Public

Storage Behind Constraints

Understanding the issue, the options considered, and NESO's proposed direction

Industry webinar | August 2026

NESO
National Energy System Operator

Public

By the end of this webinar, you will understand

- what “storage behind constraints” means in practice;
- the repetitive re-trading issue NESO observes;
- the options developed and considered with industry;
- how the shortlist was reached;
- why NESO is proposing a short-term operational response;
- The process before any changes are implemented.

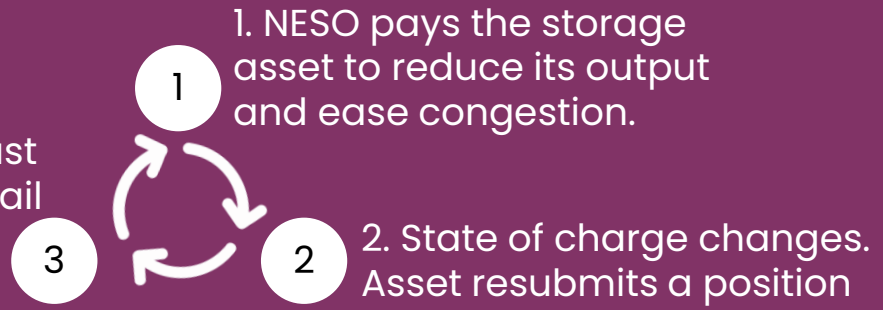
Public

Storage Behind Constraints

Storage scheduled to generate during export constraints can increase congestion.

NESO dispatches in merit order. Behind export constraints, this can create a feedback loop for storage that increases balancing actions and costs, conflicting with the requirement to minimise overall balancing costs.

The aim is to retain the system and flexibility benefits of storage while reducing unintended consumer cost impact.



Cycle repeats until the constraint clears

This cycle is a rational response , not malicious behaviour. The issue is the incentive structure.

COST IMPACT

£58.2M - £97.9M

In additional balancing costs from RRT

2025 Calendar Year

50% cost growth between 2024–25FY and 2025–26FY

Source: NESO Market Monitoring

WHY THIS MATTERS

- Cost grew 50% year-on-year and storage deployment is still increasing.
- Inconsistent decisions in the control room create uncertainty for BM participants.
- NESO has a licence obligation to operate the network economically and efficiently.

NESO
National Energy System Operator

Public

What outcome are we trying to achieve?

This operational review is aiming to increase the net value that storage provides to society

- NESO places significant value on increasing storage on the system to deliver the flexibility needed to achieve Clean Power 2030
- CP30, and the Reformed National Pricing Programme, recognise that the existing market and system design in GB does not currently deliver the most efficient use of the new types of assets that will deliver CP30
- This operational review aims to get us a step closer to delivering the system that maximizes overall consumer and system value of the assets essential for CP30

Public

How We Got Here

Long list of options

Internal scoping

Jan - Feb 2026

Industry engagement

2 Group meetings

Mar – Apr 2026

Short-listing Framework

Applied with Industry

Apr 2026

ESN & Energy UK presentations

Working groups

May 2026

Broader Industry Engagement

***22 June**: Markets, Balancing and Dispatch: A Summer System Update (London)*

***25 June**: CCP Webinar*

***2 July**: Markets, Balancing and Dispatch: A Summer System Update (Glasgow)*

***6 August**: This Webinar*

Jun-Aug 2026

We considered 16 core options through industry workshops

Changes asset behaviour in BM

1A: Redispatch storage, but they can subsequently only discharge at a portion of their PN.

Do Nothing

2A: Dispatch in price order

Change decision making in control room

3A: Dispatch according to order of actions prioritizing generation before storage, through BPS.

3AA: As 3A but storage can charge

3B: No charging of storage behind constraints

3C: Only dispatching storage assets up to a single cycle per constraint period.

3CA: As 3C but charging unrestricted

New markets to change storage behaviour

4B: Grid Trade Master Agreement Schedule 7a

4A: Boundary flow smoothing

6A: Capacity Reserve Market. NESO tenders for availability during constraint periods.

4C: Redispatch in bid/offer pairs to return SOC change to zero.

Reduce need to redispatch storage assets

5A: Intertrip services

5B: DA information transparency and optimisation

5C: Non-firm / central scheduling of storage assets.

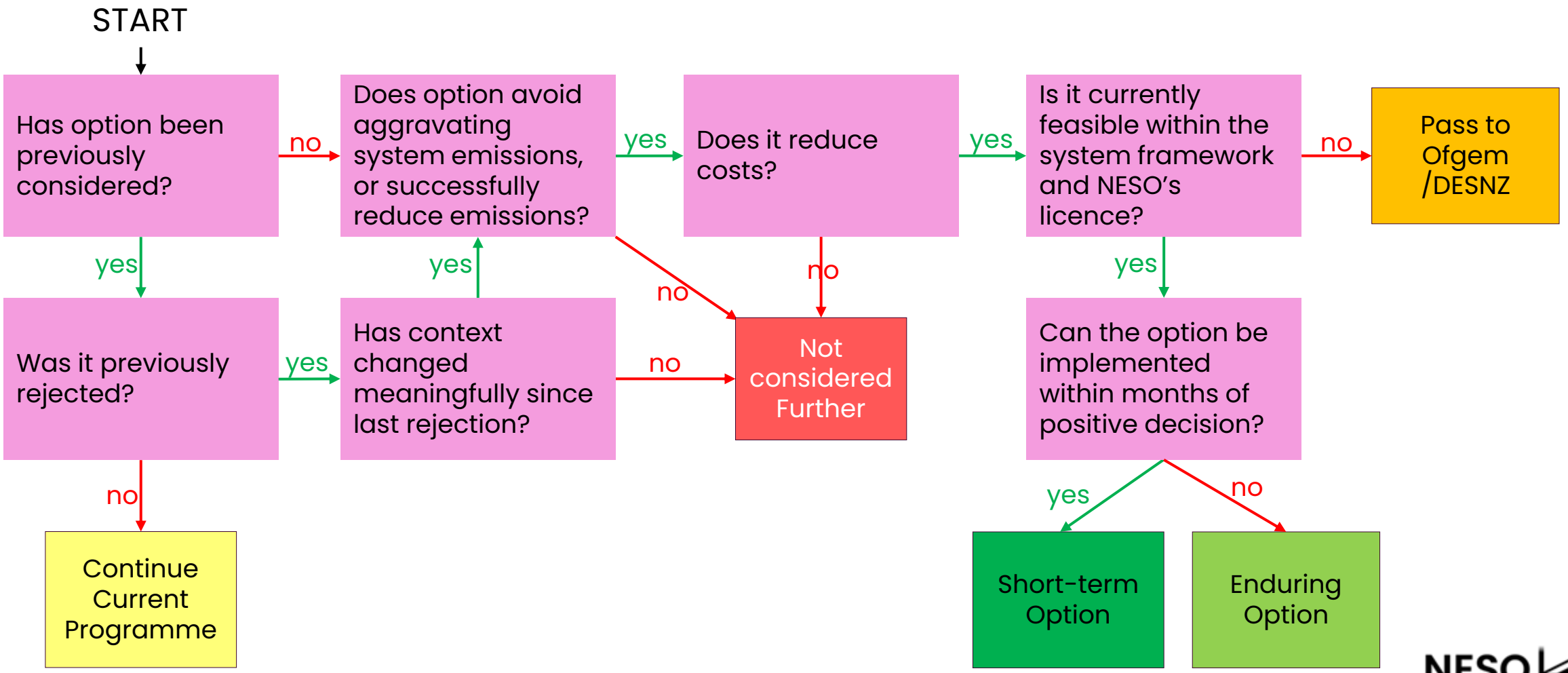
6B: Advanced cost benefit modelling

6C: Guidance on reasonable cycles per day

NESO National Energy System Operator

Public

… and applied a shortlisting framework to narrow the options for further consideration



Public

Option descriptions

Public

1A) Storage assets after redispatch only discharge at a portion of their PN

Not considered Further

Option description

- This option would see NESO redispatching storage behind constraints in merit order on the basis that, after a system-flagged redispatch, storage would be limited in how far it could increase later export PNs during the constraint period.
- Therefore, repetitive re-trading would be addressed because storage assets would not be able to flexibly adjust their FPNs to reflect the change in their expected SOC.

