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GROUP REF.: B4
PREF. SUBJECT: PS1 and PS3
QUESTION N°: S.1

The term "grid forming" has many interpretation and it is very important to recognize that none of them are standardized or even normalized. Below is a summary of common principles used for VSC control.

- **Grid Following**, i.e. synchronized to the grid frequency through the use of a traditional phase-locked loop (PLL), has existed for a very long time and is today widely used by voltage source converters controlling power. In this solution active power is prioritized over frequency output. System frequency can, however, be indirectly controlled in the traditional sense by modulating the active power output.
- **Grid Forming**, i.e. generating a system voltage and frequency to act like a "slack bus" without any synchronization to the grid frequency (no PLL), has also existed for a very long time and is today de-facto standard for offshore wind systems, passive networks, black-start, etc. In this solution the frequency is prioritized over active power. Controlling the active power is not relevant since the purpose is to act like a "slack bus". Frequency can however be modulated for the purpose of (indirectly) triggering active power response from other units in the system (equipped with frequency control) and in this way support the system, e.g. frequency mirroring onshore-offshore. Frequency droop can also be included in the case of multiple converters offshore.
- **Synchronous Grid Forming**, i.e. a hybrid/combination of the two principles above where a soft/slow/weak synchronization to the grid is done. Both power and frequency is controlled simultaneously with priority determined by specification and network conditions.

The definition Synchronous Grid Forming is today what is most commonly referred to when the, all too general, expression "grid-forming" is used. Even though this is being discussed as a new concept it has existed for decades and is not limited to pilot projects and EMT simulations. The first implementation was commissioned in the Caprivi Link HVDC project in Namibia. It was then referred to as Power-Synchronization Control or Extremely Weak Network Control. Similar concept are implemented in Mackinac HVDC project in Michigan (US) as well as Kriegers Flak HVDC project between Denmark and Germany. For these projects the network strength has been very low and normal grid-following control has not been sufficient. The novelty of today's grid forming requirements is to utilize the same control concept for a wider range of network strength, i.e. both weak and strong grids. However, this can be accomplished by utilizing strong experience and learnings from previous projects combined with control design optimization principles.

Even though the grid forming concept is old it is highly relevant in today's power systems and needs to be further defined. However, these efforts should not be to define/standardize a control solution but rather to define/standardize performance requirements of this function, e.g. envelope reference curves for phase shifts and change in network strength similar to what we have today for fault-ride through requirements. This approach will allow for vendor optimization and competitive differentiation as well as preserving innovation and R&D initiative in the market.

The physical limitations of converters and/or converter systems should also be clarified in order to avoid contradictory requirements. For HVDC systems, there are at least two stations and they require a proper coordination to guarantee DC link stability and support grids in the best way. Grid forming control may be used in one or two stations. If grid forming control is used in DC voltage control station, the DC voltage control should be fast enough to maintain the stability of DC link. This is due to limited energy in HVDC system (MMC submodules). The consequence is that inertia provision is cancelled by DC voltage control action. There are already articles addressing this issue, e.g. Evaluation of Inertia Emulation Strategies for DC- Voltage-Controlled and Power-Controlled Converter Stations in HVDC Interconnections.

Energy for inertia provision needs to come from AC grids. Thus, inertia provision is mainly feasible for active power control station in a interconnector (HVDC connecting two different synchronous AC grids). It's not feasible for an embedded HVDC (HVDC within the same synchronous grid) or HVDC connecting Isolated grid (such as PV or offshore wind farms if PV or wind farms operates in the traditional way i.e. grid-following mode & MPPT). Additional storage (on DC or AC side) is required for inertia provision in that case. For HVDC connecting offshore wind farms, inertia provision for onshore grid may also be possible if wind farm can operate in grid-forming mode. However, this is currently not matured. Also, wind turbines need to operate below MPPT with a sufficient headroom for grid support which may be economically questionable.