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CMP393 supporting analysis

Zenobe

DECEMBER 2023

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Overview of CMP393

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Overview of CMP393

CMP393 proposes using both imports and exports to calculate ALF for electricity storage, floored at zero

The treatment of storage in TNUoS warrants review

The most recent significant overhaul to TNUoS charges took place in 2014, in Project TransmiT. In 2014, there were no battery assets connected to the transmission network, but since then over 1GW of battery capacity has connected at transmission level with a further 2GW at distribution level.

Battery storage was first considered in TNUoS charging in 2019/20. The volume of battery storage is expected to continue to grow, providing ancillary services and managing the variability of renewable assets. So ensuring that the treatment of storage meets the Applicable Charging Objectives (ACOs) has become increasingly important.

Status Quo treatment of Storage

The TNUoS charging methodology currently includes battery storage and pumped storage assets in the 'Conventional Carbon' generation classification. Battery storage is therefore treated the same as CCGTs and Coal.

Assets' Annual Load Factor (ALF), which affects how transmission-connected assets are charged, uses the asset's exported generation only. If the metered output or FPN of the plant is negative (such as when storage imports), it is floored at zero for the calculation of ALF.

CMP393 proposes to alter the calculation of ALFs for pumped and battery storage to account for net system usage (i.e. imports and exports). The ALF would be floored at zero, so higher imports than exports would not result in a negative ALF to align with demand charges and not incentivise inefficient storage.

New modification proposals are evaluated against the Applicable CUSC Charging Objectives[1]:

Applicable Charging Objectives (ACOs)	Impact
(a) Facilitating competition	Positive
(b) Reflecting the costs incurred by Transmission Licensees	Positive
(c) Account for changes in Transmission Licensees' business	Positive
(d) Compliance with relevant regulations	Neutral
(e) Promoting efficiency in the implementation and administration of the system charging methodology	Neutral

Status Quo Storage ALF

$$\text{Status Quo Storage ALF} = \frac{\text{Gross Generation Volume (MWh)}}{\text{TEC (MW) x 24 x 365}}$$

CMP393 proposed Storage ALF

$$\text{CMP393 Storage ALF} = \frac{\max(0, \text{Gross Generation Volume (MWh)} - \text{Gross Demand Volume (MWh)})}{\text{TEC (MW) x 24 x 365}}$$

- Under CMP393, storage demand (import) would be included, and the storage ALF would include a floor at 0.

[1] CMP393 Final Proposal | NGESO

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Executive Summary

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Executive Summary

Our analysis shows that TNUoS charges under CMP393 would better meet the ACOs than the Status Quo

Case for Change – TNUoS charging and the treatment of storage

National Grid ESO's DCLF ICRP Transport and Tariff (T&T) model is designed to reflect the network reinforcements made by transmission licensees to enable new connections and maintain the security of the network.

The model reflects reinforcements for two network loading conditions, with adjustments for annual load factors (ALFs), to capture how different technologies' connections lead to network reinforcements. Currently, storage is treated as part of the conventional carbon generation classification, and its ALF is based only on exports.

Project TransmiT, the last substantial update to the methodology in 2014, did not consider the impact of battery storage. Therefore, the methodology needs updating to ensure that the principles of the TNUoS methodology, known as the Applicable Charging Objectives (ACOs), are met.

CMP393 proposes that changing the calculation of ALF for storage to reflect imports as well as exports would better facilitate the ACOs, making charges more cost-reflective, more competitive, and more reflective of changes to transmission licensees' business.

Our conclusion is that the treatment of storage within the TNUoS methodology needs review to ensure consistency with network planning assumptions and the principles of the TNUoS methodology.

Doing so would improve performance of the charging methodology against the ACOs.

Calculating Storage ALFs to meet the Applicable Charging Objectives

Documentation from Project TransmiT and the CUSC states that the ALF in the TNUoS charging methodology should be *'a proxy of the impact an individual generator has on the costs of a system'.*

Recently, NGESO updated their connection planning assumptions (CPAs) to reflect the growth in storage deployment and operation. The CPAs, which forecast transmission network reinforcements required by new connections, consider storage imports as well as exports. However, TNUoS has not yet been updated to reflect this.

We conclude that the storage ALF should be consistent with the assumptions under the CPAs, to reflect the costs incurred by transmission licensees for a new connection. This would include storage import and export during periods of highest network load.

CMP393 approximates behaviour during high network load (i.e. constraints) by applying a 'storage ALF' across all periods. If it can be shown that this approximation is reasonable, both now and in the future, then the CMP393 ALF would better meet the ACOs than the status quo. It would also follow that the ALF should apply to both the shared and non-shared components of year-round, as storage actions under current wholesale market signals do not respond directly to constraints.

The subsequent quantitative analysis in this report demonstrates that the CMP393 Storage ALF is consistent with the historic and future behaviour of storage assets during periods of network constraint.

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Case for Change – TNUoS charging and the treatment of storage

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CMP393 and the Applicable Charging Objectives

The TNUoS methodology needs review to ensure treatment of storage meets the ACOs

The Applicable Charging Objectives against which CMP393 has a positive impact are (a), (b) and (c), with neutral impacts on (d) and (e).

This section outlines where the current methodology does not achieve these objectives as motivation for reform and suggests how CMP393 improves performance against these objectives. The impact of CMP393 is explored in more detail later in this report.

(a) Facilitating competition

The Conventional Carbon generation classification (as used for storage) is for technologies that are controllable, can easily increase and decrease their output, and are likely to be exporting at peak times. 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, undue 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*'.[1]

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. Such a signal, which does not reflect how batteries use the transmission system, will hinder effective competition.

CMP393 would ensure that the characteristics of storage are more accurately reflected in the charging methodology to improve competition.

(b) Reflecting the costs incurred by Transmission Licensees

In order the reflect the costs incurred by Transmission Licensees, the transmission charging methodology should reflect how battery storage and pumped storage assets import power from the transmission system, as well as exporting it. Charges will then better reflect the impacts of electricity storage on the network reinforcements.

The methodology was last updated in 2014, and so it was not designed with battery storage in mind. As a result of this, it does not fully reflect the way electricity storage interacts with the transmission system, as it only considers export actions. **CMP393 would address this by including import actions too.**

(c) Accounts for changes in Transmission Licensees' business

The transmission charging methodology should respond to the accelerating deployment of storage in the transmission system and the measures taken by transmission licensees to connect these projects.

As already noted, the latest review of the methodology under TransmiT in 2014 did not consider that licensees would need to connect battery storage and how these assets operate.

While the charging methodology has not adapted, National Grid ESO have recently updated their Connection Planning Assumptions (CPAs, see Annex A for more detail). These provide a generation background against which reinforcements to enable new connections are assessed. This background considers both the export and import behaviour of storage in worst-case network conditions.

CMP393 will ensure that the TNUoS charging methodology remains aligned with how transmission licensees plan for new connections.

[1] Project TransmiT Impact Assessment of CMP213 options | Ofgem

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Project TransmiT (2014) – battery storage assumptions

The last significant update to TNUoS charging methodology did not consider grid-scale batteries

The last substantial update to the TNUoS methodology took place in 2014 as part of Project TransmiT with no grid-scale batteries connected

Project TransmiT's aim was to update the transmission charging methodology to accommodate low carbon generation. The supporting analysis did not consider the impact of large volumes of battery storage – instead only considering pumped storage.

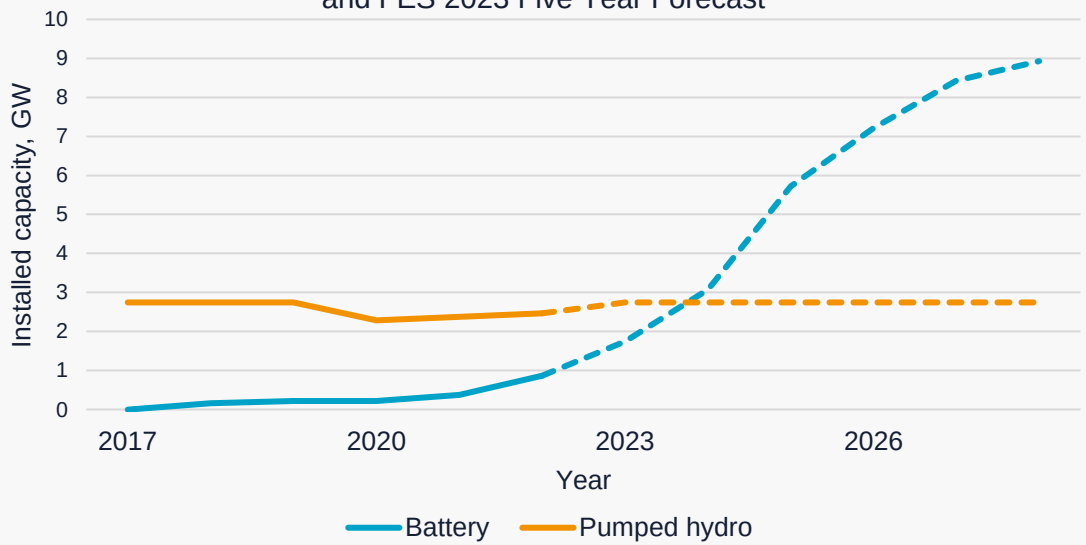
In 2014, there were no battery assets connected to the transmission network, only pumped storage. Since then, over 1GW has connected at transmission with more projected in the coming decade (see Figure 1). This growth in battery storage connections is driven by the growth of renewable generation, which creates the opportunity for batteries to provide ancillary services at lower cost and mitigate the variability of renewable resources.

Just as Project TransmiT reviewed the charging methodology to accommodate high growth in renewable capacity, the current methodology should be reviewed to ensure that the Applicable Charging Objectives are met for a system with high storage capacity.

Technologies considered during TransmiT[1]

Low carbon	Carbon	Storage
Onshore Wind	Gas	Pumped Storage
Offshore Wind	Coal	
Nuclear	Oil	
Other renewable	OCGT	
	CCS	

Figure 1: Transmission connected storage capacity from historic FES and FES 2023 Five Year Forecast



[1] CMP213 Impact Assessment Modelling v2 2 (ofgem.gov.uk)

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Project TransmiT (2014) – modelled constraint costs

The modelling undertaken during Project TransmiT does not reflect the current network constraints

The supporting analysis of Project TransmiT does not reflect the realities of current network constraints

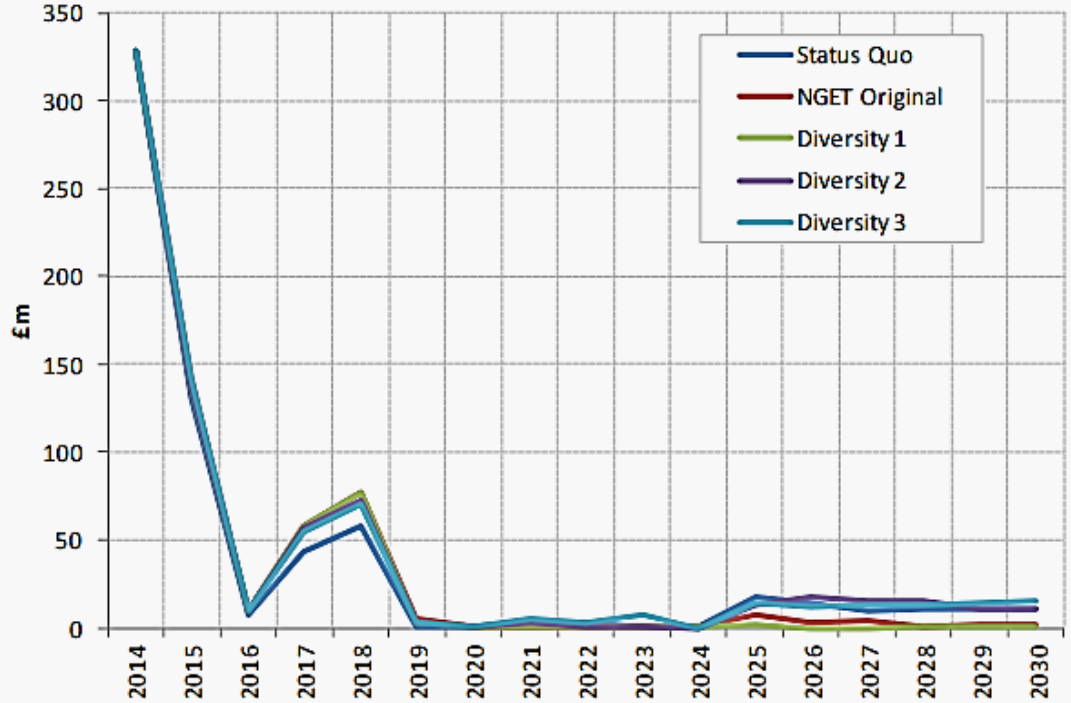
The modelling undertaken during Project TransmiT forecasted that constraint costs would be below £25m per year in the 2020s as shown in Figure 2.[1]

In contrast, thermal and voltage constraints were £1.6bn for 2022/23.[2] Constraint costs have tended to increase year on year due to the rapid growth in wind generation, particularly in Scotland, despite additional HVDC bootstraps being commissioned.

In the TNUoS methodology, the faster rate of decarbonisation has amplified the importance of the Year-Round tariff, as this becomes the main driver of constraints and TNUoS revenue recovery.

It has therefore become more important for the cost-reflectivity of TNUoS charges overall that the Year-Round tariff is charged appropriately. A key component of this is the calculation of ALF.

