

18/08/2026

EirGrid Extraordinary GCRP Meeting

18 August 2026



EirGrid Extraordinary GCRP Agenda

INTRODUCTION:

Welcome

MODIFICATION PROPOSAL:

MPID349 Grid Forming Requirements for HVDC.



18/08/2026

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MPID349

Non-Mandatory Grid Forming Requirements for HVDC



MPID349 (Non-Mandatory Grid-Forming Requirements for HVDC Units)

Key Points

- Grid Forming can provide **enhanced system strength, resilience and support** for secure operation of the all-island power system with high levels of renewable generation.
- MPID349 **enables the integration of grid-forming** technologies from HVDC interconnectors into the Irish power system.
- MPID349 introduces **non-mandatory conditions**.
- MPID349 applies **only to HVDC interconnectors**.
- MPID349 **does not introduce obligations** on existing interconnectors or other Users.
- MPID349 supports the **All-Island Grid Forming Strategy**.
- MPID349 provides an **interim national framework** ahead of the EU Network Code HVDC 2.0.



MPID349 (Non-Mandatory Grid-Forming Requirements for HVDC Units)

Structure

Interconnector Data Requirements (PC.A6.1(v)(h))

Introduces additional data submission requirements for HVDC interconnectors that declare grid-forming capability. Owners must provide additional technical information, including parameters related to inertia, damping and impedance.

Technical Requirements (CC.7.5.13)

Establishes a new Grid Code section (CC.7.5.13) for voluntary grid-forming capability in HVDC interconnectors.

Defines how HVDC interconnectors that elect to provide grid-forming capability should operate during normal system conditions and during system disturbances.

Performance-based requirements include:

- Voltage Source Behaviour (CC.7.5.13.8)
- Synthetic Inertia Contribution (CC.7.5.13.9)
- Behaviour at Current Limits (CC.7.5.13.10)
- Withstand Capabilities (CC.7.5.13.11)
- Fault Ride Through (CC.7.5.13.12)

Definitions

Introduces new Grid Code definitions to support implementation of the framework.



MPID349 (Non-Mandatory Grid-Forming Requirements for HVDC Units)

JGCRP/GCRP meetings 26 March 2026

- The draft proposal was circulated on 10 March 2026 and presented at the JGCRP/GCRP meeting on 26 March 2026.
- **Overall feedback:**
 - Members generally welcomed the proposal and did not consider the proposed technical requirements excessively onerous.
 - Representatives from the Interconnector and Offshore sectors requested further engagement and clarification.
- **Post meeting note:** The Offshore representative welcomed the extended review timeline and requested a summary of industry feedback at the next JGCRP meeting.



Outcomes

- Removed the term "non-retrospective" from the modification justification.
- Implemented clear demarcation within the Grid Code to show that Grid Forming requirements are non-mandatory.
- Extended the industry review period until the end of May.
- Returned the proposal to the June JGCRP meeting following industry review and feedback.



MPID349 (Non-Mandatory Grid-Forming Requirements for HVDC Units)

Engagement with Interconnectors

- A dedicated engagement session with Greenlink, EWIC and Celtic Interconnector representatives was held on 13 May 2026.

Feedback/queries	How it was addressed
It was confirmed that, although very technical, the proposed modification is not more onerous than the expected HVDC 2.0 requirements.	No action required.
Recommended that the non-mandatory provisions be clearly demarcated within the Grid Code, distinct from other requirements.	Section CC.7.5.13 was renamed from “GRID FORMING” to “NON-MANDATORY GRID FORMING” to clearly demarcate it from other mandatory requirements.
Raised concern about the risk of unintended obligations being placed on existing interconnectors, and the need for a clear trigger for application.	An explicit opt-in / “declared” mechanism was introduced in the proposal. The conditions apply only where the Interconnector Owner declares the capability, subject to agreement with the TSO.
Recommended revising the definition of Grid Forming to differentiate from Black Start capability.	A clarifying note was added to address potential ambiguity in the interpretation of Grid Forming capability confirming that Black Start capability alone is not sufficient to demonstrate Grid Forming capability.

Outcome

Following review of the revised proposal, Interconnector representatives confirmed support for the modification on 4 June 2026.

