Synchronous Condenser Grid Code Implementation Note

Version 1.0 – October 2022

EIRGRID SONI

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Version History

Version	Date	Comment
1.0	October 2022	Initial Publication for Industry Feedback

Introduction

This Implementation Note has been written by EirGrid and SONI to offer guidance to those planning to connect Synchronous Condensers Units (SCU) in order to provide system services within Ireland and Northern Ireland, specifically in relation to the application of Grid Codes within both jurisdictions. At present, there are no specific Grid Code requirements for Synchronous Condensers. This Implementation Note does not propose any Grid Code modifications at this time. Once published, we are happy to receive stakeholder feedback on the contents of this Implementation Note. That feedback will then be used to develop further versions of this Implementation Note, which will subsequently be incorporated into the Grid Code.

Part A of this document lists the technical requirements published in the relevant jurisdictional Grid Code and states the extent to which they apply to SCUs. Where a Grid Code requirement is modified in order to be applied to SCUs, the modified form of that requirement specific to SCUs is detailed in Part B.

Note that in Part B, formatting is used to help the reader identify key variations when applying the SONI or EirGrid Grid Code, this is as follows:

- Normal font is used to describe characteristics that are required for both the SONI and EirGrid Grid Code
- Italics font is used to highlight specific characteristics that apply to either the SONI or EirGrid Grid Code.

Objectives

- The purpose of the Implementation Note is to assess the applicability of relevant Grid Code clauses and provide clarity on the clauses which will need to be adjusted in order to address the specific nature of Synchronous Condensers. EirGrid and SONI welcome feedback and engagement from industry on EirGrid and SONI's emerging thinking on Grid Code applicability to Synchronous Condensers.
- This Implementation Note takes a high level view of the Grid Code and highlights key areas where the Grid Code might have to be changed to accommodate Synchronous Condensers. For the avoidance of doubt not every section of the Grid Code has been reviewed and all sections of the Grid Code are still in force until formal Grid Code modifications have been approved.
- It is anticipated that there will be one further iteration of this Implementation Note following industry engagement and lessons learnt from the commissioning, testing and operation of the first Synchronous Condenser. It is the intention of EirGrid and SONI to propose Grid Code modifications as appropriate and following the relevant modification processes.
- Part A of the Implementation Note details the applicability of key Grid Code technical requirements to SCUs. Part B details our current thinking for new and modified Grid Code requirements.

Part A: Applicability of Grid Code Technical Requirements

Part A of this Implementation Note provides a summary view of key SONI and EirGrid Grid Code clauses and outlines how EirGrid and SONI intend for them to be applied to Synchronous Condensers, subject to further developments and EU Network Codes.

Tables A1, A2, A3, A4 provide a reference to the General Connection Conditions, Connection Conditions Schedule 1, Operating Codes, and Schedule & Dispatch C-odes respectively, connecting in Northern Ireland as identified in the SONI Grid Code version 8 October 2020.

Tables A5, A6, A7, A8 provide a reference to the Modelling Requirements for Users, Connection Conditions, Operating Conditions and Schedule & Dispatch respectively, connecting in Ireland as identified in the EirGrid Grid Code version 10.

To assist industry engagement with this Implementation Note, each table lists the Grid Code section and applicability of the Synchronous Condensers to this section as outlined in the Tables A1, A2, A3, A4, A5, A6, A7 & A8.

The applicability of each Grid Code section and sub-section is indicated in one of three ways:

<table>
<tr><td>Applies</td><td>Indicates that this section or sub-section of the Grid Code applies to Synchronous Condensers.</td><td>Signified in green</td></tr>
<tr><td>Does not apply</td><td>Indicates that this section or sub-section of the Grid Code should not apply (derogation applies) in respect of Synchronous Condensers (accompanied by a note to indicate why this section or sub-section should not apply).</td><td>Highlighted in grey</td></tr>
<tr><td rowspan="2">Variation to be developed</td><td rowspan="2">Indicates that this section or sub-section of the Grid Code as written should not apply to Synchronous Condensers, but that a new or varied requirement applies in its place. The new or varied requirements to apply are contained in Part C of this document.</td><td>Minor variations are coloured in orange</td></tr>
<tr><td>Significant conceptual variations are highlighted in blue</td></tr>
</table>

Table A1: SONI Grid Code Connection Conditions

Grid Code Section	Subject	Grid Code Sub-Section	Applicability to Synchronous Condensers
CC1	Introduction	CC1.1	Applies
		CC1.2	Applies
		CC1.3	Applies
		CC1.4	Applies
		CC1.5	Applies
CC2	Objectives	CC2.1	Applies
CC3	Scope	CC3.1	Applies
		CC3.2	Applies
		CC3.3	Applies
CC4	Connection Principles	CC4.1	Applies
		CC4.2	Applies
		CC4.3	Applies
CC5	Supply Standards	CC5.1	Applies
		CC5.2	Applies
		CC5.3	Applies
		CC5.4	Applies
		CC5.5	Applies
		CC5.6	Applies
CC6	Technical Criteria	CC6.1	Applies
		CC6.2	Applies