Figure 2: Project TransmiT modelled constraint costs



[1] Project TransmiT Impact Assessment of CMP213 options | Ofgem
[2] Constraint Breakdown Costs and Volume | ESO (nationalgrideso.com)

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Year-Round sharing and constraint costs

Allowance was made in the methodology for the characteristics of renewables during constrained periods

Year-Round sharing

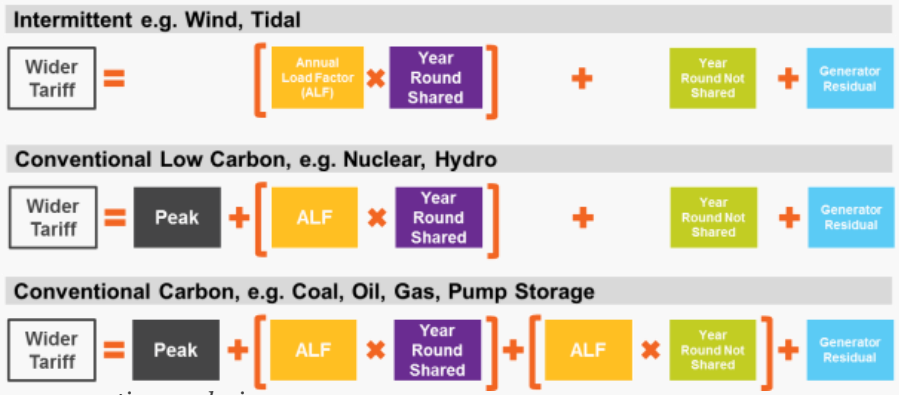
In the Year-Round background (see Annex B and C for further detail), it could be assumed that any two generators may generate independently, which reduces the need for reinforcement – so, assets should pay in proportion to their average generation (ALF).

However, this is not necessarily true. 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.

For this reason, the full year-round tariff is split into a shared and non-shared component according to the split of conventional carbon and low-carbon generators in that zone. Renewables must pay the full non-shared element without ALF adjustment.

Application of the sharing factor and ALF

The diagram below shows how different tariff components are charged to each type of generator and how ALF is applied.

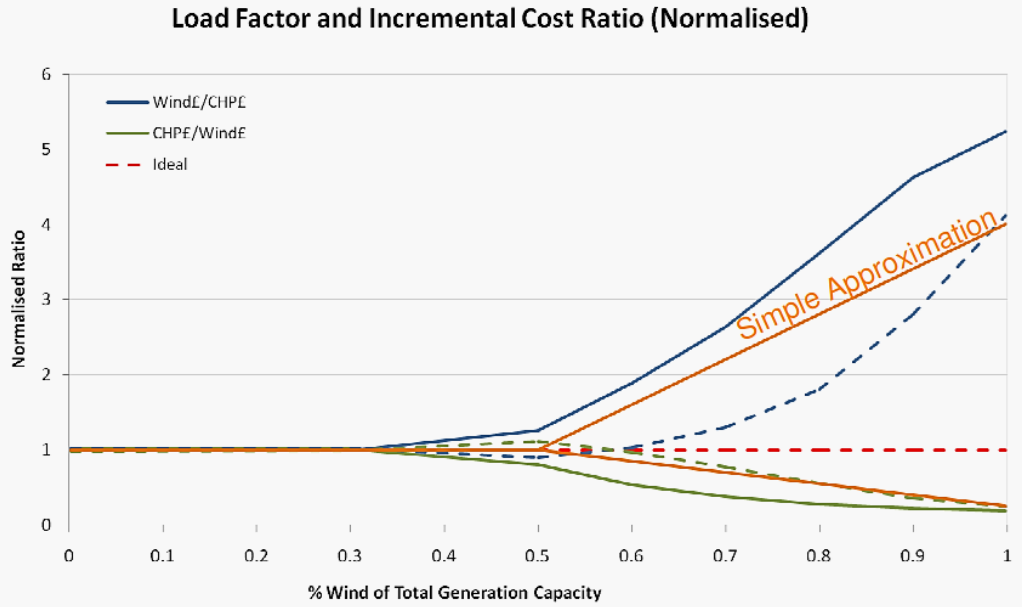


Accounting for the impact of high renewable penetration on constraint costs

When the sharing methodology was developed during Project TransmiT, a simple model of constraint costs was created. It studied how the incremental constraint cost due to additional capacity changed as renewable deployment increased.

The graph below shows the modelled ratio of incremental constraint costs when wind or thermal capacity is added, at different levels of wind capacity behind a constraint which motivated Year-Round sharing. This graph is taken from the original Project TransmiT documentation.

Similar consideration should be given to how storage capacity impacts constraint costs given its increasing prevalence on the transmission system.



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Storage treatment in TNUoS needs review

The remainder of this report considers how the ALF could be adjusted to improve alignment with the ACOs

The analysis of this section has highlighted the case for reviewing the TNUoS charging methodology and its treatment of storage. This case is summarised in the diagram below.

The current treatment of storage does not meet the Applicable Charging Objectives of being cost-reflective, facilitating competition between technologies and storage projects, and reflecting developments in transmission licensees' business.

This is to be expected, as the **last major review of the methodology under Project TransmiT did not consider the impact of grid scale battery storage** as it was not a significant part of the capacity mix in 2014.

Just as Project TransmiT considered the unique characteristics of renewables by adding the Year-Round background and introducing Year-Round sharing, **there is a case for changing the treatment of battery storage assets to reflect their own characteristics**.

While there are other areas of the methodology where assumptions for storage could be reviewed**, this analysis focusses on the Annual Load Factor (ALF) and the proposals set out in CMP393 to create storage-specific ALFs**.

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Calculating Storage ALFs to meet the Applicable Charging Objectives

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Motivation For ALFs in Project TransmiT and CUSC

ALFs were introduced to reflect how an asset affects constraint and network reinforcement costs

ALFs were introduced to recognise that different types of generators have greater or lesser impact on constraint costs and network investment

As described in CUSC, the use of ALFs in the TNUoS charging methodology is to recognise the impact of different types of generation on the system's incremental investment costs.

Project TransmiT created the methodology, which approximates the impact an individual generator has on constraint and reinforcement costs by adjusting the Year-Round tariff by a generator's ALF. This is to ensure that plants face signals which reflect their contribution to network constraints and the need for reinforcements.

CUSC

*"**To recognise that various types of generation will have a different impact on incremental investment costs** the charging methodology uses a generator's TEC, Peak Security flag, and **Annual Load Factor (ALF)** when determining Transmission Network Use of System charges relating to the Peak Security and Year Round backgrounds respectively. For the Year Round background the diversity of the plant mix (i.e the proportion of low carbon and carbon generation) in each charging zone is also taken into account."*

Section 14.14.10 CUSC Section 14 – Charging Methodologies v1.38
CUSC Code Documents | ESO

Project TransmiT

*"… when transmission investment planners carry out a full CBA to determine the efficient level of investment, **they will consider how a generator impacts on constraint costs on the system**. This will be based on a generator's output rather than its capacity.*

*To reflect this, another adjustment is made in WACM 2 to adjust the Year-Round tariff by a generator's ALF. This is **a proxy of the impact an individual generator has on the costs of a system** when investment is planned to manage constraint costs.*

Plant that operates more frequently would pay charges reflecting their increased likelihood of triggering (or avoiding) constraint costs."

Ofgem's Decision Letter to approve changes under Project TransmiT
Project TransmiT: Decision on proposals to change the electricity transmission charging methodology | Ofgem

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How should storage ALF be calculated?

Storage ALF should include import and export, and be applied to both the Year Round shared and non-shared components

Storage ALF should reflect typical storage behaviour during constraints

Recently, NGESO's Connection Planning Assumptions (CPAs) have been updated to reflect the deployment of grid-connected storage, with the average generation of each technology in worst-case network conditions taken to provide the assumptions to assess required network reinforcements. More information can be found on this in Annex A.

To align with CPAs, the ACOs and the intention of ALF as described in CUSC and Project TransmiT, storage ALF should reflect the overall behaviour of storage during constraints, instead of just exports.

The current ALF only reflects exports in constraints

In practice, generators are charged based on their ALF across all periods because this is deemed to be a reasonable approximation of their relative use of the network during Year-Round constraint periods.

Where this approximation is not valid, such as for wind where generation is correlated with constraints, there are adjustments through sharing.

The current approach for storage, which uses their export only to calculate ALF, may also be a poor approximation. The later analysis in this report shows that the current ALF is not a good approximation for storage actions during constraints and therefore storage should be treated differently, as is the case for wind generators.

To demonstrate the appropriateness of CMP393, it must be shown that storage exports and imports across all periods, including constrained periods

The later sections of this report show that storage actions do not correlate with constraints. This is shown using historic analysis of storage actions across different categorisations in constrained periods, as well as forward-looking modelling of storage actions and network constraints.

Therefore, the CMP393 Storage ALF is a good proxy for storage actions during constraints.

Since the Storage ALF proposed by CMP393 is a better proxy for storage behaviour during constraints, it would better reflect the ACOs than the status quo

This means that CMP393 would improve the cost-reflectivity of charges, as it would reflect actions that reduce and increase network constraints. Meanwhile, the current methodology only reflects exports and therefore does not consider the full range of cost impacts from storage actions.

Since the interaction between storage and constraints would be well represented by the CMP393 Storage ALF, there is no need to update the sharing methodology to accommodate storage. Therefore, storage should continue to pay both the existing shared and non-shared Year-Round tariffs with both adjusted for the CMP393 Storage ALF.

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Overview of storage ALF analysis

Storage behaviour during periods of constraint is consistent with CMP393, with a tendency to import

The analysis indicates that both types of storage exhibit both import and export behaviour during periods of network constraint, with a small tendency towards importing.

This is the same as a storage asset's overall operating profile, where they charge slightly more than they discharge due to efficiency losses.

Our analysis evaluates the wholesale market behaviour of battery and pumped storage in both historical data and simulations of future dispatch during periods of B6 constraint, as summarised on the chart.

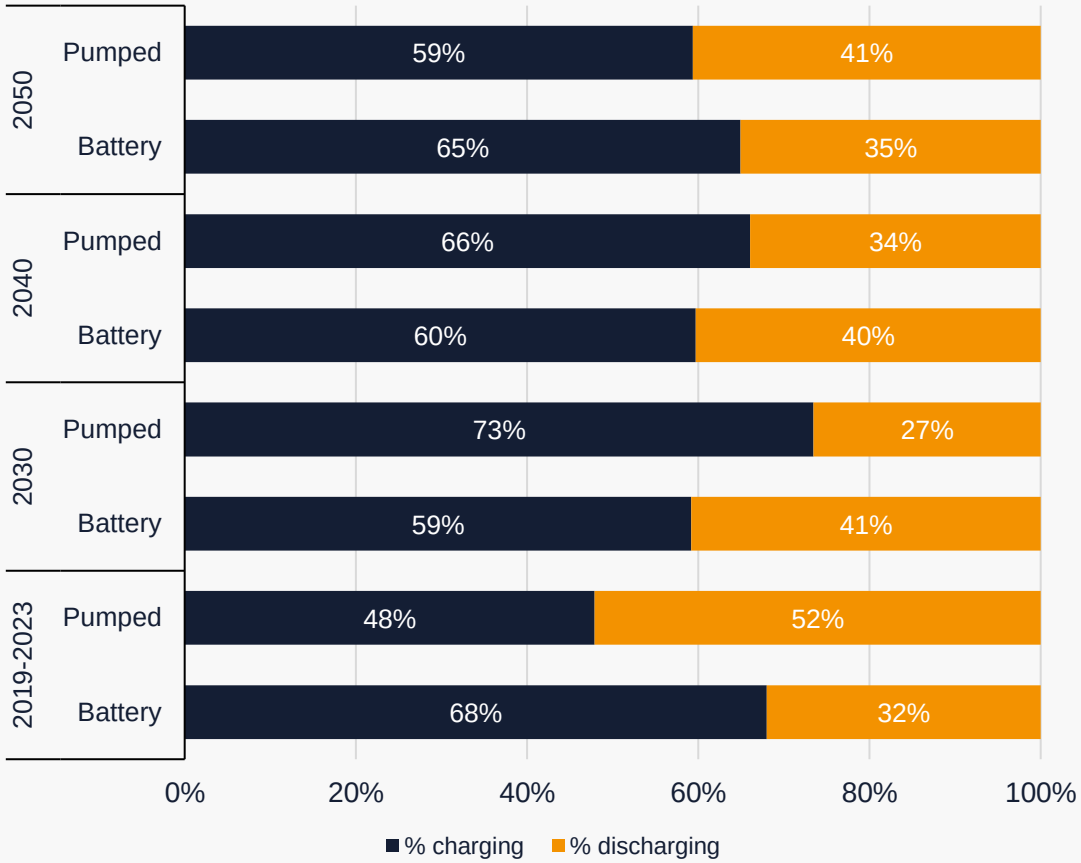
This indicates that storage behaviour is not strongly correlated with constraints, and therefore the CMP393 Storage ALF achieves the aims of ALF (and by extension, the ACOs) better than the status quo.

Based on historic FPN data, the storage behaviour during periods of network constraint in terms of time spent importing and exporting is consistent with the CMP393 Storage ALF. This finding is consistent across transmission and distribution assets on both sides of the B6 boundary.

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.

This analysis supports the basis of the CMP393 proposal that, in the Year-Round scenario, storage often imports as well as exports and the overall split is well represented by the CMP393 Storage ALF.

Split between charging and discharging during periods of B6 constraint by year and technology



More information on this analysis can be found in later sections Annual Load Factors: Backward-looking analysis and Annual Load Factors: Forward-looking analysis.

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CMP393 Storage ALF improves methodology against ACOs

Quantitative analysis supports the conclusion that storage actions are not correlated with constraints

The analysis of this section has highlighted that ALF should consider how assets act during constraints. We concluded that the CMP393 Storage ALF, based on actions across all periods, is a fair reflection of their impact on constraint costs and network reinforcement.

To align with CPAs, the ACOs and the intention of ALF as described in CUSC and Project TransmiT, **storage ALF should reflect the overall behaviour of storage during constraints, instead of just exports.**

CMP393 proposes that storage actions are not correlated with network constraints. If this can be proved, then using their **ALF across all periods, including both import and export, would be a reasonable approximation of their impact on network constraints**.

Historic and forward-looking analysis indicates that **both pumped and battery storage both import and export during periods of network constraint**, with a small tendency towards importing. This is the same as a storage asset's overall operating profile, where they charge slightly more than they discharge due to efficiency losses.

This indicates that storage behaviour is not strongly correlated with constraints, and therefore the **CMP393 Storage ALF based on actions across all periods is appropriate and better meets the ACOs than the Status Quo.**

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Annual Load Factors: Backward-looking analysis

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Approach

We analysed historic FPNs during periods of network constraint, using the B6 boundary

Step 1: Collect data on battery FPNs

- Taken directly from Elexon (via LCP Enact) from Oct 2019 to Oct 2023. These should represent storage asset actions before considering locational constraints i.e. their contribution to constraints.

