

STCP 06-1 Issue 006 Black Start

STC Procedure Document Authorisation

Party	Name of Party Representative	Signature	Date
National Grid Electricity System Operator Ltd			
National Grid Electricity Transmission plc			
SP Transmission plc			
Scottish Hydro Electric Transmission plc			
Offshore Transmission Owners			

STC Procedure Change Control History

Issue 001	23/12/2004	BETTA Go-Live Version
Issue 002	28/07/2005	Issue 002 incorporating PA028
Issue 003	05/10/2005	Issue 003 incorporating PA035 and PA037
Issue 004	30/09/2010	Issue 004 incorporating Offshore
Issue 005	19/05/2016	Issue 005 incorporating PM088
Issue 006	01/04/2019	Issue 006 incorporating National Grid Legal Separation changes

1 Introduction

1.1 Scope

1.1.1 This document describes the planning and procedures required by NGESO and the TOs to manage the Black Start recovery of Total System in an efficient manner.

1.1.2 Only the onshore part of the National Electricity Transmission System is included in the Black Start strategy Local Joint Restoration Plans (LJRPs) and any Power Islands created under them only include sites from within a single Transmission Area. No offshore networks currently include a nominated Black Start station.

1.1.3 An onshore TO will not control an offshore network under a LJRP. To avoid a situation arising of an onshore TO controlling assets owned by an offshore TO then where an offshore network connects within an onshore network covered by a LJRP the offshore network will be disconnected prior to or at the start of the implementation of the LJRP. The offshore TO will not participate in the LJRP except to disconnect from the onshore TO's system.

1.1.4 Where an offshore network connects within an onshore network covered by a Local Joint Restoration Plan (LJRP) the offshore transmission network would only be connected when the LJRP has been terminated and operational control has transferred back to NGESO.

1.1.5 This document covers the restoration of the Total System following a Partial Shutdown or Total Shutdown in accordance with the Local Joint Restoration Plans. The restoration process may include an onshore TO carrying out the processes set out in Local Joint Restoration Plans.

1.1.6 TO network start up plans may be invoked in response to power island operation. Their use is outside the scope of this document. They are considered in STCP 06-2 Power Island Management.

1.1.7 This procedure applies to NGESO and each TO. For the purposes of this document, the TOs are:

- NGET as an onshore Transmission Licence holder
- SPT as an onshore Transmission License holder
- SHETL as an onshore Transmission License holder
- Offshore Transmission License holders as appointed by OFGEM.

1.2 Objectives

1.2.1 The objective of this document is to enable, as far as possible, restoration of the TOs' Transmission Systems and interfacing Users' Systems in the shortest possible time using the most effective means following a Total Shutdown or Partial Shutdown.

2 Key Definitions

2.1 None

3 Procedure

3.1 Responsibilities

3.1.1 NGESO shall establish the overall Black Start for the TOs' Transmission Systems. This shall require Black Start Stations and other Power Stations to be party to Local Joint Restoration Plans. Where an offshore network connects within an onshore network covered by a Local Joint Restoration Plan (LJRP) the offshore TO shall not be a party to the Local Joint Restoration Plan and the offshore TO network will not be connected to the onshore TO network until the LJRP has been terminated as outlined in sections 3.4.11, 3.4.12 or 3.4.14 and NGESO have taken control of co-ordination of the interconnection of both systems.

3.1.2 NGESO shall establish Local Joint Restoration Plans (as described in this document) and associated Ancillary Service Agreements.

3.1.3 Local Joint Restoration Plans shall be agreed by NGESO, the relevant onshore TO and any relevant Users

3.1.4 NGESO shall provide the onshore TO with a signed copy of each Local Joint Restoration Plan relevant to that TO's Transmission System. Where an offshore network connects within an onshore network covered by a Local Joint Restoration Plan (LJRP) the offshore TO shall receive a copy of the agreed LJRP for information.

3.1.5 Where requested by NGESO, the relevant onshore TO shall assist in the development and production of Local Joint Restoration Plans.