		CC6.3	Applies
		CC6.4	Applies
		CC6.5	Applies
		CC6.6	Applies
		CC6.7	Applies
		CC6.8	Applies
		CC6.9	Applies
		CC6.10	Applies

CC7	Technical Criteria	CC7.1	Applies
		CC7.2	Applies
		CC7.3	Applies

CC8	Technical Criteria	CC8.1	Applies
		CC8.2	Applies
		CC8.3	Applies
		CC8.4	Applies
		CC8.5	Applies
		CC8.6	Applies
		CC8.7	Applies
		CC8.8.1	Applies
		CC8.8.2	Applies
		CC8.8.3	Applies
		CC8.8.4	Applies
		CC8.8.5	Does not apply
		CC8.8.6	Applies
		CC8.8.7	Does not apply

CC9	Site Related Conditions	CC9.1	Applies
		CC9.2	Applies
		CC9.3	Applies
		CC9.4	Applies
		CC9.5	Applies

CC10	Approval To Connect	CC10.1	Applies
		CC10.2	Applies
		CC10.3	Applies

CC11	Obligations on Users Connected to the Distribution System	-	Applies

CC12	Generator Aggregators	CC12.1	Does not apply

CC13	Demand Side Units	-	Does not apply

CC14	Fuel Security Code	CC14.1	Does not apply

CC15	Operational Notification Procedure for Generating Units Connecting to the Transmission System	CC15.1	Applies
		CC15.2	Applies
		CC15.3	Applies
		CC15.4	Applies
		CC15.5	Applies

CC16	Operational Notification Procedure for Generating Units Connecting to the Distribution System	CC16.1	Applies
		CC16.2	Applies
		CC16.3	Applies
		CC16.4	Applies
		CC16.5	Applies

Table A2: SONI Grid Code Connection Conditions Schedule 1 Part 1

Grid Code Section	Subject	Grid Code Sub-Section	Applicability to Synchronous Condensers
CC.S1.1.1	Applicability	CC.S1.1.1	Applies
CC.S1.1.2	Generating Unit Connections	CC.S1.1.2	Applies
CC.S1.1.3	Generating Plant Performance Requirements	CC.S1.1.3.1	Applies
		CC.S1.1.3.2	Does not apply
		CC.S1.1.3.3 (a)	Variation applies – see section B.1
		CC.S1.1.3.3 (b),(d),(e),(f)	Applies
		CC.S1.1.3.3 (c),(d ii)	Does not apply
		CC.S1.1.3.4	Applies
		CC.S1.1.3.5	Applies
		CC.S1.1.3.6	Does not apply
		CC.S1.1.3.7	Does not apply
		CC.S1.1.3.8	Does not apply
		CC.S1.1.3.9 (a)	Variation applies. See section B.2
		CC.S1.1.3.9 (b), (c)	Does not apply
CC.S1.1.4	Blackstart Capability	CC.S1.1.4	Does not apply
CC.S1.1.5	Generating Unit Control Arrangements	CC.S1.1.5.1	Does not apply
		CC.S1.1.5.2	Does not apply
		CC.S1.1.5.3	Does not apply
		CC.S1.1.5.4	Variation applies.
		CC.S1.1.5.5	Variation applies.
CC.S1.1.6	Coordination with existing	CC.S1.1.6.1	Applies

	protection	CC.S1.1.6.2	Applies
		CC.S1.1.6.3	Applies
		CC.S1.1.6.4	Applies
		CC.S1.1.6.5	Applies
		CC.S1.1.6.6	Applies
		CC.S1.1.6.7	Applies

CC.S1.1.7	Negative Phase Sequence Loadings	CC.S1.1.7	Applies

CC.S1.1.8	Neutral Earthing	CC.S1.1.8.1	Applies

CC.S1.1.9	Fault Ride Through	CC.S1.1.9	Variation applies – See section B.3
		CC.S1.1.9.1	Applies
		CC.S1.1.9.2	Applies
		CC.S1.1.9.3	Applies
		CC.S1.1.9.4	Applies
		CC.S1.1.9.5	Applies
		CC.S1.1.9.6	Applies
		CC.S1.1.9.7	Applies

SONI Grid Code Connection Conditions Schedule 2

SONI Grid Code Connection Conditions Schedule 2 does not apply.

Table A3: SONI Grid Code Operating Code

Grid Code Section	Subject	Grid Code Sub-Section	Applicability to Synchronous Condensers
OC.1	Demand Forecasting	OC.1.1	Does not apply
		OC.1.2	Does not apply
		OC.1.3	Does not apply
		OC.1.4	Does not apply
		OC.1.5	Does not apply
OC.2	Operational Planning	OC.2.1	Applies
		OC.2.2	Applies
		OC.2.3	Applies
		OC.2.4	Applies
		OC.2.5	Applies
		OC.2.6	Applies
		OC.2.7	Applies
		OC.2.8	Applies
		OC.2.9	Applies
		OC.2.A.1	Applies
		OC.2.A.2	Applies
OC.3	Operating Margin	OC.3.1	Does not apply.
		OC.3.2	Does not apply.
		OC.3.3	Does not apply.
		OC.3.4	Does not apply.
		OC.3.5	Does not apply.
		OC.3.6	Does not apply.
		OC.3.A	Does not apply.
OC.4	Demand Control	OC.4.1	Does not apply
		OC.4.2	Does not apply
		OC.4.3	Does not apply
		OC.4.4	Does not apply
		OC.4.5	Does not apply

