

G17 – Capacity Provider Payments

EMRS Guidance

Public

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Change Amendment Record

Version	Date	Description
V1.0	09 January 2017	Go Live Version
V2.0	07 March 2017	Updates to accommodate change in payment terms from 3 to 5 Working Days
V3.0	01 November 2017	Updates to penalty charges and over-delivery payments
V4.0	01 March 2018	Updates to include Relevant Expenditure Deductions
V5.0	12 December 2019	Updates to include Relevant Benefit Deductions
V6.0	12 December 2019	Updates to include Relevant Benefit Deductions

1. Introduction

Capacity Providers, which have secured a Capacity Agreement Obligation through an auction or the whole or part of such a capacity obligation through secondary trading, will receive Capacity Payments for any month during the Delivery Year when they hold such an obligation. Following System Stress Events, Capacity Providers may be eligible for additional payments or subject to financial penalties, depending on whether they exceed their Capacity Obligations (over-deliver) or fail to meet them (under-deliver).

This document provides Capacity Providers with an understanding of the payments and potential penalties (including their timings) associated with their Capacity Obligations and also an overview of how a Capacity Provider can potentially reallocate volume following a System Stress Event in order to optimise their net income from settlement.

Note that Capacity Agreements awarded for Delivery Year 2017/18 from a Transitional Auction, for Demand Side Response obligations, are not able to participate in secondary trading of obligations and they are subject to the original penalty regime rather than the new regime applying to other agreements for Delivery Year 2017/18. However, they can participate in Volume Reallocation.

2. Purpose

The purpose of this document is to answer the following questions:

- What are the different Capacity Provider payments?
- How are Capacity Provider payments calculated?
- How do I validate my Capacity Provider Payments?
- What is a System Stress Event?
- What can I do after a System Stress Event if I under-delivered or over-delivered?
- How are Capacity Provider Penalties calculated?
- How are over-delivery payments calculated?
- What happens if I don't provide required metered data for settlement?
- Is VAT applicable to the Capacity Provider Payments?

3. Who is this document for?

This guidance is for Capacity Providers and their agents and provides information on Capacity Market settlement.

4. Associated documents

This document should be read in conjunction with¹:

- EMRS Working Practice WP1 - Overview of EMR Settlement
- EMRS Working Practice WP195 – Capacity Market and CFD Metered Data
- EMRS Working Practice WP48 – Volume Reallocation

5. What are the different Capacity Provider payments?

There are three types of Capacity Provider payments which are outlined in *Figure 1*:

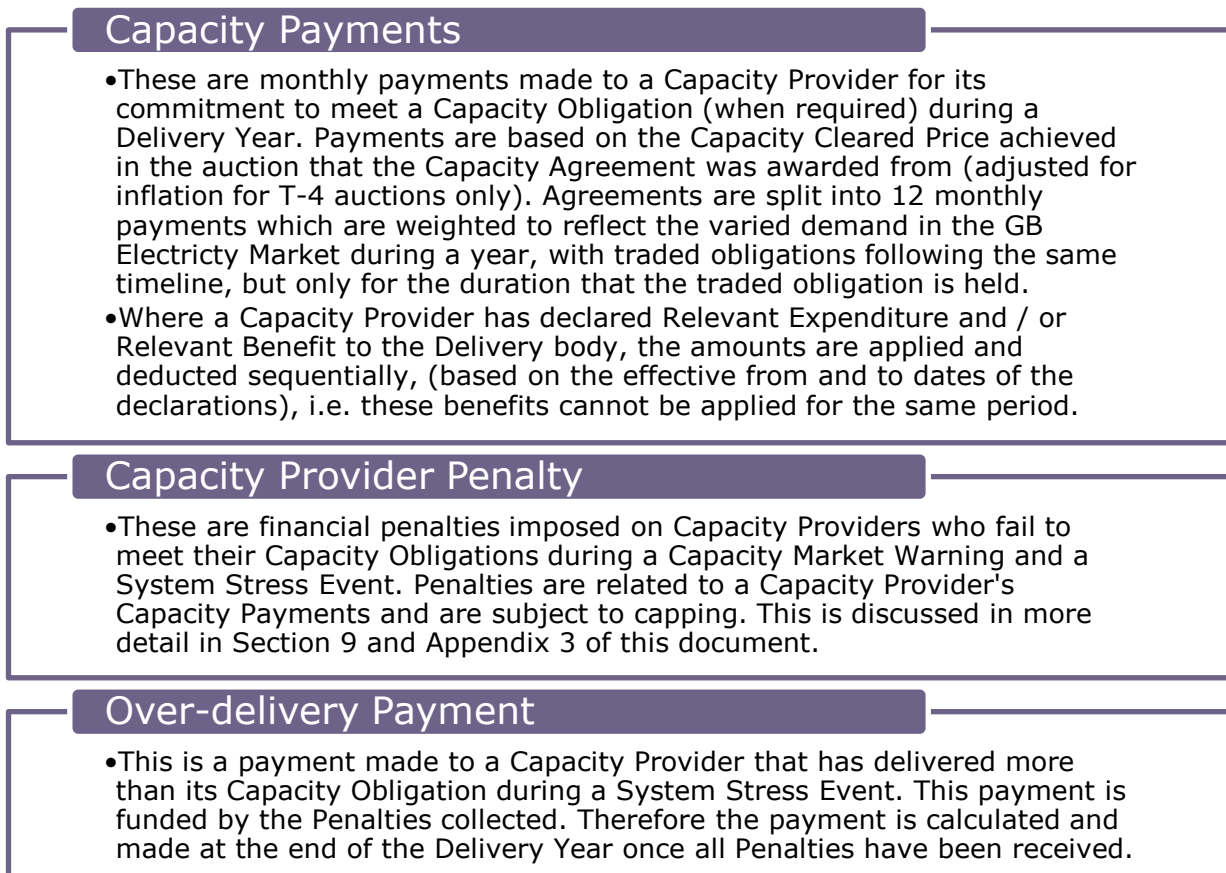


Figure 1: Capacity Provider Payments

6. How are Capacity Provider Payments calculated?

Capacity Payments are paid monthly during the Delivery Year to Capacity Providers that hold a Capacity Obligation during that Delivery Month. The amount of each payment is based on the Capacity Cleared Price (CCP) - adjusted for inflation², the sum of the Auction Acquired Capacity

¹ EMRS Working Practices and Guidance Documents can be found on the EMRS website:

<https://www.emrsettlement.co.uk/publications/>

² Only T-4 Auctions are adjusted for inflation

Obligation (AACO) and Physically Traded Capacity Obligations (PTCO), and an applied monthly weighting factor³. Capacity Providers will receive a Credit Note⁴ for the monthly Capacity Payment which is determined using the calculation in *Figure 2*.



