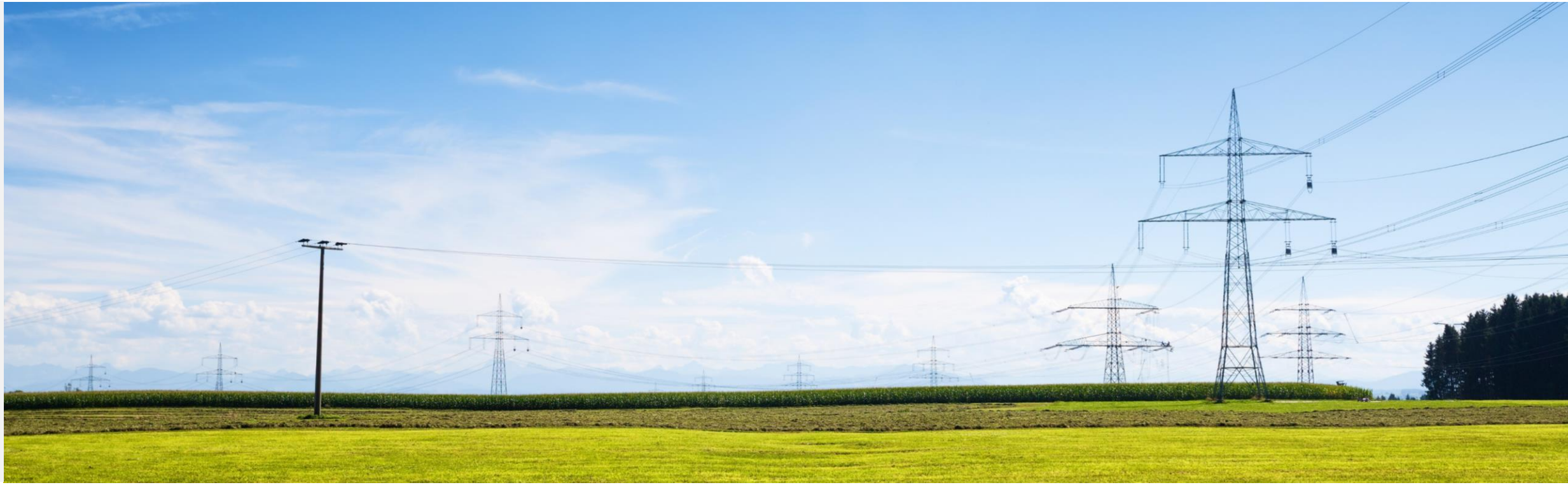
Report from the Expert Group ‘Identification of storage devices’ (EG STORAGE)

Phase 2

18th GC ESC meeting, 04 June 2020



Ioannis Theologitis on behalf of Antony Johnson, Chair of EG STORAGE

entsoe

Reliable Sustainable Connected

Terms of Reference

Scope of Work and deliverables for June 2020

The objectives of Phase II of the Expert Group on Storage are:-

- Revise any relevant Articles of the Connection Network Codes (RfG, HVDC and DCC) according to the results and observations of the technical assessment from phase I.
- List and briefly assess any possible implications to other Network Codes and Guidelines that these revisions may have.
- List any possible questions to be addressed by other Network Codes / Guide Lines (market, operation).
- Include some information related to the specific case of Electric Vehicles.
- Identify the possible configurations for grid connection, and the different modes of operation.
- Asses the consequences on connection requirements.
- List any possible question to be addressed by other Network Codes / Guide Lines.

Phase 2

Scope of Work and deliverables for June 2020

Report outlining the findings of the Group

- Definitions
- Operation of storage under low frequency conditions and linkage with Emergency and Restoration Code
- Interaction with other EU Codes
- Electric Vehicles
- Updated Excel Spreadsheet of capabilities

Updates to RfG, HVDC and DCC

Phase 2 - Meetings

Approval of the Phase I report by GC ESC	June 2019
First Phase II Meeting – Recap / Terms of Reference - Webinar	8 November 2019
Second Meeting – Physical Meeting – ENTSO-E Offices	19th November 2019
Third Meeting – Special meeting on Electric Vehicles - Webinar	10th December 2019
Fourth Meeting - Webinar	16th December 2019
Emilie Milin (RTE) hands chair to Antony Johnson (National Grid ESO)	January 2020
Fifth Meeting - Webinar	28th January 2020
Sixth Meeting Physical Meeting – ENTSO-G Offices – Discussion of draft report and draft connection network codes	4th March 2020
Seventh Meeting - Webinar	13th March 2020
Eighth Meeting - Webinar	2 April 2020
Ninth Meeting – Webinar	7 May 2020
Several bilateral meetings where held with particular Expert Group Members and others who has expressed particular comments on the report	May 2020
Submission of final report and draft legal text	June 2020

Contents of Phase II of the Report

- Purpose/Description/ Deliverables
- Clean Energy Package
- Technologies, Applications, Topologies and implementation in the connection network codes
- Electric Vehicles / Electromobility
- Electric vehicles and overview from the European Commission
- Definitions
- Interactions with other EU Codes – including operation under low Frequencies
- Interactions with other expert groups
- Technical Requirements
- Standards applicable to Storage
- Compliance
- National Implementation Approaches
- Assumptions
- Recommendations
- References
- Extracts from Legal Text
- Spreadsheet