OC.5	Operational Liaison	OC.5.1	Applies
		OC.5.2	Applies
		OC.5.3	Applies
		OC.5.4	Applies
OC.6	Safety Co-ordination	OC.6.1	Applies
		OC.6.2	Applies
		OC.6.3	Applies
		OC.6.4	Applies
		OC.6.5	Applies
		OC.6.6	Applies
		OC.6.A	Applies
		OC.6.B	Applies
OC.7	Contingency Planning	OC.7.1	Applies
		OC.7.2	Applies
		OC.7.3	Applies
		OC.7.4	Applies
		OC.7.5	Applies
		OC.7.6	Applies
		OC.7.7	Applies
		OC.7.8	Applies
OC.8	Operational Event Reporting and Information Supply	OC.8.1	Applies
		OC.8.2	Applies
		OC.8.3	Applies
		OC.8.4	Applies
		OC.8.5	Applies
		OC.8.A1	Applies
		OC.8.A2	Applies
OC.9	Numbering and Nomenclature of Plant and Apparatus at Connection Sites	OC.9.1	Applies
		OC.9.2	Applies
		OC.9.3	Applies

		OC.9.4	Applies
OC.10	System Tests	OC.10.1	Applies
		OC.10.2	Applies
		OC.10.3	Applies
		OC.10.4	Applies
		OC.10.5	Applies
		OC.10.A1	Applies
		OC.10.A2	Applies
		OC.10.A3	Applies
		OC.10.A4	Applies
OC.11	Testing Monitoring and Investigation	OC.11.1	Applies
		OC.11.2	Applies
		OC.11.3	Applies
		OC.11.4	Applies
		OC.11.5	Does not apply
		OC.11.6	Does not apply
		OC.11.7	Does not apply
		OC.11.8	Does not apply
		OC.11.9	Does not apply
		OC.11.A	Does not apply
		OC.11.10	Applies
		OC.11.11	Applies
		OC.11.12	Applies
		OC.11.13	Applies
		OC.11.14	Applies
		OC.11.B	Applies

Table A4: SONI Scheduling and Dispatch

Where there is a difference between a provision in the SONI Grid Code and an equivalent provision in the EirGrid Grid Code, the box in column "Grid Code Sub-Section" is shaded a dark grey colour.

Grid Code Section	Subject	Grid Code Sub-Section	Applicability to Synchronous Condensers
SDC 1	Unit Scheduling	SDC1.1	Applies
		SDC1.2	Applies
		SDC1.3	Applies
		SDC1.4	Variation Applies – See sections B.4.1 & B.4.2
		SDC1 Appendix A Part 1	Variation Applies – See section B.4.2
		SDC1 Appendix A Part 2	Applies
		SDC1.B.1	Does not apply
		SDC1.B.2	Does not apply
		SDC1.B.3	Does not apply
		SDC1.B.4	Does not apply
		SDC1.ANNEX	Applies
SDC 2	Control Scheduling and Dispatch	SDC2.1	Applies
		SDC2.2	Variation Applies – See section B.4.3
		SDC2.3	Applies
		SDC2.4	Variation Applies – See section B.4.4
		SDC2.A.1	Applies
		SDC2.A.2	Variation Applies – See section B.4.5
		SDC2.A.3	Does not apply
		SDC2.A.4	Applies
		SDC2.A.5	Does not apply
		SDC2.A.6	Does not apply

		SDC2.A.7	Applies
		SDC2.A.8	Does not apply
		SDC2.A.9	Does not apply
		SDC2.A.10	Does not apply
		SDC2.A.11	Does not apply
		SDC2.A.12	Does not apply
		SDC2.B	Not used
		SDC2.C	Does not apply
		SDC2.D1	Does not apply
		SDC2.D2	Does not apply
		SDC2.ANNEX	Applies
SDC 3	Frequency Control	SDC3.1	Does not apply
		SDC3.2	Does not apply
		SDC3.3	Does not apply
		SDC3.4	Does not apply
		SDC3.5	Does not apply
		SDC3.6	Does not apply
		SDC3.7	Does not apply
		SDC3.8	Does not apply

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Table A5: EirGrid Modelling Requirements for Users

Grid Code Section	Subject	Applicability to synchronous condensers
PC.A8	Modelling requirements for users	Applies
PC.A8.1	Introduction	Applies
PC.A8.2	Model Capabilities	Variation applies to model template only. FRT & voltage fluctuation studies only.
PC.A8.2.1	Model Aggregation	Applies
PC.A8.3	Model Documentation and Source Code	Applies
PC.A8.4	Confidentiality	Applies
PC.A8.5	Time to comply	Applies
PC.A8.6	Validation of Model	Applies
PC.A8.7	Maintenance of Model	Applies
PC.A8.8	Software Environment and Model Usability	Applies

