Scheduling & Dispatch

Proposed Changes for Battery Storage Units

Modifications Committee

23rd April 2024

This presentation provides background, content, and an explanation for the proposed changes to the Trading & Settlement Code for the Scheduling & Dispatch Programme initiative SDP_002: ESPS (Battery) Integration.

Achievable – Valuable – "Simple"

EirGrid semo Single Electricity Market Operator SONI

History of the Mod

- This mod was introduced to the mods committee on 19th October.
- Based on feedback from committee members it was decided that further sessions were required to work through the detail of the mod before going to a vote. Further sessions were held by the Scheduling and Dispatch team on the 8th and 15th of November.
- Updates were made to the mod it was resubmitted for a vote in the December 5th committee meeting. The updated mod was voted to be recommended for approval by the mods committee.
- On receiving the Final Recommendation Report the Regulatory Authorities had concerns about certain aspects of the mod and requested that changes be made.
- An additional session with industry and the RAs was held on April 5th during which an approach was agreed on.
- Updates have been made to the mod based on that session and the mod has been resubmitted for a vote in this April committee meeting.

Updates to Mod Proposal since December Mods Committee Meeting

- Based on discussions with industry and the RAs, updates have been made to the mod proposal:
    - System Operator (SO) flags will be applied to all actions on these units. This is to reflect that fact that will primarily be scheduled and dispatched to follow PNs, and dispatch decisions away from PNs will be made for system reasons, not based on price.
    - The requirement to use Complex Commercial Offer Data in the settlement of Battery Storage Units has been removed. This is no longer required as it will be enacted through the application of System Operator (SO) flags.

- Based on ongoing discussions with vendors:
    - Update to proposed changes on the naming of Pumped Storage Cycle Efficiency and (battery) Storage Cycle Efficiency.
    - Updates to list of Technical Offer Data fields applicable to Battery Storage Units.

System Improvements

We are working with our vendors to remove limitations on market systems which currently restrict batteries' participation in the market.

The primary changes which will allow the control centre and market participants to gain greater value from these units in the balancing market are:

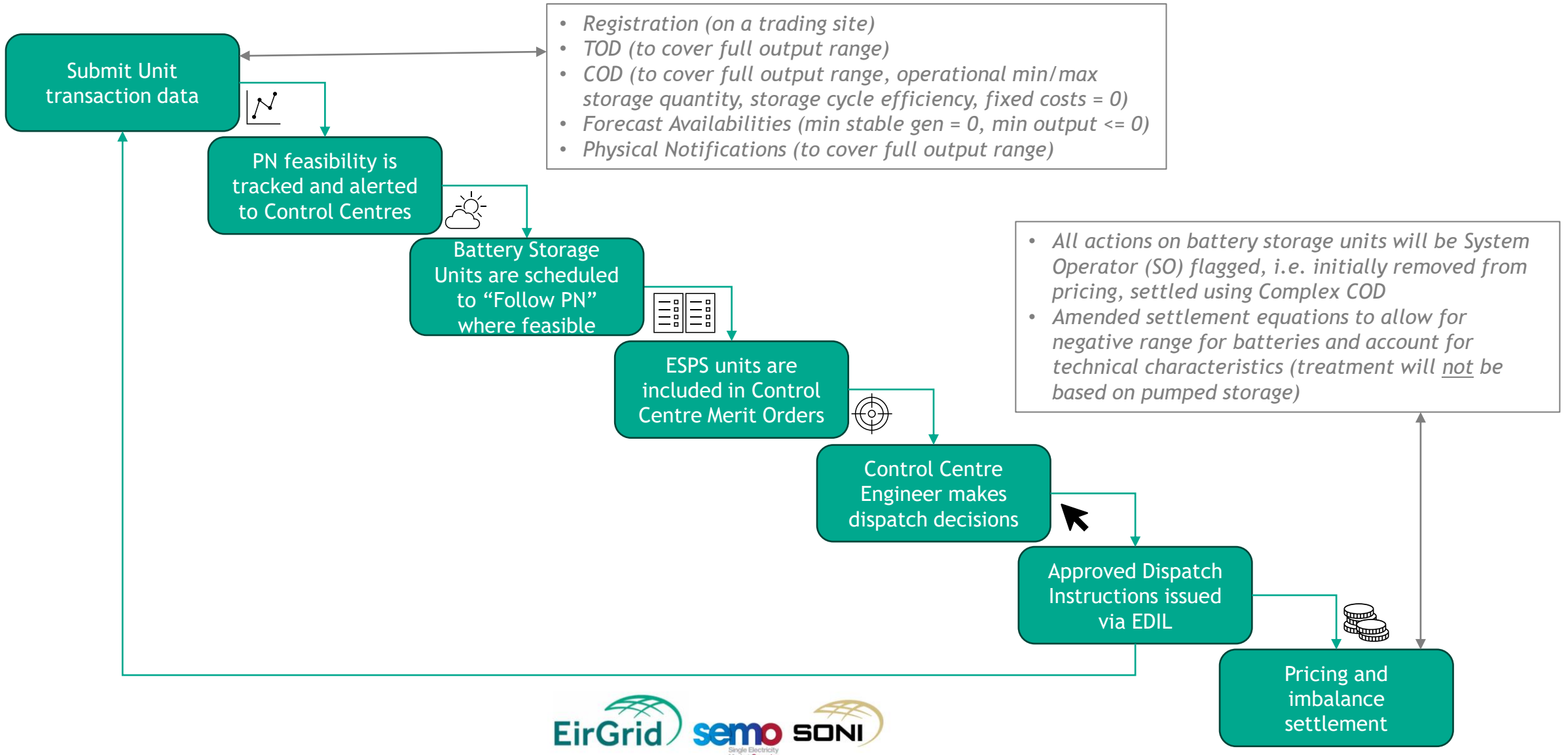
- The ability to register and identify these units correctly as Battery Storage Units.
- The ability for participants to submit negative Physical Notifications, representing an intention to import.
- The ability to schedule and dispatch these units to follow Physical Notifications.
- The ability for these units to receive negative Dispatch Instructions.

