

CONTROL SYSTEM MODEL REQUIREMENTS FOR USERS

PC.A.9.1 OBJECTIVE

PC.A.9.1.1 Control and protection system models, along with other **Plant** and **Apparatus** information are required by this **PC**, with supporting documentation to be provided to **The Company** in order for **The Company** and **Transmission Licensees** to assess the impact of relevant **Plant** and **Apparatus** on the transient performance, security and stability of the **Transmission System**.

PC.A.9.1.2 The control and protection system models submitted by the **User** shall be representative of relevant **Plant** and **Apparatus** at the **Connection Point**, or **User System Entry Point** which could include **Embedded Medium Power Stations** not subject to a **Bilateral Agreement**, appropriate to the type of model eg. RMS or EMT. All control and protection system models must take into account all communication, controller and processing delays relevant to modelling the performance of relevant **Plant** and **Apparatus**. If all **Power Park Units** or **DC Convertors** or **HVDC Converters** contained within the relevant **Plant** and **Apparatus** are not identical, the control system model shall account for this by accurately representing the overall performance of the relevant **Plant** and **Apparatus** at the **Connection Point** or **User System Entry Point** which could include **Embedded Medium Power Stations** not subject to a **Bilateral Agreement**.

PC.A.9.1.3 The control and protection system models shall include representation of all relevant functionality required by the Grid Code including services provided to **The Company**. For example, this includes voltage control, LFSM-O, LFSM-U, frequency response, fault ride through, fast fault current injection, protection and automatic switching of shunt devices. Where modes of operation are selectable, the ability to select the mode of operation shall be included within the control system model. Additional guidance on relevant functionality will be published on **The Company's Website**.

PC.A.9.2. SCOPE

PC.A.9.2.1 All **Users** shall provide root mean-square (RMS) models which represent the relevant **Plant**, **Apparatus** and controllers in balanced, RMS, positive phase-sequence, time domain studies.

PC.A.9.2.2 The list of **Plant** and connection type required to submit EMT models that accurately represent the behaviour of the relevant **Plant** and **Apparatus** are summarised in Table PC.A.9.2.2. For the **Plant** and connection type listed in Table PC.A.9.2.2 with a **Completion Date** on or before 01 September 2022, **User's** shall provide EMT models only upon specific request from **The Company**. In addition, any relevant **User** in respect of **Plant** and connection type listed in Table PC.A.9.2.2 which has been subject to a control system change and/or **Modification** after 01 September 2022, shall provide EMT models.

Commented [GY1]: Alen Creighton's Comment - How would a DNO know whether a Generator had made changes to the control system?

Connection Type	Plant Type	Provision of EMT model		Relevant Grid Code Clause
		Plant Completion Date on or before 01/09/22	Plant Completion Date after 01/09/22	
Directly Connected (Bilateral Connection Agreement)	DC Converter Station / HVDC System	On request and/or after control system change and/or Modification	Always	PC.A.5.4.3 and PC.A.9.2.2
	Power Park Module including Power Park Units and any Dynamic Reactive Compensation Equipment	On request and/or after control system change and/or Modification	Always	PC.A.5.4.2 and PC.A.9.2.2
	OTSDUW	On request and/or after control system change and/or Modification	Always	PC.A.9.2.2 and PC.A.6.7 or PC.A.5.4.3 as applicable
	Synchronous Power Generating Module	On request or after control system change and/or Modification	Always	PC.A.5.3.2 and PC.A.9.2.2
Bilateral Embedded Generator Agreement (BEGA) – Large Power Station	Power Park Module including Power Park Units and any Dynamic Reactive Compensation Equipment	On request or after control system change and/or Modification	Always	PC.A.5.4.2 and PC.A.9.2.2
	Synchronous Power Generating Module	On request or after control system change and/or Modification	Always	PC.A.5.3.2 and PC.A.9.2.2

Connection Type	Plant Type	Provision of EMT model		Relevant Grid Code Clause
		Plant Completion Date on or before 01/09/22	Plant Completion Date after 01/09/22	
Bilateral Embedded Generator Agreement (BEGA) – Medium Power Station	Power Park Module including Power Park Units and any Dynamic Reactive Compensation Equipment	On request or after control system change and/or Modification	Always	PC.A.5.4.2 and PC.A.9.2.2
	Synchronous Power Generating Module	On request or after control system change and/or Modification	Always	PC.A.5.3.2 and PC.A.9.2.2
Bilateral Embedded Generator Agreement (BEGA) – Small Power Station	Power Park Module including Power Park Units and any Dynamic Reactive Compensation Equipment	No	No	N/A
	Synchronous Power Generating Module	No	No	N/A
Bilateral Embedded Licence Exemptible Large Power Station Agreement (BELLA)	Power Park Module including Power Park Units and any Dynamic Reactive Compensation Equipment	On request or after control system change and/or Modification	Always	PC.A.5.4.2 and PC.A.9.2.2
	Synchronous Power Generating Module	On request or after control system change and/or Modification	Always	PC.A.5.3.2 and PC.A.9.2.2
Embedded Medium Power Stations (LEEMPS — Embedded Medium Power Stations not subject to a Bilateral Agreement) Note: Data, models and validation reports to be	Power Park Module including Power Park Units and any Dynamic Reactive Compensation Equipment	On request or after control system change and /or Modification	Always	PC3.3, PC.A.5.4.2 and PC.A.9.2.2

Connection Type	Plant Type	Provision of EMT model		Relevant Grid Code Clause
		Plant Completion Date on or before 01/09/22	Plant Completion Date after 01/09/22	
provided by Network Operator to The Company	Synchronous Power Generating Module	On request or after control system change and/or Modification	Always	PC3.3, PC.A.5.3.2 and PC.A.9.2.2
Network Operator – Bilateral Connection Agreement (BCA)	Dynamic Reactive Compensation Equipment	On request or after control system change and/or Modification	Always	PC.A.6.7 and PC.A.9.2.2
Non-Embedded Customers - Bilateral Connection Agreement (BCA)	Transmission Connected Demand	On request or after control system change and/or Modification	Always	PC.A.6.7 and PC.A.9.2.2
Small Power Station without a Bilateral Embedded Generator Agreement (BEGA)	Synchronous Power Generating Module	No	No	N/A
	Power Park Module including Power Park Units and any Dynamic Reactive Compensation Equipment			

Table PC.A.9.2.2 Overview of EMT Model Provision

PC.A.9.2.2.1 Where **The Company** requests EMT models from a **User** for relevant **Plant** with a **Completion Date** (or commissioning date in the case of an **Embedded Medium Power Station** not subject to a **Bilateral Agreement**) on or before 01 September 2022 and which **Plant** has not been subject to a **Modification** or control system change, the **User** shall acknowledge the request within 30 days; and

- (a) if a **GB Code User**, shall provide the EMT models within 9 months of the request from **The Company** unless otherwise agreed (such agreement not to be unreasonably withheld).
- (b) if an **EU Code User**, shall provide the EMT models within 3 months of a request from **The Company** unless otherwise agreed (such agreement not to be unreasonably withheld).

The document on EMT model requirements, the approach and process for retrospective submission is listed as one of the **Electrical Standards** in the Annex to the **General Conditions**.