Making a positive difference for energy consumers

CUSC Connection and Use of System Code (CUSC) Modification Proposal (CMP) 393: Using Imports and Exports to Calculate Annual Load Factor for Electricity Storage (CMP393)

Decision	The Authority[1] has decided to reject[2] this modification
Target audience	National Grid Electricity System Operator (NGESO), Parties to the CUSC, the CUSC Panel and other interested parties
Date of publication:	30 September 2024
Implementation date:	N/A

Background

Transmission Network Use of System ("TNUoS") charges recover the annual cost of the provision, maintenance, and upgrade/expansion of the electricity transmission system. TNUoS charges are levied on both generators and demand users. Generator TNUoS is comprised of a local charge, dependent on the specific assets connecting a generator to the Main Integrated Transmission System ("the MITS"), which constitutes the 'meshed' network utilised by all electricity generators and consumers); and a wider tariff which recovers the costs of the MITS. The generation wider tariff is calculated depending on the generator classification. Three different classifications exist, Intermittent (e.g. Wind, Tidal, Solar), Conventional Low Carbon (e.g. Nuclear, Hydro) and Conventional Carbon (e.g. Coal, Combined Cycle Gas Turbine, Biomass, Pumped Storage, Batteries).

The wider tariff is made up of four parts:

[1] References to the "Authority", "Ofgem", "we" and "our" are used interchangeably in this document. The Authority refers to GEMA, the Gas and Electricity Markets Authority. The Office of Gas and Electricity Markets (Ofgem) supports GEMA in its day to day work. This decision is made by or on behalf of GEMA.
[2] This document is notice of the reasons for this decision as required by section 49A of the Electricity Act 1989.

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1. Peak Security: Locational element that relates to cost driven by generators using the system at peak times. Under this background, the costs of Average Cold Spell (ACS)[3] demand are met only by conventional plant.
2. Year Round Shared: Locational element that represent the proportion of transmission network costs shared with other zones. Under this background, the costs of Average Cold Spell demand are met by a mix of conventional plant and intermittent generation.
3. Year Round Not Shared: Locational element that represents proportion of transmission network costs specific to that zone.
4. Generator Adjustment: A flat rate non-locational adjustment tariff to ensure that the generation tariffs are compliant with (retained) EC Regulation 838/2010 may be applied. [4]

On 25 July 2014, we approved CMP213[5] which introduced the Peak Security and Year Round elements to recognise that different types of generators impose different costs on the network. This means that only conventional generators are charged the former but all generators, including intermittent, are subject to the latter. CMP213 also introduced the concept of an Annualised Load Factor (ALF) for generators, an average of their load factor for the last five years. In the Year Round background, it is assumed that any two generators may generate independently, which reduces the need for reinforcement. Assets should therefore pay in proportion to their average generation, by way of Annual Load Factor ("ALF") which is applied to the wider tariff calculation.

When the sharing methodology was developed during Project TransmiT[6], a simple model of constraint costs was created. It studied how the incremental constraint cost due to additional capacity changed as renewable deployment increased. Where there are high concentrations of, for example, wind generation, output will be correlated. This means that during periods of network constraint, wind assets generate more than their average generation.

[3] NGESO ACS Methodology 2022.pdf (emrdeliverybody.com)
[4] Commission Regulation (EU) No 838/2010 of 23 September 2010 on laying down guidelines relating to the inter-transmission system operator compensation mechanism and a common regulatory approach to transmission charging (Text with EEA relevance) (legislation.gov.uk)
[5] Project TransmiT Decision on proposals to change the electricity transmission charging methodology.pdf (ofgem.gov.uk)
[6] Project TransmiT was an independent and open review of electricity transmission charging. The project's aim was to ensure arrangements are in place to support the move to a low carbon energy sector whilst continuing to provide safe, secure and high quality network services at value for money to consumers.

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On 15 September 2017, we approved CMP268[7], which introduced a new 'Conventional Low Carbon' category to the charging methodology. Under CMP 268, renewables must pay the full non-shared element without ALF adjustment to reflect the chance of correlated generation during this background. For the Conventional Carbon category, the Year Round Shared and Year Round Not Shared ("YRNS") elements of the charge are multiplied by an ALF, reflecting the export of the asset averaged across a year.

For the first five years of an asset's operation, a generic ALF is used based on the technology type. After five years a generator specific ALF is calculated by taking the last five years of load factor data, removing the highest and lowest value and calculating the mean of the three remaining values. Generic ALF is used to fill in any missing data, calculated from the 10 most recently commissioned generators of each type, where available. The current methodology can be found in section 14.15.101 – 14.15.114 of the CUSC.

