



# **Loss of Mains Protection Update (Oct 2012)**

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# Loss of Mains Protection

1. Background
2. Outcomes
3. Proposals

# 1. Background

- Strathclyde University on behalf of NIE has carried out a laboratory based verification of loss of mains protection (LOM)
- The scope was to determine the sensitivity and stability of LOM protection relays using RoCoF and VS algorithms up to and including frequency changes of 2hz/sec and delays of 500mSec and VS of 6 and 12 degrees
- These simulations included :-
  - Protection sensitivity tests for active and reactive power imbalances of up to +10 to -10% following an islanding situation
  - Protection Stability analysis for single, two phase and three phase faults with voltage retention from 20% to 80%
- 23 scenarios where simulated on both Synchronous and DFIG generation technologies

## 2 Outcome Summary

- Protection response depends significantly on the generation technology
- SM based DG
  - At 2 Hz/Sec the existing LOM protection is not capable of detecting genuine LOM events at power imbalances less or equal to 10% of generator rating
  - A poor sensitivity occurs when using any of the setting tested for a VS methodology – no operation for the minimal setting of 6 degrees
- DFIG based DG
  - At 2 hz/sec with no time delay all genuine LOM events were detected
  - At 2hz/sec with 500mSec delay some LOM events were not detected

## 2 Outcome Summary Cont

- DFIG based DG cont
  - VS based protection showed good sensitivity at both 6 & 12 degrees
  - Voltage instability occurs in all scenarios which would also prevent stable operation of systems supplied with DFIG generation
- LOM protection stability in response to remote system faults remains good for both types of technologies
- The introduction of fast frequency response for embedded generation could dramatically impact its capability to react to an LOM event using existing relaying.

### 3. Proposals

- All generation connected at 11kV and below will have no change to their present LOM setting regime.
- All SM generation will have no change to their LOM setting regime other than VS will be removed as an option
- All other 33kV connected generation will have their LOM protection changed to accommodate the stability requirements for a major loss of generation. This presently will be:-
  - Where the generation is incapable of fast frequency response a RoCoF setting of 2hz/sec delayed by 500mSecs will apply. VS may be used subject to a suitable stability setting being advised by system operators
  - Where generation is capable of responding to frequency then other LOM systems will be utilised such as Intertripping.



**Thank you  
for Listening**