Scheduling & Dispatch Programme – SDP_06

Proposed Changes for Synchronous Condensers – V3

Modifications Meeting 127B – 12th March 2025

This presentation provides background, content, and an explanation for the proposed changes to the Trading & Settlement Code for the Scheduling & Dispatch Programme initiative 6 (SDP_06)

Achievable – valuable – "Simple"

EirGrid semo Single Electricity Market Operator SONI

Agenda

1. Scheduling & Dispatch Programme
2. Background
3. Mod_01_25 History
4. Actions from Modifications Meeting 127 & Feb 26th Industry Call
5. Modification Proposal - Version 2 & Version 3
6. Scheduling and Dispatch Principles
7. Questions?

Scheduling & Dispatch Programme
Initiative 6 (SDP_06)

The integration of synchronous condensers is vital for achieving Irelands goal of **80% renewable electricity** and **95% SNSP** by 2030.

Synchronous condensers provide the same benefits to the grid as conventional generators, without providing electricity.

Synchronous condensers provide **inertia**, **reactive power control**, as well as addressing **short circuit** issues.

The current market framework does not accommodate the unique characteristics of synchronous condensers.

SDP_06 aims to:

- **Realise the value** of the services provided by synchronous condensers
- Enhance **scheduling and dispatch mechanisms** for synchronous condensers.

Background

Background - Current Challenges

Synchronous condensers are currently **not defined** in the TSC and there are various **system limitations** for these units at present.

System limitations / workarounds:

- Synchronous condensers are modeled as **multi-fuel generator units** in the Market Management System (MMS), which does not support **negative dispatch instructions** or allow them to be considered "ON" at **0MW**.

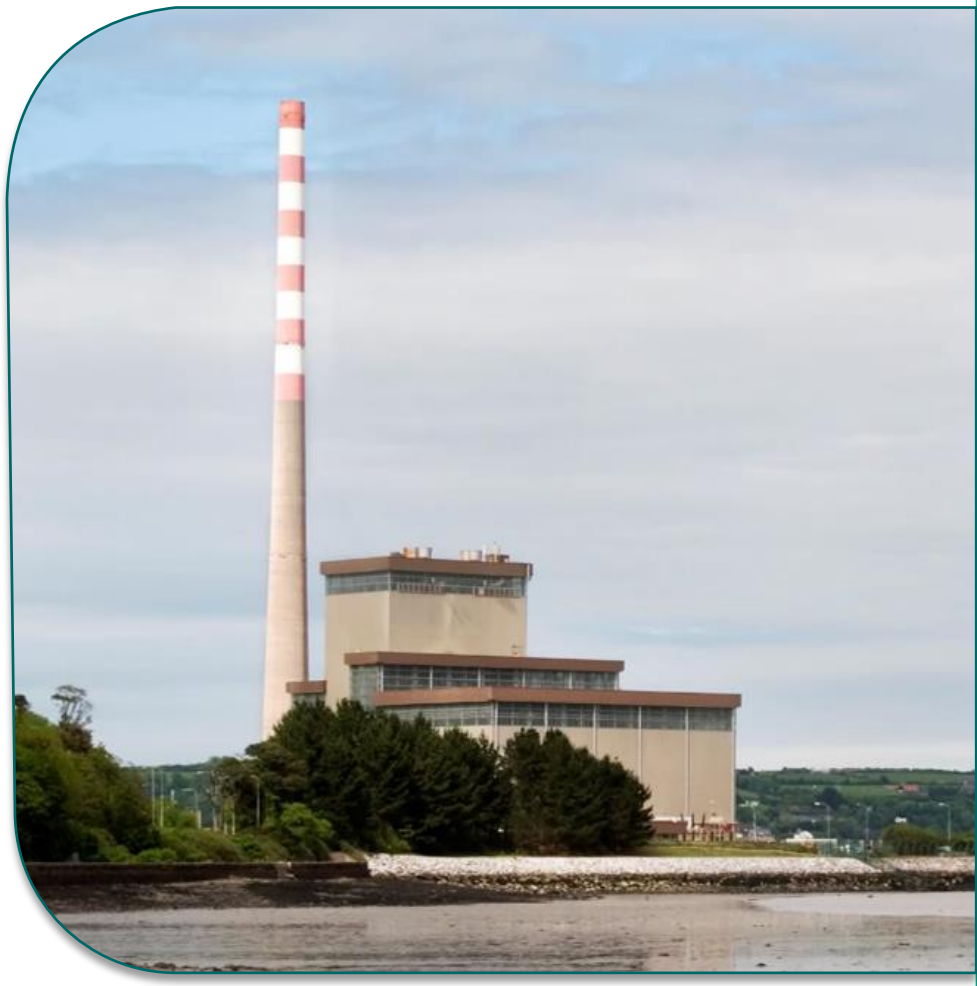
- To address this, synchronous condensers receive a **1MW dispatch instruction**, which misrepresents their operational characteristics.