Table A6: EirGrid Grid Code Connection Conditions

Grid Code Section	Subject	Grid Code Sub-Section	Applicability to synchronous condensers
CC.1	Introduction	CC.1.1	Applies
		CC.1.2	Applies
		CC.1.3	Applies
		CC.1.4	Applies
CC.2	Objective	CC.2.1	Applies
		CC.2.2	Applies
		CC.2.3	Applies
		CC.2.4	Applies
		CC.2.5	Applies
CC.3	Scope	CC.3	Applies
CC.4	Transmission Station Compound	CC.4.1	Applies
		CC.4.2	Applies
CC.5	Plant Designations	CC.5.1	Applies
		CC.5.2	Applies
		CC.5.3	Variation applies. See section B.5
		CC.5.4	Applies
CC.6	Relevant Technical Standards applying to user plant and apparatus	CC.6.1	Applies
		CC.6.2	Applies
CC.7	Specific Design and Performance Standards	CC.7.1	Applies
		CC.7.2	Applies
		CC.7.3.1.1 (q) (s),(y)	Variation applies – See sections B.2, B.3
		CC.7.3.1.1 (g),(i),(j),(w),(x),(z),(aa),(bb),(cc)	Applies
		CC.7.3.1.1 (d ii),I,(k),(l),(m),(n),(o),(p),(r),(t i),(u),(v),(dd),(ee),(ff)	Does not apply

		CC.7.3.1.2, CC.7.3.1.3	Does not apply & Governor
		CC.7.3.1.4 → CC.7.3.9	Does not apply
		CC.7.3.3	Applies
		CC.7.3.6	Variation applies - See section B.1
		CC.7.4	Does not apply
		CC.7.5	Does not apply
CC.8	Transmission System Performance	CC.8.1	Applies
		CC.8.2	Applies
		CC.8.3	Applies
		CC.8.4	Applies
		CC.8.5	Applies
		CC.8.6	Applies
CC.9	Metering	CC.9.1	Applies
CC.10	User Protection and Power Quality	CC.10.1	Applies
		CC.10.2	Applies
		CC.10.3	Applies
		CC.10.4	Applies
		CC.10.5	Applies
		CC.10.6	Applies
		CC.10.7	Applies
		CC.10.8	Applies
		CC.10.9	Applies
		CC.10.10	Does not apply
		CC.10.11	Does not apply
		CC.10.12	Does not apply
		CC.10.13	Applies
CC.11	Communication Facilities	CC.11.1	Applies

CC.12	Signals to be provided by users	CC.12.1	Applies
		CC.12.2	Variation applies to signal template only
		CC.12.3	Applies
		CC.12.4	Applies
		CC.12.5	Applies
		CC.12.6	Does not apply
CC.13	Power Supplies	CC.13.1	Applies
CC.14	Responsibility for Safety	CC.14.1	Applies
		CC.14.2	Applies
CC.15	Commissioning and Notification	CC.15.1	Applies
		CC.15.2	Applies
		CC.15.3	Applies
		CC.15.4	Applies
		CC.15.5	Applies
		CC.15.6	Applies
		CC.15.7	Applies
		CC.15.8	Applies
		CC.15.9	Applies
		CC.15.10	Applies
		CC.15.11	Applies
		CC.15.12	Applies
		CC.15.13	Does not apply
		CC.15.14	Does not apply

Table A7: EirGrid Grid Code Operating Conditions

Grid Code Section	Subject	Grid Code Sub-Section	Applicability to Synchronous Condensers
OC.1	Demand Forecasts	OC.1.1	Does not apply
		OC.1.2	Does not apply
		OC.1.3	Does not apply
		OC.1.4	Does not apply
		OC.1.5	Does not apply
		OC.1.6	Does not apply
OC.2	Operational Planning	OC.2.1	Applies
		OC.2.2	Applies
		OC.2.3	Applies
		OC.2.4	Applies
		OC.2.5	Not Used
		OC.2.6	Applies
		OC.2.7	Applies
OC.3	Not Used	OC.3	Not Used
OC.4	System Services	OC.4.1	Applies
		OC.4.2	Applies
		OC.4.3	Does not apply
		OC.4.4	Applies
		OC.4.5	Applies
		OC.4.6	Does not apply
		OC.4.7	Does not apply
OC.5	Demand Control	OC.5.1	Does not apply
		OC.5.2	Does not apply
		OC.5.3	Does not apply
		OC.5.4	Does not apply

		OC.5.5	Does not apply
		OC.5.6	Does not apply
		OC.5.7	Does not apply
OC.6	Small Scale Generator Conditions	OC.6.1	Does not apply
		OC.6.2	Does not apply
		OC.6.3	Does not apply
		OC.6.4	Does not apply
		OC.6.5	Does not apply
		OC.6.6	Does not apply
		OC.6.7	Does not apply
OC.7	Information Exchange	OC.7.1	Applies
		OC.7.2	Applies
OC.8	Operational Testing	OC.8.1	Applies
		OC.8.2	Applies
		OC.8.3	Applies
		OC.8.4	Applies
		OC.8.5	Applies
		OC.8.6	Applies
		OC.8.7	Applies
		OC.8.8	Applies
		OC.8.9	Applies
		OC.8.10	Applies
		OC.8.11	Applies
		OC.8.12	Applies
OC.9	Emergency Control and Power System Restoration	OC.9.1	Applies
		OC.9.2	Applies
		OC.9.3	Applies
		OC.9.4	Applies