3.1.6 The relevant onshore TO and NGESO shall each inform the other party if they become aware of any material change that may invalidate a Local Joint Restoration Plan.

3.1.7 NGESO shall regularly review, update and re-issue the Local Joint Restoration Plans as necessary.

3.1.8 When a Total or Partial Shutdown exists, NGESO shall notify the relevant TOs and Users of the situation. The Parties shall agree the implementation of those Local Joint Restoration Plans (taking account of advised Generating Unit availabilities and the availability of each TO Transmission System).

3.1.9 In Scotland, the relevant onshore TO shall implement the Local Joint Restoration Plans.

3.1.10 If there is a failure of the voice communications the procedure described in section 3.5 shall be applied.

3.1.11 NGESO shall direct and manage the Black Start through:

- agreeing the implementation of the Local Joint Restoration Plans or other actions with the relevant onshore TO;
- overseeing the coupling of Power Islands; and
- co-ordinating the operation of established parts of the National Electricity Transmission System.

3.1.12 NGESO shall ensure that Users and offshore TOs shall abide with the Local Joint Restoration Plans.

3.1.13 NGESO shall periodically carry out Black Start and remote synchronisation tests and NGESO will advise the onshore TO of these. The relevant TO shall co-operate with NGESO in facilitating these tests including the provision of additional staff and resources when identified as needed by NGESO. NGESO shall procure that relevant Users and offshore TOs co-operate in facilitating such tests.

3.2 Local Joint Restoration Plans

3.2.1 Description of Local Joint Restoration Plans

3.2.1.1 Local Joint Restoration Plans (LJRP) shall include the agreed method and procedures for Power Island creation. This may require the relevant onshore TO to issue instructions to Power Stations (other than Black Start Stations) that are party to the relevant Local Joint Restoration Plan and to liaise with any offshore TO connecting within the network covered by the LJRP to the extent required to disconnect the offshore network from the onshore network prior to LJRP implementation.

3.2.1.2 It may be deemed appropriate for a specific restoration option to be developed which prioritises restoration of a site deemed of strategic importance to the Transmission System restoration. Where possible this should be achieved as part of a standard Local Joint Restoration Plan. However there may be occasions when this restoration option is only achievable using assets on either side of an onshore TO boundary.

Should this be the case; an Annex to each relevant LJRP should be developed, discussed and agreed with the relevant onshore TO and Users which will allow one TO to operate a Power Island that encompasses another TO's area. The Annex will specifically detail the restoration route, equipment to be energised, and load to be supplied. It will also detail the command and communication chain for this Annex to be enacted and the format of instructions that should be issued.

NGESO will instruct the enacting of this Annex (if no communications exist then this can be enacted upon communication and agreement between both TOs). Once the Annex is enacted the LJRP will end if the network is extended any further than detailed in the Annex. At this point the LJRP will end and control of the interconnected Power Island will revert to NGESO as per standard LJRP operation. On the day, all parties to the Annex have the right to refuse this operation if deemed it places plant/personnel/restoration at risk.

3.2.1.3 Local Joint Restoration Plans and any Power Islands created under them shall only include sites from within a single onshore Transmission Area (unless an Annex to the LJRP exists for a defined restoration route and is signed, and agreed, by all impacted TOs). Where an offshore network connects within an onshore network covered by a Local Joint Restoration Plan (LJRP) the offshore TO will not participate in the LJRP apart from facilitating disconnection from the onshore TO's system.

3.2.1.4 Local Joint Restoration Plans shall detail the agreed method and procedures which the onshore TO shall use to restore parts of the Transmission network, and coordinate the actions of Black Start Station Generating Unit(s) that shall energise parts of the Transmission System, and meet complementary demand, so as to form a Power Island.

3.2.1.5 The Local Joint Restoration Plan shall include a record of which TO and which onshore TO sites are covered by the Local Joint Restoration Plan, and shall set out what actions are required by NGESO and the onshore TO should a Total Shutdown or a Partial Shutdown (and the need to implement a Local Joint Restoration Plan) arise.

