

22nd November 2017

Dear Provider

Proposal for Trial: Methodology for Performance Monitoring of Dynamic Firm Frequency Response

This letter outlines the feedback received from industry on the proposed trial, and sets out NGET's final proposal. NGET would like to thank parties who submitted responses and offered their time towards the development of the trial. Overall NGET received positive feedback from industry on our approach to develop and improve the performance monitoring process, with parties viewing the trial as an enabler for DSR.

NGET received 10 formal responses from the consultation, with the majority interested in participating in this trial at some point during the trial period. Several further providers expressed interest in joining the trial without submitting a formal response. From the feedback, NGET received consistent messaging that this trial was a move in the right direction for DSR and enabling a more reflective performance monitoring process. Nearly all responses highlighted the benefits of a closer to real time methodology and the anticipated increased accuracy of performance monitoring. The main concern which was flagged throughout responses was ensuring the accuracy of the forecasts and that NGET monitored this.

In addition to formal responses, a number of parties have engaged in further discussions that have helped NGET understand requirements and concerns around the proposal. As a result of the feedback received, NGET have developed a revised performance monitoring method for the calculation of the "A" section of the PPM formula based around a forecasting approach. Appendix 1 outlines the specific details of the final trial methodology. Feedback welcomed a formal template that providers shall use to submit their data. This has been developed as part of the trial and shall be available on the FFR website or via account managers.

From the feedback received NGET have incorporated the below in addition to the initial proposal parameters.

- Extending the sign up date for the duration of the trial to encourage increased participation and time for providers to develop their internal processes.
- Initial proposal outlined time stamping as the assurance method to provide confidence that forecasts are generated in real time. Feedback indicated there are a number of other solutions which could be deemed acceptable and not to restrict only one option.
- Optionality in providing data through an online portal/API.
- The vast array of technologies participating face different challenges in creating forecasts and as a result it was proposed to offer more than the original 30 second granularity. Many providers noted they would be willing to do this closer to real time and would welcome the optionality to do so. Based on this NGET have introduced 3 different forecast options.
- Providers expressed a desire for NGET not to stipulate how far ahead of real time the forecast should be generated so long as it is in place by the start of the next period. NGET have structured the process in such a manner that the onus is on the provider to ensure the forecast is generated in real time catering for variable timescales needed to generate the forecast.

Appendix 2 contains a copy of the Special Conditions that shall be formally introduced to providers' Framework Agreements for participation. This contains the terms providers shall be subject to under the trial.

Providers are requested to contact their account manager if they wish to join this trial. Account managers will discuss the date parties are looking to go live for their portfolio and the proposed forecasting method. Following this, NGET shall update provider's Framework Agreements accordingly. Should parties not currently have an assigned account manager please contact Alex Byers directly.

Please send any correspondence regarding this trial to Alex Byers on the contact details below:

Email: alex.byers@nationalgrid.com

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Kind Regards

Claire Spedding

Head of Business Development
For and on behalf of National Grid Electricity Transmission plc

Appendix 1

NGET are initiating an optional trial in order to test potential improvements to the performance monitoring process of Non-BM dynamic FFR. The proposed methodology aims to result in an improved process around performance monitoring for those with variable demand/generation portfolios. This in turn should provide clearer guidance to providers' counterparties, new DSR accounts and investors as to the potential returns and penalties involved in providing FFR. The final trial methodology also supports the industry's desire to move products closer to real time, increasing access to flexibility. The results of this trial will feed into the development of our frequency response services and products.

The trial is for an initial 9 month period with the opportunity to extend. The earliest opportunity to go live under the trial is 1st December 2017. For the avoidance of doubt providers are able to sign up to this trial at any time between 1st December 2017 and 1st August 2018.

Initially the trial will only be open to Non-BM dynamic participants. Providers who choose not to participate will remain on the current Standard Contract Terms. Participating in this trial will result in following a revised methodology that will feed into the calculation of the Percentage Performance Measure (PPM) under section 4a.14 of the Standard Contract Terms (SCTs). The trial will not amend the Performance Factor % (below) that is applied to calculate monthly payment deductions. For the avoidance of doubt, participants will not be subject to different penalty percentages and the trial will not impact NGET's rights to performance monitor and associated payment deductions. The below table will not change as part of this trial.