- **Timescale:** Months – needs changes to regulatory framework and market rules

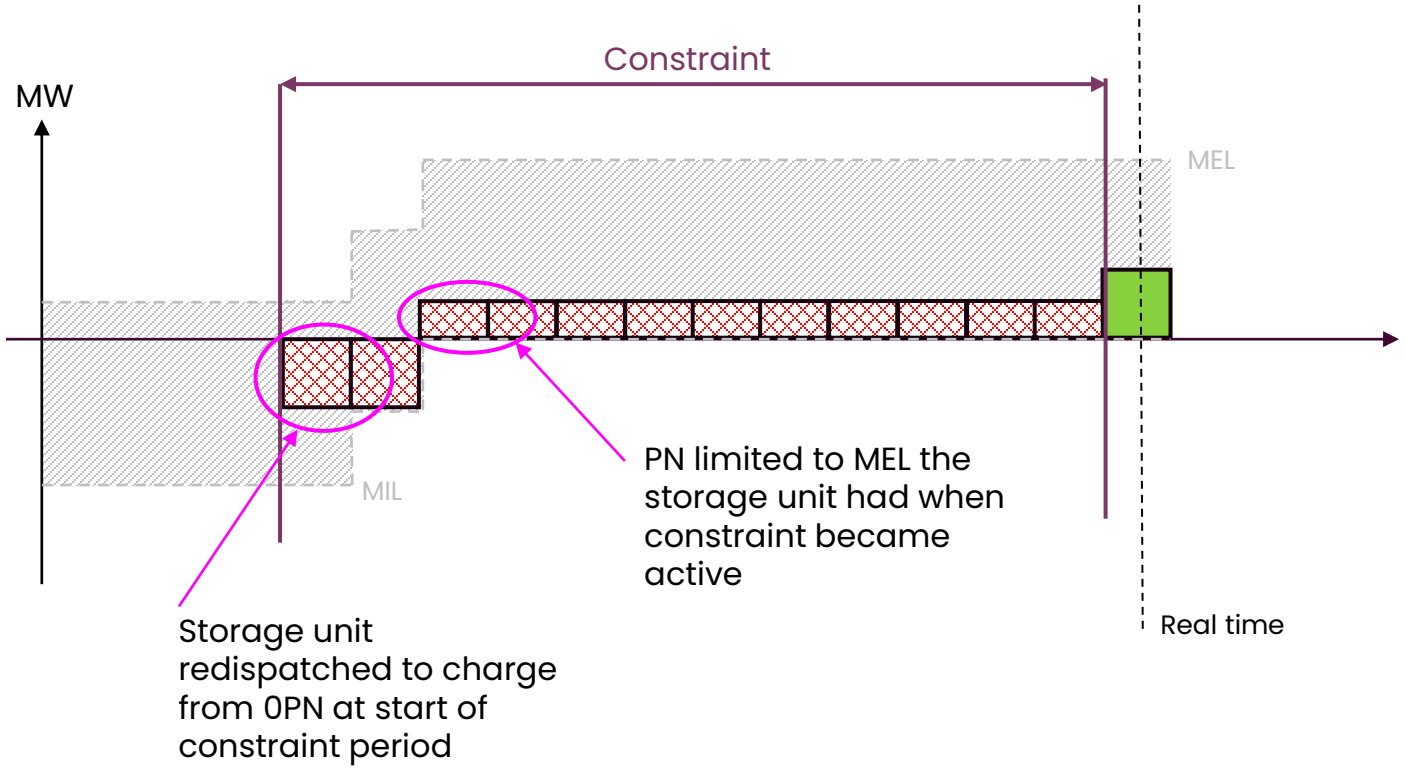
NESO National Energy System Operator

Public

1A) Storage assets after redispatch only discharge at a portion of their PN

Not considered Further

Example



- Unit redispatched from 0 PN to charge – utilising full available storage capacity
- On change of state of charge unit then submits PN to discharge, however this is capped to the volume unit had at start of constraint

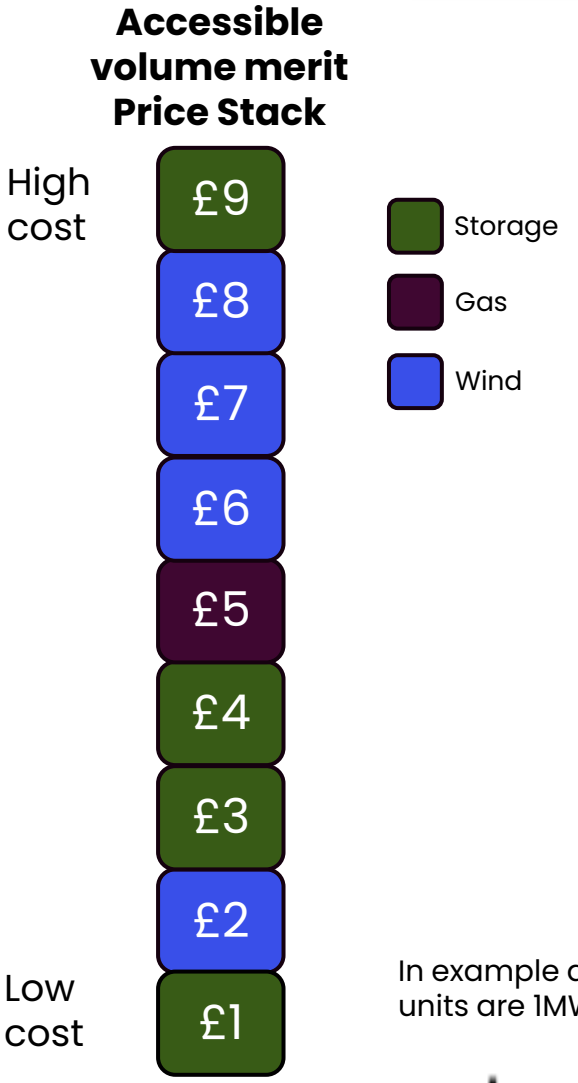
Public

2A) Dispatch in price-based merit order

Option description

Status Quo

- The control room redispatches all storage assets, including storage behind constraints, based exclusively on whether they have the lowest marginal bid/offer prices for a given settlement period.
- This would mean the control room effectively ignoring the possibility that the storage asset may in subsequent periods submit higher FPNs as a result of the change in their expected SOC.
- Impacts on future settlement period and overall total cost are ignored.
- **Timescale:** Immediate - in NESO remit. Clarification of approach in Balancing Principles Statement.

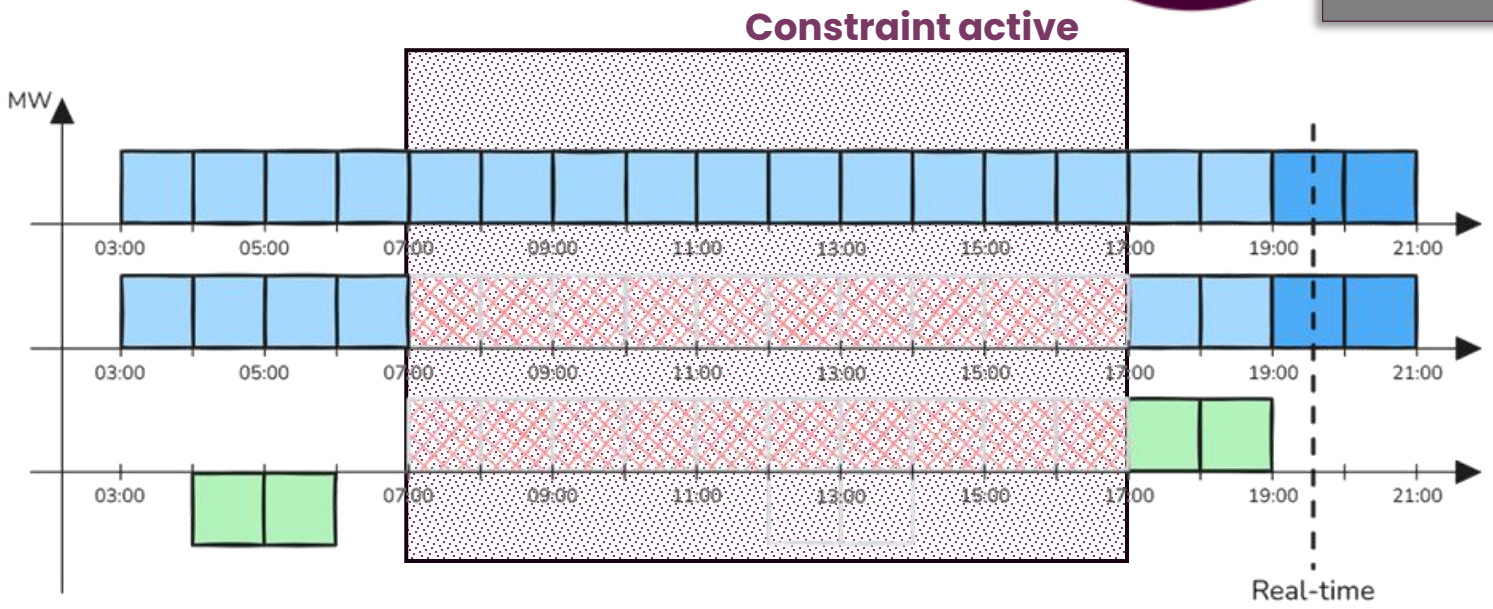


Public

2A) Dispatch in price-based merit order

Status Quo

Example



Bid/Offer Volume	Cost
Wind	
0 MWh +£25/MWh	£0
-10 MWh +£10/MWh	-£100
Storage	
-10 MWh +£5/MWh	-£50

- Storage has the lowest price in each settlement period so is redispatched over the more expensive wind unit
- Impact for future settlement periods is ignored

NESO National Energy System Operator

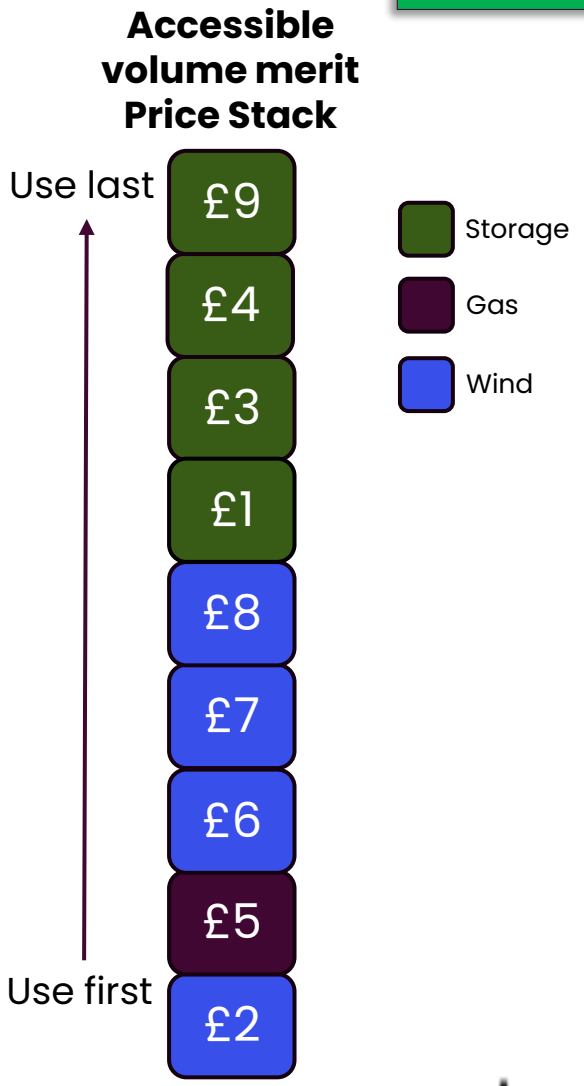
Public

3A) Prioritise dispatch of generation over storage behind constraints in BPS

Short-term Option

Option description

- This option would see NESO recommend amending the Balancing Principles Statement (BPS) to clarify that when managing export constraints, the control will first reduce generation or increase demand; then reduce storage exports; then increase storage imports (each in price order).
- This would effectively formally enable NESO not to redispatch storage behind constraints until comparable generator bids had been exhausted, even when storage bid prices are competitive with generation, on the basis that they would increase the volume of constraints in subsequent timeframes.
- **Timescale:** Immediate – clarification of approach in Balancing Principles Statement

