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National Grid

Transmission Plant Specification (Application)

TPS 2.7.1
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Provision of Information and Controls to National Grid Control Points and Other Users

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PROVISION OF INFORMATION AND CONTROLS TO NATIONAL GRID CONTROL POINTS AND OTHER USERS

FOREWORD

This document defines the National Grid application policy and sets out the control requirements for primary and secondary plant and information to be acquired and displayed at the National Grid Control Centre, Network Operations Centre, Remote Operating Points (where required), Substation Control Point and Event Logging/Archiving systems. This document also defines the information to be provided to other Users including those external to National Grid at interface busbars and information to be made available via an Information Management Unit Port.

The application policy is to be used in the configuration of Substation Control Systems for the purposes of Telecommand.

1 SCOPE

This Specification defines the application policy for the control and information which shall be provided by Substation Control Systems when installed and operated within National Grid. The specification identifies typical plant items, circuit and substation configurations and sets out the control and information requirements for each of the control points and user interfaces on the SCS.

2 REFERENCES

This Specification makes reference to, and should be read in conjunction with the following related specifications:

- NGTS 2.7 - Specification for Substation Control Systems.
- TGN(T) 94 - Application of Electrical Measurement Transducers for Operational Metering and Control Purposes.

2.1 Definitions

ATCC (AVC)	Automatic Tap Change Control (Automatic Voltage Control).
ARS	Automatic Reactive Switching.
BAY	In the context of this Specification, a bay consists of a discrete set of control equipment capable of controlling and monitoring the primary and secondary plant of one or more circuit or circuit ends.
CANC	Cancel Control, (associated with CB synchronising).
CB	Circuit Breaker
Circuit	In the context of this Specification, a circuit consists of one of the following circuit or circuit ends: Feeders, including: OHL, Transformer, Generator and Series Reactor. Bus Section (including Mesh Corners). Bus Coupler. Shunt Compensation Equipment.
DAR	Delayed Auto Reclose.
DBI	Don't Believe It (00 or 11 state for a double point indication).
HV	High Voltage.

IMUP	Information Management Unit Port.
IONA	Investment in On-Line Network Analysis.
LV	Low Voltage.
MOSC	Manual Override of Synchrocheck Control, (associated with CB synchronising).
MOSI	Manual Override of Synchrocheck Indication, (associated with CB synchronising).
MSC	Mechanically Switched Capacitor.
MWso	Mega Watts sent out.
MVArso	Mega VARs sent out.
NGCC	National Grid Control Centre.
OMS	Operational Metering Summator.
PSSC	Power System Synchrocheck Control, (associated with CB synchronising).
PSSCI	Power System Split Control Indication, (associated with CB synchronising).
PSSI	Power System Split Indication, (associated with CB synchronising).
QB	Quadrature Booster.
RIP	Running, Incoming and Phase Angle Voltage analogue measurements, (associated with CB synchronising).
RCP	Remote Control Point. Operator Interface equipment installed at a remote location used to control a substation. May be sited at a ROP or NGCC.
ROP	Remote Operating Point (where provided). A site containing the Remote Control Points for a group of substations under the direction of a control engineer at the NGCC.
SBMCP	Substation Based Maintenance Control Point.
SCC	Synchrocheck Close Control, (associated with CB synchronising).
SCP	Substation Control Point. The central Operator Interface provided for control of the SCS within the substation.
SCS	Substation Control System. The collection of telemetry equipment, man machine interfaces and software which is the subject of NGTS 2.7.
SRSI	Synchrocheck Relay Selected Indication, (associated with CB synchronising).
SVC	Static VAr Compensator.
TCIP	Tap Change In Progress.
VSC	Voltage Selection Control, (associated with CB synchronising).
VSI	Voltage Selection Indication, (associated with CB synchronising).

3 GENERAL REQUIREMENTS

The primary objective of a Substation Control System is to secure the control and operation of plant items to facilitate the efficient running of the Supergrid Transmission System. To meet these objectives it is necessary that the SCS provides the required functionality and is configured at each substation to provide the control facilities and information required to effectively operate the Substation Plant.

