CUSC Modification Proposal Form

CMP393: Using Imports and Exports to Calculate Annual Load Factor for Electricity Storage

Overview: This modification proposes to alter the definition of Annual Load Factor with respect to electricity storage, taking into account imports as well as exports. Here, 'electricity storage' refers to all storage that has booked Transmission Entry Capacity (i.e., pumped and battery).

Modification process & timetable

1. **Proposal Form**
   09 June 2022
2. **Workgroup Consultation**
   3 October 2022 to 24 October 2022
3. **Workgroup Report**
   19 January 2023
4. **Code Administrator Consultation**
   1 February 2023 to 22 February 2023
5. **Draft Final Modification Report**
   23 March 2023
6. **Final Modification Report**
   12 April 2023
7. **Implementation**
   01 April 2024

Status summary: The Proposer has raised a modification and is seeking a decision from the Panel on the governance route to be taken.

This modification is expected to have a: High impact

Storage Operators, Generators, Transmission Owners, ESO, Parties Liable for TNUoS

Proposer's recommendation of governance route	Standard Governance modification with assessment by a Workgroup	
Who can I talk to about the change?	**Proposer:** Robert Newton robert.newton@zenobe.com 07342 169677	**Code Administrator Contact:** Paul Mullen Paul.j.mullen@nationalgrideso.com 07794537028

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What is the issue?

The Transmission Network Use of System (TNUoS) charging methodology currently includes battery storage and pumped storage in the 'Conventional Carbon' generation classification. As such, battery storage and pumped storage assets face the Conventional Carbon generation tariff: Peak + (Annual Load Factor [ALF] x year-round shared) + (ALF x year-round not shared) + generation adjustment.

Using only output to calculate ALF for pumped storage and battery storage does not reflect how storage assets can import power, as well as export it. Consequently, the TNUoS methodology does not accurately reflect how storage assets interact with the National Electricity Transmission System (NETS).

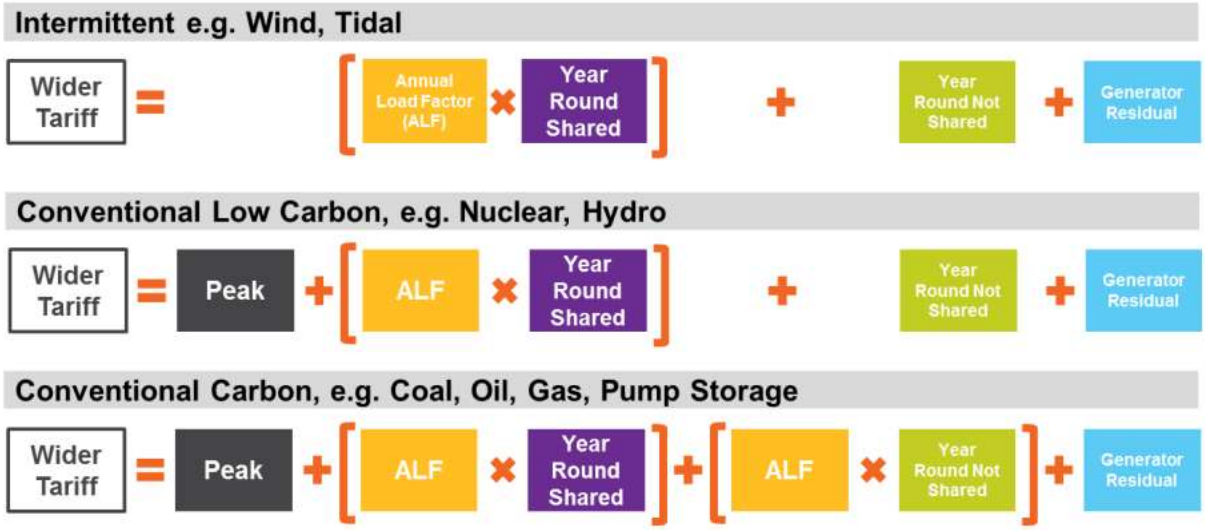

Figure 1: TNUoS Generation Classifications. See *TNUoS Guidance for Generators* (National Grid ESO, 2019), <https://www.nationalgrideso.com/document/138046/download>, p. 11.

For the purposes of transmission charging and ALF, battery storage is considered as pump storage.[1]

Why change?

In the view of the Proposer, current TNUoS charging arrangements for electricity storage are inconsistent with the CUSC Applicable Charging Objectives (ACOs).[2] The TNUoS methodology does not reflect how storage assets import, as well as export, power. As a result, the methodology provides storage operators with an inaccurate economic signal that creates a barrier to entry, inhibiting effective competition. Charges are not cost-reflective, as they do not fully reflect how storage interacts with the NETS. Nor do charges take account of developments in transmission licensee business, as they do not reflect the increasing amount of storage connecting to the NETS.