- There are three key limitations to this approach. Firstly, battery assets have predominantly sold their capacity into ancillary markets, so their actions will be driven more by managing state of charge than wholesale market drivers. Secondly, assets may be aware of future locational constraints when deciding on their FPN. Finally, some of this data is taken from lockdown periods which may not be the most representative in terms of demand.

Step 2: Establish when the network is constrained

We determined that a network boundary (we used B6) was constrained when both:

1. The excess of generation (based on FPNs) over demand north of the B6 boundary exceeded the stated boundary limit: [Day Ahead Constraint Flows and Limits | ESO (nationalgrideso.com)]
2. NGESO reported thermal constraint costs across the same boundary on that day [Thermal Constraint Costs | ESO (nationalgrideso.com)]

Step 3: For a key boundary, calculate the distribution of storage FPNs at times when that boundary is constrained (excluding 0)

- Used the B6 boundary as this is a key driver of network constraints both now and for the rest of the decade.

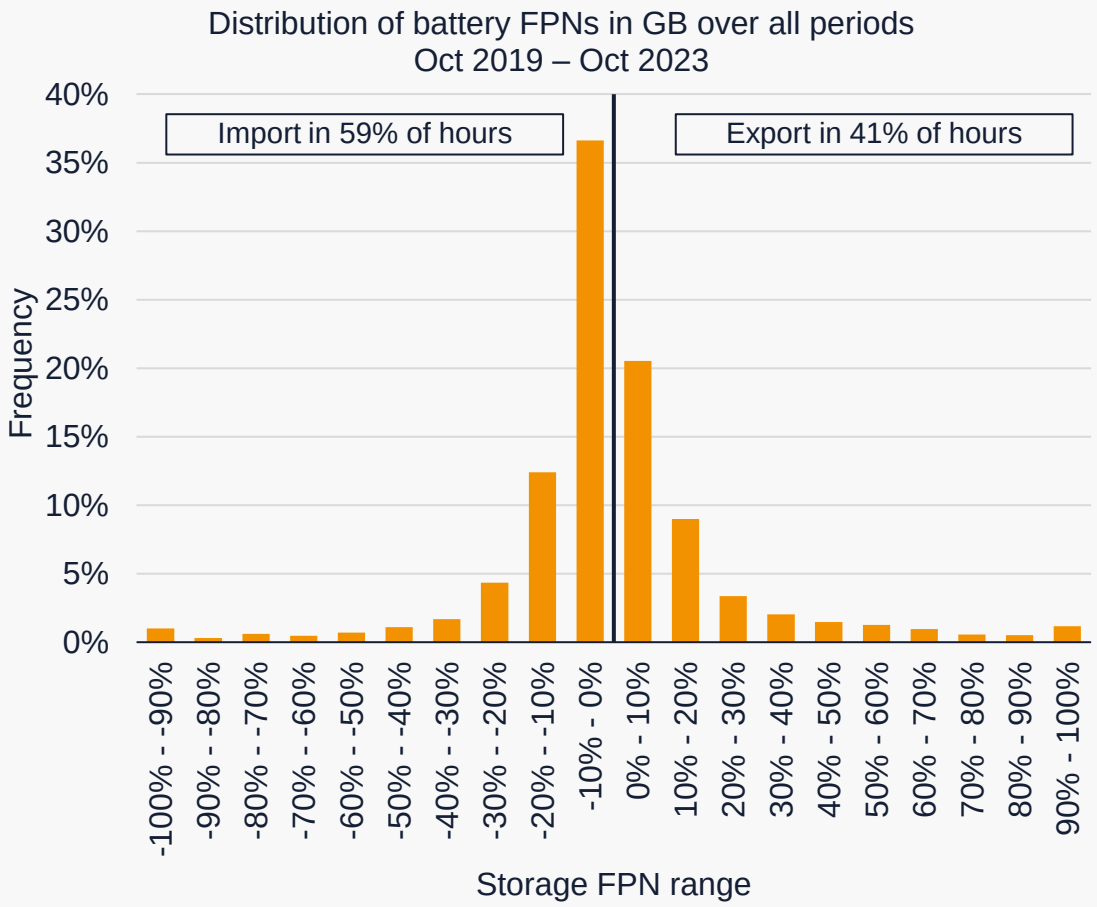
- The diagram below shows the boundaries for which we have constraint data (SCOTEX is used as B6).



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Battery storage analysis – all periods

Across all periods from October 2019 to October 2023, battery storage evenly imports and exports



The chart shows storage behaviour across all periods, with and without network constraints, based on their FPN.

Note that we have adjusted the weighting of charging periods to account for storage actions which are not visible through FPNs, such as actions taken to provide balancing services and ancillary services. The adjustment has been made to align storage actions with an assumed efficiency of 85% for battery storage. In the later analysis on pumped storage, the same approach has been taken to achieve an efficiency of 75%. For almost all batteries, this is a change of ±10%.

As expected, battery storage more often charges than discharges on average due to efficiency losses.

CMP393 proposes to use the annual load factor (ALF) of these storage assets using both imports and exports over all periods to estimate their contribution to the network constraints represented by the Year-Round background.

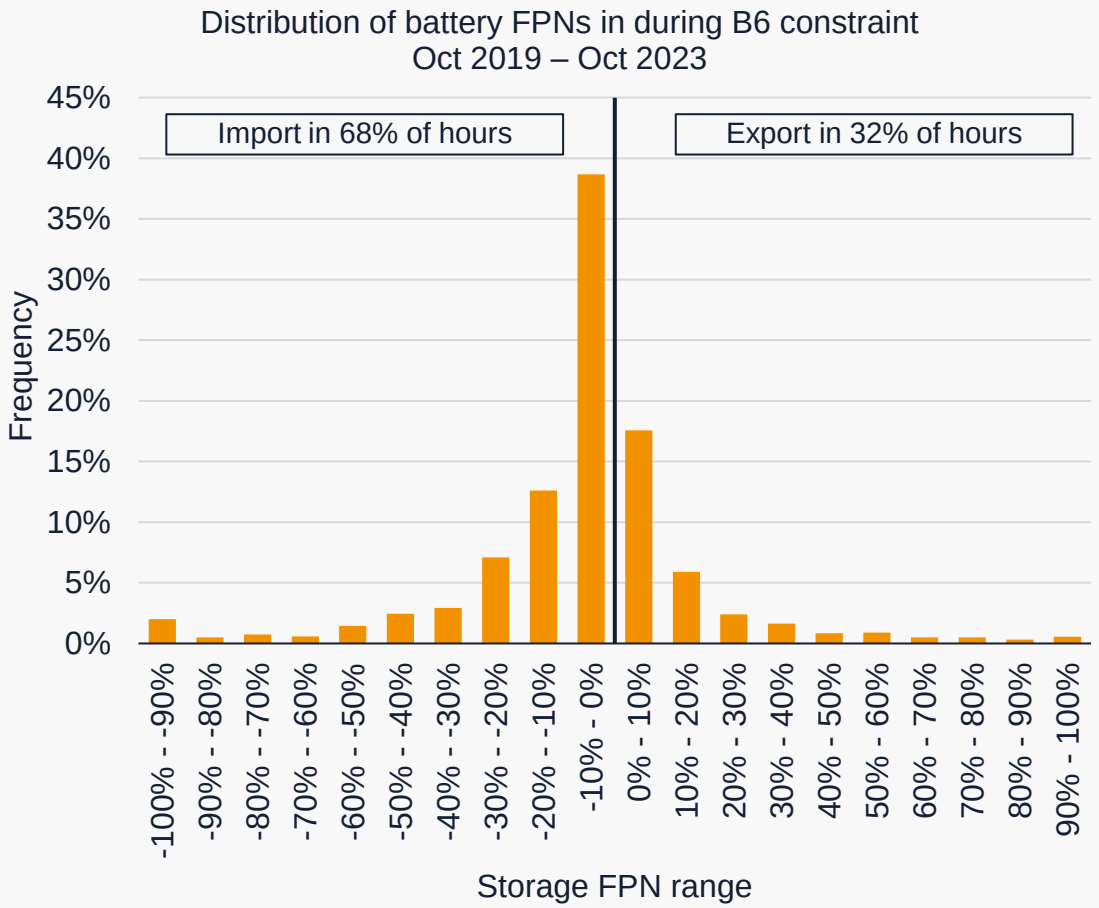
If this assumption is reasonable, then there should be a similar distribution for storage actions during periods of network constraints. This is considered in the following slides.

Note: The weighting of charging periods has been adjusted to account for storage actions that are not visible through FPNs.

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Battery storage analysis – during constraints

Battery storage has an ALF close to net neutral during periods of constraint



Storage behaviour during periods of B6 constraint is similar to their actions across all periods, with an increase in the likelihood of import.

Overall, storage behaviour as measured at FPN is relatively symmetrical about 0, with storage more often importing than exporting during periods of constraint. This shows that the storage ALF is on average negative during periods of constraints.

- This suggests that considering both imports and exports when calculating storage's contribution to constraints (through ALF) is more representative.

During periods of B6 boundary constraint, storage more often imports than exports.

- However, most of the difference is due to periods with little import.

This analysis includes battery North and South of the B6 constraint at both transmission and distribution connected assets

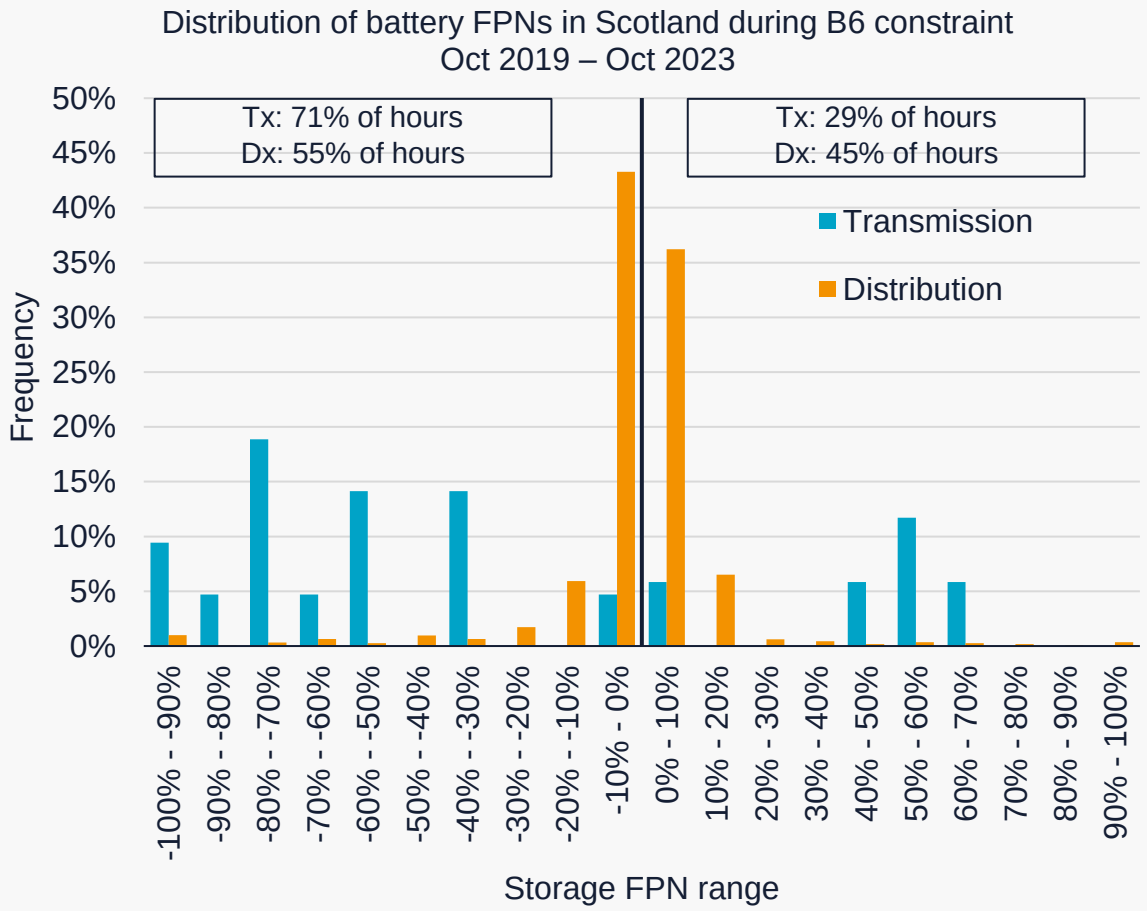
- The following slides produce the same analysis split into these four groups.

Note: The weighting of charging periods has been adjusted to account for storage actions that are not visible through FPNs.

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Battery storage analysis – Scottish assets by connection type

In Scotland, similar trends are seen for both transmission and distribution connected batteries



The majority of battery storage assets are distribution connected and, in Scotland, these assets evenly import (55%) and export (45%) during periods of B6 constraint.

- Note that at distribution level, there are different dispatch incentives at different times of day due to DUoS charges (e.g. incentivised to dispatch at peak demand or "red band" times). This may influence this distribution where high demand is related to high network flows.
- Overall, it is likely that there are lower wholesale prices during constraints which will incentivise storage assets to import.
- While most of these distribution-connected assets are below the capacity threshold to pay TNUoS, Ofgem has indicated that the threshold will be lowered in future.

At transmission level, battery storage assets show a stronger tendency to import (71%) during periods of B6 constraint.

