occur after a piece of equipment has been removed from service on a prescheduled basis, or after system readjustment following an emergency condition.

Emergency condition voltages occur after a disturbance, before the system equipment can be readjusted, such as: tap changers, switched reactor and capacitor banks, and so forth.

2.2. Voltage Ranges

The transmission voltage ranges in this section are determined by PacifiCorp for nominal voltages of 46 kV and above.

Table I—Voltage Range Limits

Operating Mode	Normal Operation		Outage / Emergency Conditions ²	
	Looped	Radial	Looped	Radial
System Configuration	Looped	Radial	Looped	Radial
Maximum Voltage	1.06 ¹	1.06 ¹	1.10	1.10
Minimum Voltage	0.95	0.90	0.90	0.85

1. In some situations, voltages may go as high as 1.08 pu at non-load busses, contingent upon equipment rating review.
2. Voltages immediately after an emergency condition may fall outside these ranges before operations occur to bring the voltage level up to, or above the minimum acceptable level, or down to, or below the maximum acceptable level.

2.3. Voltage for Generators Interconnecting with the PacifiCorp System

All non-PacifiCorp-owned generation entities that interconnect with the PacifiCorp system, such as Qualifying Facilities (QF's) and Independent Power Producers (IPP's), must include language in their contract that defines the voltage profile requirements to be held under specific system conditions. The analysis required for each interconnection with a generating

facility will require that the following items be considered: (1) that the generating station's voltage profile be set such that voltages at any level of the affected system remain within the recommended voltage ranges as specified in these documents; (2) that the generating station's voltage profile be such that the generator will not cause PacifiCorp customers to receive service voltages outside of ANSI ranges A or B as applicable; and (3) that each proposed new interconnection with a generating facility be studied giving consideration to loading levels for customer loads, generation levels, future requirements in the area, and possible power schedules through the system under consideration.

3. Shunt Reactive Switching Guidelines

Voltage fluctuation values applied to shunt reactive devices and switching capacitors are shown in Table 2 below.

Table 2—Shunt Reactive Switching Limits

Shunt reactive devices switched regularly	±3.0%
Shunt reactive devices switched seasonally	±4.5%
Shunt reactive devices switched only during emergencies for voltage support	±6.0%