Ramping Margins

(TOR2, RRS, RRD, RM1, RM3, RM8)

System Services Report

Unit Name

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# Document Version History

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Version** | **Date** | **Comment** | **Name** | **Company** |
| 0.1 | Insert date | Minor version (v0.1) - First submission for review and approval | Insert name | Insert company |
| 1.0 | Insert Date | Revised to version 1.0 following approval by EirGrid, SONI.  | Insert Name | Unit Company Name |

# Introduction

The Unit shall submit the latest version of this test report template as published on the EirGrid or SONI websites[[1]](#footnote-2).

The report shall be developed for technical and non-technical readers and shall follow the agreed test programme. The report is submitted to generator\_testing@eirgrid.com or  generator\_testing@soni.ltd.uk  as appropriate.

The purpose of the report is to present analysis, tables and graphs of the **existing approved** Technical Offer Data (TOD) for a unit[[2]](#footnote-3). If a Unit is updating or amending its TOD values due to a change in its operating characteristics, all relevant testing shall be completed and the new TOD values validated **before** completing this report.

If your technology is not listed in this report, please contact generator\_testing@eirgrid.com or  generator\_testing@soni.ltd.uk  as appropriate.

# Abbreviations

MW Mega Watt

MEC Maximum Export Capacity

kV kilovolt

TOR Tertiary Operating Reserve

RM Ramping Margin

RRS Replacement Reserve – Synchronised

RRD Replacement Reserve – Desynchronised

TOD Technical Offer Data

# Unit Data

|  |  |
| --- | --- |
| Unit name | Name |
| Unit connection point | HV Bushings of T101 in XX 110kV station |
| Unit connection voltage | \_\_\_\_\_\_\_\_kV |
| Unit Fuel Type  | Name:\_\_\_\_\_\_\_\_\_ |
| Registered Capacity | \_\_\_\_\_\_\_\_\_\_\_MW |
| Contracted MEC | \_\_\_\_\_\_\_\_\_\_\_MW |
| Installed Plant | Name:\_\_\_\_\_\_\_\_\_\_\_MVA:\_\_\_\_\_\_\_\_\_\_\_\_MW:\_\_\_\_\_\_\_\_\_\_\_\_ |
| House Load  | \_\_\_\_\_\_\_\_\_\_\_MW |

# System Services Definitions

The definitions referenced in this document are for indicative purposes only. In the event of inconsistency between the definitions in this document and those in the DS3 System Services Agreement, the definitions in the DS3 System Services Agreement shall prevail.

## Ramping Services (TOR2, RRS, RRD, RM1, RM3, RM8)

TOR2 is the additional MW output (and/or reduction in demand) provided compared to the pre-incident output (or demand) which is fully available and sustainable over the period from 5 minutes to 20 minutes following an event.

RRS and RRD are the additional MW output (and/or reduction in demand) provided compared to the pre-incident output (or demand) which is fully available and sustainable over the period from 20 minutes to 1 hour following an event.

RM is defined as:

 “the guaranteed margin that a unit provides to the system operator at a point in time for a specific horizon and duration”

There are horizons of one, three and eight hours with associated durations of two, five and eight hours respectively. It is important to remember that RM is defined by **both** the minimum ramp-up and the output duration. Thus the RM represents the increased MW output that can be delivered by the service horizon time and sustained for the product duration window.

|  |  |  |
| --- | --- | --- |
| **RM Service** | **Ramp-up Requirement** | **Sustained Output Duration** |
| **TOR2** | 5 Mins | 20 Mins |
| **RRS** | 20 Mins | 1 Hour |
| **RRD** | 20 Mins | 1 Hour |
| **RM1** | 1 Hour | 2 Hours |
| **RM3** | 3 Hour | 5 Hours |
| **RM8** | 8 Hours | 8 Hours |

# Assessment

The maximum contracted value for each service can be based on any of the TOD sets. *i.e.* the unit may apply for a TOR2 contract volume based on TOD Set 1 and an RM1 contract volume based on TOD Set 2.