The SCS functionality is defined in NGTS 2.7 and documents referred to therein. The configuration of the SCS is the subject of this document. The following sections set out the control facilities and information to be provided to/at each control point and to other Users including those external to National Grid at Interface substations.

This Document provides application policy for the majority of plant items, circuit configurations and substation topologies which are present on the National Grid Transmission System.

Throughout the document, reference is made to the facilities to be provided at the National Grid Control Centre (NGCC). Some facilities/data will however be distributed from NGCC to the National Grid Network Operations Centre. It is not the purpose of this document to define the distribution of these facilities; they will be managed by National Grid (System Operations) in conjunction with the Network Operations Centre.

National Grid requirements for 'plant information' are also specified in the form of data to be presented at an Information Management Unit Port. Where these data requirements require additional inputs to the SCS and the source does not currently exist, the inputs shall be physically provided and configured on the SCS to allow future connection as and when the source plant inputs become available.

3.1 Plant Items

Appendix A provides guidance on the control, indications, alarms, and where appropriate analogues, which are to be provided for the following primary and secondary plant items:

- (a) Circuit Breakers
- (b) Disconnectors
- (c) Earth Switches
- (d) Shunt Compensation Equipment (MSCs, Reactors)
- (e) Transformers
- (f) Quadrature Booster Schemes
- (g) ATCC Schemes
- (h) ARS Schemes
- (i) SVCs
- (j) DAR
- (k) Feeder Protection
- (l) Busbar Protection
- (m) Other Protection
- (n) Protection Signalling Systems
- (o) Intertripping
- (p) Miscellaneous Systems

3.2 Circuits

Additional facilities for circuit configurations not covered in Appendix A are detailed in Appendix B, Tables B1 to B3.

3.3 Substation

Appendix C gives guidance on miscellaneous facilities which are to be provided for each site and substation voltage level. The provision of facilities include:

- (a) Additional site alarms.
- (b) Voltage level based Site analogues.

3.4 Alarm and Event Logging Legends

Reference is made throughout this document to the source and group alarm requirements of plant items, circuits and substations. This hierarchical approach should ensure that the majority of the alarms which are required to be presented at the various control points and user interfaces are identified. There will, however, be a number of instances where equipment and alarm information is available which is not identified using this approach.

To ensure consistent alarm information is provided at all control points, reference should be made to the National Grid Master Alarm List. This list provides guidance on the use of alarm texts, event logging legends, alarm grouping and alarm filtering requirements as follows:

- (a) A comprehensive list of alarms for numerous plant items is provided in the form of Generic Equipment Models.
- (b) A general list of raw alarms with associated grouping and Remote Operating Point alarm legends. This list should be used whenever a Generic Equipment Model does not exist. Care should be exercised in the use of the Master Alarm List as some raw alarms appear in more than one group. The correct grouping can be determined only by consideration of the associated plant item.

