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Storage behind constraints

Consultation on treatment of storage during active transmission constraints

NESO
National Energy System Operator

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Executive summary

We estimate that repetitive re-trading (RRT) by electricity storage may have added up to £97.9 million to balancing costs in 2025. We are consulting on options to reduce these costs and control room workload while retaining the benefits storage provides to the electricity system.

The options would change how our control room treats storage during active transmission constraints. Our aim is to manage constraints more consistently and efficiently, supporting a reliable and affordable electricity system while retaining useful storage charging.

RRT can occur when we accept a bid from storage behind an export constraint to reduce its export. The energy remains stored and can be scheduled for export again while the constraint is still active. We may then need to take further balancing actions, increasing overall balancing costs and operational workload.

This behaviour can be commercially rational under current arrangements. The concern is the incentive created and its interaction with constraint management, rather than an assertion of misconduct.

The consultation seeks stakeholder views on whether operational changes should be introduced through the Balancing Principles Statement (BPS) to reduce these costs. The consultation is not a decision to change the BPS and does not identify a preferred option.

What we are consulting on

The approach to storage behind active transmission constraints is currently dealt with on a case-by-case basis. This retains operational flexibility, allowing engineers to select the actions they consider most efficient based on available information and expected system conditions. However, treatment can vary between circumstances, and this approach does not directly address RRT. One of the following options could provide for a more consistent approach.

Use non-storage actions first (Option 3A)

NESO would use non-storage actions before storage actions, following the merit order, to manage active constraints.

Retain storage charging (Option 3AA)

NESO would apply Option 3A to storage bids in managing discharge while retaining storage charging in merit order. This aims to preserve useful charging during the constraint and renewable energy absorption. However, storage charged through the Balancing Mechanism (BM) could subsequently schedule to discharge via the wholesale market while the constraint remains active.

Targeted storage charging (Option 3AA Max)

NESO would retain in-merit charging where a prospective assessment indicates that doing so is unlikely to increase constraint management costs later in the same constraint. The potential benefit depends on the charged energy not being discharged until after the constraint ends. This is an intended outcome, not a settled operational mechanism. A rule would need to be capable of

being applied in advance, consistently and transparently; the mechanism remains under assessment.

All three options would apply only to system-flagged actions during active transmission constraints. Storage would remain able to participate in the wholesale market, could spill to capture the Imbalance Settlement Price, and remain eligible for energy-flagged BM actions.

This consultation seeks evidence on the outstanding questions that will determine whether NESO should make a change and, if so, which option best meets the objectives of this review. Table 1 summarises the options.

Table 1: Summary of the options we are consulting on

	Current approach	Use non-storage actions first	Retain storage charging	Targeted storage charging
Bids to reduce storage export	Case by case, generally in merit order	After non-storage actions	After non-storage actions	After non-storage actions
Charging instructed by NESO	Case by case, generally in merit order	After non-storage actions	In merit order	In merit where assessed as unlikely to increase later constraint costs
Main benefit	Keeps operational discretion	Reduces opportunities for RRT	Keeps more useful charging	Keeps useful charging while limiting RRT
Main risk	RRT and inconsistency continue	May forgo useful charging	Later discharge into constraint recreates costs	Delivering useful charging without subsequent discharge into the same constraint

How to respond

Due date: Written responses to this consultation must be lodged by 17:00 on Thursday **26 November 2026**

How to respond: You can access the Storage Behind Constraints response form ***here***

Publication: We will publish non-confidential responses on our website. We will share all responses with Ofgem, including any parts marked confidential. Please indicate in your response which parts should be redacted from publication.

Contact: For any questions or clarifications, please contact **box.SkipRates@neso.energy**

Responses should address the questions in section 5 and provide evidence where possible.

Abbreviations

Term	Meaning
BESS	Battery energy storage system
B6	B6 transmission boundary
BM	Balancing Mechanism
BOA	Bid-Offer Acceptance
BMU	Balancing Mechanism Unit
BPS	Balancing Principles Statement
C9	Licence condition governing relevant statements and consultation
DESNZ	Department for Energy Security and Net Zero
FPN	Final Physical Notification
LDES	Long-duration energy storage
PN	Physical Notification
PSH	Pumped storage hydro
REMA	Review of Electricity Market Arrangements
RNP	Reformed National Pricing
RRT	Repetitive re-trading
TCLC	Transmission Constraint Licence Condition

1. The problem and case for change

Repetitive re-trading (RRT) is not new. It has existed for many years but only gained wider attention more recently through the Review of Electricity Market Arrangements (REMA), FTI Consulting's analysis of storage "flip-flopping"[1], and NESO's work to reduce 'skip rates'[2]. Reducing constraint costs is now a shared focus for DESNZ and NESO through the Constraint Management workstream of the Reformed National Pricing (RNP) programme. This issue is expected to grow as storage capacity increases over the next decade, adding to a continually growing control room workload.

1.1. How RRT arises

The transmission network is designed to operate within defined thermal limits. If too much power is allowed to flow across a transmission circuit, the associated equipment can overheat and become damaged. We, as electricity system operator, are responsible for ensuring these limits are not exceeded while operating a secure and efficient electricity system.

When more electricity is produced in one region than can be transported safely across the transmission network, we may need to limit generation in that region (or, increase demand). In this situation, the affected assets are described as being behind an export constraint.

To balance supply and demand in real time, we instruct generators, storage assets and electricity users to change their planned output or consumption. These instructions are called Bid-Offer Acceptances (BOAs). The affected Balancing Mechanism Units (BMUs) submit physical and commercial data through bids and offers. A bid proposes reducing generation or increasing demand; an offer proposes increasing generation or reducing demand.

RRT can occur when storage behind an active export constraint is instructed to reduce its scheduled export:

1. The operator submits a Physical Notification (PN) to export.
2. NESO accepts a bid to reduce that export. The energy remains stored, increasing the asset's expected state of charge relative to its original schedule.
3. The operator can sell the retained energy again and submit a new export position.
4. If the constraint remains active, NESO may need to accept further bids from the same asset.

Figure 1 illustrates this sequence through an example.

In this example, the retained energy is ultimately scheduled for discharge after the constraint clears (1d) but only following repeated balancing interventions (1b and 1c). Under licence condition C1.7[3], the pursuit of economy and efficiency should consider relevant information beyond a single settlement period, including likely future costs.

[1] FTI Consulting, The curious case of batteries flip-flopping, December 2024.
[2] 'Skips' occur when NESO control room dispatch instructions appear to deviate from the least-cost merit order of prioritising cheaper actions ahead of more expensive ones. The 'skip rate' refers to the frequency at which skips occur.
[3] https://epr.ofgem.gov.uk/c/9wgWVKeHRymQ3pBbiptyqA/p/0196c209-4e4c-4e2b-92ae-525b634f2f51/wvp/eb4d7dac-bcd0-4fc6-9fe7-a6073ae60c3a