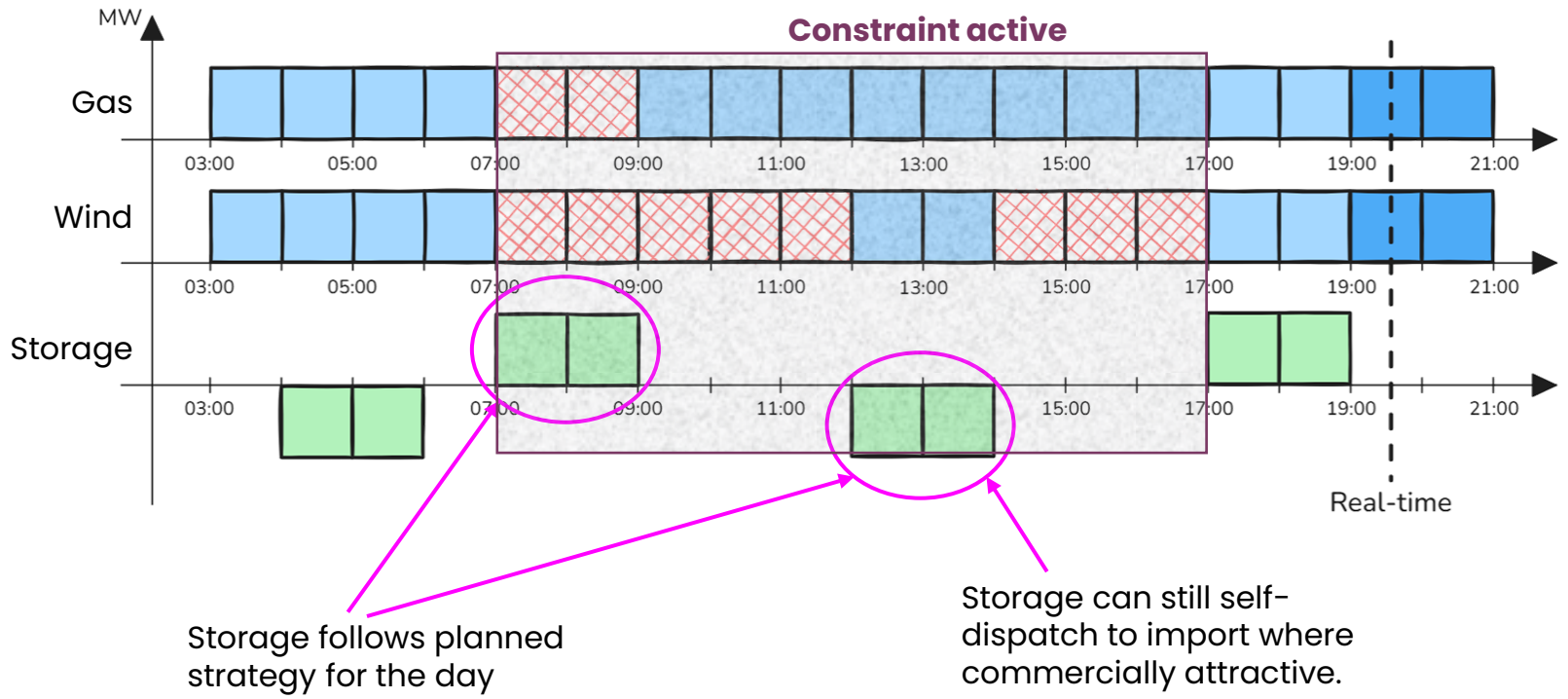


Public

3A) Prioritise dispatch of generation over storage behind constraints in BPS

Short-term Option

Example



Key

- Generation planned Physical Notifications (PNs)
- Storage planned PNs
- PN changed through system-tagged actions

- Storage in this example not utilised to manage constraint – constraint can be managed through use of other generation units
- Storage remains able to participate in wholesale and ancillary service markets.
- No system-flagged storage actions in this example.

NESO National Energy System Operator

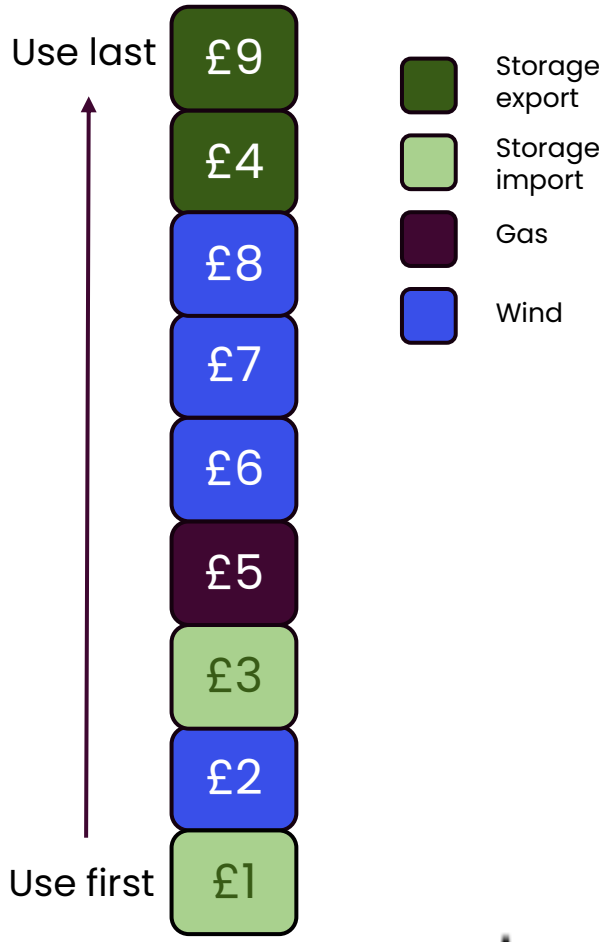
Public

3AA) As 3A but storage can charge

Option description

Short-term Option

- As in Option 3A, generation is reduced or demand increased before storage exports are redispatched.
- Unlike Option 3A, storage import is redispatched in merit order.
- This allows storage to absorb low-cost or curtailed renewable generation while generation remains prioritized over storage exports.
- The option was developed from Option 3A during the April 2026 industry workshop.
- **Timescale:** Short term, but longer than Option 3A because detailed BPS drafting and control-room process changes would be required.

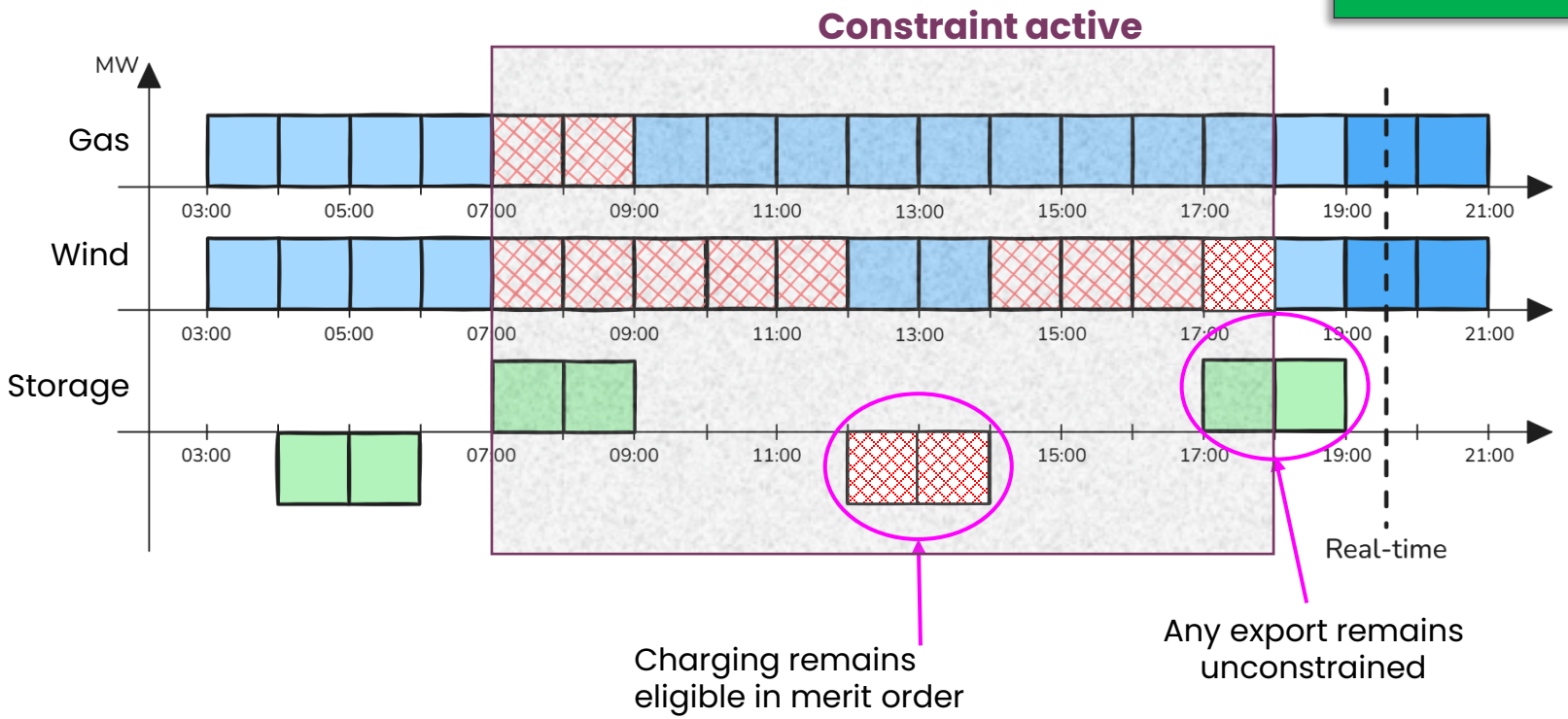


Public

3AA) As 3A but storage can charge

Short-term Option

Example



Key

- Generation planned Physical Notifications (PNs)
- Storage planned PNs
- PN changed through system-tagged actions

- Export Physical Notifications would continue to be redispatched after generation, as under Option 3A.
- This retains some of the simplicity of Option 3A but does not fully remove the feedback loop. Charging behind a constraint can still alter an asset's expected state of charge and can affect later discharge, so a reduced feedback loop remains.

