LFMS-O and FFCI

Energy Networks Association

GCDF

07 March 2018

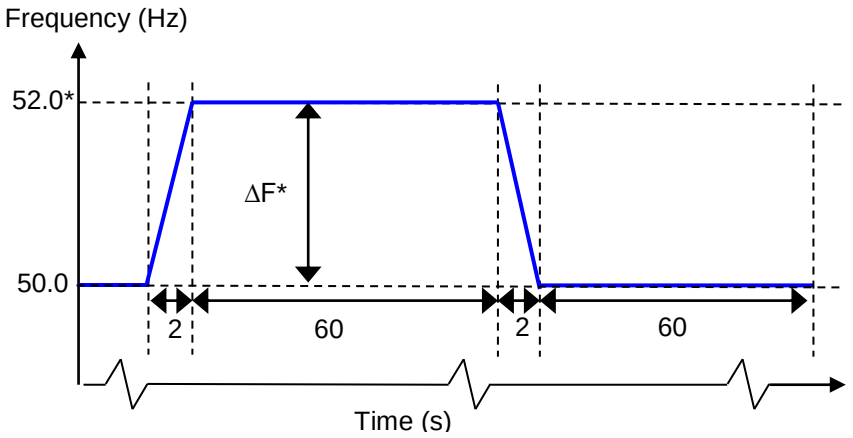
Agenda

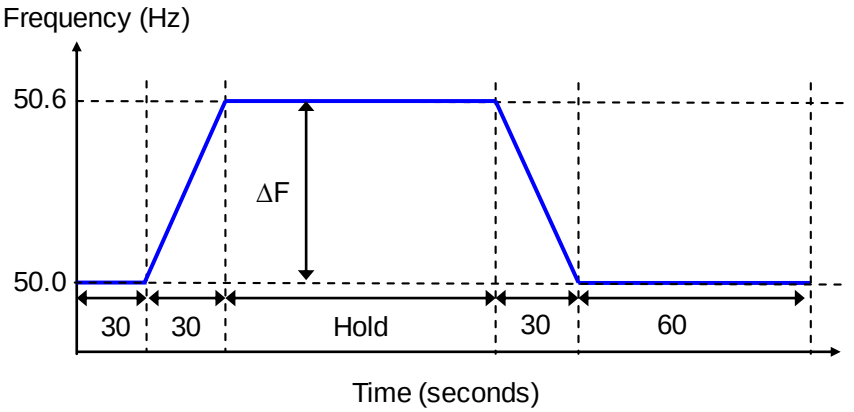
1. LFMS-O for Type B
2. FFCI

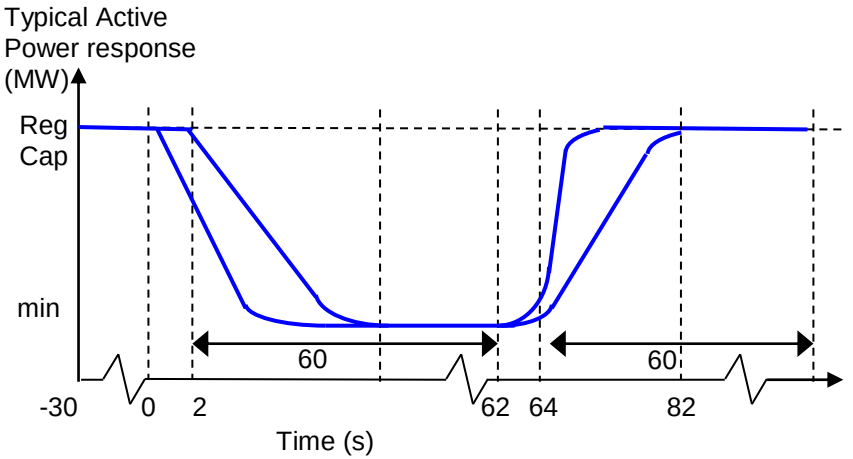
LFSM-O

- A new requirement for Type B D connected Generation
- Not historically provided in isolation for G connected as G connected has had to provide FSM
- LFSM-O testing requirements historically mixed in with FSM tests
- Point of contention is how fast the response needs to be delivered – current G Code drafting is “within 10s, as much as possible”
- When taken in isolation of FSM, ie for Type B only, DNOs and Generators need to understand what constitutes compliance
- Also an issue in that the physical characteristics of modern high efficiency clean burn engine driven synchronous machines are slow to respond to active power set point changes