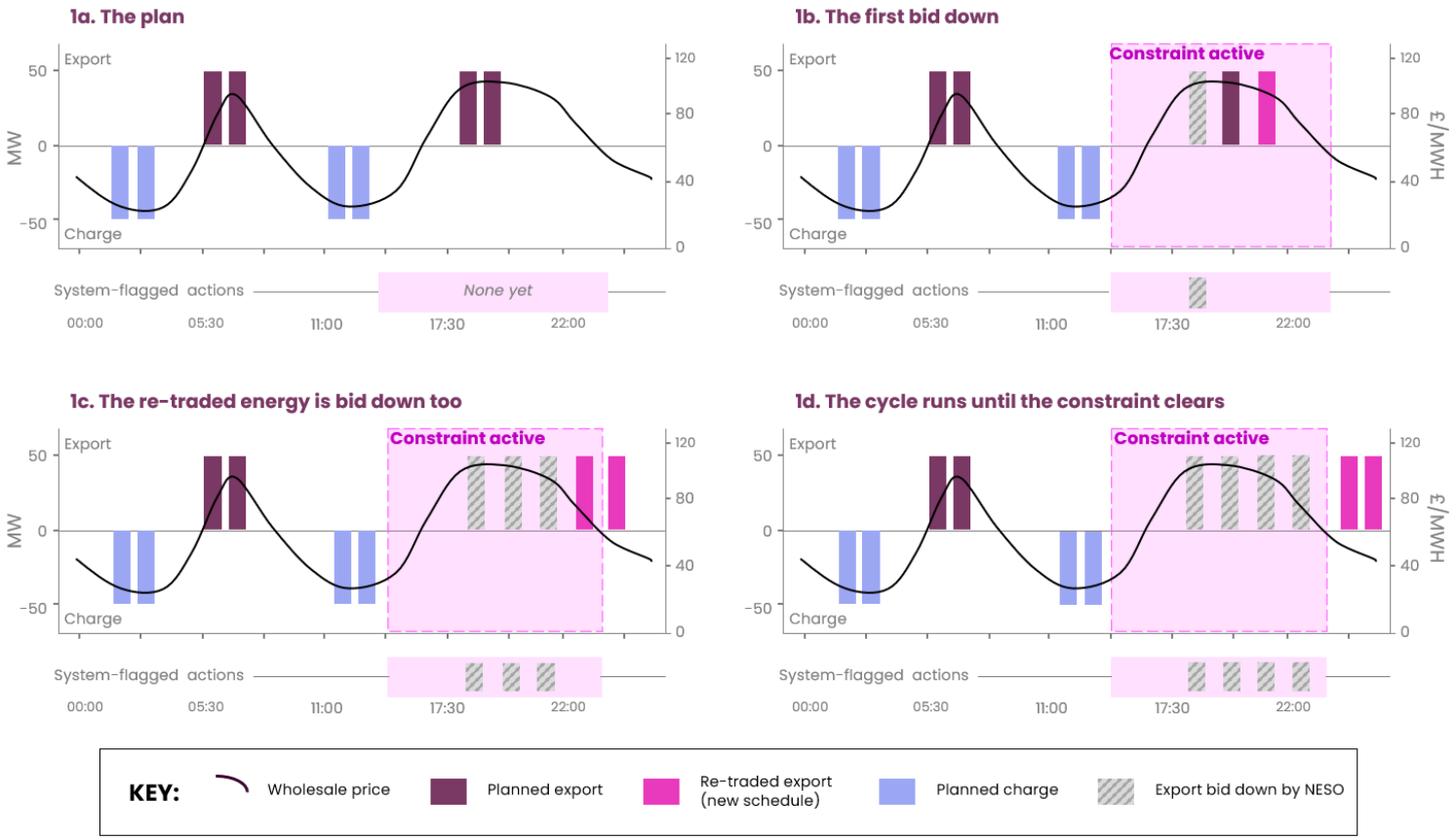


Figure 1: How repetitive re-trading arises

Each bid-down action may also require NESO to procure replacement energy elsewhere. The overall cost therefore depends on repeated constraint actions and replacement energy, not just the storage bid price.

This behaviour can be commercially rational under existing market arrangements. The concern is how market incentives interact with constraint management, not an assertion that re-trading itself constitutes misconduct.

Why focus on storage?

Storage assets differ from other generation because they are energy-limited, can both import and export electricity, and fundamentally exist to cycle energy. When we accept a bid to reduce a storage asset's scheduled export, the energy remains stored and can be exported later. This creates a new opportunity to sell the retained energy.

This differs from curtailed wind or other renewable generation, which would typically lose the energy that was not generated. A gas-fired plant saves fuel when bid down, but the action does not change its ability to generate later in the same way.

Across a long constraint, repeated actions can mean that the total volume bid down exceeds the energy the storage asset can hold. Conversely, if a storage asset cannot discharge, it may be unable to create headroom for charging in later periods. These technical differences may justify

different treatment during active constraints, while recognising that storage may have legitimate reasons for wanting to discharge and create headroom[4].

Why not charge storage when wind is being turned down?
We already use storage charging where it is cost-effective. Charging can absorb energy behind a constraint that would otherwise be curtailed. However, if the stored energy is scheduled for export before the constraint ends, further balancing actions may be needed, adding to balancing costs and NESO's operational workload.

The benefit therefore depends on when storage charges and discharges relative to the constraint. The most beneficial pattern from a system operation perspective is to charge when residual demand behind the constraint is lowest, retain the energy until the constraint ends, and discharge when residual demand is high.

1.2. Why action is being considered

We have an obligation to balance the system economically and efficiently while considering the interests of current and future consumers. RRT conflicts with this obligation as it increases the volume and cost of actions needed to manage transmission constraints. We consider that the following factors support action now to reduce RRT costs:

- **The costs are material and growing:** We estimate that RRT may have added £97.9 million to balancing costs in calendar year 2025. The estimated RRT balancing cost impact increased by nearly 50% between financial years 2024/25 and 2025/26.[5]
- **More storage is expected:** Short and long duration storage capacity is forecast to increase significantly. Ofgem's June 2026 publication on long duration electricity storage (LDES) included minded-to decisions to support 5.1GW of storage in Scotland coming online from 2029.[6] Until network development catches up with new generation, more storage is likely to be located behind constraints. The scope for RRT scales with the volume installed.
- **Inconsistent operational decisions:** Control room engineers must balance dispatching actions in merit within each settlement period against minimising overall balancing costs. This can lead to inconsistent treatment, creating uncertainty for market participants and variable cost outcomes.
- **RRT adds operational complexity:** Repeated storage bid-down actions and the associated replacement energy offers increase the number of instructions our control room must validate, issue and monitor. This adds workload, reduces situational awareness and increases pressure on control room systems and processes. Changes in storage schedules also make constraint forecasting and planning harder. When storage becomes full and stops importing, constraint flows may need to be managed at short notice, leaving less time

[4] Pumped storage hydro may desire headroom in anticipation of snowmelt, rainfall or to comply with environmental requirements. Batteries may need to restore headroom to fulfil a Quick Reserve contract or other service obligations.

[5] The methodology for calculating these costs is provided in the Appendix.

[6] Ofgem, 2026, Window 1: Minded-to decisions – Long duration electricity storage consultation.

to respond. Together, these effects materially increase the operational challenge of managing constraints.

- **Existing rules cannot resolve the issue alone:** In June 2026, Ofgem concluded that the Transmission Constraint Licence Condition (TCLC) regulates bid pricing but not dispatch behaviour or replacement energy.[7] It therefore cannot, by itself, address the negative system impacts of RRT. Ofgem identified NESO's Storage Behind Constraints operational review as part of the work assessing potential responses.
- **Significant market reforms will take longer to implement.** More significant market reforms, such as those being explored in the Dispatch Reform workstream of the Reformed National Pricing (RNP) programme, could be designed to improve the commercial signals faced by storage assets to align better with system needs for constraint management. However, these reforms are in the early stages of discussion and would take years to implement. It is therefore preferable to implement a solution in advance of more significant reforms.

1.3. Objectives and scope

Electricity storage assets are units that convert electrical energy into a form that can be stored, store that energy and subsequently convert it back into electrical energy. This reflects the definition in our electricity system operator licence. This review applies to these technologies, especially the prevailing technologies of battery energy storage systems (BESS) and pumped storage hydro (PSH), at BMU level[8].

We will assess the options against four objectives:

- reduce unnecessary balancing costs for consumers;
- maintain secure and reliable system operation;
- retain useful storage charging where it benefits the system; and
- provide a clear, consistent and deliverable approach.

We will also consider whether each option is coherent with the direction of longer-term market reforms. Together, these tests consider reliability, useful renewable-energy absorption and affordability without assuming that every option delivers all three outcomes.

This consultation focuses on changes we could implement quickly. We are also separately assessing longer-term options to address the underlying market and operational drivers of RRT, including through RNP Dispatch Reform.

> **Question 1:** Since Ofgem's June 2026 policy paper clarified its view on RRT and the TCLC, have you changed the way in which you operate and/or trade? If you made changes, what effects have you observed on re-trading volumes, revenues and balancing costs?

[7] Ofgem, 2026, Policy paper: Repetitive Re-trading (RRT) by electricity storage in transmission constraint periods

[8] Currently, the BMU threshold is 50MW in England and Wales, 30MW in South Scotland or 10MW in North Scotland.

2. Options

In early 2026, NESO developed a longlist of options through internal analysis and engagement with storage operators, trade bodies, Ofgem and DESNZ. Industry workshops tested the problem, reviewed the options and applied a shortlisting framework.

