DS3 System Services
New Signals Requirements for the
Regulated Arrangements

November 2019

Version 2.0

Disclaimer

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1.1 Purpose of Document

This document sets out the new signals requirements that applicable Providing Units are required to implement should they procure for certain DS3 System Services for the Regulated Arrangements.

This version of the document (2.0) includes new signals requirements for Energy Storage Units (ESUs).

Specifically, this document describes the signals requirements for:

- The provision of FFR and POR through the use of Emulated Inertia by Wind Farm Power Stations (WFPSs);
- The provision of FFR, POR, SOR and TOR1 by Aggregators;
- The provision of FFR by Aggregators, Interconnectors and Energy Storage Units (ESUs);
- The provision of FFR, POR, SOR, TOR1 and TOR2 by Energy Storage Units (ESUs).

The full list of the signals required of Providing Units of System Services by EirGrid and SONI can be found on the EirGrid website at http://www.eirgridgroup.com/customer-and-industry/general-customer-information/grid-code-compliance-test/compliance-testing/system-services-testing/index.xml.

1.2 New Signals Requirements for the Provision of FFR and POR through Emulated Inertia by WFPS Units

This section sets out the additional signals that are required to be implemented by WFPSs that will provide any of FFR and POR through the use of Emulated Inertia during the Regulated Arrangements.

Table 1 describes the additional required signals that:

- The Transmission System Operator (TSO) will use to electronically transmit enable / disable instructions of Emulated Inertia to the WFPS;
- The WFPS will use to confirm implementation of TSO enable / disable instructions of Emulated Inertia;
- The WFPS will use to advise the TSOs of its real-time availability to provide the FFR and POR services through the use of Emulated Inertia.

Table 1: New Signals Required for Provision of FFR and POR through Emulated Inertia by WFPSs

Signal Name	Type	Update / Refresh	Description
Emulated Inertia On (TSO to WFPS)	Binary - Control	On Trigger	Control from NCC/CHCC to enable the Emulated Inertia Service of a WFPS.

Emulated Inertia On (WFPS to TSO)	Binary - PI	On Trigger	Feedback from WFPS to confirm enablement of the Emulated Inertia Service *i.e.* WFPS will provide Emulated Inertia in response to an event.
Emulated Inertia Off (TSO to WFPS)	Binary - Control	Off Trigger	Control from NCC/CHCC to disable the Emulated Inertia Service of a WFPS.
Emulated Inertia Off (WFPS to TSO)	Binary - PI	Off Trigger	Feedback from WFPS to confirm disablement of the Emulated Inertia Service *i.e.* WFPS will NOT provide Emulated Inertia in response to an event.
Emulated Inertia FFR Availability (MW) (WFPS to TSO)	Analogue	1 second resolution	This signal represents the real-time megawatt availability of FFR that the WFPS would provide from Emulated Inertia should an event occur at that moment in time. This signal shall not be impacted by the "Emulated Inertia On / Off" signals. This signal shall account for the number of turbines available, wind speeds at each turbine, the unit's contracted reserve curve parameters and any limitations caused by Maximum Export Capacities.
Emulated Inertia POR Availability (MW) (WFPS to TSO)	Analogue	1 second resolution	This signal represents the real-time megawatt availability of POR that the WFPS would provide from Emulated Inertia should an event occur at that moment in time. This signal shall not be impacted by the "Emulated Inertia On / Off" signals. This signal shall account for the number of turbines available, wind speeds at each turbine, the unit's contracted reserve curve parameters and any limitations caused by Maximum Export Capacities.

1.3 New Signals Requirements for the Provision of FFR, POR, SOR and TOR1 by Aggregators

This section sets out the additional signals that are required to be implemented by Aggregators that will provide any of the automated frequency response services – FFR, POR, SOR and TOR1 – during the Regulated Arrangements. Aggregators include Providing Units that provide System Services via a suite of Individual Sites (ISs) from generation and / or demand reduction.