- Synchronous condensers can submit **non-zero Commercial Offer Data (COD)** in the Balancing Market. However, they are not settled using this COD, and these prices can lead to **sub-optimal scheduling and dispatch outcomes**.

EirGrid semo Single Electricity Market Operator SONI

Background - Mod_13_19

- The aim of Mod_13_19 is to ensure System Services Providing Units are **not charged for their energy consumption** while providing System Services.
- This includes synchronous condensers and windfarms that provide system services at 0MW.
- For each Trading Site Supplier Unit which is registered in a Trading Site with a System Service Providing Unit, a **System Services flag** indicates the Imbalance Settlement Periods where the System Services Providing Unit is dispatched to provide System Services.
- Energy consumed during flagged periods will not be charged. In non-flagged periods, units will pay for their energy consumption as usual.



Background - Revenue Streams

Low Carbon Inertia Services (LCIS)

In **SEM-21-021**, the SEM Committee requested that the TSOs bring forward proposals for a **fixed term procurement**, in relation to LCIS. The aim of this was to procure services such as inertia from low carbon sources.

SEM-23-002 decided LCIS would be procured through a phased approach, with a targeted volume of 10,000 MVA.s, in Phase 1, to meet LCIS requirements for 2026. For **Phase 1 procurement**, TSOs contracted **10,963 MVA.s** of LCIS.

The contract duration and payment information for LCIS are outlined in SEM-23-064. Units with an LCIS contract *"will be prohibited from the provision of other related system services (i.e. Synchronous Inertial Response and Steady State Reactive Power) as these services overlap with the LCIS service procured"*.

System Service Payments

System services are products, other than energy, that are required for the continuous, secure operation of the power system. System services payments are paid outside of the SEM by the TSOs.

Synchronous condensers that do not have an LCIS contract are eligible for the following System Services payments.

- **Synchronous Inertial Response (SIR)** utilizes stored kinetic energy to enhance system stability, with payments adjusted based on performance and capability improvements.
- **Steady State Reactive Power (SSRP)** incentivizes payments through scalars that reward automatic voltage regulation and the provision of reactive power at zero MW output.

EirGrid semo Single Electricity Market Operator SONI

Mod_01_25 History

Mod_01_25 History

1 Modifications Meeting 127

- → Took place on Wednesday 5th February
- → New Modification Proposal Mod_01_25 was presented but no vote was taken

T&SC Modification - summary	Notes
Proposes a modification to establish a structured framework for synchronous condensers within the T&SC. The primary changes include: • The ability to **register** and identify these units correctly as Synchronous Condenser Units. • Outlining appropriate **data submissions** for synchronous condensers. • Dispatch instructions for synchronous condensers shall not be utilised in Imbalance Pricing or Imbalance Settlement. • References to '**DS3 System Services**' have been changed to 'System Services' throughout the T&SC, Appendices and Glossary.	• The application of Mod_13_19 will remain, meaning that units providing System Services at 0MW (including synchronous condensers) will not incur charges for their energy consumption while providing these services. • Changes to ensure optimal scheduling and dispatch mechanisms for synchronous condensers will be required but will not form part of the TSC modification. • EirGrid and SONI are currently progressing Grid Code modifications in relation to Synchronous Condensers. These were drafted based on out-of-date assumptions. The TSOs are aware and will update the modifications accordingly.

