CIGRE Task Force B4.77 [1] attempted to clarify the definition of *Grid-forming* with respect to a HVDC application by providing separate definitions of *Grid-Forming* and ***Synchronous*** *Grid-Forming*:

Grid Forming: A converter that can regulate both instantaneous AC frequency and AC voltage. Such a converter is also able to provide reactive current equal to the steady-state rated current during AC faults.

Synchronous Grid Forming: A converter is a Grid-Forming converter that is also able to operate in parallel with other AC frequency regulating equipment and converters.

CIGRE WG B4.87, 'Voltage Sourced Converter (VSC) HVDC responses to disturbances and faults in AC systems which have low synchronous generation' is developing a functional description of synchronous grid forming for a HVDC application and CIGRE JWG B4/C4.93 "Development of Grid Forming Converters for Secure and Reliable Operation of Future Electricity Systems." is investigating the services provided from Power Electronic sources considering how they vary dependent on the energy source.

Today, a quick review of the literature will uncover several lists of definition for Grid-Forming [1, 2, 3, 4] but, whilst these lists contain many overlaps, there are also inconsistencies. A very basic definition that can be drawn from these references is that a Grid-Forming converter should:

- Act as a voltage source (both PPS and NPS), and
- Should apply current limits in a way that has the least negative impact on the AC system whilst maintaining the integrity of the converter rating

More agreed functional description would benefit the market in terms of being able to plan a future HVDC scheme against a known behavioural response and would assist vendors in developing their solutions against a known market need. However, the requirements should remain at a functional level and not dictate implementation methods as this may constrain some vendors due to Intellectual Property restrictions, thereby stifling the market but, also, limiting innovation. Hence, defining response envelopes against defined test cases would be a practical way forward for the industry.

References

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