As a result of these changes, updates to the rules for Battery Storage Units in the Trading and Settlement Code are required.

System Improvements

- Due to system limitations, the scheduling of Battery Storage Units cannot be optimised by market systems.
- In response to this and feedback from participants the approach detailed here has been developed as an **interim solution**.
- An **enduring solution** will follow as part of an upcoming programme of work within the TSOs and SEMO.
- Industry engagement on that work has begun through EirGrid/SONI/SEMO's Strategic Markets Programme.

Day in the Life - Battery Storage Units



Dispatch of Battery Storage Units

Proposed Operational Policy:

- Grid controller will dispatch the unit to follow PNs except for in certain, defined circumstances, e.g. system alerts. Dispatch decisions will not be made based on commercial factors.

Trickle Charge:

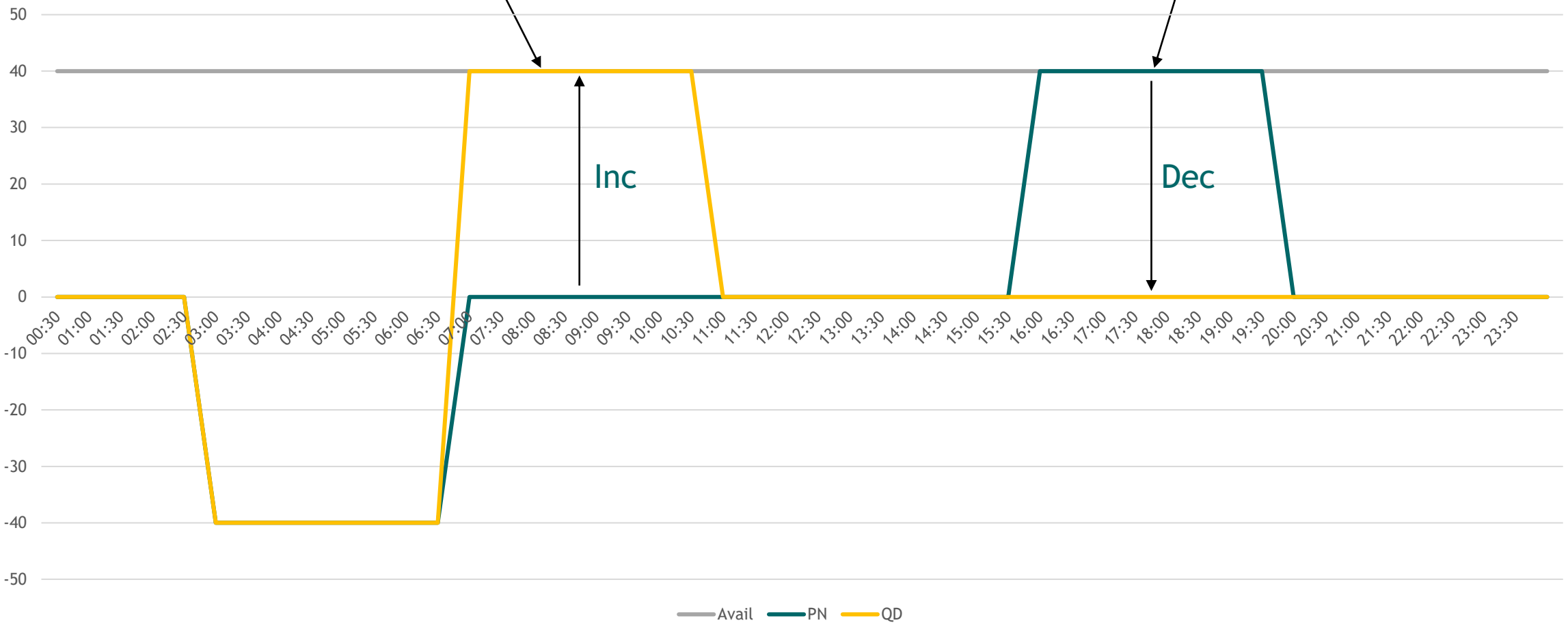
- Will be available up to the 1MW tolerance included in the Uninstructed Imbalance Charge.

