

Frequency Response Imbalance Compensation

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Overview

- ◆ **Background**
- ◆ **The issues**
- ◆ **The story so far**
- ◆ **Working Group**
- ◆ **The amendment proposal**
- ◆ **Longer term**

Mandatory Frequency Response

- ◆ **Grid Code obligation**
- ◆ **Provided by all licensed generators**
- ◆ **Established charging principles**
- ◆ **Payments:**
 - ◆ **De-load via bid/offer acceptance**
 - ◆ **Holding payment on capability**
 - ◆ **Delivery or imbalance compensation**

Current FR Imbalance Payment

- ◆ $I_{P\xi} = \text{adj}_{\text{low}} * [|\delta f_j| / 0.5\text{Hz}] * P_{\text{MWh}} * (\text{ref} - \text{SSP}_j)$
(low frequency, primary response)
- ◆ $I_{H\xi} = \text{adj}_{\text{high}} * [|\delta f_j| / 0.5\text{Hz}] * H_{\text{MWh}} * (\text{SBP}_j - \text{ref})$
(high frequency response)
- ◆ Half hourly (settlement period) calculation

The Issues

- ◆ **Settlement period based calculation**
- ◆ **Use of adjustment factors**
- ◆ **Reference price/production costs**
- ◆ **Non-delivery charges**

The story so far...

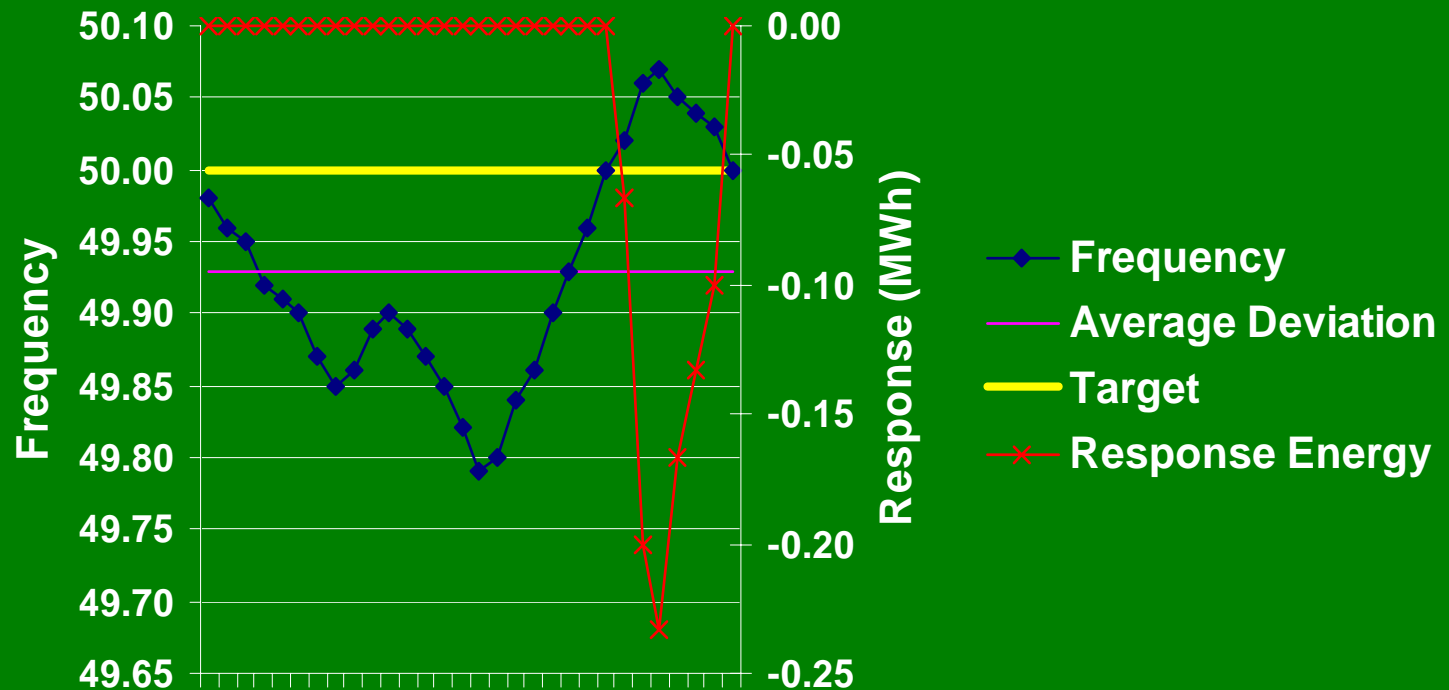
- ◆ **Issues raised by a number of providers**
- ◆ **CUSC route most appropriate**
- ◆ **National Grid proposed amendment**
- ◆ **CUSC delay**
- ◆ **Pre-CUSC Working Group**
- ◆ **CUSC Panel on 21 September**