		OC.9.5	Applies
		OC.9.6	Applies
OC.10	Monitoring, Testing and Investigations	OC.10.1	Applies
		OC.10.2	Applies
		OC.10.3	Applies
		OC.10.4	Applies
		OC.10.5	Applies
		OC.10.6	Applies
		OC.10.7	Applies
		OC.10.8	Applies
OC.11	Safety Co-ordination	OC.11.1	Applies
		OC.11.2	Applies
		OC.11.3	Applies
		OC.11.4	Applies
		OC.11.5	Applies

Table A8: EirGrid Scheduling and Dispatch

Grid Code Section	Subject	Grid Code Sub-Section	Applicability to synchronous condensers
SDC 1	Unit Scheduling	SDC1.1	Applies
		SDC1.2	Applies
		SDC1.3	Applies
		SDC1.4	Variation Applies – See sections B.4.1 & B.4.2
		SDC1 Appendix A Part 1	Variation Applies – See section B.4.2
		SDC1 Appendix A Part 2	Applies
		SDC1.ANNEX	Applies
SDC 2	Control Scheduling and Dispatch	SDC2.1	Applies
		SDC2.2	Variation Applies – See section B.4.3
		SDC2.3	Applies
–		SDC2.4	Variation Applies - See section B.4.4
		SDC2.A.1	Applies
		SDC2.A.2	Variation Applies – See section B.4.5
		SDC2.A.3	Does not apply
		SDC2.A.4	Applies
		SDC2.A.5	Does not apply
		SDC2.A.6	Does not apply
		SDC2.A.7	Applies
		SDC2.A.8	Does not apply
		SDC2.A.9	Does not apply
		SDC2.A.10	Does not apply
		SDC2.A.11	Does not apply
		SDC2.A.12	Does not apply
		SDC2.B.1	Applies
		SDC2.B.2	Applies

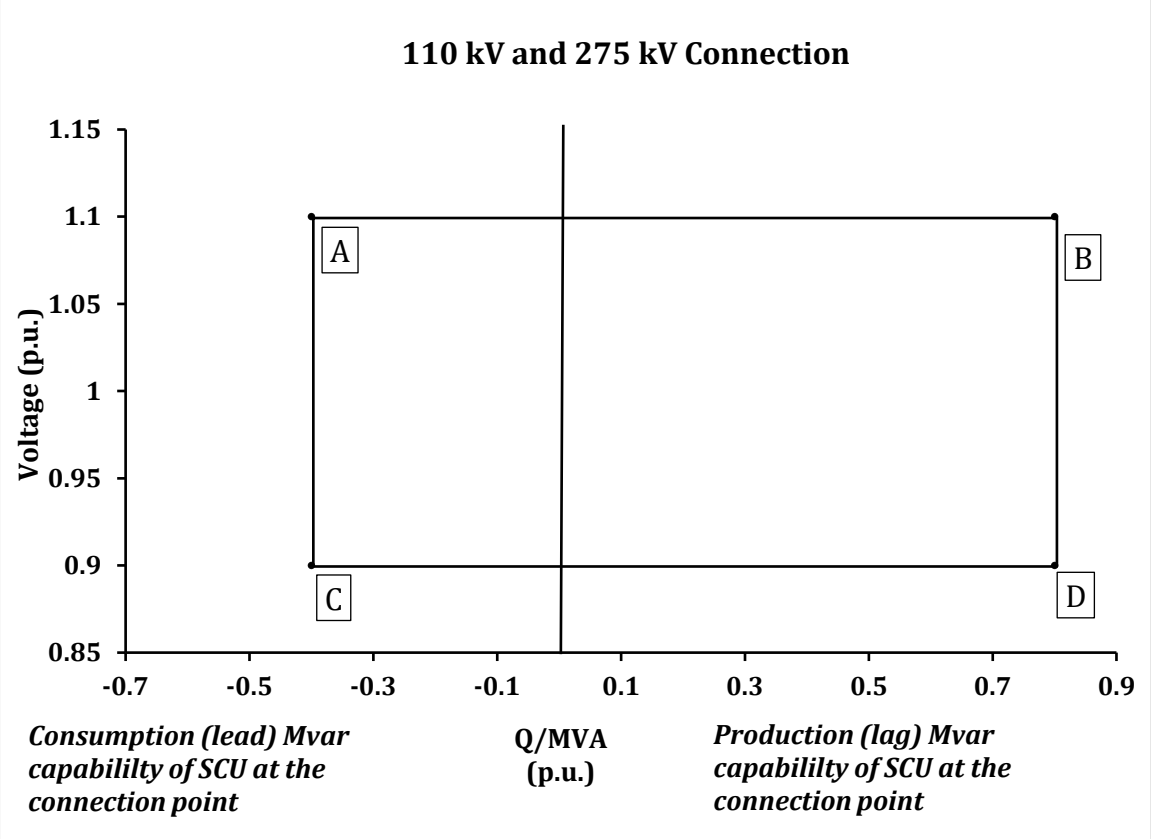
		SDC2.B.3	Applies
		SDC2.B.4	Applies
		SDC2.B.4	Applies
		SDC2.B.5	Applies
		SDC2.B.7	Applies
		SDC2.B.8	Applies
		SDC2.B.9	Applies
		SDC2.B.10	Applies
		SDC2.B.11	Applies
		SDC2.B.12	Applies
		SDC2.B.13	Applies
		SDC2.B.14	Applies
		SDC2.B.15	Applies
		SDC2.B.16	Applies
		SDC2.B.17	Applies
		SDC2.ANNEX	Applies