Settlement of Dispatch Away from PNs

- The TSO will **not** require these units to redeclare availability in EDIL when discharged or charged away from PNs by the TSO.
- Settlement will be based on **EDIL availability**, meaning that dispatch away from PNs that have become infeasible due to previous TSO actions will be settled as if available, i.e. at the better of COD price and the imbalance price.
- **All actions** on these units will be **System Operator (SO) flagged**. This is to account for the fact that these units will primarily be scheduled and dispatched to follow PNs, and dispatch decisions away from PNs will be made for system reasons, not based on price.

Unit is discharged across morning peak from PNs of zero.
Unit does not redeclare availability.
This inc action is initially SO flagged out of pricing.
Balancing Market Settlement = + CIMB + CPREMIUM (based on Complex COD due to SO flag)

Unit is dispatched to zero across evening peak as it has zero charge.
Unit has not declared availability of zero so receives CDISCOUNT payment.
This dec action is initially SO flagged out of pricing.
Balancing Market Settlement = - CIMB + CDISCOUNT (based on Complex COD due to SO flag)



Registration as Part of a Trading Site

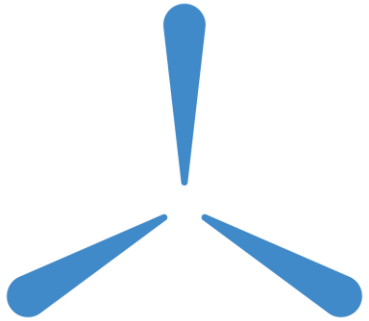
- Battery Storage Units will be required to register as part of a Trading Site like other generator units.
- Previously Battery Storage Units were required not to register as part of a Trading Site to match the treatment of Pumped Storage Units.
- Non-firm quantities are calculated on a Trading Site basis, so without being part of a Trading Site non-firm quantities will not be applied to Battery Storage Units.
- If a Battery Storage Unit is the only unit registered on a Trading Site, the existing logic ensures that quantities below zero will never be settled as non-firm.

Commercial Offer Data

- *Additional fields for battery storage units:*
  - Operational Minimum Storage Quantity (MWh)
  - Operational Maximum Storage Quantity (MWh)

These fields will allow a warning to be provided to the control centre if Physical Notifications submitted by a participant for a battery unit cause the unit's storage level to fall outside of these operational limits.

- *Forecast Minimum Stable Generation:*
  - To be mandated to be submitted as zero for all imbalance settlement periods.
  - This will allow unit to be synchronised instantly to import or export.



- *Forecast Minimum Output:*
  - Values may be <= 0 for Battery Storage Units, unlike conventional generators for which Min Output must = 0 (no change to T&SC).

