EirGrid GCRP Meeting

26 March 2026

EirGrid GCRP Agenda

INTRODUCTION: 10 mins

- Welcome to Members;
- Minutes and Actions from the Previous Meeting (3 December 2025).

MODIFICATION PROPOSAL: 30 mins

- MPID349 Grid Forming Requirements for HVDC;
- MPID346 Incorporate a reference to point (b) into point (e) of PC.1;
- MPID347 Clarification of User Cost Responsibilities for Incorrect Data Submissions;
- MPID348 Synchronous Condenser Unit Time to De-Synchronise.

DISCUSSION ITEM: 15 mins

- DRAFT Paper - EirGrid Electromagnetic Transient model specification Data Centres;

UPDATES: 15 mins

- Grid Code Derogations;
- Grid Code Modifications;
- CRU.

AOB: 5 mins

26/03/2026

MPID349

Non-mandatory Grid Forming Requirements for HVDC

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Scope

EirGrid Approach

- Inserts a new Grid Code framework for HVDC interconnectors that offer grid forming capability
- Non-mandatory and non-retrospective
- Defines expected grid forming behaviour only when capability is offered
- Interim national framework before NC HVDC 2.0 implementation
- Provides early visibility for developers and TSOs
- Supports trials and operational learning

European Legislation

Background and European Context

- The technical capabilities requirements for high voltage direct current systems are defined in Regulation (EU) 2016/1447 (NC HVDC)
- In September 2022, the EC asked ACER to propose amendments to the NC HVDC to reflect the latest developments in the sector
- In December 2024, following public consultation, ACER submitted to the EC its recommendation for amending NC HVDC 2.0. These amendments include non-exhaustive non-mandatory grid forming requirements for HVDC systems
    - The process of finalising the adoption of the updated regulation is now the responsibility of the EC
    - After the publication of the NC HVDC 2.0, ENTSO-E will release an IGD on exhaustive grid forming requirements
- February 2026, EirGrid and SONI released the “All-Island Grid Forming Strategy”, outlining a phased approach for the adoption of grid-forming capability across the All-Island power system

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Grid-Forming Roadmap & Strategy

A staged approach to the introduction of grid forming capabilities in the All-Island power system to enhance security and reliability of supply

1. Introduction of **non-mandatory grid forming requirements** for HVDC and PPMs in grid codes
2. **Technology trial** for HVDC and PPMs
3. Introduction of **mandatory grid forming requirements** in grid codes, informed by trials, stakeholder feedback and detailed system studies, in compliance with European Network Codes

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What is Grid-Forming?

Functional behaviour at the Grid Connection Point

Definition:

The expected requirement for a device with Grid-Forming characteristics is for it to appear at the Grid Connection Point as a passive source that injects current, within its current capability limits, in the sub-transient and transient timeframe (sub-cycle up to tens of cycles) opposing Disturbances

In grid forming mode, a converter:

- Behaves like a voltage source
- Controls AC voltage magnitude, frequency and phase
- Responds immediately to disturbances
- Enhances system strength, stability and inertia

Note: The response of the GFM device to a system disturbance (voltage phase, magnitude or frequency) is expected to **flow naturally**, without explicit control actions or delays.

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All-Island Power System Context

Dynamics of the All-Island Power System

Challenges

- Transitioning towards a converter-based power system brings stability and operational challenges
- High shares of renewables challenges conventional stability mechanisms.
- A decrease in the minimum number of online synchronous generators brings reduction in synchronous torque and damping
- Decaying system strength and inertia, driving new oscillatory phenomena
- Reduction in available fault current
- Maintaining adequate power quality

Approach

- Facilitate integration of new technologies capable of providing essential stability services and enhancing the reliability and security of the All-Island system with high levels of renewables
- Grid forming controls allow converter-based technologies (i.e., HVDC, wind, solar PV and batteries) to provide stabilising functions traditionally delivered by synchronous machines
- So, when this capability is provided, it can strengthen the transmission system and support secure power system operation with higher renewable shares

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Structure of the Grid Code Modification Proposal

New Grid Code sections are included for grid forming operation mode

These sections collectively define how HVDC interconnectors are expected to perform when operating in grid forming mode, as well as the information required by the TSO to safely integrate such capabilities

1 Interconnector Data Requirements

- Specifies the additional data that the HVDC interconnector owner must submit to the TSO when grid forming capability is provided

2 “GRID FORMING” technical requirements

- Defines the technical requirements applicable to HVDC interconnectors operating in grid forming mode
- Works in parallel with existing HVDC interconnector clauses and supersedes specific legacy provisions when grid forming functionality is enabled

3 Definitions

- Creates a common interpretation of the new terminology, so that the technical requirements can be read consistently by TSOs, interconnector owners and other stakeholders

Clause Mapping

Integration of grid forming requirements into the Grid Codes

The new grid forming sections are included in the EirGrid Grid Code into the corresponding locations as follows:

	EirGrid
Interconnector Data Requirements	PC.A6.1.v.h
Grid forming technical requirements	CC.7.5.13
Grid forming definitions	Definitions

Interconnector Data Requirements

Additional data needed by the TSO to safely integrate HVDC interconnectors with grid forming capability

When an HVDC converter operates in grid forming mode, the HVDC Interconnector Owner must provide:

- Effective impedance (positive and negative sequence) – including both physical and virtual impedance
- X/R ratio of the Interconnector Converter Station
- Inertia constant (H_{eq})
- Damping
- Frequency-dependent impedance

These parameters enable the TSO to model the HVDC Interconnector accurately and ensure secure integration of grid forming capability under a wide range of system conditions

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Grid Forming technical requirements - Part 1

Outlines the minimum set of technical parameters needed for HVDC interconnector operating in grid forming mode

1. **General applicability rules** – specifies the conditions under which grid forming operation applies

2. **Voltage-source behaviour** – the HVDC interconnector must behave as a controllable voltage source

- Internal voltage amplitude, phase angle, and frequency must be controllable
- Following a disturbance, the converter must respond immediately
- Effective impedance must be within 0.2–0.5 pu, and $X/R \geq 10$
- The converter must contribute to Synchronising Active Power (to oppose phase-angle jumps) and Voltage Stiffness (reactive power response to magnitude changes)

3. **Synthetic inertia contribution** – the HVDC interconnector must emulate the inertia provided by synchronous machines

- It defines the active power response of the HVDC interconnector to system ROCOF
- Must respond with no intentional delay
- Use a minimum equivalent inertia constant of $H_{eq} \geq 3$ MW·s/MVA and a damping ratio ≥ 0.4

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Grid Forming technical requirements - Part 2

Outlines the minimum set of technical parameters needed for HVDC interconnector operating in grid forming mode

4. **Current limitation** – it defines how the HVDC interconnector must behave when it reaches its current limits during disturbances

- Only current magnitude may be limited; the phase angle must be preserved
- The converter must not change control mode
- The converter must remain stable, connected, and smooth during transitions
- Once system conditions improve, the converter must return to full capability without a bump

5. **Withstand capability** – it defines the ability for the HVDC interconnector to remain stable and connected under severe but credible disturbances

- Withstand ±30° phase-angle jumps at the Grid Connection Point
- Remain stable during sudden network topology changes
- Continue to operate even when system strength falls below the minimum Short Circuit Ratio
- Must not:
  - trip
  - block
  - introduce oscillations

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Grid Forming technical requirements - Part 3

Outlines the minimum set of technical parameters needed for HVDC interconnector operating in grid forming mode

6. **Fault ride-through (FRT)** – it defines the required behaviour during voltage dips (both symmetric and asymmetric):

- Provide immediate voltage support based on its effective impedance
- Inject positive and negative sequence currents with no prioritisation
- Respect current limits as defined in the Current Limitation rules
- After the fault is cleared:
  - Restore active power quickly: ≥50% within 500 ms / ≥90% within 1.5 s
  - Avoid causing >5% voltage overshoot

7. **Optional capabilities** – additional advanced grid forming functions that may be provided

- Voltage Balancing: Maintaining balanced three-phase voltages by absorbing negative sequence current
- Islanding Capability: Ability to energise and stabilise an isolated network section
- Re-synchronisation Capability: Ability to smoothly re-connect an islanded section to the live grid
- Black Start Capability: If equipped, the station must be able to start in GFM Mode and energise the network

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Grid Forming definitions

They ensure consistent interpretation of technical terms across TSOs, manufacturers, and Interconnector Owners.

- **Effective Impedance:** Total impedance (physical + virtual) seen at the Grid Connection Point
- **Grid-Forming (GFM):** Capability to act as a voltage source
- **GFM Mode:** Control mode meeting all grid forming technical requirements
- **Interconnector STATCOM State:** DC-isolated state with modified requirements
- **Islanding Capability:** Maintain voltage and loads during islanding
- **Re-synchronisation Capability:** Smooth reconnection of an island to the grid
- **Self-Synchronisation:** Autonomous creation of voltage waveform
- **Synchronising Active Power:** Immediate active power response to angle jumps
- **Synthetic Inertia:** Active-power response to ROCOF
- **Voltage Balancing:** Control of negative-sequence current to balance voltages

MPID349

- This modification proposal was presented and discussed at the JGCRP.
- Do members support the submission of MPID349 to the CRU for review and decision?

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MPID346

Incorporate a reference to point (b) into point (e) of PC.1

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- This change adds **point (b)** to **point (e)** of PC.1 to ensure the Planning Code is complete and consistent.
- Point (e) covers cumulative development impacts needing Transmission System reinforcement but currently misses point (b) due to a typo.
- Developments in point (b), involving **new or modified Connection Sites**, can cause significant cumulative impacts like other points.
- Leaving out point (b) creates ambiguity in assessing cumulative impacts.
- Including point (b) ensures all development types are treated consistently for thorough Transmission System planning.