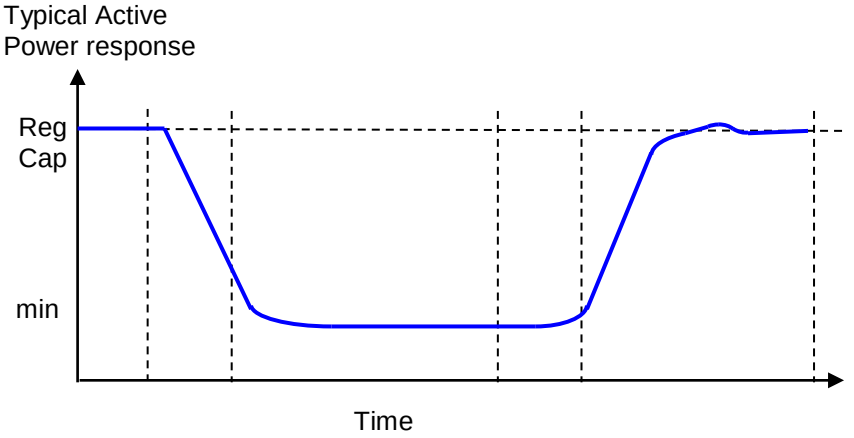
Existing G99 Drafting







Step Response

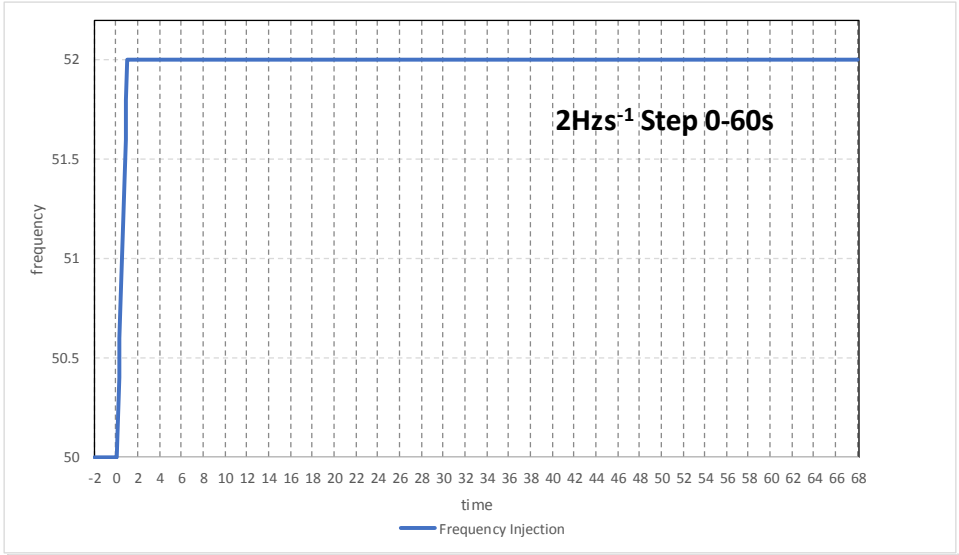


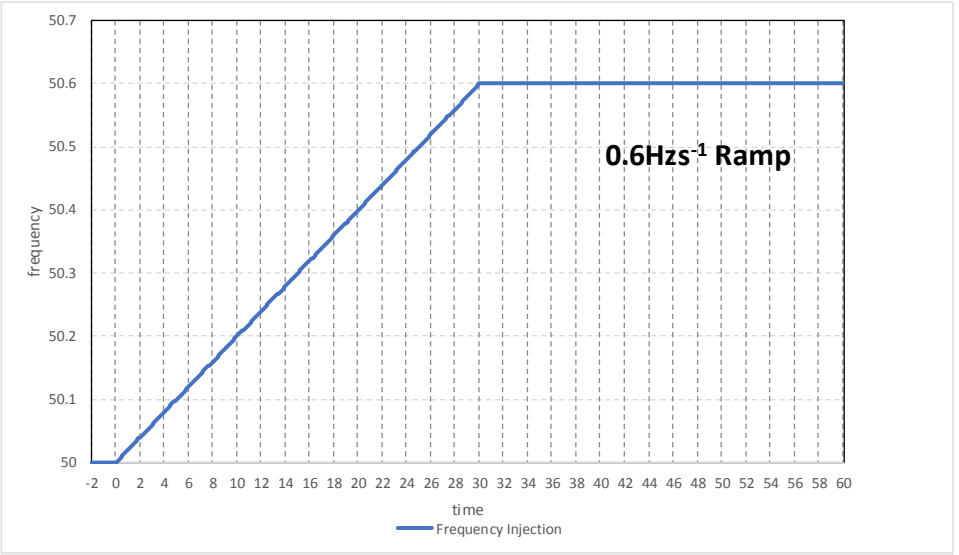
Ramp Response

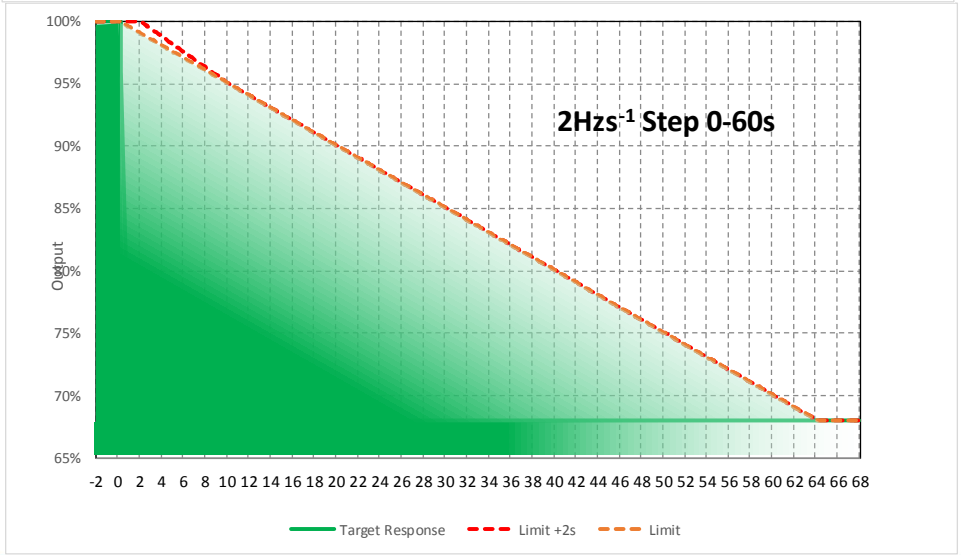
“As much as possible”

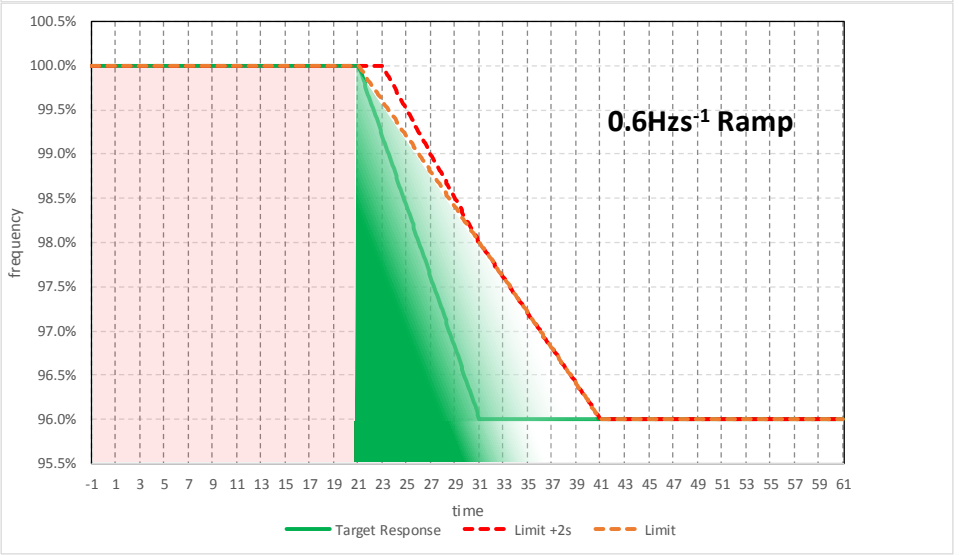
- Typical/Expected LFSM-O droop is 10%; FSM droop 3% to 5%;