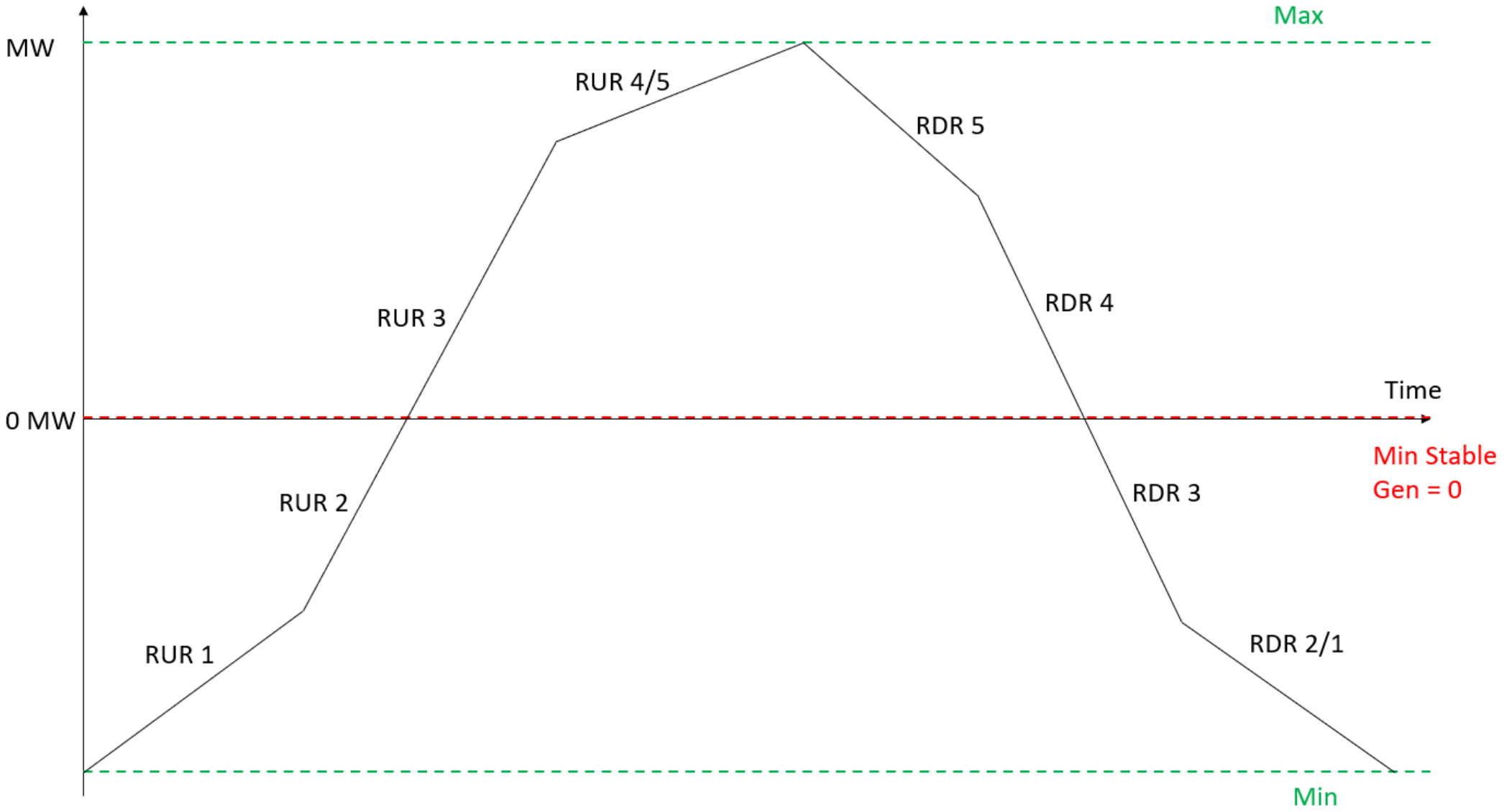
Technical Offer Data

- *Updated field names:*
  - Storage Cycle Efficiency (for Battery Storage Units)
  - Minimum Storage Quantity (for both Pumped Storage and Battery Storage)
  - Maximum Storage Quantity (for both Pumped Storage and Battery Storage)

- *Field to be removed:*
  - Battery Storage Capacity (exists to allow units to be profiled to storage capacity when a GOOP PUMP instruction is received, these units will not receive these instructions and so will not need this field, will instead be profiled to Target Instruction Level)

- *Applicable Fields:*
  - Start up and load up/de-loading fields not required.
  - Dwell times, restricted range, short term maximisation fields not required.

Sample Technical Offer Data Profile



Charging Mode

- Definition of Battery Storage Unit in charging mode is proposed to be removed:

F.2.1.4 The Market Operator shall determine whether a Battery Storage Generator Unit, u, is in Charging Mode for the purposes of the calculations in this Code as follows:

(a) If the value of a Battery Storage Unit's Dispatch Quantity ($qD_{uo\gamma}(t)$) at all times within an Imbalance Settlement Period, γ, is positive (i.e. in the generating range of the Unit's output), then the Unit is deemed to be in Generating Mode for the entirety of that Imbalance Settlement Period; and

(b) If the value of a Battery Storage Unit's Dispatch Quantity ($qD_{uo\gamma}(t)$) at any time within an Imbalance Settlement Period, γ, is negative (i.e. in the charging range of the Unit's output), then the Unit is deemed to be in Charging Mode for the entirety of that Imbalance Settlement Period.