3B) No charging of storage behind constraints

Not considered Further

Option description

- Under this option, when a storage BMU is located behind an export constraint, NESO would not issue any negative BOAs to the asset
- While this would still lead to an increase in constraint volumes compared to the status quo, it would mitigate volumes from RRT "snowballing".
- May be simpler to describe operationally but was not shortlisted because it does not materially reduce RRT and may reduce renewable storage.
- **Timescale:** Immediate – clarification of approach in Balancing Principles Statement

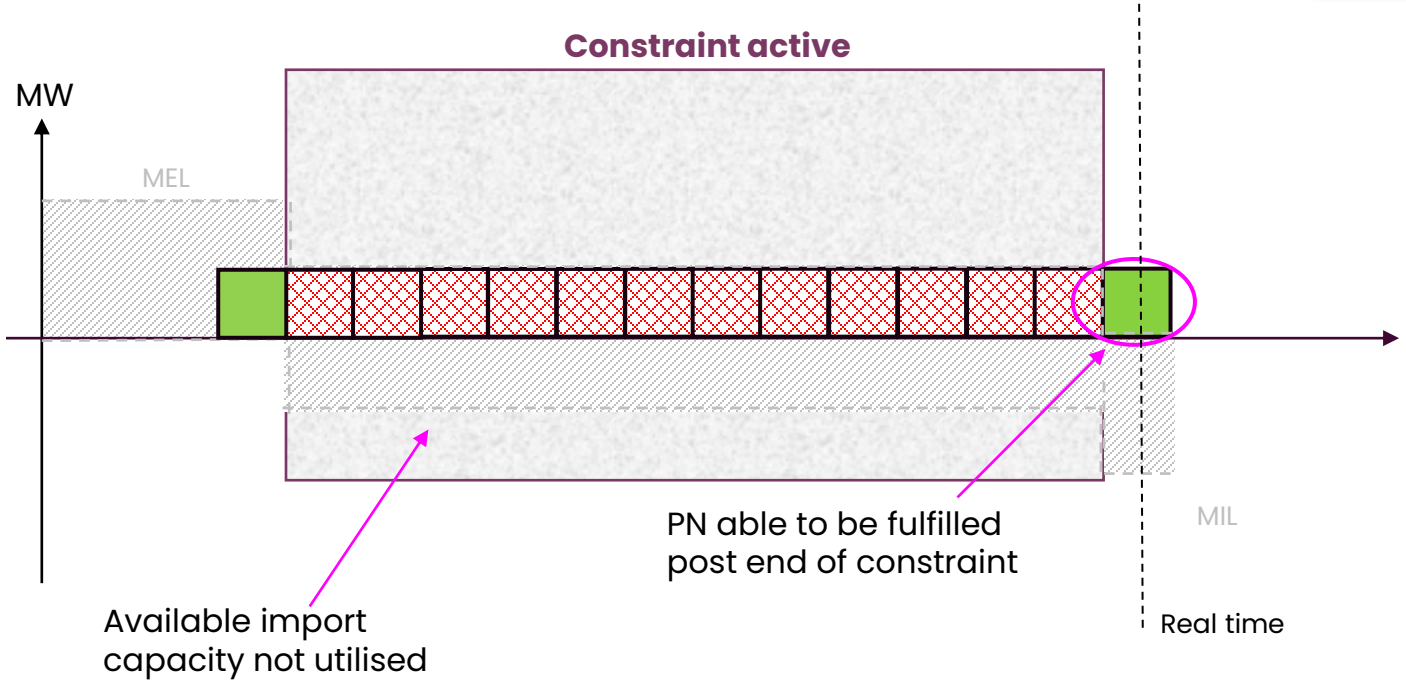
NESO National Energy System Operator

Public

3B) No charging of storage behind constraints

Not considered Further

Example



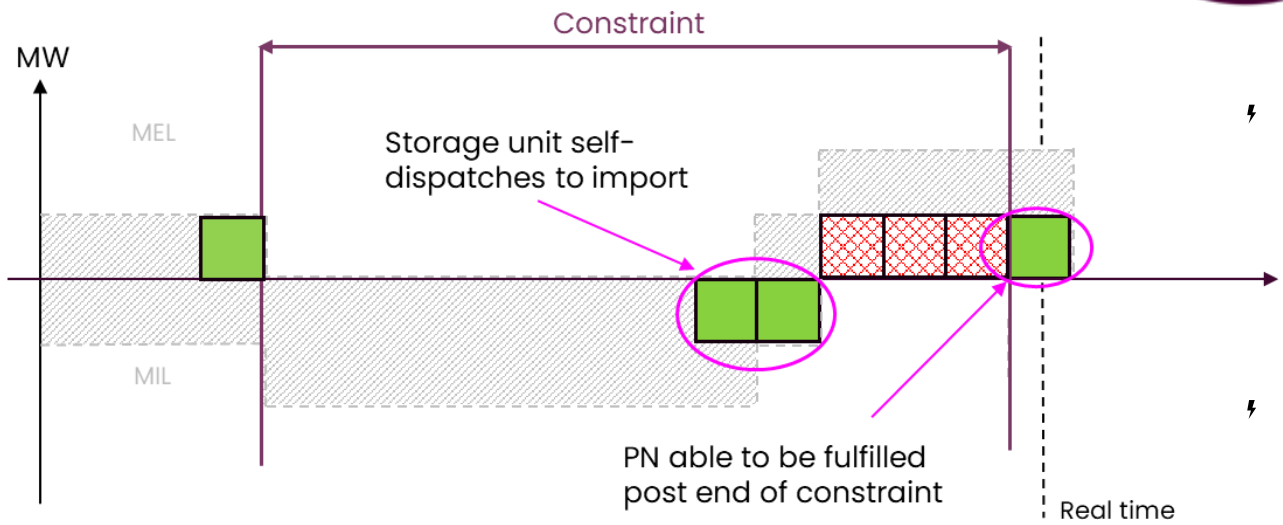
- Storage unit enters constraint with a positive PN to discharge
- PN bid to zero during constraint but available capacity to import remains unutilised

Public

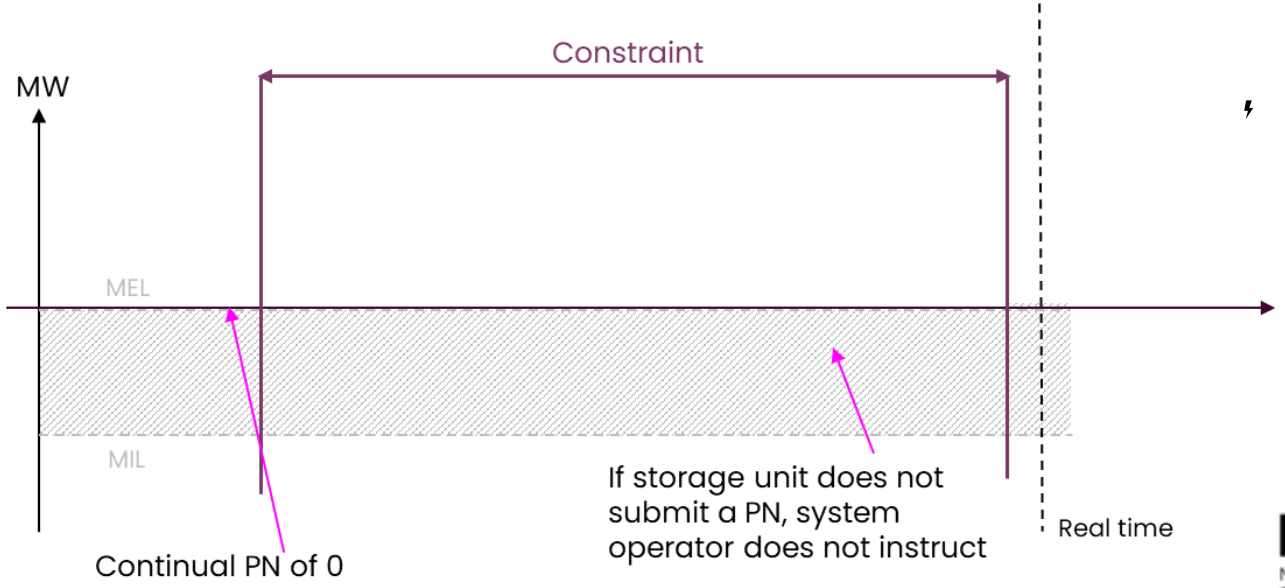
3B) No charging of storage behind constraints

Not considered Further

Example



- Storage units can self dispatch to import, however will not be instructed by system operator to import
- Export PNs redispatched



- If a unit has a 0PN and maximum import capability, it would be expected that the unit would sit unutilised during a constraint

