# FFR Assessment Document

May 2022

# Note to customers who are contracted to provide FFR (DS3 System Service Contract)

### Section 1: Summary of steps in FFR assessment

1. Chargeable Frequency Event occurs (less than 49.7Hz)
2. FFR template is issued to providing units that were available/on during the event
3. Completed template is returned to TSO (FFRmonitoring@Eirgrid.com) within 3 business days. Failure to provide this information may result in a Fail Record for the Performance Incident.
4. Reserve report issued presenting the response of the unit against what was expected (an explanation of how the pass/fail criteria detailed on the issued report is applied has been detailed in Section 2)
5. Performance scalars calculated in accordance with the DS3 System Services Protocol – Regulated Arrangements and fed into the applicable Scalar Data Pack

### Section 2: Explanation of how the pass/fail criteria are measured for FFR

| Unit Performance | |
|---|---|
| Initial FFR Expected within Response Time* | 0.240 |
| Max FFR Achieved within Response Time | 10.440 |
| % Initial FFR Achieved within Resp. Time * | 100.0% |
| % Time FFR Achieved & Sustained to 10s * | 52.9% |
| Energy Provided > Recovered | Y |
| FFR Performance Assessment | Fail |

*Unit Performance figures include tolerance levels which are not shown in the charts below.

Fig. 1 Example from FFR Performance Report

The pass/fail criteria for FFR are dependent on the last two values in the unit performance table – circled with the outcome of the performance assessment in Figure 1.

The additional values in the table are displayed for information purposes only (included due to the familiarity of customers with the "initial response" metric from other reserve reports).

The "% Time FFR Achieved & Sustained to 10s" metric (detailed in Figure 1) is calculated as follows:

- The assessment of FFR performance is carried out following the Frequency reaching the Reserve Trigger for the Providing Unit at time T=0.
- Let R be a unit's FFR Response Time.
- "Time Periods" are defined to be 20ms long for FFR.

- For each time period (t) from T=0 to T=10 seconds, an expected FFR response value (E) is calculated based on the contracted FFR value, frequency and the unit response type. These calculated expected values (E) at each time period are then capped by the declared FFR value at the time of the event and by the available headroom.

  Tolerance levels are applied after this cap.

  Headroom is not applicable to wind emulated energy response. For all other technology types it is calculated as follows:

  Headroom = pre event availability – pre event output (both averaged from -1.5s to -0.5s).

- The expected values (E) are compared with the actual response values (A) for each time period from T=0 to T=10 seconds as follows:

  1. <u>FFR Achieved</u>: For each time period from T=0 to T=10 seconds assess whether E (MW) or higher was achieved within the following R seconds (Successful Y/N).

     It should be noted here that the unit is not expected to respond at T=0, but rather has R seconds to provide the initial response.

  2. <u>FFR Sustained</u>: For each time period from T=R to T=10 seconds assess whether the actual response A was higher than or equal to the lowest E value within the previous R seconds (Successful Y/N).

  3. The <u>"% Achieved and Sustained"</u> is the percentage of successful time periods from both assessments 1 and 2 above.

  4. <u>Tolerances</u> are applied as outlined in the Protocol document (Section 5.14.1.2):

     "At each **Sample Point**, a tolerance of the maximum of 10 % of the **Expected Response** at the sample point or 1 MW applies (if 1 MW is greater than 50% of the **Expected FFR Response** then a tolerance of 50% of the Expected FFR Response is applied). This tolerance is subtracted from the **Expected FFR Response** for the assessment of under frequency events".

     Formula used: Tolerance level (MW) = Min[50% of E, Max[1 MW, 10% of E]].

     Where E is the expected FFR response value at each time period as explained above.

- The "Energy Provided > Recovered" metric is calculated as follows:

  The amount of energy provided above the pre-event output over the period T=0+R to T=10 seconds following the frequency event must be higher than the amount below the pre-event output in the period T=10 to T=20 seconds.

All the assessments need to be a pass in order to achieve a pass for the event. There is no partial pass.

It should be noted that the two metrics, 'Initial FFR Expected within Response Time' and 'Max FFR Achieved within Response Time', have no impact on the FFR assessment. They are included for information purposes only.

They are calculated as follows:

1. Initial FFR Expected within Response Time: Calculate expected FFR based on the frequency at T=0 and the unit characteristics.

2. Max FFR Achieved within Response Time: Max achieved FFR in the first R seconds. R is the response time of the unit assessed.

   This is essentially to show whether the required initial response from point 1 above was achieved within the first R seconds.

### Section 3: Instructions on how to fill in the TSO issued FFR template following a Frequency Event

- Please ensure that the FFR data submitted covers at least the T-5s to T+20s period, where T is the Time Zero of the Performance Incident applicable to your unit.

- Data Resolution: The readings must be provided in 20ms intervals.

- <u>Time Zero Determination:</u>
  - For the purposes of FFR assessment, Time Zero (T) occurs when the <u>frequency <= the unit's 1st trigger point</u>. To emphasise, that is <u>less than or equal to</u>.
  - The time period where the frequency first reaches (less than or equal to) <u>49.8 Hz must also be present</u> in the data template in most cases:
    - If the unit's 1st trigger is <u>less than</u> 49.8 Hz then <u>both time periods</u> when the frequency reaches 49.8 Hz and when it reaches the unit's 1st trigger (Time Zero) must be present.
    - If the unit's 1st trigger is <u>greater than</u> 49.8 Hz and if the frequency reaches this unit's trigger more than once before reaching 49.8 Hz, then the final time period when the frequency reaches the unit's 1st trigger (before reaching 49.8 Hz) is considered Time Zero.
      If this occurs a long time before reaching 49.8 Hz it is not necessary to have that time period in the file. Time Zero will be taken as when the frequency reaches 49.8 Hz instead.

- The format of the template must not be altered so that the data can be processed correctly.
  Please do not provide any additional data, tabs or charts than what is outlined in the template. These are not currently required.
  Please also refrain from adding or moving any columns in the spreadsheet or renaming any tabs or headers.