Harmonic Studies Preliminary Guidelines

Inputs.

1. Emission Limits > provided by AEMO
   * Planning levels / background harmonics > Assumed, provided by IEC 61000 standards
2. Frequency sweeps > provided by AEMO
3. Frequency sweeps with N-1 scenarios > provided by AEMO

Assumptions

Background harmonics (if not included – if included need to specify what has been included and what assumptions were made)

1.          85% of planning level for 5-7th harmonics

2.         50% for all other orders

Apply summation law from IEC 61000

Alpha factor = 1

Methodology

1. Calculate harmonic impedance polygons from AEMO frequency sweeps representing frequency dependent impedance upstream from POC
2. PF model
   * Include grid connection
   * Correct transformer representation
   * Full reticulation network modelled
3. Credible scenarios for the generator
   * Transformer impedance tolerances
   * Turbine output power levels (based on OEM datasheet)
   * Partial operation e.g. 1 transformer OOS
4. Determine harmonic emissions at POC in the absence of background harmonics (using polygon vertices)
5. Calculate maximum amplification factors at POC (Z including WF / Z without WF)
6. For harmonics with positive amplification factor check contributions + amplification of background harmonics
7. Discuss with NSP if unsure of any exceedances
8. Describe harmonic filter topologies/ratings (if needed to mitigate harmonics)
   * Repeat study with filter

Results

* + With/without filters
  + With/without background harmonics
  + Proposed filter solutions (if needed to mitigate harmonics)
  + Amplification factors with/without filters