Figure 2: Monthly Capacity Payments Calculation

For example:

- Capacity Cleared Price from a T-1 auction (so no adjustment for inflation): **£18,000/MW**
- Capacity Obligation: **7.8MW**
- Monthly Weighting Factor: **8.4%**

Calculation⁵:

Step 1: calculates the annual Capacity Payment and represents the part of the calculation shown in brackets in the diagram

18,000 x 7.8 = £140,400 which is the Annual Capacity Payment

Step 2: is to calculate the monthly payment and represents the part of the calculation shown outside the brackets in the diagram

£140,400 x 0.084 = **£11,793 for the month**

i – The Capacity Cleared Price (CCP) for T-1 Auctions is not adjusted for inflation.
For T-4 Auctions the CCP is adjusted for Inflation using CPI. A worked Example can be found in Appendix 4

If the CMU and its related capacity obligations have changed ownership during the month, then the monthly payment is apportioned between Capacity Provider owners by the days they owned the CMU in the month.

If a Capacity Provider has engaged in secondary trading of PTCO then these are calculated in the same way, for the obligation traded and the number of days for which the trade is effective in the month. A Capacity Provider will see separate invoice lines on their monthly Capacity Payment credit note for each CMU’s AACO and any PTCO.

Capacity Providers will be issued with a Credit Note on the 28th Working Day following the end of the relevant Delivery Month.

Deductions for Relevant Expenditure and where applicable Relevant Benefit

³ Published on EMRS website

<https://www.emrsettlement.co.uk/documents/2017/04/key-figures-payments-201718.pdf>

⁴ EMRS is obligated to issue Credit Notes on behalf of ESC for Capacity Payments as per The Electricity Capacity Regulations (as amended) 2014 40(2)(b) <http://www.legislation.gov.uk/ukdsi/2014/9780111116852/regulation/40>

⁵ The formulas used as the basis for this calculation are found in The Electricity Capacity Regulation 2014 Schedule 1 (as Amended) <http://www.legislation.gov.uk/uksi/2014/2043/contents/made>

Relevant Expenditure

- Capital Expenditure funded by relevant investment under the Enterprise Investment Scheme. This is granted to a Person, in ranted in any form for a CMU and in respect of the costs of the CMU.

Relevant Benefit

- Relevant Benefit is the amount of State Aid or Union Funding that is not Excepted Benefit or Authorised Benefit and which is Granted to a Person, in ranted as above in any form for a CMU and in respect of the costs of the CMU.

If a Capacity Provider has declared Relevant Expenditure or Benefit (as defined as in the Capacity Market Rules in relation to a CMU to the Delivery Body), Capacity Payments must be offset by the total Relevant Expenditure amount. To do this, EMRS will make deductions from the Monthly Capacity Payments until the Total Relevant Expenditure Amount has been offset.

If the total Relevant Expenditure amount exceeds a month's payment, that payment is capped at £0 and deductions will continue in subsequent months (and subsequent Delivery Years if necessary) until the total amount has been off set. Deductions for Relevant Expenditure are shown as an additional line on the monthly Credit Note as a positive item.

Only once the total Relevant Expenditure has been utilised can the Relevant Benefit be deducted (where due). This deduction will follow the same methodology as Relevant Expenditure deductions i.e. If the total Relevant Benefit amount exceeds a month's payment, that payment is capped at £0 and deductions will continue in subsequent months (and subsequent Delivery Years if necessary) until the total amount has been set off. Deductions for Relevant Benefit are shown as an additional line on the monthly Credit Note.

For example:

Following on from the example above which worked out the monthly capacity payment using the equation in *Figure 2* to be £11,793, let's assume that the monthly payment is the same each month and the Capacity Provider has declared Relevant Expenditure of £18,000 to the Delivery Body. EMRS will calculate their monthly capacity payment as usual and then deduct the Relevant Expenditure amount from any money to be paid out.

Month 1:

After calculating the monthly payment, EMRS deducts the Relevant Expenditure amount.

$$£11,793 - £18,000 = -£6,207 = \mathbf{£0 \text{ for the month}}$$

Since the Relevant Expenditure amount exceeds the monthly payment, the Capacity Payments are reduced to nil for that month and the outstanding Relevant Expenditure continues to be deducted from subsequent month's payments. Capacity Providers will still receive a credit note where the payment has been capped to £0.

Month 2:

The outstanding Relevant Expenditure is £6,207 after the first month's deductions.

$$£11,793 - £6,207 = \mathbf{£5,586 \text{ for the month}}$$

The Capacity Provider's payment for that CMU has been reduced by the outstanding Relevant Expenditure amount and the Total Relevant Expenditure amount has been offset. The outstanding Relevant Expenditure

Month 3:

The total Relevant Expenditure amount has been set off between the deductions in months 1 and 2; there will be no deductions from month 3 onwards.

$$£11,793 - £0 = \mathbf{£11,793 \text{ for the month.}}$$

Capacity Providers have up until 3 months after the start of the Delivery Year to submit a revised Relevant Expenditure amount to the Delivery Body.