MPID349 (Non-Mandatory Grid-Forming Requirements for HVDC Units)

Engagement with WEI

- Feedback received from WEI on 27 April 2026, followed by a dedicated engagement meeting on 3 June 2026.

Feedback/queries	How it was addressed
Material Change Without Adequate Consultation	The Grid Forming Strategy was developed over a period of eight months with significant stakeholder engagement, including WEI. A public workshop took place on 10th March and subsequent presentations have been delivered to industry, including the WEI Policy Forum on 14th April. The specific changes introduced with MPID349 were circulated to JGCRP/GCRP members on 10th March and presented during the meeting on 26th March, with an agreed review process until end of May. The TSO is open to further engagement.
Precedent setting and future obligation risk	Section CC.7.5.13 was renamed from “GRID FORMING” to “NON-MANDATORY GRID FORMING” introducing a clear demarcation. The proposal modification applies to HVDC Interconnectors only. Any future modifications applying to other type of Users will be subject to the standard JGCRP/GCRP governance process.
Blurring of Grid Code and Market Services Risk of a de-facto Grid Forming Market	The Grid Code lays out the technical requirements for non-mandatory grid forming. There are no current plans for introduction of new system services products specifically for grid forming.
Lack of supporting analysis	Many studies and system incidents provide evidence of decaying system strength and increased risk of instability in inverter-dominated systems. Grid Forming is one of the various mature technologies capable of addressing these challenges. The proposed MPID349 removes barriers to the introduction of this capability in the Irish power system without introducing any obligations on existing Users.



Note: This slide summarises the *key feedback* related to the scope and contents of MPID349

MPID349 (Non-Mandatory Grid-Forming Requirements for HVDC Units)

JGCRP/GCRP meetings 25 June 2026

- The revised proposal, incorporating previous industry feedback, was circulated on 10 June 2026 and discussed at the JGCRP/GCRP meeting on 25 June 2026.
- **Feedback received**
 - Concerns were raised regarding the proposed definitions and the potential future application of Grid Forming requirements to PPMs.
 - Members found it difficult to identify changes within the revised proposal.
 - Additional time was requested to review the updated modification.
- **Clarifications provided**
 - Definitions only apply where explicitly referenced within Grid Code clauses.
 - The proposed definitions cannot be applied to other user categories without a further Grid Code modification process.



Outcomes

- A marked-up (redline) version of the modification was circulated on 9 July 2026
- The review period was extended to 23 July 2026

MPID349 (Non-Mandatory Grid-Forming Requirements for HVDC Units)

Feedback from SSE

- Feedback was received from SSE on 23 July 2026, and responses were issued on 4 August 2026.

Feedback/queries	How it was addressed
Definitions and terminology: (1) Multiple terms used interchangeably for grid-forming technologies. (2) Remaining use of the acronym “GFM”. (3) Inconsistencies in voltage terminology and capitalisation. (4) Concern that “Withstand Capability” is not unique to grid forming plants.	(1) Terminology was standardised throughout the document to “Grid Forming Plant”. (2) GFM acronym removed from the definitions section for consistency. (3) Updated terminology across the document to consistently use “Transmission System Voltage”. (4) The definition has been renamed to “Grid Forming Withstand Capability”.
Technical Clarifications: (1) Why is a Grid Forming Plant described as a “passive source” rather than an active source? (2) What differentiates Grid Forming (GFM) from Grid Following (GFL) plants if both provide fault ride-through current?	(1) “Passivity” refers to the plant's impedance behaviour at the connection point, which improves stability and damping of system disturbances, while still actively controlling voltage and frequency. (2) The key distinction is that GFM plants behave as voltage sources that establish and support system voltage and frequency, whereas GFL plants act as current sources that rely on an existing voltage waveform for synchronisation.
“Synchronising Active Power”, “Synthetic Inertia Contribution”, and “Voltage Stiffness Contribution” are described as both capabilities and calculated quantities.	It was confirmed that these terms describe both a capability and the measurable/calculable response resulting from that capability. Equations are included to quantify performance.
Grid Forming Effective Impedance: Clarification requested on reactive power base values and measurement location.	It was clarified that “Qbase” refers to maximum reactive power requirement at Registered Capacity (Pmax) and is measured at the Connection Point.
Standards & equations: (1) Move “unsaturated fault current” calculations into the definitions section. (2) Reference IEC standards for Voltage Unbalance Factor rather than defining it. (3) Remove equations from definitions and place them in external guidance.	(1) Change not implemented; equations for calculation of “unsaturated fault current” remain with the performance requirement section to preserve context. (2) Change not implemented; the definition is intended to clarify an inherent grid-forming capability rather than reference a withstand requirement. (3) Change not implemented; equations are retained within the Grid Code to ensure clarity, precision, and self-contained requirements.