- LFMS-O is therefore ≈ 50% of FSM response
- So as much as possible could be 50% of the equivalent FSM response – but capped at 5% of Registered Capacity

Might be presented??









LFMS-O Proposal

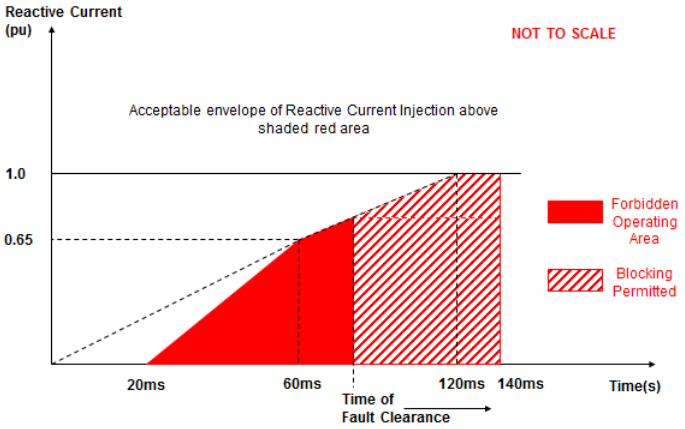
- Create clear text requirements for LFSM-O performance
- Supplement with clear diagrammatic representation in Grid Code and in G99

