SSEN FLEXIBILITY SERVICES

Flexible Power - Payment Calculations

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Scottish & Southern
Electricity Networks

INTRODUCTION

This document provides the detailed calculations used by SSEN for the calculation of payments in respect of distribution flexibility products, where a Provider is integrated with the Flexible Power platform.

DEFINITIONS AND INTERPRETATION

This document has been developed in line with the ENA Standard Agreement for Flexibility Services and terms shall be defined and interpreted in accordance, unless the context otherwise requires or such terms are defined below. Specific parameter values can be found in the service terms of the Flexibility Service Agreement.

"Accepted Availability Window" means a committed Availability Window in respect of a Dispatch Group which is notified by the Company as being required by the Company for Secure or Dynamic services;

"Availability Cost" has the meaning given in to it in 1.3(d) below;

"Availability Payment" means any payment calculated in accordance with 2.1 below;

"Availability Settlement Period" means each full thirty (30) minute period within an Accepted Availability Window, as described in 1.2 below;

"Event Proportion" has the meaning given to it in 2.5.3 below;

"Delivery Proportion" has the meaning given to it in 2.3.2 in respect of Secure or Dynamic services, and/or in 3.2.2 in respect of Restore services below;

"Delivery Target Threshold" has the meaning given to it in 3.2.3;

"Event" means a specific instance when Utilisation has been scheduled (instructed);

"Event Delivery Proportion" has the meaning given to it in 2.5.3 below;

"Grace Factor" has the meaning given to it in 2.3.1;

"Monthly Delivery Proportion" has the meaning given to it in 2.5.2 below;

"Payable Overdelivery" means the % of overpayment above 100% that will be available in respect of Utilisation Payments for Restore Services as set out in 3.2;

"Payment Proportion" means the value calculated in accordance with 2.3.4 in respect of Secure and Dynamic services, and/or in 3.2.4 in respect of the Company's Restore Services below;

"Penalisation Multiplier" has the meaning given to it in 2.3.3 in respect of Secure and Dynamic services and/or the Company's Secure Services, and/or in Paragraph 3.2.3 in respect of Restore services below;

"Reconciliation Grace Factor" has the meaning given to it in 2.5.5 below;

"Utilisation" means in respect of a Dispatch Group, the Service Response following a Utilisation Instruction from the Company in accordance with this Agreement which is provided continuously until the Event End Time and "Utilised" shall be construed accordingly;

"Utilisation Cost" has the meaning given to it in 1.3 below;

"Utilisation Payment" means any payment in respect of Sustain, Secure or Dynamic services calculated in accordance with 2.2 of this below, or any payment in respect of Restore services calculated in accordance with 3.1 below;

"Utilisation Settlement Period" means each full one (1) minute period during a Utilisation event, as described in 1.2 below, with the first Utilisation Settlement Period being the minute in which the Response Time ends.

1 GENERAL

1.1 For Secure and Dynamic services, there are two primary payments: Availability Payments and Utilisation Payments. For Sustain and Restore services, there is one payment: the Utilisation Payment. Availability Payments are paid for every Accepted Availability Window.Utilisation Payments are made for every instance of Utilisation.

1.2 Availability Payments and Utilisation Payments are calculated at a different granularity called the Availability Settlement Period and the Utilisation Settlement Period. The constants used to convert between MWh values and the individual time segments are (SP_u) and (SP_a), which correspond to the fraction of an hour for Utilisation and Availability. The Utilisation Settlement Period is 1 minute. The Availability Settlement Period is 30 minutes i.e.:

$$SP_u = \frac{1}{60} \text{ and } SP_a = 0.5$$

1.3 In respect of each Dispatch Group there are three key values:

    a) The Contracted Capacity (CC_s), given in MW;

    b) An Utilisation Cost (UC_s), which is the price per MWh for Utilisation. The Utilisation Cost for each of the Company Dynamic Services, the Company's Secure Services and/or the Company's Restore Services for each Zone shall be as set out in the relevant Contract Award;

    c) An Availability Cost (AC_s), which is the price for Availability in respect of an Accepted Availability Window at a Dispatch Group. This is a price per MW per hour of Availability. The Availability Cost for a CMZ shall be as set out in the relevant Contract Award.

1.4 Payments are calculated on a month-by-month basis. The calculations in this document determine the Utilisation Payments and the Availability Payments due for a Dispatch Group for a given month.

1.5 For the Secure and Dynamic Services, after each operational month, (m), there is a list of Accepted Availability Windows and a list of Events, which are written as (AP_m) and (E_m). The top-level calculations will loop through these lists, but the bulk of the work is performed for an individual Accepted Availability Window and an individual Event.

