# Frequency Response Energy Payment

**BSSG 5th June 2013**

Further to the Update published on 21st January 2013 National Grid has been reviewing the CUSC Response Energy Payment (REP) formula with particular reference to renewable generation.

## Current Situation

The current formula is linked to the Market Index Price (MIP)

- For the provision of Low Frequency Response (LF), where there is an increase in the energy generated, the provider is paid MIP * 1.25, to cover the cost of fuel required to generate the additional energy. Renewable generators providing LF response will pick up additional Renewable Obligation Certificate (ROC) payments, but not incur fuel costs; hence this level of payment to the generator would seem inappropriate.
- For the provision of High Frequency Response (HF), where there is a reduction in the energy generated, the provider pays MIP * 0.75, representing the saving on fuel costs associated with the reduction in energy generated. Renewable generators providing HF response will receive reduced ROC payments and not benefit from fuel savings; hence payment from the generator would seem inappropriate.

Whilst over time the Response Energy volumes will tend toward zero, for each individual settlement period this will not be the case, and will result in payment to or from the generator.

## Proposed Options

### Option 1

National Grid has been working with wind farm operators to develop a methodology that can be used to mitigate the risks associated with the existing REP and ROC payments, by factoring this into the Frequency Response Holding payments; a copy of this is attached at the end of this paper.

Whilst this provides a short term solution, renewable generation operators will tend to price the service based on the worst case risk mitigation and this will inevitably lead to uneconomic pricing or the provision of Frequency Response.

### Option 2

The existing MIP based REP could be modified so that the payments are reversed for renewable generation

- For the provision of Low Frequency Response (LF), the renewable generator pays MIP * 0.75, to reflect that where there is an increase in the energy generated, a renewable generator will pick up additional ROC payments;

- For the provision of High Frequency Response, the renewable generator would be paid MIP * 1.25, to reflect that where there is a reduction in the energy generated, the renewable generator will receive reduced ROC payments.

Whilst this option would better reflect the cost associated with providing response energy, it is still based around energy prices and as such does represent the true costs which are ROC based.

**Option 3**

The REP could be modified to include a new payment methodology specifically for renewable generation.

- For the provision of Low Frequency Response (LF), to reflect where there is an increase in the energy generated, the renewable generator would pay the relevant ROC rate to National Grid;

- For the provision of High Frequency Response, to reflect where there is a reduction in the energy generated, the generator would receive payment at the relevant ROC rate from National Grid.

The relevant ROC rate would need to represent the actual ROC received for the particular renewable generation classification; for example:

i) Onshore Wind – 1(or 0.9) x ROC
ii) Offshore Wind – 2 x ROC
iii) Wave / Tidal 2 x ROC

Options 2 and 3 would work for all generation where the renewable source is non-fuel based.

For renewable generation where fuel is used to provide the generation e.g. biomass then a combination of the existing MIP based payment methodology and options 2 or 3 may be more appropriate. However for option 2 this would effectively be a payment of 0.5 x MIP to the generator for both high and low frequency response energy.

**Next Steps**

National Grid will continue to assist the industry in understanding the current REP methodology and how the short term solution can be used to mitigate the risks associated with this and in conjunction with the BSSG will further develop an alternative REP methodology to be applied to renewable generation.

To develop a new REP methodology National Grid would look to establish a small working group to determine the best solution; members of the BSSG with experience of operating renewable generation would be invited to join this group. The group would then report back to the BSSG with a final proposal around October 2013, these would then be presented to the CUSC panel, and a CUSC modification raised.

**Contact Information**

Should you have any queries relating to the above information please email cusc.team@nationalgrid.com.

# **Frequency Response from wind:** Pricing Guidance

Issue numbe
May

## Introduction:

National Grid has a duty to maintain the system frequency within a certain limit by ensuring that sufficient generation is ready to provide Frequency Response (FR). National Grid despatches this based on the most economic cost of the action. To this end, all licensed generators are obliged under the Grid Code to provide mandatory Frequency Response.

