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Question 2.12 What were the challenges identified or lessons learned from any cases or examples of distribution level islanding systems which were both intentionally and not-intentionally disconnected from the main power system? (C6 report)

2.12: Due to inherent risks, DERs must detect islanding and immediately cease to energize the islanded part of the distribution network. The following challenges are usually observed regarding the unintentional islanding detection and mitigation:

A. With the higher penetration of DERs, no voltage and frequency deviations may be experienced to indicate the formation of an island. Thus, in this case, there is a higher chance that the load in the islanded part of the distribution network matches the total output generation of the DERs. Therefore, DERs can feed the islanded part of the network, thus maintaining voltage and frequency within their limits.

B. Non-detective zone of voltage & frequency relays in the PCC (Point of common coupling) is problematic and may allow islanding for a certain time. As such, traditional tools for islanding detection (i.e., simple voltage & frequency relays) oftentimes prove to be inadequate. More sophisticated functions/methods/relays are usually needed (e.g., ROCOF and VS relays).

C. Unnecessary tripping due to network disturbances is another challenge. Thus, sensitivity of relays for islanding detection leads to unnecessary operation of these relays when we have a network disturbance (e.g., a sudden load addition/disconnection or when a fault happens on an adjacent feeder fed from the same substation). It is always very difficult to find proper settings for islanding protection in order to achieve both sensitivity and selectivity.

D. According to the IEEE 1547-2018, DERs are required to detect island in less than 2 seconds even with perfect generation-load balance and for any voltage or frequency trip settings within allowable range. Under these conditions, there is no detectable change in the PCC (Point of common coupling) or DER's terminal voltage, thus making the detection speed a major issue.

E. The requirements on low voltage ride through and low/high frequency ride through within the IEEE 1547-2018 may degrade islanding detection.

F. With the rising penetration of DERs, grid-supporting functions of DERs become increasingly important. In this situation, passive anti-islanding methods are safer as they do not adversely impact the aforementioned functions. However, within the context of the passive methods, addressing three major criteria: 1) islanding detection speed, 2) sensitivity, and 3) selectively at the same time still remains a big challenge.