2 SUSTAIN, SECURE AND DYNAMIC SERVICES

2.1 Availability Payments (Secure and Dynamic Services)

2.1.1 Availability Payments for an Accepted Availability Window are determined as the sum for all Availability Settlement Periods in that Accepted Availability Window, based on binary values of Dispatch Group availability during each Availability Settlement Period.

2.1.2 ST_{aw} and FT_{aw} are written for the start and finish time of the given Accepted Availability Window.

2.1.3 The raw Availability Payment given to a Dispatch Group for an Accepted Availability Window is as follows:

Where the Availability Cost is a payment per MW per hour:

$$AP_{s,w} = \left(\sum_{j=ST_w}^{FT_w} AC_s \cdot SP_a \cdot CC_s \cdot SA_{s,j} \right)$$

Where:

$AP_{s,w}$	is the Availability Payment for a Dispatch Group (s) during an Accepted Availability Window *(w)*
$\sum_{j=ST_w}^{FT_w}$	sums the payment for every Availability Settlement Period in the Accepted Availability Window, from start to finish time inclusive
$AC_{s,w}$	is the Availability Cost for that Dispatch Group and Accepted Availability Window on a £ per MW per hour basis
SP_a	is the Availability Settlement Period
CC_s	is the Contracted Capacity
$SA_{s,j}$	is a binary value representing Dispatch Group availability in each Availability Settlement Period.

2.2 Utilisation Payments (Sustain, Secure and Dynamic Services)

2.2.1   For a Dispatch Group (s), Utilisation Payments for Sustain, Dynamic and Secure Services are calculated per Event (e). Each Event has a start time (ST_e) and a finish time (FT_e), such that $ST_e < FT_e$.

2.2.2   The Utilisation Payment for a Dispatch Group (s) per Event *(e)* is calculated as follows:

$$UP_{s,e} = \sum_{j=ST_e}^{FT_e} CC_s \cdot UC_s \cdot SP_u \cdot PP(CC_s, AD_{s,j})$$

Where:

$U_{s,e}$	is the Utilisation Payment for a Dispatch Group (s) during each Event (e)
$\sum_{j=ST_e}^{FT_e}$	sum of the Utilisation Settlement Periods during the constraint Utilisation event,
CC_s	Contracted Capacity
UC_s	Utilisation Cost
SP_u	Utilisation Settlement Period of the Dispatch Group, as defined above
$AD_{s,j}$	is the actual, metered MW delivery of the Dispatch Group (s) for each Utilisation Settlement Period during the Event (*j*). In the payment calculations, there is no difference between Generator Sites and Demand reduction Sites, since this value is the 'reported to grid' value
PP	is the Payment Proportion , being the fraction of the full price due for every Utilisation Settlement Period based on delivery performance.

2.3 Utilisation Payment Proportion

2.3.1   A margin of error, known as the Grace Factor (GF) is allowed in respect of under-delivery of the Contracted Capacity (CC) for a Dispatch Group. Delivery of equal to or greater than the required level of Contracted Capacity less the applicable Grace Factor is awarded the full Utilisation Payment. A deduction from the full payment will be made for delivery of less than the required level of Contracted Capacity less the applicable Grace Factor.

2.3.2   The Delivery Proportion ($DP_{s,j}$) is defined as the ratio of actual MW delivery to Contracted Capacity. This ratio is a value that represents a percentage and rounded to two significant figures to ensure it represents a whole percentage.

2.3.3   The Grace Factor determines the acceptable under-delivery for a Dispatch Group. For every % point under that level, called the Penalisation Multiplier, (PM) of the full payment is deducted. Over-delivery is capped, and paid at Contracted Capacity.

2.3.4   Thus, the Payment Proportion is a value between 0 and 1 (or 0 and 100%). The calculation contains two separate cases:

$$1)\ if\ DP_{s,j} \geq (1-GF)\,, PP_{s,j} = 1$$
$$2)\ if\ DP_{s,j} < (1-GF), PP_{s,j} = Max(0,\ 1-GF-PM.[1-GF-DP_{s,j}]\,)$$

2.4 Monthly Utilisation Payments

2.4.1   The total Utilisation Payments due for a given Dispatch Group in a month is calculated as the sum of the individual Utilisation Payments:

$$MUP_{s,m} = (\sum_{e \in M} UP_{s,e})$$

2.5 Monthly Reconciliation (Secure & Dynamic Services)

2.5.1   At month end, Availability Payments are subject to a monthly reconciliation based on the Dispatch Group's Utilisation performance over the month.

2.5.2   The Monthly Delivery Proportion ($MDP_{s,m}$) is the capped average of all delivery proportions for a given Dispatch Group and month, calculated as follows;

$$MDP_{s,m} = \frac{\sum_{e \in Em} Min(1, EP_{s,e})}{\#E_m}$$

Where:

$e \in E_m$	is the Delivery Proportion during each and every Event in the set of Events for the month (*m*).
$\#E_m$	is the number of Events in the month.
$Min(1, EP_{s,e})$	caps the Delivery Proportion during each Event at 100%, even if the Dispatch Group over-delivers.
$EP_{s,e}$	Event Proportion for each Dispatch Group (*s*) and Event (*e*) as defined below.

