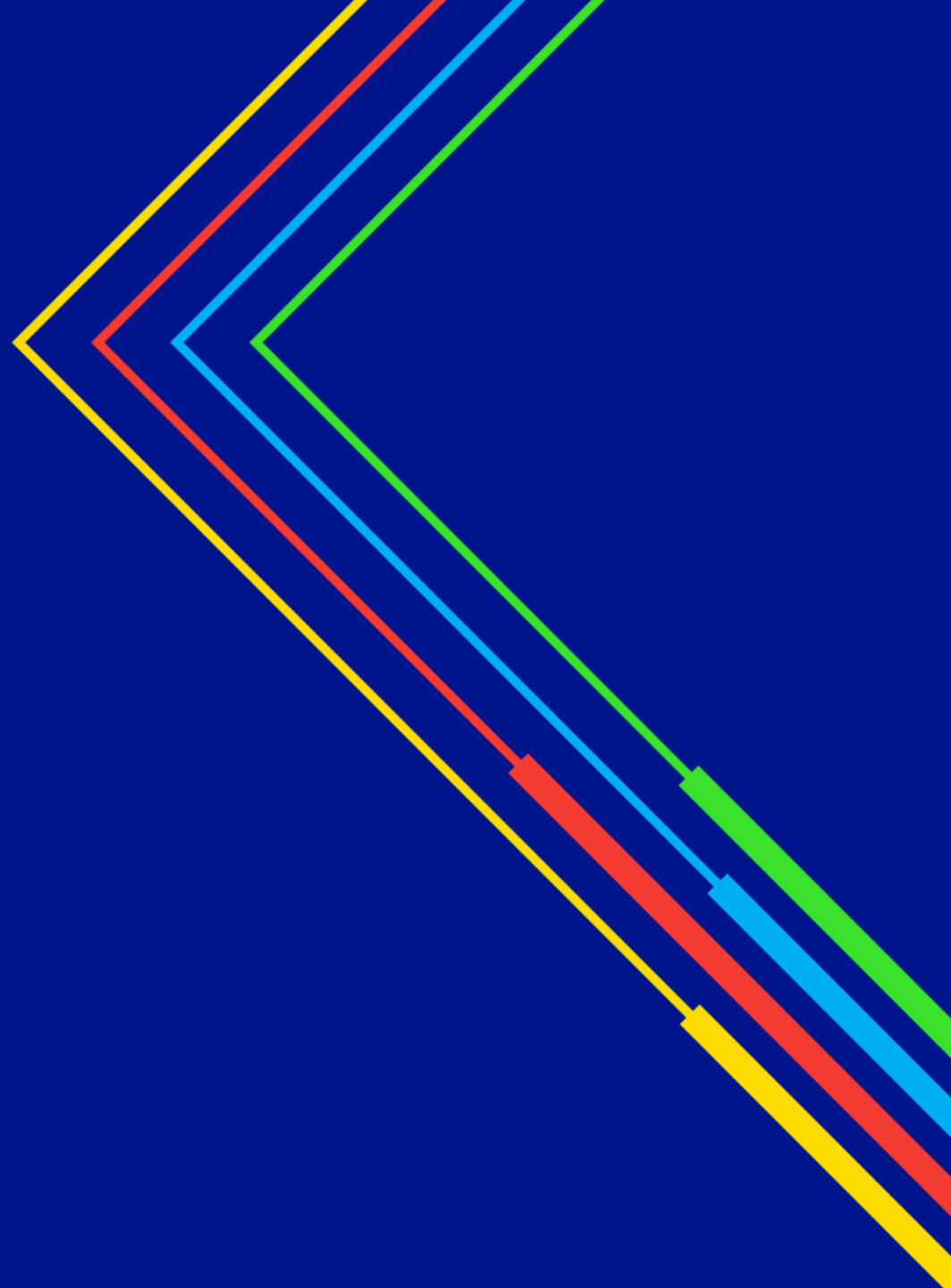


Protection system risks during ESR Tests

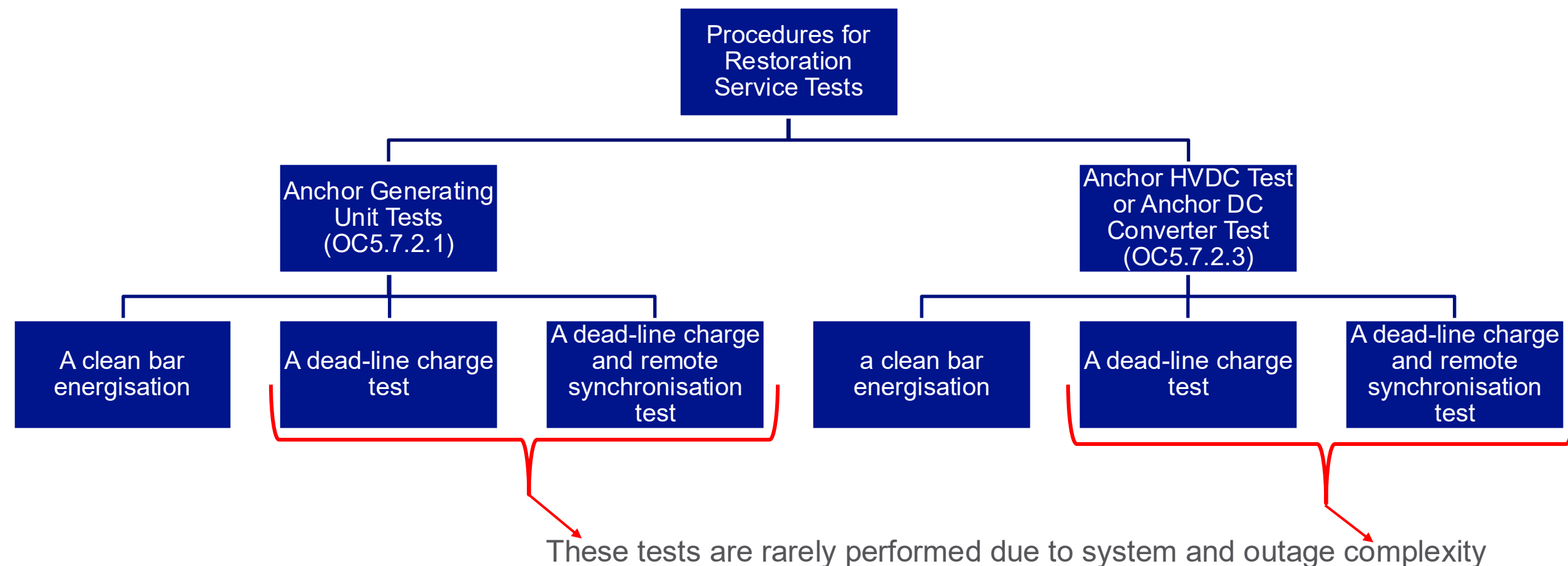
July 2026

nationalgrid

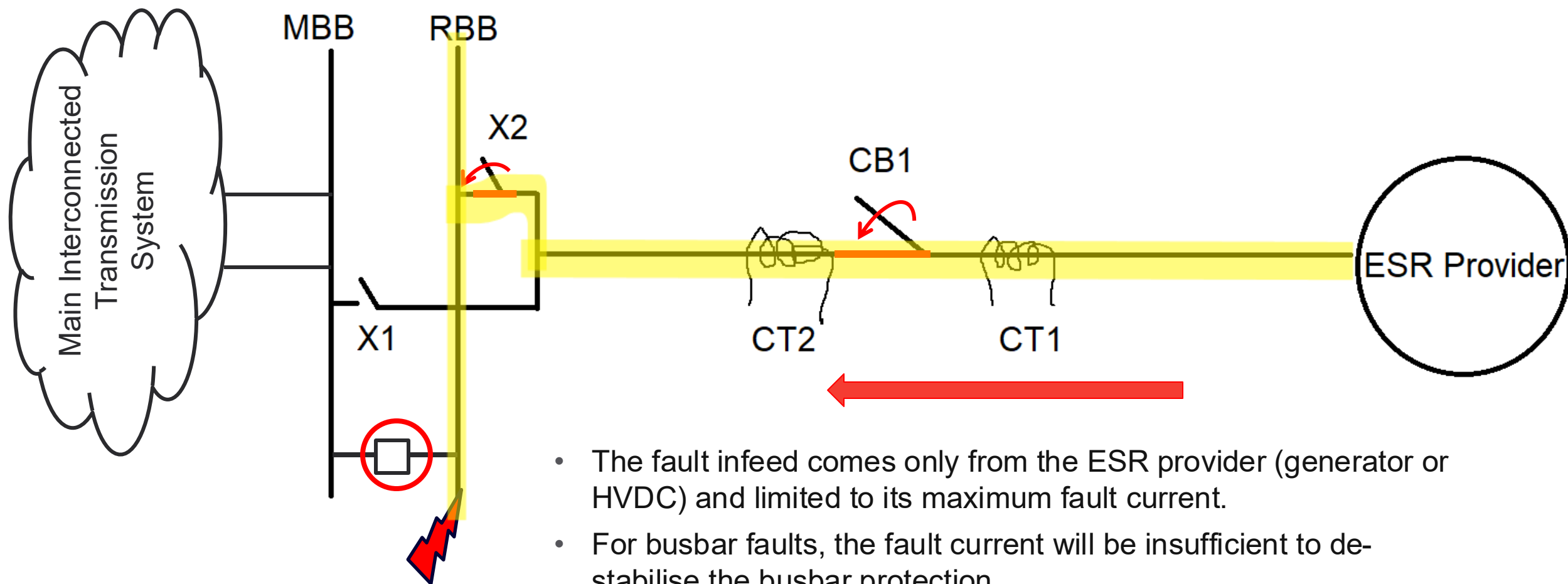


Restoration Service tests

OC5.7.2 (Procedures for Restoration Service Tests) stipulates the need for two restoration contractor's tests that have an impact on the transmission system protection; these tests are:



Energising Clean bar



- The fault infeed comes only from the ESR provider (generator or HVDC) and limited to its maximum fault current.
- For busbar faults, the fault current will be insufficient to destabilise the busbar protection.
- Reducing the busbar protection sensitivity would affect the reliability of the live system (i.e. MBB).