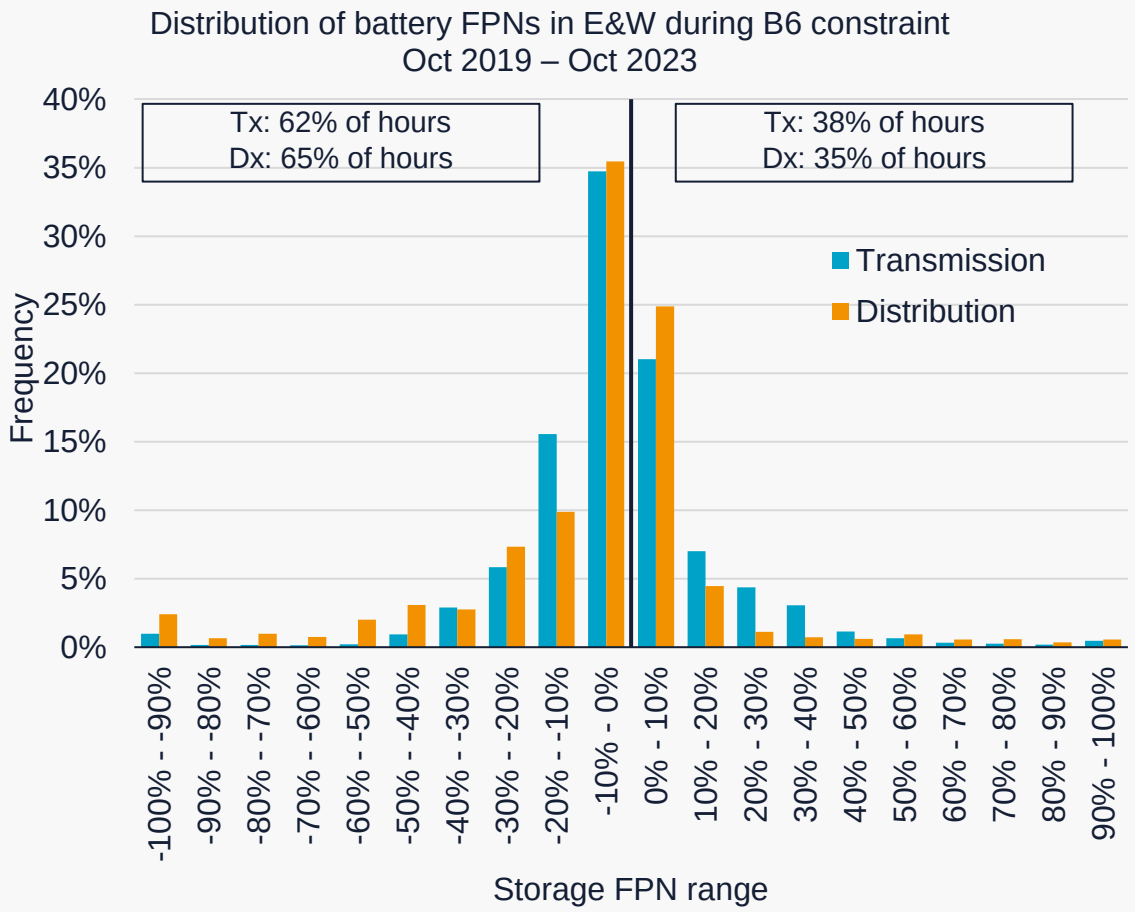
- However, this is based on a small number of assets and sample hours.

Note: The weighting of charging periods has been adjusted to account for storage actions that are not visible through FPNs.

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Battery storage analysis – E&W assets by connection type

In England and Wales, both connection type batteries are more likely to charge during constraints



In England and Wales, as in Scotland, there are still very few transmission connected batteries relative to distribution connected assets.

However, based on a small sample size, there is still a tendency to import at transmission level during constraints.

At distribution level, there is also a trend towards import during constraints as in Scotland, but there is still a relatively even split between charging and discharging.

Across all breakdowns between distribution and transmission, and North and South of B6, there is a similar conclusion that battery assets both import and export with similar likelihood during periods of network constraint.

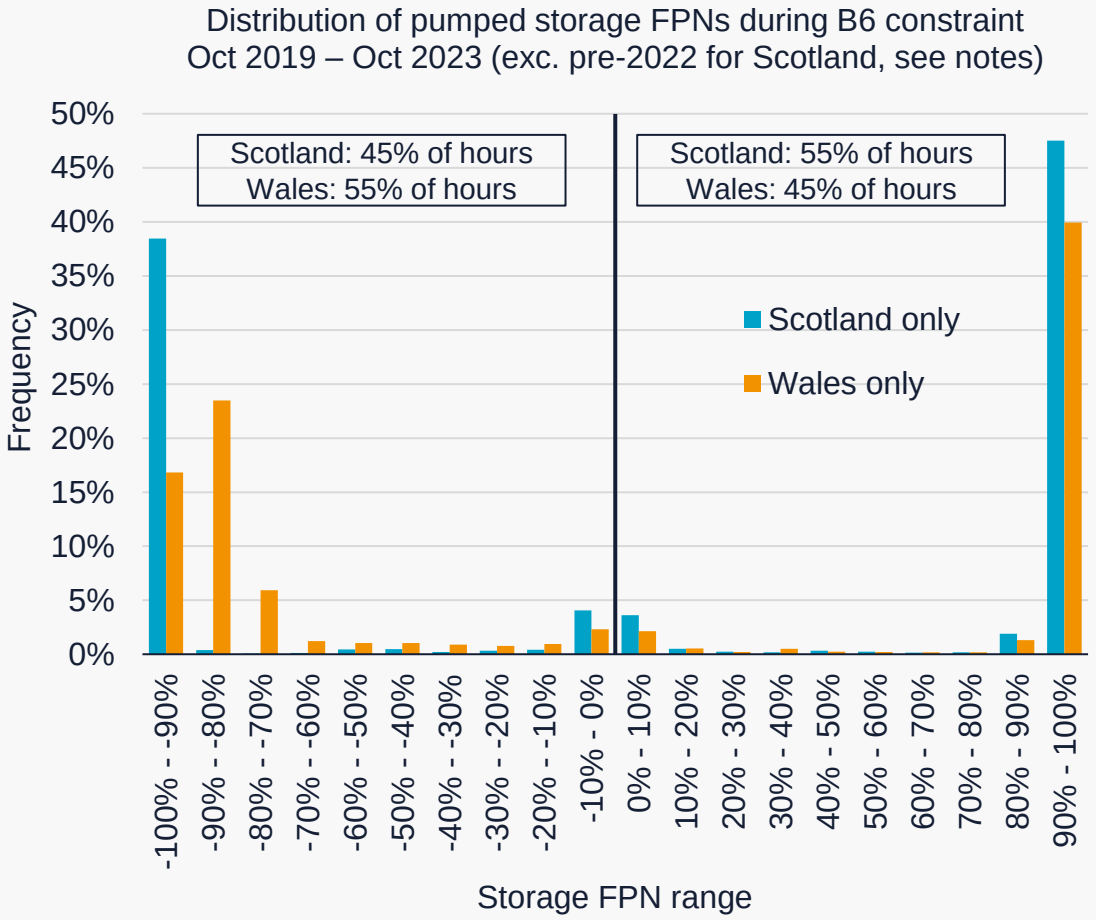
In particular, the likelihood of import and export during these periods is not materially different to their behaviour across all periods under any of these breakdowns.

Note: The weighting of charging periods has been adjusted to account for storage actions that are not visible through FPNs.

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Pumped storage analysis

Pumped storage assets are more active in wholesale markets and tend to charge during constraints



We have replicated the same analysis for pumped storage assets in Scotland and Wales.

Note that this analysis excludes Foyers and Cruachan from the period of October 2019 – December 2021 due to investigations and fines from Ofgem relating to actions in the balancing mechanism during periods of locational constraint.

The Scottish assets show a slight tendency towards discharging during periods of constraint.

For pumped storage assets in both Scotland and Wales, they are both importing and exporting with similar likelihood during periods of B6 constraint.

This suggests that considering all pumped storage actions when calculating their contribution to constraints (through ALF) is more representative.

Note: The weighting of charging periods has been adjusted to account for storage actions that are not visible through FPNs.

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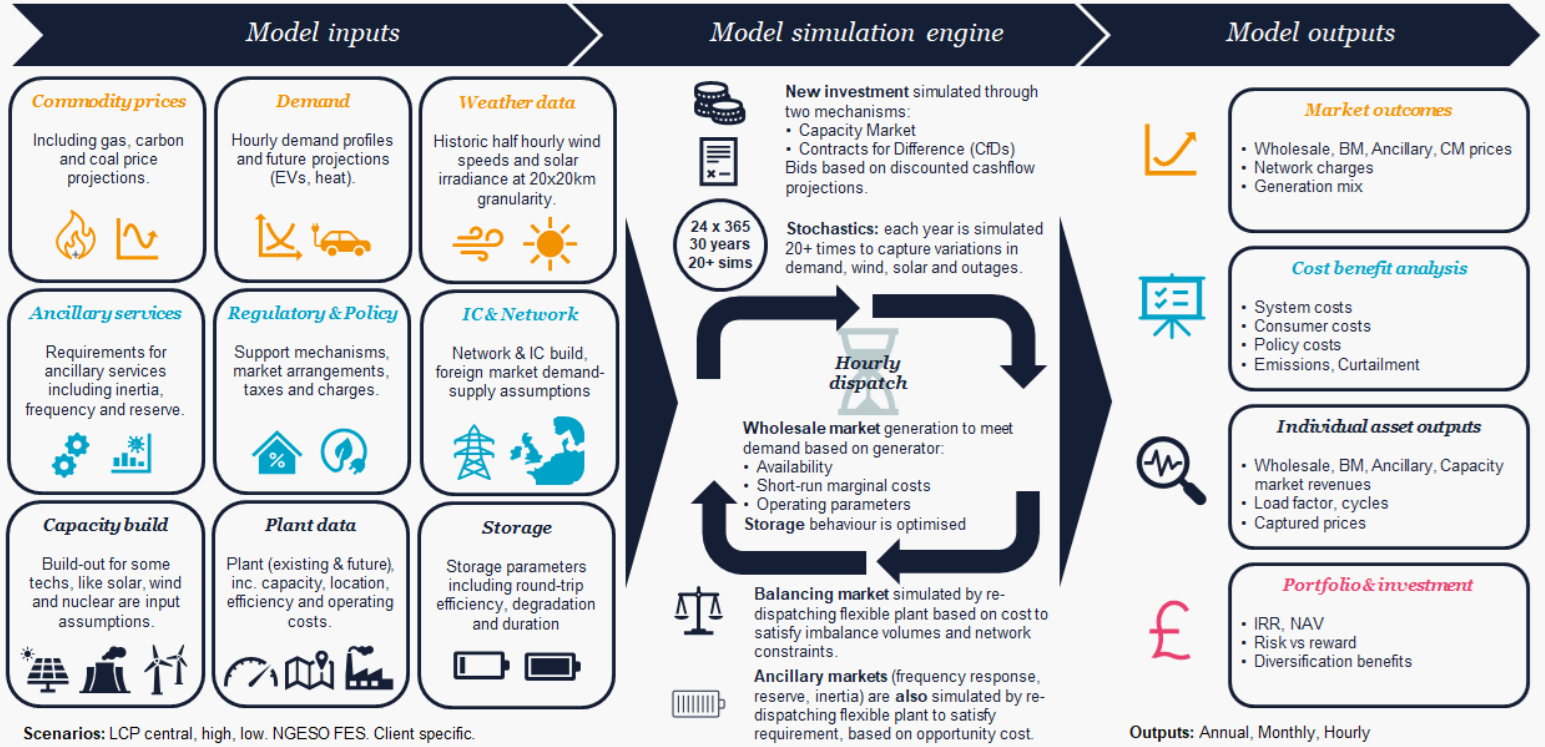
Annual Load Factors: Forward-looking analysis

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Approach

Modelling future network constraints and battery dispatch behaviour

High level overview of the LCP Delta EnVision modelling framework



To understand the future behaviour of battery and pumped storage assets, we have used our EnVision modelling framework (pictured) which can capture:

- Periods of high and low renewable generation
- Network constraints on key boundaries
- Optimised storage dispatch behaviour

The aim of this analysis is to replicate the outputs of the historical analysis for future samples years (2030, 2040, 2050) in LCP's Central Net Zero consistent market scenario.

The outputs of this analysis are:

- 2-hour battery and 48-hour pumped storage behaviour after wholesale market dispatch during periods of B6 boundary constraint.

Note that we have only modelled transmission connected assets, so the effect of distribution network charge signals has not been considered. This means that in this analysis, wholesale dispatch signals are the same in Scotland and England, so only a single set of results is shown.

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Results from forward-looking analysis over B6

2-hour duration battery storage in 2040

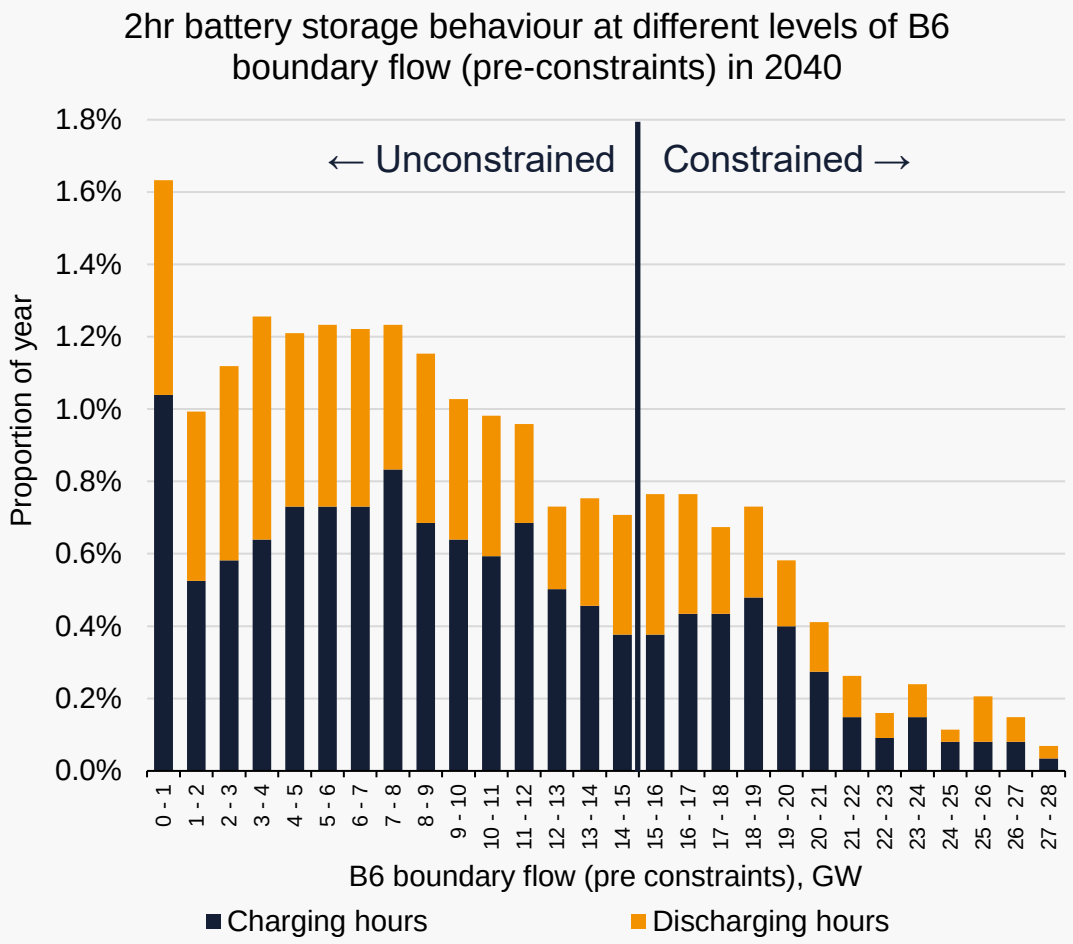


Chart description

- The chart shows the split of 2-hour duration battery storage behaviour between charging and discharging at different levels of B6 boundary flow in a simulated 2040 year.
- All these values are calculated **before** actions to manage locational constraints.
- The vertical line shows the boundary capacity of the B6 boundary in this year – any hours with higher flow are those with constraints.

