Report from the Expert Group 'Identification of storage devices' (EG STORAGE)

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14th Grid Connection European Stakeholder Committee Meeting

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EG STORAGE structure

ACER Agency for the Cooperation of Energy Regulators

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Expert group: Identification of storage devices (EG STORAGE)

Chair: ENTSO-E, Emilie Milin
Vice-Chair: EASE, Noce Christian

Problem Statement

On 11 June 2018, the Grid Connection European Stakeholder Committee (GC ESC) decided to establish an expert group on the definition of storage devices. The creation of this EG was proposed by ENTSO-E to elaborate on connection network code (CNC) issues, which had been raised by stakeholders during the CNC implementation. The ENTSO-E proposal was based on a stakeholder survey to identify priority topics.

In order to prevent a confusion of the definition of the storage devices and the energy storage as defined in the forthcoming recast of the Electricity Directive a different title has been chosen for this EG, i.e. identification of storage devices.

Target (objectives)

The objectives of the EG Storage are to:

- identify storage technologies/applications/topologies;
- investigate the possibility of a useful definition of storage device which could lead to the definition of connection requirements at EU level (due to cross-border relevance); and
- categorize storage devices (if reasonable).

Task description

Without prejudice to national grid codes, the Network Code on Requirements for Generators (NC RfG) and Demand Connection Code (NC DC) do not currently apply to storage devices, except pump-storage power generating modules.

Discussion with stakeholders / stakeholder interventions at the GC ESC / in workshops with stakeholders have revealed some questions related to storage devices, especially regarding the connection requirements for such units, because of the growth of energy storage projects. The EG Storage is tasked to consider the following actions:

- identify energy storage technologies and topologies: for each, case of application including in combination with other system users, present penetration and growth potential, main characteristics;
- categorize the different storage technologies: depending on their cross-border impact at the grid connection point characterized (e.g. facility size, functionalities, robustness, protection settings, etc.,) while taking into account the findings from the previous point;
- identify relevant functional applications for storage devices: Limited frequency sensitive mode at overfrequency/underfrequency (LFSM-O/U), Frequency Sensitive Mode (FSM), Demand Response (DSR), Fault Ride Through, ramping rates etc.; and
- define if/how these applications could be implemented by standalone storage devices, in association with other system users (e.g. storage device as part of a new or existing power generating facility or demand facility).

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Public space

EG STORAGE

Identification of storage devices.

Annex

EG STORAGE Reporting 13th GC ESC

EG STORAGE Reporting 12th GC ESC

Final EG meetings since last GC ESC meeting

- 18 April 2019, webinar

Internal EG space

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Name

- Additional references
- archive (non-exhaustive)
- Kick-off meeting_181015
- meeting_190318_Brussels
- report
- ToR and Annex
- webinar_181123
- webinar_181220
- webinar_190125
- webinar_190221
- 180914_GC ESC_EG STORAGE_notes from preparatory call
- EG STORAGE draft table of requirements
- EG STORAGE draft table of requirementsSAFTanswer300119
- EG STORAGE reporting_12th GC ESC
- EG STORAGE_contact list
- READ ME

Final report

The report includes:

- the status regarding RfG requirements / other requirements
- details how co-located sites are treated (with examples)
- material presented to the group including experiences from Member States
- reference to applicable standards
- references to compliance
- references to the mixed customer sites work with the respective EG

However, the report shall refrain from a recommendation, whether storage devices should be covered by amending the existing codes or drafting a dedicated new code.

Recommendations 1/4

Classification of storage technologies, assessment of Clean Energy Package definitions (grid connection perspective)

- **Electricity Storage** is best defined as "*the conversion of electrical energy into a form of energy which can be stored, the storing of that energy and the subsequent reconversion of that energy back into electrical energy".*

  Two types of Electricity Storage

  - Synchronous Electricity Storage Modules (export mode ~ Synchronous Power Generating Module)
  - Non- Synchronous Electricity Storage Modules (export mode ~ Power Park Module)

- **Energy Storage** plant
  - Simply convert electricity into another energy medium for onward conversion without re-converting that energy into electrical energy at that connection point.
  - This would be treated as demand or a demand response service(s).

  Note: The current scope of application of DCC doesn't cover demand units connected to a DSO or CDSO unless they provide demand response services.

Recommendations 2/4

Requirements

- The EG categorized the different technologies under synchronous and non-synchronous and has been assessing their capabilities against the RfG requirements (starting point)
- The table was finalized after the inputs from the last meeting on March 18
- Possible technology additions have also been included in the final report e.g. power to gas (P2G) in the final version
- **Additional requirements from DCC, HVDC requirements or E&R requirements related to storage behaviour**
  - low frequency demand disconnection during importing modes of operation (DCC).
  - Active power control (ramping, switching) (HVDC – Article 13)
  - Switch or disconnect storage devices before 1st step of LFDD (E&R – Article 15)

Recommendations 3/4

Grid connection configuration

- Two broad connection configurations exist
  - a **standalone site** where the facility comprises solely of storage modules which are controlled as one module or a group of modules
  - a **co-located site** which comprises either
    - (a) storage integrated with a generating or demand facility and **the storage unit can be independently controlled** from the main plant or
    - (b**) the storage unit** is inherently linked to the operation of the main plant and **cannot be independently controlled within the facility**.
- Certain forms of electricity storage devices to be excluded from the requirements – for example Synchronous Flywheels, Synchronous Compensators and Regenerative braking systems.
- Technical requirements shouldn't take into account ownership of storage units.
- Technical capabilities should be included into the connection network codes. Then the way to use those capabilities will be described in the operational network codes.

Recommendations 4/4

Out of scope of EG's work

- Operational and data requirements applicable to storage fall outside the scope of this CNCs related work (as operational and data matters fall within the other, non-connection related, European Network Codes).

- The case of electric vehicles was agreed as technically out of scope of this EG's work
  - an initial view was that any requirements should be based on the connection point rather than the electric vehicle itself.

- The Workgroup discussed the capability of storage units from changing mode from import to export under low frequency conditions which is a requirement of the Emergency and Restoration Code.
  - The workgroup highlighted some issues over this requirement but also noted that where the TSO defined a short cycle time tripping could be used as an alternative.