

Proposal to initiate Expert Working Group on Grid Supporting FFCI



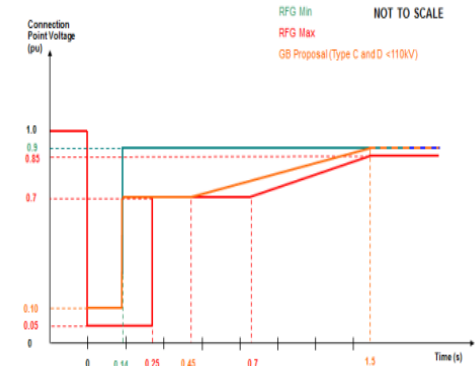
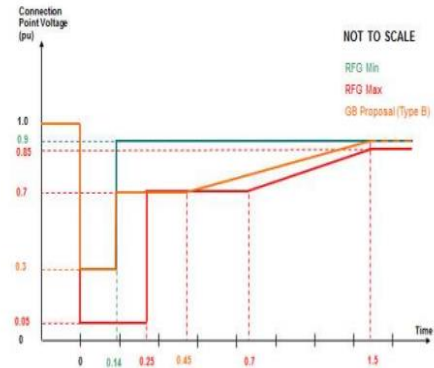
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GCDF
12/01/18

Overview

- Within the GC0100 consultation it was noted that by Jan 2021 there was a requirement for an Option1-like proposal to maintain compliance with EU code defined Voltage against time profiles for a transmission fault.
- It was noted in GC0100 consultation that should Options 2 or Options 3 be taken forward as interim steps, an Expert Working Group would need to be formed to define, clarify and propose a suitable proposal to provide enduring security of supply across fault ride through for all Transmission and Distribution connected users.
- It is recognised that Jan 2021 is barely 3 years away and that for larger projects conducting design work in the near term there is a need to provide suitable advice and guidance to ensure suitable accommodation and support growth in non-synchronous technologies thereafter- which again may be delivered by the Expert Working Group.

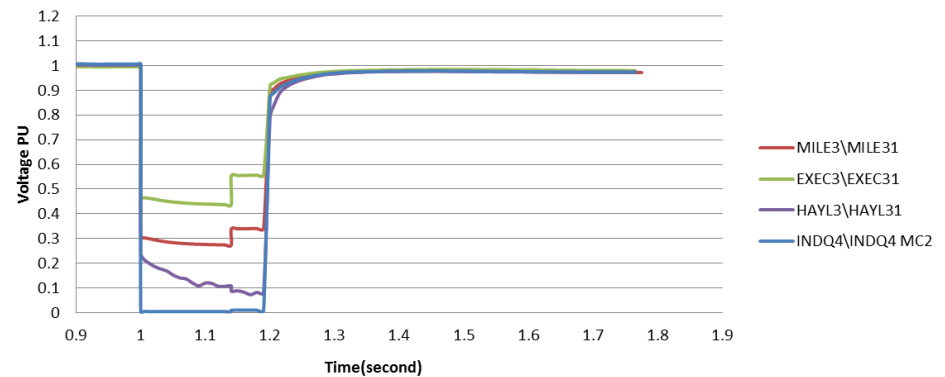
The problem statement (1):-

- Current measurement-led convertor control is unable to deliver the *instantaneous* support to maintain voltage against time support



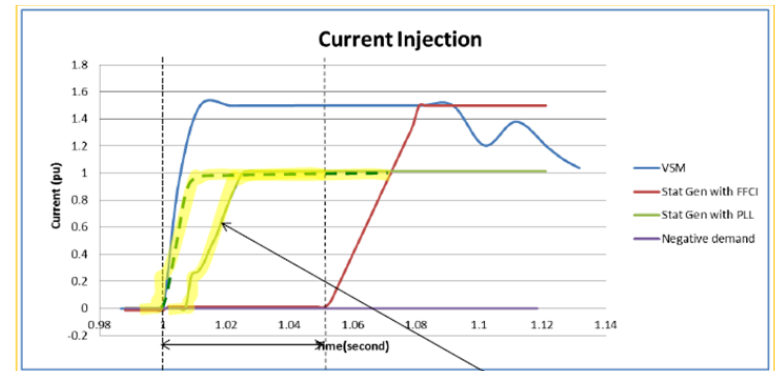
- Only an option 1-like *non-measurement dependant* approach can achieve this at the point of connection interface.

Retained Voltage

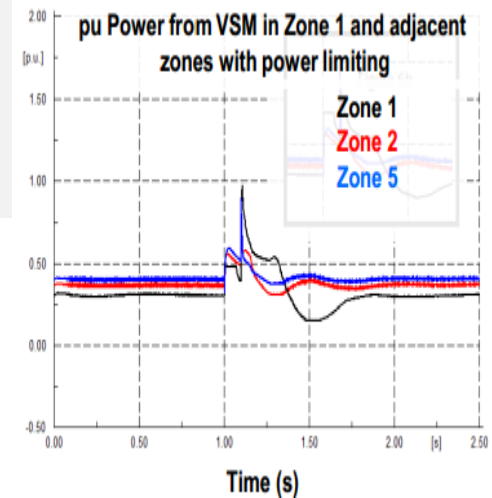
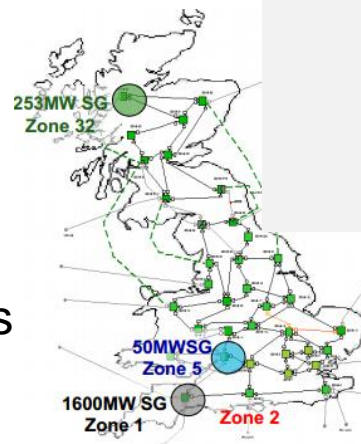


The problem statement (2):-

- Measurement-less reactive current supplied in phase with the load up to 1.5p.u continuous rating is needed *during a fault* in order to ensure that voltage against time curves are met from 2021 across all FES scenarios considered.