As B6 boundary flow increases, 2-hour battery storage tends to be charging more often after wholesale dispatch.

- In our modelling of 2040, when the B6 boundary is constrained and batteries take an active position after wholesale dispatch, the battery is charging 60% of the time and discharging 40%.
- This is mostly due to high levels of renewable generation in Scotland correlating with low market prices and high boundary flows. However, high boundary flows are also seen in periods of high demand leading to higher prices, so storage still sometimes discharges at high boundary flows.

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Results from forward-looking analysis over B6

48-hour duration pumped storage in 2040

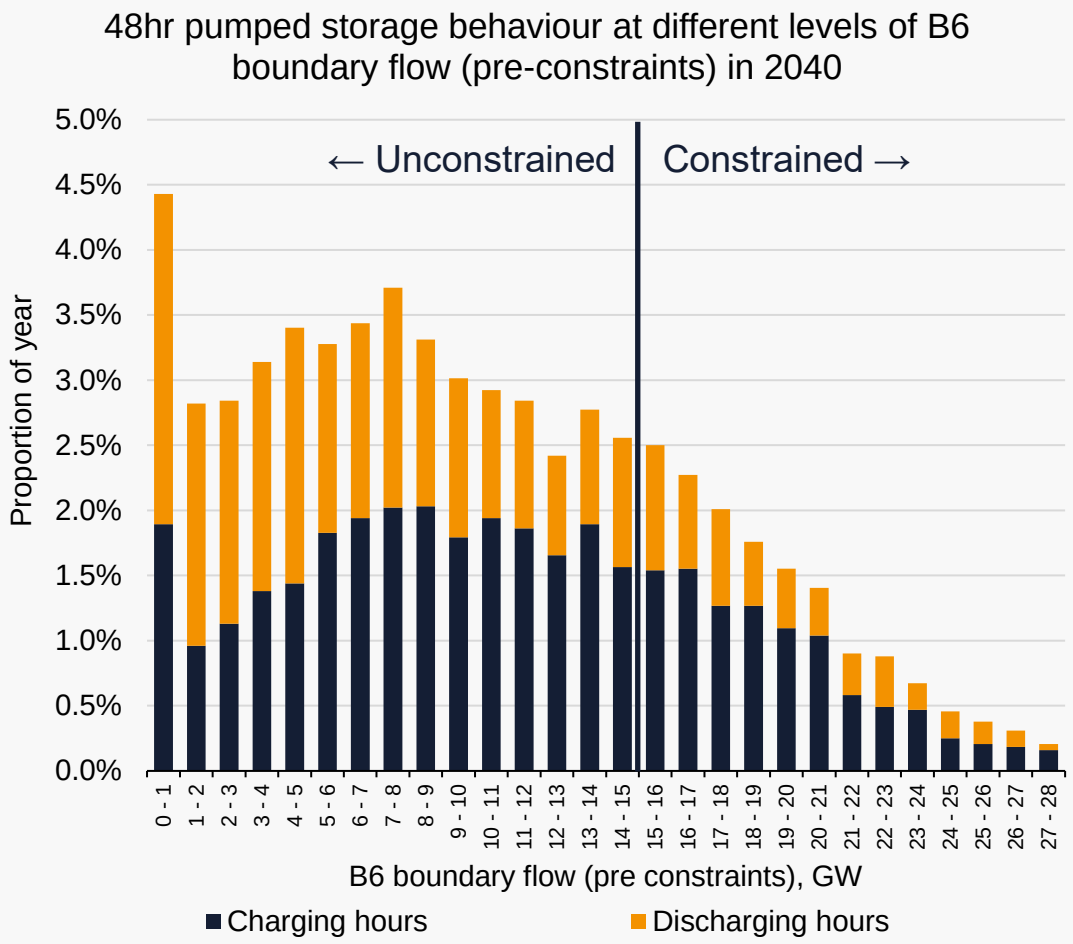


Chart description

- The chart shows the split of 48-hour duration pumped storage behaviour between charging and discharging at different levels of B6 boundary flow in a simulated 2040 year.
- All these values are calculated **before** actions to manage locational constraints.
- The vertical line shows the boundary capacity of the B6 boundary in this year – any hours with higher flow are those with constraints.

Similar results are seen for pumped storage as for battery storage, but with a stronger trend towards charging during periods of constraint.

- In our modelling of 2040, when the B6 boundary is constrained and pumped storage takes an active position after wholesale dispatch, the asset is charging 66% of the time and discharging 34%.
- Due to the longer duration of pumped storage, it can hold its charge through prolonged periods of higher renewable output (leading to network constraints), and discharge at a higher market price when renewable output is lower. This means that there is less discharge during periods of constraint than for battery storage. However, some discharging will still occur during network constraints at peak demand times.

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Results from forward-looking analysis over B6

We see similar trends in our modelling of other snapshot years

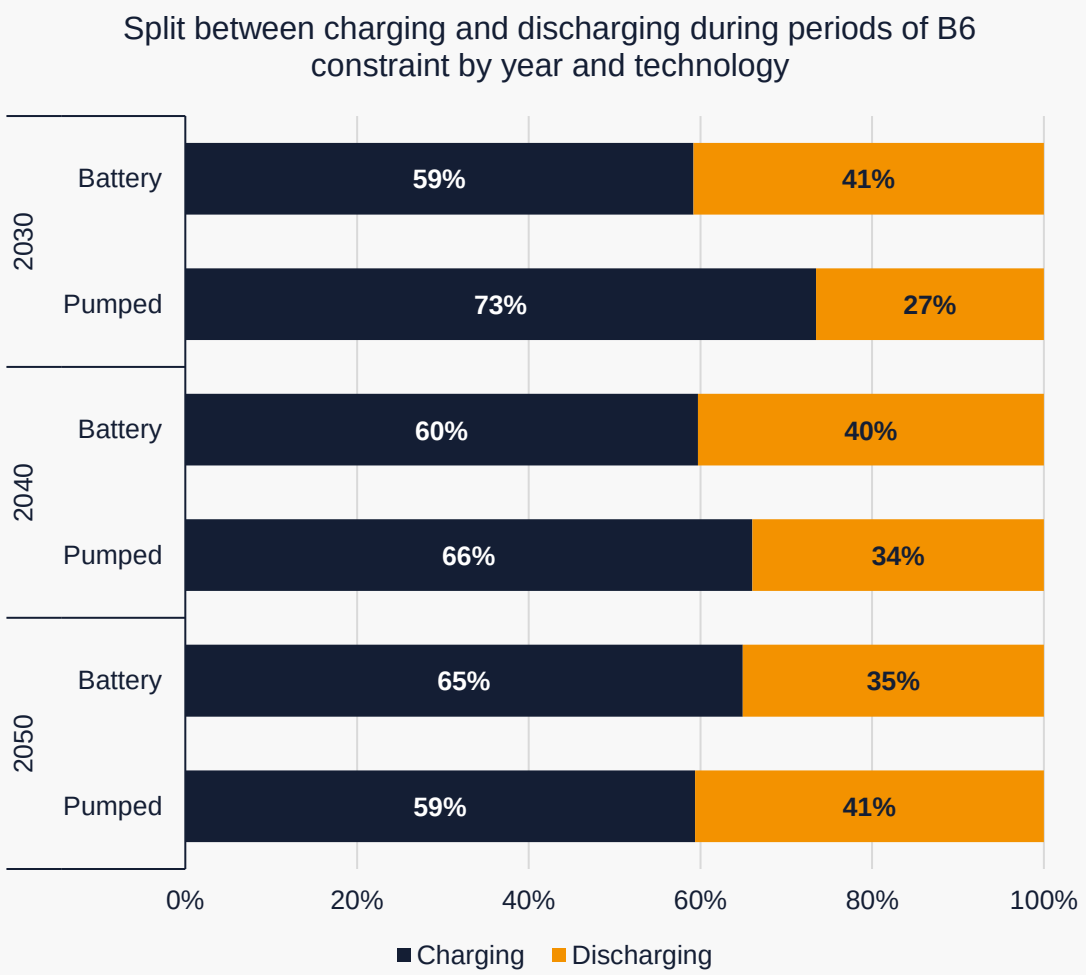


Chart description

- The chart shows for each of 2030, 2040 and 2050 the split of storage behaviour between charging and discharging during periods of B6 boundary constraint.
- Each of these are broken down to show 2-hour battery storage and 48-hour pumped storage.
- All these values are calculated **before** actions to manage locational constraints.

The conclusion that storage behaviour after wholesale dispatch during periods of B6 constraint is split across charging and discharging, with a preference towards charging, and is consistent across years and technology.

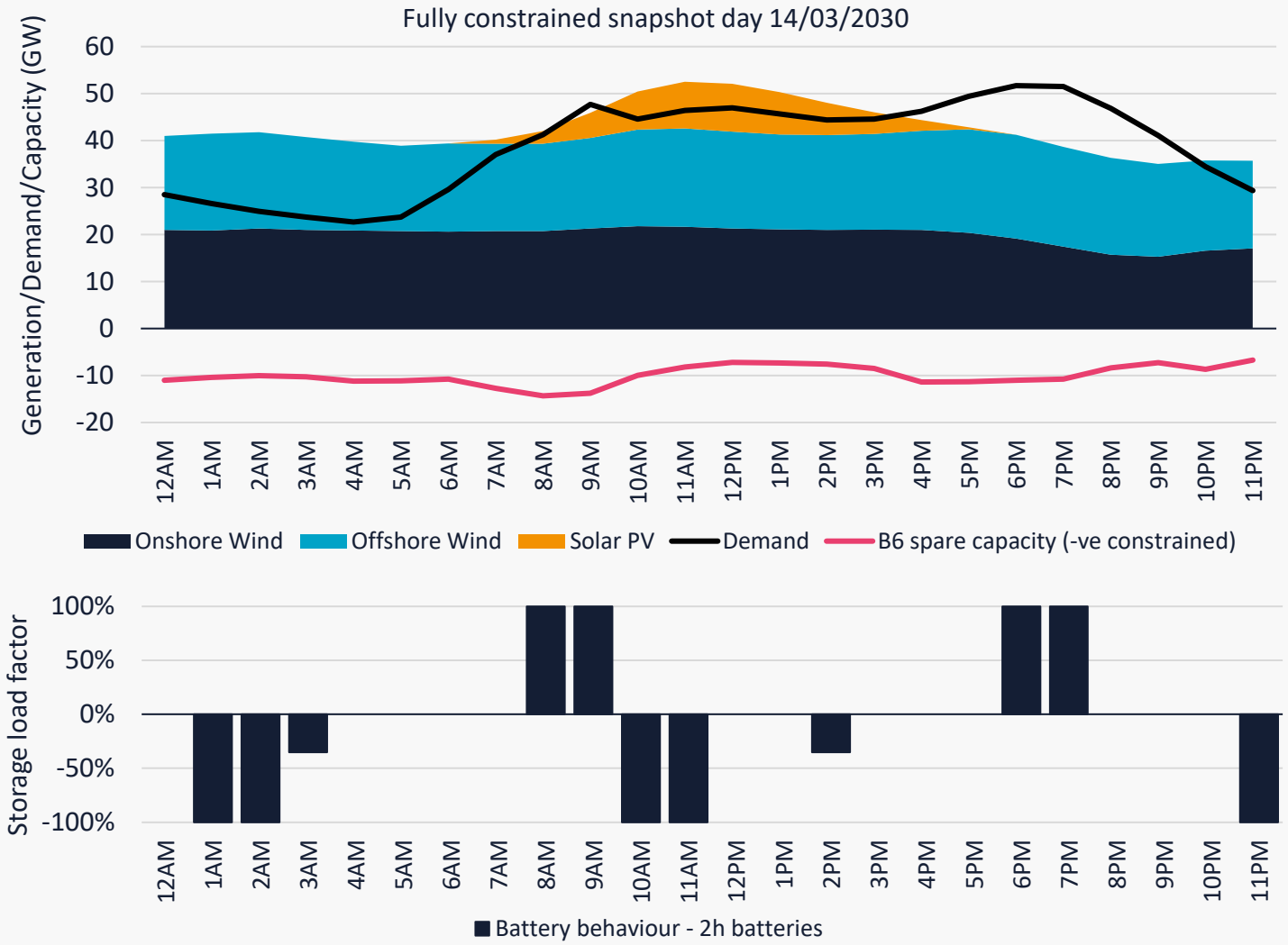
This indicates that over time, we expect storage to be both increasing and reducing network constraint costs in periods which the year-round tariff is designed to represent.