- The current text is based on legacy arrangements which recognised that Pumped Storage Units cannot control the exact level to which they consume power when dispatched to pump.
- Battery Storage Units are currently aligned with pumped storage units in the Trading and Settlement Code.
- However, unlike Pumped Storage Units, Battery Storage Units can control the level to which they consume power and can run to specific negative MW Target Instruction Levels when dispatched to charge, and so do not need different treatment while importing and exporting.

Imbalance Charge

- We propose that Battery Storage Units be removed from the clause below so that the Imbalance Charge is applied the same while charging as discharging.

F.5.3.3 The Market Operator shall calculate the Imbalance Component Payment or Charge ($CIMB_{u\gamma}$) for each Pumped Storage Unit or Battery Storage Unit, u, in each Imbalance Settlement Period, γ, for which it is in Pumping Mode (as determined in paragraph F.2.1.3) or in Charging Mode (as determined in paragraph F.2.1.4), as the case may be, as follows:

$$CIMB_{u\gamma} = PIMB_{\gamma} \times \left(\sum_{o} \sum_{i} \left(QAOLF_{uoi\gamma} - Max\left(QAOBIAS_{uoi\gamma}, QAOUNDEL_{uoi\gamma} \right) \right) + \sum_{o} \sum_{i} \left(QABLF_{uoi\gamma} - Min\left(QABBIAS_{uoi\gamma}, QABUNDEL_{uoi\gamma} \right) \right) \right)$$

- As described above this exception was put in place to account for the technical limitations of Pumped Storage Units, which do not apply to Battery Storage Units.
- The need for this change was identified by the TSOs in SEM-21-017: EirGrid and SONI Analysis of SEM Compliance with Commission Regulation (EU) 2017/2195 of 23 November 2017 Establishing a Guideline on Electricity Balancing.

Uninstructed Imbalance

F.9.4.2 When a Pumped Storage Unit or Battery Storage, u, is in Pumping Mode or Charging Mode, as the case may be, for an Imbalance Settlement Period, γ, or any part thereof, the Market Operator shall calculate the Uninstructed Imbalance Charge ($CUNIMB_{u\gamma}$) for that Pumped Storage Unit or Battery Storage Unit, u, in that Imbalance Settlement Period, γ, as having a value of zero.

- We propose that Battery Storage Units be removed from the clause above so that the Uninstructed Imbalance Charge is applied while charging as it is while discharging.
- Unlike Pumped Storage Units, Battery Storage Units can control the level to which they consume power when dispatched to charge, and so do not need different treatment while importing and exporting.
- The existing tolerances within the Uninstructed Imbalance calculation (minimum of 1MW) may be used by Battery Storage Units to trickle charge.

Testing Charge

Testing Charge for Generator Units other than Interconnector Error Units (F.13.2.1):

$$CTEST_{u\gamma} = -Max\left(QMLF_{u\gamma}, 0\right) \times PTESTTARIFF_{u\gamma}$$

Testing Charge for Interconnector Error Units (F.13.2.2):

$$If\ QMLF_{u\gamma} > 0\ then$$

$$CTEST_{u\gamma} = -Max\left(QMLF_{u\gamma}, 0\right) \times PTESTTARIFF_{u\gamma}$$

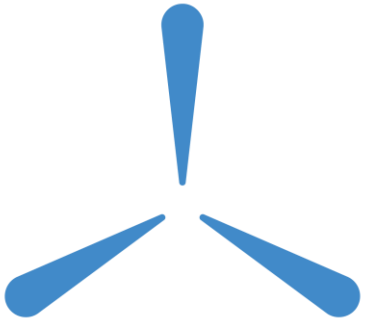
$$else$$

$$CTEST_{u\gamma} = QMLF_{u\gamma} \times PTESTTARIFF_{u\gamma}$$

We propose that Battery Storage Units also be included under F.13.2.2 so that negative meter quantities can be handled appropriately, and the Testing Charge can be incurred for testing while importing and exporting.

System Operator (SO) Flagging

- All actions on these units will be System Operator (SO) flagged.
- As a result, actions on these units will initially be flagged out of pricing. They may be tagged back into pricing through the Net Imbalance Volume (NIV) tag, but the price used will be capped by the Price of the Marginal Energy Action (PMEA).
- The SO flag will also ensure that these units are always settled using Complex COD.



Instruction Profiling

- Battery Storage Units will be dispatched using MWOF Dispatch Instructions rather than GOOP instructions as GOOP instructions are more aligned to the technical characteristics of Pumped Storage Units and are not well suited to Battery Storage Units.
- Minimum Stable Generation to be submitted as zero.
- SYNC instructions may be issued to charge or discharge.
- Ramp Rates will be used for the full range between Registered Minimum Output and Maximum Generation.