## Example graphs

For example if a De-synchronised conventional unit has the following TOD data values (**EDIL Instruction at t = 0**):

|  |  |
| --- | --- |
| Time to sync | 10 Min |
| Block load | 5 MW |
| Load up Rate 1 | 1.5 MW/Min |
| Ramp up Rate 1 | 2.5 MW/Min |
| Registered Capacity / Maximum Continuous Rating | 100 MW |
| Dwell up Time Quantity 1 | 24.5 MW |

Then the graph of the Technical Offer Data would look like this:



Figure 1: Example graph of a De-Synchronised Conventional Unit showing its' RRD, RM1 and RM3 Values

If a synchronised conventional unit had the following TOD data values (**EDIL instruction at t = 0**):

|  |  |
| --- | --- |
| Minimum Stable Generation | 15 MW |
| Ramp up Rate 1 | 1.5 MW/Min |
| Registered Capacity / Maximum Continuous Rating | 100 MW |
| Ramp up Time Quantity 1 | 25.5 MW |
| Dwell Time Quantity 1 | 25 MW |
| Dwell Time 1 | 5 Mins |
| Ramp up Rate 2 | 3.0 MW/min |

A graph of the Technical Offer Data would look like this:



**Figure 2: Example graph of a Synchronised Conventional Unit showing its' RRS, RM1 and RM3 Values**

# Analysis

## Summary

|  |  |  |
| --- | --- | --- |
| **System Service** | **Result** | **Comments** |
| Tertiary Operating Reserve (TOR2) | \_\_\_\_\_\_\_\_MW |  |
| Replacement Reserve Synchronised (RRS) | \_\_\_\_\_\_\_\_MW |  |
| Replacement Reserve Desynchronised (RRD) | \_\_\_\_\_\_\_\_MW |  |
| Ramping Margin (1 Hour) | \_\_\_\_\_\_\_\_MW |  |
| Ramping Margin (3 Hour) | \_\_\_\_\_\_\_\_MW |  |
| Ramping Margin (8 Hour) | \_\_\_\_\_\_\_\_MW |  |

## TOR2

**Measured Performance:**

Applications for a TOR2 contract shall include evidence of the units’ ability to provide TOR2 from an EDIL instruction or appropriate alternative, as agreed with the TSO. The start time for this data shall be the time the EDIL instruction was issued (not the effective time). The response shall be sustained over the 5-20 minutes period. The test information used for this assessment shall be agreed in advance with the TSO.

*[Insert a graph of the unit’s output over a suitable time period in response to an EDIL instruction. The graph shall be clear and shall highlight the TOR2 value that the unit is contracting for. The graph shall have a one second resolution, shall be clearly labelled and easy to read.]*

**Analysis of TOD Set 1:**

|  |  |
| --- | --- |
| Min Load | 15 MW |
| Ramp up Rate 1 | 1.5 MW/Min |
| Max Reg Cap | 100 MW |
| Ramp up Time Quantity 1 | 25.5 MW |
| Dwell Time Quantity 1 | 5 Mins |

1. Starting Load = 25 MW (starting above dwell point 1).
2. Ramp up Rate 1 2.5 MW/min \* 5 minutes = 12.5 MW

TOR2 capability from 25 MW = (a) + (b) = 12.5 MW.

*[Insert a graph of the unit’s output over a suitable time period. The graph shall be clear and shall highlight all the System Services values that the unit is contracting for. All Graphs shall be clearly labelled and easy to read. All Graphs shall have a one second resolution]*



Figure 1: Graph illustrating the TOD analysis for TOR2 based on TOD Set 1.

## RRD

Insert analysis of TOD (specifying which set is used) as per analysis carried out for TOR2.

Include a graph illustrating the TOD analysis.