All ALF calculations currently only account for Gross Generation Volumes. This includes battery or pumped hydro storage asset, which can import and export energy, but only the export of energy is considered when calculating their ALF.

The modification proposal

Zenobe (the "Proposer") raised Connection and Use of System Code (CUSC) Modification Proposal CMP393[8] (the "Proposal") on 9 June 2022, to change the TNUoS charging arrangements for electricity storage. CMP393 seeks to alter the definition of Annual Load Factor (ALF) for electricity storage to reflect how storage assets can import power, as well as export it.

Here, '*electricity storage*' refers to all storage (i.e. pumped and battery) that has booked Transmission Entry Capacity (TEC)[9] As other storage technologies connect to the National Electricity Transmission System (NETS), their inclusion is anticipated by the Proposer.

The CMP393 proposes to introduce a new term, *Gross Demand Volume.* The proposed change would see the ALF calculated by subtracting net energy imports from net exports.

[7] CMP268 Authority Decision Letter (ofgem.gov.uk)
[8] CMP 393 Final Proposal: download (nationalgrideso.com)
[9] TEC is the maximum permitted MW capacity a generator can export.

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In many cases, storage assets will import more energy than they export, due to losses in the system known as the "round trip efficiency". Most storage technologies have a round trip efficiency of less than 100% meaning they lose some energy during cycle of charging and discharging.

If an asset imports more energy across a year than it exports, it could result in a case where the ALF calculation would be negative, resulting in assets being paid a credit for that component of the wider charge. To prevent this outcome, the value of the ALF has been floored at zero in the proposed methodology.

The Proposer considered that CMP393 would better facilitate Applicable CUSC Objectives (ACOs) (a), (b) and (c), with a neutral impact on the remaining objectives, stating that this change would result in the TNUoS charging methodology more accurately reflecting how storage assets interact with the NETS.

CUSC Panel[10] recommendation

The CUSC Panel (the "Panel") met on 31 May 2024 and voted on CMP393 against the ACOs. Six out of nine of the Panel members considered that CMP393 better facilitated the ACOs than the existing provisions within the CUSC (the 'Baseline'), and therefore recommended its approval. However, some Panel members highlighted significant specific concerns during the voting, in particular that this change would reward storage assets for operational actions (already provided for in balancing services and included in the Balancing Mechanism) within TNUoS charging, and therefore there was a risk of double counting. Further details on the views of the Panel members are set out in the Final Modification Report (FMR)[11].

Technical analysis

The Proposer engaged consultancy Lane Clark Peacock (LCP) to undertake analysis and evaluate the wholesale market behaviour of battery and pumped storage using both historical data and simulations of future dispatch during periods of constraint on the B6 transmission network boundary, located between the transmission licence areas of SP Transmission and National Grid Electricity Transmission. All modelling results are based

[10] The CUSC Panel is established and constituted from time to time pursuant to and in accordance with section 8 of the CUSC.

[11] Final Modification Report: download (nationalgrideso.com)

on the behaviour of assets before any actions have been taken to manage constraints, such as redispatch in the Balancing Mechanism.[12]

The analysis indicates that storage behaviour is not strongly correlated with constraints. The forward-looking analysis shows that storage behaviour after wholesale dispatch during periods of B6 constraint is split across charging and discharging, with a preference towards import (charging). The Proposer argues that this demonstrates that the proposed CMP393 storage ALF achieves the aims of ALF (and by extension, the ACOs) better than the baseline arrangements. We consider this argument later in this letter.

Our decision

We have considered the issues raised by the modification Proposal and the FMR dated 17 June 2024. We have also considered and taken into account the responses to the industry consultation on the Proposal which are attached to the FMR. We have concluded that:

- Implementation of the Proposal will not better facilitate the achievement of the ACOs;[13] and
- Directing that the modification be made would not be consistent with our principal objective and statutory duties.[14]

Reasons for our decision

We consider that the Proposal will not better facilitate any of the ACOs, and will have a negative impact on objectives (a) and (b) and neutral impact on all other relevant objectives.

Our view on the technical analysis:

We consider there are some limitations to the analysis undertaken. It is limited in scope to investigate only the B6 boundary. No consideration is given on how this modification would affect storage operators located in the South-East in areas dominated by synchronous

[12] The balancing mechanism is an open auction used by the Energy System Operator to balance supply and demand in the electricity system after closure of the wholesale market, close to real time.
[13] As set out in Standard Condition C5(5) of NGESO's Transmission Licence, see: https://epr.ofgem.gov.uk//Content/Documents/Electricity%20transmission%20full%20set%20of%20consolidated%20standard%20licence%20conditions%20-%20Current%20Version.pdf
[14] The Authority's statutory duties are wider than matters which the Panel must take into consideration and are detailed mainly in the Electricity Act 1989 as amended.