Table 2 describes the additional required signals that:

- The TSO will use to electronically transmit enable / disable instructions of the automated frequency response services to the Aggregator;
- The Aggregator will use to confirm implementation of TSO enable / disable instructions of the automated frequency response services;
- The Aggregator will use to advise the TSOs of its real-time availability to provide any of the automated frequency response services;
- The Aggregator will use to advise the TSOs of its MW response during an event;
- The Aggregator will use to advise the TSOs of the sum of the MW load reading at the main incomer of all of the ISs providing automated frequency response services.

Table 2: New Signals Required for Provision of FFR, POR, SOR and TOR1 by Aggregators

Signal Name	Type	Update / Refresh	Description
Frequency Response On (TSO to Aggregator)	Binary - Control	On Trigger	Control from NCC/CHCC to enable the automated frequency response services of an Aggregator.
Frequency Response On (Aggregator to TSO)	Binary - PI	On Trigger	Feedback from Aggregator to confirm enabled status of automated frequency response services *i.e.* in an event, the Aggregator will provide the FFR, POR, SOR, TOR1 services as per the availability signals.
Frequency Response Off (TSO to Aggregator)	Binary - Control	Off Trigger	Control from NCC/CHCC to disable the automated frequency response Services of an Aggregator.
Frequency Response Off (Aggregator to TSO)	Binary - PI	Off Trigger	Feedback from Aggregator to confirm disabled status of automated frequency response services *i.e.* in an event, the Aggregator will NOT provide the FFR, POR, SOR, TOR1

			services as per the availability signals.
FFR Availability	Analogue	1 second resolution; latency of no more than 5 seconds	This signal identifies in real-time the remaining aggregate MW of FFR which is available from the Aggregator* *i.e.* if the Aggregator is providing its full FFR response, this signal shall be 0 MW. The upper limit for this value is per the System Services Agreement. This signal shall not be impacted by the "Frequency Response On / Off" signals.
POR Availability	Analogue	1 second resolution; latency of no more than 5 seconds	This signal identifies in real-time the remaining aggregate MW of POR which is available from the Aggregator* *i.e.* if the Aggregator is providing its full POR response, this signal shall be 0 MW. The upper limit for this value is per the System Services Agreement. This signal shall not be impacted by the "Frequency Response On / Off" signals.
SOR Availability	Analogue	1 second resolution; latency of no more than 5 seconds	This signal identifies in real-time the remaining aggregate MW of SOR which is available from the Aggregator* *i.e.* if the Aggregator is providing its full SOR response, this signal shall be 0 MW. The upper limit for this value is per the System Services Agreement. This signal shall not be impacted by the "Frequency Response On / Off" signals.
TOR1 Availability	Analogue	1 second resolution; latency of no more than 5 seconds	This signal identifies in real-time the remaining aggregate MW of TOR1 which is available from the Aggregator* *i.e.* if the Aggregator is providing its full TOR1 response, this signal shall be 0 MW. The upper limit for this value is per the System Services Agreement. This signal shall not be impacted by the "Frequency Response On / Off" signals.

Frequency Response Quantity Provided	Analogue	1 second resolution; latency of no more than 5 seconds	The value of this signal is equal to the response in MW that the Aggregator unit is providing* across frequency response services. When triggered to respond, the value will be based on the aggregation of additional MW output and / or load reductions seen across dispatchable loads providing the response. This shall have a value of 0 MW, unless the Aggregator is providing FFR, POR, SOR or TOR1.
Main Incomer Load Readings	Analogue	1 second resolution; latency of no more than 5 seconds	The value of this signal is the sum of the MW load reading at the main incomer of all of the individual sites providing frequency response services. Its purpose is for cross checking that the quantities calculated in the Frequency Response Quantity Provided signal align with actual additional MW output / demand reduction seen on the system.

*This is an aggregated signal to include response from both generation and demand reduction as applicable.

1.4   New Frequency Response Control Signals Requirements for the Provision of FFR by Interconnectors, Energy Storage Units and Aggregators

This section sets out the additional frequency response control signals that are required to be implemented by Interconnectors, Energy Storage Units – e.g. batteries – and Aggregators that will provide FFR during the Regulated Arrangements.