PROPOSED CHANGES:

Red Line Version Text

Deleted text in ~~strike-through red font~~ and new text highlighted in blue font

PC.1 INTRODUCTION

Development of the **Transmission System** will arise for a number of reasons including, but not limited to:

(a) development on a **User System** already connected to the **Transmission System;**

(b) the introduction of a new **Connection Site** or the **Modification** of an existing **Connection Site** between a **User System** and the **Transmission System;**

(c) changing requirements for electricity transmission facilities due to changes in factors such as **Demand, Generation,** technology reliability requirements, and/or environmental requirements; and

(d) a development on the **NI System;**

(e) the cumulative effect of a number of such developments referred to in (a), (b), (c) and (d) by one or more **Users.**

Green-line version (proposed New Text):

PC.1 INTRODUCTION

Development of the **Transmission System** will arise for a number of reasons including, but not limited to:

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(d) a development on the **NI System;**

(e) the cumulative effect of a number of such developments referred to in (a), (b), (c) and (d) by one or more **Users.**

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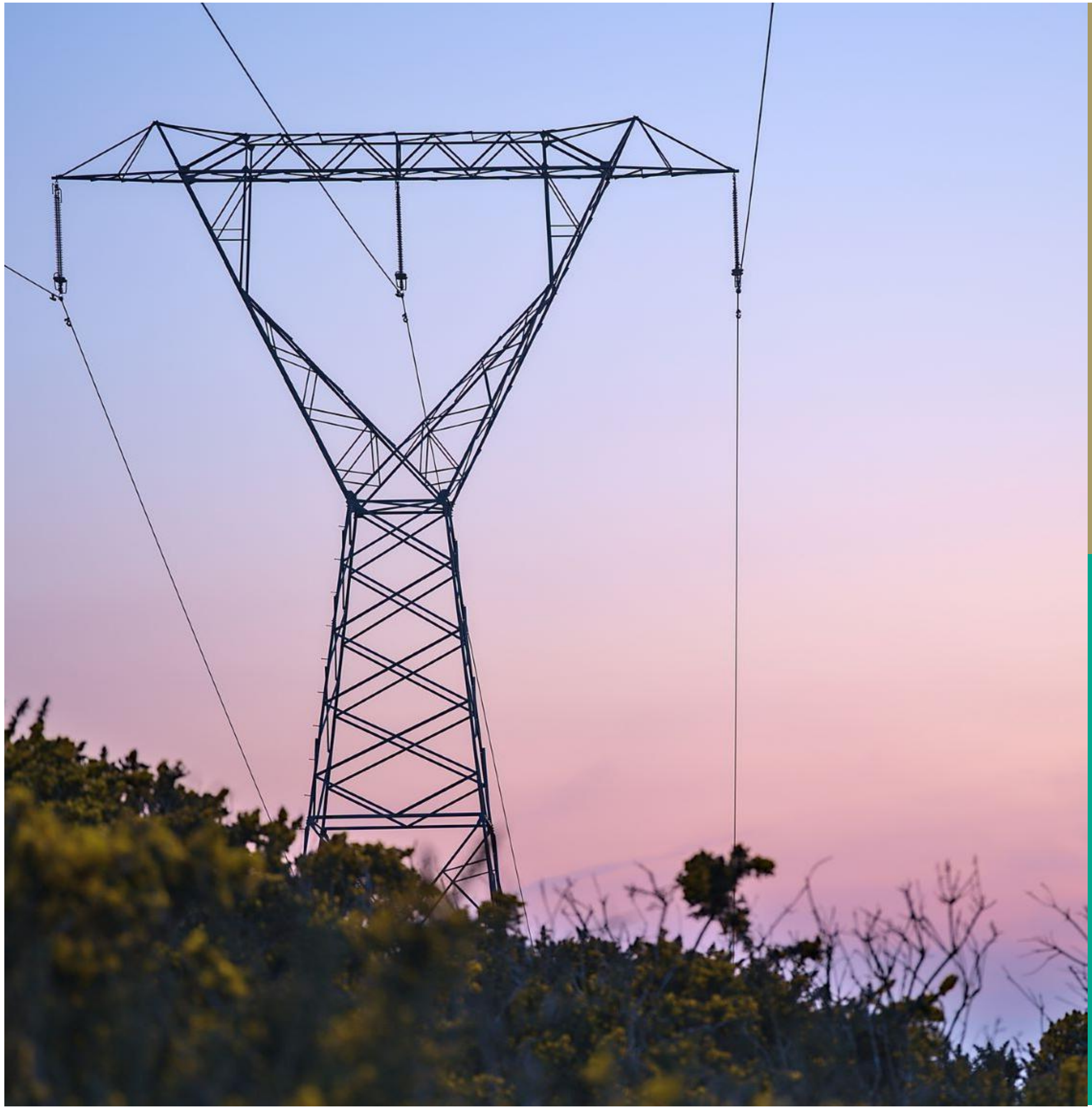
MPID347

Clarification of User Cost Responsibilities for Incorrect Data Submissions



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- Clarifies the **application of PC.8.4** where User-submitted data is subsequently found to be **incorrect or inaccurate**, particularly in relation to **cost allocation**.
- Addresses **ambiguities in the existing drafting**, including the **sequence of events** that trigger cost recovery, while **retaining the original intent and obligations**.
- Improves **clarity, consistency, and usability** of the Planning Code without introducing **new requirements or responsibilities**.