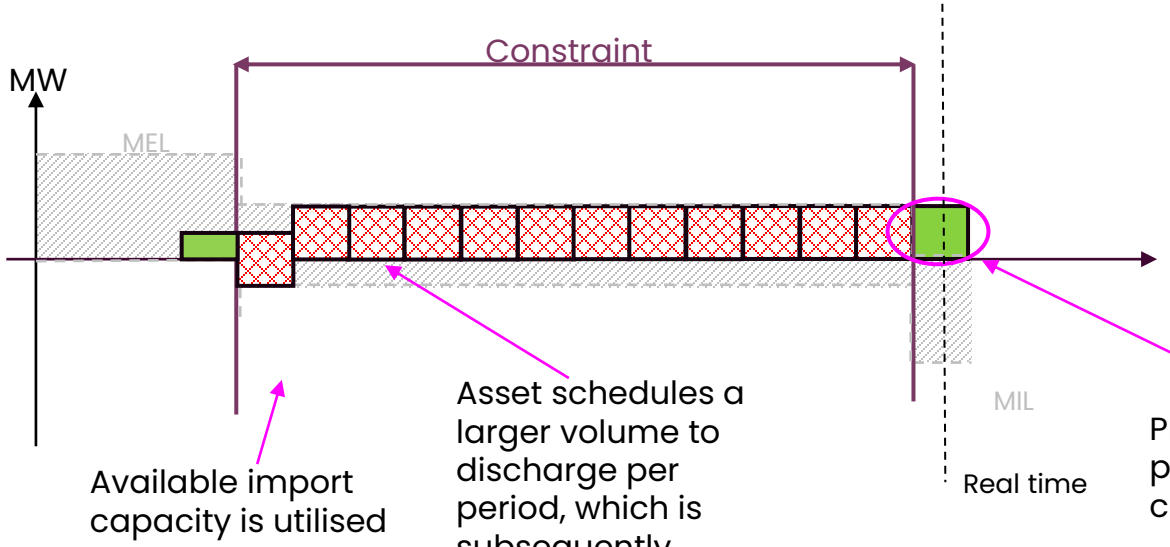
NESO National Energy System Operator

Public

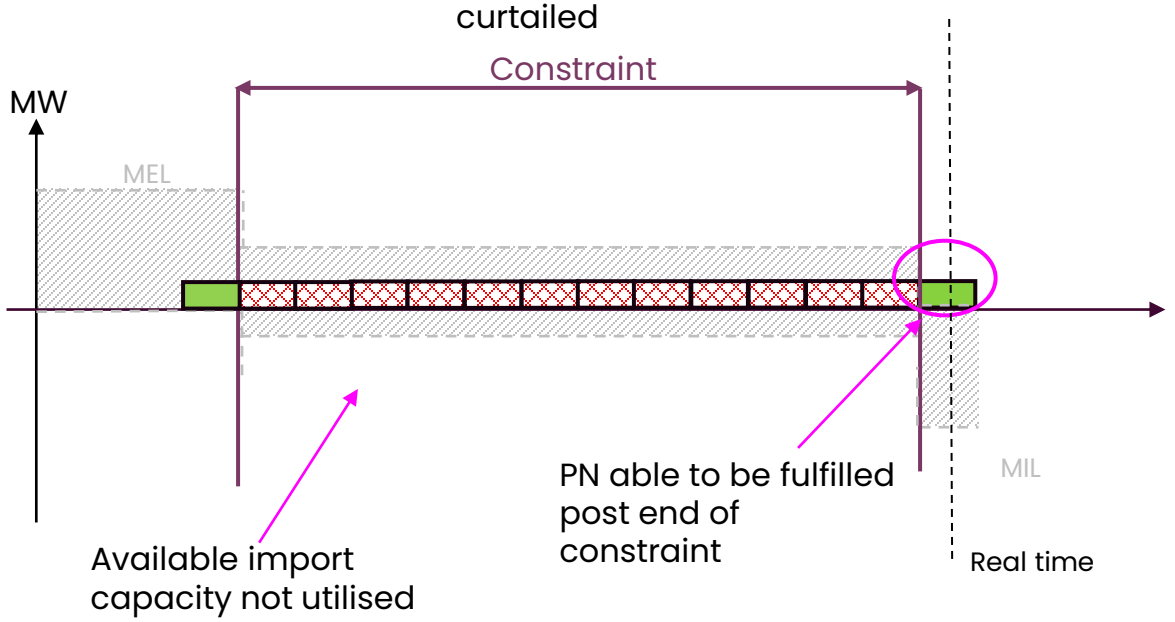
3B) No charging of storage behind constraints

Not considered Further

Example



- This chart shows the current pattern if the asset is bid to charge, in addition to bidding to stop discharge



- This chart shows this proposed option, where by avoiding charging the asset, the volume of repetitive retrading is limited

NESO National Energy System Operator

Public

3C) Only dispatching storage assets up to a single cycle per constraint period

Option description

Enduring Option

- Under this option, NESO would limit redispatch of a storage asset to a single cycle during a constraint period, then prioritize other available actions.
- The basis for this is that currently, storage assets behind constraints can be paid to reduce their discharge for multiple times the volume they could have ever discharged for a single constraint period, on the basis that their expected state of charge keeps changing.
- This option tries to find a reasonable middle ground – compensating storage assets for a "fair" amount, while still reducing the overall constraint costs caused by RRT.
- **Timeline:** Tactical solution – months (need to consider viability), long term solution 1yr+. Would need NESO IT tool deployment to manage effectively and in real time. Would also need DESNZ & Ofgem support.

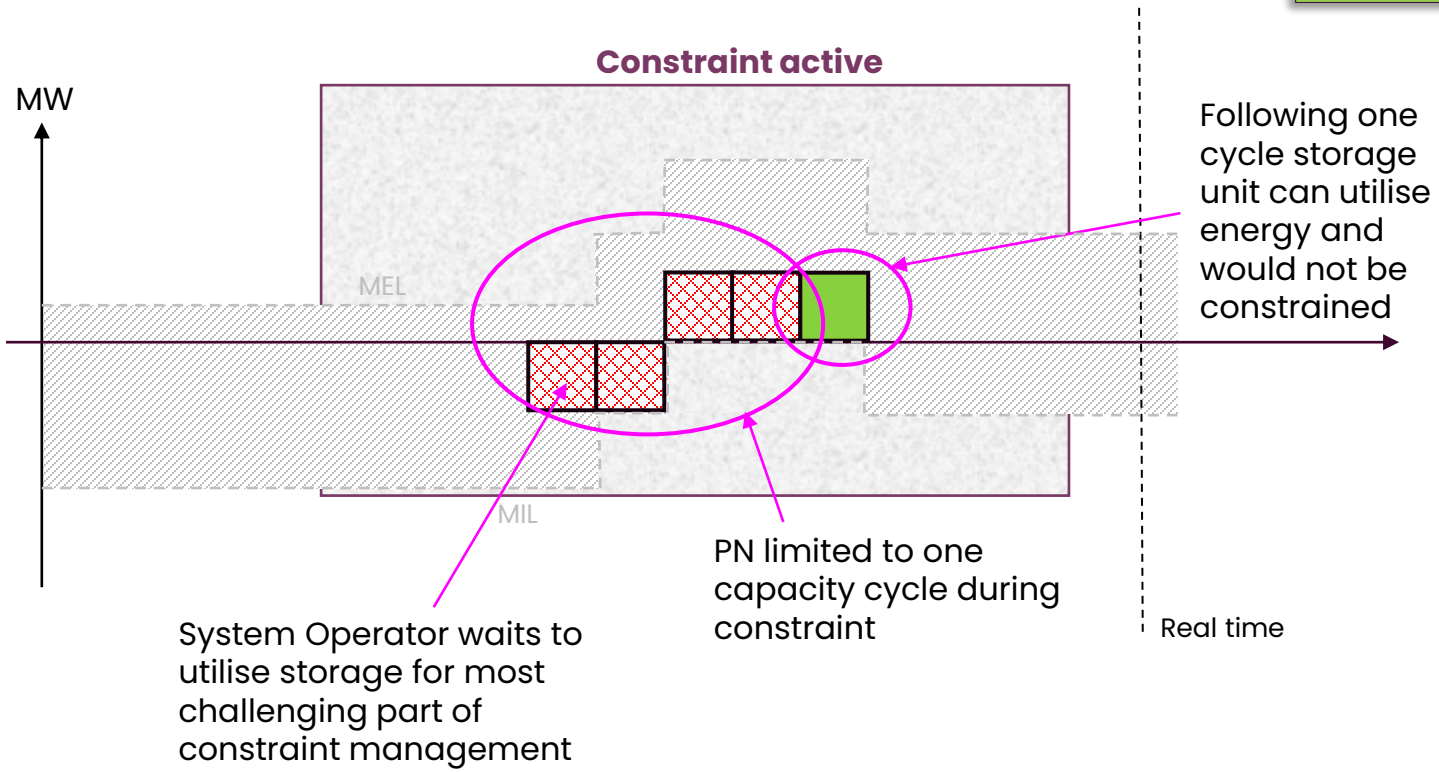
NESO National Energy System Operator

Public

3C) Only dispatching storage assets up to a single cycle per constraint period

Enduring Option

Example



- Storage permitted to cycle capacity of unit one time
- System Operator chooses to wait and use unit at most optimal time to manage system constraint
- Storage unit may cycle capacity through changed PN once – does not need to be immediately following redispatch to charge
- Following one cycle any further positive PNs are not redispatched

Public

3CA) Single discharge cycle, with import unrestricted

Enduring Option

Option description

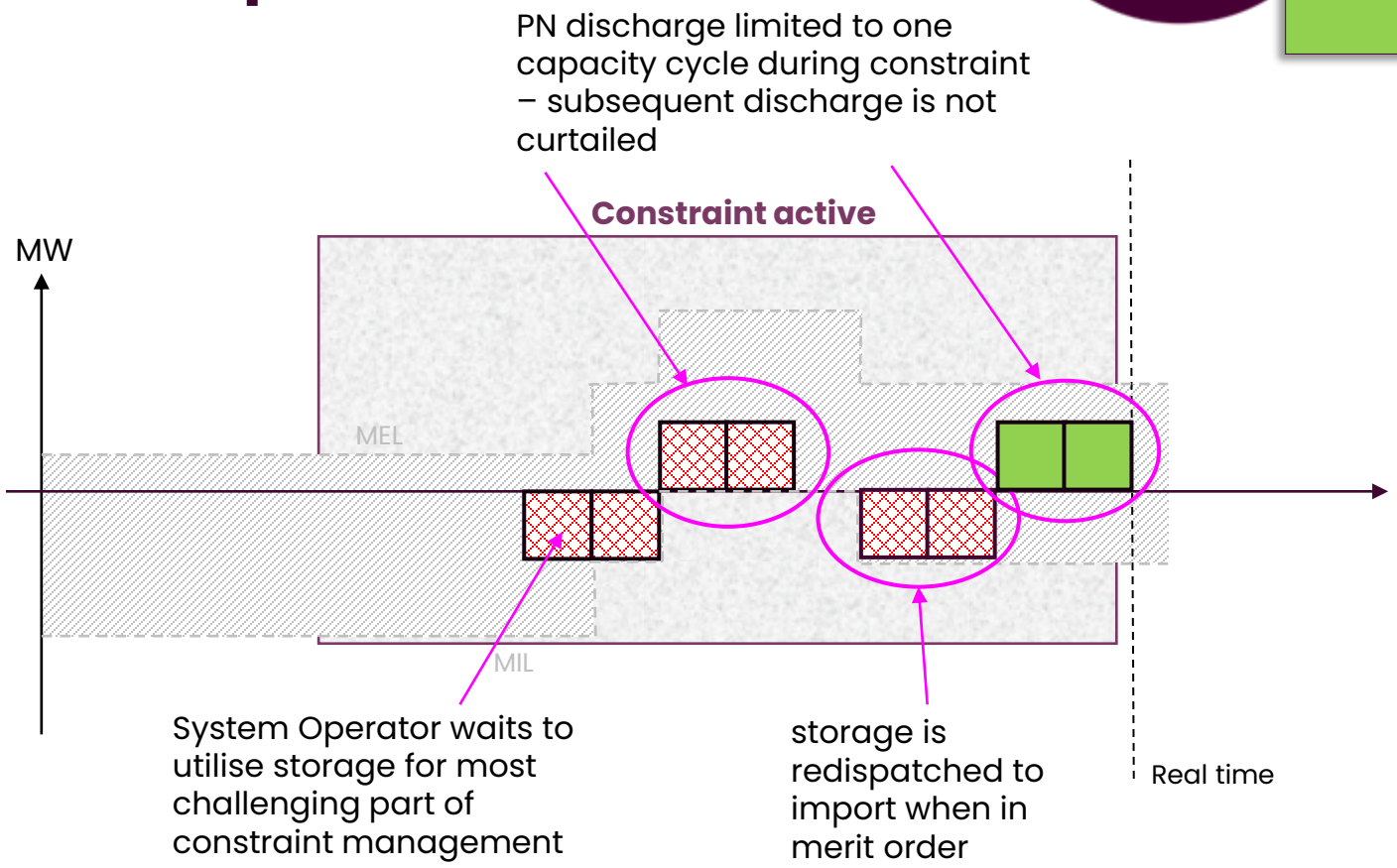
- Builds on Option 3C by retaining the limit of one discharge cycle per constraint period.
- Unlike Option 3C, there is no restriction on import during the constraint period. Storage assets may import as much energy as they are technically able to where commercially attractive.
- The single cycle limit applies only to the discharge side, directly targeting the mechanism that drives repetitive re-trading while allowing storage to use its full charging capability.
- The option was developed as an Option 3C variant during the April 2026 industry workshop; charging remains unrestricted while further discharge redispatch is limited.
- **Timescale:** Long term, 12 months or more. Implementation would require the same NESO IT tooling as Option 3C to monitor and enforce single cycle discharge limits in real time, together with support from DESNZ and Ofgem. The option should be included in the cost-benefit assessment alongside Options 3C, 4B and 6A.