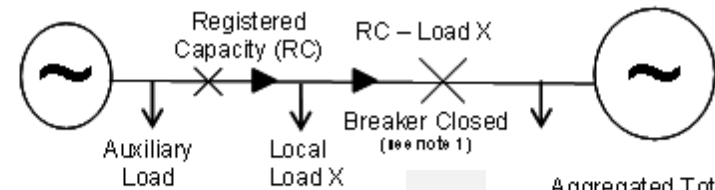
- Measurement-less control implies that for a fault of a generator circuit the control system needs also to support increased *active power delivery*- this delivered across for maximum of up to a 20s period, against a 12s time constant (SQSS definition of system instability)



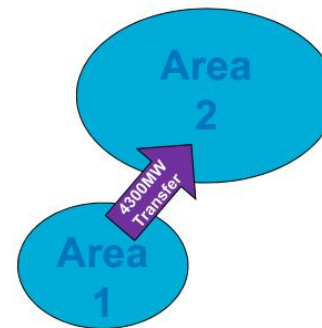
The problem statement (4):-

- Under CP.A. 3.6. in addition a load rejection test is defined for which the power islands formed either side of the separation must be contained.
- In the Power island created where a surplus of demand exists, a measurement-less control would become unstable/ trip if unable to support the power imbalance ahead of LFDD action occurring as specified within OC6.
- In order to support such islanding a rating of *up to 1.3 p.u* is required across the period of emergency action. Which would be within a period of under 3s

Generator Under Test



CC.6.3.7 and CP.A.3.6

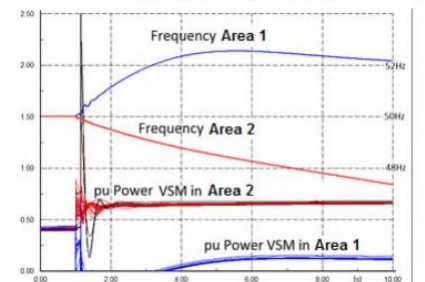


Scenario

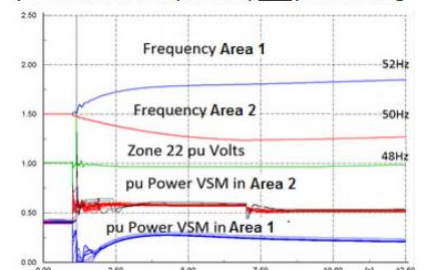
- System is operating at 93% NSG
- System load is 40GW
- Short circuit is applied to AC interconnection
- Loss of AC interconnection between exporting Area 1 and importing Area 2
- Does LFDD work?

Aggregated Total System
25GW (or Infinite Bus)

pu Power from VSM (all zones) without power limiting



pu Power from VSM (all zones) with power limiting



A range of Options:-

■ **Control system modification & development.**

- It is not clear to what extent should the capability of the User convertors be developed with appropriate modification to achieve the above measurement-less control nor where appropriate use of storage or other short term resources may be needed, or external network support in the case of HVDC in order that the inertial active power requirement may be met.
- De-loading convertor-based output in the steady state and using the same control approach equally may be an option; should the above modification not be efficient/economic.

■ **Supplementary asset support**

- it is not clear to what extent use of more conventional support as an alternative or supplement to the above (synch comps, synchronous generation constraint, de-clutched generation operation).
- It is not clear across Network owners and Users of the transmission system where and how such a requirement may be most appropriately delivered.

■ **Flexible, enabling, code specification**

- The above is needed, potentially in combination with other frameworks, to achieve a specification providing clarity to users without prejudicing their ability to drive innovative efficient solutions or driving excessive industry cost/ barriers to entry.
- This should be supported by CBA to avoid excessive or inappropriate specification
- Does not preclude other market-based measures complementing or supporting any end delivery of requirements.

Next Steps proposal

- We propose to establish a two stage Expert Working Group:-
 - **Stage1**; framework supporting further focussed engagement across manufacturers and industry on the functional needs for sufficient FFCI, together with further appreciation of those considerations impacting the technologies available and envisaged to be deployed from 1st January 2021 onwards.
 - **Stage 2**; cost benefit assessment across all above considerations of an Option 1-like approaches that may be implemented from January 2021.

- Stage 1 would be envisaged to commence in early Feb 2018, with Stage 2 commencing in the early summer.

- A proposal for the working group is attached. We would seek agreement to convene the group to the above programme in order to support providing further clarity to users.