Paris Session 2022



OSMOSE WP3: grid forming capability and synchonisation services SC C4 PS3

Question 16 What local- and whole-system considerations shall be applied to optimise the design and mitigate any potential side-effects when using synchronous condensers, grid-forming inverters, or a combination to address emerging system stability issues?



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OSMOSE WP3: definition of grid forming capability

A GFM unit shall, within its rated power and current, be capable of self-synchronise, standalone and provide synchronization services.

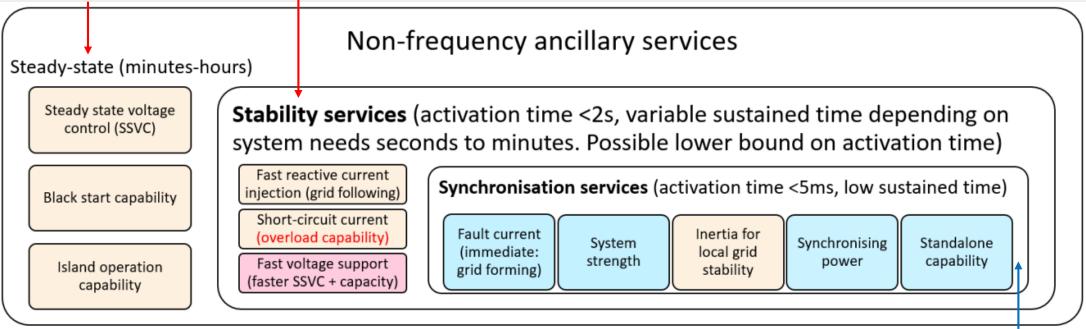
- By definition, a GFM does not rely on specific grid conditions to synchronise: it can operate at a wide range of short-circuit ratios and inertia levels.
- Synchronization services include a natural/ inherent/ immediate/ undelayed deployment of synchronising power, system strength, fault current and inertial response.
- Hence, a GFM unit will help others to maintain synchronism under stressful conditions, while still complying with the general requirements applying to the specific technology.
- No overload or capacity reservation is associated to the GFM capability, neither the provision of traditional ancillary services such as primary voltage and frequency regulation

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¹ Immediate means subcycle. A 5 ms maximal response time threshold could be adopted as proposed in GC0137 ² Taking into account physical components between the converter and PCC (filters, valve reactors, transformer...).

OSMOSE WP3: definition of synchronisation services

Out of scope of GFM with the existing frequency regulation services that can be provided by grid following units¹.



¹ Grid following units (normal operation) may include an island mode or black start capability (switch to V-f mode)

GFM is the **capability** to provide (some) synchonisation services

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OSMOSE WP3: types of GFM units and suited technologies

	Type 4	 Services provided: Type 3 + "High" fault current (more than 2 times Nominal) Criticality: if protections fail to detect faults Cost: high for converters since they have to be oversized, null for synchronous machines
	Type 3	 Services provided: Type 2 + Inertial response Criticality: When system inertia decreases globally Cost: limited due to the need of an energy buffer from a few seconds to 1min
	Type 2	 Services provided: Type 1 + Synchronising power profile Criticality: When system inertia decreases locally Cost: very limited due to the need of an energy buffer <1 s. WPP Other FFR resource are supposed to be available elsewhere to take over.
	Type 1	 Service provided: Stand alone + System strength + "Low" fault current (within ratings, usually equal or close to nominal). Operate wide range of SCR Criticality: When system strength decreases locally Cost: null, only software
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