This means that storage actions are not forecast to be heavily correlated with constraints, and therefore the CMP393 Storage ALF is cost-reflective of their impact on network constraints and reinforcements.

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Snapshot days – fully constrained day

A sample day when B6 is constrained in every period



The charts show modelled outcomes in the GB power market for a sample day with constraints over the B6 boundary across the full day.

- The B6 constraint is driven mostly by high onshore wind output.
- Storage chooses to charge/discharge in response to wholesale markets prices. This leads to charging overnight and during the day at high solar output and discharging during the morning and evening peaks.

Chart description

The top chart shows, for a selected sample day:

- Total GB demand and available renewable generation
- Spare capacity over the B6 boundary (where negative values show that the boundary is constrained)

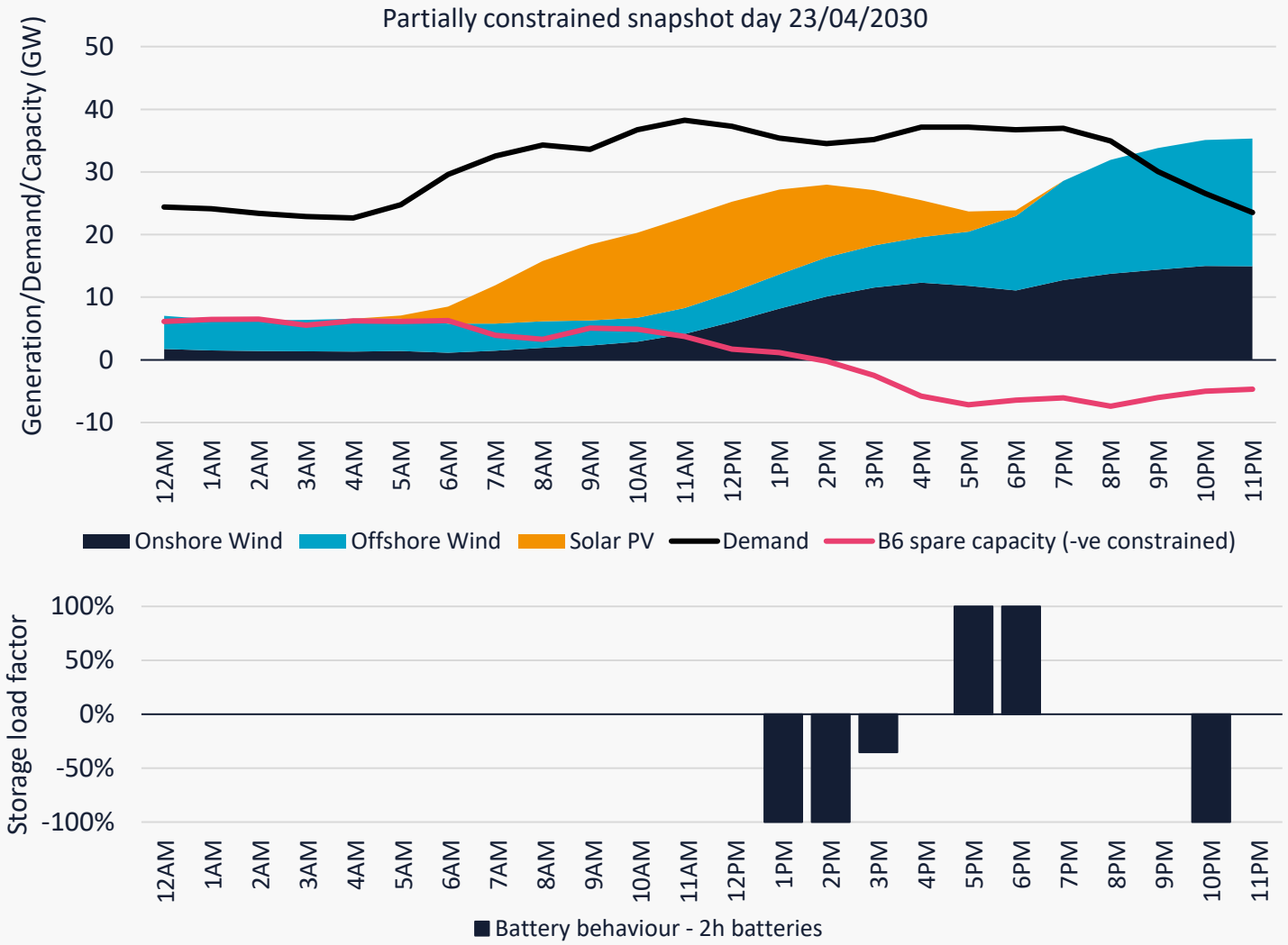
The bottom chart shows storage actions in wholesale markets on the same sample day.

Note: storage is optimised over more than a day, so may not see fully balanced charge and discharge within day.

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Snapshot days – partially constrained day

A sample day when B6 is constrained in some periods



The charts show modelled outcomes in the GB power market for a sample day with constraints over the B6 boundary later in the day.

- The B6 boundary flow increases as available onshore and offshore wind generation increase, leading to constraints in the evening.
- On this sample day, storage only acts in the evening and overnight when the market has both an excess of renewable generation and a need for thermal generation in different periods.

Chart description

The top chart shows, for a selected sample day:

- Total GB demand and available renewable generation
- Spare capacity over the B6 boundary (where negative values show that the boundary is constrained)

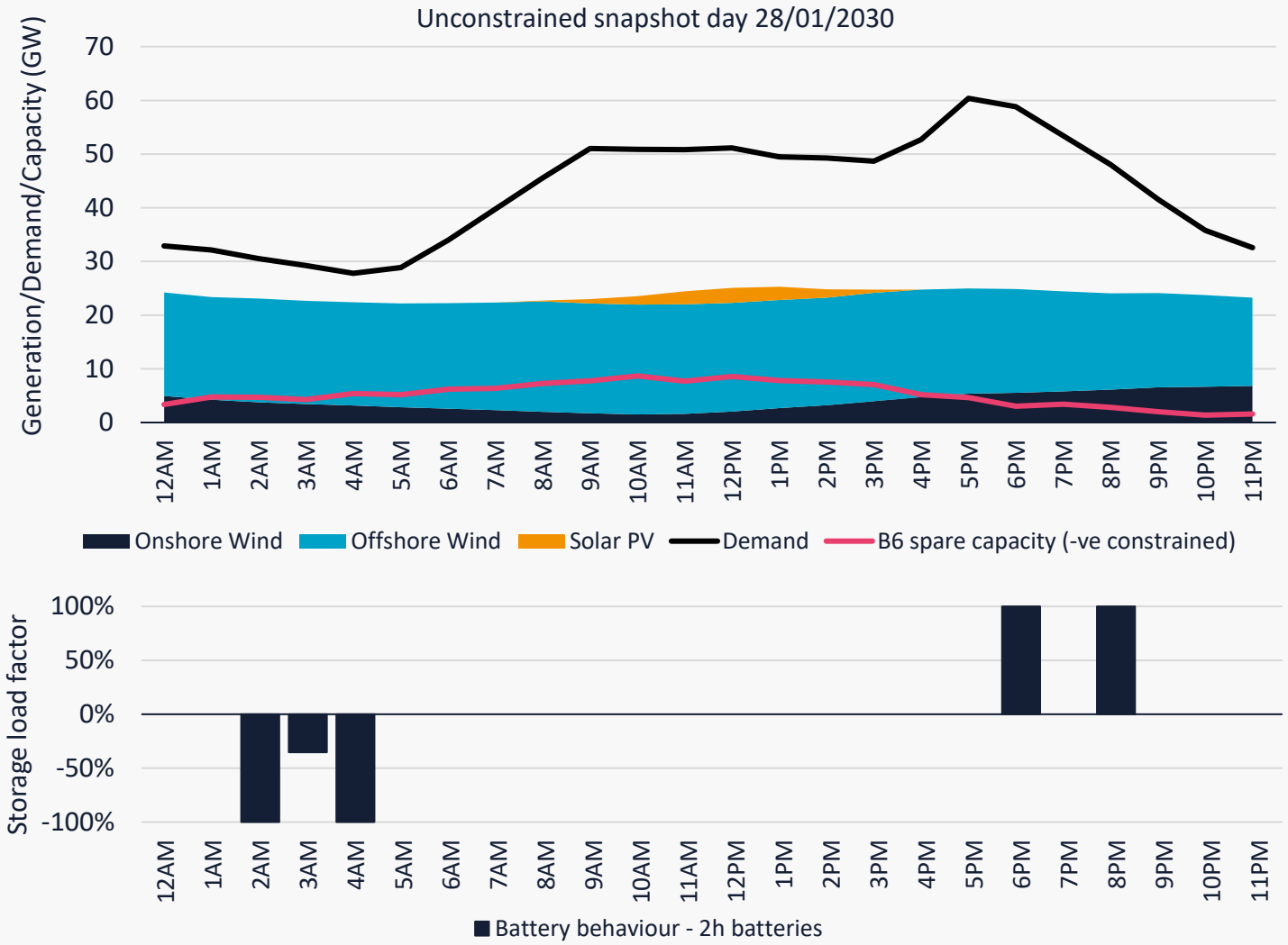
The bottom chart shows storage actions in wholesale markets on the same sample day.

Note: storage is optimised over more than a day, so may not see fully balanced charge and discharge within day.

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Snapshot days – unconstrained day

A sample day when B6 is not constrained in any period



The charts show modelled outcomes in the GB power market for a sample day with no constraints over the B6 boundary.

- Low onshore wind output all day leads to low flows over the B6 boundary in wholesale market dispatch.

Chart description

The top chart shows, for a selected sample day:

- Total GB demand and available renewable generation
- Spare capacity over the B6 boundary (where negative values show that the boundary is constrained)

The bottom chart shows storage actions in wholesale markets on the same sample day.

Note: storage is optimised over more than a day, so may not see fully balanced charge and discharge within day.

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Annex A: Connection planning assumptions (CPAs)

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Connection Planning Assumptions (CPAs)

When storage is offered a connection, the network operator considers their average behaviour during constraints

When a new asset asks for a connection to the network, National Grid ESO provides the relevant Transmission Operator with a set of loading conditions for generators against which to assess what reinforcements would be needed.

Based on conversations with NGESO, we believe that the approach to developing Connection Planning Assumptions is as follows:

- A GB-wide dispatch of the wholesale power market is carried out. There are stochastic simulations of different wind and demand conditions.
- Battery assets are assumed to participate in wholesale arbitrage, as this is their main long-term revenue stream.
- In the local area of the new connection, the level of constraint is calculated in each period and the results for the most constrained 5% of hours are kept. These will differ regionally depending on the capacity mix.
- Across these periods, the average generation of each technology is taken and provides the assumptions that are passed to the network operator for them to assess required reinforcements.
- Storage assets may be both charging and discharging across those periods, and so the assumption passed onto the ESO is based on their average position.
- The required reinforcements are calculated to accommodate full import and export of a storage asset.

Implications for Storage treatment in TNUoS

- During the most constrained periods, storage which is assumed to already connect may be importing or exporting and their average behaviour is considered.
- The network must be able to accommodate the maximum import and export of the additional storage, but each individual asset is understood to be a relatively minor contributor to the constraints in these periods.
- The TNUoS methodology aims to replicate these peak loading conditions on the network through two national backgrounds. The backgrounds could be considered a proxy for more granular connection planning assumptions.
- The CPA methodology provides a precedent for evaluating both storage imports and exports when considering system constraints in relation to network planning.
- Therefore, TNUoS charges should also represent the range of possible storage actions during constraint periods.

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Annex B: TNUoS Charging and Transport & Tariff model methodology

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Objective of TNUoS charging

TNUoS charges send signals to generators which aim to reflect their contribution to network/constraint costs

Background on TNUoS charging

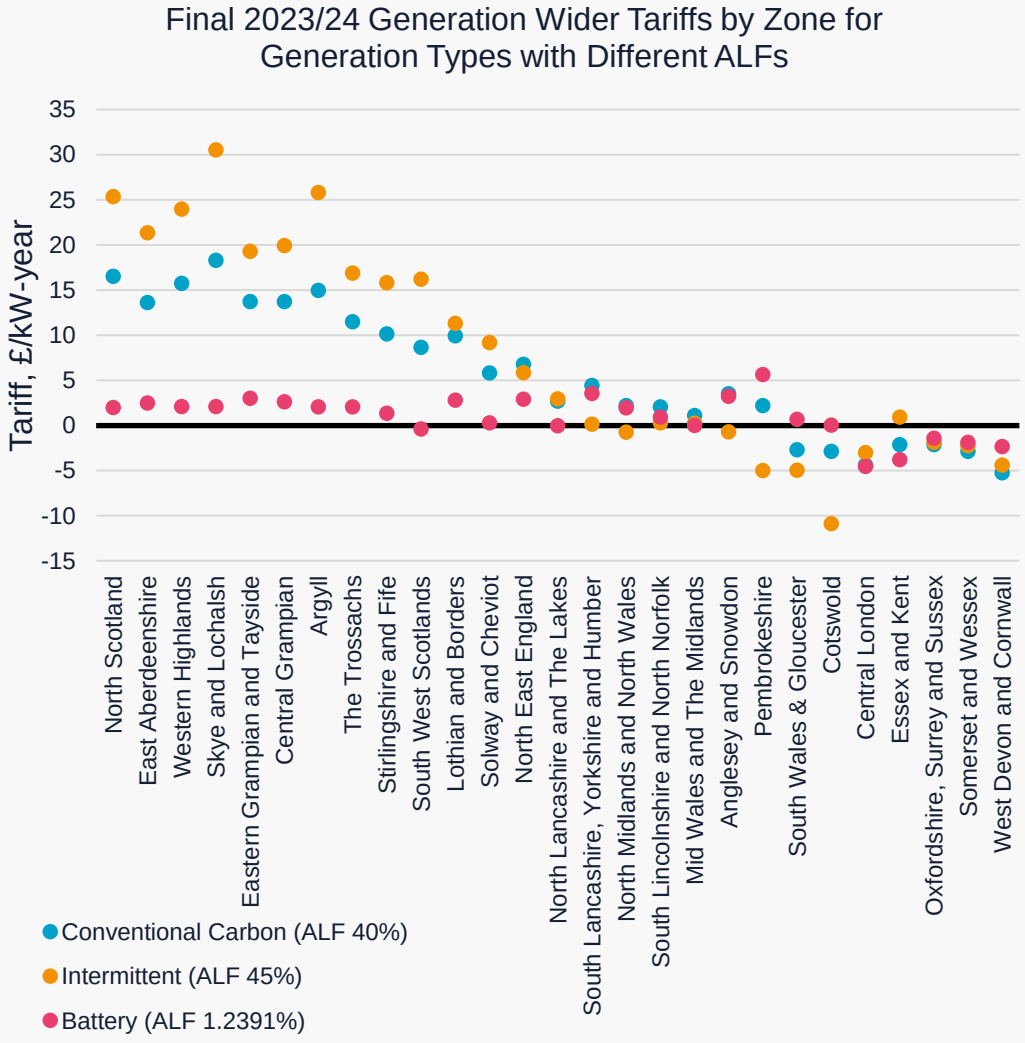
The Generation Wider TNUoS Tariff sends a cost signal to generators based on the network reinforcement costs caused by a new connection. Typically, in GB, this is a cost to those projects located in Scotland, further from demand, and a revenue for those located furthest south. This is shown in the chart on the right for a conventional carbon generator (ALF 40%), an intermittent generator (ALF 45%), and a battery asset (ALF 1.24%).