MPID349 (Non-Mandatory Grid-Forming Requirements for HVDC Units)

Feedback from WEI

- Feedback was received from WEI on 22 July 2026 from the perspective of Power Park Modules (PPMs). The feedback has been reviewed and formal responses will follow.

WEI Feedback Areas (i)
(1) Redline version and review period
(2) No precedent for PPMs
(3) Mandatory / non-mandatory demarcation
(4) Definitions not creating obligations by implication
(5) Definition cross-reference table
(6) Operational policy roadmap alignment
(7) Coordinated industry workstream
(8) Consolidated roadmap
(9) System-need justification and cost-benefit assessment
(10) Required level of grid-forming deployment

WEI Feedback Areas (ii)
(11) Technology neutrality
(12) No priority status without approved framework
(13) System service arrangements
(14) Synthetic inertia and DS3 emulated inertia
(15) No reduction in existing Grid Code capability
(16) EMT compliance dependency
(17) Alignment with EMT workstream
(18) Trial framework
(19) Approval safeguards
(20) Market code and capacity market interaction



Key Observation: Several WEI comments relate to broader policy, implementation and deployment considerations for Grid Forming technologies. These topics extend beyond the scope of MPID349, which is limited to introducing a voluntary framework for Grid Forming capability on HVDC interconnectors.

MPID349 (Non-Mandatory Grid-Forming Requirements for HVDC Units)

Updated proposal reflecting stakeholder feedback from the March and June JGCRP/GCRP review cycles

MPID (EirGrid Use Only): [349](#)

Date: [3019/067/202626/03/2026](#)

Company Name: EirGrid

Applicant Name: EirGrid

Email Address: Gridcode@eirgrid.com

Grid Code Version: 16

Grid Code Section(s) Impacted by Modification Proposal:

- PC.A6
- CC.7.5
- Definitions

Modification Proposal Justification:

Purpose:

The purpose of this modification is to incorporate grid forming capabilities for Interconnectors in anticipation of the upcoming HVDC 2.0 requirements. The minimum grid forming technical requirements for Interconnectors introduced in this modification are non-mandatory ~~and non-retrospective~~.

This Grid Code modification should be understood as an intermediate step supporting the non-mandatory phase identified in the All-Island Grid Forming Strategy. The proposed requirements are non-mandatory ~~and non-retrospective~~. Existing HVDC installations would not be required to retrofit equipment or change their operating modes as a result of this proposal. Where grid forming capability is ~~declared deferred~~ by an interconnector owner, this modification defines the expected behaviour at the Grid Connection Point and provides a basis for assessment and compliance in grid forming mode.

The proposal was updated following stakeholder engagement, with all material changes clearly identified and circulated for further review.

- Changes arising from March JGCRP/GCRP feedback are shown using tracked changes.

Feedback addressed:

- (1) Removal of the term “non-retrospective”.



MPID349 (Non-Mandatory Grid-Forming Requirements for HVDC Units)

Updated proposal reflecting stakeholder feedback from the March and June JGCRP/GCRP review cycles



Red-line Version of Impacted Grid Code Section(s) - show proposed changes to text:

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

PC.A6 Interconnector Data Requirements

PC.A6.1. Interconnector Operating Characteristics and Registered Data

(v) Interconnector power electronic converter and control systems

(h) If the Interconnector has **declared Non-mandatory Grid Forming** capability, the following additional data shall be provided to the TSO:

- Positive and negative sequence **Grid Forming Effective Impedance (z_{eff})** and X/R ratio of the **Interconnector Converter Station**.
- Equivalent Inertia Constant (H_{eq}).
- Damping ratio.
- Frequency-dependent impedance (**R, X and Z**) of the **Interconnector Converter Station** in the frequency range from 5 Hz to 2500 Hz for a representative number of operating points and control modes.

