ESR Operational Metering, Commissioning and Testing Guidance

1. Operational Metering Requirements

- Frequency (Hz);
- Voltage (kV);
- Availability (Available/Unavailable);
- Active Power Output (MW);
- Reactive Power Output (MVAr);
- For Contracted Top Up Plant comprising wind turbines, wind speed forecasts and observations (ms-1) and wind direction forecasts and observations (degrees);
- For Contracted Top Up Plant comprising hydro-electric plant, the upper reservoir limits.

2. The Commissioning Assessment

The Commissioning Assessment will be a detailed process made up of 4 parts. This process involves more steps than the regular ESR capability tests (due every 3 years, see section 3 below), and will provide thorough assurance of the contracted plant's capability to deliver an ESR service if called upon

will aim to demonstrate that with and without external power supplies to all or part of the ESR Service Provider, the restoration Auxiliary Unit(s) can be independently started and in turn allow the reliable start-up of the Main Unit(s) in the manner (including without limitation within the timescales) required by the technical parameters.

Part A – Auxiliary Unit(s) – Demonstration of Capability (where applicable)

Where possible, Commissioning Assessments shall demonstrate that the contracted plant's Auxiliary Unit(s) remains capable of providing the relevant service following repeated failure. This is not a requirement for regular Capability Assessments. The process should be expected to be as follows:

1. 3 Consecutive starts/shutdowns of the Auxiliary Unit(s)
2. Start sequence initiated and interrupted before Aux Unit at Full Speed No Load (FSNL)
3. Start sequence initiated and interrupted at FSNL
4. Start sequence initiated and allowed to complete
5. Prove that the Main Unit(s) can revert to normal operation and the Auxiliary Unit(s) removed from service.
6. Safe shutdown of the Auxiliary Unit(s): No external supplies are to be provided to the Auxiliary Unit(s) during the Commissioning Assessment and activities shall be conducted consecutively and without delay between shutdowns and restarts.

The above can also apply for Contracted Top Up Plant, with the difference of auxiliary supplies being from the TO/DNO supply, provided an agreement can be made ahead of the test.

Part B – Demonstration of Electricity System Restoration (ESR) Capability (where applicable)

Contracted Anchor/Primary Restoration Services are expected to complete a Dead Line Charge (DLC) & Remote Synchronisation test (RST) as a part of their Commissioning Assessment:

1. Remove all external supplies from the ESR Service Provider.
2. Re-start the power generating module/facility.

3. Energise a pre-isolated bus bar at point of connection onto to the Network (example: isolated bus bar 400kV substation) by dead bar close of the relevant Circuit Breaker.
4. Energise a pre-isolated circuit of the network out of the relevant substation.
5. Synchronise to an adjacent power island.

For Contracted Top-Up Services:

1. Remove all external supplies from the Contracted Top Up Plant.
2. Restart the Contracted Top Up Plant LV supplies and its related monitor, control and other relevant equipment, needed for the Contracted Top Up Plant to reach a position of readiness to connect to the Network or power island.
3. Simulate the restoration of external supplies by energising the station busbar at the point of connection onto to the Network, from the upstream Network side.
4. Synchronise the Contracted Top Up Plant to the Network or power island. Total time to restore supplies, start up and synchronise to the Network shall not exceed the agreed allocated time period (this is to be agreed in line with the plants reasonable NDZ times).
5. The Top-Up plant shall be loaded with Active/Reactive power for an agreed duration of time.

Part C – Electricity System Restoration Telephony Systems

During the Commissioning Assessment, all relevant communication/telephony systems are required to be testing. This includes communications between relevant control points, as well as any internal communications for the contracted provider (such as control point to field staff). Both Primary/Anchor and Top-Up Restoration Service Providers are expected to demonstrate this capability.

Part D – Local Joint Restoration Plan (LJRP) / Relevant Documentation

Contracted Anchor/Primary restoration Providers are expected to undertake a desktop Exercise to develop a relevant Local Joint Restoration Plan (LJRP) agreed between the Contracted ESR Provider, NESO, TO, and DNO (where relevant).

Contracted Top Up Plants do not form part of an LJRP; but rather is expected to produce an equivalent document which will outline the technical capability, responsibilities, interface, and communications between all relevant parties. This again is developed by all relevant parties.

3. Further Guidance Around Testing:

Testing Types

Once the Commissioning Assessment has been completed, all contracted Anchor/Primary & Top-Up ESR Service Providers are required to complete further capability assessments once every 3 years, in line with the minimum requirements set out in Grid Code OC5.7. There are also 3 additional types of tests which can be completed to further demonstrate a Primary/Anchor plants capability:

- **Dead Bar Charge (DBC)** – this test will involve the run up of the contracted ESR Unit(s), followed by the energisation of a pre-isolated busbar at the connection substation
- **Dead Line Charge (DLC)** – This test follows the same process as a Dead Bar Charge, with the addition of the energisation of a pre-isolated circuit (and remote busbar, if possible)
- **Remote Synchronisation Test (RST)** – this test includes the energisation of a pre-isolated part of the network, followed by the synchronisation of the resultant 'Power Island' to the rest of the network via a relevant CB with Check Synch functionality. This test can be completed in conjunction with a Dead Bar Charge or Dead Line Charge test.