Public

3CA) Single discharge cycle, with import unrestricted

Enduring Option

Example



- Storage is redispatched to import when it is in merit order throughout the constraint period.
- After the single discharge cycle is used, any further export PNs are not redispatched, consistent with option 3C.

Public

4A) Boundary flow smoothing (BFS) project

Continue Current Programme

Option description

- Boundary flow smoothing is an innovation project assessing a concept that could smooth the flow of power over a boundary by using flexible assets close to a constrained boundary to export or import electricity, helping to manage peaks and troughs in the power flow.
- If the fluctuation in the boundary flow could be reduced, it might allow the control room to take fewer actions, enabling more renewable power to cross the boundary and thus reducing constraint costs.
- This option is being developed under an innovation project, looking at challenges e.g. how to optimise across multiple nesting boundaries, and the assets needed to achieve smoothing.
- This would smooth short-term boundary-flow volatility; it does not directly add network capacity or specifically address RRT.
- **Timescale:** 1yr+. Dependent on results of innovation project and if deemed viable then implementation.

Further information:
https://www.neso.energy/document/372021/download

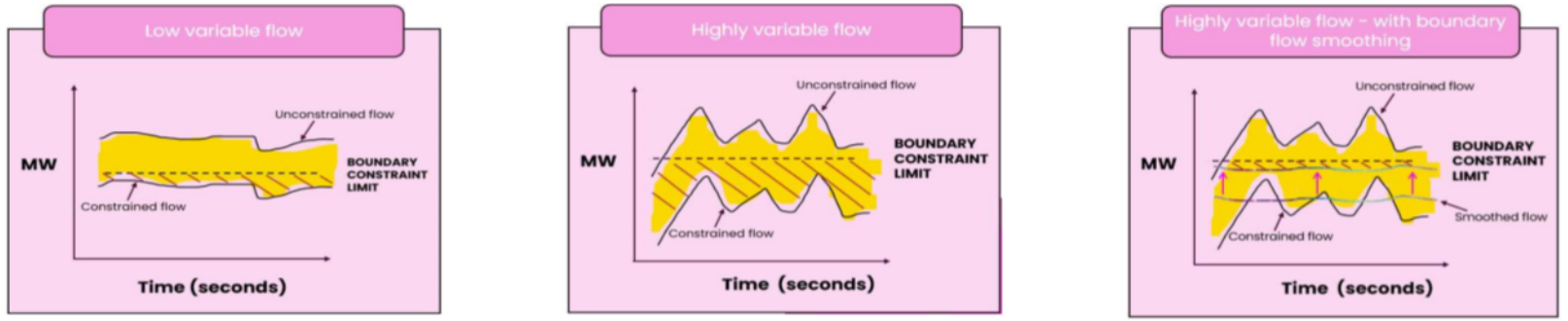
NESO National Energy System Operator

Public

4A) Boundary flow smoothing (BFS) project

Continue Current Programme

Example



- **Power flows over constrained boundaries are often very variable,** due to rapid changes in supply and demand on both sides of the boundary
- **This variability can make it harder to keep the constrained flow to just below the limit,** therefore when variability is high, ENCC may choose to reduce the flow a bit further below the limit, to reduce the risk of the variability in the flow causing the limit to be exceeded
- **With a smoothing service, a flexibility service provider (FSP), located near a constrained boundary, could receive a high-resolution, low-latency data feed of the flow over the boundary**. The FSP could adjust its supply or demand to counteract the flow variability, and it would provide the service whenever instructed, typically when the boundary is constrained

Potential implication

- **If the fluctuation in the boundary flow could be reduced, it might allow the control room to take less actions,** enabling more renewable power to cross the boundary and thus reducing constraint costs

NESO National Energy System Operator

Public

4B) Grid Trade Master Agreement (GTMA) Schedule 7a

Option description

Enduring Option

- NESO would use its current trading tools under the GTMA to procure energy services in advance of the balancing timeframe, potentially reducing the need to redispatch assets in the balancing timeframe, and therefore repetitive retrading.
- In theory, agreeing positions ahead of gate closure could reduce reliance on BM redispatch and require assets to maintain agreed PNs for the traded period.
- Using GTMA would be similar to Constraint Management Markets (CMMs), in that they are constraint management tools used before gate closure. Therefore, the subsequent analysis from the Constraints Collaboration Project focuses on CMMs.
- **Timescale**: CMMs previously rejected through CCP. Delivery could take 1Y+ due to it being a new market/service.

Further information:
https://www.neso.energy/document/350606/download

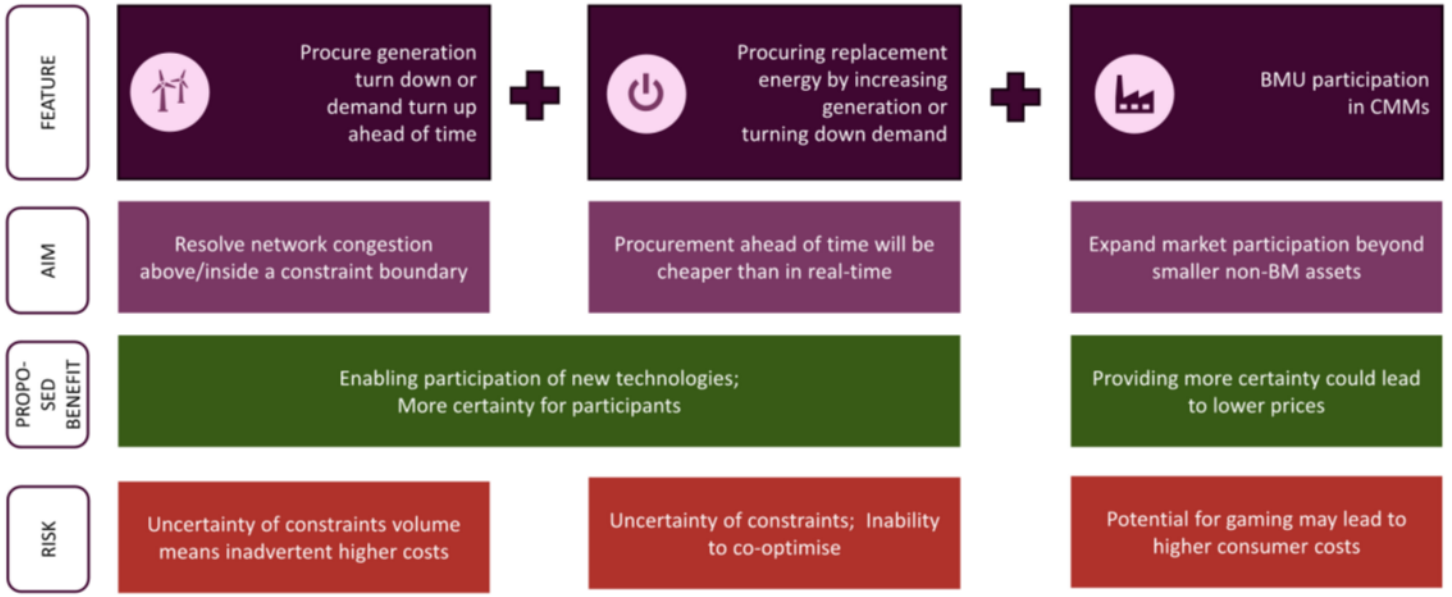
Public

4B) Grid Trade Master Agreement (GTMA) Schedule 7a

Enduring Option

Example

A day ahead (or closer to real time) CMM can be designed in different ways, so we have broken it into the different features and have assessed the relative opportunities and risks are associated with each.