EirGrid semo Single Electricity Market Operator SONI

Mod_01_25 History

2 Industry Call

→ Took place on Wednesday 26th February

→ Changes from Mod_01_25 V1 to V2 were presented

→ The following **actions from Modifications Meeting 127 were discussed**:

- Proposer to assess how Synchronous Condensers will function alongside standard GU that can operate in Synchronous Condenser Mode.
- Proposer to review LCIS contracts and confirm this proposal does not run contrary to them.
- Proposer to review how the times to sync and de-sync within the TODs will be handled.

→ Following discussion, further **actions were established**:

- TSOs to assess whether updates are required to Tie Breaking rules to mention Synchronous Condensers.
- TSOs to confirm reports for System Services Providing Units.
- TSOs to take comments on working more closely with FASS into consideration.

EirGrid semo Single Electricity Market Operator SONI

Actions from Modifications Meeting 127

Actions from Modifications Meeting 127

Proposer to assess how Synchronous Condensers will function alongside standard GU that can operate in Synchronous Condenser Mode

Wind units:

- System Services Providing Units that are wind units can provide reactive power but **do not provide inertia.**
- Control rooms do not explicitly schedule for reactive power.
- These units will not impact the SDP_06 solution which is aimed at scheduling for inertia.

Other units:

- There is currently one conventional generator unit that can operate in synchronous condenser mode.
- This unit has a Synchronous Compensation Service Agreement in place and does not have a DS3 or LCIS contract. As there are separate arrangements in place, this unit is not impacted by the T&SC modification.
- The TSOs do not envisage additional units of this nature i.e. needs will be met by LCIS procurement.

EirGrid semo Single Electricity Market Operator SONI

Actions from Modifications Meeting 127

Proposer to review LCIS contracts and confirm this proposal does not run contrary to them

Both the DS3 / LCIS Contracts were internally reviewed:

- It was determined that neither the DS3 / LCIS Contracts contain any provisions that conflict with the proposed changes to the T&SC.
- References to Technical Offer Data (TOD) were noted but no apparent conflictions with proposed modification, as Synchronous Condensers will be submitting relevant TOD.
- There is a clause in the both agreements which states that nothing shall prevent the Service Provider from operating the Unit in such a manner so as to comply with its obligations under the T&SC.

Important Note: Both contracts contain a clause that allows them to be amended to avoid conflicts arising from changes in the: Grid Code, Distribution Code, Network Codes, Metering Code or Trading and Settlement Code, to “most closely reflect the intentions” of the original agreement.

EirGrid semo Single Electricity Market Operator SONI

Actions from Modifications Meeting 127

Proposer to review how the times to sync and de-sync within the TOD will be handled

- Elements of Technical Offer Data have been reviewed and synchronous condensers will now also submit Start Up Time elements of Technical Offer Data i.e.
  - Synchronous Start Up Time Hot (hours)
  - Synchronous Start Up Time Warm (hours)
  - Synchronous Start Up Time Cold (hours)
- This has been included in V2 of the modification.
- This will allow schedulers to determine how quickly a synchronous condenser can be committed.

Actions from Feb 26th Industry Call

Actions from Feb 26th Industry Call

TSOs to assess whether updates are required to Tie Breaking rules to mention Synchronous Condensers.

- No updates required (tie breaking occurs randomly).

TSOs to confirm reports for System Services Providing Units

- Existing reports for Operational Schedules and Dispatch Instructions can be used to determine when Units of type “Synchronous Condenser” are ON (and therefore will provide inertia).
- There will be no new reports resulting from SDP_06.

EirGrid semo Single Electricity Market Operator SONI

Actions from Feb 26th Industry Call

TSOs to take comments on working more closely with them FASS into consideration

- As per SEMC decision paper SEM-24-066, DASSA will initially procure reserve services.
- The TSOs published a consultation paper titled **"DS3 System Services Tariffs to FASS ('The Gap')"** in January 2025. One of the proposals in this paper is to extend the DS3 System Services Regulated Arrangements to cover the gap between the DS3 contracts' expiry date (30th April 2026) and the Go Live of the DASSA Arrangements and the future arrangements for the procurement of non-reserve services (planned for December 2026). This consultation is open until 25th March 2025.
- The TSOs will also publish a Non-Reserve consultation paper over the coming months.
- There is close collaboration between SDP and the FASS team, to ensure that there is no misalignment.