CC.7.5.13 **NON-MANDATORY GRID FORMING**

CC.7.5.13.1 The conditions specified in this section of the **Grid Code** apply to **Interconnector Converter Stations** with **declared Non-mandatory Grid Forming** capability including those operated in **Interconnector STATCOM State**, unless otherwise specified. **Non-mandatory Grid Forming capability is a non-mandatory requirement which will be provided through agreement with the TSO.**

CC.7.5.13.2 The conditions specified in this section of the **Grid Code** are in addition to those specified in CC.7.5.1 to CC.7.5.12 for **HVDC Units**, excluding the clauses listed below. The equivalent clause applicable to **Non-mandatory Grid Forming** are included between brackets for clarity:

- CC.7.5.9.5(a) does not apply for **Grid Forming** -(CC.7.5.13.13 applies for **Grid Forming**)
- CC.7.5.12.5 does not apply for **Grid Forming** -(CC.7.5.13.12.2 for **Grid Forming**)
- CC.7.5.12.6 does not apply for **Grid Forming** -(CC.7.5.13.12.3 for **Grid Forming**)

CC.7.5.13.3 The **Interconnector Converter Station(s)** shall have the capability to remotely enable/disable the ~~GFM~~**Grid Forming Mode** upon TSO request. The details of this functionality will be provided by the TSO. When the ~~GFM~~**Grid Forming Mode** is disabled in all **Interconnector**

The proposal was updated following stakeholder engagement, with all material changes clearly identified and circulated for further review.

- Changes arising from March JGCRP/GCRP feedback are shown using tracked changes.

Feedback addressed:

- (2) Included the term “**declared**” to clarify that the conditions apply only where the Interconnector Owner declares the capability.
- (3) Clear clause demarcation: Section CC.7.5.13 was renamed from “GRID FORMING” to “**NON-MANDATORY GRID FORMING**” to clearly demarcate it from other mandatory requirements.
- (4) Included the words “**non-mandatory**” before “Grid Forming” to further emphasise its voluntary nature.
- (5) Included a sentence clarifying that the provision of non-mandatory grid forming capability is subject to agreement with the TSO.
- (6) “**GFM**” acronym removed.

MPID349 (Non-Mandatory Grid-Forming Requirements for HVDC Units)

Updated proposal reflecting stakeholder feedback from the March and June JGCRP/GCRP review cycles



The proposal was updated following stakeholder engagement, with all material changes clearly identified and circulated for further review.

- Changes arising from March JGCRP/GCRP feedback are shown using tracked changes.
- Changes arising from the June GCRP review cycle are highlighted in yellow.

Feedback addressed:

- (7) Updated terminology across the document to consistently use “Transmission System Voltage”.
- (8) The “Withstand Capability” definition has been renamed to “Grid Forming Withstand Capability”.
- (9) A clarifying note was added to address potential ambiguity in the interpretation of Grid Forming capability confirming that Black Start capability alone is not sufficient to demonstrate Grid Forming capability.



CC.7.5.13.10.3. When the **Transmission System** ~~voltage~~ **Voltage** magnitude and/or voltage phase angle recovers towards the pre-Disturbance grid conditions, the **Interconnector Converter Station** shall react with an instantaneous reduction of current, once the unlimited voltage source behaviour results in a current below the **Interconnector Converter Station** -capability limits.

CC.7.5.13.11 **Grid Forming Withstand Capability**

CC.7.5.13.11.1 The **Interconnector** shall have **Grid Forming** ~~Withstand~~ **Capabilities** for the Transmission System conditions defined in CC.7.5.1.1 and below:

- Phase-angle jump at the **Grid Connection Point** up to $\pm 30^\circ$.
- Any sudden **Transmission System** topology change under the range of short circuit power (in MVA) and network characteristics specified by the **TSO** in CC.7.5.1.1(x).

CC.7.5.13.15 The **Interconnector** may provide **Islanding Capability** and **Re-synchronisation Capability**, as agreed with the **TSO**. -The conditions and parameters of these capabilities shall be agreed with the **TSO**.