Options were grouped according to whether they could be implemented quickly, required enduring reform, belonged within another programme, sat outside our remit or were not feasible. Further engagement through industry events in June and July and a webinar in August informed the shortlist. Stakeholders raised concerns that the options would not sufficiently preserve storage's wider system benefits, particularly useful charging behind constraints. The *Targeted storage charging* option has been developed in response and included in the shortlist.

The wider option review[9] considered limits on bid price or cycle limits, bilateral or pre-gate procurement, locational services, intertrip schemes[10], information measures and the possibility of a new product, Capacity Reserve[11]. These approaches may contribute to enduring reform, but they are not currently being progressed as options capable of implementation within the timeframe considered in this consultation. Consultation responses may inform the treatment of these alternatives.

2.1. The shortlist

The options address RRT by changing when we accept storage bids and offers during active constraints. This consultation considers:

- **Use non-storage actions first (Option 3A)** prioritises non-storage actions, reducing opportunities for storage to retain energy after being bid-down and reschedule it for export during the same constraint.
- **Retain storage charging (Option 3AA)** applies this treatment to storage discharge but keeps charging in merit order. This preserves more useful charging, but storage charged through the BM can still schedule discharge through the wholesale market while the constraint remains active, potentially requiring further actions.
- **Targeted storage charging (Option 3AA Max)** retains charging only where a prospective assessment indicates that doing so is unlikely to increase costs later in the same constraint. Its benefit depends on avoiding subsequent discharge into that constraint. The operational mechanism remains unresolved. Section 3.4 discusses potential approaches for delivering this outcome.

[9] NESO, 2026, Storage Behind Constraints: Understanding the issue, the options considered, and NESO's proposed direction, webinar, 6 August 2026

[10] An intertrip scheme automatically disconnects or reduces generation if a network fault occurs. This allows the network to be run closer to its limits in normal conditions.

[11] Capacity Reserve is a proposed service where NESO would procure storage availability ahead of constraint periods. Storage would receive availability payments and follow NESO redispatch instructions, with utilisation paid through the BM.

Figure 2 provides an illustrative example of how charge, discharge and BM actions differ under each of the options relative to current practice.

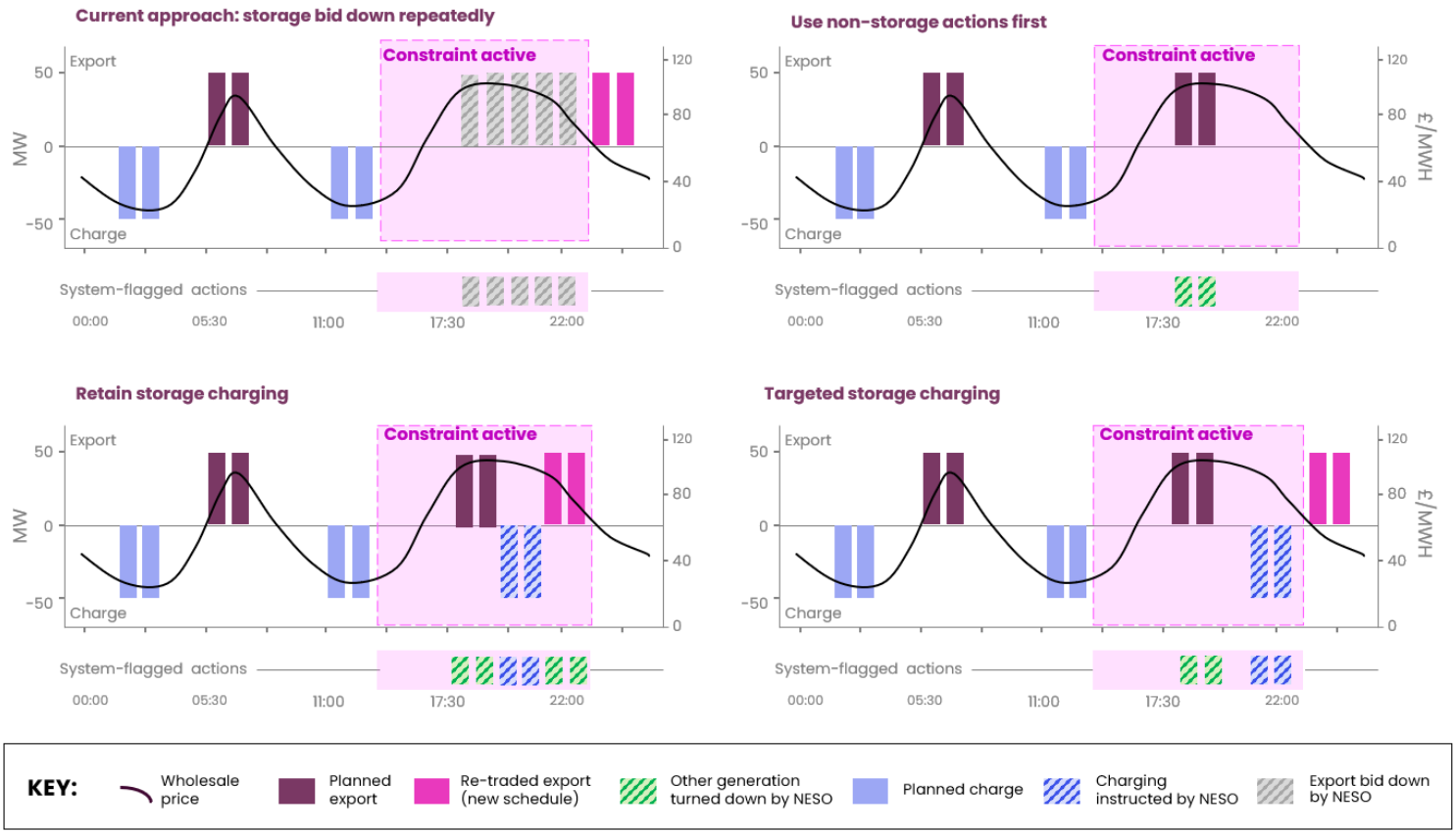


Figure 2: How each option changes storage charging and discharge during an active constraint

Through this review, the options will be assessed against the objectives in section 1.3. Table 2 summarises our initial view of their operational treatment, value, deliverability and limitations.

Table 2: Initial assessment of the shortlisted options

	Operational treatment	Consumer and system value	Deliverability and consistency	Key limitations
Status quo	Case-by-case treatment during active constraints.	Retains operational discretion.	Already in place, but inconsistent.	RRT and inconsistent treatment continue.
Use non-storage actions first	Use relevant non-storage actions before storage actions when managing active constraints.	Designed to reduce requirement for repeated storage actions.	Relatively simple, subject to consistent application.	May forgo some useful charging and thereby affect unit revenues and consumer benefit.
Retain storage charging	Retain storage charging in merit order while using non-storage actions ahead of reducing storage discharge.	Retains more charging and renewable absorption, but later discharge may recreate costs.	Requires process definition and monitoring.	Does not remove the opportunity to charge in the BM and discharge through the wholesale market during the constraint.

Targeted storage charging	Retain charging where a prospective assessment indicates that doing so is unlikely to increase costs later in the same constraint. Charging near the expected end is one possible approach.	Designed to retain some charging while addressing RRT; cost effects remain under assessment.	Requires a rule that can be applied in advance, consistently and transparently.	Depends on constraint forecasts and subsequent discharge timing.

Question 2: Which of the proposed options best meets the objectives in section 1.3? Please provide your reasoning.

Question 3: Is there another option that would better meet the objectives in section 1.3 and could be implemented by NESO within six months? Please describe the approach and how it compares with the proposed options.

3. Evidence and assessment

As system operator, we have visibility of the physical limits and power flows across the transmission network as part of our scheduling and dispatch activities. The network diagrams available through our Data Portal[12] illustrate the transmission assets and network elements included in these processes.

This data is currently used to calculate skip rates behind thermal constraints. The methodology compares an idealised merit-order outcome, in which no skips occur, with actual market outcomes to determine skip rates for each major system constraint.

For this project, we adapted the 'skips behind thermal constraints' methodology[13] to compare observed BM outcomes with the outcomes that might have occurred under the different options. Table 3 summarises the modelled 2025 balancing-cost ranges. The remainder of this section sets out the analytical approach, presents the results and seeks stakeholder evidence on outstanding issues.