**Analysis of TOD Set 1:**

|  |  |
| --- | --- |
| Time to sync | 10 Min |
| Block load | 5 MW |
| Load up Rate 1 | 1.5 MW/Min |
| Minimum Stable Generation | 24.5 MW |
| Ramp up Rate 1 | 2.5 MW/Min |
| Registered Capacity / Maximum Continuous Rating | 100 MW |
| Dwell up Time Quantity 1 | 24.5 MW |

1. Time to Sync + Block Load = 5 MW after 10 minutes.
2. Load up Rate 1 1.5 MW/min \* 10 minutes = 15 MW

RRD capability from desynchronised = (a) + (b) = 20 MW.

*[The graph shall be clear and shall highlight all the System Services values that the unit is contracting for. All Graphs shall be clearly labelled and easy to read.]*



Figure 1: Graph illustrating the TOD analysis for RRD based on TOD Set 1.

## RRS

Insert analysis of TOD (specifying which set is used) as per analysis carried out for TOR2 or RRD.

Include a graph illustrating the TOD analysis.

*[The graph shall be clear and shall highlight all the System Services values that the unit is contracting for. All Graphs shall be clearly labelled and easy to read.]*

## RM1

Insert analysis of TOD (specifying which set is used) as per analysis carried out for TOR2 or RRD.

Include a graph illustrating the TOD analysis.

*[The graph shall be clear and shall highlight all the System Services values that the unit is contracting for. All Graphs shall be clearly labelled and easy to read.]*

## RM3

Insert analysis of TOD (specifying which set is used) as per analysis carried out for TOR2 or RRD.

Include a graph illustrating the TOD analysis.

*[The graph shall be clear and shall highlight all the System Services values that the unit is contracting for. All Graphs shall be clearly labelled and easy to read.]*

## RM8

Insert analysis of TOD (specifying which set is used) as per analysis carried out for TOR2 or RRD.

Include a graph illustrating the TOD analysis.

*[The graph shall be clear and shall highlight all the System Services values that the unit is contracting for. All Graphs shall be clearly labelled and easy to read.]*

# Technical Offer Data

The Unit shall include the approved Technical Offer Data[[3]](#footnote-4) used for the analysis. Multiple Technical Offer Data Sets may be used for the Analysis.