If EMRS has already made deductions in excess of an updated Relevant Expenditure amount, EMRS will credit this back to the Capacity Provider in the next generated monthly Credit Note.

Month 3 (Where Relevant Expenditure has been utilised and Relevant Benefit is applied):

The total Relevant Expenditure amount has been off set between the deductions in months 1 and 2; Relevant Benefit can now be offset from Month 3 onwards, using the same calculations as noted for Relevant Expenditure above.

Transfer of Ownership and subsequent Termination of a CMU

Upon a Change of Ownership, any approved outstanding Relevant Expenditure and / or Relevant Benefit travel with the CMU to which it is applied.

7. How do I validate my Capacity Payments?

All Invoices and Credit Notes will be sent with accompanying backing data in CSV format⁶, and also over the Data Transfer Network (DTN) if requested⁷. This can be used to validate Capacity Payments, Penalty Charges or Over Delivery Payments. The data is based on the D0366 Data Flow (CM Capacity Provider Invoice Backing Data) which can be found on the Master Registration Agreement Service Company (MRASCo) website⁸ includes neither Relevant Expenditure nor Relevant Benefit deductions backing data but these will appear as lines on Credit Notes.

Capacity Providers who have declared Relevant Expenditure and / or Relevant Benefit in their Funding Declarations should be aware that their payments will be reduced and can keep track of their deductions using their Credit Notes.

The below example works through how backing data (D0366 and the related T062 csv file) can be used to validate Capacity Payments. The same principles apply for validating Penalty Charges or Over Delivery Payments.

All backing data starts with the same six columns shown in Table 1 below:

Table 1: First six columns of backing data (Fields A-F in the excel spreadsheet)

J1889	J1950	J1949	J1951	J1952	MPID
CAPCOM	1287	20151006	20151009	-7622.23	CAPC

A brief description of the corresponding first six data items provided in the data flow D0366 is given in table 2 below:

Table 2: Invoice Information

Header	Data Item	As appears in Backing data	Description
J1889	EMR Party ID	CAPCOM	Identifies EMR Party
J1950	EMR Invoice Number	1287	Invoice Reference
J1949	EMR Invoice Issued Date	20151006	Date e.g. 06 October 2015
J1951	EMR Invoice Payment Date	20151011	Date e.g. 11 October 2015
J1952	EMR Invoice Total	-7622.23	£7,622.23
MPID	Market Party Identifier	CAPC	Used if an EMR Party requests data be sent over the DTN

⁶ Invoices, Credit Notes and backing data can also be viewed on the EMR Settlement Portal

<https://www.emrsettlementportal.co.uk/>

⁷ EMRS Working Practice WP195 – Capacity Market and CFD Metered Data:

<https://www.emrsettlement.co.uk/documents/2015/10/wp195-capacity-market-cfd-metered-data.pdf>

⁸ <https://dte.mrasco.com/>

Capacity Payments

The columns 11 – 22 relate to Capacity Payments which are shown in the example below in Table 3.

Table 3: Columns 11 – 22 of the backing data (Fields K-V in the excel spreadsheet)

J1930	J1923	J1895	J1896	J1925	J1903	J1900	J1918	J1919	J1922	J1969	J2055
KONAMI	201508	120	T-4-2014	35.284	846.82	750	88.086	99.457	0.075	-7622.23	F

A brief description of the corresponding data items is given in Table 4 below. The corresponding Credit Note is found in Appendix 2.

Table 4: Capacity Payments

Header	Data Item	As appears in Backing data	Description
J1930	CMU ID	KONAMI	Reference used to identify a CMU
J1923	CMU Month ID	201508	August 2015
J1895	Auction Acquired Capacity Obligation	120	This is the Capacity Obligation of the CMU (120MW)
J1896	Auction Identifier	T-4-2014	Identifies the Auction that this Obligation was awarded from
J1925	CM Penalty Rate	35.284	Used to calculate penalties if CMU under-delivers during a System Stress Event
J1903	Capacity Price	846.82	The Capacity Cleared Price, if appropriate adjusted for inflation (£846.82)
J1900	Capacity Cleared Price	750	The Cleared Price from the Auction (£750)
J1918	CM Base CPI	88.086	This is the average of the monthly values of CPI for the months of the base period for the Auction (88.086%)
J1919	CM CPI	99.457	The average of the monthly values of CPI for the months of the winter season ending on the 30th April preceding the start of Delivery Year (99.457%)
J1922	CM Monthly Weighting Factor	0.075	The weighting factor for the month (7.5%)
J1969	Monthly Capacity Payment	-7622.23	This is the value of the Capacity Payment as it appears on the credit note (£7,622.23)

Header	Data Item	As appears in Backing data	Description
J2055	Capacity Payment Suspension Flag	F	This can be a T (True) or F (False). It will be True if a Capacity Provider has failed to meet Satisfactory Performance requirements and Capacity Payments will be reduced according to the days Suspended in the month. (False)

8. What happens if my Capacity Payments need to be corrected?

Any corrections of Capacity Payments, Terminations, Additional Recovery, Relevant Expenditure or Relevant Benefit to be applied will be provided via ad hoc invoices to the CMU owner. Each of these amounts will be displayed on the invoice by Delivery Month and Year for each CMU to which it applies.

9. What is a System Stress Event?

A System Stress Event is defined in the Capacity Market Rules⁹ and is where the System Operator has instructed (involuntary) load reduction to maintain the security of the transmission system in the event of a shortage of generation to meet demand.

When a shortage of generation is anticipated, a Capacity Market Warning will be issued by the System Operator.