Table 3: Modelled change in calendar-year 2025 balancing costs relative to the current approach

Option	Modelled outcome
Use non-storage actions first (Option 3A)	£7 million saving to £95 million cost increase
Retain storage charging (Option 3AA)	£53 million saving to £184 million cost increase
Targeted storage charging analytical case (Option 3AA Max)	£53 million saving to £49 million cost increase

3.1. Analytical approach

The analysis estimates how the options would have affected balancing costs in calendar year 2025. It combines the 'skips behind thermal constraints' dataset with data on RRT volumes and replacement energy costs. The latter defines RRT as the re-trading of energy previously bid down and is identified by positive PN changes following a system-tagged bid. This definition omits the volumes associated with the first system-tagged bid and PNs submitted before the system action.[14]

The skips behind constraints methodology reconstructs constraint management options so that outturn results can be compared with least-cost constraint management. It involves identifying the feasible volumes available from units behind active constraints as well as specific constraint

[12] NESO, 2026, 24 Months Ahead Constraint Limits

[13] Skip Rates Behind Active Thermal Constraints, Final Methodology; Skips Behind Active Thermal Constraints: Methodology and Implementation Guide

[14] The Appendix provides more detail.

requirements. The volumes are ranked by price and a volume equal to the constraint requirement is taken to be 'in-merit'.

Our calendar-year 2025 baseline of £1,139 million reflects the bid costs of managing the export constraints included in the skips behind constraints analysis, as well as the associated replacement energy costs identified separately in the Appendix.

For *Use non-storage actions first*, the model changes the treatment of storage while meeting the same constraint requirement. The resulting cost changes comprise:

- **Additional constraint management costs:** using available non-storage actions instead of relevant storage actions increases costs.
- **Avoided RRT bid costs:** reducing identified RRT volumes reduces the need for repeated storage bid-down actions.
- **Changes in replacement energy costs:** fewer constraint actions reduce the replacement energy required and are expected to reduce the cost of the marginal balancing action.

For *Retain storage charging*, the model retains eligible charging in merit order and distinguishes charging bids from bids that only reduce discharge. It also tests the additional costs of discharging that energy while the constraint remains active.

The model assumes one charging cycle and an initial state of charge of 0%. These are analytical assumptions, not proposed operating restrictions. They illustrate the trade-off between charging and subsequent discharge rather than fully simulating unrestricted charging in merit order.

Targeted storage charging also retains eligible charging in merit order and distinguishes charging bids from bids that only reduce discharge. However, in contrast to the previous option it assumes that charged units do not schedule to discharge into the same constraint.

3.2. Result for Use non-storage actions first (Option 3A)

For calendar year 2025, the model estimates £95 million in additional constraint-management costs. Potential savings comprise £11 million from avoided RRT bids and £91 million from replacement energy. The net outcome ranges from a £7 million saving to a £95 million cost increase.

This range depends on where substitute intraday supply comes from.[15] The primary difference between this result and NESO's estimate of RRT costs is the cost of using more expensive generation volume after storage is removed from the in-merit stack.

[15] Substitute intraday supply is distinct from the balancing replacement energy procured after a constraint action.

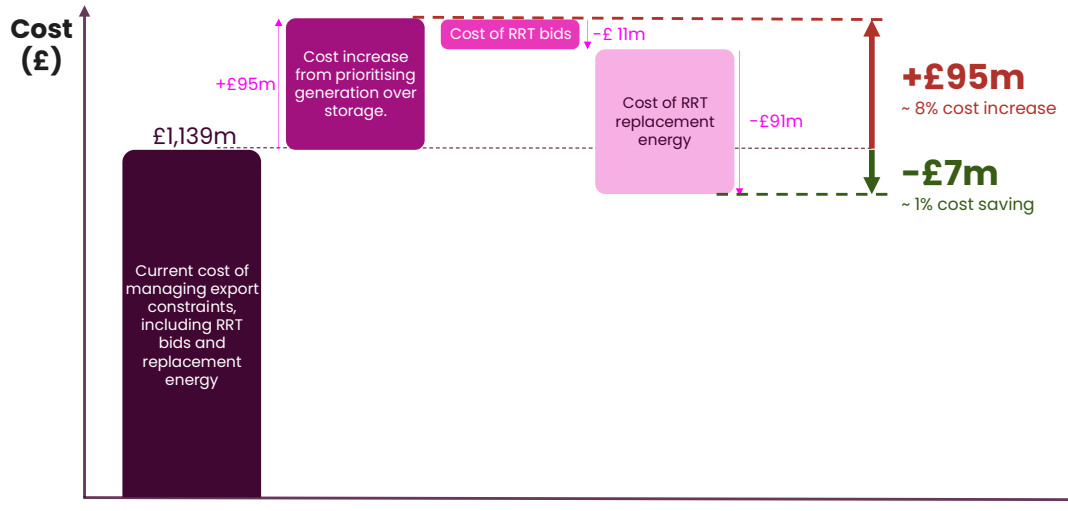


Figure 3: Modelled balancing-cost changes for Use non-storage actions first; calendar year 2025

This analysis assumes that, when RRT volumes are no longer used for system-flagged BM actions, those volumes are also removed from intraday trading in the wholesale market and supplied by another unit.

The substitute unit could be located:

- **Inside the constrained area:** substitute supply retains the excess energy behind the constraint, requiring further bid-down actions and replacement energy from outside the area leading to an increase in cost.
- **Outside the constrained area:** substitute supply reduces the need for replacement energy, creating balancing cost savings.

A non-physical trader could also provide the volume, although we would expect it to be sold to an entity with a physical position before real time.

The £7 million saving assumes all substitute wholesale market supply comes from outside the constrained area. The £95 million cost increase assumes all of the substitute volume is behind the constraint. The break-even point requires 93% of substitute supply to come from outside the constrained area.

These are scenario ranges, not forecasts or statistical confidence intervals. No probabilities are assigned, and the analysis does not identify which assets would replace individual trades.

The available evidence suggests greater scope for substitute supply from England and Wales, outside the prevailing export constraints. In 2025, the most material export constraints were in Scotland, where dispatchable generation available for intraday trading was limited outside storage. The largest dispatchable units, at Peterhead Power Station, also tend to be more expensive than units in England and Wales because of generator Transmission Network Use of System charges and thermal efficiency.

This suggests that the option could provide a net balancing cost benefit. We seek evidence on how operators and wider portfolios would rebalance, and where substitute supply might come from.

Balancing cost changes are not equivalent to changes in overall consumer or system value. Some effects may transfer costs or revenues between the BM and other markets. These wider effects have not been quantified but are assessed qualitatively in section 3.5.

3.2.1. Storage behaviour in response to wholesale prices under Use non-storage actions first (Option 3A)

We assessed whether storage in Scotland responding to day-ahead prices would help or hinder constraint management at the B6 transmission boundary, using data from 1 July 2025 to 30 June 2026. Complete constraint data was available for 330 days, so the results should not be read as complete observations for the entire year. The analysis assumes one charge–discharge cycle per day, without BM redispatch. It tests whether low-price charging and subsequent high-price discharge would shift energy from periods of higher constraint volume to periods when the constraint was weaker or inactive. Figure 4 shows these comparisons by season.

The results are mixed. The implied cycle would have helped constraint management on 35% of days, had no effect because the constraint was inactive on 33%, and increased constraint volumes on 32%. Overall, the tested strategy was beneficial or benign on 68% of days, with a slightly higher proportion of beneficial or benign cycles in winter and spring than in summer and autumn.