PROPOSED CHANGES:

Red-line version (deleted text in red strike-thought, proposed next in blue.

PC.8.4

~~In the event that any of the data items submitted are shown to be incorrect or inaccurate then the **User** will bear the cost of the **Test** in full and the data values as ascertained by the **Tests** will be the values used in the data. If, as a result of the changes to the data arising from the **Test** or **Tests**, the **TSO** have to redo or perform additional system studies then the **User** will also bear the cost reasonably incurred as a result of this additional work.~~

If any submitted data items are found to be incorrect or inaccurate, the User shall bear the full cost of the **Test(s)**. In such cases, the data values determined by the **Test(s)** shall be the values used.

Additionally, if changes to the data arising from the **Test(s)** require the **TSO** to repeat existing system studies or perform new ones, the **User** shall bear the reasonable costs incurred for this additional work(s).

Green-line version (proposed New Text):

PC.8.4

If any submitted data items are found to be incorrect or inaccurate, the User shall bear the full cost of the **Test(s)**. In such cases, the data values determined by the **Test(s)** shall be the values used.

Additionally, if changes to the data arising from the **Test(s)** require the **TSO** to redo existing system studies or perform new ones, the **User** shall also bear the reasonable costs incurred for this additional work.

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MPID348

Synchronous Condenser Unit Time to De-Synchronise

Introduction to Proposal MPID348

- At the June 2025 GCRP meeting, MPID319 Synchronous Condenser Unit Incorporation was recommended for submission to the Regulators for decision.
- As part of that modification proposal, an additional clause is required for time to de-synchronise for Synchronous Condenser Units.
- The aim of this proposal is to include such a clause for Synchronous Condenser Units (a similar requirement also exists for Generators).

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Proposed New Text

- Below are the changes proposed - the black text is text already present in the MPID319 modification proposal, and the blue text is new proposed text.

SCU1.4.1
Each **Synchronous Condenser Unit** shall, as a minimum, have the following capabilities: […]
(l) Time to De-Synchronise: as quickly as the technology allows, and in any event not greater than 40 minutes, except where agreed with the TSO.

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Electromagnetic Transient Model Specification for Data Centres – Draft Paper

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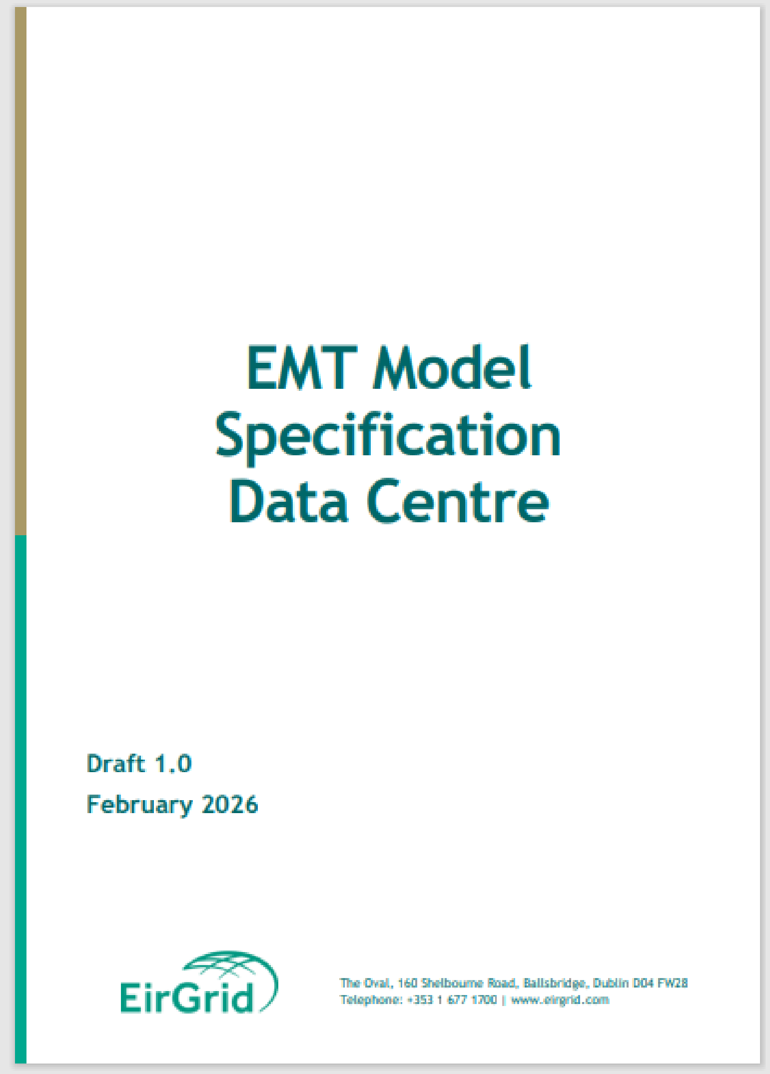
Electromagnetic Transient Model Specification for Data Centres