- CMMs were previously rejected through the Constraints Collaboration Project (CCP) in early 2025
- Using GTMA would entail many of the same benefits of CMMs in that it enables more widespread procurement of balancing services ahead of gate closure, which may reduce the cost of constraint management because assets can bid in with lower risk premia that are present due to the short notice of the balancing mechanism

Public

4C) Redispatch in bid/offer pairs to return SOC change to zero

Pass to Ofgem /DESNZ

Option description

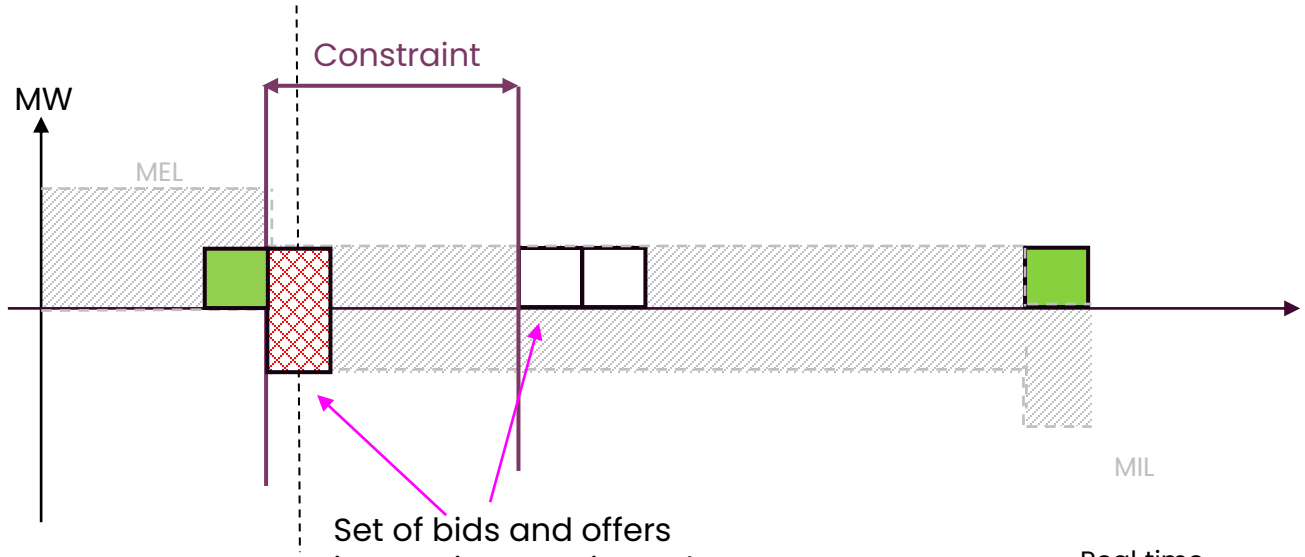
- Under this option, NESO would issue bids and offers to storage assets in pairs of equal (but opposite) volumes, such that the state of charge (SOC) change by the end of the offer is zero.
- The idea is that, if the storage asset knows that the additional SOC that they receive through a bid acceptance is already committed to a future offer, then they won't change their PN for the intervening periods, thereby avoiding RRT.
- Storage assets would be enabled to price their single-cycle "spread" value, or the value of holding their charge.
- There are other ways that this option can be developed, and it bears strong similarities to an option discussed by industry, a capacity reserve. We are considering grouping all options which involve creating a new market/service, including this option, together.
- **Timescale**: 1Y+. Would involve developing a new market/service. Only suitable as longer-term option. Depending on service, could require changes to regulation.

Public

4C) Redispatch in bid/offer pairs to return SOC change to zero

Pass to Ofgem /DESNZ

Example



Set of bids and offers instructions are issued simultaneously by NESO, leading to no deviation in the expected state of charge for a given period, but involves taking a constraint action outside of the balancing window

Public

5A) Extended Intertrip services

Option description

Continue Current Programme

- Extended Constraints Management Intertrip scheme would expand NESO's existing Intertrip scheme which enables the NESO control room to increase power flow on the existing transmission infrastructure, thus reducing the amount of generation being curtailed pre-emptively to avoid thermal constraints

- Participants are paid under the relevant CMIS commercial terms, including arming payments and any applicable activation arrangements.

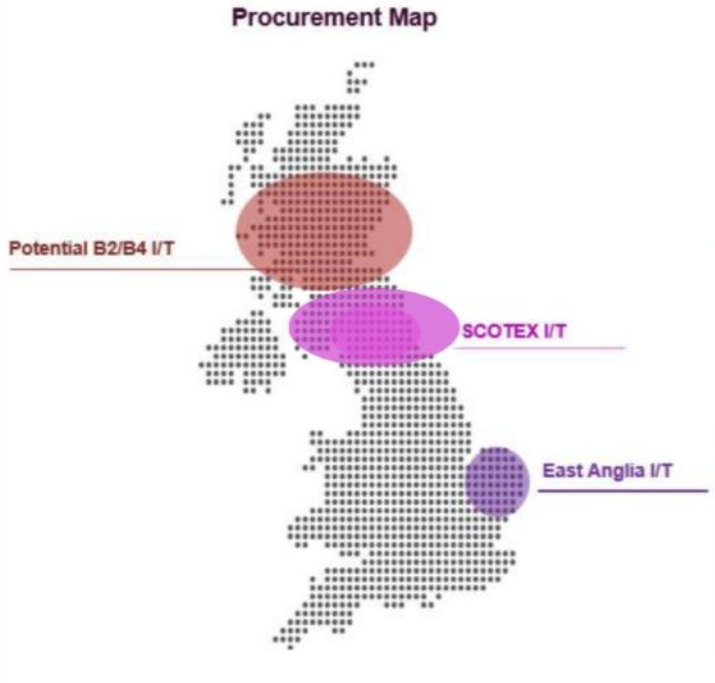
- **Timescales:** Delivery through CMIS depends on constraint boundary, further details in next slide. Aside from the limits on potential arming of further intertrips, further delivery would be 1Y+.

Further information:
https://www.neso.energy/industry-information/balancing-services/network-services/constraint-management-intertrip-service

5A) Extended Intertrip services

Example

Continue Current Programme



CMIS Scotland (multiple boundary areas):

- NESO is working with both Scottish TOs to explore options for a Constraint Management Intertrip Service (CMIS) at the B2, B4 and B5 boundaries.
- This work includes assessing whether to integrate the B6 boundary or pursue a separate solution, with all services targeted for **mid-2027.**

SCOTEX B6 - CMIS:

- Extension of the into B7a by National Grid Electricity Transmission (NGET) to include circuits in North England where the constraints can be managed by generators who are part of CMIS B6.
- Discussions underway with NGET and expected to complete **late 2026.**

East Anglia EC5 - CMIS:

- An enduring commercial CMIS for the EC5 boundary region.
- Introduces 200ms Stability Trip alongside the existing Thermal (10 second de-load), with increased number circuit monitoring.
- Tender outcome letters have now been sent to all bidding parties. Results published here.
- Expected go live in **July 2026,** replacing the current Interim EC5 service.

NESO National Energy System Operator

Public

5B) DA information transparency and optimisation

Option description

Continue Current Programme

- Under this option, NESO would publish more data at the day-ahead stage on the location and size of transmission system constraints, thereby giving assets the information necessary to avoid scheduling to create constraints.
- However, there would be no financial incentives to do so.
- In addition, it is possible that this information could be used to strategically manipulate constraints for profit.
- We recognise that elements of further information on constraints may be prerequisites to other options presented.
- **Timeline:** 1yr+ – requires review of ability to publish additional constraint information (ongoing) and regulatory framework changes to incentivise scheduling behaviours.

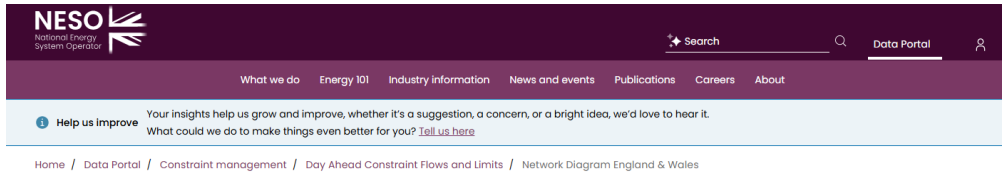
NESO National Energy System Operator

Public

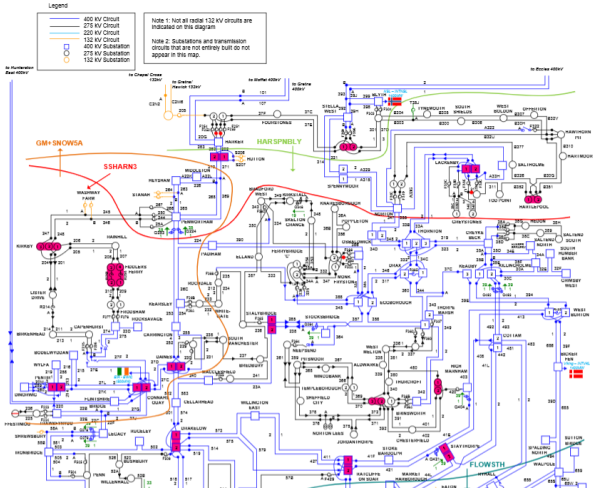
5B) DA information transparency and optimisation

Continue Current Programme

Examples

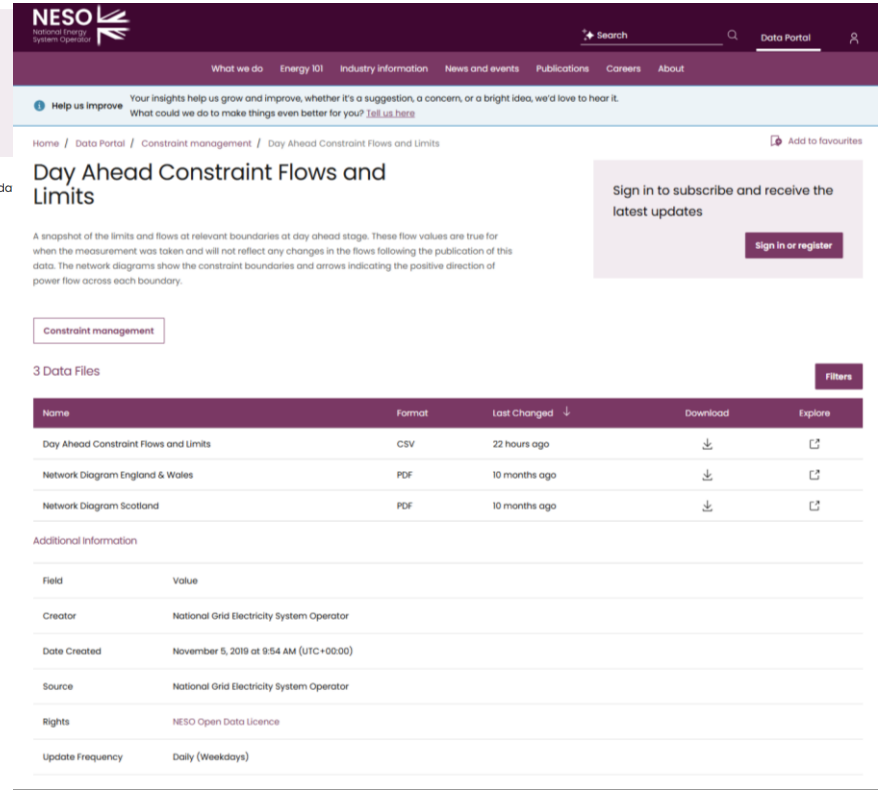


The Network Diagram for England & Wales showing the locations of the constraints contained in the constraints da
GM+SNOW5A, HARSPNBLY, SEIMPPR23 and SSHARN3 constraint groups.