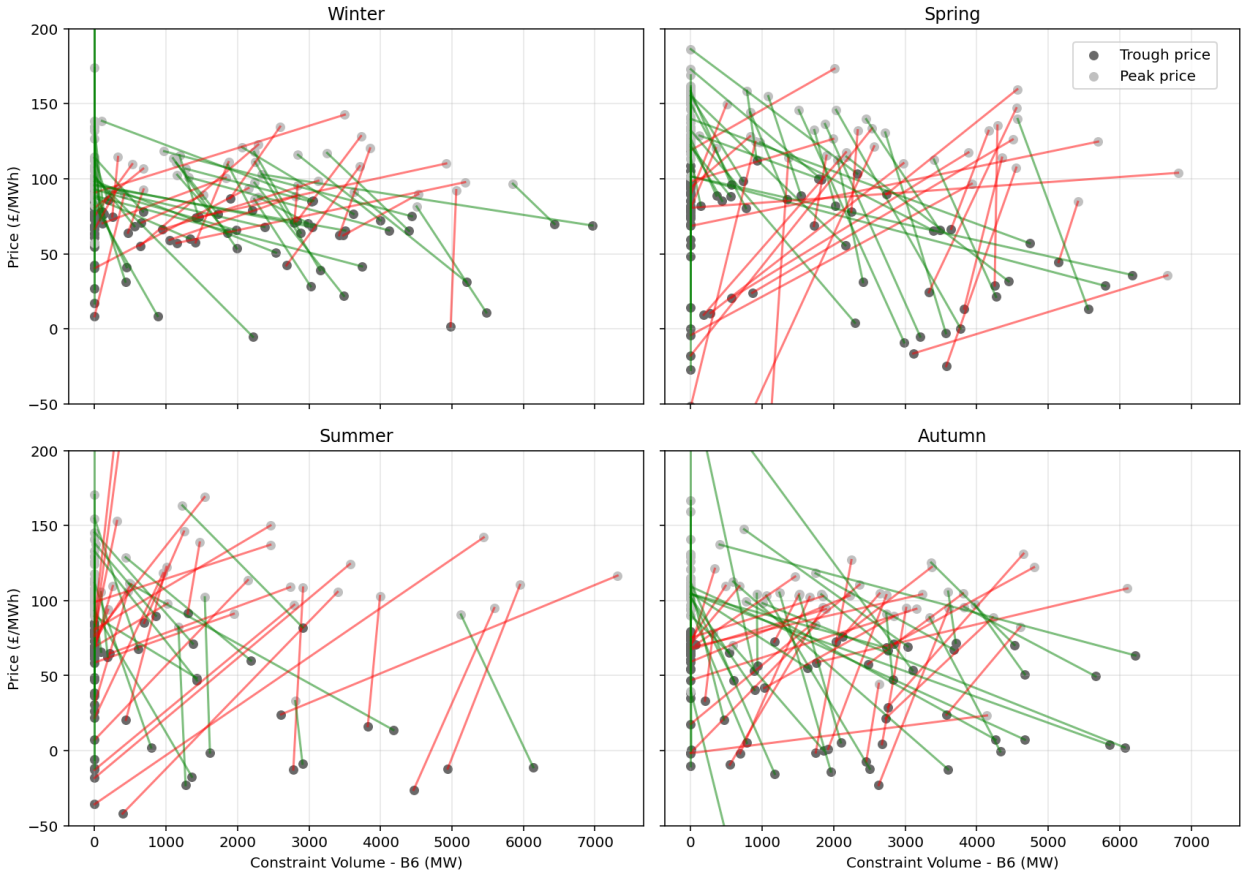


Figure 4: Daily high-low price pairs compared with excess energy above the B6 boundary

The analysis shows that national wholesale price signals do not reliably align storage operation with constraint management needs at the B6 boundary. The 68% helpful-or-neutral result includes days when the constraint was inactive, not only days when storage actively reduced constraint volumes. This analytical case focuses on active export constraints whereas nested import constraints can also affect whether charging is helpful.

This limited test covers one boundary, one simplified strategy and day-ahead prices only. It does not assess storage revenues or capture intraday trading, BM opportunities, ancillary service obligations or other optimisation strategies. The findings are more applicable to short-duration storage than to pumped storage hydro or other long-duration storage and are not a forecast of behaviour under *Use non-storage actions first*.

3.3. Results for Retain storage charging (Option 3AA)

Retain storage charging would keep charging in merit order while prioritising non-storage actions over bids that reduce storage discharge during active export constraints. This preserves useful charging, but subsequent discharge can create offsetting constraint costs.

The model retains charging bids up to a 100% state of charge, assuming one cycle from an initially empty asset. If the charged energy is discharged while the constraint remains active, further bid-down actions and replacement energy are required.

For calendar year 2025, the modelled outcome ranges from a £53 million saving to a £184 million cost increase. The cost increase can exceed the estimated RRT cost because the analysis includes substitute constraint actions and replacement energy, not RRT alone.

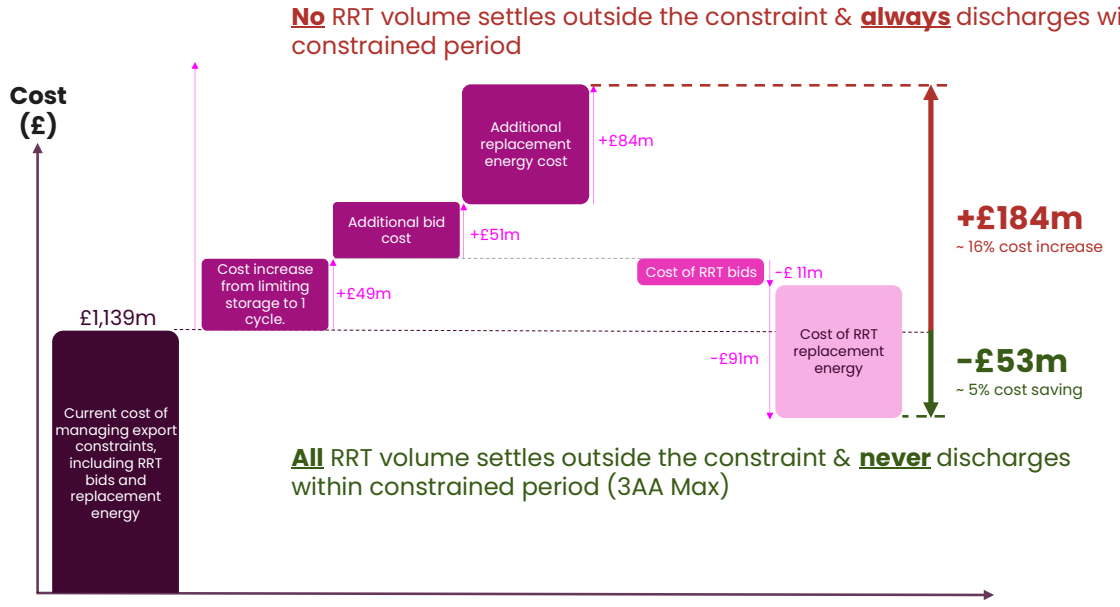


Figure 5: Modelled balancing-cost changes for Retain storage charging; calendar year 2025

The maximum saving assumes substitute intraday wholesale market supply comes from outside the constrained area. Retaining some charging bids reduces the additional constraint

management costs relative to *Use non-storage actions first*. However, excluding further charging through the one-cycle assumption still adds £49 million relative to the baseline.

The maximum cost increase assumes:

- all substitute intraday supply comes from behind the constraint; and
- storage completes one cycle, discharging while the constraint remains active.

In practice, the option could allow multiple cycles, particularly for short-duration storage. These could reduce initial constraint-management costs but increase subsequent bid and replacement-energy costs. The results illustrate the difficulty of addressing RRT through the BM while other trading routes remain available.

3.4. Targeted storage charging analytical case (Option 3AA Max)

We developed *Targeted storage charging* in response to stakeholder feedback. It seeks to retain useful charging while reducing the likelihood of subsequent discharge into the same active export constraint. Because it relies on NESO's prospective judgement about the duration of constraints, its outcomes could be less consistent than either of the other options.

The analytical case assumes that charged energy is retained until the constraint ends. Under this assumption, the modelled outcome ranges from a £53 million saving to a £49 million cost increase. The range depends on the location of substitute supply and the avoidance of subsequent discharge into the constraint. It is not a forecast or confidence interval and does not establish that an operational mechanism can deliver the outcome.