The charge varies between assets based on how they are expected to use the network at times of highest network usage. This depends on their asset class and their load factor. (See later slide on the 'generation backgrounds' for more detail)

Investable cost-reflective signals

While the methodology makes several generalisations for simplicity, it tries to reflect the actual behaviour of these assets and hence the network costs or constraint costs that they cause. This is in line with one of the aims of the ongoing TNUoS Taskforce, which is to ensure that the TNUoS methodology is cost-reflective.

This provides a locational signal to generators, based on operational assumptions. If these assumptions are incorrect, the TNUoS charges may not be cost-reflective and risk incentivising generators to locate in an inefficient location at a higher system cost which is ultimately borne by consumers.



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Transport and Tariff (T&T) model

The T&T model captures increases in maximum network flows generators cause on an optimised network

Model assumptions

- The Transport and Tariff[1] model takes a view of the future locations of demand and generation across different transmission zones.
- It assumes that the network is perfectly sized to accommodate the maximum flow on each network circuit.
- The maximum flow on each network asset is calculated by analysing network flows under two backgrounds – the 'Peak' and 'Year-Round' – with different generation mixes. (More information on these on the next slide.)
- Each network asset is 'tagged' as constrained under one background or the other. These tags are used to imply which types of generators cause reinforcement on which assets.

Impact of additional connections

- At each point on the network, the model analyses the change in network flows if more generation were added at that location and demand were scaled up across the network to compensate.
- This is measured as the change in maximum power flow on each network asset measured in MW-km.
- The change in flow is summed up across all assets tagged as 'Peak' and 'Year-Round' separately.
- For example, adding generation in one location might increase total flow on all 'Peak' assets but decrease total flow on 'Year-Round' assets.
- Each point on the network now has a calculated MW-km impact under each background.

Creating zonal charges

- The impacts at each point are aggregated together to produce averages for each zone. This is weighted by generation at each point under the associated background.
- This means that the model has an estimate of, for example, the change in MW-km of network flows under the 'Year-Round' background if generation is added in Zone 1, North Scotland.
- The MW-km impact is converted in the cost using the expansion constant and expansion factors. The expansion constant is a £/MW-km value based on the cost of new build 400kV OHL. The expansion factors take account of the different costs of reinforcements at different voltages or for cables rather than OHL.

Notes: [1] DCLF ICRP Transport and Tariff Model

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TNUoS charges consider two market backgrounds

The T&T model estimates maximum flows and generator contributions by considering the two backgrounds.

Peak background

This background reflects the '**Security Criterion**' in the SQSS – that the network must be reinforced to cope with peak network demand allowing for contingency.

This scenario is defined in the CUSC as:

- Peak demand
- No renewable generation
- No interconnector imports

Year-Round background

This background reflects the '**Economy Criterion**' in the SQSS – that the network must be reinforced up to a level at which the cost of managing constraints is equal to the cost of additional reinforcement.

While this is a single background, it is **designed to represent a typical scenario where networks are constrained**. It therefore still assumes peak demand, but with relatively high renewable generation.

Assets are charged based on their average generation over the year, with allowance for how they share the network with other users.

Modelled load factors under each background

Section 14 of the CUSC sets out the load factors assumed for different types of generators under each of the backgrounds. Battery storage is treated as pumped storage.

Under both backgrounds, it is assumed that total demand is equal to peak demand.

Those generators with a 'Fixed' load factor have their load factors set to the stated value.

Those with 'Variable' load factors have the same load factor as each other and are set so that their total generation meets the demand after 'Fixed' load factor plants' generation is considered.

Generation Plant Type	Peak Security Background	Year Round Background
Intermittent	Fixed (0%)	Fixed (70%)
Nuclear & CCS	Variable	Fixed (85%)
Interconnectors	Fixed (0%)	Fixed (100%)
Hydro	Variable	Variable
Pumped Storage	Variable	Fixed (50%)
Peaking	Variable	Fixed (0%)
Other (Conventional)	Variable	Variable

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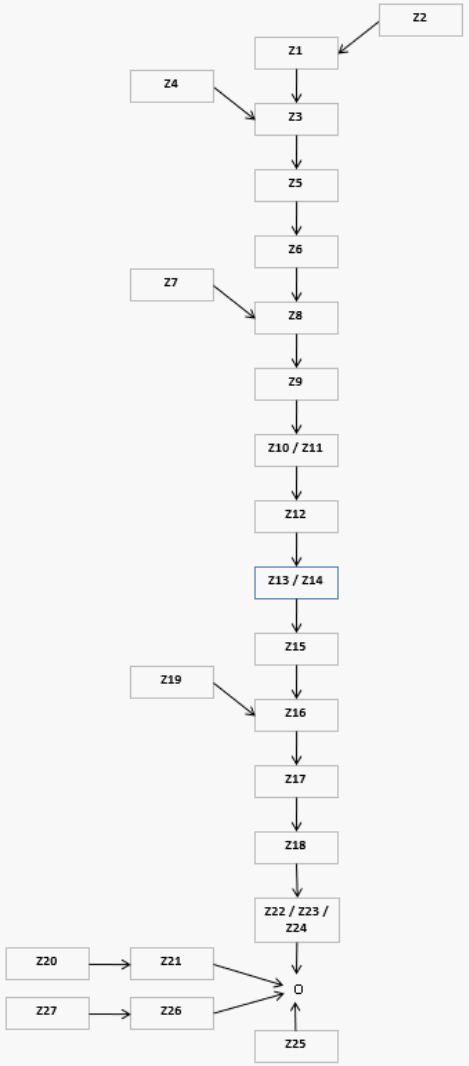
Annex C: Year-Round Sharing methodology

This section provides a high-level overview of the sharing methodology within the Transport and Tariff model.

- It explains how the Year-Round tariff produced by the T&T model is split into a shared and non-shared components
- This is based on the assumed direction of network flows and the relative prevalence of carbon and low-carbon generation in different areas of the network.

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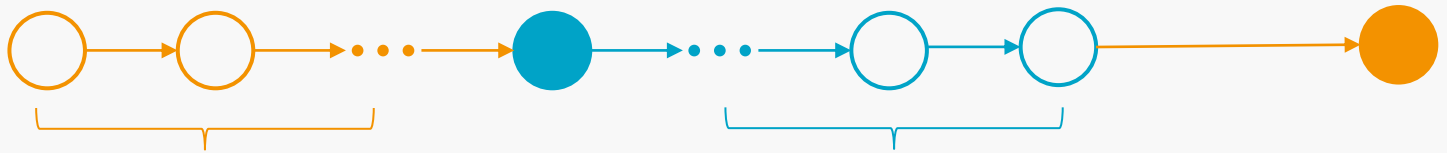
Sharing Methodology



The diagram to the left shows the "Connection Map" used in the Transport and Tariff model.

This is an estimate of the direction of flow between zones towards demand.

To explain the calculation, we will show how the proportion of the year-round tariff that's shared is calculated for a single zone using the simplified diagram below.



These are the zones "upstream" of the target zone.
Generation comes from these zones and passes through the target zone to demand.

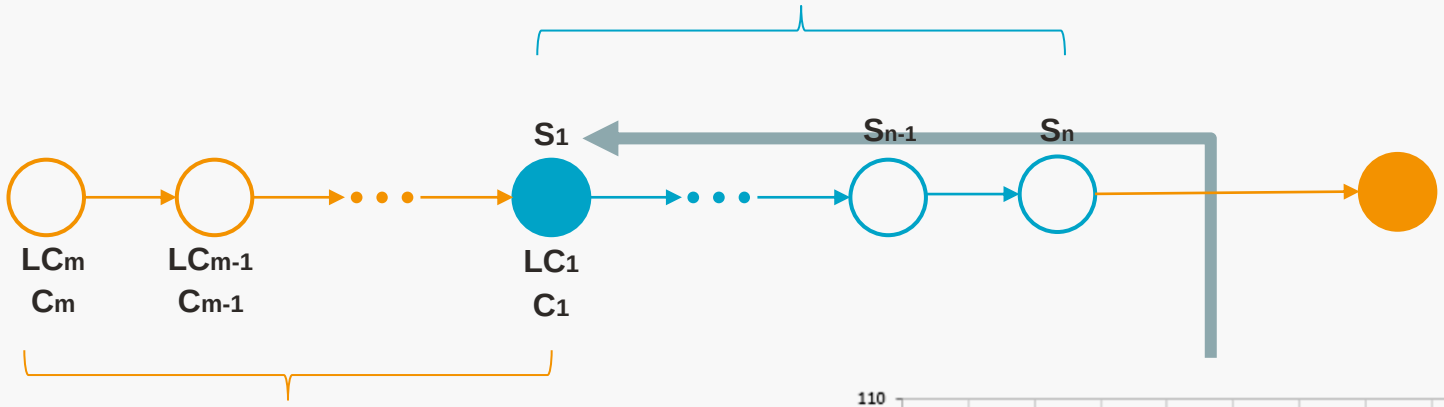
These are the zones "downstream" of the target zone.
Flow from the target zone incurs "cost" by causing reinforcements in these zones.

This is the assumed centre of demand.
It is not a specific zone, but the sink for the flow.

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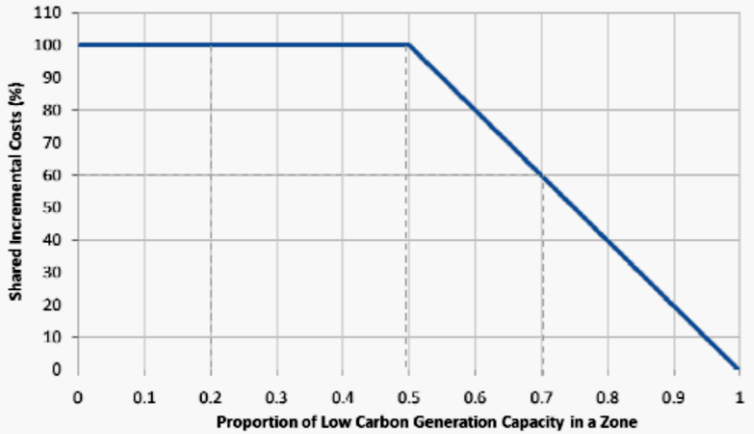
Sharing Methodology

For **every zone downstream of the target node, the calculation works out a sharing factor** for those zones.



The sharing factor for each zone depends on the **total carbon (C) and low carbon (LC) generation in that zone and all zones upstream.** (This is the sum of LC and C across these zones.)

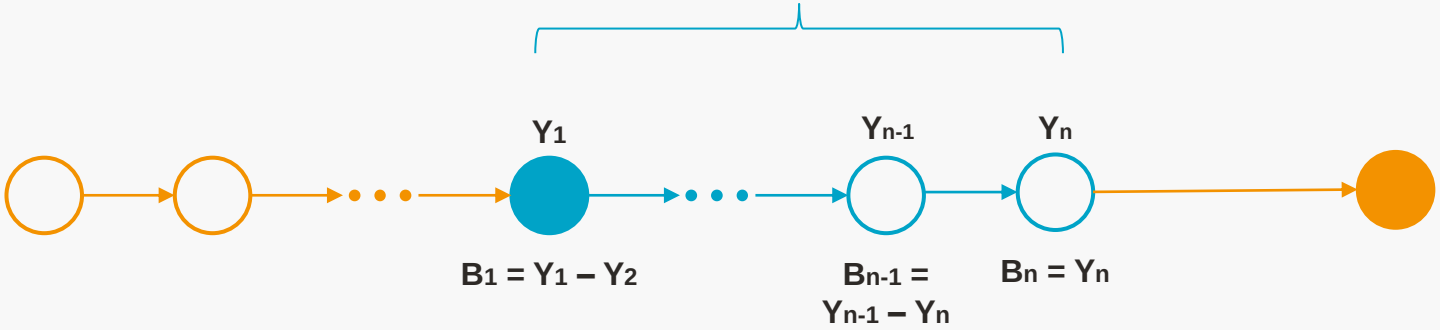
The ratio of these sums (LC/(C+LC)) is used alongside the curve to work out the sharing factor, S, for that zone.



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Sharing Methodology

Each zone has calculated the overall year-round incremental cost before sharing, Y.
This is the incremental cost of flow from those zones under YR.