Percentage Performance	Performance Factor
<10%	100%
>10%, <60%	50%
>60%<95%	25%
>95%	0%

Providers will be required to sign up via their account managers to participate in this trial. Participation will be at a Framework Agreement level, meaning all units/assets within the Framework Agreement will be subject to the trial methodology.

Forecasting

NGET is adopting a forecasting based approach to performance monitoring under the trial. Forecasts are to be generated and stored by providers close to real time. NGET will use the difference between the forecasted and actual delivery to derive the actual response provided, and therefore the 'A' value of the PPM formula.

Following feedback NGET will offer 3 levels of forecast duration to accommodate for different parties systems and obtain a wide range of data for analysis. Providers shall have the option to sign up to one of the below durations in the table. This could be amended during the trial but would require a formal contract amendment.

Providers will be required to generate and store a 30, 10 or 5 second forecast of their demand/generation (or aggregated demand/generation) every 30, 10 or 5 seconds respectively. For the avoidance of doubt, the forecast details what the asset would be doing if no response was being delivered (i.e. the frequency sitting at 50Hz). Forecasts are required in 1 second granularity. For example a 30 second forecast would therefore have 30 separate data points.

These forecasts are required to be generated by real time, and therefore the onus is on the provider as to how far in advance these are generated. The only requirement is that the forecasts are generated before the start of the forecast period. The table below outlines how this will work in practice for each option.

Forecast duration	No. of data points
30 seconds	30
10 seconds	10
5 seconds	5

Each provider must engage with their account manager to outline their proposed forecasting methodology. Research has suggested that forecasting close to real time should result in providers being able to ascertain a high level of accuracy, therefore making it easier to assess the actual levels of response delivered.

It will be critical to ensure the accuracy of the forecasts if NGET is to gain confidence in using this approach more widely. NGET therefore will require reporting on the accuracy of the forecasts generated to gain valuable data around this approach in the GB market. This information will feed into developing the performance monitoring options for the future frequency response product range. At this stage NGET will not penalise providers for poor forecasting, beyond the impact on their assumed response figure in the PPM calculation. Should there be consistent concerns regarding the accuracy of this forecast NGET reserves the right to address the suitability of the trial for the party.

Data & Template

Currently NGET do not have an electronic solution in place to allow real time data flow for forecasting. Providers will be required to produce their forecast and store this data until requested by NGET. Therefore suitable assurances will be required to demonstrate the data was created at real time. The method of assurance is required to be agreed between NGET and the provider as part of the sign-up process.

As part of the feedback providers requested NGET provide a template for the format they wish the data to be submitted. A copy of this template including granularity of data can be found on the NGET FFR website.

The template provided shall be completed by the provider and sent to account managers upon request. This template requests forecast and actual delivered generation/demand during a sample period (half hour).

Under the trial, NGET welcomes providers to offer access to data via online portals/micro web services. NGET request the ability to input the sample period required and extract the relevant data. For the avoidance of doubt NGET is not stipulating users provide portal access, but recognise the trial is a good opportunity to introduce performance monitoring data exchange through such a mechanism. Should portal services become unavailable providers will still need the ability to submit data in the Excel template format.

Details of required data required in the template is summarised below.

- Time and date
 - o Period requested by NGET.
 - o 1 second granularity.
- Forecast data
 - o 30, 10 or 5 second forecast of how the portfolio would be performing if not providing frequency response.
 - o MW value to 3 decimal places.
- Frequency
 - o NGET shall performance monitor against this frequency, as well as confirm its alignment to the centrally recorded system frequency.
 - o 3 decimal places.
- Active power
 - o Metered output of the asset/aggregated portfolio.
 - o MW value to 3 decimal places.

Contract – Special Condition

In order to sign-up to this trial, a Special Condition shall be inserted into the Framework Agreement. A copy of the special conditions can be found in Appendix 2. Account managers will support parties in the contractual process.