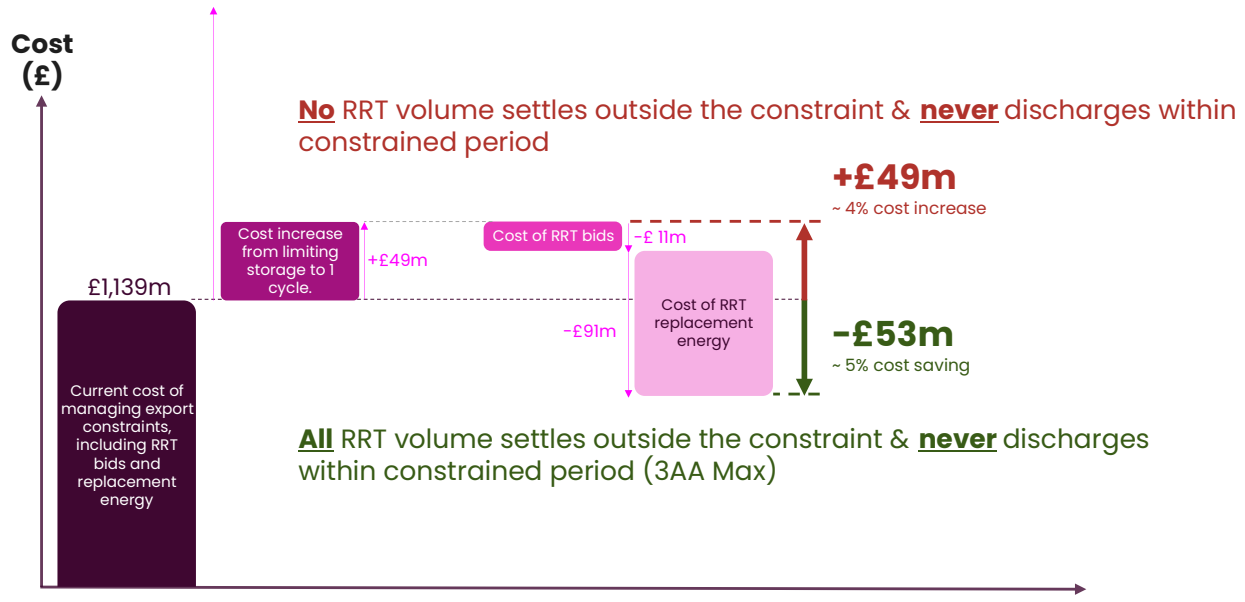


Figure 6: Modelled balancing-cost changes for Targeted storage charging; calendar year 2025

Potential approaches include:

- **Restriction:** prohibit discharge PNs following a BM charging instruction for the remainder of the constraint. This would be legally challenging and is not being pursued via this review.

- **Dispatch approach:** instruct charging nearer the expected end of a constraint. This may reduce re-trading opportunities but is only one possible approach.
- **Desired behaviour:** set an expectation that storage instructed to charge retains the energy until the constraint ends, without introducing a restriction, incentive or market rule.
- **Incentive or penalty:** incentivise compliance or penalise storage that self-dispatches into the same active constraint after receiving a BM instruction to charge. The design and proportionality of any mechanism remain unresolved.

The analysis has not established the value of charging near a constraint's expected end. It may reduce re-trading opportunities but also limit useful charging. Further evidence is needed on this trade-off.

For a NESO-led dispatch approach, we would seek to develop a prospective decision rule covering constraint end forecasts, uncertainty, recurring or nested constraints, and recent and subsequent exports by the same BMU. We would also seek to ensure consistent application and retrospective transparency.

Before progressing an approach, we would define the rule and available information, test consistent application, assess legal and firm-access implications, and complete operational validation. This consultation does not imply that these steps have been completed.

Respondents should distinguish the intended outcome from the mechanism proposed to deliver it. Proposals should explain how they would avoid subsequent discharge into the same active constraint, what information and incentives they require, and how they would protect consistency, transparency and participant access.

3.5. Summary of analysis

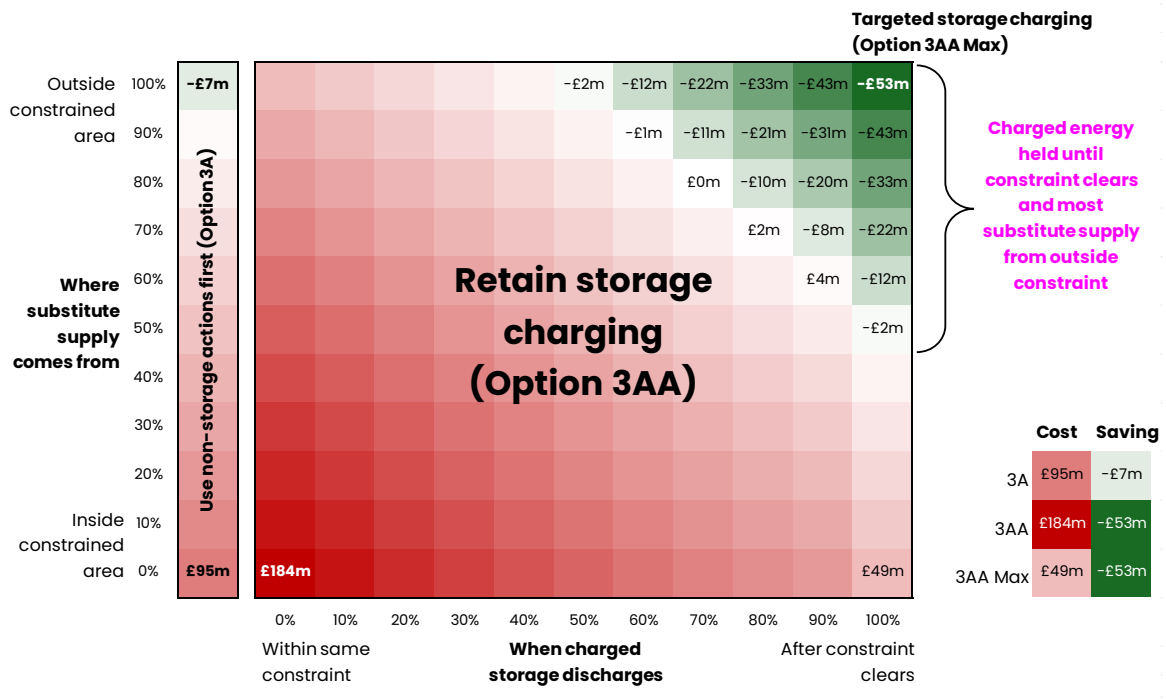


Figure 7: Modelled change in 2025 balancing costs relative to the current approach (baseline £1,139 million)

3.6. Other impacts and considerations

The analysis presented so far has focused on balancing cost impacts whereas the impact on end-consumers would also depend upon how the options impact wholesale market trading and ancillary service markets. Further, due to the technical differences between different types of storage, the relative impact of the options may vary. We discuss these impacts qualitatively below.

Wholesale market impacts

Our assessment of wholesale market impacts is guided by C1.11 of NESO's licence.[16] We consider the most relevant wholesale market impact to be on intraday trade, including intraday auctions and intraday continuous trading, because these markets operate within the timeframe in which RRT occurs. Most GB forward trading takes place 'over-the-counter' before the formal day-ahead markets, and intraday volumes are smaller than day-ahead volumes. The volume of trade potentially affected by the options in this paper therefore appears relatively small based on historical observations, suggesting that consumer-cost effects through this trading channel may be limited. Intraday continuous trading is pay-as-bid, so a change in the price of the marginal unit does not necessarily affect the price received by other units.

To the extent that the RRT options reduce intraday volumes associated with RRT, we consider this likely to improve efficiency because a greater share of the remaining trades should be physically deliverable. This is consistent with GB's net pool arrangements, under which market participants trade their own positions and NESO undertakes residual balancing close to real time. Physically deliverable trades support more efficient price formation by allowing market prices to reflect the marginal units needed to serve demand and balance the system. They also reduce the operational workload and cost of bidding down an undeliverable position and procuring replacement energy.

Ancillary service impacts

Use non-storage actions first and *Retain storage charging* would preserve the ability of units to submit PNs and to charge or discharge, so they would not physically prevent operators from positioning units to meet ancillary-service contracts or similar obligations. However, limiting BM charging under *Use non-storage actions first* could affect the commercial case for offering these services.

The other ancillary service consideration is the anticipated implementation of locational procurement. Locational procurement could be expected to reduce the chance of us procuring reserves from units behind active constraints where service provision involves exporting energy. As such, we rate the impact on ancillary services of the RRT options as minimal in the expectation that locational procurement will lead to fewer ancillary service contracts being awarded to storage behind constraints.

Long-duration and short-duration storage

PSH is a technology type; long-duration energy storage is a duration category. The terms are therefore not interchangeable, although pumped storage assets may also qualify as long-

[16] C1.11 says that NESO must carry out its operational actions in a way best calculated to ensure it does not unduly distort competition or create inefficiency across the wholesale electricity market and Balancing Services markets.

duration storage. PSH accounts for most of the balancing-cost impact attributed to historical RRT (see Appendix). The behaviour test in section 3.2.1 is more applicable to short-duration storage[17]; the options themselves and main analysis apply to all storage technologies in scope.