Available options

Energise to the open CB	Change the overcurrent relay settings	Install a temporary overcurrent relay
This limits the test to the generator's open CB which elements the busbar faults. However, if the TO owns an asset(s) between the transmission level CB and the generator, the TO would still need to clear the fault on these assets. In that case another CB and/or isolator should be opened. Sometimes this is not feasible due to interlocking schemes.	If eliminating the TOs owned assets from the test is not feasible, the setting of the existing O/C relays (if available) should be modified on the test day to provide fault clearance. This requires additional hours during the test as well as long notice to allocate resources and run simulation studies	If there is not any O/C, a temporary O/C must be commissioned before the test and decommissioned upon the completion of the test. This a major piece of work and will require work on a live busbar. Therefore, it requires extended outage to commission and decommission the relay as well as long notice to allocate resources and run simulation studies

Proposed modifications to the GC

OC5.7.2.1 (for Anchor Generator)

(g) Where required by **The Company** and/or relevant **Network Operator** and technically feasible, the test may be arranged such that the relevant **Generating Unit** shall energise the dead sections of the **System** as required in the relevant **Restoration Plan**. As part of these tests, **The Company** (in the case of an **Local Joint Restoration Plan**) or **Network Operator** (in the case of a **Distribution Restoration Zone Plan**) may require the **Anchor Generator** to undertake a:

- a) A dead line charge test only; or
- b) A dead line charge and a remote synchronisation test.

(g) Where required by **The Company** and/or **Relevant Transmission Licensee** and/or relevant **Network Operator** ~~and technically feasible~~, the test may be arranged (where it is technically feasible to do so) such that the relevant **Generating Unit** shall energise a the dead sections of the **System** or to a point of the **System** agreed between **The Company** and/or **Transmission Licensee** and/or **Network Operator** as required to facilitate the test and provide assurance that the requirements of the relevant **Restoration Plan** can be satisfied~~in the relevant **Restoration Plan**~~. As part of these tests, **The Company** (in the case of an **Local Joint Restoration Plan**) or **Network Operator** (in the case of a **Distribution Restoration Zone Plan**) may require the **Anchor Generator** to undertake a:

OC5.7.2.3 for Anchor HVDC

OC5.7.2.3

Anchor HVDC Test or Anchor DC Converter Test

- a) The **HVDC System** or **DC Converter** shall demonstrate its technical capability to energise the busbar of the disconnected AC substation to which it is connected, within the **GB Synchronous Area** within a timeframe specified by **The Company** and/or relevant **Network Operator** in the **Anchor Restoration Contract** or **Top Up Restoration Contract**. In the case of **HVDC Systems** this shall be in accordance with the requirements of ECC.6.3.5.4. As part of this test, all **Auxiliaries** are required to be derived from within the **HVDC System** or **DC Converter Station**;
- b) The test shall be carried out while the **HVDC System** or **DC Converter Station** starts from **Shutdown**;
- c) The test shall be deemed to have been successfully completed when the following conditions are cumulatively fulfilled:
 - i) The **HVDC System Owner** has demonstrated its **HVDC System** or **DC Converter Station** is able to energise the busbar of the isolated AC-substation to which it is connected within the **GB Synchronous Area**.

OC5.7.2.3

Anchor HVDC Test or Anchor DC Converter Test

- a) The **HVDC System** or **DC Converter** shall demonstrate its technical capability to energise the busbar of the disconnected AC substation to which it is connected, or equivalent, within the **GB Synchronous Area** within a timeframe specified by **The Company** and/or relevant **Network Operator** in the **Anchor Restoration Contract** or **Top Up Restoration Contract**. In the case of **HVDC Systems** this shall be in accordance with the requirements of ECC.6.3.5.4. As part of this test, all **Auxiliaries** are required to be derived from within the **HVDC System** or **DC Converter Station**;
- b) The test shall be carried out while the **HVDC System** or **DC Converter Station** starts from **Shutdown**;
- c) The test shall be deemed to have been successfully completed when the following conditions are cumulatively fulfilled:
 - i) The **HVDC System Owner** has demonstrated its **HVDC System** or **DC Converter Station** is able to energise the busbar of the isolated AC-substation to which it is connected within the **GB Synchronous Area** or an equivalent as agreed with **The Company** and/or **Relevant Network Operator** and **Relevant Transmission Licensee**.

Conclusion

- **The proposed changes are giving NESO and TOs the flexibility on deciding the energisation boundaries during the ESR test.**
- **These modification minimise the need for protection modifications and the associated delay and outages.**
- **Some cases will still require protection modifications (when it is unavoidable to energise TO owned assets).**