The current arrangements for FR are designed for conventional generation rather than renewable generation service provision. Given the cost of Renewable Obligation Certificates (ROCs) and the subsequent reflection in prices to reduce output, currently wind farms are not generally going to be the economic action for FR. However, there may be times when due to system conditions, wind farms may be the economic choice, for example where the GB demand is low and base load nuclear and wind plant is dominant. The frequency of these circumstances will increase with the expected growth in renewables.

This note explains the payment structure for the provision of frequency response and a deficiency in one of the payment elements. It proposes an interim solution that can be implemented now by renewable generation, prior to the creation of a Grid Code Workgroup to establish an enduring solution.

## Payment Structure

The FR payments are broken down into a **Holding Payment** and **Response Energy Payment** which is detailed further below;

### Holding Payment

The Holding payment is paid based on the provider's capability for either a fall or increase in frequency ((Primary (P) at 0.5Hz, Secondary (S) at 0.2Hz and High (H) at 0.5Hz)) for the allowable combinations of P & H or P, S and H during the period where the generator is instructed into frequency sensitive mode. Providers can update their prices on a monthly basis and can price for each of Primary, Secondary and High modes. This can be done through the Frequency Response Price Submission System (FRPS).[1] Historic and current prices for each provider can be viewed on our website.[2]

### Response Energy Payment (REP)

The Response Energy Payment is made for the expected volume of frequency response delivered. This is an administered formula based price which can be viewed under the CUSC (Section 4.1.3.9A)[3]. This aims to compensate generators for energy imbalance exposure and the cost (or avoided cost) of producing energy. However, this does not work for renewables where the fuel costs can be considered to be zero.

The formula is linked to the Market Index Price (MIP) which represents the price of wholesale electricity for the relevant period of trading.

- For the provision of low (primary and secondary) FR i.e. there is a positive energy response, the provider is paid at the rate of Market Index Price (MIP) * 1.25 (there is a 25% benefit)

[1] https://www.nationalgrid.com/frps/
[2] http://www.nationalgrid.com/uk/Electricity/Balancing/services/frequencyresponse/mandatoryfreqresp/
[3] http://www.nationalgrid.com/uk/Electricity/Codes/systemcode/contracts/

- For the provision of high FR i.e. there is a negative energy response, the provider pays National Grid under the rationale that the provider saves fuel (clearly this is different for a wind farm). The formula equals MIP * 0.75 (the provider does not pay the full price)

This calculation is performed for every minute the unit is instructed to Frequency Sensitive Mode. The net energy is calculated over this time frame, and summated for each settlement period. If the settlement period contains a high and low frequency event, the energy taken will be deducted from the energy given and the rate applied to remaining energy on a net basis.

It is worth noting that this volume tends to be near zero for the majority of settlement periods as system frequency is not static, meaning the generator will generally be providing both primary and high frequency response.

## Balancing Mechanism Actions

### Deload

For normal system balancing of generation and demand, there may be times where a Bid Offer Acceptance (BOA) is issued by National Grid to a generator which leads to them either increase (offer) or decrease (bid) their generation. This would be compensated on a £/MWh basis which is priced by the generator accordingly.

When providing frequency response, they may be instructed to both deload and operate in frequency sensitive mode for the provision of both low (primary and secondary) and high FR. Generators may also be instructed to operate in frequency response mode without deload so that they can provide high frequency response.

### Imbalance Exposure

Ordinarily, any deviation from the traded position of a generator i.e. their contracted output, would generally result in them being exposed to imbalance changes. However, as FR is considered as a service which aids in the operation of the transmission system, the traded position of, or on behalf of a wind farm is held whole so that no additional exposure to imbalance occurs. This is achieved through the Applicable Balancing Services Adjustment Data (ABSVD)[4] process that adds or subtracts the volume of energy associated with frequency response provision in the trading account.

## Energy Cost for Renewables

### Fuel costs

For conventional generation (e.g. gas fired plant), when they respond to low frequency i.e. they increase their output, they are compensated based on the average price of energy in that particular period plus a 25% margin to take into account increased fuel costs to provide the energy.