If a System Stress Event occurs¹⁰ more than four hours after a Capacity Market Warning, Capacity Providers will be required to deliver their Adjusted Load Following Capacity Obligation (ALFCO) (by either increasing generation or decreasing demand as appropriate). Any Capacity Provider who fails to deliver against their obligation will be subject to penalties and those that over-deliver may be eligible for additional payments.

i – Adjusted Load Following Capacity Obligation (ALFCO) is, at a high level, a Capacity Providers committed obligation for a settlement period, with balancing services taken into account e.g. acceptance of a negative bid offer to reduce output

⁹ <https://www.ofgem.gov.uk/electricity/wholesale-market/market-efficiency-review-and-reform/electricity-market-reform/capacity-market-cm-rules>

¹⁰ System Stress Events are only determined post-event to ensure it meets minimum scheme requirements

10. What can I do after a System Stress Event if I under-delivered or over-delivered?

Following a System Stress Event, where a CMU has delivered metered volumes greater than its ALFCO, it is permitted to reallocate (sell) the excess output to another CMU which did not deliver enough to meet all of its ALFCO. It is even possible for CMUs that pre-qualified for a Capacity Market auction but failed to win an agreement, to be Registered Participants for Volume Reallocation¹¹ more details can be found in EMRS Working Practice WP48 – Volume Reallocation. The transaction allows the buyer to meet its obligation via a combination of its own output and that acquired from other CMUs. Once the volume has been reallocated the seller is not eligible to receive Over-Delivery Payments for any volume transferred to another CMU.

EMR Settlement Ltd (EMRS) will publish a Capacity Volume Register containing initial over-delivery and under-delivery volumes as well as metered volumes and ALFCO's of all participating Capacity Providers during the System Stress Event(s). This will be published by 5pm on the 10th Working Day following the end of the Delivery Month in which any System Stress Event(s) occurred¹¹ and will provide information to Capacity Providers wishing to explore potential Volume Reallocation opportunities.

Capacity Providers that want to reallocate volume will need to inform EMRS via a Capacity Market Volume Reallocation Notice (CMVRN). The window for Volume Reallocation to be submitted to EMRS is from the 11th to the 19th Working Day in the month following the Delivery Month in which the System Stress Event occurred. More detailed information on the Volume Reallocation process including CMVRN requirements can be found in EMRS Working Practice WP48 – Volume Reallocation and a visualisation of the timescales for Volume Reallocation can be found in **Appendix 1**.

11. How are Capacity Provider Penalties calculated?

Capacity Providers that do not deliver sufficient metered volumes to meet their Capacity Obligation during a System Stress Event, and are unable to reallocate volume from another CMU, are required to pay a penalty.

The intention of the penalty regime is to adequately penalise Capacity Providers for not meeting their Capacity Obligations during a System Stress Event to dis-incentivise non-performance, whilst ensuring that the risk of gaming is minimised and there remains a continued incentive to be available to meet their future Capacity Obligations over the Delivery Year.

Penalties are calculated on a monthly basis if one or more System Stress Events has occurred during a Delivery Month.

¹¹ Excluding obligations obtained through transitional auctions, for which Volume Reallocation is not permitted

The penalty amount is firstly determined for each individual CMU, and then gets apportioned to the Capacity Provider based on the length of time that CMU was held during the month. This can mean a Capacity Provider incurs penalties for a CMU they did not own at the time of the System Stress Event giving rise to the penalties.

Monthly penalties are capped at the individual agreement level as well as at the CMU level. The monthly penalty calculation takes into account an annual penalty cap which means that cumulative penalties over a delivery year can never be greater than Capacity Payments scheduled for a CMU over the Delivery Year.

More details on the penalty calculation are given in the detailed work example in **Appendix 3** Worked Example of Penalty Rate Calculation.

An invoice for the amount will be issued on the 21st Working Day of the month following the Delivery Month in which the System Stress Event(s) occurred. This is following the Volume Reallocation window as discussed in Section 10.

Any unpaid penalties are subject to Late Payment Interest and if they remain unpaid will be netted off against future Capacity Payments¹².

12. How are Over-Delivery Payments calculated?

Over-Delivery Payments are calculated and paid at the end of the Delivery Year when all Under-Delivery Penalties have been due for payment from Capacity Providers that have failed to deliver against their obligations during the Delivery Year. It is the Under-Delivery Penalty “Pot” which is used to pay Over-Delivery Payments. Similarly to penalty charges, the over-delivery payments are firstly determined at the CMU level, and then get apportioned to the Capacity Provider based on the length of time the CMU was held during the Delivery Year.

The rate of Over-Delivery Payments at the CMU level is determined as the minimum of the weighted penalty rate and the total penalty payments received during the Delivery Year as a proportion of the total over-delivered volume in the Delivery Year.

This over-delivery rate (ODR_{ij}) is multiplied by the over-delivered volume for the relevant settlement periods where the adjusted load following capacity obligation ($ALFCO_{ij}$) is less than the adjusted volume delivered, after any Volume Reallocation (AE_{ij}) and these payments are then summed across each relevant settlement period in the Delivery Year for the CMU.

This figure for each CMU then gets apportioned to the Capacity Provider based on the proportion of days for which the CMU was held. This can mean that a Capacity Provider receives an over-delivery payment for a CMU when they did not own the CMU at the time of the over-delivery during a System

¹² The Electricity Capacity Regulations 2014 (49) (<http://www.legislation.gov.uk/ukxi/2014/2043/contents/made>)

Stress Event. We then sum the individual CMU apportionment line items to arrive at the total over-delivery payment for the Capacity Provider for the Delivery Year.

In the event that no penalty payments are received as a consequence of a System Stress Event then no payments for over-delivery are made.

The calculation used to determine Over-Delivery Payments for the CMU in a relevant settlement period is shown in Figure 3.