## Generator Approved TOD

|  |  |
| --- | --- |
| **Set Number** | **Set Description** |
| **Set 1** | e.g. CCGT |
| **Set 2** | e.g. OCGT |
| **Set 3** | e.g. running on Distillate Fuel |
| **Set 4** |   |
| **Set 5** |   |
| **Set 6** |   |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter Type** | **DATABASE\_PARAMETER** | **Value** | **Set 1** | **Set 2** | **Set 3** | **Set 4** | **Set 5** | **Set 6** |
| **Cooling Boundaries and Start Up Times** |
| **Cooling Boundary Details - Hot** | **COOLING\_BOUNDARY\_TIME\_HOT** | **Hours** |   |   |   |   |   |   |
| **Cooling Boundary Details - Warm** | **COOLING\_BOUNDARY\_TIME\_WARM** | **Hours** |   |   |   |   |   |   |
| **Cooling Boundary Details - Cold** | **COOLING\_BOUNDARY\_TIME\_COLD** | **Hours** |   |   |   |   |   |   |
| **Start Up Time Details - Hot** | **STARTUP\_TIME\_HOT** | **Hours** |   |   |   |   |   |   |
| **Start Up Time Details - Warm** | **STARTUP\_TIME\_WARM** | **Hours** |   |   |   |   |   |   |
| **Start Up Time Details - Cold** | **STARTUP\_TIME\_COLD** | **Hours** |   |   |   |   |   |   |
| **On Off Times** |
| **Min On Time** | **MIN\_ON\_TIME** | **Hours** |   |   |   |   |   |   |
| **Max On Time** | **MAX\_ON\_TIME** | **Hours** |   |   |   |   |   |   |
| **Min Off Time** | **MIN\_OFF\_TIME** | **Hours** |   |   |   |   |   |   |
| **Block Loading** |
| **Block Loading Flag** | **BLOCK\_LOAD\_FLAG** | **Yes / No** |   |   |   |   |   |   |
| **Block Loading Flag - Hot** | **BLOCK\_LOAD\_HOT** | **MW** |   |   |   |   |   |   |
| **Block Loading Flag - Warm** | **BLOCK\_LOAD\_WARM** | **MW** |   |   |   |   |   |   |
| **Block Loading Flag - Cold** | **BLOCK\_LOAD\_COLD** | **MW** |   |   |   |   |   |   |
| **Load Up Break Points and Rates** |
| **Load Up Hot Details - Rate 1** | **LOAD\_UP\_RATE\_HOT\_1** | **MW** |   |   |   |   |   |   |
| **Load Up Hot Details - Rate 2** | **LOAD\_UP\_RATE\_HOT\_2** | **MW** |   |   |   |   |   |   |
| **Load Up Hot Details - Rate 3** | **LOAD\_UP\_RATE\_HOT\_3** | **MW** |   |   |   |   |   |   |
| **Load Up Hot Details - Quantity 2** | **LOAD\_UP\_QUANTITY\_HOT\_2** | **MW** |   |   |   |   |   |   |
| **Load Up Hot Details - Quantity 3** | **LOAD\_UP\_QUANTITY\_HOT\_3** | **MW** |   |   |   |   |   |   |
| **Load Up Warm Details - Rate 1** | **LOAD\_UP\_RATE\_WARM\_1** | **MW** |   |   |   |   |   |   |
| **Load Up Warm Details - Rate 2** | **LOAD\_UP\_RATE\_WARM\_2** | **MW** |   |   |   |   |   |   |
| **Load Up Warm Details - Rate 3** | **LOAD\_UP\_RATE\_WARM\_3** | **MW** |   |   |   |   |   |   |
| **Load Up Warm Details - Quantity 2** | **LOAD\_UP\_QUANTITY\_WARM\_2** | **MW** |   |   |   |   |   |   |
| **Load Up Warm Details - Quantity 3** | **LOAD\_UP\_QUANTITY\_WARM\_3** | **MW** |   |   |   |   |   |   |
| **Load Up Cold Details - Rate 1** | **LOAD\_UP\_RATE\_COLD\_1** | **MW** |   |   |   |   |   |   |
| **Load Up Cold Details - Rate 2** | **LOAD\_UP\_RATE\_COLD\_2** | **MW** |   |   |   |   |   |   |
| **Load Up Cold Details - Rate 3** | **LOAD\_UP\_RATE\_COLD\_3** | **MW** |   |   |   |   |   |   |
| **Load Up Cold Details - Quantity 2** | **LOAD\_UP\_QUANTITY\_COLD\_2** | **MW** |   |   |   |   |   |   |