Part B: New and Modified Requirements

B.1: Reactive Power Capability:

SONI CC.S1.1.3.3 (a)

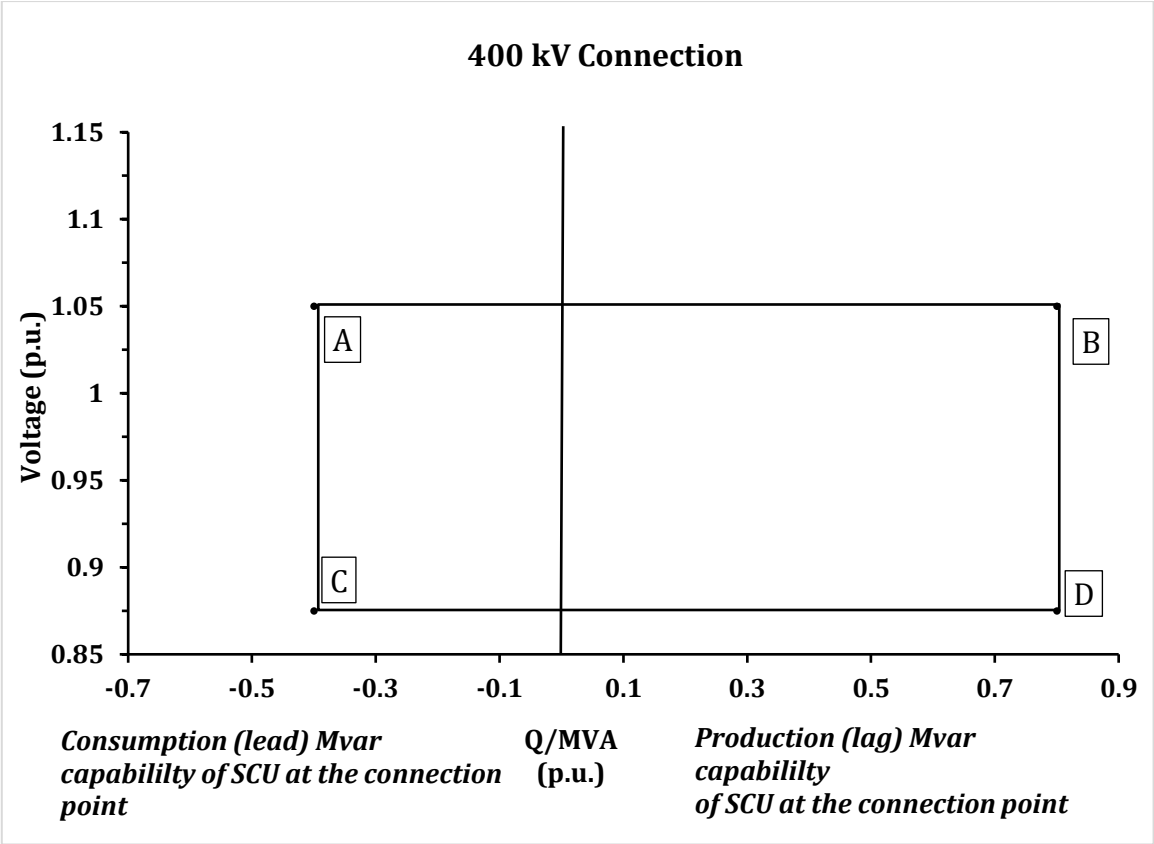
A variation of reactive power capability for steady state operation, across the following voltage ranges is required. SONI propose the following additional figures for SCUs. These figures use a per unit approach for MVA rating, as opposed to using power factors. The reactive power capabilities at 110kV and 275 kV connection points are depicted in *Graph C.1* and outlined in *Table C.1*. Whereas, the reactive power capabilities for 400 kV connections are outlined in *Graph C.2* and outlined in *Table C.2*.



Graph C.1: Reactive power capability for 110 kV and 275kV connections

Point A	**Mvar** consumption (lead) capability of the **SCU** at MVA rating and **Voltage** of 1.1 p.u. at the **Connection Point**
Point B	**Mvar** production (lag) capability of the **SCU** at MVA rating and **Voltage** of 1.1 p.u. at the **Connection Point**
Point C	**Mvar** consumption (lead) capability of the **SCU** at MVA rating and **Voltage** of 0.9 p.u. at the **Connection Point**
Point D	**Mvar** production (lag) capability of the **SCU** at MVA rating and **Voltage** of 0.9 p.u. at the **Connection Point**

Table C.1: Reactive power capabilities for 110 kV and 275 kV connections.



