EG CROS – Final presentation

1st December 2023

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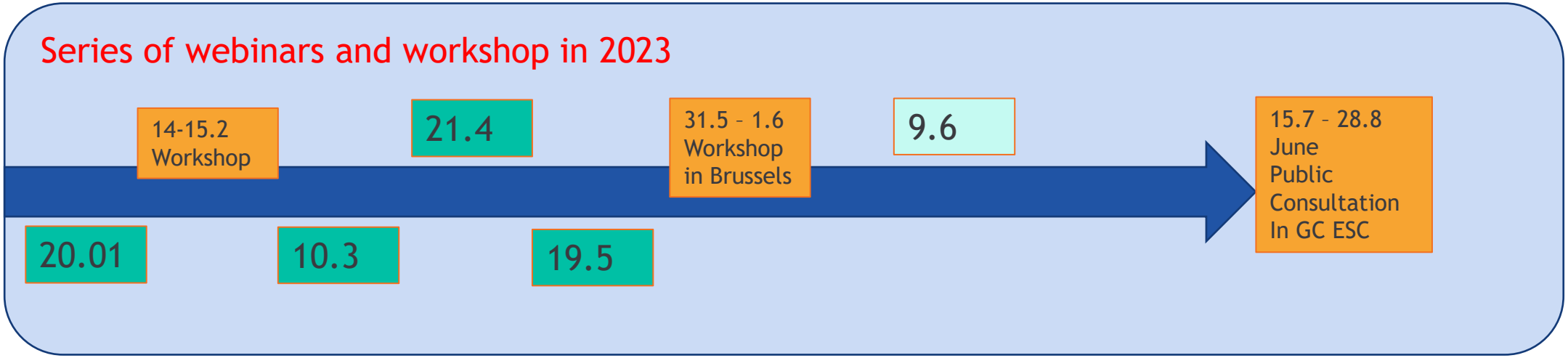
Reliable Sustainable Connected

Timeline of the EG CROS Phase II



Objectives of EG CROS Phase II

List of the regulatory gaps regarding connection network codes that have been identified in the Phase I report of the EG CROS are exhausted in the Phase II. Those gaps are:

Lack of regulation for offshore Demand Facilities, power to gas demand facilities and Electricity Storage Modules connected to Remote-end HVDC converters stations;

Unclarity with regard to applicability of NC HVDC;