Storage can provide system value by retaining renewable electricity that cannot be exported through a constraint and discharging it after the constraint clears. Longer-duration assets may provide this benefit over inter-day timescales, but they also have more time and opportunity to re-trade energy before a constraint ends.

However, without wider changes to market frameworks, our options each provide challenges relating to how LDES can provide this system value:

- **Current approach:** NESO can dispatch long-duration storage locationally through BM system actions, but assets behind constraints may still face commercial incentives to re-trade.
- **Use non-storage actions first:** this could limit NESO's use of longer-duration storage to absorb constrained renewable generation for discharge after the constraint clears, including across days, potentially forgoing this system benefit.
- **Retain storage charging:** this would preserve NESO's ability to charge longer-duration storage behind constraints, but would not ensure the energy is retained until the constraint clears. It could still be sold intraday and scheduled for discharge during the same constraint.
- **Targeted storage charging:** charging a longer-duration asset sufficiently to provide value may need to begin many hours before the expected end of a constraint. This increases exposure to forecast error and creates more opportunity to re-trade before the constraint clears.

Question 4: Do you have evidence on where alternative intraday volumes would come from under the three proposed options? Please provide supporting evidence.

Question 5: What information would market participants need to schedule storage efficiently under *Targeted storage charging*? Is this information already available and, if not, how could it be provided?

Question 6: What practical mechanism could deliver *Targeted storage charging* while preserving useful charging and avoiding subsequent discharge into the same active constraint? Please explain how each mechanism would work and the extent to which it would meet the objectives in section 1.3.

[17] This behaviour test speaks only to the effectiveness of Option 3A/*Use non-storage actions first* and does not feed into the conclusions from the rest of the analysis.

4. Implementation considerations if a change is progressed

4.1. Why changes to the BPS may be appropriate

If we propose to progress a change following this consultation, amending the BPS is currently considered the appropriate method to reflect and communicate the updated principles for balancing actions. *Use non-storage actions first*, *Retain storage charging* and *Targeted storage charging* would reflect a change in the principles the control room uses to order balancing actions during transmission constraints. The BPS sets out the principles for managing transmission constraints.

This consultation is not a decision to amend the BPS. Any resulting proposal would follow the applicable licence condition C9 process if applicable. We review our C9 statements, including the BPS, annually.

Any change will seek to clearly define when different treatment applies, provide an objective technical basis for it and avoid undue discrimination. Existing cost order principles would generally apply in other circumstances.

4.2. Operational method, safeguards and monitoring

The operational design is not yet finalised. The emerging approach sets out how the options could translate into control room treatment and the issues to resolve before implementation. Consultation evidence and further operational assessment will inform the final design if we decide to progress a change.

The proposed treatment would change the priority given to relevant storage actions when managing an active constraint. It would apply at BMU level. The final method would define which batteries, PSH units, and other storage assets fall within scope, so that the classification can be applied consistently.

Prioritisation of actions

Under *Use non-storage actions first*, NESO would use non-storage actions before storage actions, following the merit order, to manage active constraints. Storage actions would remain available where relevant non-storage actions are insufficient. Within the storage actions, the proposed principle would be to use:

- For export constraints: instructed charging before actions that reduce storage exports, with cost order applied within each category.
- For import constraints: reduce storage exports before instructed charging, with cost order applied within each category.

Retain storage charging would keep instructed charging in price order while applying the non-storage-first treatment to storage export reductions. *Targeted storage charging* would retain instructed charging only where a prospective assessment indicates that doing so is unlikely to increase costs later in the same constraint. Charging nearer the expected end is one possible dispatch approach, but the value of late charging and the operational rule remain unresolved.

Targeted charging and operational discretion

A prospective charging approach could apply where NESO has sufficient confidence that a constraint will soon end and remain inactive for a defined period. The final design would specify how recent and subsequent exports are treated. It will not imply a restriction on access unless the legal basis and proportionality of that restriction have been established.

A more detailed method would define how NESO assesses the expected end of a constraint using information available at the time, accounting for nearby or overlapping constraints, and accounting for recent or subsequent exports by the same BMU. This could also allow short departures from the proposed hierarchy during significant changes in system conditions to manage operational risk. The final method would define the circumstances and extent of this discretion.

Safeguards and monitoring

The current analytical and operational case is focused on active export constraints. An implementable method would seek to define the active-constraint trigger, action hierarchy, affected BMUs, system and energy flags, exceptions and operator discretion. It would also need an explicit decision on whether and how import constraints are captured.

Safeguards would cover record keeping, monitoring, review, operator training and change control. For *Targeted storage charging*, we would expect each use of operational discretion to involve the retention of the information and judgement relied on at the time, allowing consistency to be monitored and decisions reviewed against subsequent outcomes.

The final assurance arrangements will depend on the option selected and the detailed operational method.

4.3. Next steps and the BPS change process

This is a standalone options consultation, ahead of any BPS change proposal under the formal C9 process. Responses may change our assessment of the options, the evidence on which it relies, and whether any change should progress to a subsequent BPS change proposal.

After the consultation closes, NESO intends to:

- assess responses and prepare a summary explaining how material evidence and concerns were considered;
- complete further analytical, operational and legal assessments as needed;
- decide whether to propose to progress a change and, if so, which option to take forward to the consultation through the C9 process; and
- if a proposed change is progressed, develop and consult on the required BPS amendments through the applicable C9 process.

A resulting BPS proposal is anticipated in Q1 2027, although timing and alignment with the annual update remain unconfirmed.

Question 7: What safeguards, monitoring and review arrangements would be needed for any change to the treatment of storage behind constraints? What additional data might NESO need to implement these arrangements?

Question 8: What material impacts or unintended consequences could arise from any of the options, including effects on competition, investment, emissions, or ancillary services? How significant would these be for a short-term solution? Please quantify these impacts where possible.

5. Consultation questions

Please provide evidence wherever possible, specifying the period, asset types and operating circumstances covered. Distinguish observed outcomes from forecasts or assumptions.

The Problem:

- **Question 1:** Since Ofgem's June 2026 policy paper clarified its view on RRT and the TCLC, have you changed the way in which you operate and/or trade? If you made changes, what effects have you observed on re-trading volumes, revenues and balancing costs?

The Options:

- **Question 2:** Which of the proposed options best meets the objectives in section 1.3? Please provide your reasoning.
- **Question 3:** Is there another option that would better meet the objectives in section 1.3 and could be implemented by NESO within six months? Please describe the approach and how it compares with the proposed options.

The Evidence:

- **Question 4:** Do you have evidence on where alternative intraday volumes would come from under the three proposed options? Please provide supporting evidence.
- **Question 5:** What information would market participants need to schedule storage efficiently under *Targeted storage charging*? Is this information already available and, if not, how could it be provided?
- **Question 6:** What practical mechanism could deliver *Targeted storage charging* while preserving useful charging and avoiding subsequent discharge into the same active constraint? Please explain how each mechanism would work and the extent to which it would meet the objectives in section 1.3.

Implementation:

- **Question 7:** What safeguards, monitoring and review arrangements would be needed for any change to the treatment of storage behind constraints? What additional data might NESO need to implement these arrangements?
- **Question 8:** What material impacts or unintended consequences could arise from any of the options, including effects on competition, investment, emissions, or ancillary services? How significant would these be for a short-term solution? Please quantify these impacts where possible.

Appendix. NESO RRT Analysis

NESO currently monitors the bidding behaviour of all units behind active transmission constraints under the TCLC and reports any concerns to the regulator, Ofgem. A study conducted in 2025 assessed the impact of storage units participating in repetitive re-trading behind export constraints on balancing costs. The study was used in an Ofgem Open Letter published on 19th June 2026 on Repetitive Re-trading by electricity storage in transmission constraint periods.

Our analysis sought to identify the materiality of RRT. It combined internal and external datasets to provide a complete view of the unit behaviours behind export constraints, including ancillary service contracts awarded at the day-ahead stage from the Enduring Auction Capability platform.