Graph C.2: Reactive power capability for 400 kV connections

Point A	**Mvar** consumption (lead) capability of the **SCU** at MVA rating and **Voltage** of 1.05 p.u. at the **Connection Point**
Point B	**Mvar** production (lag) capability of the **SCU** at MVA rating and **Voltage** of 1.05 p.u. at the **Connection Point**
Point C	**Mvar** consumption (lead) capability of the **SCU** at MVA rating and **Voltage** of 0.875 p.u. at the **Connection Point**
Point D	**Mvar** production (lag) capability of the **SCU** at MVA rating and **Voltage** of 0.875 p.u. at the **Connection Point**

Table C.2: Reactive power capabilities for 400 kV connections.

EG CC.7.3.6.1

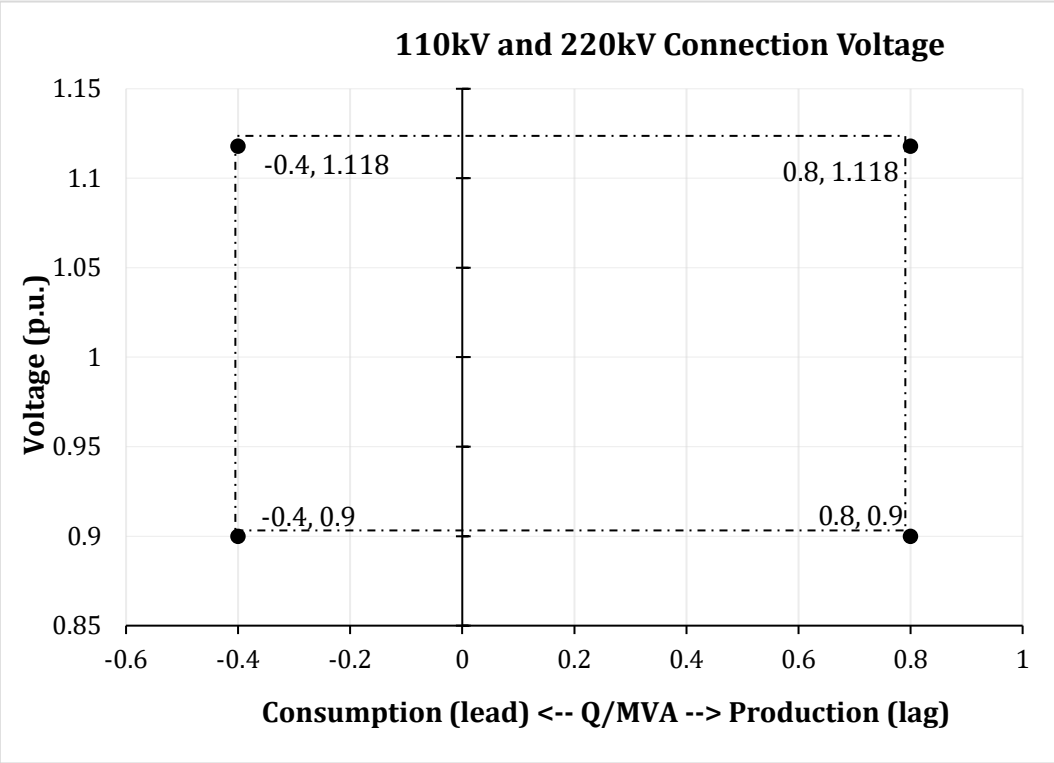
Similar to the variation of SONI CC.S.1.1.3, EirGrid propose the addition of a new table for reactive power capability for SCUs only (*Table C.3*). This has the addition of a fourth column, stating the capability at both the connection point and at the terminals.

Voltage Range	Connected at:	Reactive power capability at terminals (Ratio of MVAr to MVA rating of the Synchronous Condenser)	Reactive power capability at the Connection point (Ratio of MVAr to MVA rating of the Synchronous Condenser)
99kV ≤ V ≤ 123kV	110kV	0.9 lagging/production to 0.4 leading/absorption	0.8 lagging/production to 0.4 leading/absorption
200kV ≤ V ≤ 245kV	220kV	0.9 lagging/production to 0.4 leading/absorption	0.8 laging/production to 0.4 leading/absorption
360kV ≤ V ≤ 420kV	400kV	0.9 lagging/production to 0.4 leading/absorption	0.8 lagging/production to 0.4 leading/absorption