- Development of the model specifications was supported by international consultants (RTEi).
- Model specification is **software agnostic**.
- **Site Specific Plant Model** required at the Point of Connection and model to reflect the **actual characteristics of the Data Centre facility**.
- **Unencrypted** EMT models to be provided for all Data Centres components.
- The **model specification** document covers:

1. Intended use of the Model
2. Model Components
3. Model Structure
4. Model Fidelity
5. Software Platform
6. Usability and Compatibility
7. Model Package
8. Maintenance of Model



EMT Model Specification Data Centre

Draft 1.0

February 2026

EirGrid

The Oval, 160 Shelbourne Road, Ballsbridge, Dublin D04 FW28
Telephone: +353 1 677 1700 | www.eirgrid.com

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Electromagnetic Transient Model Specification for Data Centres

Background:

The number and size of **Data Centre** connections in Ireland is growing rapidly. As compared to the conventional loads, the Data Centres (Inverter –Based Loads) behave differently and are significantly large enough to influence the **dynamic stability** of the All Island power system.

To plan and operate the All-Island power system in a secure and reliable manner, the TSO requires all Data Centre Users connected to, or applying for a connection to, the Transmission System to provide **high-fidelity simulation EMT models** of their facility.

Requirements for provision of EMT models by Users was captured in **GC PC.A8** in 2016, the document is in compliance with this grid code section.

Additionally, the contents of the documenet also align with **European Legislation EU 2016/1388** highlighted in the **Network Code on Demand Connection** and the amendments recommended to the existing Network Codes submitted by **ACRE to the European Commission** .

Detailed **model validation requirements** will follow.

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3. Updates: 20 minutes

a. Grid Code Derogations;

b. CRU;

c. Grid Code Modifications.

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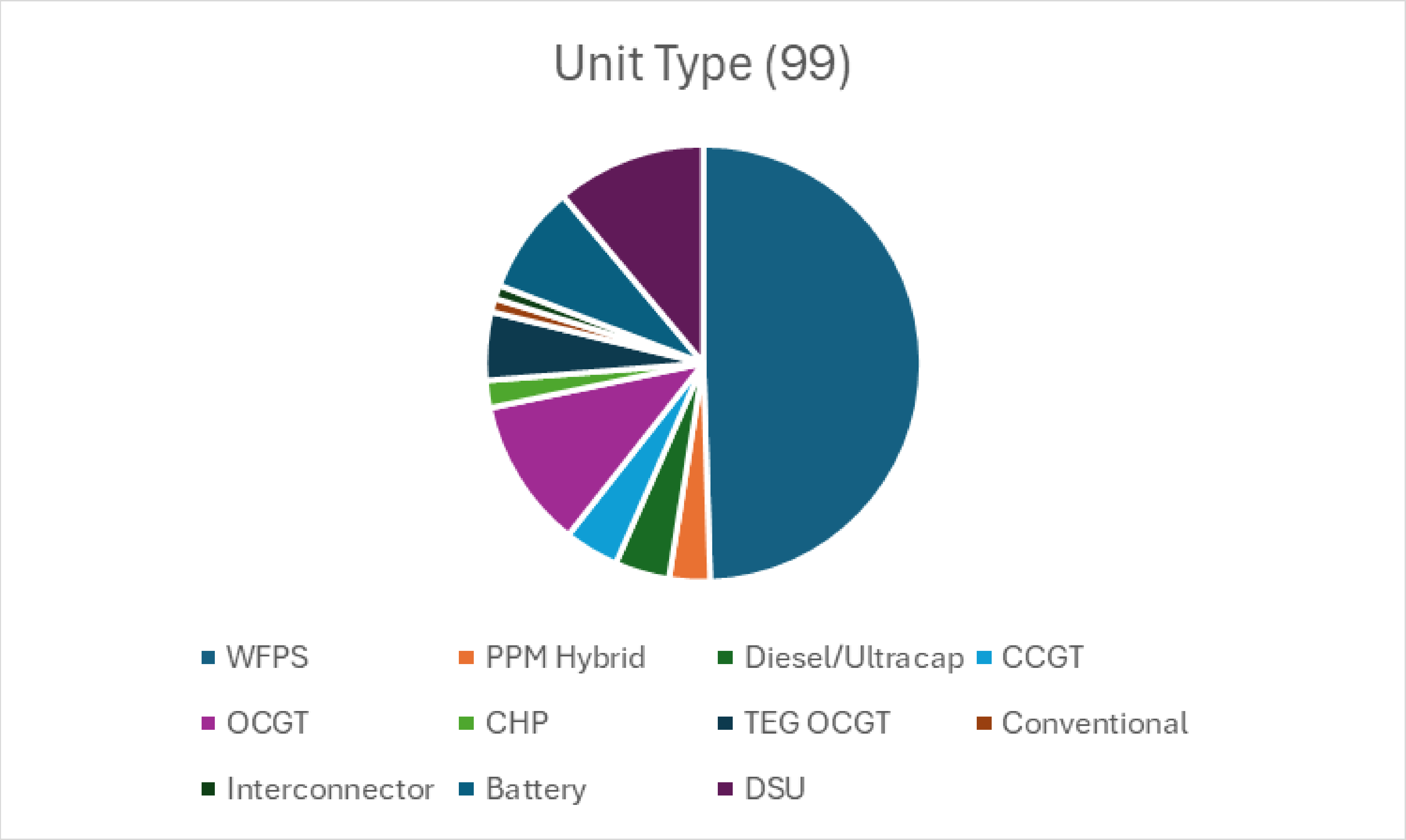
Current Derogations Stats