In the view of the Proposer, storage operators should face a tariff that aligns more closely with the CUSC Applicable Charging Objectives. The tariff should incentivise effective competition in the storage sector, reflect the value of storage to transmission licensees, and take account of new strategic, market and technological developments.

[1] See *Final Annual Load Factors for 2022/23 TNUoS Tariffs* (National Grid ESO: 2022), <bit.ly/3xzSwed>, pp. 10, 14, 17.
[2] By 'electricity storage' the Proposer refers to all storage that currently has booked Transmission Entry Capacity (i.e., pumped and battery).

We have organised our response this section under the following subheadings:

1. Changes in Licensee Business
2. Effective Competition
3. Value to Transmission Licensees
4. Interaction with Wider Work on TNUoS

The Proposer has engaged Cornwall Insight to model the effects of increased storage deployment behind constraint boundaries on curtailment and network reinforcement costs. Cornwall Insight also modelled how the proposed Code Modification would affect generator TNUoS costs. The results of the modelling are summarised in an annex ('Annex 1').

1. Changes in Licensee Business

The last substantial updates to the transmission charging methodology took place in 2014, as part of Project TransmiT. Ofgem introduced a new 'Intermittent' generation classification for renewables, and split TNUoS tariffs into 'Peak' and 'Year Round' components. They chose to adjust the Year Round component by ALF to provide 'a proxy of the impact an individual generator has on the costs of a system when investment is planned to manage constraint costs'.[3] Here, ALF is calculated based on output, and no consideration is given to input. As a result, the methodology results in an inaccurate proxy of the impacts of individual storage assets on constraint costs.

Since 2014, the amount of intermittent renewable generation connected to the NETS has increased substantially, and the system need for storage has intensified. The market has responded to this need, with numerous storage operators working to integrate renewables into power networks. Other than the 2019/20 addition of battery storage to the Conventional Carbon generation classification, transmission charging regulation has not adapted to the accelerating deployment of storage.[4] As a result, tariffs are based on inaccurate and outdated assumptions.

In 2013, National Grid Electricity Transmission undertook modelling to provide quantitative evidence of the impacts of implementing the Project TransmiT proposals. The results of this modelling substantially influenced the decision to implement TransmiT. The modelling did not consider the possible impacts of battery storage deployment on the electricity system.[5] Since the Project TransmiT changes were implemented, the UK landscape for electricity storage has changed considerably. The 2014 T-4 Capacity Market auction saw 2699MW of awarded capacity for storage, with the majority provided by pumped storage.[6] The 2022 T-4 auction saw 2527MW awarded to pumped storage, and 1093MW awarded to battery storage.[7] In light of these changes, there is a need to update the charging methodology to maximise the positive system impacts of storage, and of battery storage in particular.

The ESO, Ofgem, and BEIS have all published strategies and scenarios emphasising the strategic need for flexibility in an increasingly non-synchronous power system. The ESO is amending its generation background, or Connection Planning Assumptions (CPA),

[3] *Project TransmiT: Decision on proposals to change the electricity transmission charging methodology* (London: Ofgem, 2014), p. 13.
[4] See *Final TNUoS Tariffs for 2019/20* (National Grid ESO: 2019), p. 13.
[5] See 'Project TransmiT: Impact Assessment of industry's proposals (CMP213) to change the electricity transmission charging methodology', Ofgem, (137/13, 2013), <bit.ly/3x4HNH2>.
[6] *Final Auction Results: T-4 Capacity Market Auction 2014* (National Grid, 2014).
[7] *Final Auction Report: 2021 Four year ahead Capacity Auction (T-4)* (National Grid ESO, 2022).

modelling to take account of the net positive effects of storage in constrained renewable power systems in worst-case conditions. In the view of the Proposer, the current generation transmission charging methodology is outdated and it contradicts current objectives and developments.

2. Effective Competition

In the view of the Proposer, the current methodology unduly discriminates against storage. The Conventional Carbon generation classification is for technologies that are controllable, that can easily increase and decrease their output, and that are likely to be exporting at peak times.[8] This description does not fully capture the capabilities of storage technologies, which can import as well as export power. As Ofgem observed in justification of their decision to introduce a new tariff for intermittent generation, discrimination can arise from 'unjustifiably treating different cases alike', and different asset classes should 'be treated differently according to the impact they have on the network'.[9] The current transmission charging methodology provides storage operators with a signal designed for coal or gas-fired generators, with ALF calculated based on output and not input. This does not accurately reflect how storage interacts with the NETS, and it does not incentivise storage operators to deploy in ways that would provide overall system benefits. The resulting barrier to entry inhibits effective competition of the storage sector in constraint regions.

