

TYPE REGISTRATION OF PROTECTION AND CONTROL SOLUTIONS FOR HVDC SYSTEMS

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PURPOSE AND SCOPE

The purpose of this guide is to set out the detailed requirements for the National Grid policy on type registration contained in PS(T) 003 that shall be applied to HVDC Protection and Control (P&C) solutions. It shall be read in conjunction with UKBP/TP183 which sets out some more general information on the type registration process.

This document applies to HVDC P&C solutions purchased to National Grid Technical Specifications (TS) 2.7, TS 2.24, TS 2.31, and associated level 3 Technical Specifications TS 3.7.4, TS 3.7.5, TS 3.7.19, the TS 3.24.XX series document suite together with Transmission Plant Specification (TPS) 2.24.1 and TPS 2.7.1.

Particular attention should be given to the HVDC P&C functions detailed within TS 3.24.90.

PART 1 –PROCEDURAL

1 HVDC PROTECTION AND CONTROL TYPE REGISTRATION REQUIREMENTS

1.1 The HVDC Protection and Control Components, Sub-Components and associated Equipment Cubicles grouped together and defined as a 'Solution'

For type registration purposes, HVDC P&C solutions shall encompass a range of convertor station numerical protection and control components, measuring systems, local human machine interface (HMI) systems, thyristor gating and monitoring electronics, intra-station and inter-station communication facilities, appropriately versioned software and the interconnection of all these assets through a range of factory manufactured wired interface cubicles.

Generally, protection and control system primary equipment such as a.c. current transformers, a.c. voltage transformers and d.c. measuring components, uninterruptible

power supplies, battery chargers and associated battery systems, which together play important roles within the HVDC solution, are excluded from the scope of this document and should be considered for type registration separately.

The operational boundaries of the HVDC P&C solution will be very much project specific but expectations are that it should fully encompass the converter station a.c. primary banking connection busbars and connected circuit breakers, harmonic filter banks, the converter transformer(s) and the converter equipment, the d.c. busbars, filter banks, smoothing reactors and associated station to station connections.

Care should be taken to ensure the converter station a.c. feeder circuits P&C solution appropriately interfaces with the HVDC converter station P&C solution.

1.2 Type Registration of HVDC Protection and Control 'Solutions'

The type registration process provides National Grid with the necessary checks and assurances to ensure that all of the secondary equipment components used within a HVDC P&C solution, which may impact on the operation of the converter station and the electricity transmission systems to which it interconnects, are suitable and fit for its intended purpose.

Type Registration discharges some of these responsibilities through the adoption of a documented risk managed process. This process seeks in the first instance to undertake checks on a solution provider's approach and attitude to health, safety and the environment, to review any published quality assurance records on the components being offered and to assess technical and manufacturing capability. Once National Grid is satisfied that these checks have been successful, and that a robust business needs case for the technology exists, a solution may then be accepted for type registration.

A review of the component(s) literature relevant to the P&C solution offered for type registration would then commence in earnest. This review will hinge around compliance against TS2.31 and TS3.24.90 with particular focus within the review on prepared functional design and test specifications (FDS's and TS's), compliance statement checklists (CSC's), non conformance sheets (NCS's), schedule for commissioning tests (SCT's), generic equipment model sheets (GEMS) and standard application diagrams (SAD's).

The ability to freely communicate with a person or persons responsible for the submission of the relevant documentation within the solution provider organisation is extremely useful at this stage.

Full detail of the type registration process is captured within National Grid UK Business Procedure UKBP/TP183. It expects a submission to be made in the form of a 'type registration pack' details of which come later in Section 2, 3 and 4 of this document.

The principal components which go to make up a HVDC P&C solution can be divided into three principal technology areas:

- a) The protection systems Intelligent Electronic Device(s) (IED's), Human Machine Interface (HMI) facilities and associated software.
- b) The control systems IED's, HMI facilities and the associated software.
- c) The wiring cabinets used to provide connection between principal solution equipment and its sub-equipment(s) and/or with primary plant.

Because of the nature of the technology under review and its limited role-out onto the system within National Grid, it is expected that a HVDC P&C solution attains (if successful) the status of 'Restricted' within the type registration arena. This is because the functionality and operability of the P&C solution offered for use in an HVDC installation is generally bespoke, unlike that of an item of primary plant switchgear or a standard bay P&C solution that is fixed

and can be rolled out on many projects without change or modification to the original submission.

Type registration of the HVDC P&C solution will be recognised on initial application as being 'Pending' in accordance with UKBP/TP183, indicating the review of the submission has started.

A status of 'Pending' within the type registration process gives no indicator that the submission will ultimately achieve full type registration and as such, delivery/installation and site commissioning should not commence until registration of the solution has been successfully and notification issued to the solution provider.

Note - There may be components within the HVDC P&C solution offered (particularly protection components used to protect the AC infrastructure) which could function within normal AC transmission projects outside that of the HVDC project arena without modification. These components may have already been offered into National Grid some time previously within another P&C solution that successfully gained type registration status. In cases such as this, National Grid may accept previous checks on these component parts as evidence of their compliance or part compliance against associated technical specifications.

Application for type registration of HVDC P&C solutions usually is initiated against a major project, following the production of an invitation to tender by National Grid. Sufficient time must be allowed within overall project timescales to handle receipt and review all type registration documentation relative to the P&C solution. Care should be taken at the start of the process to accurately predict the impact on the project delivery timescales from bringing in a supplier with no previous experience in this technology area or indeed working within the UK market or National Grid directly.

Additionally, and some would say of equal importance, are the checks needed to confirm the solutions ability to perform within the designed operational parameters of its application. Therefore, in order to attain full type registration, the HVDC P&C solution will need to have successfully completed both its visual inspections and operational performance checks to the agreed factory test programme to the satisfaction of the National Grid type registration engineer and the design assurance engineer assigned to the project (although it should be recognised that one National Grid individual may perform both functions). This differs from that of other 'usual' P&C solution type registrations where the function of type registration and factory acceptance testing are mostly uncoordinated.

It is only after this time that the solution will attain a 'Restricted' status within the type registration process and by doing so, in accordance with the project delivery timescales, can be made ready for delivery to site for installation and commissioning in accordance with UKBP/TP106 and CH21.

2 TYPE REGISTRATION PACK

Type registration information shall be presented to National Grid in the form of a type registration pack. The pack shall comprise of but not be limited to:

- a) A self certification statement for the overall HVDC P&C solution (form in UKBP/TP183) in accordance with all the relevant technical specifications and any project specific specifications, as appropriate.
- b) A populated function integration table for each of the P&C solutions (Appendix A in TS 3.24.90).
- c) A prepared schedule of non-compliances for the overall HVDC P&C solution – (form in UKBP/183 or similar) together with a complienance statement checklist (CSC) against all relevant technical specifications and project specific specifications.