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generation. No examples are given for effect on generator tariffs per zone or other constrained boundaries beyond the B6 boundary. While this limitation is driven by a lack of data on other network boundaries and covers the most commonly used example of system constraints, it does not provide a full and clear picture of the system wide impacts of storage assets and therefore the full picture of the impact of this change. Furthermore, the historical data presented during B6 constraint is based on a small number of assets and sample hours – some assets removed due to Balancing Mechanism investigations and fines. In addition, the analysis makes use of only a small number of sample hours due to COVID peaks.

Our assessment against the ACOs:

(a) that compliance with the use of system charging methodology facilitates effective competition in the generation and supply of electricity and (so far as is consistent therewith) facilitates competition in the sale, distribution and purchase of electricity;

The Proposer states that the amendments to the transmission charging methodology for battery storage and pumped storage as part of CMP393 will ensure that the charging methodology better reflects how storage assets interact with the NETS. They consider that this will remove a barrier to entry, better incentivising storage operators to compete to connect and provide system balancing services, which will facilitate competition in the generation of electricity.

However, the Panel views were mixed, with five of the nine believing the Proposal better facilitates ACO (a), highlighting that this would provide a more accurate economic signal for storage, therefore improving competition. Those finding the Proposal positive also stated that by reducing the costs for storage in some locations it would encourage and facilitate further competition in the energy market. Among the responses from Panel members who found this modification to be negative or neutral against ACO (a) questioned the cost reflectivity of the locational signal and considered that the Proposal would result in a potential unfair advantage for storage technologies when compared to other forms of generation, with a risk of double counting system benefits within TNUoS charges that are already rewarded in the Balancing Mechanism (BM)[15].

[15] The balancing mechanism is an open auction used by the Energy System Operator to balance supply and demand in the electricity system after closure of the wholesale market, close to real time.

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We consider that other large demand users can also help the system by turning up or down in response to system constraints. While storage assets may operate differently to other conventional carbon technologies, current TEC types are designated solely with regard to the flexibility of dispatch of an asset, resulting in storage being classified as Conventional Carbon. We believe that this modification could result in storage receiving undue advantage when compared with other technology types, by reducing their charges, providing an impediment to fair competition within the market. This distortion could also result in storage receiving an undue advantage over other forms of flexible demand such as Demand Side Response which could also help during system constraints.

While the technical analysis provided suggests that there is a balance between storage assets importing and exporting during system constraints, it is not clear that those actions would be beneficial to the system at that time. We consider established market mechanisms such as the BM are an appropriate method by which to reward flexible responses that benefit the system at times of constraint. Rewarding all storage assets through lower TNUoS charges for operational actions that may or may not further contribute to constraints could potentially double count these payments or even reward assets for actions that have little or no impact on system constraints. Therefore, we conclude that CMP393 would result in a negative outcome for ACO (a).

(b) that compliance with the use of system charging methodology results in charges which reflect, as far as is reasonably practicable, the costs (excluding any payments between transmission licensees which are made under and accordance with the STC) incurred by transmission licensees in their transmission businesses and which are compatible with standard licence condition C26 requirements of a connect and manage connect)

The Proposer considers that this modification will result in more cost-reflective charges by ensuring that the transmission charging methodology reflects how battery storage and pumped storage assets import power from the NETS, as well as exporting it. As a result, they consider that charges will better reflect the impacts of electricity storage on the NETS. The Proposer states that the methodology was last updated in 2014 and was not designed with battery storage specifically in mind. As a result of this, it does not currently fully reflect the way electricity storage interacts with the NETS and that this modification will help to rectify this.

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Five out of nine panel members found the proposal to be positive with regard to ACO (b). They believe the change to the methodology better reflects the ability of storage to act as both demand and generation. However, several Panel members acknowledged this solution is still an imperfect representation of the impact of storage on the network but represents a marginal improvement to the status quo and therefore considered the modification to better facilitate ACO (b). Those panel members who found the modification to be neutral or negative against ACO (b) highlighted that while there are issues with the existing methodology, this Proposal is not a material improvement when compared to the baseline.