Pre-CUSC Working Group

- ◆ **Following formal CUSC process**
- ◆ **Terms of Reference**
 - ◆ **Review National Grid's proposal**
 - ◆ **Consider alternatives**
 - ◆ **Working Group report and proposal**
- ◆ **Significant progress made**

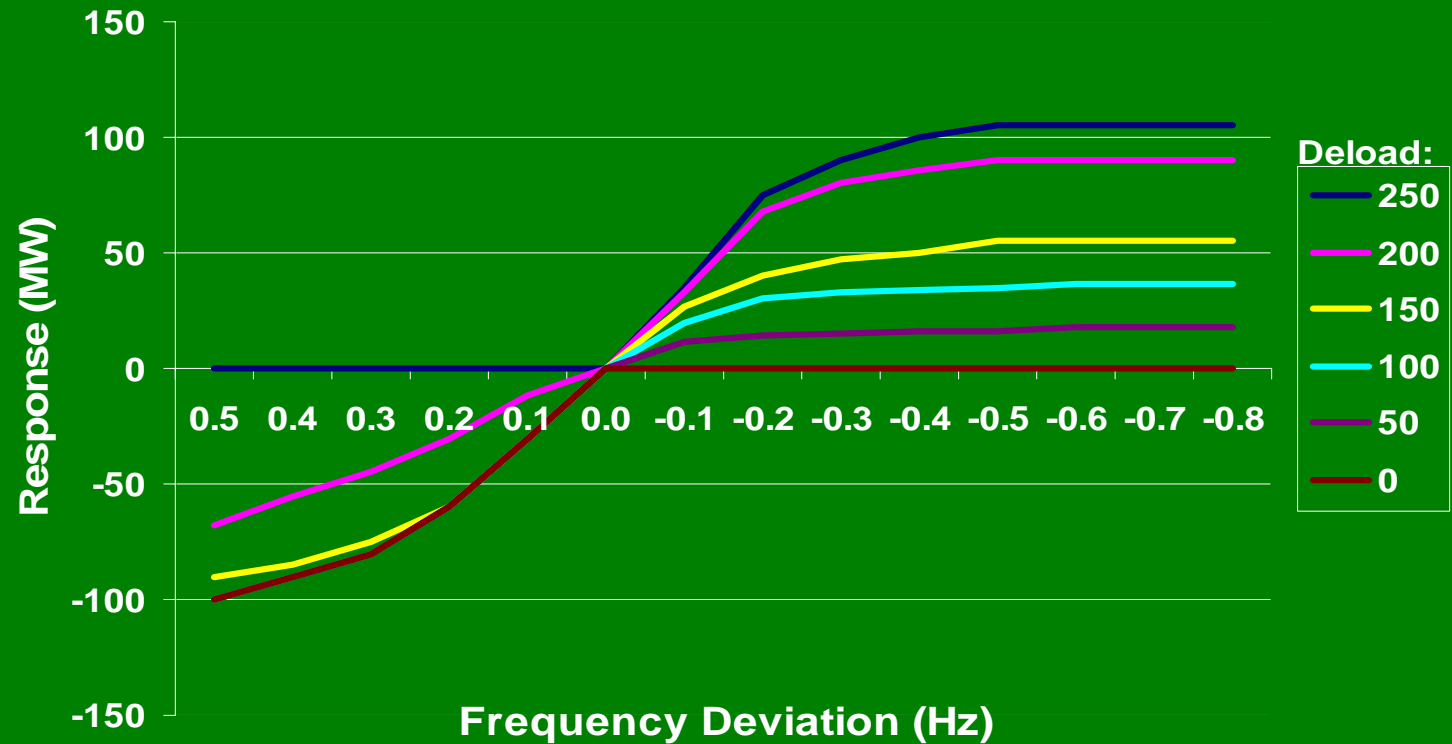
Per-minute Energy Calculations

Frequency Response Delivery at MEL over a single Settlement Period

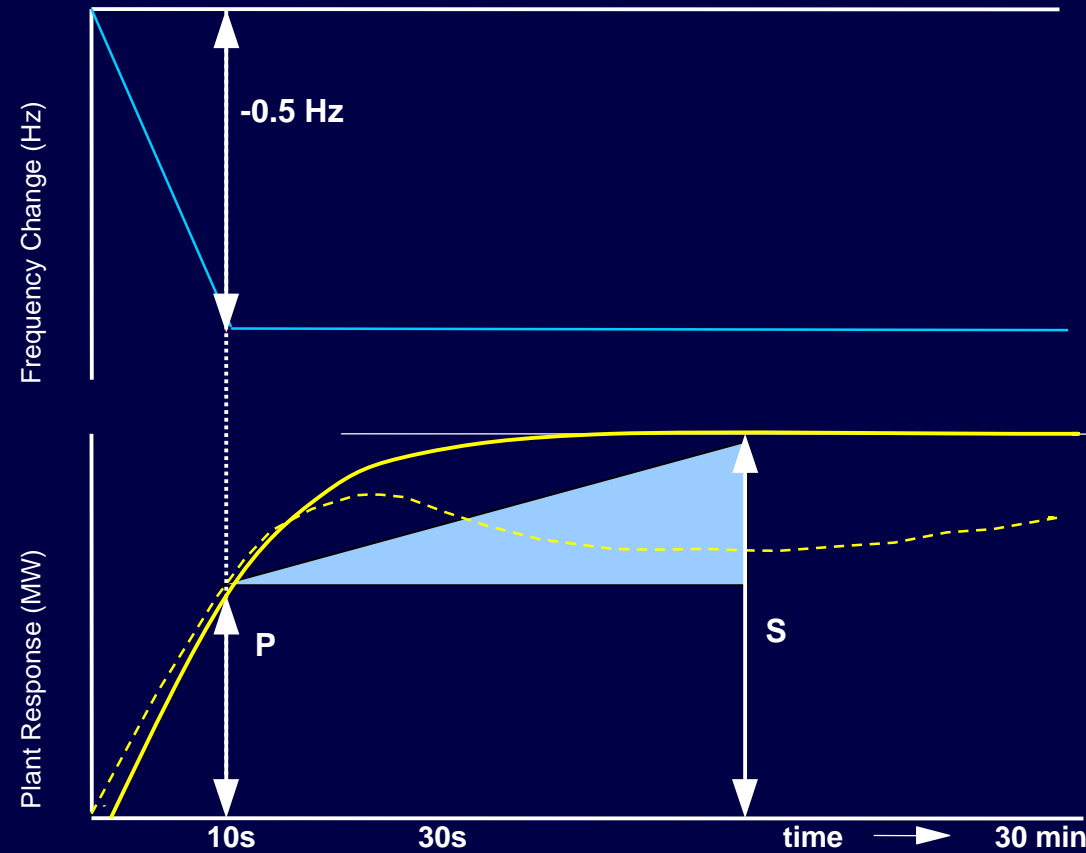


Detailed Interpolation of Matrix

Typical Frequency Response Curves



Primary & Secondary Volume



Compensation for Non-Delivery

- ◆ **Use algebra in BSC (Section T - 4.8)**
- ◆ **Apply this to calculated volume of response energy**

Reference Price

- ◆ **A number of options considered:**
 - ◆ **Single fixed price**
 - ◆ **Prices by fuel type**
 - ◆ **Bid/offer prices**

BSC Modification

- ◆ **Longer term solution**
- ◆ **More appropriate**
- ◆ **Consistent with CUSC work**
- ◆ **Covers other Balancing Services**

Further Information

- ◆ http://www.nationalgrid.com/uk/indinfo/cusc/mn_working_group.html