More details on the above tests can be found in Section 3.3 below, or in Grid Code OC5.7.

Testing Regime

The Commissioning Assessment and Capability Assessment are to be progressed at a date, or dates, suggested by the Electricity System Restoration (ESR) Service Provider. The testing regime requirement is applicable to all ESR service providers connected to either transmission or distribution networks. The below Testing Regine requirements shall also apply for Contracted Top Up Plant.

Testing dates:

Commissioning Assessment:

i. To be progressed on Year 0 and ahead of the service commencement.
ii. ESR Service Provider to suggest/submit a minimum of 3 sets of dates to NESO, each set consisting of 2 consecutive days (day 1/preferred, day 2/backup).
iii. NESO to choose one of the sets.

Capability Assessment on Year 3 (n) of the contract:

i. ESR Service Provider to suggest/submit to NESO, between weeks 35 and 38 on Year 2 (n-1), a minimum of 3 sets of dates for the Capability Assessment to be progressed sometime within Year 3 (n).
ii. Each set of dates consisting of up to 7 consecutive days.
iii. NESO to choose one of the sets.
iv. At least 7 calendar days ahead of the first day of the set chosen by NESO to progress with the ESR Capability Assessment, the ESR Service Provider to inform (firm) preferred & backup test dates (consecutive days);
v. If the test needs to be postponed due to any unforeseen system issue a new date shall be agreed within the 10 working days immediately after the backup test date between NESO and the Provider.

NESO's expectations around the dates suggested by each ESR Service Provider includes any day of the week/weekends. However, the proposed test date shall be agreed by all parties involved in the testing, and may be required to factor in external operational considerations.

The test period is expected to last ≥ 3 hours between 10:00 – 16:00 (this time-period with the option of being reviewed/adjusted by NESO and/or Provider to accommodate any potential uncertainty. If any dispute arises, 10:00 – 16:00 will withstand).

Dead Bar/Line Charge Tests & Remote Synchronisation Tests

In the case of a DBC/DLC, or RST being agreed, the approach followed by NESO, the following process is expected to be followed:

1. Prior to agreeing the scope of the test, the relevant TO and/or DNO shall be consulted. This collaboration allows the TO/DNO to raise potential issues with the energisation of their assets. In some cases, further investigation may be required in order to confirm if it is feasible to conduct a DBC/DLC, or RST. For this reason, it is critical for testing planning to start at year (n-1).
2. A DBC, DLC, or RST will always happen in conjunction with 'regular' ESR Capability Assessment(s), and will follow the same procedure;
3. All electrical external supplies to the plant are removed, and the provider is expected to start up using internal auxiliary supplies such that they are in a position to energise the pre-agreed assets;
4. **DBC Test**: re-energisation of the pre-isolated busbar at the ESR providers connection point upon closure of the TO/DNO circuit breaker. This energisation can happen via either soft or sequential energisation.
5. **DLC Test**: the same process as DBC, in addition to the further re-energisation of the extended network. The network assets to be energised are agreed ahead of time and switched out of service/configured prior to the ESR test commencement. Again, this energisation can be via either soft energisation or a step-by-step approach with one circuit breaker switched at a time.
6. **RST Test**: re-synchronisation of the power island created by the ESR Service Provider onto GB via a PSS, equipment similar to a Unit's synchroniser but located at a remote substation, owned and operated by the relevant TO or DNO.

Timings for each test:

1. ESR Capability Assessment/DBC: period of time needed by the ESR Service Provider to restart its equipment after a blackout event and reach a position where it can re-energise (@0MW) part of a dead Network. Expected to take up to 2 hours.
2. DLC Test: following a successful DBC, period of time needed to re-energise part of the Network. The moment an ESR Service Provider successfully energises a dead bar at the local Network substation is the moment ESR capability test ends and the DLC Test starts. Expected to take up to 1/2 hour, however can be dependant on TO/DNO switching times.
3. RST Test: following DLC test, once all relevant network assets have been re-energised. The period of time needed to re-synchronise the power island created by the ESR Service Provider onto GB is expected to take up to 1/2 hour; but dependant on TO/DNO switching times
4. **Total time needed**: ≥3h (2h+1/2h+1/2h).

Comments:

- When progressing with a DLC and RST test, NESO will typically pursue the re-energisation of the preferred restoration route agreed under the relevant Local Joint Restoration Plan (LJRP);
- Providers are expected to run on their Auxiliary Generation for the entire duration of the tests: ESR Capability Assessment, DLC and RST;
- If the Provider has multiple Units contracted for the provision of the Service but can reach the contracted figures with just one, NESO will pursue a DLC and the RST with just one unit. All other contracted Units shall progress with a ESR capability assessment only.
- NESO is expecting to progress with two DLC and RST tests throughout the Contract Term, always in combination/at the same time as the ESR Capability Assessment:
    - Test 1 (Commissioning Assessment): 1 or more ESR Capability Tests (depending on the number of Units contracted, and considering the comments above) + 1 DLC + 1 RST;
    - Test 2 (three years later): 1 or more ESR Capability Tests (depending on the number of Units contracted, and considering the comments above) + 1 DLC + 1 RST;