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

Emilie Milin, Chair of EG STORAGE

12th Grid Connection European Stakeholder Committee Meeting

13 December 2018, Brussels

EG STORAGE structure

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

Expert group: Identification of storage devices (EG STORAGE)

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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).

Public space
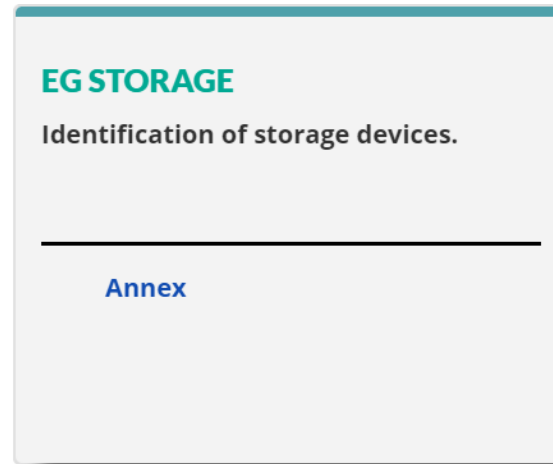
Internal EG space

EG STORAGE meetings

- 15 October 2018 kick off meeting
- 23 November 2018, webinar
- **20 December 2018, webinar**

- 34 listed members
- 12 different representative organizations
- 50% participation of members
- >80% participation of organizations

- Overall good collaboration among the members, with useful discussions and presentations
- Good input in accordance with the agreed follow up actions
- Common space (SharePoint) and emails are used to provide inputs
- Workplan continues as agreed with no changes foreseen at the moment

Evaluation of RfG requirements for storage modules

Expert Group Identification of storage devices (EG STORAGE)

List of requirements under consideration

Version: 15.10.2018 - Updated 02.11.2018 to include GB Work

Content:
1. Frequency parameters
2. Voltage parameters
3. Parameters of System restoration
4. Parameters of Instrumentation and protection system

- The EG acknowledged the relevance with the tasks of GB Grid Code Electricity Storage Working Group (GC0096)
  - *The GB experience can be used a good reference and guidance for the EG STORAGE*
- A template with RfG requirements has been created to assess better the different storage technologies
  - *The template was updated with the results of the GB group and is being further updated by the rest of the EG members*
- The EG discussed about classifying the different storage technologies into:
  - *Synchronous Electricity Storage module – similar requirements to SPGMs*
  - *Non-Synchronous Electricity Storage module – similar requirements to PPMs*
- If necessary, a separate category can be introduced for certain storage technologies e.g. flywheels or superconducting storage (SMES)
- Additional requirements coming from DCC or/and HVDC or storage specific requirements (e.g. switching) will be considered
- Analysis of existing IEC and CENELEC standards is within the actions

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Snapshot from the template and ongoing work

Requirement	General (G) /Site specific (S)	Non-Mandatory Requirement	Article	Definition	Type A	Type B	Type C	Type D	Comment	GB Synchronous Electricity Storage Module (treated in the same way as an Synchronous Power Generating Module)	GB Non-Synchronous Electricity Storage Module (treated in the same way as a Power Park Module)	GB Grid Code Reference
FREQUENCY RANGES	G		13.1.a.(i)	TSO	X	X	X	X	time period for operation in the frequency ranges	47 - 47.5 Hz - 20 seconds 47.5 - 49.0 - 90 minutes 49.0 - 51.0Hz - Unlimited 51.0 - 51.5Hz - 90 minutes 51.5Hz - 52 Hz - 15 minutes Alternative Frequency ranges can be agreed with National Grid were justified	48 - 47.5 Hz - 20 seconds 47.5 - 49.0 - 90 minutes 49.0 - 51.0Hz - Unlimited 51.0 - 51.5Hz - 90 minutes 51.5Hz - 52 Hz - 15 minutes Alternative Frequency ranges can be agreed with National Grid were justified	ECC.6.1.2.1.2
RATE OF CHANGE OF FREQUENCY (ROCOF) WITHSTAND CAPABILITY	G		13.1.(b)	TSO	X	X	X	X	maximum ROCOF for which the Power Generating Module (PGM) shall stay connected	1Hz / second measured over a 500ms timeframe	1Hz / second measured over a 500ms timeframe	ECC.6.3.1.3
	G			RSO TSO	X	X	X	X	specify ROCOF of the loss of main protection		For DC Connected Electricity Storage Modules 2Hz/s measured over a 1 second period	
Limited Frequency Sensitive Mode (LFSM)-O	G		13.2.(a)	TSO	X	X	X	X	frequency threshold and droop settings	LFSM-O - 50.4Hz Threshold, Droop - 10% or less LFSM-U - 49.5Hz Theshold, Droop - 10% or less	LFSM-O - 50.4Hz Threshold, Droop - 10% or less LFSM-U - 49.5Hz Theshold, Droop - 10% or less	ECC.6.3.7.1 & ECC.6.3.7.2

Cover | **Frequency parameters** | Voltage parameters | System Restoration | Instrumentation and Protection

Links with EG MCS

The title of EG MCS allows mixed cases of storage such as generation + storage to be treated within that EG too
- There is an agreement that cases of/with storage devices will be addressed within the EG STORAGE and information on how to categorize them (and the associated requirements) will be shared with EG MCS.

EG Storage will study two cases :
- **Storage device as a standalone device** (either as a facility comprising solely of storage units or in a facility with other devices such as generation unit or demand unit), which means that this storage device can be operated independently from other devices within the same facility/location.

- **Storage device as a supplementary component**, associated with a generation unit or a demand unit. In this case, operation of the storage device is linked to the operation of the generation unit/demand unit. For example, use of storage device to comply with some RfG requirements (e.g FSM) when modernizing an existing generation unit.

Regarding those two cases, EG storage will :
- Give some examples
- Study the consequences regarding the technical requirements

Those cases will be included in the deliverable of EG storage (through the item categorization/functional application of storage devices)

Workplan

2018/2019	40	41	42	43	44	45	46	47	48	49	50	51	52	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
Meetings/ webinars			⬠ STORAGE				⬠ STORAGE				⬠ STORAGE&ESC																						
PMO (ENTSO-E)										Ongoing PMO support																							
Define the categories of storage technologies																																	
Define the requirements per category of storages																																	
Assess the requirements against standards and national cases																																	
Ensure proper links with EG MCS																																	
Compile information/Proposal																																	