

## **SYSTEM TO GENERATOR OPERATIONAL INTERTRIPPING SCHEMES GENERATING UNIT REQUIREMENTS**

### **Introduction**

At the GCRP meeting 23rd November 2006 the paper "Guidance on System to Generator Intertrips" circulated by National Grid on the 20th October 2006 was discussed. A number of Panel members considered that, whilst the paper provided a useful start, more comprehensive guidance could be provided to both developers and Users regarding System to Generator Operational Intertripping Schemes. Following this discussion, it was agreed that generator representatives would jointly provide a revised paper for consideration by the Panel. Following further discussion between generator and NGET representatives, the following revised text is proposed for consideration.

### **Background**

Grid Code CC6.3.17 states: "*NGET may require that a System to Generator Operational Intertripping Scheme be installed as part of a condition of the connection of the Generator. Scheme specific details shall be included in the relevant Bilateral Agreement.*" An intertrip scheme may be mandated for a number of reasons. However, the Grid Code fails to provide any further information regarding what might comprise such scheme, the functional specification and required performance that might be included within the bilateral agreement. The CEGB standard "Design Memorandum 099/86 (1975)" covering the classes of intertrip lapsed following privatisation and no recognised industry standard or other description currently exists, leaving the User exposed to the uncertainty of what requirements may be specified in the bilateral agreement. Concern with the lack of transparency of these arrangements was also expressed by Ofgem in its decision letter to Grid Code Consultation A/05 "Grid Code changes consequential to CUSC Amendment Proposal CAP076 – Treatment of System to Generator Intertripping Schemes".

It is important to the manufacturer, developer and generator to have a common and clear understanding of the range of likely requirements in order to assess the risk and cost associated with different types of generating plant, in the event that such a scheme is required a condition of connection.

### **Proposed description**

It is proposed that Grid Code CC6.3.17 be substituted with the following text:

"NGET may require that a System to Generator Operational Intertripping Scheme be installed as part of a condition of the connection of the Generator. The System to Generator Operational Intertripping Scheme, where required, will be defined as a Category 1 Intertripping Scheme, Category 2 Intertripping Scheme, Category 3 Intertripping Scheme, or Category 4 Intertripping Scheme.

Category 1 Intertripping Scheme: The installation of a Category 1 intertrip is an option for the generator. These Intertrips are used to facilitate a Variation to Connection Design. The specific criteria applied to Connection Design are contained within the SQSS but an intertrip would only be acceptable if it did not reduce the security of the transmission system as a whole, affect any third party, or compromise National Grid's ability to meet other statutory or licence obligations. A Category 1 intertrip could also apply if an existing power station was seeking to expand its capacity.

Category 2 Intertripping Scheme: This category is intended to cover local issues i.e. the intertrip is required when there are outages on local circuits (as specified in the BCA) and the generator concerned is the only one that can reduce the overload if fault conditions occur. A Category 2 intertrip is only armed during periods when maintenance to specific circuits is being undertaken. As the purpose is to deal with maintenance, the inclusion of an intertrip would be consistent with the SQSS, whereas the addition of an extra line would not be.

Category 3 Intertripping Scheme: A Category 3 intertrip would only arise as a result of a generator request. It would be installed as an alternative to reinforcement of a third party system where the Scheme removes overloads on the third party system e.g. DNO System. The Scheme is installed in accordance with of the SQSS. In these instances the Generator has the choice of contracting with the third party to undertake the required reinforcement work, or to have the intertrip. The intertrip would have to satisfy the same criteria as for Category 1.

Category 4 Intertripping Scheme: The requirement for this type of intertrip arises out of the use of DAR protection that is used as a matter of course on critical transmission circuits. The DAR cannot operate (i.e. potentially switch a circuit back in) in circumstances where a generator remains connected post-fault to the circuit (because the generator will no longer be synchronised with the main transmission system), and the intertrip is therefore required to ensure that the generator is completely disconnected as quickly as possible to safeguard the overall operation of the transmission system.