CC.7.5.13.16 The **Interconnector** may provide **Black Start Capability**. If this capability is provided, the **Black Start Station** shall be able to remain in **Grid Forming Mode** with no change of control mode. The **Black Start** requirements defined in OC.4.7 remain applicable. Note: **Black Start Capability** alone shall not be considered sufficient to demonstrate **Grid Forming** capability at the **Grid Connection Point**. All the criteria defined in CC.7.5.13 shall be met

MPID349 (Non-Mandatory Grid-Forming Requirements for HVDC Units)

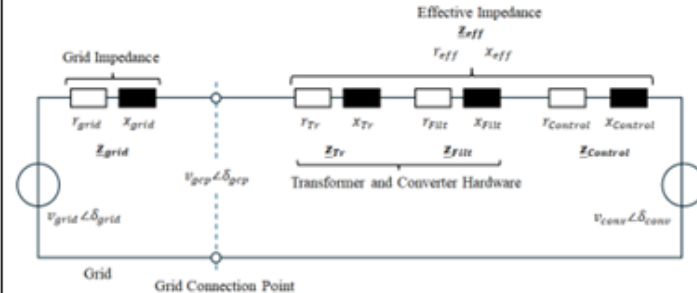
Updated proposal reflecting stakeholder feedback from the March and June JGCRP/GCRP review cycles



Definitions

Grid Forming Effective Impedance (z_{eff} —)

This is the **GFM Interconnector Converter Station impedance of a Plant with Grid Forming Plant capability**, observed at the **Grid Connection Point**, at nominal **Frequency**. For clarity, this **Grid Forming Effective Impedance** includes the aggregate of all physical impedances such as transformers, cables and converter(s) impedance, and the virtual impedance from the control at nominal **Frequency**. The **Grid Forming Effective Impedance** (z_{eff} —) is illustrated in the following equivalent circuit representation:



The **Grid Forming Effective Impedance of a Grid Forming capable Plant**, in positive and negative sequences, is defined in per unit as:

$$z_{eff} = \frac{Z_{eff SI}}{Z_{base}}$$
$$Z_{eff SI} = \sqrt{X_{eff SI}^2 + R_{eff SI}^2}$$
$$Z_{base} = \frac{V_{base}^2}{S_{base}}$$
$$S_{base} = \sqrt{P_{base}^2 + Q_{base}^2}$$

Where:

- z_{eff} is the **Grid Forming capable Plant Grid Forming Effective Impedance in per unit (p.u.)**.
- $Z_{eff SI}$ is the **Grid Forming capable Plant effective impedance at the nominal Transmission System Frequency**, seen from the **Grid Connection Point** in Ohms (Ω). It includes the aggregate of physical equipment impedances such as cables, transformers and filters, and the virtual impedance from the control.

The proposal was updated following stakeholder engagement, with all material changes clearly identified and circulated for further review.

- Changes arising from March JGCRP/GCRP feedback are shown using tracked changes.
- Changes arising from the June GCRP review cycle are highlighted in yellow.

Feedback addressed:

- (10) Definitions and Terminology were standardised throughout the document to “**Grid Forming Plant**”.
- (11) Relocation of the formulation for Grid Forming Effective Impedance to the definitions section to improve clarity.



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- $X_{eff\ SL}$ is the **Grid Forming capable Plant** effective reactance at the nominal **Transmission System Frequency**, seen from the **Grid Connection Point** in Ohms (Ω). It includes the aggregate of physical equipment reactances such as cables, transformers and filters, and the virtual reactance from the control.
- $R_{eff\ SL}$ is the **Grid Forming capable Plant** effective resistance at the nominal **Transmission System Frequency**, seen from the **Grid Connection Point** in Ohms (Ω). It includes the aggregate of physical equipment resistances such as cables, transformers and filters, and the virtual resistance from the control.
- V_{base} is nominal phase to phase RMS voltage in kV of the **Grid Forming capable Plant** **Grid Connection Point**.
- S_{base} is the base MVA power of the **Grid Forming capable Plant**.
- P_{base} is the **Grid Forming capable Plant** Registered Capacity in MW.
- Q_{base} is the maximum absolute value of **Reactive Power** capability as specified in CC.7.5.10.d, in either consumption (Import/lead) or production (Export/lag), of the **Grid Forming capable Plant** in Mvar.
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Feedback addressed:

- (12) Added clear reference to the base for reactive power (Q_{base}) in the definition of Grid Forming Effective Impedance.