Recommendations I

- 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"*
- Electricity Storage is either generation or demand. An "Electricity Storage Module" will be treated in the same way as a Power Generating Module with additional requirements for the demand element
- The technical requirements are equally applicable when in an import and export mode of operation
- It is recommended that ENTSO-E prepare an "Implementation Guidance Document" to clearly define how the technical requirements to storage apply when constructed on the same site as generation and/or demand
- It is proposed the same level of banding (Types A – D) will be used as for Power Generating Modules
- Certain forms of equipment such as Synchronous Flywheels, Synchronous Compensators and Regenerative Braking Systems do not fit within the definition of a Power Generating Module or Electricity Storage Module. It is down the to the TSO to define the applicable requirements on them to ensure sufficient System robustness
- Operational and data requirements fall outside the scope of this work
- Electric Vehicles are included within the proposed requirements – see later slide
- Requirements are proposed for Electricity Storage Modules to transition from an import mode of operation to an export mode of operation under low frequencies. This applies to all Type A, B, C and D Electricity Storage Modules.

Recommendations II

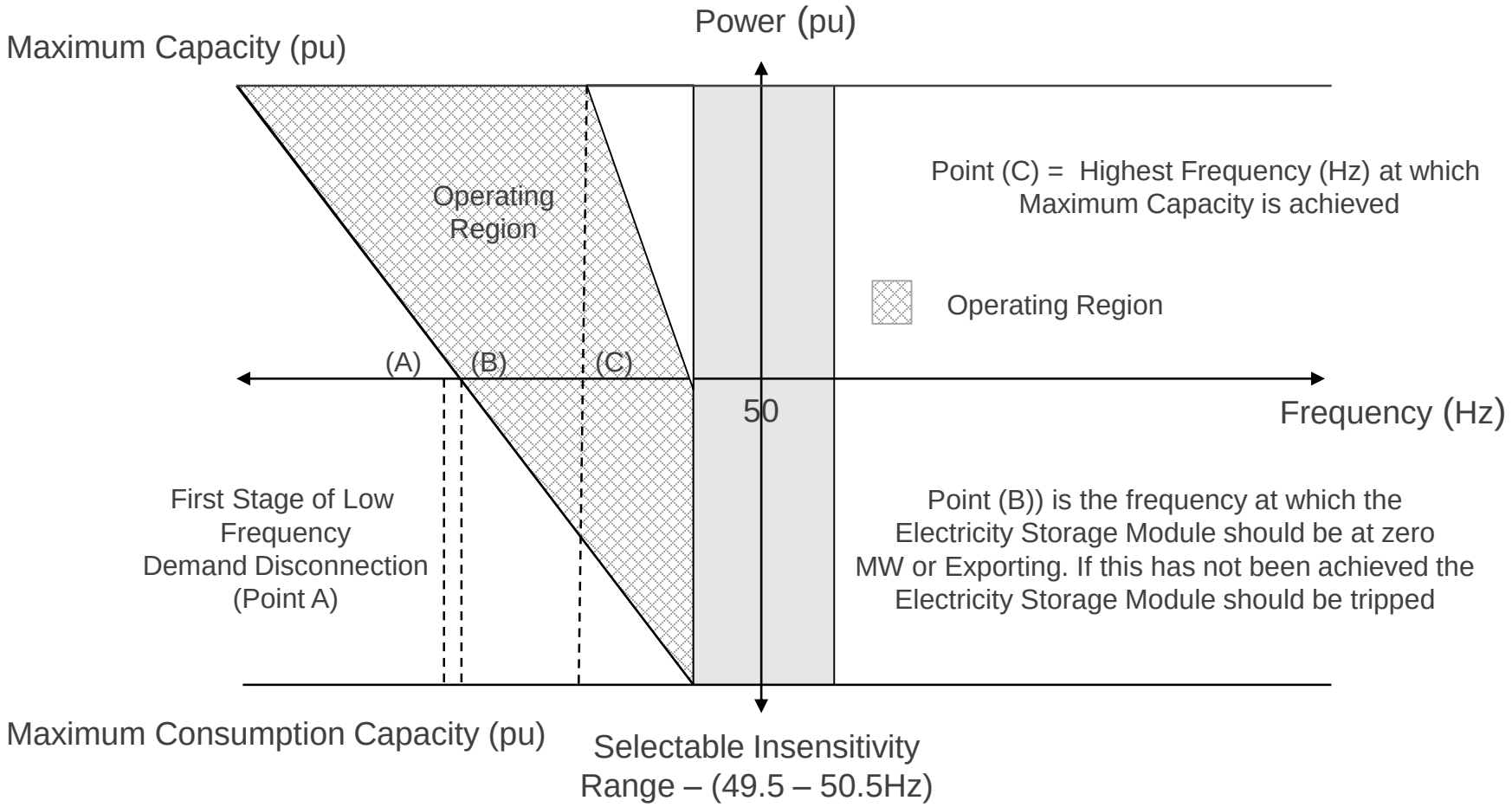
- Whilst Quality of Supply issues are not seen as a cross border issue the Expert Group was made aware of the very significant challenges that fast electric vehicle chargers could have on the network

