Why Do Regulator Taps Not Match the IEEE Test Feeder Results?

From OpenDSSWiki

Question

After running the OpenDSS for the IEEE Test cases I have observed that calculated tap positions are "generally" slightly different that the solution presented by IEEE Radial Test Feeder. Even when the data are identical, why do we obtain different solutions?. Is there a unique solution?. The OpenDSS strategy seems to determine tap positions after the base case load flow is solved. Is it right?

Answer

Many of the older Test Feeder solutions were posted by Bill Kersting using his feeder analysis program that he was using at the time (may have been RDAP?). Bill has told me that the algorithm computes the tap required to get to the center of band. If you set the regulator taps to what Bill posted, the OpenDSS results will often agree to 4-5 significant digits. Some test feeders have distributed loads, while OpenDSS has only spot loads, so these will never match that well.

The tap the OpenDSS computes will depend on tap at the beginning of the iteration procedure. There are often at least 3 tap positions that will give voltages within band. Taps are usually 5/8% while the band might be 2 or 3 volts out of 120V. Thus, the band is wider than one tap. So there can be more than one tap that gives a solution within band. Starting from neutral (tap 0), OpenDSS will usually stop one tap short of Kersting's solution. Once the voltage gets back in band, it stops iterating. It does not try to get center of band; just back in band.

I claim that you will only get the "right" answer by doing at least 1 daily simulation. Sometimes, it takes simulating 2 daily load cycles for the taps and capacitor switch positions to settle out and repeat the same solution. In the OpenDSS, another approach is to start a little bit below the peak load, use Dutycycle mode with a time step of a few seconds (half the shortest time delay of regulator controls, for example) and gradually sneak up on the peak load. In addition, you can limit the regulators to change no more than one tap at a time rather than run to the ultimate solution. This gives a better replication of what happens in real life.

Given the accuracy of distribution data, plus/minus one tap will not have much impact on planning decisions. For matching published results, one frequently has to force tap positions to match to get a closer match to a benchmark case.

--Rdugan 15:16, 27 January 2011 (UTC)

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