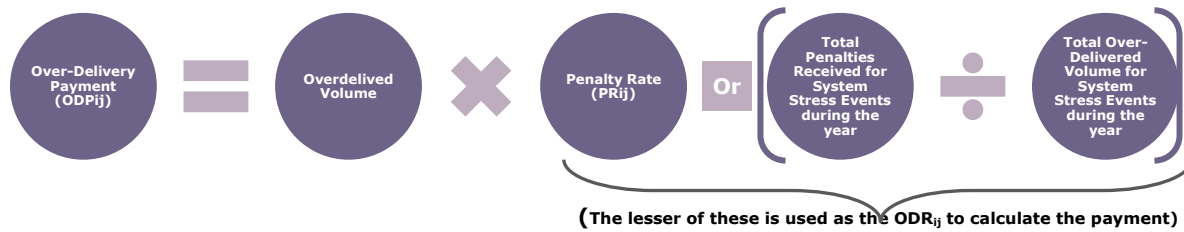


Figure 3: Over-Delivery Payments Calculation

For example:

- Total over-delivered volume in the delivery year: **200 MW**
- Penalty rate for the relevant settlement period: **£800**
- Total penalties received for Stress Events during the year: **£100,000**
- Over-delivered volume during settlement period: **20MW**

Calculation:

Step 1: Allocate the penalties received to the over-delivered volume.

$$100000/200 = £500$$

Step 2: Determine the minimum of the penalty rate and step 1.

$$ODR_{ij} = \min (500,800) = £500$$

Step 3: Take the over-delivery rate and multiply by the corresponding over-delivered volume for the relevant settlement period.

$$ODP_{ij} = 500 * 20 = \mathbf{£10,000}$$

We would do a similar calculation for all other relevant settlement periods relating to this CMU, and then apportion these amounts to the Capacity Provider and finally sum the apportionments.

Capacity Providers will receive Credit Notes for any monies owed for Over-Delivery by the 28th Working day following the end of the Delivery Year.

13. What happens if I don't provide required metered data for settlement?

In the event of a System Stress Event, Capacity Providers must provide EMRS with the required data as stipulated in the Capacity Market Rules¹³ unless it is provided by BSCCo. More information on submitting data can be found in Working Practice WP195 Capacity Market and CFD Metered Data. If the Capacity Provider does not provide the required data by the 9th Working Day after the end of the month in which the System Stress Event occurs they will be served a Data Default Notice¹⁴ and any Capacity Payments will be withheld until the Capacity Provider complies with their data requirements and the Data Default notice has been revoked. For any CMUs missing data required for determining System Stress Event performance, EMRS will apply 'minimum' values to determine Under-Delivery and associated Penalties.

14. Is VAT applicable to the Capacity Provider Payments?

Capacity Payments, Over-Delivery Payments and Penalties are all deemed outside the scope of VAT by the HMRC¹⁵. You will therefore find that all your Credit Notes and Invoices for these payments will have the VAT code of 0.

15. Need more information?

For more information, please visit our website www.emrsettlement.co.uk or email us at contact@emrsettlement.co.uk.

16. Acronyms and Definitions

A list of acronyms and definitions can be found in the 'Acronyms and Definition' document on our website.¹⁶

13 The Capacity Market Rules 2014 (14.5) <https://www.ofgem.gov.uk/ofgem-publications/95392/20150618ofgemcapacitymarketrulesconsolidated-pdf>

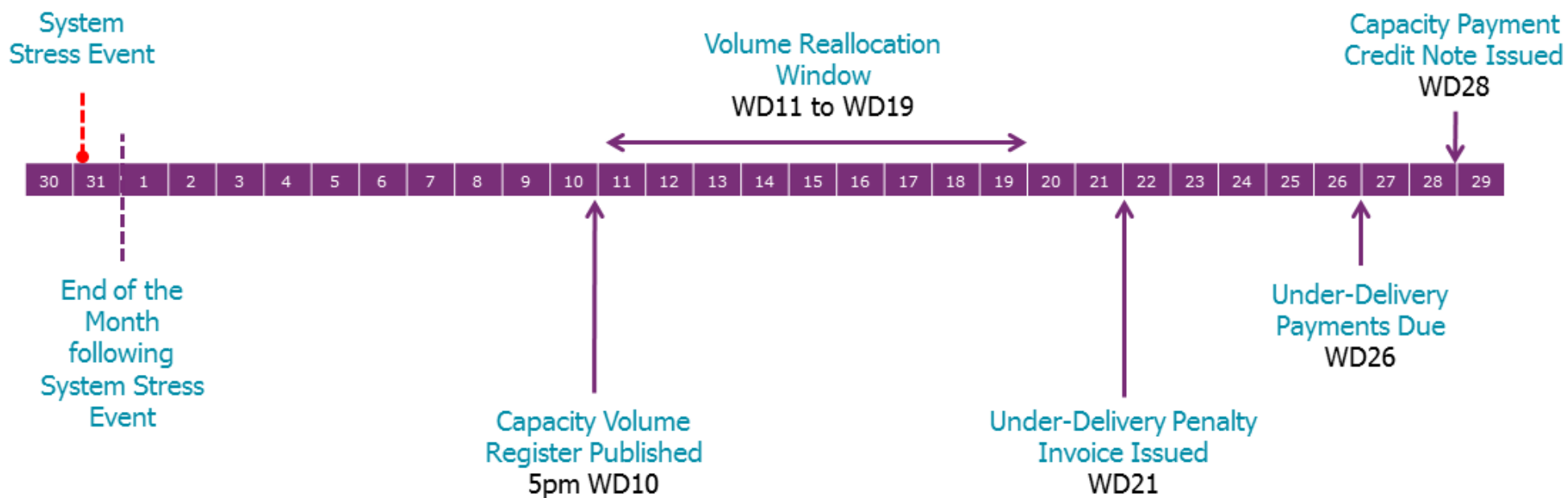
14 The Electricity Capacity Regulations 2014 (37) <http://www.legislation.gov.uk/uksi/2014/2043/regulation/37/made>

15 HMRC's Ruling on treatment of VAT in the Capacity Market: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/342805/HMRC_letter_on_Capacity_Market_transactions_3_.pdf

16 <https://emrsettlement.co.uk/publications/>> Useful Links

17. Appendix 1 – Volume Reallocation Timescale

Please note that the diagram only shows Working Days (weekends and public holidays are not included).



18. Appendix 2 – Example of Capacity Payment Credit Note

This is the Credit Note for the backing data described in Section 7.