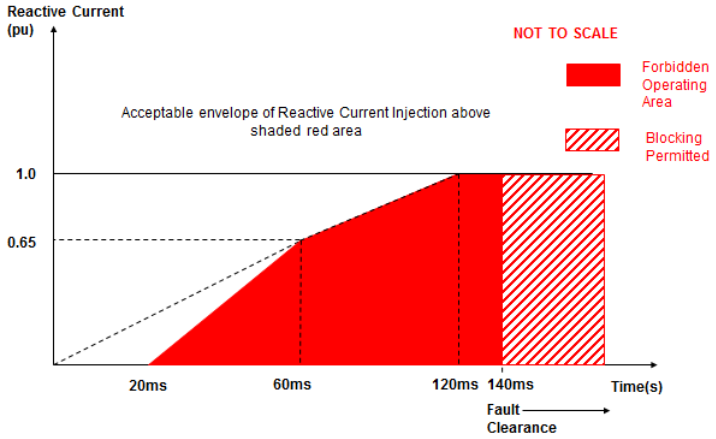
FFCI

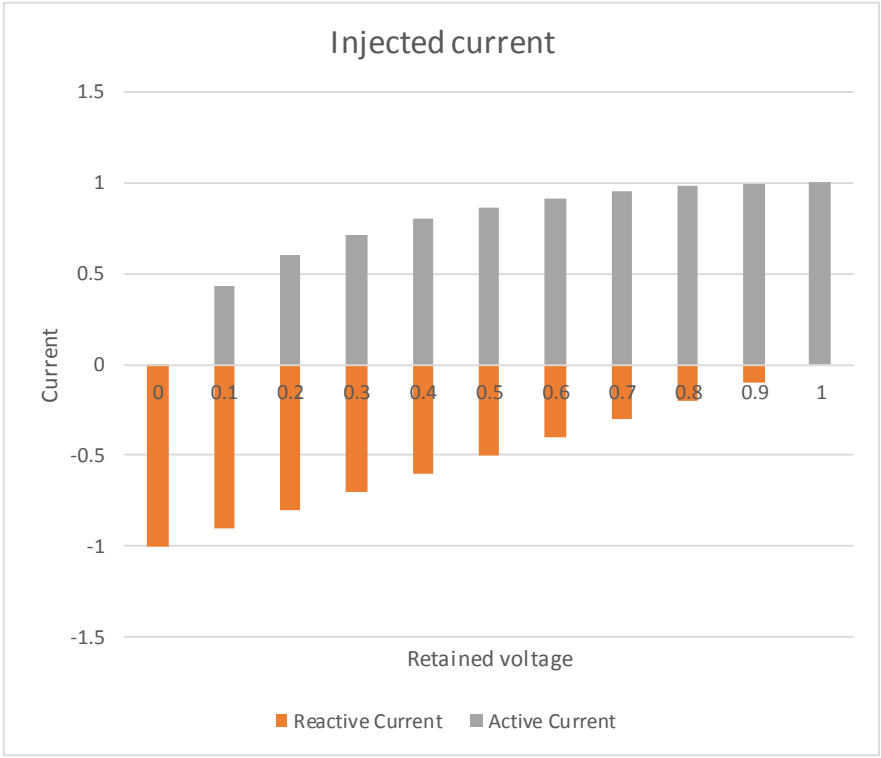
- ECC 6.3.16.1.2 refers to reactive current, implying the current is always to be in quadrature with the voltage
- The same paragraph states that reactive current will be in proportion to the retained voltage
- ECC 6.3.16.1.4 states that reactive current injected shall be in proportion and in phase with the change in system voltage at the connexion point.
- This implies that the injected current must always be purely reactive, and in phase with the voltage drop at the connexion point.
- In reality, it seems it is the total inject current that needs to be both proportional to and in phase with the voltage.
- The graphs in 6.3.16.1.2 show the reactive current limit against time, but do not attempt to show how current must vary with retained voltage.

Is there sufficient clarity re requirements

- Is there a case for somehow combing the existing graphical representation with one that includes how injected current might vary with voltage too?







FFCI Proposal

- Invite NG to try to redraft ECC 6.3.16.1 to improve clarity;
- Suggest a single WG meeting is probably enough to agree improved text.