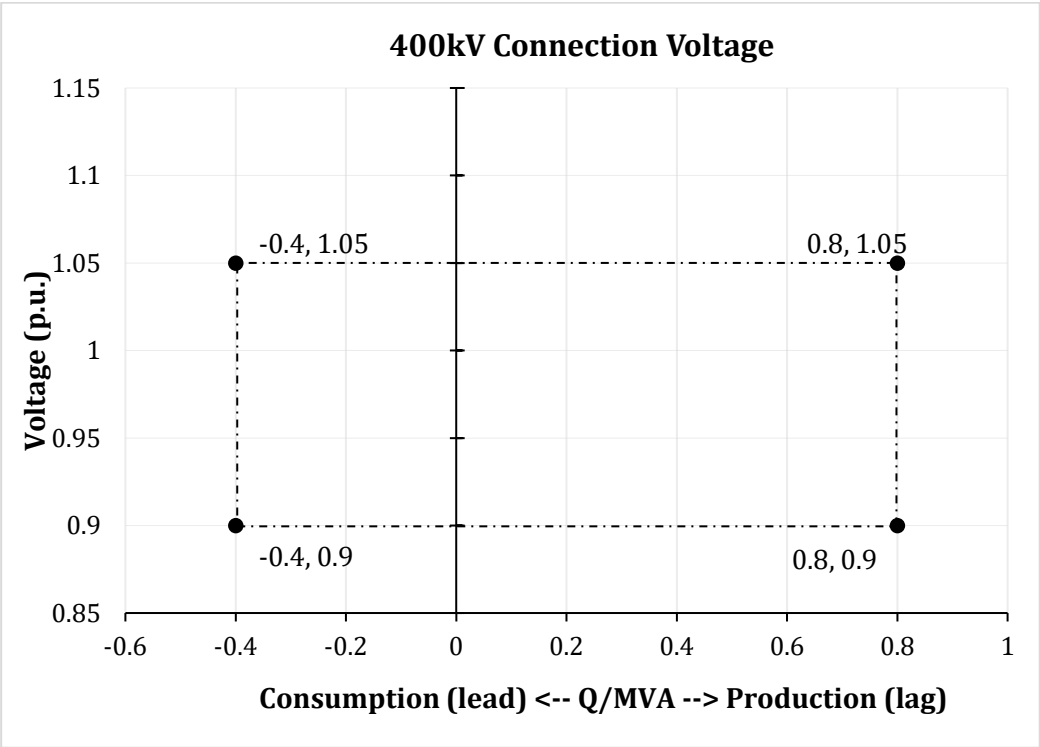
Table C.3: New table for reactive capabilities for SCUs only.

EG CC.7.3.6.5

Similar to the variation for SONI CC.S.1.1.3.3 above. A variation of reactive power capability at the connection point, for steady state operation across the following voltage ranges is proposed, through the addition of *Graph C.4* and *C.5* for SCUs.



Graph C.4: Proposed reactive power capability for 110 kV and 275 kV connections



Graph C.5: Proposed reactive power capability for 400 kV connections

B.2: Start Up Time, Ramp Rates

SONI CC.S1.1.3.9 (a) & EG CC.7.3.1.1 (q), (s)

SONI and Eirgrid would like to discuss an appropriate start-up and ramping time, and whether other scenarios for start-up should be included.

SONI and Eirgrid would like to discuss how block load output upon synchronisation should be appropriated for SCU reactive power.

B.3: Fault Ride Through

SONI CC.S1.1.9, EG CC.7.3.1.1 (y)

SONI and Eirgrid would like to discuss the appropriation of SCU FRT (Fault Ride Through) capability.

SONI propose the addition of a new section for SCU FRT.

B.4: Scheduling and Dispatch

B.4.1 Availability

EG & SONI SDC1.4.1.1

SCUs are to be added to the scope of units covered by this section. It is our intention that post operational and commercial system changes each SCU unit shall declare their SCU Availability in MVArs. Note that this may not result in change to the current Availability declaration definition but could result in a new Grid Code definition specifically covering the unique properties of SCUs.

Note: Specifically for SCUs connecting in advance of key operational and commercial system changes the technical workaround for SCUs will be to declare availability via a pre-agreed low MW figure (e.g. 0.001MW).

EG & SONI SDC1.4.1.3

EirGrid and SONI propose the inclusion of MVAr in the whole numbers submission.

EG & SONI SDC1.4.4.5

Commercial Offer Data (COD) is to be varied to incorporate MVArs in item (b), and to create a new item (e) for SCU. Currently COD can only be declared in MW values only.

B.4.2 Technical Offer Data

EG & SONI SDC1 – Appendix A

The Technical Offer Data table needs to be varied to include SCU as a column. EirGrid and SONI would like to have a discussion with industry on whether additional rows and parameters are required.

B.4.3 Objectives

EG & SONI SDC2.2

Extend the scope of objectives to include MVAr for SCU application.

B.4.4 Procedures

EG & SONI SDC2.4.1.1

EirGrid and SONI propose to separate SCUs and Generation Units (Gus) within this section.

EG & SONI SDC2.4.1.3

EirGrid and SONI propose a variation to include a comparison between a Synchronous Condenser and generator.

EG & SONI SDC2.4.2.11 (c)

EirGrid and SONI propose a variation to represent an appropriate synchronisation time for SCUs.

EG & SONI SDC2.4.2.11 (d)

EirGrid and SONI propose a variation to include MVAr in the availability notification for SCUs.

B.4.5 SDC2 – Appendix A Dispatch Instructions for CDGUs and Demand Side Units

EG & SONI SDC2.A.2

SCUs are to be added to the scope of units that can be dispatched (MVAr only)

B.5 Plant Designations

EG CC5.3

The plant designation for SCU is not specified. EirGrid propose designations SI1:SI.