3. Value to Transmission Licensees

Battery storage technologies are modular and have relatively short lead times, and so can rapidly deploy in strategic locations with the right economic incentives. Transmission charging must respond to the development of this strategically important new sector. Basing storage ALF on imports and exports would ensure that the TNUoS regime responds to the changing needs of the NETS. Amending generation tariffs for storage would remove a disincentivise hindering operators from deploying in generation-constrained locations, where their assets can alleviate constraints, reduce curtailment, and provide stability services. In the view of the Proposer, this would provide significant value to transmission licensees.

Storage operators provide active power services, alleviating network constraints by importing surplus electricity. This reduces the need for the ESO to pay generators to curtail their output, and it reduces the need for transmission licensees to invest in expensive network upgrades in response to the stresses that intermittent sources of generation in low-demand areas place onto the grid. Storage operators also provide a range of stability services, including short circuit level, inertia and reactive power. Accelerating deployment of storage in constrained areas would reduce reinforcement and curtailment costs, thus reducing the overall TNUoS cost for both generation and demand users. In turn, this would reduce costs for consumers while reducing energy wastage and driving progress to net zero. See Annex 1 for Cornwall Insight's modelling showing the results of the proposed modification on constraint costs and overall TNUoS costs.

4. Interaction with Wider Work on TNUoS

Work in this area could lead towards creating a separate generation classification for storage with respect to charging. That is not the purpose of this modification. Rather, the

[8] See *TNUoS Guidance for Generators* (National Grid ESO: 2019), p. 10.
[9] *Project TransmiT*, p. 18.

Proposer intends to focus on changing ALF calculation for storage within the current charging methodology.

Ofgem recently published draft terms of reference for the forthcoming TNUoS Task Force. This document sets out the terms of reference for the forthcoming Task Force charged with improving the present methodology, and conducting a longer-term review of the purpose and structure of TNUoS charges. While there is some overlap between this modification and the Task Force, the proposed changes are not explicitly in scope of the Task Force. Ofgem stated in a call for evidence on the Task Force that 'it is possible that other changes to the charging methodology [will be] implemented […] outside of the Task Force processes'.[10] This modification is therefore intended to achieve targeted change outside the scope of the Task Force process and through the standard governance procedure, in line with Ofgem's intention to 'move quickly'.[11] Ofgem has already shown it is prepared to move forward with storage-related 'quick win' modifications (CMP280, CMP281) alongside Significant Code Reviews on transmission charging. Furthermore, CMP315 / CMP375 will run alongside the TNUoS Task Force, setting a direct precedent for the proposed approach. As set out in Annex 1, Cornwall Insight's modelling shows the primary benefits of the proposed modification are in early years (2025-30), supporting use of the Standard Governance Procedure to achieve a 2024 implementation date.

The Proposer considers that this modification proposal does not conflict with the existing modification proposal CMP331 'Option to replace generic Annual Load Factors (ALFs) with site specific ALFs'. CMP331 seeks to amend the methodology to resolve a defined issue faced by new generators. It does not mention issues associated with ALFs and storage. The Proposer sees no reason why CMP393 and CMP331 could not be progressed separately.

What is the proposer's solution?

This modification proposes to alter the definition of ALFs with respect to storage. All storage that has booked TEC (i.e., pumped and battery, as currently defined) would face an ALF calculation based on net system usage, and not export only. As other storage technologies connect to the NETS, it is anticipated that they too will be included.

Storage technologies will face a TNUoS tariff with a bespoke Annual Load Factor (Storage ALF) calculation, taking into account imports as well as exports. It is proposed that the tariff will read: peak + (Storage ALF x year round shared) + (Storage ALF x year round not shared) + residual.

Baseline ALF = Gross Generation Volume (MWh) / TEC x 24 x 365

CMP393 Storage ALF = Gross Demand Volume (MWh) – Gross Generation Volume (MWh) / TEC x 24 x 365

Draft Legal Text

To be developed by the Workgroup.

[10] See Ofgem, 'TNUoS Call for Evidence: Next Steps', 25 February 2022, <bit.ly/3PShU5X>.
[11] See 'TNUoS Call for Evidence'.

What is the impact of this change?