A System to Generator Operational Intertripping Scheme would comprise a system which, when armed, and following a fault on the transmission system, would disconnect the selected Generating Units or CCGT Modules or Power Park Modules at a Power Station from the transmission system by opening the User's circuit breakers within a specified period of the trip signal being received. The trip signal would be provided by NGET normally at its substation adjacent to the Power Station.

A System to Generator Operational Intertripping Scheme will be armed in response to an Ancillary Service instruction given by NGET to the Generator in accordance with BC2.8 during the planned outage of a specified transmission circuit.

The trip signal would be initiated in the event of a fault outage occurring on a specified transmission circuit. The System Operator will strive to avoid tripping a User and where possible will initiate other post-fault actions (including but not limited to post-fault de-loading) prior to sending the inter-trip signal. However, because there is an inter-trip installed this is an indication in itself that the scope for other post-fault actions by the SO is normally very limited.

In order to protect an otherwise overloaded transmission or distribution circuit or to preserve the stability of the transmission system the overall time from fault inception to the opening of the selected Generating Units will be in accordance with CC.6.2.2.2.2.

At some locations depending on prevailing system conditions, it may be possible to utilise delayed auto re-close (DAR) (See Category 4 Intertripping Scheme above) to avoid tripping the generation where the fault is transitory and post-fault overload is below a critical value. The sending of the trip signal to the generating unit breakers will be delayed until the DAR has attempted to return the faulted circuits to service (a delay

typically around 20 seconds). If this is successful then the trip signal will not be sent. The overall time between fault inception and the opening of the selected Generating Unit circuit breakers will be in accordance with CC.6.2.2.2.2 with an allowance for DAR operation. NGET will determine whether the trip signal can be delayed based on the system conditions existing at the time of the event.

The requirement for a System to Generator Operational Intertripping Scheme will be specified in the relevant Bilateral Agreement and will also include the Category of the scheme, the number of the generating units(s) that may be instructed to be armed, and the time within which the load reduction should be achieved where applicable and the circuit breaker(s) should be opened. The relevant Bilateral Agreement will also specify the planned circuit outage(s), the corresponding fault outage and either the overloaded circuit(s) or will identify the system as being required for transmission stability reasons.”

### **Timing of Intertrips**

In the earlier draft of this text Generator representatives drew attention to typical times for trips of 6 to 15 seconds. NGET representatives are concerned about inclusion of such timings is inappropriate, referencing as they do an obsolete standard. Nevertheless, generator representatives continue to believe that inclusion of reference to typical timings (plus an appropriate caveat to allow specific timings to be established via the bilateral) would be beneficial for generator developers. **I suggest the Grid Code Review Panel consider what additional we can put in this section to help Generator Developers.**

Additionally, the reference to timings in CC.6.2.2.2.2 is hardly clear to me.

*'The times specified in accordance with the **Bilateral Agreement** shall not be faster than:*

*(i) 80mS at 400kV*

*(ii) 100mS at 275kV*

*(iii) 120mS at 132kV and below*

*but this shall not prevent a **User** or **NGET** having faster fault clearance times. Slower fault clearance times may be specified in accordance with the **Bilateral Agreement** for faults on the **GB Transmission System**.'*

I suggest the **Grid Code Review Panel** discusses this briefly at its next meeting to see if greater clarity is possible.

### **CUSC Facsimile**

It is noted that the facsimile forms to be used in the event that NGET wishes to instruct the arming or de-arming of an Intertripping scheme are provided as CUSC Section 4 Schedule 3. It appears inconsistent to the generator representatives for a facsimile associated with an Ancillary Service instruction to be given in accordance with the Grid Code to be contained within the CUSC. NGET representatives are adamant that it must remain within the CUSC. It has not proved possible to resolve this disagreement.

### **Recommendation**

The Grid Code Review Panel is invited to:

- Recognise the Grid Code deficiencies regarding intertripping schemes;
- Review the proposed description to be included within the Grid Code

- Consider the section on timings in CC.6.2.2.2.2 and the provision of specific up-to-date indicative timings and agree changes and additions as appropriate
- Consider a means by which direct inclusion of a fax template can be achieved without compromising NGET's legal concerns