2.5.3   In order to define the Event Proportion (*EP*) , we first need the Event Delivery Proportion (*EDP*). For each individual Event the total, uncapped Delivery Proportions for each Utilisation Settlement Period are summed.

$$EDP_{s,e} = (\sum_{j=ST_e}^{FT_e} = DP_{s,j})\,/(FT_e - ST_e + 1)$$

2.5.4   As such, the Delivery Proportion for each Utilisation Settlement Period of the constraint Utilisation event is calculated. It is important to note that this is uncapped. This does not apply across Events in the month, as with the $MDP_{s,m}$ calculation.

2.5.5 When calculating the Event Proportion (EP) the Event Delivery Proportions are also given a grace factor, called the Reconciliation Grace Factor (RGF). Thus the Constraint Event Delivery Proportion is:

$$1) \; if \; 1 \leq EDP_{s,e} + RGF < 1 + RGF, EP_{s,e} = 1$$
$$2) \; otherwise \; EP_{s,e} = EDP_{s,e}$$

2.7 Monthly Availability Payments

2.7.1 The monthly Availability Payment for a Dispatch Group for a given month is calculated as follows:

$$AP_{s,m} = (\sum_{w \in M} AP_{s,w}) . MDP_{s,m}$$

That is, the total Availability Payments due for the Dispatch Group for the month multiplied by the Constraint Event Delivery Proportion.

3 RESTORE SERVICES

3.1 Utilisation Payment

3.1.1 For a Dispatch Group (s), Utilisation Payments for Restore Services are calculated per Event (e). Each Event has a start time (ST_e) and a finish time (FT_e), such that $ST_e < FT_e$.

3.1.2 The Utilisation Payment for a Dispatch Group (s) per constraint Utilisation event *(e)* is calculated as follows:

$$U_{s,e} = \sum_{j=ST_e}^{FT_e} CC_s . UC_s . SP_u . PP(CC_s, AD_{s,j})$$

Where:

$U_{s,e}$	is the Utilisation Payment for a Dispatch Group (s) during each Event (e)
$\sum_{j=ST_e}^{FT_e}$	sum of the Utilisation Settlement Periods during the Event
CC_s	Contracted Capacity,
UC_s	Utilisation Cost,
SP_u	Utilisation Settlement Period of the Dispatch Group, as defined above.
PP	is the Payment Proportion and works out what fraction of the full price is due to the Dispatch Group for every Utilisation Settlement Period based on delivery performance.
$AD_{s,j}$	is the actual, metered MW delivery of the Dispatch Group (s) for each Utilisation Settlement Period during the constraint Utilisation event *j*. In the payment calculations, there is no difference between Generator Sites and Demand reduction Sites, since this value is the 'reported to grid' value.

3.2 Utilisation Payment Proportion

3.2.1 Delivery of the Contracted Capacity for a Dispatch Group of equal to or greater than the Delivery Target Threshold *(DTT)* is awarded the Utilisation Payment "at rate" (i.e. the payment % will equate to the delivery %), up to a maximum Payable Over-delivery (**PO**) % of the Contracted Capacity. A

deduction from full payment of will be made based on the rules below for delivery of less than the Delivery Target Threshold of Contracted Capacity.

3.2.2   The Delivery Proportion $(DP_{s,j})$ is defined as the ratio of actual MW delivery to Contracted Capacity. This ratio is a value that represents a percentage and is rounded to two significant figures to ensure it represents a whole percentage.

3.2.3   The Delivery Target Threshold (DTT) determines the acceptable under-delivery for a Dispatch Group. For every % point under that level, a fixed proportion, called the Penalisation Multiplier, (PM) of the full payment is deducted.

3.2.4   Thus, the Payment Proportion is a value between 0 and 1+PO (or 0 and 100%+PO%). The calculation contains three cases:

$$1)\ if\ DP_{s,j} \geq (1 - DTT)\ and\ DP_{s,j} \leq 1 + PO,\ PP_{s,j} = DP_{s,j}$$
$$2)\ if\ DP_{s,j} < (1 - DTT),\ PP_{s,j} = Max\big(0,\ 1 - DTT - PM.\big[1 - DTT - DP_{s,j}\big]\big)$$
$$3)\ if\ DP_{s,j} > 1 + PO,\ PP_{s,j} = 1 + PO$$

3.3 Monthly Utilisation Payments

3.3.1   The total Utilisation Payments due for a given Dispatch Group in a month is calculated as the sum of the individual Utilisation Payments:

$$MUP_{s,m} = \Big(\sum_{e \epsilon M} UP_{s,e}\Big)$$

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