Reporting

NGET is conducting this trial to develop performance monitoring process for assets providing the service with variable demand/generation profiles and how the FFR service can be developed in relation to performance monitoring methodologies.

NGET shall collect appropriate data throughout the duration of the trial in order to fully understand the implications of the changes being tested. These shall be shared with industry through a report at the end of the trial, as well as at appropriate stages throughout, detailing key high level findings, successes and drawbacks. This information shall be published on the National Grid FFR website and may feed into reports produced under the Flexibility work stream¹. Note that NGET will not share individual performance of providers or the accuracy of their data but will collate to provide a consolidated overview of the trial, outlining the areas which could be improved and those which have worked well. All data will remain confidential and shall be published anonymously.

Any methodologies deemed beneficial to both NGET and the wider industry may then be considered for introduction into the SCTs/FAs through the formal mechanisms. The Trial Monitoring Provisions will not necessarily be reflected in the Tender Rules and SCTs following the end of the trial.

¹ <https://www.nationalgrid.com/uk/electricity/balancing-services/future-balancing-services>

Key Parameters

Please see below a table capturing the key points to assist in clarifying the trial parameters:

Overall trial details	Trial period will run from 1st December 2017 to 31st August 2018.
	NGET reserve the right to make amendments throughout the trial period in order to develop the trial and ensure its effectiveness.
	Providers sign up through the Framework Agreement; therefore all units under that agreement shall be subject to the trial.
	Providers are able to leave the trial upon written notification subject to reasonable circumstances, for example technology related etc.
	Trial participants are subject to the same PPM calculation already in place, and the current penalty structure still applies to all providers.
	This trial concerns only the calculation of the 'A' part of the PPM formula.
	'A' part of formula shall be calculated from the difference between the generated forecast and actual delivery data.
	The Trial Monitoring Provisions will not necessarily be reflected in the tender rules and Standard Contract Terms following the end of the trial.
Forecasting	A choice of 30, 10 or 5 second forecasts, at the same frequency.
	NGET will request details of the forecasting method to be used upon sign-up to the trial.
	Onus is on the provider to ensure the forecast is generated in real time.
	Providers must generate forecast far enough in advance to ensure by the start of the next 30/10/5 second period it has been generated. Provider must ensure they leave enough time for their system to make this calculation.
	If a forecast fails to be generated for real time and ends up being generated post event, providers should include the last second spot value of the last successfully generated forecast and assume this same value over the missed forecast in their submitted data to NGET, limited for up to 5 minutes of missed data.
	If no forecasts are produced for 5 minutes or longer due to system failure, the provider shall inform NGET and the original method of performance monitoring shall be switched back to by default over this period.
	Providers must generate a forecast even if it is assumed to be the same as previous period.
	NGET will monitor the accuracy of the forecasting for purposes of the trial. Accuracy of forecasts will not have explicit implications other than its impact on the calculated PPM.
Data	Forecasts shall be generated by real time and stored on providers systems for at least 12 months (as specified in the Standard Contract Terms).
	Data shall either be provided in the template supplied by NGET or through access to an online portal/web service.
	NGET reserve the right to amend the template throughout the trial to ensure continued development and effectiveness of the trial.