Contact Details in case of queries

Contact partner: EMR Settlement Services Helpdesk
 E-Mail: contact@emrsettlement.co.uk
 Telephone: 0207 380 4333

CREDIT NOTE

The Capacity Company
 351 Euston Road
 London
 NW1 2AW
 U.K

Bill data (please provide during enquiries)

Invoice Number: 1287
 Invoice Date: 6 October 2015
 Due Date: 11 October 2015

Payment Types

Payment Type	CMU	VAT Code	Net Amount (£)
Capacity Payment for August 2015	KONAMI	O	£ -7,622.23

VAT Breakdown				Subtotal (£)	£ -7,622.23
Code	Net Total	Tax Rate	Tax Amount	VAT (£)	£ 0.00
O	£ -7,622.23	0%	£ 0.00	Grand Total (£)	£ -7,622.23

Bank Name Royal Bank of Scotland Group
 Sort Code 60-70-80
 Account Number 10018522
 Account Name ESC Op Cost Receipt

 Electricity Settlements Company Ltd
 Fleetbank House, 2-8 Salisbury Square, London EC4Y 6JX
 T: +44 (0)20 7211 8881
 www.electricitysettlementscompany.uk

Electricity Settlements Company Ltd, Company Number 898 6391
 Registered office: Fleetbank House, 2-8 Salisbury Square, London EC4Y 6JX. Registered in England and Wales

This invoice / credit note is issued under the Electricity Capacity Regulations 2014 (as amended).

19. Appendix 3 – Worked Example of Penalty Rate calculations

High Level Steps

For each Relevant Settlement Period (RSP) in which a System Stress Event occurs, we carry out the following high-level steps:

1. Calculate a weighted period Penalty Rate (PR_{ij}) based on all of the capacity obligations (be they original Auction Awarded AACO or Physically Traded PTCO) held by the CMU (i). This is multiplied by the excess of Adjusted Load Following Capacity Obligation ($ALFCO_{ij}$) over adjusted net output (AE_{ij}) to establish the Settlement Period Penalty (SPP_{ij}).
2. These SPP_{ij} 's are summed to give the total settlement period penalty (SP_{ij}). We also find the maximum for this quantity ($MaxSP_{ij}$), where we take the under-delivered volume exactly equal to $ALFCO_{ij}$.
3. Based on the mix of obligations held, we calculate the Annual Penalty Cap (APC_{ij}) and Residual Monthly Capacity Payment ($RMCP_{ij}$). The APC_{ij} is used to find the annual penalty cap "headroom" (Q_{ij}) taking into account previous monthly penalty amounts.
4. SP_{ij} , $MaxSP_{ij}$ and $RMCP_{ij}$ are used to find the CMU Monthly Penalty Cap (MPC_{ij}). This is then used to apply that monthly penalty cap (P_{ij}).
5. Taking P_{ij} and Q_{ij} , we consider the number of settlement period penalties to date to determine if we use P_{ij} or the minimum of P_{ij} and Q_{ij} for the penalty amount for the settlement period ($SPPSA_{ij}$). In the last relevant settlement period, this becomes the monthly penalty amount ($MPSA_{im}$) that is apportioned to the Capacity Provider ($aMPSA_{im}$). Otherwise the calculations are repeated.
6. During each relevant settlement period, we also calculate the Apportioned Penalty Amounts ($ASPPA_{ijN}$) which are then used to find the agreement monthly penalty caps (MPC_{ijN}), and filter through to the next settlement period for the CMU monthly penalty cap (MPC_{ij}).

The below worked example will illustrate how a penalty charge is calculated in detail.

Worked Example

For each relevant settlement period in which a System Stress Event occurs, we calculate a weighted period penalty rate (PR_{ij}) based on all of the agreements held by the CMU. The penalty rate is multiplied by the excess of $ALFCO_{ij}$ over adjusted net output (AE_{ij}) to establish the settlement period penalty (SPP_{ij}).

For example:

- Individual Capacity Obligation 1 (ICO_{ij1}): **10MW**
- Individual Capacity Obligation 2 (ICO_{ij2}): **20MW**

- Price of obligation 1 (PE_{1x}): **£18,000**
- Price of obligation 2 (PE_{2x}): **£20,000**

Calculation

Step 1: Determine the Penalty Rate for each obligation

$$PR1 = 18000 \div 24 = \text{£}750$$

$$PR2 = 21000 \div 24 = \text{£}875$$

Step 2: Combine penalty rates with respective obligations to find the weighted Penalty Rate for the settlement period

$$PR_{ij} = (PR1 \times ICO_{ij1} + PR2 \times ICO_{ij2}) \div (ICO_{ij1} + ICO_{ij2})$$

$$= (750 \times 10 + 875 \times 20) \div (10 + 20)$$

$$= 25000 \div 30$$

$$= \text{£}833.33.$$



Figure 4: Settlement Period Penalty Calculation

All of the settlement period penalties in the month are summed, up to and including the period for which we are making these calculations. This gives the total settlement period penalty (SP_{ij}). This figure is cumulative for the month, in that subsequent figures include previously summed settlement period penalties. We also calculate a variant of this quantity whereby the undelivered volume is exactly equal to ALFCO_{ij}, in which case we get a maximal for the total settlement period penalties (MaxSP_{ij}).

Based on the mix of obligations held by the CMU, we determine the residual monthly capacity payment (RMCP_{ij}), as well as the annual penalty cap (APC_{ij}) for the settlement period.