- The Expert Group noted that as many storage applications are limited in size, many of them will fall into the Type A or Type B Power Generating Module category. There is concern that whilst many of them are quite small on an individual basis, the cumulative effect on the network is more significant. There was some discussion as to whether requirements such as LFSM-U, FSM and Reactive Capability should be applied to storage at lower levels. *As storage is treated in the same way as generation and the issue is no different to some other forms of generation technology (eg residential solar) it is recommended that this issue is addressed by the future "Baseline type A" Expert Group with appropriate input from ENTSO-E.*

- Consideration should be given to the treatment of Flexible load during low system frequencies. ENTSO-E need to consider this issue in the light of growing flexible demand and V1G Electric Vehicles – see Slide 10.

- It is recommended that following submission of the final reports, the Expert Groups (Storage, Mixed Customer Sites and Pumped Storage Hydro) compare the findings so there is consistency in the requirements going forward.

Performance of Electricity Storage Modules under low system frequencies



Performance of Electricity Storage Modules under low system frequencies – Selectable Parameters

TSO defined Parameter	Unit	Range
Insensitivity	Hz	49.5 – 50.5 Hz
Power Gradient	MW/Hz or pu/Hz	Within operating range of Figure 10
Point A - First Stage of Low Frequency Demand Disconnection	Hz	TSO defined according to the E&R (EU 2017/2196) code
Point B – Frequency at which the Electricity Storage Module should be at zero	Hz	TSO defined according to the E&R (EU 2017/2196) code
Point C – Frequency at which Maximum Export Capability can be reached	Hz	49.6 – 49.0Hz
Time t1 – Maximum Operating time for complete characteristic	s	TSO defined in the range 1 – 25s
Time t2 – Initiation time from inception of frequency fall	s	TSO defined in the range 0 – 5s
Final Loading Point following frequency fall	MW	0 – Maximum Capacity

Electric Vehicles

- ACER have prepared a position paper entitled "*Technical position paper concerning the integration of electromobility in the scope of amendments of the Network Codes Requirements for Generators and Demand Connection Code - May 2020" which is referenced in the report*
- Two classes of EV's defined
  - V1G – Where an Electric Vehicle which can only import Active Power from the Network
  - V2G – Where an Electric Vehicle can both import and Export Active Power to and from the Network
- Under the recommendations it is proposed that V1G is treated in the same way as demand (under DCC) in the same way as any other flexible load such as a heat pump.
- V2G is treated as any other Electricity Storage Module with the same banding threshold. As an EV is essentially a mobile battery they would be treated in the same way as a power park module.
- The ACER report is far more detailed but the approach adopted by the Expert Group is consistent with that recommended by ACER. These issues are dealt with in more detail in the report.
- The Expert Group sees a potential contradiction with the requirement of Art. 15.3 of the Emergency and Restoration code and believes the E&R code has to be respected. This issue in particular needs to be assessed by the European Stakeholder Committee.

Legal Text - HVDC and DCC

- **Covered in Appendix A of the Report**
- **No changes to HVDC**
- **Very minor changes to DCC**

Article 3(2)(b) – Scope of Application

~~(b) storage devices except for pump-storage power generating modules in accordance with Article 5(2).~~

Article 27(4) – Demand Response – General Provisions

Electricity storage modules are required to satisfy the requirements of section 15.3. of EU 2017/2196. For the avoidance of doubt this requirement is not considered to be a demand response service.

Legal Text - RfG

- Covered in Appendix A of the Report
- Most changes are to RfG
  - New section added to the recitals (Whereas)
  - Three new definitions and one amended
  - Changes to Articles 1, 3 and 6 – General Application
  - Minor changes to Articles 13, 14 and 15 – generally relating to frequency control or active power output when in an importing mode of operation
  - Minor changes to Article 21(3) (Power Factor Control) and 48(4) (Compliance)
  - New Annex I added specifically for electricity storage modules when in an import mode of operation as well as compliance and models. Performance whilst charging under low frequencies are shown on slides 8 and 9 of this presentation.

Legal Text – RfG - Definitions

(5) power-generating module' means either a synchronous power-generating module or a power park module. A power generating module includes an electricity storage module.

(66) 'electricity storage' means 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.

(67) 'electricity storage module' is a power generating module which can inject and consume active power to and from the network.

(68) 'maximum consumption capacity' means the maximum continuous active power which an electricity storage module can import from the network,

Summary

- **Full details of the findings including the legal text are included in the report**
- **The ESC and ENTSO-E are asked to consider the recommendations of the report**
- **Draft legal text has been included in the report as a suggestion only and it is for ENTSO-E to consider and develop this work further.**
- **The Chairman of the workgroup is very grateful to all members who have contributed to this work**