- Need to navigate security concerns on constraint information along with providing equal access for all market participants

- Enhance current information that is currently published



https://www.neso.energy/data-portal/day-ahead-constraint-flows-and-limits

Public

5C) Non-firm / central scheduling of storage assets

Option description

Continue Current Programme

- A broad category of options, this option recognises that ultimately, the cause of repetitive re-trading is a market schedule which doesn't align with the operational requirements of the system, and that scheduling the market efficiently in the first instance (or removing compensation for infeasible positions) would be the most impactful way of addressing repetitive retrading.

- This is a significant change to market design, and is at most appropriate for consideration through RNP.

- **Timeline:** Multiple years of consultation, policy development, and implementation.

NESO National Energy System Operator

Public

6A) Capacity Reserve Market

Option description

Enduring Option

- NESO procures storage availability through a competitive tender process during known or forecast constraint periods, with assets bidding to be available and then paid to be utilized through the Balancing Mechanism.
- Similar to existing Constraint Management Markets (CMMs) and GTMA Schedule 7A (Option 4B), this is a pre-gate procurement mechanism.
- Payments for availability are agreed in advance of the constraint, with utilization called off through the balancing mechanism. The storage asset would only follow NESO redispatch actions throughout availability period.
- Raised through industry engagement as a long-term alternative.
- **Timescale:** Long-term option requiring development of a new market or service and engagement with Ofgem and DESNZ. Grouped with options 3C, 3CA and 4B for cost-benefit assessment.

NESO National Energy System Operator

6B) Advanced cost benefit modelling

Option description

Not considered Further

- NESO develops enhanced real-time decision-support tools to assess the costs and benefits of redispatching individual storage assets behind constraints, rather than relying solely on price order.
- The assessment would weigh the risk of RRT costs against the asset's constraint management value before issuing an instruction, enabling more informed case-by-case decisions.
- This option would require real time modelling of market conditions, PN submissions, wholesale and BM bidding behaviour, and future period RRT impacts.
- While it could support more informed case by case decisions, the forecasting capability needed to deliver this consistently across all settlement periods is not currently considered achievable in terms of speed, reliability or coverage. It is therefore not proposed as a standalone option at this stage.

NESO National Energy System Operator

Public

6C) Guidance on reasonable cycles per day

Option description

Pass to Ofgem /DESNZ

- NESO publishes non-binding guidance on the number of charge and discharge cycles a storage asset can reasonably expect to receive each day while behind a constraint.
- Provides industry with a clearer benchmark for commercial decision-making without requiring changes to the Balancing Principles Statement or wider market rules.
- Does not directly prevent RRT but may reduce volumes by setting expectations and discouraging repeated re-submission of positions for marginal gains.
- This option would provide guidance or monitoring on the number of charge and discharge cycles a storage asset could reasonably undertake during constraint periods.
- While it could offer a softer signal to industry, defining a “reasonable” number of cycles is challenging and may vary by asset type, commercial position and service obligations.
- This is therefore better considered with Ofgem and DESNZ rather than through a short-term operational change led by NESO.

NESO National Energy System Operator

Outcome of the shortlist workshop

Changes asset behaviour in BM

1A: Redispatch storage, but they can subsequently only discharge at a portion of their PN.

Do Nothing

2A: Dispatch in price order

Change decision making in control room

3A: Dispatch according to order of actions prioritizing generation before storage, through BPS.

3AA: As 3A but storage can charge

3B: No charging of storage behind constraints

3C: Only dispatching storage assets up to a single cycle per constraint period.

3CA: As 3C but charging unrestricted

New markets to change storage behaviour

4B: Grid Trade Master Agreement Schedule 7a

4A: Boundary flow smoothing

6A: Capacity Reserve Market. NESO tenders for availability during constraint periods.

4C: Redispatch in bid/offer pairs to return SOC change to zero.

Reduce need to redispatch storage assets

5A: Intertrip services

5B: DA information transparency and optimisation

5C: Non-firm / central scheduling of storage assets.

6B: Advanced cost benefit modelling

6C: Guidance on reasonable cycles per day

- Not considered further
- Long-term Option
- Short-term Option
- Continue Current Programme
- Pass to Ofgem/DESNZ
- Status Quo

NESO National Energy System Operator

Public

Our Shortlist, up close

SHORT TERM (3 – 6 MONTHS)

Option 3A

Change NESO's balancing rules; Amend the BPS to dispatch generation before storage behind export constraints.

✓ Breaks the repetitive retrading loop.

✓ Removes the cost externality without removing storage from wholesale or ancillary markets.

✓ Resolves tension between merit order and NESO's economic dispatch obligation.

- Short term option that does not fully resolve the issue

Option 3AA

As 3A but enables in-merit charging behind constraints without curtailing discharge.

✓ Preserves storage activity in BM

✓ Storage absorbs cheap or excess renewable energy mid-congestion.

- Does not remove the feedback loop; potential for more unwanted dispatch behind constraints with limited decarbonisation benefit.

- More complex to implement than 3A.

ENDURING (1 – 2 YEARS)

Options for Cost-Benefit Assessment

3C: Single dispatch per constraint period

NESO would limit storage redispatch to one cycle per constraint period.

3CA: As 3C, with charging unrestricted

No limits on charging during congestion but can only bid back a single discharge.

4B: GTMA Schedule 7A Expansion

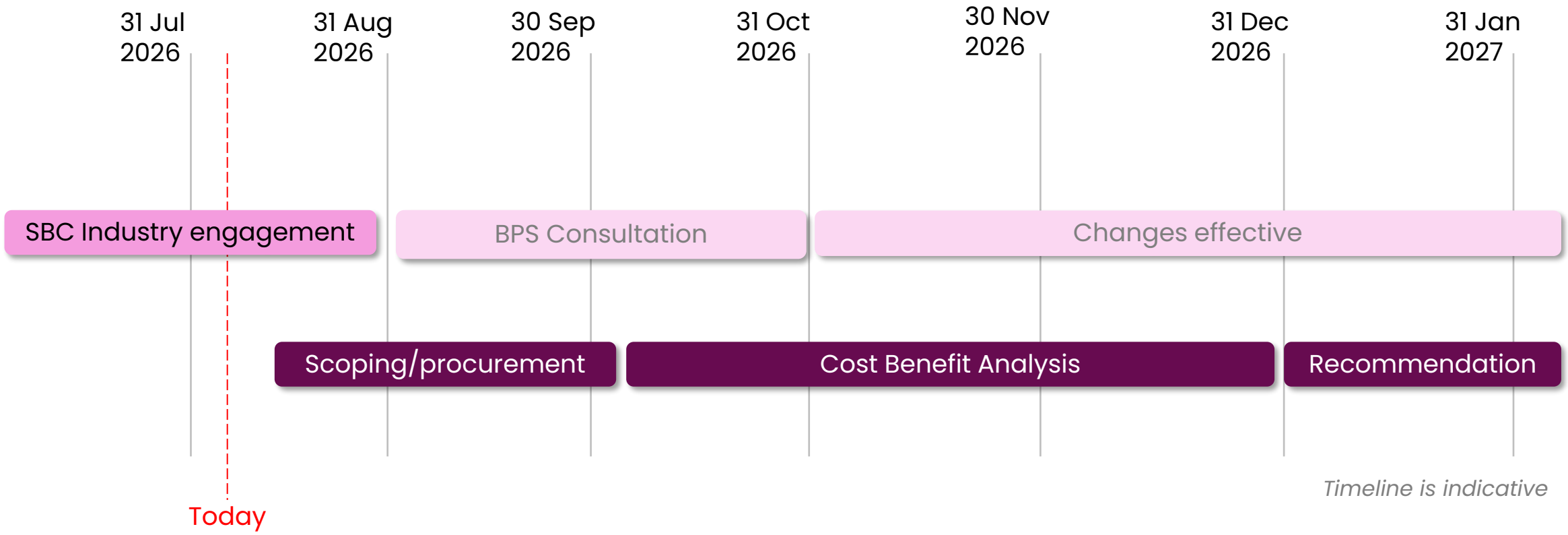
Extend current trading platform to agree positions with BMUs before gate closure.

6A: Capacity Reserve Market

A competitive market where storage bids to be available during congestion periods.

Public

What Happens Next?



Timeline is indicative

KEY: Short-term | Subject to internal governance | Enduring

Public

Thank you

NESO
National Energy System Operator

Public

Glossary

Term	Meaning
RRT	Repetitive Re-Trading: the cycle where a storage asset is redispatched to charge, then resubmits a position to discharge, prompting another redispatch.
SOC	State of Charge: how full a storage asset's capacity is at a given moment.
PN	Physical Notification: an asset's declared intention to generate, import or export in a given settlement period.
BOA	Bid-Offer Acceptance: NESO's instruction accepting an asset's bid or offer, redispatching it away from its PN.
MEL / MIL	Maximum Export Limit / Maximum Import Limit: the technical bounds on how much an asset can export or import.
BM	Balancing Mechanism: the real-time market NESO uses to balance supply and demand after gate closure.
BMU	Balancing Mechanism Unit: an individual asset (generator or storage) registered to participate in the BM.
BPS	Balancing Principles Statement: NESO's published statement of how it applies dispatch principles in the BM.
FPN	Final Physical Notification: an asset's confirmed position for a settlement period, submitted ahead of real time.
GTMA	Grid Trade Master Agreement: NESO's contractual framework for trading energy services ahead of the BM.
CMM	Constraint Management Market: a pre-gate market for procuring constraint-solving services ahead of the BM.
CP30	Clean Power 2030: the government's target for a decarbonised power system by 2030.
RNP	Reformed National Pricing: the wider programme addressing GB market and system design reform.
TCLC	Transmission Constraint Licence Condition: intended to prevent electricity generators from obtaining excessive benefits from transmission constraints.