Objectives of EG CROS Phase II

List of the core technical requirements scoped in the phase II of the EG CROS

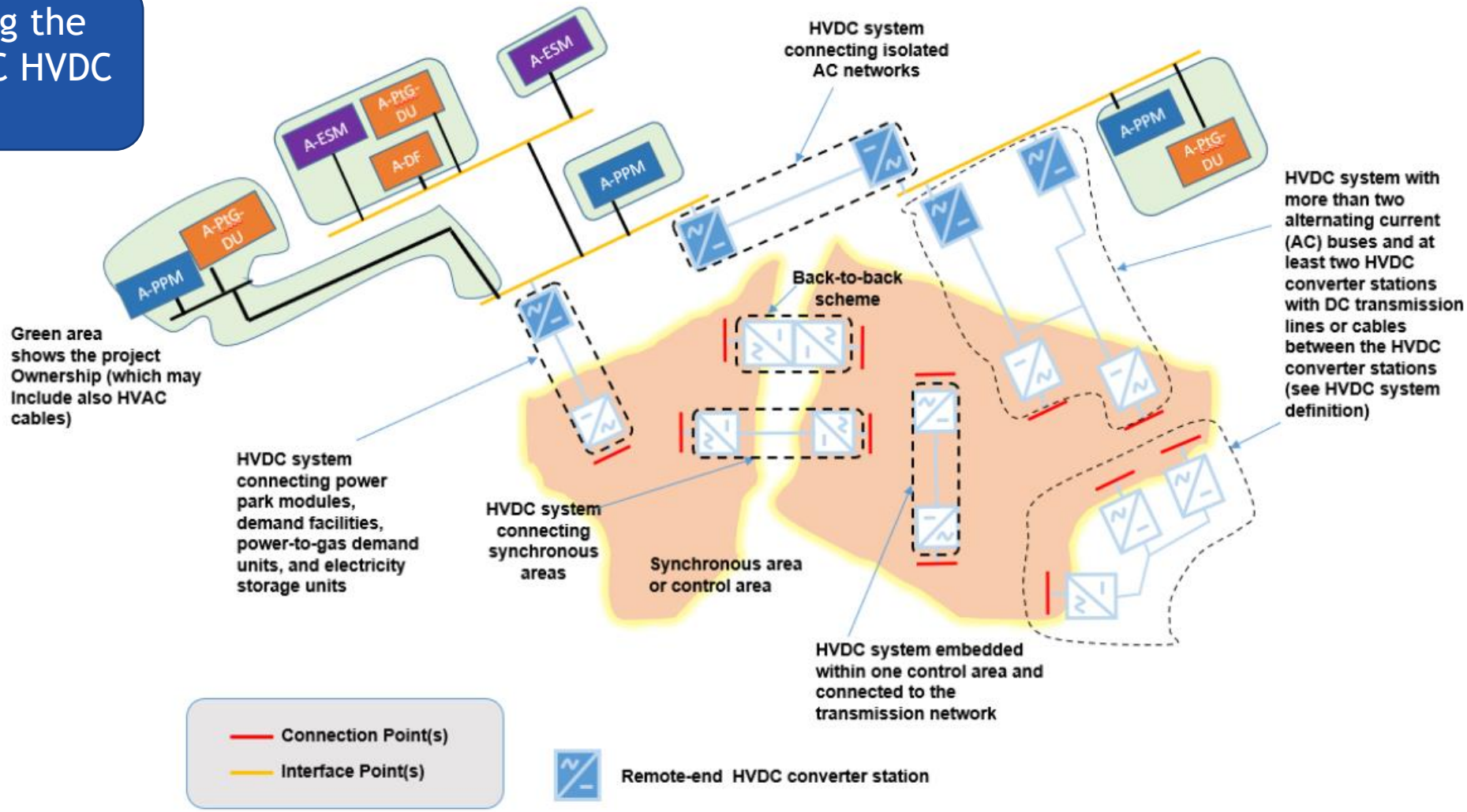
1. Evaluation of existing definitions of NC HVDC in order to support the development of amendment proposals;

2. Definition/drafting of grid forming technical requirements for HVDC systems and DC connected Power Park Modules (integrating lessons learnt from other EGs);

3. Draft technical requirements (legal text) for DC connected Power Park Modules, DC connected demand facilities and DC connected Electricity Storage Module in a shared/common interface points at isolated AC networks;

Assessment of the Applicability of NC HVDC

Figure presenting the topologies that NC HVDC applies



New definitions proposed for NC HVDC

- **‘connection point’** means the AC interface at a synchronous area at which the Power-Generating Module, Demand Facility, distribution system or HVDC system is connected to a transmission system, offshore network, distribution system, including closed distribution systems, or HVDC system, as identified in the connection agreement;

- **‘Isolated AC network’** means an AC network which is not part of a synchronous area, which is connected to a synchronous area via one or more HVDC systems;

- ‘**Interface point’** means the AC interface of an isolated AC network at which technical specifications affecting the performance of the relevant equipment can be prescribed as specified by the RSO and as identified in the connection agreement;

- **‘Remote-end HVDC Converter Station‘** means an HVDC Converter Station which is not synchronously connected to any synchronous area;

New definitions proposed for NC HVDC

- **'Asynchronously connected Power Park Module (A-PPM)'** means a Power Park Module that is connected via an interface point to one or more remote-end HVDC converter stations;
- **'Asynchronously connected Power-to-Gas Demand Unit (A-PtG-DU)'** means a Power-to-Gas Demand Unit that is connected via an interface point to one or more remote end HVDC converter stations;
- **'Asynchronously connected Electricity Storage Module (A-ESM)'** means an Electricity Storage Module that is connected via an interface point to one or more remote end HVDC converter stations;
- **'Asynchronously connected Demand Facility (A-DF)'** means a facility which consumes electrical energy and is connected via an interface point to one or more remote end HVDC converter stations.