Figure 5: Residual Monthly Capacity Payment Calculation



Figure 6: Annual Penalty Cap Calculation

For example:

- Annual Capacity Payment for AACO (ACP_{Nx}): **£200,000**
- Annual Capacity Payments for PTCO₁ (tACP₁): **£50,000**
- Annual Capacity Payments for PTCO₂ (tACP₂): **£20,000**
- Annual penalty cap percentage for AACO and PTCO's (G_y / tG_y): **100%**
- Monthly penalty cap percentage for AACO and PTCO's (F_y / tF_y): **200%**
- Monthly weighting factor (WF_{mx}): **8%**
- Proportion of days PTCO₁ held (DT_{mN}/D_m): **10/30**
- Proportion of days PTCO₂ held (DT_{mN}/D_m): **5/30**

Calculation (RMCP_{ij})

Step 1: Determine the residual based on the AACO.

$$ACP_{ix} \times WF_{mx} \times F_y = 200000 \times 8\% \times 200\% = \text{£}32,000$$

Step 2: Determine the residual based on the PTCO's. At this step we could add all of the capacity payments for the PTCO's held, and multiply that total by the weighting factor and penalty cap percentage (as the penalty cap percentage has to date stayed the same for all auctions, so is the same for both AACO and PTCO). For the purposes of this example, they are done separately to reflect that they could vary in future.

$$tACP_1 \times WF_{mx} \times tF_y = 50000 \times 8\% \times 200\% = \text{£}8,000$$

$$tACP_2 \times WF_{mx} \times tF_y = 20000 \times 8\% \times 200\% = \text{£}3,200$$

Step 3: Combine the residual based on AACO and the residual based on the PTCO's.

$$RMCP_{ij} = 32000 + 8000 + 3200 = \text{£}43,200$$

Calculation (APC_{ij})

Step 1: Determine the cap based on the AACO.

$$ACP_{ix} \times G_y = 200000 \times 100\% = \text{£}200,000$$

Step 2: Determine the cap based on the PTCO's. These will have to be done individually since the proportion of days a particular PTCO is held may not be the same.

$$tACP_1 \times WF_{mx} \times tG_y \times DT_{m1}/D_m = 50000 \times 8\% \times 100\% \times 10/30 = \text{£}1,333.33$$

$$tACP_2 \times WF_{mx} \times tG_y \times DT_{m2}/D_m = 20000 \times 8\% \times 100\% \times 5/30 = \text{£}266.66$$

Step 3: Combine the caps based on AACO and PTCO's.

$$APC_{ij} = 200000 + 1333.33 + 266.66 = \text{£}201,599.99$$

Once we determine SP_{ij} , $MaxSP_{ij}$, $RMCP_{ij}$ and APC_{ij} , we use them alongside previous monthly penalty amounts and penalty apportionments to find the appropriate settlement period penalty settlement amount ($SPPSA_{ij}$).

To determine this, we consider a settlement period condition alongside the values of two quantities – P_{ij} and Q_{ij} .

- i. P_{ij} is the total settlement period penalties as a proportion of the maximal, scaled against the lesser of the monthly penalty cap (see below re MPC_{ij}) and maximal settlement period penalties and,
- ii. Q_{ij} is the annual penalty cap adjusted for previous monthly penalty amounts in the Delivery Year, up to (but not including) the month in which we calculate Q_{ij}

We calculate each of these, and then the following condition is considered:

Are there positive settlement period penalties (SPP_{ij}) in at least 48 relevant settlement periods of the Delivery Year, where at least 8 settlement period penalties occur in each of at least 6 months?

Based on the outcome of the condition, $SPPSA_{ij}$ takes the value:

- i. P_{ij} (if no) or
- ii. $\min(P_{ij}, Q_{ij})$ (if yes)

For example:

Table 5: Number of monthly Settlement Periods of Penalty (SPP_{ij})

Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Scenario 1	0	10	12	8	20	0	0	0
>=8/m		Y1	Y2	Y3	Y4			
Cum DYTD	0	10	22	30	50	50	50	50
Scenario 2	8	10	5	9	5	10	8	12
>=8/m	Y1	Y2		Y3		Y4	Y5	Y6
Cum DYTD	8	18	23	32	37	47	55	67

Table 5 presents the number of relevant settlement periods of penalty. In scenario 1, we have a total of 50 relevant settlement periods of penalty across the months October to May, whereas

scenario 2 has a total of 67 relevant settlement periods of penalty across the same months. Based on the condition for $SPPSA_{ij}$:

Scenario 1 would yield a value of P_{ij} in any of the above months we want to calculate the $SPPSA_{ij}$ for, since the 50 penalties only occur across the 4 months of November to February;

Conversely, scenario 2 would yield a value based on $\min(P_{ij}, Q_{ij})$ from the 8th relevant settlement period of penalty in May, because that is when the condition is met that there are 6 months where the number of relevant settlement periods of penalty are at least 8 (ie Oct, Nov, Jan, Mar, Apr, May). Although the cumulative for the Delivery Year To Date reaches 48 relevant settlement periods of penalty in April the second condition is not met in April.

For the last relevant settlement period in the month, $SPPSA_{ij}$ is the monthly CMU penalty amount ($MPSA_{im}$). We apportion this between CMU owners by multiplying each penalty amount by the proportion of time the CMU was held during the month ($aMPSA_{im}$). Finally the sum of all apportionments across the month determines the monthly Capacity Provider penalty ($MPSA_m$).

During the above process an apportioned settlement period penalty amount ($ASPPA_{ijN}$) is calculated (for each obligation) during each relevant settlement period based on $SPPSA_{ij}$, which is used in the next relevant settlement period to determine that period's agreement level penalty cap (MPC_{ijN}) and CMU monthly penalty cap (MPC_{ij}).