Appendix 2

National Grid Electricity Transmission Plc: Rider to FFR Agreement - Monitoring

Special Conditions

1. For the purposes of these **Special Conditions**, the following terms shall have the following meanings:
 - “**Actual Delivery Data**” means, in relation to a **Sample Period**, the metered consumption or output (as the context requires) of a **Contracted FFR Unit**, such data to be provided in all cases on a second by second basis and in the format required by the **Template**;
 - “**Default Value**” means, in respect of any part of a **Sample Period** (not exceeding five (5) minutes) for which a **Load Forecast** is unavailable, the value of the output or consumption (as the context requires) forecasted for the **Contracted FFR Unit** in the last second in the last available **Load Forecast**, such value to apply for each second that a **Load Forecast** is unavailable;
 - “**Forecast Period**” means a period of [30 seconds][10seconds][5 seconds];
 - “**Letter of Invitation**” means the letter of invitation to participate in the **Monitoring Trial** issued by **National Grid to FFR Providers** on 22November 2017;
 - “**Load Forecast**” means a forecast prepared and stored by the **FFR Provider** and made available to **National Grid** in accordance with paragraph 4A.14.1;
 - “**Monitoring Trial**” means the trial of alternative monitoring provisions for the purposes of section 4A of the **Tender Rules and Standard Contract Terms** pursuant to the **Letter of Invitation**;
 - “**Original Monitoring Provisions**” means paragraphs 4A.14.1 to 4A.14.3 inclusive (*Monitoring and Testing*) of the **Tender Rules and Standard Contract Terms**, as the same may be modified from time to time;
 - “**Participating FFR Units**” means the **FFR Units** of each **FFR Provider** participating in the **Monitoring Trial**;
 - “**Template**” means the template for the submission by **Participating Providers** of **Load Forecasts** and **Actual Delivery Data** attached to the **Letter of Invitation**;
 - “**Trial Monitoring Provisions**” means the substitute paragraphs 4A.14.1 to 4A.14.3 inclusive set out in paragraph 8 below.
2. The **Original Monitoring Provisions** shall with effect from [] until the first to occur (the “**End Date**”) of: (i) a notice from **National Grid** in accordance with paragraph 3 below; (ii) a notice from the **FFR Provider** in accordance with paragraph 5 below; and (iii) 31 August 2018 or such later date (being a date not later than 30 November 2018) as **National Grid** may notify to all **Participating Providers** in writing, be deleted and replaced

by the **Trial Monitoring Provisions**. For the avoidance of doubt the **Original Monitoring Provisions** shall be reinstated and apply following the **End Date**.

3. **National Grid** may by not less than seven (7) days' notice in writing to the **FFR Provider** terminate these **Special Conditions** if:

3.1 it considers that the **Monitoring Trial** should end and it gives notice to terminate the equivalent **Special Conditions** in each of the other **Participating Providers' FFR Agreements**; or

3.2 it reasonably considers that the **Trial Monitoring Provisions** do not accurately reflect the actual **Response** of the **FFR Provider's FFR Units**.

4. **National Grid** may, by notice in writing to all **Participating Providers**, make such modifications to the **Trial Monitoring Provisions** as it reasonably considers necessary or desirable to better reflect the actual **Response** of **FFR Units** provided that it shall first have notified details of its proposed modifications to **Participating Providers** in writing and allowed a period of not less than fifteen (15) **Working Days** for the submission of comments on the proposed modifications.

5. The **FFR Provider** may by not less than seven (7) days' notice in writing to **National Grid** terminate these **Special Conditions** if:

5.1 it reasonably considers that the **Trial Monitoring Provisions** do not accurately reflect the actual **Response** of the **FFR Units** and sets out in the notice its reasons for forming that view; or

5.2 it has received notice of a proposed modification from **National Grid** under paragraph 4 and it has notified and not subsequently withdrawn its objection to the proposed modifications.

6. If for any reason the **FFR Provider** has been unable at any time to prepare **Load Forecasts** in accordance with the **Trial Monitoring Provisions** for a period of five (5) minutes, the operation of the **Trial Monitoring Provisions** shall be suspended with automatic effect and the **Original Monitoring Provisions** shall apply for the period of such suspension. The **FFR Provider** shall notify **National Grid** in writing if it is so unable to prepare **Load Forecasts** and the reasons therefor and its best estimate of the period of unavailability. The **FFR Provider** shall further notify **National Grid** in writing once it is able to resume the preparation of **Load Forecasts** and the **Trial Monitoring Provisions** shall once more apply.

7. The **FFR Provider** hereby acknowledges and agrees that **National Grid** may publish on an anonymised basis any data created in connection with the operation of the **Trial Monitoring Provisions** in any report it publishes in relation to the **Monitoring Trial**.