Amendments proposed for the NC HVDC

Phase II: NC HVDC Amendment Proposals

Amendment 1: Article 3 (scope of NC HVDC)
Amendment 2: Article 4 (Application to existing HVDC systems)
Amendment 3: Article 12 (RoCoF withstand capability)
Amendment 4: Article 14 (Grid forming capability)
Amendment 5: Article 16 (Frequency control)
Amendment 6: Article 19 (short circuit contribution during faults)
Amendment 7: Article 35 (Priority ranking of protection and control)
Amendment 8: Article 36 (Changes to protection and control schemes and settings)

Amendments proposed for the NC HVDC

Phase II: NC HVDC Amendment Proposals

Amendment 9: Title III (increase of scope)
Amendment 10: Article 38 (scope)
Amendment 11: Article 39 (Frequency stability requirements)
Amendment 12: Article 40 (Reactive power and voltage requirements)
Amendment 13: FRT Capability of power to gas demand units
Amendment 14: Article 41 (Control requirements)
Amendment 15: Article 42 (Network characteristics)
Amendment 16 Article 43 (Protection requirements)
Amendment 17: Article 44 (power quality)
Amendment 18: Article 45 (General system management requirements)
Amendment 19: NEW Article X (Grid forming capability)

Amendments proposed for the NC HVDC

Phase II: NC HVDC Amendment Proposals

Amendment 20: Article 37 (black start)
Amendment 21: Article 44 (power quality)
Amendment 22: Article 47 (Frequency stability requirements for remote-end HVDC
Amendment 23: Article 48 (voltage ranges, remote end HVDC station)
Amendment 24: Article 50 (power Quality)
Amendment 25: Article 52 (parameters and settings)
Amendment 26: Annex I (Frequency ranges referred to in Article 11)
Amendment 27: Annex II (Requirements applying to FSM, LFSM O/U)
Amendment 28: Annex III (Voltage ranges)
Amendment 29: Annex V (FRT profile referred to Article 25)
Amendment 30: Annex VII (Voltage ranges and time periods referred to in Article 40)
Amendment 31: Annex VIII (Reactive power and voltage requirements referred to in Article 48)
Amendment 32: Article 54 (Simulation model requirements for HVDC systems)

Final Conclusions

- This Expert Group proposes amendments of the NC HVDC in order to facilitate the development of offshore grids in Europe, which is seen as a key enabler for the energy transition.
- It is the view of the Expert Group that the amended new version of the NC HVDC including the proposals made in this report can facilitate the future developments in multi-terminal, multi-vendor HVDC grids and does not consist of any barrier.
- It is the view of the Expert Group members that the amendment of the NC HVDC shall not be performed independently from the NC RfG and the NC DC as there are various interdependencies highlighted in the frame of this report (connection point definition, FRT requirements, grid forming requirements, storage and HVDC connected Demand Facility requirements).

The content of this report is supported by the Experts contributing to this report and the associations they represent.

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Thank you very much for your attention

Our values define who we are, what we stand for and how we behave.
We all play a part in bringing them to life.

EXCELLENCE

We deliver to the highest standardss. We provide an environment in which people can develop to their full potential.

TRUST

We trust each other, we are transparent and we empower people. We respect diversity.

INTEGRITY

We act in the interest of ENTSO-E

TEAM

We care about people. We work transversal and we support each other. We celebrate success.

FUTURE THINKING

We are a learning organisation. We explore new paths and solutions.

We are ENTSO-E