| **Load Up Cold Details - Quantity 3** | **LOAD\_UP\_QUANTITY\_COLD\_3** | **MW** |   |   |   |   |   |   |
| **Soak Times and Quantities** |
| **Soak Hot Details Hot - Time 1** | **SOAK\_TIME\_HOT\_1** | **Mins** |   |   |   |   |   |   |
| **Soak Hot Details Hot - Time 2** | **SOAK\_TIME\_HOT\_2** | **Mins** |   |   |   |   |   |   |
| **Soak Hot Details Hot - Quantity 1** | **SOAK\_TIME\_QUANTITY\_HOT\_1** | **MW** |   |   |   |   |   |   |
| **Soak Hot Details Hot - Quantity 2** | **SOAK\_TIME\_QUANTITY\_HOT\_2** | **MW** |   |   |   |   |   |   |
| **Soak Hot Details Warm - Time 1** | **SOAK\_TIME\_WARM\_1** | **Mins** |   |   |   |   |   |   |
| **Soak Hot Details Warm - Time 2** | **SOAK\_TIME\_WARM\_2** | **Mins** |   |   |   |   |   |   |
| **Soak Hot Details Warm - Quantity 1** | **SOAK\_TIME\_QUANTITY\_WARM\_1** | **MW** |   |   |   |   |   |   |
| **Soak Hot Details Warm - Quantity 2** | **SOAK\_TIME\_QUANTITY\_WARM\_2** | **MW** |   |   |   |   |   |   |
| **Soak Hot Details Cold - Time 1** | **SOAK\_TIME\_COLD\_1** | **Mins** |   |   |   |   |   |   |
| **Soak Hot Details Cold - Time 2** | **SOAK\_TIME\_COLD\_2** | **Mins** |   |   |   |   |   |   |
| **Soak Hot Details Cold - Quantity 1** | **SOAK\_TIME\_QUANTITY\_COLD\_1** | **MW** |   |   |   |   |   |   |
| **Soak Hot Details Cold - Quantity 2** | **SOAK\_TIME\_QUANTITY\_COLD\_2** | **MW** |   |   |   |   |   |   |
| **Deloading** |
| **Deloading Details - Rate 1** | **DELOAD\_RATE\_1** | **MW / mins** |   |   |   |   |   |   |
| **Deloading Details - Rate 2** | **DELOAD\_RATE\_2** | **MW / mins** |   |   |   |   |   |   |
| **Deloading Details - Quantity 2** | **DELOAD\_QUANTITY\_2** | **MW** |   |   |   |   |   |   |
| **Minimum Stable Generation** |
| **Min Stable Generation - Quantity** | **MIN\_STABLE\_GEN** | **MW** |   |   |   |   |   |   |
| **Ramp Up Rates** |
| **Max Ramp Rate Details - Up** | **MAX\_RAMP\_UP** | **MW / mins** |   |   |   |   |   |   |
| **Ramp Rate Up Details - Rate 1** | **RAMP\_UP\_RATE\_1** | **MW / mins** |   |   |   |   |   |   |
| **Ramp Rate Up Details - Rate 2** | **RAMP\_UP\_RATE\_2** | **MW / mins** |   |   |   |   |   |   |
| **Ramp Rate Up Details - Rate 3** | **RAMP\_UP\_RATE\_3** | **MW / mins** |   |   |   |   |   |   |
| **Ramp Rate Up Details - Rate 4** | **RAMP\_UP\_RATE\_4** | **MW / mins** |   |   |   |   |   |   |
| **Ramp Rate Up Details - Rate 5** | **RAMP\_UP\_RATE\_5** | **MW / mins** |   |   |   |   |   |   |
| **Ramp Rate Up Details - Quantity 2** | **RAMP\_UP\_QUANTITY\_2** | **MW** |   |   |   |   |   |   |
| **Ramp Rate Up Details - Quantity 3** | **RAMP\_UP\_QUANTITY\_3** | **MW** |   |   |   |   |   |   |
| **Ramp Rate Up Details - Quantity 4** | **RAMP\_UP\_QUANTITY\_4** | **MW** |   |   |   |   |   |   |
| **Ramp Rate Up Details - Quantity 5** | **RAMP\_UP\_QUANTITY\_5** | **MW** |   |   |   |   |   |   |
| **Dwell Up Times** |
| **Dwell Time Details - Time 1** | **DWELL\_TIME\_1** | **Mins** |   |   |   |   |   |   |
| **Dwell Time Details - Time 2** | **DWELL\_TIME\_2** | **Mins** |   |   |   |   |   |   |