Table 3 describes the additional required signals that:

- The TSO will use to electronically transmit FFR frequency response control modes to the Providing Unit;
- The Providing Unit will use to confirm implementation of the FFR frequency response control mode;
- The TSO will use to trigger the Providing Unit to respond.

Signal Name	Type	Update / Refresh	Description
Reserve Response Mode 1 (TSO to Providing Unit)	Digital - Control	On Trigger	This signal will instruct the unit to go to Reserve Response Mode 1. This control mode will have its own parameterisable frequency response curve which will be pre-defined for the Providing Unit in agreement with the TSOs. An instruction to operate in Reserve Response Mode 1 means that all other Reserve Response Modes must be 'off'.
Reserve Response Mode 2 (TSO to Providing Unit)	Digital - Control	On Trigger	This signal will instruct the unit to go to Reserve Response Mode 2. This control mode will have its own parameterisable frequency response curve which will be pre-defined for the Providing Unit in agreement with the TSOs. An instruction to operate in Reserve Response Mode 2 means that all other Reserve Response Modes must be 'off'.
Reserve Response Mode 3 (TSO to Providing Unit)	Digital - Control	On Trigger	This signal will instruct the unit to go to Reserve Response Mode 3. This control mode will have its own parameterisable frequency response curve which will be pre-defined for the Providing Unit in agreement with the TSOs. An instruction to operate in Reserve Response Mode 3 means that all other Reserve Response Modes must be 'off'.
Reserve Response Mode 4 (TSO to Providing Unit)	Digital - Control	On Trigger	This signal will instruct the unit to go to Reserve Response Mode 4. This control mode will have its own parameterisable frequency response curve which will be pre-defined for the

			Providing Unit in agreement with the TSOs. An instruction to operate in Reserve Response Mode 4 means that all other Reserve Response Modes must be 'off'.
Reserve Response Mode 5 (TSO to Providing Unit)	Digital - Control	On Trigger	This signal will instruct the unit to go to Reserve Response Mode 5. This control mode will have its own parameterisable frequency response curve which will be pre-defined for the Providing Unit in agreement with the TSOs. An instruction to operate in Reserve Response Mode 5 means that all other Reserve Response Modes must be 'off'.
Reserve Response Mode 1 On (Providing Unit to TSO)	Digital - PI	On Trigger	This feedback signal will confirm that the Providing Unit is operating at Reserve Response Mode 1, and no other Reserve Response Mode.
Reserve Response Mode 2 On (Providing Unit to TSO)	Digital - PI	On Trigger	This feedback signal will confirm that the Providing Unit is operating at Reserve Response Mode 2, and no other Reserve Response Mode.
Reserve Response Mode 3 On (Providing Unit to TSO)	Digital - PI	On Trigger	This feedback signal will confirm that the Providing Unit is operating at Reserve Response Mode 3, and no other Reserve Response Mode.
Reserve Response Mode 4 On (Providing Unit to TSO)	Digital - PI	On Trigger	This feedback signal will confirm that the Providing Unit is operating at Reserve Response Mode 4, and no other Reserve Response Mode.
Reserve Response Mode 5 On (Providing Unit to TSO)	Digital - PI	On Trigger	This feedback signal will confirm that the Providing Unit is operating at Reserve Response Mode 5, and no other Reserve Response Mode.

Reserve Response Mode Enable Pulse (TSO to Providing Unit)	Digital 0.5 second pulse		This enable pulse triggers the Aggregator to read and implement the Reserve Response Mode.

1.5   New Availability Signals Requirements for the Provision of FFR, POR, SOR, TOR1 and TOR2 by Energy Storage Units

This section notes that availability signals are required to be implemented by Energy Storage Units that will provide any of the FFR, POR, SOR, TOR1 and TOR2 services during the Regulated Arrangements.

The Energy Storage Unit will use signals to advise the TSOs of its real-time availability to provide any of the abovementioned services.

A detailed specification of the signals required by EirGrid and SONI of Energy Storage Units providing System Services can be found on the EirGrid website at http://www.eirgridgroup.com/customer-and-industry/general-customer-information/grid-code-compliance-test/compliance-testing/system-services-testing/index.xml.