8. The **Trial Monitoring Provisions** are:

4A.14 MONITORING AND TESTING

Monitoring

4A.14.1 The availability of **Firm Frequency Response** and the amount of **Response** delivered by each of the **FFR Provider's FFR Units** shall be monitored from time to time as more particularly described in this paragraph 4A.14. For the purposes of such monitoring, the **FFR Provider** shall in respect of each **Forecast Period** and by not later than the commencement of that **Forecast Period**:

- (a) prepare a forecast (expressed in MW) of the power consumption or output (as the context requires) of the **FFR Unit** for that **Forecast Period** on a second by second basis and in the format of the **Template** and otherwise in such manner (either by time-stamping or otherwise) as will enable **National Grid** to verify to its reasonable satisfaction that the forecast was prepared on or before the commencement of that **Forecast Period**;
- (b) retain and store a copy of each **Load Forecast** for a period of not less than twelve (12) months; and
- (c) [email] [make available on the **FFR Provider's** portal] each **Load Forecast** to **National Grid** as soon as reasonably practicable following a notice under paragraph 4A.14.2.

4A.14.2 Without prejudice to the generality of sub-paragraph 4A.14.1, **National Grid** may require, by notice in writing to the **FFR Provider**, the delivery of **Response** by the **Contracted FFR Unit** to be assessed during any **Sample Period** in accordance with the methodology set out below:-

- (a) the volume of **Response** actually delivered from the **Contracted FFR Unit** during the **Sample Period** shall be calculated as the difference between (1) the power consumption or output (as the context requires) set out in the **Load Forecast** for the **Sample Period** or, in the event that a **Load Forecast** is unavailable for any part of the **Sample Period** not exceeding five (5) minutes, the **Default Value** and (2) **Actual Delivery Data** for the **Sample Period**; and
- (b) the volume of **Response** required to be delivered from the **Contracted FFR Unit** during the **Sample Period** shall be ascertained by reference to an operating profile for the **Contracted FFR Unit** derived by linear interpolation from the applicable **FFR Capability Data Tables** (as such tables are to be interpreted in accordance with sub-paragraph 4A.6), and that operating profile shall be used to determine second by second spot values of **Response** required to be delivered;
- (c) the **FFR Provider** shall derive a percentage performance measure (PPM), where:-

$$PPM = A/B * 100$$

and where:-

A is the aggregate of each second by second spot value of **Response** assumed to be delivered by the **Contracted FFR Unit** over the **Sample Period** as determined pursuant to sub-paragraph 4A.14.2(a); and

B is the aggregate of each second by second spot value of **Response** required to be delivered by the **Contracted FFR Unit over the Sample Period** as determined pursuant to sub-paragraph 4A.14.2(b);

(d) the percentage performance derived pursuant to this sub-paragraph 4A.14.2, shall be used (in accordance with (e) below) to derive a factor (the “**Performance Factor**”), which shall be used for the calendar month or months in which the **Sample Period** falls to calculate the deduction in payments otherwise falling due to the **FFR Provider** pursuant to paragraph 4A.5 as referred to in sub-paragraph 4A.5.5;

(e) the **Performance Factor** shall be derived as follows:-

Percentage Performance	Performance Factor
<10%	100%
>10%, <60%	50%
>60%<95%	25%
>95%	0%

(f) for the purposes of this sub-paragraph 4A.14.2, “**Sample Period**” shall mean any period of 30 minutes commencing upon excursion of **System Frequency** to either above or below 50Hz at a time when **National Grid** has instructed (or is deemed to have instructed) the **FFR Provider** to operate the **Contracted FFR Unit** in a **Firm Frequency Sensitive Mode** as more particularly specified in sub-paragraph 4A.4.

4A.14.3 The **FFR Provider** shall calculate the **Performance Factor** in accordance with paragraph 4A.14.2 and provide that value and details of the calculation to **National Grid** together with all information and reasonable assistance required by **National Grid** to verify the **Performance Factor** so calculated and shall use all reasonable endeavours to allow **National Grid**, its employees, agents, suppliers, contractors and subcontractors all necessary access to the **Contracted FFR Unit** and, where applicable, the **Frequency Sensitive Load Devices** comprised in the **Contracted FFR Unit** and **Customer Premises** at which the same are located in connection therewith. Without limitation the **FFR Provider** hereby grants **National Grid** the right to collect and record data from **Agreed Operational Monitoring Equipment**.