| **Dwell Time Details - Time 3** | **DWELL\_TIME\_3** | **Mins** |   |   |   |   |   |   |
| **Dwell Time Details - Quantity 1** | **DWELL\_TIME\_QUANTITY\_1** | **MW** |   |   |   |   |   |   |
| **Dwell Time Details - Quantity 2** | **DWELL\_TIME\_QUANTITY\_2** | **MW** |   |   |   |   |   |   |
| **Dwell Time Details - Quantity 3** | **DWELL\_TIME\_QUANTITY\_3** | **MW** |   |   |   |   |   |   |
| **Ramp Down Rates** |
| **Max Ramp Rate Details - Down** | **MAX\_RAMP\_DOWN** | **MW / mins** |   |   |   |   |   |   |
| **Ramp Rate Down Details - Rate 1** | **RAMP\_DOWN\_RATE\_1** | **MW / mins** |   |   |   |   |   |   |
| **Ramp Rate Down Details - Rate 2** | **RAMP\_DOWN\_RATE\_2** | **MW / mins** |   |   |   |   |   |   |
| **Ramp Rate Down Details - Rate 3** | **RAMP\_DOWN\_RATE\_3** | **MW / mins** |   |   |   |   |   |   |
| **Ramp Rate Down Details - Rate 4** | **RAMP\_DOWN\_RATE\_4** | **MW / mins** |   |   |   |   |   |   |
| **Ramp Rate Down Details - Rate 5** | **RAMP\_DOWN\_RATE\_5** | **MW / mins** |   |   |   |   |   |   |
| **Ramp Rate Down Details - Quantity 2** | **RAMP\_DOWN\_QUANTITY\_2** | **MW** |   |   |   |   |   |   |
| **Ramp Rate Down Details - Quantity 3** | **RAMP\_DOWN\_QUANTITY\_3** | **MW** |   |   |   |   |   |   |
| **Ramp Rate Down Details - Quantity 4** | **RAMP\_DOWN\_QUANTITY\_4** | **MW** |   |   |   |   |   |   |
| **Ramp Rate Down Details - Quantity 5** | **RAMP\_DOWN\_QUANTITY\_5** | **MW** |   |   |   |   |   |   |
| **Dwell Down Times** |
| **Dwell Time Details - Time 1** | **DWELL\_TIME\_DOWN\_1** | **Mins** |   |   |   |   |   |   |
| **Dwell Time Details - Time 2** | **DWELL\_TIME\_DOWN\_2** | **Mins** |   |   |   |   |   |   |
| **Dwell Time Details - Time 3** | **DWELL\_TIME\_DOWN\_3** | **Mins** |   |   |   |   |   |   |
| **Dwell Time Details - Quantity 1** | **DWELL\_TIME\_DOWN\_QUANTITY\_1** | **MW** |   |   |   |   |   |   |
| **Dwell Time Details - Quantity 2** | **DWELL\_TIME\_DOWN\_QUANTITY\_2** | **MW** |   |   |   |   |   |   |
| **Dwell Time Details - Quantity 3** | **DWELL\_TIME\_DOWN\_QUANTITY\_3** | **MW** |   |   |   |   |   |   |
| **Forbidden Zones** |
| **Restricted Region Details - Start Range 1** | **START\_FORBIDDEN\_RANGE\_1** | **MW** |   |   |   |   |   |   |
| **Restricted Region Details - End Range 1** | **END\_FORBIDDEN\_RANGE\_1** | **MW** |   |   |   |   |   |   |
| **Restricted Region Details - Start Range 2** | **START\_FORBIDDEN\_RANGE\_2** | **MW** |   |   |   |   |   |   |
| **Restricted Region Details - End Range 2** | **END\_FORBIDDEN\_RANGE\_2** | **MW** |   |   |   |   |   |   |
| **Short Term Maximisation** |
| **Short Term Max - Quantity** | **SHORT\_TERM\_MAX\_CAP\_MW** | **MW** |   |   |   |   |   |   |
| **Short Term Max - Time** | **SHORT\_TERM\_MAX\_CAP\_TIME** | **MW** |   |   |   |   |   |   |

1. <http://www.eirgridgroup.com/> or <http://www.soni.ltd.uk/> [↑](#footnote-ref-2)
2. **TOR2 applications must provide additional information. See section 7.2 TOR2 evidence** [↑](#footnote-ref-3)
3. Information on Validation Technical Offer Data requirements in 3.42A - 3.42O (T&SC) and Appendix I - Offer Data. [↑](#footnote-ref-4)