Proposer's assessment against CUSC Charging Objectives	
Relevant Objective	**Identified impact**
(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;	**Positive** Our proposed amendments to the transmission charging methodology for battery storage and pumped storage will incentivise storage operators to compete to connect and provide system services in generation-constrained regions. This will facilitate competition in the generation of electricity by reducing curtailment and tackling constraints.
(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 connection);	**Positive** This modification will result in more cost-reflective charges. It will ensure that the transmission charging methodology reflects how battery storage and pumped storage assets import power from the NETS, as well as exporting it. In generation-constrained regions, this reduces curtailment and reinforcement costs for transmission licensees.
(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;	**Positive** This modification will ensure that the transmission charging methodology responds to the accelerating deployment of storage in the NETS. This is creating opportunities for innovative network reinforcement that can

	reduce costs for transmission licensees.
(d) Compliance with the Electricity Regulation and any relevant legally binding decision of the European Commission and/or the Agency *; and	**Neutral**
(e) Promoting efficiency in the implementation and administration of the system charging methodology.	**Neutral**
*The Electricity Regulation referred to in objective (d) is Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (recast) as it has effect immediately before IP completion day as read with the modifications set out in the SI 2020/1006.	

Proposer's assessment of the impact of the modification on the stakeholder / consumer benefit categories	
Stakeholder / consumer benefit categories	**Identified impact**
Improved safety and reliability of the system	**Positive** Removing barriers to entry for storage operators will make the network more balanced and secure, and less wasteful and carbon-intensive. It will also reduce operational costs by enabling more efficient management of intermittent electricity flows in constrained regions. Storage assets provide a range of stability services, such as reactive power, short circuit level, and inertia. The proposed modification will enable more targeted and effective provision of these services, resulting in a safer and more reliable energy system.
Lower bills than would otherwise be the case	**Positive** The evolving nature of the electricity system is incentivising the ESO to provide a flexible transmission system, particularly as the move towards net zero will continue to locate renewable generation in areas of low demand. This modification proposal would remove a disincentivise for storage to locate in constrained areas of the transmission system, thereby avoiding the transmission investment that would otherwise be required to meet the provision of enhanced renewable generation. The costs of traditional transmission investment are ultimately passed on to consumers. By reducing the need for new transmission investment, this modification will drive lower bills for consumers in the long term. •
Benefits for society as a whole	**Positive**

	Government policy requires an electricity system that will help to deliver net zero. Encouraging the deployment of storage in constrained areas of the transmission system (areas that seem to be destined to become further constrained) will facilitate the move to net zero. This modification will result in reduced reinforcement costs for TOs and reduced curtailment costs for the ESO, in turn reducing costs for consumers. It will also result in less waste of electricity through curtailment, driving the more efficient use of renewable energy. This modification supports long-term Government aims to provide cheap, abundant renewable electricity. It will facilitate Government policy and accelerate the move to net zero.
Reduced environmental damage	**Positive** This modification will result in reduced environmental damage by: - Accelerating the decarbonisation of the GB energy system, mitigating climate crisis and driving progress to legally-binding net zero goals. - Enabling the more efficient use of renewable energy by mobilising flexibility to avoid curtailment and manage constraints.
Improved quality of service	**Positive** This modification would support the development of a thriving renewable energy economy in Scotland (Great Britain's most generation-constrained region) and more widely in GB. It would result in better integration of renewable generation into the GB energy system and send a strong signal incentivising investment in electricity storage. This, in turn, will drive creation of green jobs and zero-carbon industrial and economic development.

When will this change take place?

Implementation date
1 April 2024

Date decision required by
1 October 2023

Implementation approach
There are ESO process impacts in tariff setting and potential system impacts on the Transport and Tariff model.

Proposer's justification for governance route
Governance route: Standard Governance modification with assessment by a Workgroup

The Proposer has selected the Standard Governance route as the proposed modification is likely to have an impact on parties connecting to the NETS.

Interactions

☐Grid Code ☐European Network Codes	☐BSC ☐ EBR Article 18 T&Cs[12]	☐STC ☐Other modifications	☐SQSS ☐Other

None identified

Acronyms, key terms and reference material

Acronym / key term	Meaning
ALF	Annual Load Factor
BSC	Balancing and Settlement Code
CMP	CUSC Modification Proposal
CUSC	Connection and Use of System Code
EBR	Electricity Balancing Regulation
ESO	Electricity System Operator
NETS	National Electricity Transmission System
STC	System Operator Transmission Owner Code
SQSS	Security and Quality of Supply Standards
T&Cs	Terms and Conditions
TEC	Transmission Entry Capacity
TNUoS	Transmission Network Use of System charges

Reference material

- Annex 1 – Cornwall Insight modelling results.

[12] If your modification amends any of the clauses mapped out in Exhibit Y to the CUSC, it will change the Terms & Conditions relating to Balancing Service Providers. The modification will need to follow the process set out in Article 18 of the Electricity Balancing Guideline (EBR – EU Regulation 2017/2195) – the main aspect of this is that the modification will need to be consulted on for 1 month in the Code Administrator Consultation phase. N.B. This will also satisfy the requirements of the NCER process.