

ACER workshop on rate of change of frequency and grid forming capabilities

KEY TAKE AWAY OF EG RESULTS

EXPERT GROUP: ADVANCED CAPABILITIES FOR GRIDS WITH A HIGH SHARE OF POWER PARK MODULES

Chair and vice-chairs:

- Hariram Subramanian, Solar Power Europe, Huawei
- Florentien Benedict, Expert Regulation at Stedin DSO, CEDEC.
- Mian Wang, Senior Consultant at Siemens Energy, Orgalim, representation since 09/2022
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May 10th 2023

AGENDA

01 Overview of ACPPI

02 Summary of results

03 ACPPI Legal text proposal in view of ACER draft amendments

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

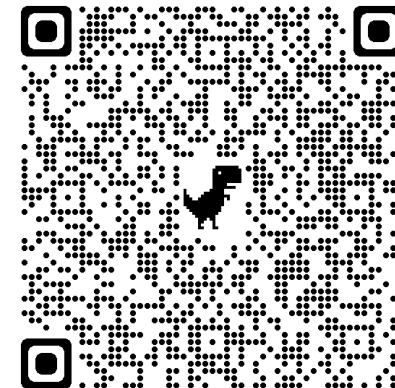
OVERVIEW

- / Established by GC-ESC on December 2021
- / Establishment was based on a GC-ESC Stakeholder survey
- / Objectives:
 - / Identify system needs for advanced capability
 - / Identify capability options to satisfy these needs
 - / Provide overview on technology readiness
 - / Recommendation on the inclusion into relevant articles of connection codes

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

OVERVIEW

- / Start of work was delayed, as it took some time to find a chair and co-chair.
- / 48 Members of 13 GC-ESC member organisations and two external experts
 - / ENTSO-E, CENELEC, GEODE, EUTurbines, WindEurope, EURELECTRIC, VGB, COGEN Europe, Orgalim, SmartEn, EASE, CEDEC, SolarPowerEurope and ACER observer.
- / Work started on April 2022
 - / 12 EG Meetings and many task force meetings
- / Work ended on April 2023, draft report delivered to GC-ESC
- / Draft report is available at:
 - / https://www.entsoe.eu/network_codes/esc/#gesc-meetings



SUMMARY

- / Chapter 1 to 4 provide an introduction and information about the EG and the state of knowledge
- / Chapter 5 gives an overview of the terms and definitions, used in this report.
- / Chapter 6: Qualitative description of the system needs
 - / general statement on how these needs could be provided by grid-forming power park modules (PPM)
- / Chapter 7: Potential issues for distribution networks
- / Chapter 8: Overview of the capabilities, limits and technology readiness of various power generating technologies and grid asset technologies
- / Chapter 9: Recommendations for developing the compliance verification and compliance monitoring
- / Chapter 10: Information on possible paths to deliver these capabilities.
- / Chapter 11: Proposal for a legal text, based on the technical chapters, agreed by all experts of ACPPM

RECOMMENDATIONS

- / Develop the compliance and monitoring requirements for grid forming technologies
- / Undertake more research into the effects of high penetration of grid forming converters in DSO networks, including in particular stability issues.
- / Initiate a program of creation of relevant standards, which should also include conformity tests and models for digital simulations.
- / Implementation should be phased, recognizing the developing maturity of the understanding of the effects of interactions of grid forming converters (GFC).

AGENDA

01 Overview of ACPPM

02 Summary of results

03 ACPPM Legal text proposal in view of ACER draft amendments

ACPPM LEGAL TEXT PROPOSAL

- / ACPPM introduces squared brackets into the legal text where a common agreement was not reachable.
 - / The decision about these items was forwarded to ACER

- / ACPPM finds many aspects of its text proposal included in the ACER draft
- / We consider this as an acknowledgement of our work and thank ACER for this
- / However, there are several deviations of the text
 - / Some are due to the squared brackets decisions
 - / Some are rewordings to improve the legal validity of the text
 - / Some seem technical in nature and are considered critical as they shift the negotiated agreements in ACPPM

Article Y 9. (c)

RESPECT THE MECHANICAL AND ELECTRICAL DESIGN OF A GENERATING UNIT

ACER PROPOSAL

After inception of a network disturbance in voltage magnitude, frequency or voltage phase angle, the following shall apply **with regard to** the power park module's **grid forming capability**, including current limits and inherent energy storage capabilities of each individual unit.

ACPPM CHAPTER 11

After inception of a disturbance (disturbances in voltage magnitude, frequency and voltage phase angle), the following shall apply **within the** power park modules **capability** including current limits and inherent energy storage capabilities of each individual unit

- / The ACPPM intention of "within the capability" was that no hardware design change is needed due to grid-forming.
 - / Is this still ensured by the term "with regard"?
- / The ACPPM intention was to focus on current carrying mechanical capabilities. Why is "grid-forming" introduced to the capability?

PREDEFINE THE DYNAMIC PERFORMANCE

ACER PROPOSAL

The relevant system operator in coordination with the TSO shall **predefine the dynamic performance** regarding voltage control and specify the temporal parameters thereof.

ACPPM CHAPTER 11

The internal voltage of each individual unit of the power park module shall be adapted according to a predefined dynamic performance in a stable and bumpless manner.

The RSO in coordination with the TSO shall **specify the temporal parameters** of the predefined dynamic performance in (c)(i) regarding voltage control.

- / The ACPPM sees the risk, that member states will establish deviating definitions of the dynamic performance and thus contradict harmonisation and increasing efforts for manufacturers and owners.
- / The ACPPM intention was to limit national implementation to temporal parameters
 - / Timing/speed of the response this is most relevant for the grid and
 - / allows some freedom of implementation to the manufacturer.
 - / Prevents multiple implementations throughout Europe

Article Y 9. (c)(ii)

CURRENT LIMITATION

ACER PROPOSAL

Where current limitation is necessary **from a transmission or distribution system operator point of view**, the relevant system operator may specify additional requirements regarding contribution of active and reactive power at the point of connection.

ACPPM CHAPTER 11

Where current limitation is necessary, the RSO may specify additional requirements regarding contribution of active and reactive power at the point of connection.

- / The ACPPM intention was to define the situation, where grid events might result in currents of a PPM that exceed the maximum current capability of a generating plant or generating unit.
- / The added TSO/DSO point of view indicates rather an issue of excess short circuit power in a grid section.
- / Converters have limited short circuit power provision, a limitation from TSO/DSO point of view seems not needed
- / The needed limitation from generating unit point of view once the PPM capability according to Y 9.(c) is exceeded, is not defined any more

Article 20 4. (a)

INERTIA OF TYPE B PPM OR STORAGE MODULE

ACER PROPOSAL

...Where specified, the power park module shall be capable of contributing to limiting the transient frequency deviation under high frequency conditions. Additionally where specified, the **power park module** shall be capable of contributing to limiting any frequency deviations from the nominal value.

ACPPM CHAPTER 11

...Where specified the power park module shall be capable of contributing to limiting the transient frequency deviation under high frequency conditions. [Additionally where specified, the **storage module** shall be capable of contributing to limiting the transient frequency deviation under low frequency conditions.]{TSO perspective}

- / The ACPPM intention was to differentiate between generating modules and storage modules.
- / Power generating modules have typically a very small inherent energy storage. So Inertia can only be provided by curtailing the prime mover and this only in over frequency reducing power.
- / Storage modules have typically a significant inherent energy storage that can technically be used to provide inertia.
- / In the ACER proposal the two sentence technically overlap. The intention is unclear.

THANK YOU FOR YOUR ATTENTION