

GRID FORMING CAPABILITIES BY WIND FARMS

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Outline

- Requirements in the NC RfG
- General technical framework needs
- Overview of recommendations

Mandatory capabilities in the NC RfG



Mandatory grid-forming capabilities

Requirements must be set within the generation unit's hardware limits including current limits and inherent energy storage capabilities of each individual unit



...and not **with regard to** the power park module's grid forming capability!

- 1) "**With regard to**" is vague and could imply/be interpreted into mandatory hardware additions or upgrades
- 2) "**Grid-forming capability**" is not properly defined

Implications of mandatory hardware changes

- **Higher costs** for:
 - Technology development - broader evaluation & verification needs
 - Turbine/project – especially when products need customisation to specific markets
- **Higher risks** for:
 - Technology development and compliance (unclear definition; inadequate harmonisation among TSOs)
- **Longer time-to-market:**
 - Hardware changes will take more time than the suggested timeline

Other major points

- 1) **Clear technical specification of the expected response** based on clear definitions of relevant terms and sub-cycle specifications e.g., instant of grid disturbance, expected reaction time, smooth transition, fault current. Requirements in current legal text proposal are simplistic and vague
- 2) **Solution agnostic approach:** Expected performance should be based on the grid connection capacity specified in the connection agreement and within capabilities of each individual unit
- 3) **Exhaustive requirements** preferred but technical maturity is not yet achieved

Exhaustive requirements

- Need to achieve technical maturity first
- Stakeholders and ENTSO-E should work together to define the detailed dynamic performance to be required by System Operators (2023-2024, basis for IGD)
- Till technical maturity is achieved, **IGD should serve as a legally binding guiding document at national/system level. Legal text in NC RfG should ensure the binding nature of IGD to ensure harmonisation**
- Once maturity is achieved, the major requirements in IGD should become exhaustive requirements in the next NC RfG revision

Overview of recommendations

1. Mandatory grid-forming requirements must be set within the generation unit's hardware limits including current limits and inherent energy storage capabilities of each individual unit
2. NC RfG should provide a framework for clear technical specification of expected response including sub-cycle specifications. An IGD should serve as a legally binding guiding document at national/system level and its specifications integrated in NC RfG in the next revision upon technological maturity
3. NC RfG should set a framework on how to quantify the need for grid-forming contributions at system level with justification subject to CBA and stakeholder consultations
4. In case of advanced grid-forming requirements needing hardware changes/additions/upgrades → proper design of grid services with adequate remuneration
5. Also for this context, NC RfG should allow to install more total capacity provided that the power output of the plant does not exceed the one in the grid connection agreement

THANK YOU! QUESTIONS?

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