3.2.1.6 The Local Joint Restoration Plan shall go on to cover the creation of Power Islands within onshore TO Transmission areas and may require the despatch of Generating Units other than those at Black Start Stations.

3.2.1.7 A Local Joint Restoration Plan shall include the agreed methods and procedures that an onshore TO shall use to restore that TO's Transmission System and interfacing Users' Systems. These procedures shall be based on the following:

- Each User shall make available relevant demand blocks;
- Generating Units at Black Start Stations shall be available to energise the National Electricity Transmission System and meet demand blocks;
- Generating Units, other than those at Black Start Stations, shall be able to receive supplies, synchronise to the National Electricity Transmission System and meet demand blocks, and

- interaction between Generating Units at Black Start Stations and any other Generating Units included in the Local Joint Restoration Plan shall be managed by the onshore TO in respect of frequency control and reactive power requirements in a Power Island.

3.2.1.8 The list of Local Joint Restoration Plans is contained in Appendix B. NGESO shall be responsible for proposing amendments to Appendix B of this STCP through the STC Committee so that the list remains current and correct.

3.2.2 Creation of a new Local Joint Restoration Plan

3.2.2.1 When NGESO identifies a requirement for a new Local Joint Restoration Plan, NGESO shall discuss and agree such a plan with the relevant onshore TO and Users.

3.2.2.2 Each Local Joint Restoration Plan shall be prepared by NGESO to reflect the above discussions and agreement. The onshore TO shall support NGESO in developing the Local Joint Restoration Plans, including the provision of relevant information, data and resources, where necessary.

3.2.2.3 When a Local Joint Restoration Plan has been prepared, it shall be sent by NGESO to the onshore TO for confirmation of the agreement. NGESO shall also send the prepared LJRP to Users involved for confirmation of the agreement

3.2.2.4 The Local Joint Restoration Plan shall then be signed by NGESO and the relevant onshore TO to confirm agreement to the Plan. NGESO shall procure that involved Users also sign to confirm agreement

Once signed by the relevant parties the Local Joint Restoration shall apply between NGESO and the relevant TO as if it were part of this STCP.

3.2.2.5 NGESO shall distribute a signed copy of the new Local Joint Restoration to each relevant onshore TO and User indicating the date of implementation. Where an offshore network connects within an onshore network covered by a Local Joint Restoration Plan (LJRP) the offshore TO will also be provided with a copy of the LJRP by NGESO for information.

3.2.3 Changes to an Existing Local Joint Restoration Plan

3.2.3.1 If NGESO becomes aware that a change is required to a Local Joint Restoration Plan, NGESO shall initiate discussions with the relevant onshore TO and Users to seek agreement for that change. NGESO shall procure that Users (the Network Operator, relevant Generators, including those for Power Stations other than the Black Start Stations, which NGESO reasonably require, Non Embedded Customers) shall join those discussions. Where an offshore network connects within an onshore network covered by a LJRP the offshore TO may be invited to participate in the discussions by NGESO.

3.2.3.2 If the onshore TO party to a Local Joint Restoration Plan becomes aware that a change is required to that Local Joint Restoration Plan, it shall contact NGESO who shall then initiate such discussions with the relevant TO, Users and other affected parties to seek agreement for that change. NGESO shall procure that Users (the Network Operator, relevant Generators, including those for Power Stations other than the Black Start Stations, which NGESO reasonably require, Non Embedded Customers) shall join those discussions. Where an offshore network connects within an onshore network covered by a LJRP the offshore TO may be invited to participate in the discussions by NGESO.

3.2.3.3 The principles applied in section 3.2.2 shall apply to discussions held under 3.2.3.1 and 3.2.3.2 and to any consequent changes.

3.2.3.4 When changes to a Local Joint Restoration Plan are agreed, NGESO shall update and reissue that Local Joint Restoration Plan to the relevant onshore TO, Users and other affected parties indicating the issue number and the date that any change takes effect.

