

Southern California Edison
WSD-001 – 2020 WMP

DATA REQUEST SET SPD - SCE - V e r b a l - 0 0 1

To: SPD

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Response Date: 7/21/2020

Question 001:

How does SCE guarantee that the open phase detection system will not activate for one line when another nearby transmission line has an open phase?

Response to Question 001:

With any new protection technology/settings, we study and analyze various system conditions that would render a desirable or undesirable outcome. Utilizing Real Time Digital Simulation (RTDS), we are able to study/replicate events that are close to real system scenarios. Using this type of testing approach, we can study events that are within zone or out of zone for a new protection scheme/setting. The RTDS analysis allows us to fine tune our schemes or settings before they are placed in-service. This was the approach taken for the Open Phase Detection settings. We ran several simulations, but specifically an Open Phase event out of zone. As previously mentioned in our conference call, the Open Phase detection utilizes the ratio of negative-sequence current over the positive-sequence current (I_2/I_1). This ratio must be above a predetermined pick up level in order to declare an Open Phase condition. In the scenario described in the question, the transmission line experiencing an Open Phase condition will satisfy the ratio of negative-sequence current over the positive-sequence current (I_2/I_1) and declaring an open phase condition. For an adjacent transmission line with an Open Phase Detection setting, it will not declare an Open Phase condition due to the following: In a meshed network, one transmission line does not feed only one load. When the conductor of an adjacent line breaks, there is a re-balancing of power flow. On every transmission line adjacent to the faulted line, there is power flow on all phases. The current on all phases ensures that the I_2/I_1 condition is not met for the function monitoring the non-faulted line and, as such, does not operate for adjacent line broken conductor. That said, it is important to ensure that there is not a series of line in series (with no load/generation in between). If that was the case, then they electrically appear as one single long transmission line. In this case, a break in one of the transmission lines would appear as a break on any of the line segments and might cause an over-reach. The Open Phase Detection logic is not a universal approach. It must be studied under various system conditions and scenarios. Hence, the need to conduct a RTDS analysis for this type of scheme and transmission lines that are to be considered.