



Wind Farm Cable Testing

What to do?

QUESTION: You just installed miles of cables with hundreds of splices and terminations. What do you do to make sure the workmanship is good? You assume the components were sound from the manufacturers but want to test the quality of the installation work by the contractors. What to do, what to use, how to do it, etc?

As with any testing program, you must ask yourself what you intend to gain by the test and what will you do with the test data. If all you want to do is to verify the installation integrity of new work, then you want to perform a simple, inexpensive AC withstand test. If it's old, water treed cable and you want to test many lengths to compare and prioritize replacement or injection, then maybe a Tan Delta test or Off-Line PD test is best, although the TD test is simpler and less expensive than PD if the test will be used simply for comparison purposes. If it's old and you need to verify if certain lengths are good, an Off-Line PD test may be the best approach. Below are the possible approaches.

- DC Overvoltage Test
- VLF AC Withstand Test
- VLF Tan Delta Test
- Off-Line Partial Discharge Test
- On-Line Partial Discharge Test

Let's take a look: DC is out, since most no longer use it due to the problems associated with DC voltage and polarizing water trees and the fact that DC leakage current testing misses too much. On-Line PD testing is mostly out since it does nothing to test the insulation or accessories at voltages above operating, even 5% above operating, missing too much to be a worthy diagnostic test. Tan Delta is used effectively to measure the level of insulation degradation of old cables, but not for new situations. We are testing new cables, which are 99% good, while looking for defects due to installation. What's left: VLF and Off-Line PD, two very different approaches.

Generally, if both are considered for a job, one or the other is probably wrong for it. For instance, you would never use PD to verify the integrity of new accessories and cables. The test is very expensive, difficult to perform, and often ambiguous at best and inconclusive at worst. Example: you measured a pd level in a splice. OK, is it acceptable or not? Splices can live with high levels of PD for decades (not insulation - this test is valuable for that, albeit expensive). There is no handbook to refer to for all types of accessories in all types of conditions tested by all types of PD equipment, and analyzed by all types of operators. PD testing is valuable in many applications, including cable, just not this one. Contact your splice maker for their thoughts.

Everything is new; all you want to do is find bad workmanship. The easiest, least expensive, surest way to do that is to perform a simple AC withstand test. If a splice passes a "proper" VLF or 60Hz withstand test, it's good and will last for years. Who cares what the PD or Tan Delta number is. It's solid if it passed 2 - 3 times normal voltage for a 30+ minute VLF test. If you have an aged system with many defect locations, then maybe VLF is not the way to go, but for new installations that are generally good, why would you use any other more complicated and expensive approach when it does not provide any additional information, usually less? VLF will not harm good insulation nor aggravate defects that are not severe enough to be triggered into PD under the test voltage. Don't let others overcomplicate or misrepresent VLF testing. There's nothing not to work, it's just a simple AC hipot test, like we do with our vacuum bottles, rubber goods, hot sticks, breakers, etc.

If in doubt, contact your cable and accessory providers for their thoughts on VLF versus PD. HVI advocates the use of all methods where appropriate. Be cautious of single technology service providers claiming only their method works.



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