EirGrid semo Single Electricity Market Operator SONI

Modification Proposal - Version 2

Version 2 – Technical Offer Data (TOD)

Appendix I – Synchronous Condensers will submit three additional forms of Technical Offer Data (TOD). These applicable fields will be defined in **TSC Appendix I - Offer Data - Table 2.**

Technical Offer Data for Generator Units

12. A Participant shall only submit Technical Offer Data to the Market Operator in respect of its Generator Units as provided for in Table 2.

Synchronous Condenser Units will only submit:

1. Minimum On Time (Hours)
2. Minimum Off Time (Hours)
3. Maximum On Time (Hours)
4. Ramp Down Rate 1 (MW / Minute)
5. Ramp Up Rate 1 (MW / Minute)
6. Start of Restricted Range 1 (MW)
7. End of Restricted Range 1 (MW)
8. Block Load Flag (True or False)
9. Registered Minimum Stable Generation (MW)
10. Registered Minimum Output (MW)
11. ***Synchronous Start Up Time Hot (Hours)***
12. ***Synchronous Start Up Time Cold (Hours)***
13. ***Synchronous Start Up Time Warm (Hours)***

Version 2 – Commercial Offer Data (COD)

- Synchronous Condenser Units will **only submit** Forecast Availability Profile, Forecast Minimum Output Profile, and Forecast Minimum Stable Generation Profile, which are used for scheduling purposes.

- Since these units **are not settled in the Balancing Market**, they will **not submit** other COD elements such as **Start Up Costs, No Load Costs, and Incremental/Decremental prices.**

- **Appendix I, Table 1 – Commercial Offer Data Elements** has been updated to have an additional column – 'Synchronous Condenser Unit'

Data Element	Energy Limited Unit	Demand Side Unit	Synchronous Condenser Unit	Other Generator Units not included in paragraph 4 of this Appendix
Simple Incremental Price Quantity Pairs (MW quantities and € / MWh or £ / MWh prices)	Yes	Yes		Yes
Simple Decremental Price Quantity Pairs (MW quantities and € / MWh or £ / MWh prices)	Yes	Yes		Yes
Complex Incremental Price Quantity Pairs (MW quantities and € / MWh or £/MWh prices)	Yes	Yes		Yes
Complex Decremental Price Quantity Pairs (MW quantities and € / MWh or £ / MWh prices)	Yes	Yes		Yes
No Load Costs (€ / hr or £ / hr)	Yes			Yes
Start Up Costs (€ or £)	Yes			Yes
Shut Down Cost (€ or £)		Yes		
Energy Limit (MWh)	Yes			
Forecast Availability Profile (MW)	Yes	Yes	Yes	Yes
Forecast Minimum Output Profile (MW)	Yes	Yes	Yes	Yes
Forecast Minimum Stable Generation Profile (MW)	Yes	Yes	Yes	Yes

Version 2 – ‘DS3 System Services’

- References to ‘DS3 System Services’ have been changed to ‘System Services’ throughout the **TSC**, **Appendices** and **Glossary.**
- The ‘System Services Provider Flag’ will continue to be used for System Services Providing Units, and it is recognised that the terminology could be rendered obsolete in the future.
- For example, from T&SC Glossary:

~~DS3~~ System Service Arrangements	means, the contractual framework in place between each System Operator and ~~DS3~~ System Services Providing Unit governing the provision of and remuneration for ~~DS3~~ System Services required by each System Operator to maintain the secure and reliable operation of the system.
~~DS3~~ System Services	means the services essential to the proper functioning of the power system as defined in the ~~DS3~~ System Services Arrangements.
~~DS3~~ System Services Provider Flag	means, a binary value derived by the Market Operator for a Trading Site Supplier Unit indicating whether a ~~DS3~~ System Services Providing Unit registered to that site was operating to provide ~~DS3~~ System Services while at zero MW exported energy in a given imbalance settlement period.
~~DS3~~ System Services Providing Unit	means, an apparatus or group of apparatus connected to the Transmission System or Distribution System that are contracted to provide ~~DS3~~ System Services to their respective System Operator.

Modification Proposal - Version 3

Version 3 – Forecast Data

Clarifications to **TSC D.4.2.11A, D.4.2.12, D.4.2.15**, covering **Forecast Availability Profile, Forecast Minimum Output Profile, and Forecast Minimum Stable Generation Profile**, to reflect the nature of Synchronous Condenser Units.