One panel member highlighted that by netting off generation and demand volumes, it would be expected that a storage ALF would be close to zero, inferring that storage requires no network capacity at all, which they believed to be logically untrue. In addition, the Panel also highlighted that this modification would require the existing Transport and Tariff model (used to calculate TNUoS charges) to take account of system constraints, which it was not designed to do. They stated that there are already established mechanisms for separately addressing these costs. The issue of double counting was also addressed within this context, highlighting the inappropriateness of a storage asset being rewarded in both the TNUoS methodology and the Balancing Mechanism for the same actions taken to address constraints.

Our view

The ability of storage assets to both import and export may have material impact on the cost of maintaining and developing the transmission system, but the proposed solution would result in most battery storage and pumped hydro plants having their ALF set at, or close to, the proposed floor of zero and, therefore the Year Round components of their TNUoS charges also at, or close to zero. This would imply they have no impact on the long run expansion costs of the transmission network. We consider that storage, although unique in its characteristics as an import and export asset, still requires network capacity to be built and therefore the associated infrastructure costs should be reflected in its charges.

CMP393 attempts to reflect operational behaviours of storage and its potential to mitigate system constraints through its operational behaviour. This modification would reward storage based on how it operates as opposed to the costs it confers on network investment. We have been clear on the role of TNUoS as a long run investment signal which represents the transmission investment triggered by storage Year Round operation, not its operational behaviour. We continue to believe that TNUoS is not the appropriate place to reflect

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operational behaviour of assets and that signals sent through TNUoS should solely seek to influence the investment decisions of system users and not real-time operation.

In addition, we would expect storage to charge and discharge in a symmetrical manner. Reflecting the co-incidence of this action with constraints is rewarding an operational mechanism for something that storage derives benefit from the market anyway (i.e. price arbitrage). This along with any participation in the BM could result in double counting, by rewarding assets for operational behaviour in multiple places. As such, we conclude that CMP393 would result in a negative outcome for ACO (b).

(c) that, so far as is consistent with sub-paragraphs (a) and (b), the use of system charging methodology, as far as is reasonably practicable, properly takes account of the developments in transmission licensees' transmission businesses

The Proposer believes that this modification will ensure that the transmission charging methodology responds to the accelerating deployment of storage in the NETS. They state that the methodology was last updated in 2014 and was not designed with battery storage specifically in mind but that since this point the amount of electricity storage, and in particular battery storage, connecting to the NETS has increased substantially. Their argument is that this modification will help to ensure that energy storage is better represented in the transmission charging methodology.

The majority of the Panel found the Proposal to be positive and a further two found it to be neutral with respect to ACO (c), with one member finding it to be negative when compared to the baseline. Panel members highlighted that a reduction in overall TNUoS costs for storage would facilitate greater deployment of storage and help to alleviate constraints on the transmission network.

Our view

The TNUoS charging methodology was not designed to consider whether import/export behaviour is balanced at operational times, it considers and signals what capacity on the network must be built to accommodate each asset as a long run investment signal.[16] Operational mechanisms fall to the market, but this modification would also include such operational signals within TNUoS charges. We believe this Proposal to be negative in this regard, as it would send a distorted locational investment signal by including these operational consideration in the signal sent by TNUoS.

[16] Open letter on strategic transmission charging reform | Ofgem

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As part of the Workgroup, analysis was conducted by the NGESO on the impact of this code modification on generator TNUoS tariffs for storage. This showed it would lower charges for storage projects located in the north with increased charges for southern projects. We are concerned the changes to costs for system user will not reflect the way Transmission Operators will be required to develop the network to accommodate these users. It is not clear, with the evidence provided to date (that is limited to only the B6 boundary when demonstrating the stated benefits), that northern storage projects would require relatively less network build/reinforcement works than equivalent southern projects. Therefore, we conclude that CMP393 would be neutral with respect to ACO (c).

Electricity storage TNUoS subgroup

We recognise there is an opportunity to review the existing charging arrangements with respect to the treatment of storage and the wider system costs reflected in the methodology. To that end, we announced in February 2024 that the NGESO would be launching an industry subgroup to review the treatment of storage in the methodologies with the focus of improving the accuracy of the investment signal sent to storage providers and encourage more beneficial siting decisions. We encourage stakeholders to engage in this group and the ongoing discussion around appropriate handling of storage in the TNUoS methodology.

Decision notice

In accordance with Standard Condition C10 of the Transmission Licence, the Authority has decided that modification proposal CMP393*: Using Imports and Exports to Calculate Annual Load Factor for Electricity Storage* should *not* be made.

Harriet Harmon
Head of Electricity Transmission Charging,
Energy Systems Management & Security

Signed on behalf of the Authority and authorised for that purpose

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