Status	Number
Dormant	39
Under TSO Assessment	99
With CRU	118
Approved by CRU	559
Approved Still Valid	213

Under TSO Assessment – Unit Type



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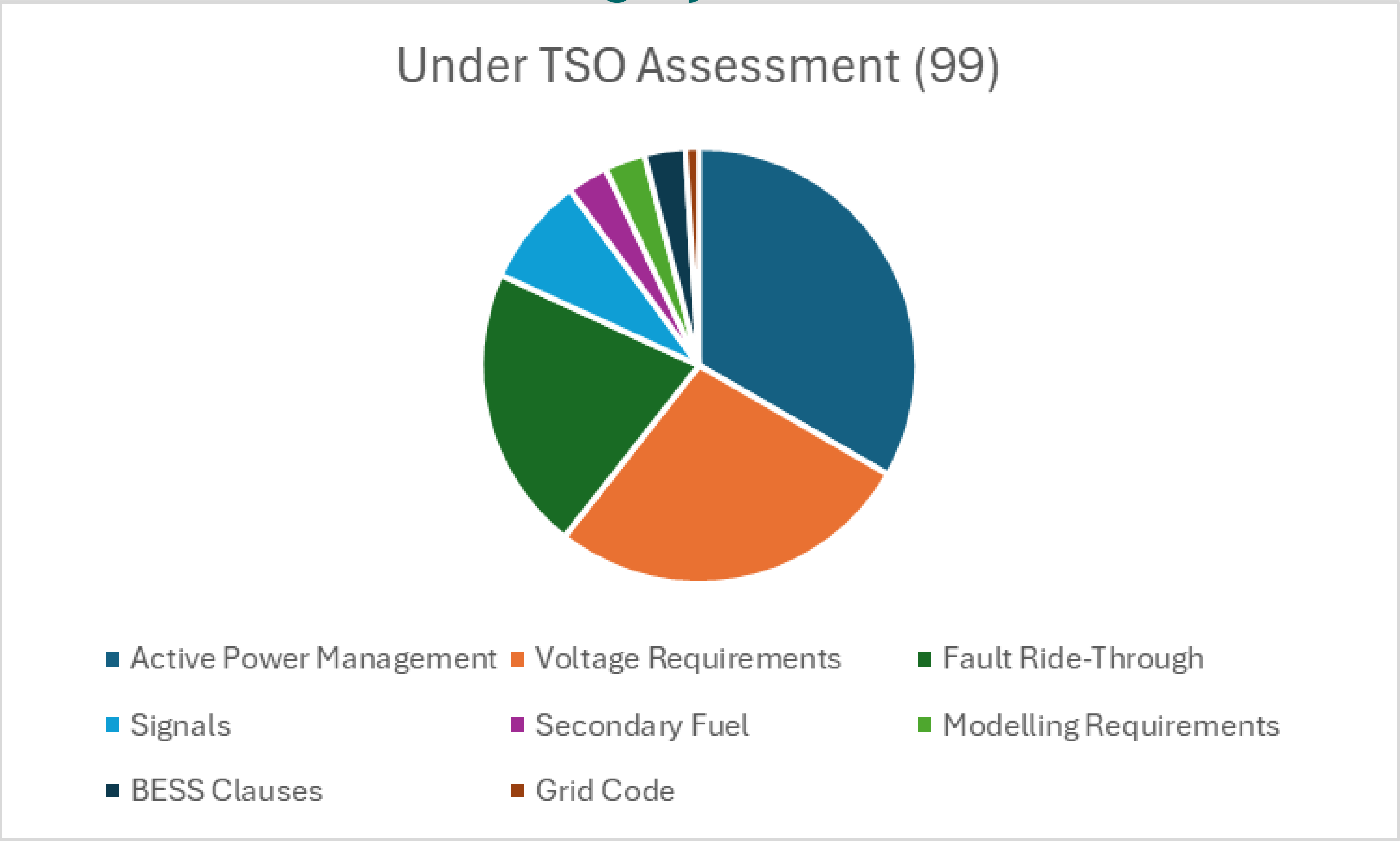
Under TSO Assessment - Category