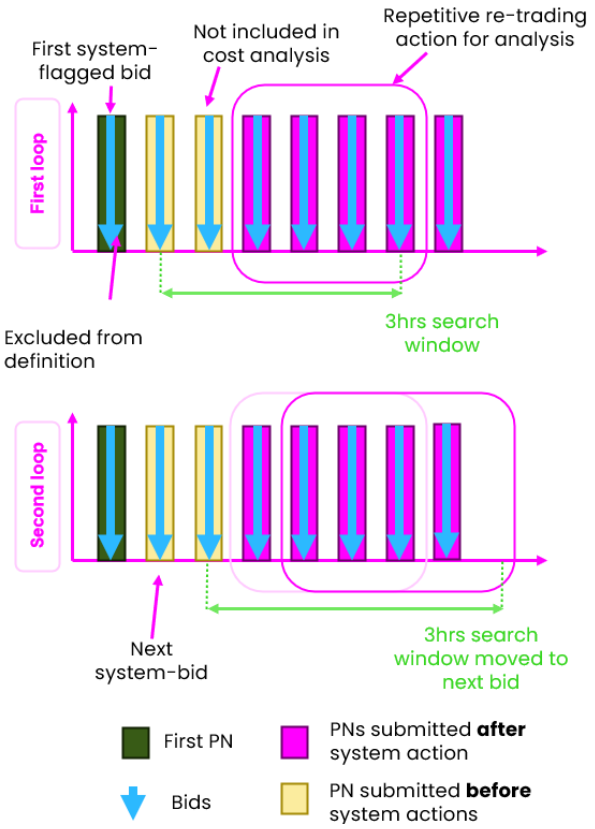


Figure 8 Schematic representing search window loops when the identified system-flagged bid.

The core algorithm loops over BMU groups where system-flagged bid volume is accepted and searches in the 3-, 6-, or 12-hour search window for instances where PN changed as a result of accepting the system-flagged bid earlier. The analysis only looks for positive PN changes (increases in FPN volume), which will require bidding-down actions to keep transmission boundaries secure. The cost impact does not attribute any cost to the additional PN, which did not require any action. The assessment also flags when a specific unit had a negative ancillary service contract in the next 3-hour period (examples of negative ancillary services include DC Low, DM Low, DR Low, or Negative Quick Reserve). The final step of this methodology is to calculate the balancing cost impact using bid costs (bid price and accepted bid volume) and energy replacement (using the same bid volume as the offer volume and the weighted average offer prices from all accepted offers on the system per half-hour).

As a result, the analysis found nearly a 50% increase in RRT balancing cost impact between financial years 2024/25 and 2025/26. The sum of the balancing costs resulting from RRT behaviour was estimated to be between £58.2m (3-hour search window) and £97.9m (12-hour search window) for the full 2025 calendar year.

The majority of the RRT balancing-cost impact for calendar year 2025, based on the 12-hour simulation results, is associated with pumped storage units (63.3%), followed by batteries (21.5%),

other non-pumped-storage-hydro fuel types (7%), "other" fuel types (4.2%) and gas-fired plants (4%). Figure 9 shows the distribution of this estimated impact by storage type.

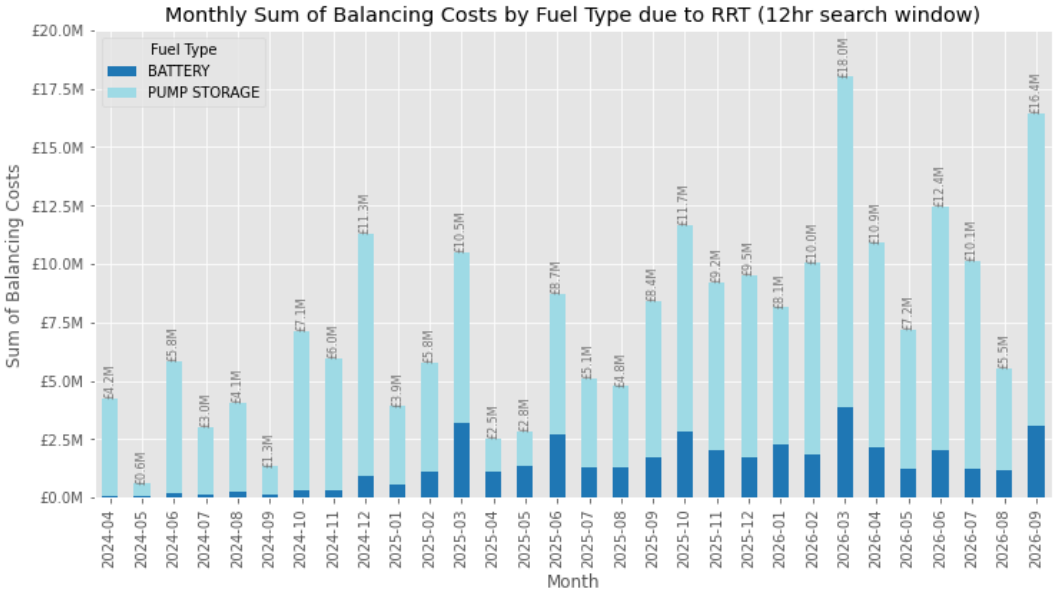


Figure 9: Balancing-cost impact attributed to RRT for pumped storage and batteries using the 12-hour search window

The results from March 2026 may be influenced by the recent increase in gas prices, followed by the Iran conflict; however, March 2026 was also the peak month for MWh volume changes after system bids behind constraints. The overall volume of PN changes increased by 62.5% from financial year 2024/25 to financial year 2025/26 using the 12-hour search window. Figure 10 shows the additional monthly PN volume identified by the analysis.

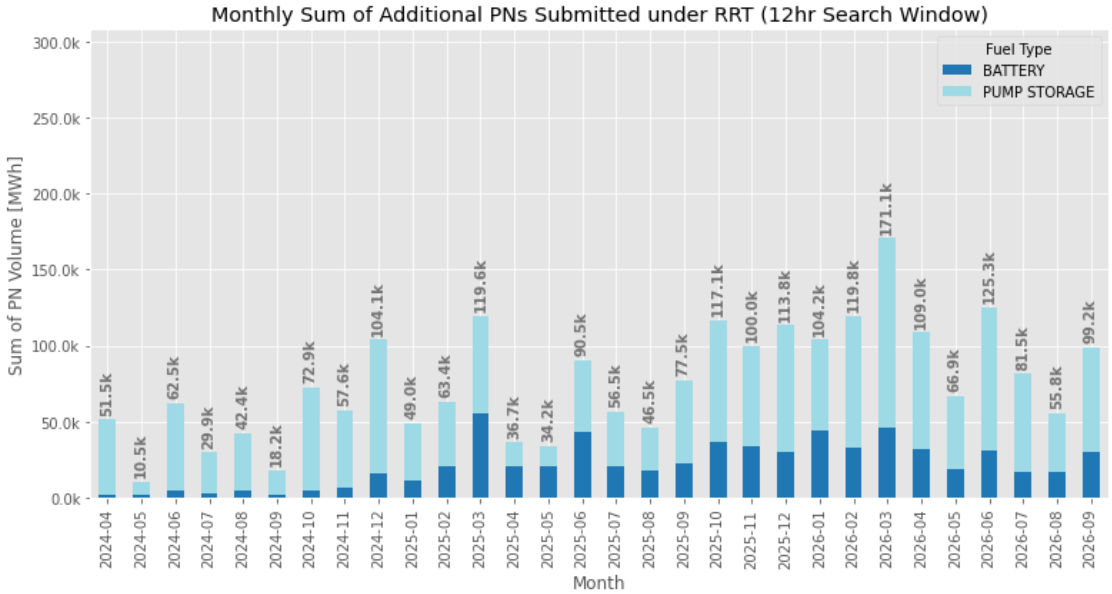


Figure 10: Additional monthly PN volume identified using the 12-hour RRT methodology

PSH units account for the majority of actions attributed to RRT, which could be due to a larger volume of offers for constraint management. On the other hand, battery RRT activities may be associated with an ancillary service contract to deliver negative energy capacity behind the constraints.

The majority of the balancing costs from RRT come from replacement energy costs, driven by offers to replace the volume that was bid down behind constraints. The bid component is typically a negative cost to the balancing costs and offsets the replacement costs. However, there is a large difference between the bid and offer prices, with a monthly spread of £113/MWh. The offer cost is typically driven by the gas-based generation synchronised in the BM, which achieved a very high price level given the recent conflict in the Middle East.