D.4.2.11A A Participant shall ensure that values of the Forecast Availability Profile submitted in respect of Synchronous Condenser Units, as part of Commercial Offer Data, shall be equal to zero in each relevant Imbalance Settlement Period.

D.4.2.12 A Participant shall ensure that values of the Forecast Minimum Output Profile submitted in respect of Pumped Storage Units~~, or~~ Battery Storage Units or Synchronous Condenser Units, as part of Commercial Offer Data, shall be equal to the expected pumping capability for that Pumped Storage Unit~~, or~~ storage capability for that Battery Storage Unit or Demand for that Synchronous Condenser Unit (as the case may be) in each relevant Imbalance Settlement Period.

D.4.2.15 A Participant shall ensure that values of the Forecast Minimum Stable Generation Profile submitted in respect of Battery Storage Units and Synchronous Condenser Units, as part of Commercial Offer Data, shall be equal to zero.

EirGrid semo Single Electricity Market Operator SONI

Version 3 – “Synchronisation”

Removal of reference to **producing energy** in the **TSC Glossary** definition of **“Synchronisation”** to reflect the nature of Synchronous Condenser Units.

Synchronisation	means the process where a Generator Unit or Interconnector is preparing to connect ~~and produce energy on~~ to the system to which it is Connected in accordance with a Dispatch Instruction as appropriate, so that the frequencies, voltage levels and phase relationships of that Generator Unit or Interconnector, as the case may be and the system to which it is Connected are aligned. “Desynchronisation”, “Synchronised” “Synchronise” and “Desynchronised” will be interpreted accordingly.

EirGrid semo Single Electricity Market Operator SONI

Scheduling and Dispatch Principles

Scheduling and Dispatch Principles (1/3)

- Synchronous condensers will be scheduled so that they are only ON when required to meet:
  - regional inertia requirement;
  - jurisdictional inertia requirement;
  - all-island inertia requirement; or
  - to satisfy any other constraint they may be subject to (e.g. voltage support in a region).
- This will be achieved in scheduling by ensuring **commitment of a synchronous condenser** results in an **increase to the Production Cost** of the optimisation in all instances.
- The contribution to the overall Production Cost of scheduling a synchronous condenser unit will **implicitly include the cost of additional generation** scheduled to meet the additional demand when the Synchronous Condenser is ON.
- Synchronous condensers should not be scheduled in order to increase demand (e.g. to maximise priority dispatch generation).

Scheduling and Dispatch Principles (2/3)

- Synchronous condensers will be scheduled taking **inertia contribution** & **consumption levels** into account.
- The following **technical, locational and operational characteristics** will be required to appropriately schedule synchronous condensers:
  - Consumption level (Registered Minimum Output) (MW)
  - Inertia contribution (MW.s)
  - Location
  - Forecast data (MW) -> Availability (=0), Minimum Stable Generation (=0), Minimum Output (<=0)
  - Minimum On Time (hours)
  - Minimum Off Time (hours)
  - Maximum On Time (hours)
  - Start-Up Time Hot/Warm/Cold (hours)
  - Ramp Up Rate 1 (MW/Min)
  - Ramp Down Rate 1 (MW/Min)
  - Start Forbidden Range 1 (MW)
  - End Forbidden Range 1 (MW)

EirGrid semo Single Electricity Market Operator SONI

Scheduling and Dispatch Principles (3/3)

- To ensure the commitment of a synchronous condenser results in an increase to the Production Cost, the SDP_06 solution will allow for configurable unit-level prices to be applied in scheduling.
- If these prices are all the same, synchronous condensers will be scheduled using the technical, locational and operational characteristics as previously discussed – or random tie-breaking if these characteristics are identical.
- The SDP_06 solution allows for these prices to be different which would introduce an additional distinguishing factor between synchronous condensers. The rationale for this is in the event that the RAs make decisions regarding any future hierarchy for synchronous condenser units (e.g. to favour one procurement method over another, including LCIS vs non-LCIS).
- The expectation is that SDP_06 would go live in 2025 without any such hierarchy (unless such decisions were made).

Questions?