To find the $ASPPA_{ijN}$, distribute the calculated $SPPSA_{ij}$ across the Individual Capacity Obligations (ICO_{ijN}) held by the CMU. There are a number of steps involved:

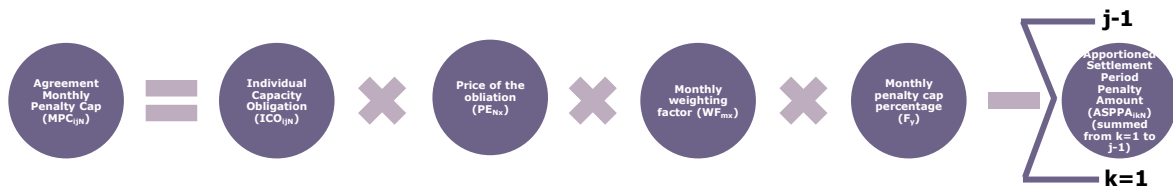
1. determine the amount of penalties to be apportioned (D) for the Relevant Settlement Period, the change in $SPPSA_{ij}$ since the previous Relevant Settlement Period, ie $SPPSA_{i(j-1)}$;
2. Order the obligations (ICO_{ijN}) by
 - a. descending Penalty Rate (PR_N) based on their cleared price,
 - b. If obligations have the same PR_N then order within those, latest first, by
 - i. Date Agreement (AACO) was awarded,
 - ii. Date Physical Trade (PTCO) is initially effective,
 1. For PTCO with the same initial effective date then by the date and time the PTCO request was received by the National Grid Delivery Body;
3. In calculation allocate D
 - a. to the first ranked obligation until the agreement penalty cap (MPC_{ijN}) is reached or the penalties to be apportioned (D) exhausted,
 - b. then allocate the remaining D to the next obligation as far as it allows,

- c. Continue doing this until D is exhausted or all of the obligations have met their agreement level penalty caps;
- 4. The amounts of D (SPPSA_{ij}) that have been allocated to each of the obligations represents the ASPPA_{ijN} for each obligation, and these ASPPA_{ijN}'s are used in the next (represented by the dashed lines in Annex 4) relevant settlement period to adjust the agreement monthly penalty cap (MPC_{ijN}) and CMU monthly penalty cap (MPC_{ij}).

Monthly penalties are capped at the individual agreement level as well as at the CMU level. The agreement monthly penalty cap and the CMU monthly penalty cap determine these.

The individual agreement monthly penalty cap (MPC_{ijN}) in Figure 7 is, in the first relevant settlement period of the month, found by multiplying the following 4 quantities together: individual capacity obligation (ICO_{ijN}), price of the obligation (PE_{Nx}), monthly weighting factor (WF_{mx}) and monthly penalty cap percentage (F_v). For all subsequent relevant settlement periods in the month we taking that product and then subtract the sum of all previous apportioned settlement period penalties (ASPPA_{ijN}) in the month. These apportionments relate to the particular agreement (N) for which we are calculating the agreement monthly penalty cap for.

Figure 7: Agreement Monthly Penalty Cap (MPC_{ijN})

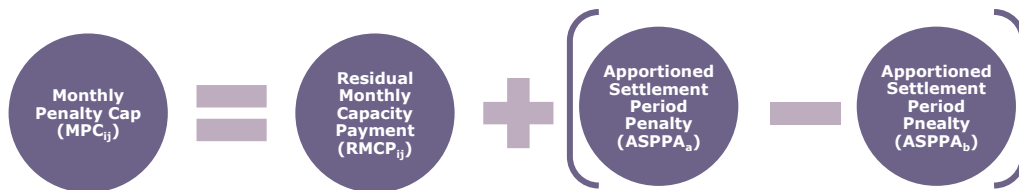


The CMU monthly penalty cap (MPC_{ij}) in Figure 8 is, in the first relevant settlement period of the month, the RMCP_{ij} that accounts for the mix of obligations held by the CMU during the relevant settlement period. Subsequent relevant settlement period CMU monthly penalty caps are determined by taking the RMCP_{ij} figure for the relevant settlement period, and adjusting this by the apportioned settlement period penalty amounts. This adjustment is as follows.

During the relevant settlement period j we would take the difference between:

- The sum of apportioned penalties for obligations held in periods prior to j, j-1 for settlement periods prior to j (ASPPA_a) and;
- The sum of apportioned penalties for settlement periods prior to j for obligations held both in period j and previous periods (ASPPA_b).

Figure 8: CMU Monthly Penalty Cap Calculation (MPC_{ij})



For example relevant settlement period (j):

- Residual Monthly Capacity Payment (RMCP_{ij}): £50,000
- Total of apportioned penalties across all previous settlement periods (1 to j-1) in the month, for obligations held in those periods (ASPPA_a): £10,000
- Total of apportioned penalties across all previous settlement periods in the month, for obligations still held in period j as well as in previous periods: £4,000

Calculation

$$\text{MPC}_{ij} = 50000 + (10000 - 4000) = \mathbf{£56,000}.$$

20. Appendix 4 – Worked Example of Capacity Cleared Price (CCP) Adjusted for Inflation

For T-4 Auctions the CCP is adjusted for inflation using the below formula:

$$PE_{ix} = CCP_i \times \frac{CPI_x}{CPI_{base}}$$

PE_{ix} is the price in pounds per MW at which capacity payments are payable

CCP_i is the Capacity Cleared Price

CPI_x is the average monthly CPI figures for the winter before the Deliver year (October '16 to April '17)

CPI_{base} is the average monthly CPI figures for the winter of the base year (October '14 to April '15) (Base year is defined in the Auction Parameters)

For example (using a fictional auction):

- Capacity Cleared Price from a T-4 auction: **£20,000/MW** Delivery Year: **17/18** Base year: **14/15**
- CPI_x: **101.9**
- CPI_{base} (Base Year is 14/15): 99.9

Month	Oct 16	Nov 16	Dec 16	Jan 17	Feb 17	Mar 17	April 17	CPI _x (average)
CPI	101.2	101.4	101.9	101.4	102.1	102.5	102.9	101.9

Month	Oct 14	Nov 14	Dec 14	Jan 15	Feb 15	Mar 15	April 15	CPI _{base} (average)
CPI ¹⁷	100.4	100.1	100.1	99.3	99.5	99.7	99.9	99.9

Capacity Cleared Price Adjusted for inflation: $(101.9/99.9)*20,000 = \mathbf{£20,412.02}$

¹⁷ All CPI values are available from the ONS website

<https://www.ons.gov.uk/economy/inflationandpriceindices/datasets/consumerpriceinflation>



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