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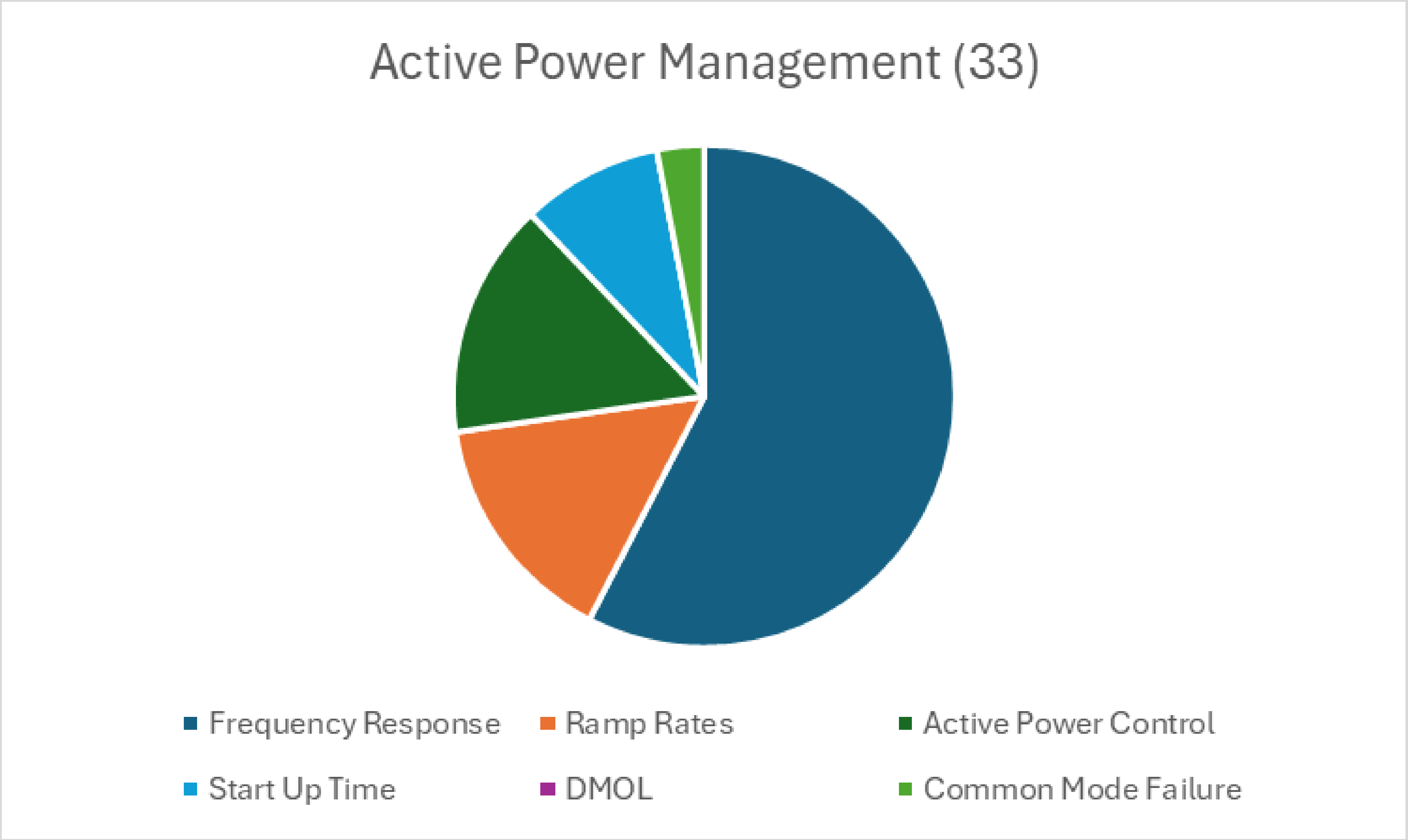
Under TSO Assessment – Active Power Management