MPID349 (Non-Mandatory Grid-Forming Requirements for HVDC Units)

Updated proposal reflecting stakeholder feedback from the March and June JGCRP/GCRP review cycles

Voltage Balancing	It refers to the <u>Grid Forming Plant GFM PPM or GFM Interconnector Converter Station</u> capability to contribute to balance the three-phase AC network voltage waveforms in magnitude. A <u>Grid Forming GFM Plant</u> with Voltage Balancing capabilities operates as a passive sink for network voltage unbalances at the Grid Connection Point , permitting the immediate and permanent flow of negative sequence current to reduce the network Voltage Unbalance Factor <u>voltage unbalance factor</u> .
Voltage Unbalance Factor (VUF)	The Voltage Unbalance Factor quantifies the degree of unbalance in a three-phase electrical system, indicating how much the phase voltages deviate from a balanced condition. The VUF is defined as the ratio of the negative sequence voltage (V_2) to the positive sequence voltage (V_1), expressed as a percentage.
Voltage Stiffness Contribution	It refers to the <u>Grid Forming Plant GFM PPM or GFM Interconnector Converter Station</u> capability to support and maintain the Transmission System Voltage magnitude. This feature results in an immediate Reactive Power response at the Grid Connection Point following a voltage magnitude variation within the Transmission System. The Voltage Stiffness Contribution (ΔQ) is calculated as follows: $\Delta Q \approx -\frac{v_{conv}\Delta v_{gcp}}{x_{eff}}$ Where: ΔQ is the Voltage Stiffness Contribution, defined as the immediate Reactive Power variation at the Grid Connection Point (p.u.). Δv_{gcp} is the Transmission System <u>voltage—Voltage</u> magnitude variation at the Grid Connection Point at nominal Frequency (p.u.). v_{conv} is the <u>Grid Forming device Interconnector Converter Station</u> internal voltage magnitude at nominal Frequency (p.u.). x_{eff} is the <u>Grid Forming GFM Plant</u> effective reactance at nominal Frequency at the Grid Connection Point (p.u.).
Grid Forming Withstand Capability	It refers to the ability of the <u>Grid Forming Plant GFM Interconnector Converter Station</u> to sustain dynamic Disturbances on the connected Transmission System and remain stable and controllable while its operating limits may be reached.

- The proposal was updated following stakeholder engagement, with all material changes clearly identified and circulated for further review.
- Changes arising from March JGCRP/GCRP feedback are shown using tracked changes.
 - Changes arising from the June GCRP review cycle are highlighted in yellow.

- Feedback addressed:
- (13) Technology-agnostic definitions: removed all references to PPMs in the definitions.
 - (14) Introduced a definition for “Voltage Unbalance Factor” to support the interpretation of the “Voltage Balancing” definition.



MPID349 (Non-Mandatory Grid-Forming Requirements for HVDC Units)

Conclusions

- MPID349 is non-mandatory and applies to HVDC interconnectors only.
- MPID349 has improved through stakeholder engagement and feedback has been incorporated through transparent revisions to the proposed modification.
- Interconnector representatives confirmed support for the modification on 4 June 2026 and 11 August 2026.

The TSO recommends submission of the proposed MPID349 to CRU for approval and seeks support from GCRP members

Date	Milestone
10 March 2026	Proposal circulated to JGCRP/GCRP
26 March 2026	First JGCRP/GCRP discussion
13 May 2026	Interconnector engagement
3 June 2026	WEI engagement
4 June 2026	Interconnectors confirm support
25 June 2026	Revised proposal discussed at JGCRP/GCRP
9 July 2026	Redline version circulated
22 - 23 July 2026	SSE and WEI feedback received
30 July 2026	Updated proposal circulated incorporating SSE and WEI feedback

Questions?

Thank you.

Meeting Minutes will be issued by COB, 01 September 2026.