Conversely with wind there are no equivalent fuel costs but loss of revenue associated with Levy Exemption Certificates (LECs) and ROCs (MWh per annum) whether by wind farms directly or Suppliers trading on their behalf. In addition to this, the formula requires the generator to pay for a reduction in output as it assumes that they are saving in fuel costs. Therefore appropriate compensation is required to address this loss.

This process is due to be addressed in a National Grid Workgroup; however in the meantime this can be accommodated by including this element within the FR holding price. The following section describes how this can be done.

[4] http://www.nationalgrid.com/uk/Electricity/Balancing/transmissionlicencestatements/

## ROCs

Where suppliers do not have sufficient ROCs to cover their obligation, the current buy out price for 2013-2014 is **£42.02MWh.**[5] Such ROCs are intended to be traded by generators and therefore the traded price should differ from the buy out price. For the avoidance of doubt, 1 ROC does not necessarily equal 1MWh of renewable energy generated, as it is technology dependent.

## LECs

These are electronic certificates issues by Ofgem for each MWh of renewable energy that is generated by an accredited generating station. The related values of LECs are set at the price at which non renewables are subject to, which at the current rate (effective from 1 April 2012) is **£5.09MWh**[6].

For every 1MWh 'lost' because of providing frequency response, equivalent ROCs and LECs revenue is lost.

## Calculation of Holding Price

To ensure that wind generators are not penalised when providing high FR, it is suggested that the holding price should take into account the Response Energy Payment plus other lost opportunities. For illustrative purposes, an example has been provided below for a wind generator which provides high FR only i.e. they reduce their output:

This has the following assumptions:

Response Time period: 1 hour
Maximum HF capability – 1MW
Market Index Price: £100/MWh
Traded ROC Price: £45/MWh

## Frequency Data

A sample of actual system frequency data taken from a summer and winter month in 2012 demonstrates the typical energy response levels required from a generator with the capability of providing 1MW of response, which has been summated across **1 day**. Please note that the figures below are a rough guide, as each generator will have their own FR capabilities as set out in their FR matrix.

| 1MW capability | **Primary** | **Secondary** | **High** |
|---|---|---|---|
| **July 2012 (average over 1 day)** | 1.06MWh | 1.06MWh | 1.48MWh |
| **December 2012 (average over one day)** | 1.19MWh | 1.19MWh | 1.40MWh |

## Calculating the Response Energy Payment for July 2012 if High Frequency Response were instructed

5 http://www.ofgem.gov.uk/Sustainability/Environment/RenewablObl/Documents1/Information%20Note%20buy%20out%20fund%20distribution%201112.pdf

6 http://www.ofgem.gov.uk/Sustainability/Environment/cclrenexem/Pages/CCLRenewablesExemption.aspx

The formula to calculate the REP is as follows:

*Energy Volume x Market Index Price x 0.75 = Response Energy Payment (REP)*

Energy used in 1hour for High Frequency Response:
1.48MWh / 24hrs = 0.06MWh

0.06MWh x (0.75 x £100/MWh) = £4.50

Divided by capability (1MW) = £4.50MWh

### Calculating lost opportunities (ROCS, LECs)

£45/MWh x 0.06 = £2.70

Divided by capability (1MW) = £2.70MWh

### Final cost

£4.50 + £2.70 = **£7.20/MWh + profit margin + maintenance costs**

## Potential benefits

As demonstrated by the example above, it is entirely possible for service providers to set their prices at a level to signal that they do not wish to be utilised compared to other generation. However, providers can benefit from this as a low risk additional income stream by ensuring that appropriate operating costs are taken into account when calculating their Holding Payment.

For those that are concerned that this service may be called upon frequently, for the majority of the time, there are other economic options available as renewables will be more expensive to utilise, as noted by the loss of ROCs and LECs. However, it is envisaged that such services would not be utilised unless there are times of system stress.

## Grid Code Enduring solution

National Grid will be discussing the development of a solution to correctly calculate and compensate renewable generation when providing frequency response. This is expected to calculate the response volume (MWh) as now, however the compensation price will be calculated based on the loss made by renewable generation rather than a market based energy price that reflects underlying fuel costs for conventional generation.