

SYSTEM TO GENERATOR OPERATIONAL INTERTRIPPING SCHEMES

Introduction

1. The paper provides a high level description of the technical obligations and commercial arrangements which are in place to facilitate the System to Generator Operational Intertripping Schemes. The paper provides examples of when operational intertrips would be utilised and specific technical information relating to the scenarios.
2. The code obligations relating to operational intertrips are described in the Grid Code (CC.3.17) and the CUSC (Section 4, Paragraph 4.2A). This is due to the fact that the operational intertrip framework requires both technical specification and commercial arrangements and as such span the relevant industry codes.
3. This paper is to be utilised as a summary note for the purposes of operational intertrips, as currently described in the Grid Code. In the event of dispute, the Grid Code and Bilateral Agreement documents will take precedence over these notes.

Description and Categorisation

4. An intertrip is a device that may be 'armed' so that it automatically trips a breaker that removes a generator from the GB Transmission System when it receives a specific signal. The signal is delivered when a predetermined fault on a specific part of the transmission system occurs. The requirement for an intertrip is usually identified at the time of connection of a generator and is specified within the Bilateral Connection Agreement (BCA) that is agreed between National Grid and the Generator for that connection.
5. Operational intertrips are utilised by National Grid (in their role of GB System Operator) to operate and manage the GB Transmission System following credible unplanned faults on the GB Transmission System (faults that need to be secured against according to the GB SQSS).
6. An operational intertrip is referred to in the Grid Code and is a formally defined term entitled 'System to Generator Operational Intertripping'. The different types of operational intertrips have been defined into four separate category schemes. The different categories are formally defined terms within the Grid Code and explain the specific circumstance in which the scheme will be utilised as reiterated in Appendix 1.
7. The BCA will specify the relevant category scheme (referred to as Category 1, 2, 3, 4 Intertripping Schemes) and may contain information regarding the number of Generating Units that may be instructed to be armed and details regarding the circuit breakers which should be opened.

Commercial Arrangements

8. Section 4 (Balancing Services) of the CUSC specifies the commercial arrangements for the arming and operation of the System to Generator Operational Intertripping Scheme and describes the mechanism for the administration of associated payments.
9. The payment provisions for the System to Generator Operational Intertripping Schemes may be summarised as follows:
 - *Category 1*
 - no payment provisions are applicable for this type of intertrip
 - *Category 2*
 - this type of intertrip would be eligible to receive a capability payment (inclusive of intertrip payment) and a Restricted Export Level Payment (in the event that National Grid is unable to restore transmission capacity within 24 hours following the trip).

- *Category 3*
 - this type of intertrip would be legible to receive a Restricted Export Level Payment (in the event that National Grid is unable to restore transmission capacity within 24 hours following the trip).
- *Category 4*
 - this type of intertrip would be legible to receive a capability payment (inclusive of intertrip payment) and a Restricted Export Level Payment (in the event that National Grid is unable to restore transmission capacity within 24 hours following the trip).

Operational Intertrip Utilisation

10. Under some system conditions it may be more economic and efficient to secure the system using post-fault actions other than generator intertripping. Examples of such post fault actions would be utilisation of post fault reductions in the output of the generator. However, because there is an intertrip installed this is an indication in itself that the scope for other post-fault actions by the SO is normally very limited.
11. At some locations depending on prevailing system conditions, it may be possible to utilise delayed auto re-close (DAR) to avoid tripping the generation where the fault is transitory and post-fault overload is below a critical value. In such cases the sending of the trip signal to the generating unit breakers may 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. National Grid will determine whether the trip signal can be delayed based on the system conditions existing at the time of the event.
12. In order to protect an otherwise overloaded transmission or distribution circuit or to preserve the stability the generator will be expected to be disconnected from the system within a very short period of time following the receipt of the signal from the transmission system. Generally this will be of the order of 80ms i.e. 30 ms for the trip relay to operate and 50 ms for the generator breaker to open. In some locations where post fault loads are low enough to avoid instability and provide sufficient time before the overloaded circuit trips, it may be possible for the trip signal from the system to be sent to the generating units control system to automatically initiate a reduction in the power output of the generator. This reduction in power will automatically trip the generator breaker through operation of the low forward power relay. The time between receipt of the signal at the power station and the breaker opening would be no more than 10 seconds.

Appendix 1 – System to Generator Operational Intertripping Scheme Categories

Category 1 Intertripping Scheme

A System to Generator Operational Intertripping Scheme arising from a variation to Connection Design following a request from the relevant User which is consistent with the criteria specified in the Security and Quality of Supply Standard.

Category 2 Intertripping Scheme

A System to Generator Operational Intertripping Scheme which is:-

- (i) required to alleviate an overload on a circuit which connects the Group containing the User's Connection Site to the GB Transmission System; and
- (ii) installed in accordance with the requirements of the planning criteria of the Security and Quality of Supply Standard in order that measures can be taken to permit maintenance access for each transmission circuit and for such measures to be economically justified,

and the operation of which results in a reduction in Active Power on the overloaded circuits which connect the User's Connection Site to the rest of the GB Transmission System which is equal to the reduction in Active Power from the Connection Site (once any system losses or third party system effects are discounted).

Category 3 Intertripping Scheme

A System to Generator Operational Intertripping Scheme which, where agreed by NGET and the User, is installed to alleviate an overload on, and as an alternative to, the reinforcement of a third party system, such as the Distribution System of a Public Distribution System Operator.

Category 4 Intertripping Scheme

A System to Generator Operational Intertripping Scheme installed to enable the disconnection of the Connection Site from the GB Transmission System in a controlled and efficient manner in order to facilitate the timely restoration of the GB Transmission System.