3.5 Analogue Sign Convention

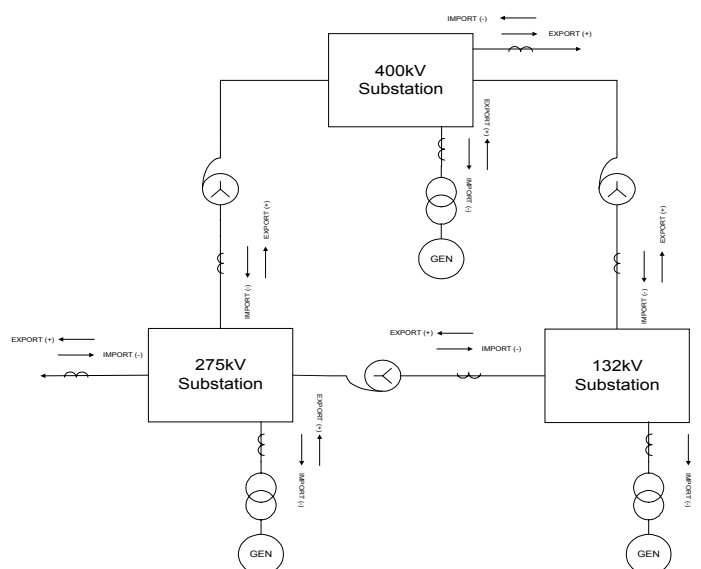


Figure 1 Analogue Sign Conventions

Where it is required to assign directional flow to a quantity (eg MW and MVar], a “positive”(+) sign shall indicate “export” and a “negative” (-) sign “import”. “Export” being defined as a flow away from the **measuring point** and “import” flow toward the measuring point. The sign convention shall apply to both remote and substation control points. Figure 1 details the application of this sign convention.

3.6 Plant Indications

All digital plant indications shall be provided as single points (OUT/OPEN condition = 1 status) unless specified otherwise.

4 OTHER USER INFORMATION

Note: The following requirements are usually provided outside the scope of the SCS, but may be provided to a remote terminal via the SCS.

4.1 Generators

Where Generators are connected to National Grid controlled busbars it has been agreed that some information should be provided to the Generators so that they can fulfill their obligations. Two classes of generator have been defined for this purpose:

(a) Nuclear Generators

It has been agreed that Nuclear Generators will continue to receive indications and analogues from all National Grid circuits at the interface substation.

(b) Black Start Power Stations

Some Power Stations have entered into contracts with National Grid to provide a Black Start capability. Such stations will be provided with indications and analogues from all National Grid circuits at the interface substation.

Interface Busbars

For all other Users external to National Grid connected at Interface Busbars (eg Power Stations, RECs), specific agreement will be reached with a view to the provision of alarm data across the interface (eg alarms pertaining to common facilities will be provided to the other User).

National Grid also requires certain information from other Users at interface busbars. The indication requirements are specified in Tables A1, A2, and B3. Alarm information is generally limited to Circuit Breaker fail alarms but other alarms may be considered on merit.

APPENDIX A - PLANT ITEM: CONTROL, INDICATION AND ALARM REQUIREMENTS

A1 CIRCUIT BREAKERS

The control, indication and alarm requirements for circuit breakers depend on whether they are required to support circuit breaker closing synchronising facilities. All National Grid circuit breakers employed on the HV Supergrid Transmission system shall be equipped with synchronising facilities with the exception of transformer HV circuit breakers. The following two sections define requirements for circuit breakers with and without synchronising facilities.

A1.1 Circuit Breakers (Equipped with Synchronising Facilities)

Table A.1.1 details the control facilities, indications and alarms to be provided for a typical circuit breaker requiring synchronising.

Table A1.1: Circuit Breakers [equipped with synchronising facilities]				
Control Point Facility Requirements		NGCC/ROP	SCP/Logger	IMUP
Controls ③	Open	✓	✓	✗
	Synch Close (SCC)	✓	✓	✗
	Manual Override of Synch (MOSC)	✓	✓	✗
	Power System Synch (PSSC) ①	✓	✓	✗
	Voltage Selection Control (VSC)	✓	✓	✗
	Cancel Control (CANC)	✓	✓	✗
Indications ③	Open/Close/DBI ②	✓	✓	✓④
	Voltage Selection (VSI)	✓②	✓	✓
	Sync Relay Selected (SRSI)	✓②	✓	✓
	Manual Override of Sync (MOSI)	✓②	✓	✓
	Power System Split Control (PSSCI) ①	✓②	✓	✓
	Power System Split (PSSI) ①	✓	✓	✓
Alarm Requirements		Group Alarms	Source Alarms	Source Alarms

① This facility can be excluded where National Grid (System Operations) have agreed that Power System Synchronising Facilities are not required. The indication shall be provided to NGCC as a single indication per voltage level.

② Initiation and Reporting shall be via a double point.

③ Application details of the controls and indications to be supported by the SCS are provided in NGTS 2.7.

④ Plant operate time required and optionally count of number of operations