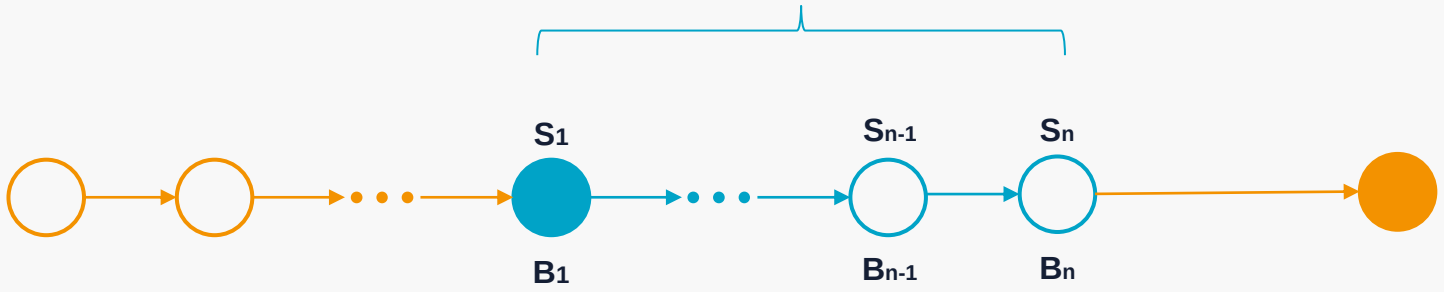
The model works out **boundary incremental costs for each zone, B**, which are the additional cost of flow due to that zone.
This is the difference between Y for that zone and the next.

Note that for the final zone before demand, the boundary incremental cost is equal to the incremental cost in that zone.

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Sharing Methodology

The target zone and each zone downstream have a calculated **sharing factor**, **S**, and an estimate of the **cost incurred in that zone**, **B**.



Year-round shared MWkm = $(S_1 \times B_1) + \bullet\bullet\bullet + (S_{n-1} \times B_{n-1}) + (S_n \times B_n)$

In each zone, **the shared proportion of the cost is the product of these values (S x B).**

The **total shared cost, used to calculate the year-round shared tariff, is the sum of those products.**

This can be interpreted as the cost incurred by flow from the target zone that should be shared, accounting for where the cost is incurred and the level of sharing in those zones.

The remainder of the Year-Round MWkm are allocated to the Year-Round Non-Shared tariff.

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Annex D: Interactions with other mods and TNUoS Taskforce analysis

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Proposed TNUoS methodology changes that interact with CMP393

Modifications and TNUoS Task Force areas of interaction

Mod	Title	Description	Status	Interaction with CMP393	
CMP292	Introducing a Section 8 cut-off date for changes to the Charging Methodologies	Introducing a cut-off date for implementation of CUSC changes affecting tariffs	Awaiting implementation		To be applied in year (t+1), CMP393 must be approved by 30 Sep in year (t)
CMP315/375	Expansion Constant & Expansion Factors review	Review the methodology and data used to calculate expansion factors and constant	Workgroup finalising report after voting on alternatives.		This will directly feed through into stronger/weaker locational signals, affecting the impact of CMP393
CMP316	TNUoS Arrangements for Co-located Generation Sites	Change how charges are incurred by co-located sites by allocating TEC to each technology	Draft Final Mod Report produced		Some consideration needed on how ALF is applied to each technology if there is a distinct formula for storage
CMP331	Option to replace generic Annual Load Factors (ALFs) with site specific ALFs	Introduce an option for site specific ALFs	Final Mod Report submitted – awaiting decision		See later slide
CMP405	TNUoS Locational Demand Signals for Storage	Change demand locational tariffs so they are not floored at zero. Storage to be paid a credit based on Year-Round costs in negative charging zones	With Workgroup		See later slide

Area of discussion	Description	Status	Interaction with CMP393	
Backgrounds for TNUoS charging	Review changing the definitions of the existing backgrounds or introducing more/fewer backgrounds	With Taskforce		See later slide
Sharing methodology	Review whether the sharing methodology is still appropriate given wider power system changes	With Taskforce		See later slide

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Modifications proposed that do not interact with CMP393

Mod	Title	Description	Status
CMP286/287	Improving TNUoS Predictability Through Increased Notice	Increase notice period of tariff setting input data	Sent back to workgroup by Ofgem.
CMP288/289	Explicit charging arrangements for customer delays and backfeeds (CMP288) and consequential change (CMP289)	Potential impact on non-locational tariffs only	Sent back to workgroup by Ofgem.
CMP330/374	Allowing new Transmission Connected parties to build Connection Assets greater than 2km in length	Change CUSC section 14 to enable connection assets greater than 2km in length	Final Mod Report submitted – awaiting decision
CMP343	Transmission Demand Residual bandings and allocation	Creating a new methodology for the demand residual tariff	Awaiting implementation
CMP344	Clarification of Transmission Licensee revenue recovery and the treatment of revenue adjustments in the Charging Methodology	Fixing the TNUoS revenue at each onshore price control period for onshore TOs, and at the point of asset transfer for OFTOs.	Sent back to workgroup by Ofgem.
CMP379	CMP379: Determining TNUoS demand zones for transmission - connected demand at sites with multiple Distribution Network Operators (DNOs)	Determine demand zones for transmission-connected demand users at multiple DNO sites	Final Mod Report (2nd) submitted – awaiting decision
CMP389	Transmission Demand Residual (TDR) band boundaries updates	Determine banding criteria for transmission connected users	Concluded – Pending Implementation
CMP391	Definition of 'Charges for Physical Assets Required for Connection'	Amending the definition of 'Charges for Physical Assets Required for Connection' as per Regulation 838/2010	Concluded – Pending Decision
CMP392	Transparency and legal certainty as to the calculation of TNUoS in conformance with the Limiting Regulation	Identifying whether (or not) particular charges fall within the Connection Exclusion	Draft Final Mod Report produced
CMP411	Introduction of Anticipatory Investment (AI) within the Section 14 charging methodologies	Introduce Anticipatory Investment (AI) and a mechanism for the recovery of AI costs within the Section 14 charging methodologies	With Workgroup
CMP413	Rolling 10-year wider TNUoS generation tariffs	Seeks to introduce an obligation on the ESO to publish generation tariffs for a rolling 10-year duration	With Workgroup
CMP418	Refine the allocation of Static Var Compensators (SVC) costs at OFTO transfer	To socialise SVC costs through wider TNUoS charges	With Workgroup
CMP419	Generation Zoning Methodology Review	To review the existing generation zoning methodology to incorporate offshore assets connected as part of the Holistic Network Design (HND) and enable the wider tariff to be applied to offshore generators	With Workgroup

CMP316

TNUoS Arrangements for Co-located Generation Sites

From the modification proposal:

Defect:

The TNUoS methodology does not adequately accommodate co-located generation sites, particularly sites that have a mixture of technologies that fall into different charging categories. Section 14 needs a methodology by which sites can be recognised and charged consistently with the cost-reflective principles underpinning the TNUoS methodology.

Why:

Currently, TNUoS methodology assess Power Station technology type and the 'controllability' of that type. The relevant formula (Conventional Carbon, Conventional Low Carbon or Intermittent) is then used to calculate the wider TNUoS tariff calculation for that site.

For co-located sites, especially those combining technologies in different charging categories, the current methodology cannot produce cost-reflective tariffs.

How:

Revisions to CUSC Section 14 to introduce a new formula to calculate the appropriate TNUoS charge per technology type.

The solution for this modification requires that each technology/fuel type for co-located generation sites will require its own BMU/metering. If it does not have this, the existing TNUoS methodology will prevail (continue to be charged based on the predominant technology/fuel type).

How this could interact with CMP393:



We do not believe that there are any direct interactions between CMP316 and CMP393. However, it is important to consider the treatment of co-located batteries under CMP393 versus batteries that are not co-located.

For batteries that are not co-located, and for co-located batteries that are separately metered (i.e., AC-coupled), CMP393 and CMP316 could both be implemented consistently and without issue.

For co-located batteries that are not separately metered (i.e., DC-coupled), it would be important to clarify how imports are calculated as part of ALF. If CMP316 is not implemented, this would apply to all co-located storage.

Different technology assets are charged differently, and so there is already an incentive as a co-located asset to change your categorisation as either a battery or renewable, as this affects how ALF applies to the YR non-shared component. Which is preferred depends on whether the YR tariff is positive or negative.

CMP393 would make this incentive larger, as the storage ALF would be 0. If CMP316 is also implemented, this incentive would only apply to DC-coupled batteries, as under this proposal AC-coupled technologies are to be charged separately.

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CMP331

Option to replace generic Annual Load Factors (ALF) with site specific ALFs

From the modification proposal:

Defect:

For a new site, ALF is calculated using a generic ALF value. Where some data exists (but not the minimum 3-year period), the generic ALF is used to replace missing data.

This results in a less cost-reflective TNUoS charge, as the generic ALF can be materially different to the actual ALF at which the generator is operating.

What:

The generic ALF is calculated from the ten most recently commissioned generators for each technology (where available).

To illustrate the range of ALFs for onshore wind, the values for 2019-20 range from 25.7% to 52.0% and the generic ALF applied is 38.5%.

Why:

This change would give more cost-reflective TNUoS charges for new transmission connected generators as their wider TNUoS charge will be based on their forecast export profile and reflect the individual characteristics of the generator. This aligns with how the generator will use the network.

How:

A new generator would be able to submit a forecast of ALF to NGESO. This must be determined by an independent third party. If NGESO agrees it has been independently calculated, it will be used instead of the generic ALF.

How this could interact with CMP393:

Changes to ALF calculation:

Like CMP393, CMP331 proposes changes to the ALF calculation.

However, CMP331 proposes changes to how new generator's ALFs are calculated and will only affect the first 3 years of generation.

Additionally, the proposal is to improve the accuracy of ALF used for new generators, rather than the underlying methodology used to calculate ALF. CMP331 is not storage specific.

While there are some limited interactions between these mods, we do not see this as a barrier to CMP393 implementation.

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CMP405

TNUoS Locational Demand Signals for Storage

From the modification proposal:

Defect:

Locational demand signals are floored at £0/kWh to avoid an operational incentive to increase import over periods with tight system margin at peak demand. However, in areas dominated by intermittent generation, import by storage can reduce flows on the transmission network, hence reducing the need for network investment.

Due to how demand is charged, tariffs have lost the signal of a negative, year-round demand locational charge to encourage storage to locate closer to generation and import when intermittent generation is operating.

Why

Improving the cost reflectivity of TNUoS charging signals should lead to more efficient investment decisions, reducing system cost. Importing when intermittent generation is operating reduces flows on the transmission system, indicating a reduced need for transmission investment.

By incentivising storage to locate on the same side of a constraint, low carbon energy which would be lost to the system can now be stored, displacing fossil fuels at a later settlement period.

How

A storage asset would be paid a demand credit linked to the year-round element of network charges when charging and would pay generation charges when discharging.

How this could interact with CMP393



Both modifications seek to change storage TNUoS charges:

CMP393 proposes changes to ALF calculation methodology. In contrast, CMP405 does not seek to change ALF, but instead give demand credit based on the year-round costs to storage in negative charging zones.

These modifications are conflicting. While CMP405 proposes demand credits when charging, CMP393 would result in year-round tariffs being set at £0/kW for most storage generators due to proposed ALF changes.

Neither modification proposes changes to the peak charge paid by storage.

We see the CMP405 modification as incompatible with CMP393. It would not be feasible to implement both CMP405 and CMP393.

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Taskforce interactions

Changes to the ALF calculation

Change to the ALF methodology

Possible change:

ALF is currently based on the maximum of a site's FPN and metered output. The taskforce has considered whether this should be changed, asking whether it fairly reflects the generator's impact on constraints and whether it distorts dispatch.

The Taskforce analysis considered what might happen if ALF were calculated based solely on FPN. This would remove the overestimate of ALF created by using the maximum of FPN and metered output – this can increase charges for generators who turn up to resolve constraints.

The downsides of moving to FPN only is that it would provide a (relatively weak) incentive to underestimate generation.

Interaction with CMP393 

Under the current methodology, some consideration is needed of how to calculate the contribution to ALF of periods where the FPN is charging but metered output is discharging (or vice versa).

The change itself would not interact directly with CMP393. However, this is an area where members may choose to raise a code mod which could lead to impacts on CMP393. CMP393 would not conflict with this potential long-term change.

Changing the ALF averaging period

Possible change:

The ALF calculation uses the last five years of historic ALF data, and removes the highest and lowest years, before taking an average over the remaining three.

The Taskforce considered the impact of ALF changing annually on volatility and predictability of tariffs as well as cost reflectiveness. Using fewer years could capture trend in ALFs over time, but would make the charge more volatile, especially for peaking generators.

Another motivation for changing the averaging period is to reflect the declining load factors of some generators in the tariffs they pay more quickly.

Interaction with CMP393 

The change itself would not interact directly with CMP393. However, this is an area where members may choose to raise a code mod which could lead to impacts on CMP393. CMP393 would not conflict with this potential long-term change.

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Taskforce interactions

Changes to the application of ALFs

Backgrounds for TNUoS charging

Possible change:

The Taskforce has considered whether we should reform the current market backgrounds. Either through changing the definitions of the existing backgrounds or introducing more/fewer backgrounds.

The Taskforce looked at the impact of removing backgrounds or calculating alternatives on the predictability, volatility and cost-reflectivity of TNUoS tariffs.

The Taskforce analysis indicated that the current backgrounds are broadly appropriate, but some small changes to their definition could be considered. It indicated that there are diminishing returns to adding additional backgrounds.

Interaction with CMP393 

ALF is currently applied to the existing year-round scenario and interacts with the sharing methodology.

If the year-round background were removed without a similar replacement, then it may not be necessary to calculate the ALF of a plant. This would mean that CMP393 had no impact on storage tariffs.

If further backgrounds were introduced, the taskforce would need to consider how sharing and ALFs were applied to these tariffs when calculating tariffs for storage and other technologies. In any case, there is a risk that ALF is applied differently to future backgrounds which makes the impact of CMP393 less certain.

Sharing methodology

Possible change:

The Taskforce may consider in detail the sharing methodology and whether it is still appropriate given the changes in the wider power system.

This work is at a very early stage and therefore it is not clear what the results of any Taskforce analysis would be.

Interaction with CMP393 

Changing the sharing methodology may change how ALF should be calculated or applied to be consistent with the sharing approach. At this stage, it is not clear how the methodology might change, but a reasonable expectation is that any change would only affect the sharing percentages.

Changes to the sharing percentages would not affect the tariffs paid by storage under CMP393 or the current methodology. CMP393 would not conflict with this potential long-term change.

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