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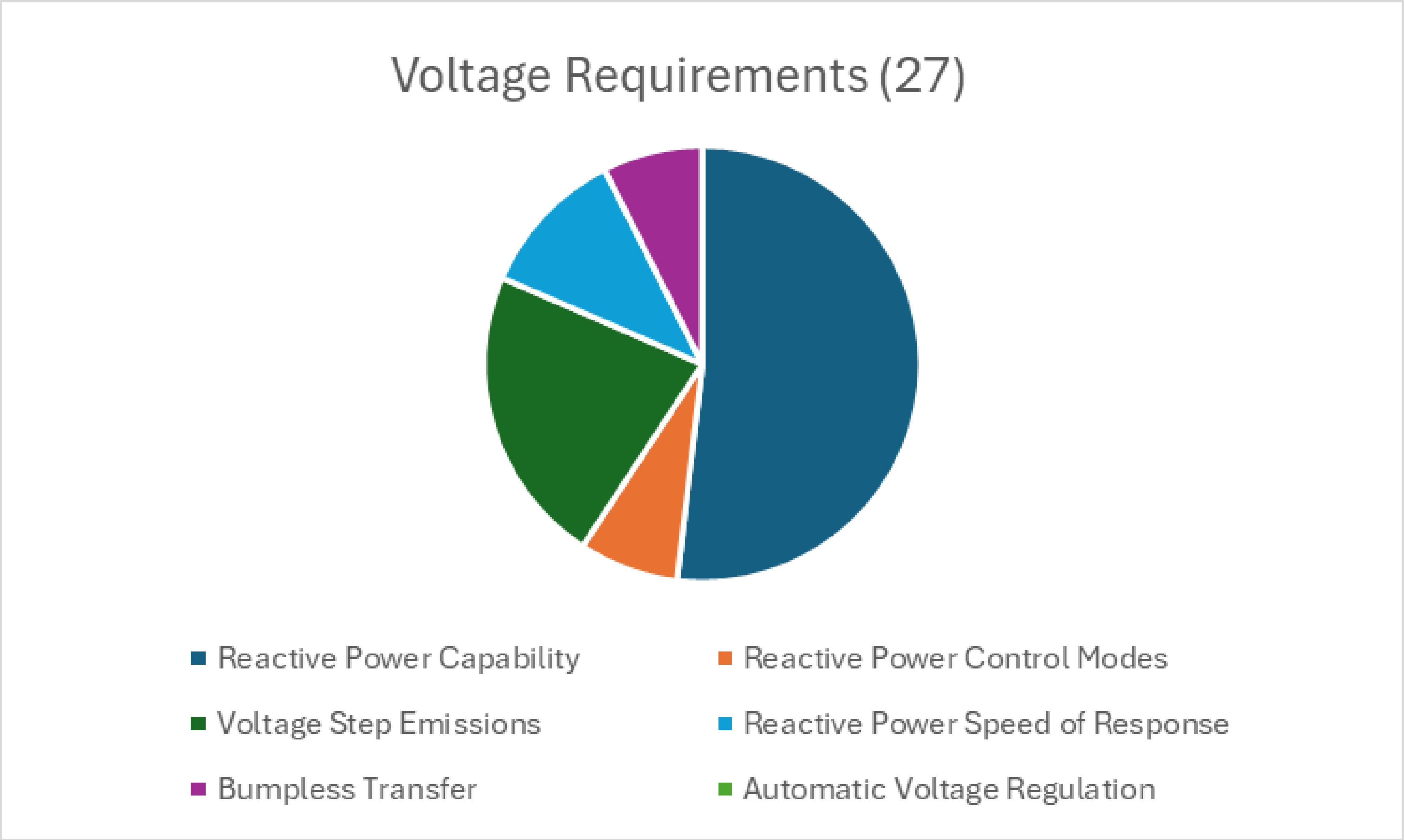
Under TSO Assessment – Voltage Requirements



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Since Last GCRP 3 December 2025

Status Update	Number
New Submissions	2
Extension Requests	32
Forwarded to CRU	1
CRU Decisions	10

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CRU Update

- Recommendation Papers with CRU for decision (7) : MPID 320, MPID 319, MPID 327, MPID 337, MPID 340, MPID 342, MPID 343
- CRU decisions since 03 December 2025 (2): MPID 293, MPID 341

Update on Modifications since 3 December 2025 Meeting

Modification	Number	MPID#
CRU Decisions	2	MPID 293 DSU Maximum Down-time; MPID341 Stranded Definition;
Recommendations with the CRU	7	MPID319 Incorporation SCU; MPID320 NPDR; MPID327 Notice to React; MPID342 Clarification PPM Solar; MPID343 Clarification Curve 1 & 2; MPID340 SCU RoCoF;
Draft Recommendation Papers with EirGrid	2	MPID345 FRT – Demand Facilities; MPID339 FASS Products;
Proposed today	4	MPID349 Grid Forming Requirements for HVDC; MPID346 Incorporate a reference to point (b) into point (e) of PC.1; MPID347 User Cost Responsibilities for Incorrect Data Submissions; MPID348 SCU Time to De-Synchronise;

AOB

Thank you.

Meeting Minutes will be issued by COB 13 April 2026