

Southern California Edison
2025-WMPs – 2025-WMPs

DATA REQUEST SET Cal Advocates - SCE - 2025 WMP - 13

To: Cal Advocates
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Job Title: Senior Engineer 2
Received Date: 6/7/2024

Response Date: 6/21/2024

Question 02:

For SCE's four-wire multi-grounded primary circuits at or below 35 kV please describe, with references to SCE's procedures:

- a) SCE's fast-trip line-current thresholds;
- b) How SCE's fast-trip line-current thresholds are calculated from measured circuit values;
- c) The intentional delays assigned to those line-current thresholds;
- d) SCE's fast-trip ground-current thresholds;
- e) How SCE's fast-trip ground-current thresholds are calculated from measured circuit values;
- f) The intentional delays assigned to those ground-current thresholds; and
- g) How the current and delay thresholds differ from non fast-trip settings.

Response to Question 02:

a) SCE's fast-trip line-current thresholds;

SCE's line (or phase) Fast Trip minimum trip setting is set to be a multiple of the phase minimum trip setting. The phase minimum trip setting is the point at which any current above that setting will cause the protective relay to begin timing. If the phase current exceeds the phase minimum trip for a time longer than the time dial setting, the relay will operate to trip. The line (or phase) Fast Trip pickup is set to 2.3 times or greater than the phase minimum trip. If the phase current exceeds the line (or phase) Fast Trip pickup for a time longer than the Fast Trip time delay, the relay will operate to trip its associated interrupting device.

b) How SCE's fast-trip line-current thresholds are calculated from measured circuit values;

SCE's line (or phase) Fast Trip pickup setting is calculated to be 2.3 times or greater than the phase minimum trip. The Fast Trip pickup setting may be greater than 2.3 times the phase minimum trip as long as it also provides more than 2.3 times the ratio of calculated end of zone fault current divided by Fast Trip pickup setting on all in zone circuit segments. This will prevent excessive overreach of downstream Fast Trip enabled devices.

The line (or phase) Fast Trip pickup provides the following margins to avoid excessive overreach of downstream protective devices:

Set the upstream pickup less than $0.75 \times$ three phase fault current at the furthest downstream protective device, which provides a 133% margin ($1/0.75 = 1.33$).

Set the upstream pickup less than $0.866 \times$ phase-phase fault current at the furthest

downstream protective device, which provides a 115% margin ($1/0.866 = 1.15$).

c) The intentional delays assigned to those line-current thresholds;

In relays which must be set in cycles, SCE sets the line (or phase) Fast Trip time delays to 4 cycles (0.067 seconds). In relays which must be set in seconds with only 2 decimals, SCE sets the line (or phase) Fast Trip time delays to 0.070 seconds (4.2 cycles). As part of a pilot, 15 critical HFRA circuits have been set with a 2 cycle (0.033 seconds) Fast Trip time delay.

d) SCE's fast-trip ground-current thresholds;

SCE's ground Fast Trip minimum trip setting is set to be a multiple of the ground minimum trip setting. The ground minimum trip setting is the point at which any current above that setting will cause the protective relay to begin timing. If the ground current exceeds the ground minimum trip for a time longer than the time dial setting, the relay will operate to trip. The ground Fast Trip pickup is set to 5 times or greater than the ground minimum trip. If the ground current exceeds the ground Fast Trip pickup for a time longer than the Fast Trip time delay, the relay will operate to trip it's associated interrupting device.

e) How SCE's fast-trip ground-current thresholds are calculated from measured circuit values;

SCE's ground Fast Trip pickup setting is calculated to be 5 times or greater than the ground minimum trip. The Fast Trip pickup setting may be greater than 5 times the ground minimum trip as long as it also provides more than 5 times the ratio of calculated end of zone fault current divided by Fast Trip pickup setting on all in zone circuit segments. This will prevent excessive overreach of downstream Fast Trip enabled devices.

The ground Fast Trip pickup should provide the following margin to avoid excessive overreach of downstream protective devices –

Set the upstream pickup less than $0.75 \times$ single phase-gnd fault current at the furthest downstream protective device, which provides a 133% margin ($1/0.75 = 1.33$).

f) The intentional delays assigned to those ground-current thresholds; and

In relays which must be set in cycles, SCE sets the ground Fast Trip time delays to 4 cycles (0.67 milliseconds). In relays which must be set in seconds with only 2 decimals, SCE sets the ground Fast Trip time delays to 0.07 seconds (4.2 cycles). As part of a pilot, 15 critical HFRA circuits have been set with a 2 cycle (0.33 milliseconds) Fast Trip time delay.

g) How the current and delay thresholds differ from non fast-trip settings.

SCE's line (or phase) Fast Trip pickup setting is set to be 2.3 times or greater than the phase minimum trip, and SCE's ground Fast Trip pickup setting is set to be 5 times or greater than the ground minimum trip. The delay thresholds differ in that the SCE's Fast Trip settings use a fixed 2 or 4 cycle time delay whereas the time overcurrent settings use a time curve characteristic which operates faster during high fault current conditions and slower during low fault current conditions. The time curve characteristic typically consists of a curve type and time dial setting.