Expert Group: Advanced capabilities for Grids with a High Share of Power Park Modules

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Presentation for the ESC GC 16 March 2023

- Timeline
- Draft report

Timeline

- XI meetings so far
- XII last meeting at 23 March 2023
- End of March 2023 final report

- Question:
  - do we opt for a written round for approval in April 2023, because the next ESC is in June 2023,
  - or does the draft report provide sufficient direction for the amendment processes and to work with till June 2023, so the approval will be in June's ESC?

Draft report (chapter numbers, work in progress)

- Summary
- Introduction
- 2.State of knowledge
- 3.Definitions/nomenclature/system needs that require advanced capabilities for grid stability
- 5.Which technologies can provide these capabilities
- 6.Compliance verification and Perfomance monitoring
- 7.Roadmap for delivering capabilities from market perspective
- Legal text proposals
- 8.Recommendations for future work

2.State of knowledge

- Overview of the
  - Papers
  - Reports
  - Studies
  - Presentations from Universities and companies

3. Definitions/nomenclature/system needs that require advanced capabilities for grid stability

- Presented in the ESC on 30th November 2022
- Sent as preliminary report on 21 December 2022 to ACER
- Stakeholders have been informed by their own members of the Expert Group Advanced Capabilities

5. Which technologies can provide these capabilities

- Hardware and primary source characteristics and technical readiness related to system needs and advanced capabilities:
  - Synchronous power generating modules
  - Power park modules: full-converter & DFIG Wind turbine, PV
  - Non-power generating modules: STATCOMs, Synchronous condensers, Storage, HVDC
- Literature review on control capabilities of grid forming controls
- Support during system restoration
- Overview/comparison of technologies (table format)
- Recommendations:
  - Technologies with higher TRL (storage, syncon, HVDC) can provide advanced capabilities much easier thus can be utilized first
  - TRL of PPMs is low:
    - Short-term: design of control for robust response against phase angle changes & low SCR
    - Long-term: quantitative/clear requirements on GFM capabilities to allow for cost-effective development

6. Compliance verification and Perfomance monitoring

- In general all test procedures regarding existing requirements in RfG can be applied also in combination with grid-forming
- Several additional verifications are needed:
  - Behaviour as a voltage source behind an impedance
  - Specified synthetic inertia if applicable
  - Availability of sufficient energy storage to provide synthetic inertia in the specified frequency range and duration
  - Behaviour during current limitation and in the transition into and out of
  - Stability verification (taking into account the effect of the PGU on the grid)

7. Roadmap for delivering capabilities from market perspective

- Three general options are described
  - Market based procurment of the service
  - Market based procurement of the service combined with a mandatory capability to ensure sufficent availability on the market
  - Long-term market procurement at specificlocations and for long durations enabling biders to build plants specific for the tender.
- Different approach for different grid-forming capabilities might be reasonable depending on investmend need for the functions
  - Amplitude jump power -> inherent energy storage expected to be sufficient
  - Phase jump power -> only small additional storage needed
  - Inertia power -> significant additional storage needed

Legal text proposal

- Work is ongoing
- The intention is to transfere the technical agreements of the other chapters into a leagal tekst
- The text is based on the entso-e proposal
  - New Article Y to include grid-forming for Type A PPM
  - Modifications in Article 20, 21, 22 regarding grid-forming for Type B, C, D
- Target is to finalize the text proposal before March 23rd to be officaly agreed on the last scheduled meeting of ACPPM

8. Recommendations for future work

- a lot of additional work is still needed before the massive introduction
- a huge standardization effort is necessary
- probably to define a new project considering all the aspects
- a shared study among all involved parties, with a precise mandate and timing, to go in depth in the “details” (which are not at all details).
- but it seems difficult to agree on that.

Questions?

- Thank you for your attention

- Thomas Schaupp
- Mian Wang
- Florentien Benedict

Representatives from the Expert Group