3.2.4 Failure to Agree

3.2.4.1 If NGESO or the relevant onshore TO do not agree on a Local Joint Restoration Plan, NGESO shall develop and agree its own restoration plan.

3.3 Black Start Incident Management

3.3.1 When notified that a Total Shutdown or Partial Shutdown has occurred, all Parties shall establish communications routes and arrangements between Duty Managers or other representatives between NGESO, onshore TO, Generators relevant Users and affected offshore TOs to provide urgent managerial communication channels. Under such conditions, it may also be necessary to invoke the System Incident Management procedures under STCP 06-3.

3.4 Black Start Procedure

3.4.1 In the event of a Total Shutdown or Partial Shutdown NGESO shall, as soon as reasonably practicable, notify the relevant onshore TO, Users and other affected parties that a Total Shutdown or a Partial Shutdown exists and that Local Joint Restoration Plan shall be implemented.

3.4.2 Where voice communication between NGESO and the relevant onshore TO and/or Users is not available and prevents NGESO from invoking Black Start, the provisions of section 3.5 shall apply.

3.4.3 In Scotland

3.4.3.1 The onshore TO shall request Black Start Stations, other Generators party to the Local Joint Restoration Plan and affected Users to assess the condition of their assets, and report on their capability to carry out their obligations under the Local Joint Restoration Plan.

3.4.3.2 Where an offshore network connects within an onshore network covered by a Local Joint Restoration Plan (LJRP) the onshore TO shall, as necessary, liaise with the offshore TO to confirm the status of the connection between the onshore and offshore networks. The relevant TO shall gather these reports and feed them back to NGESO as soon as reasonably practicable.

3.4.3.3 Where the availability and capability of the onshore TO's Transmission System and Users' Systems, and the availability of Black Start Stations and other Power Stations in the Local Joint Restoration Plan are not significantly different with the Local Joint Restorations Plan's requirements, NGESO shall give the onshore TO the authority to implement the appropriate Local Joint Restoration Plan.

3.4.3.4 Where to the extent that the availability and capability of the onshore TO's Transmission System or Users' Systems, or the availability of Black Start Stations or other Power Stations in the Local Joint Restoration Plan is significantly different to that set out in the Local Joint Restoration Plan, NGESO may choose to manage the restoration of part of the onshore TO's Transmission System outside the provisions of the Local Joint Restoration Plan, using STCP 01-1 Operational Switching and normal energy balancing processes as appropriate.

3.4.3.5 When the relevant onshore TO has been given the authority to implement the appropriate Local Joint Restoration Plan, it shall execute and progress the appropriate Local Joint Restoration Plan in accordance with its obligations under that LJRP.

3.4.3.6 Where an offshore network connects within an onshore network covered by a Local Joint Restoration Plan (LJRP) the onshore TO shall liaise with the offshore TO to confirm the intention to implement the LJRP and the disconnection of the offshore network until the LJRP is terminated and operational control is transferred back to NGESO.

3.4.3.7 When implementing a Local Joint Restoration Plan, the onshore TO shall carry out operational liaison, complete appropriate Operational Switching actions and issue instructions to Users, including Black Start Stations and Generators party to the Local Joint Restoration Plan to establish and control a Power Island in accordance with the provisions of the Local Joint Restoration Plan.

3.4.4 In England and Wales

3.4.4.1 NGESO has the sole authority to implement the Local Joint Restoration Plans.

3.4.4.2 NGESO shall request Black Start Stations, other Generators party to the Local Joint Restoration Plan to assess the condition of their assets, and report on their capability to carry out their obligations under the Local Joint Restoration Plan. NGESO shall request Network Operator party to the Local Joint Restoration Plan to assess the condition of their assets and report on their capability to carry out their obligation under the Local Joint Restoration Plan

3.4.4.3 Where an offshore network connects within an onshore network covered by a Local Joint Restoration Plan (LJRP) NGESO shall as necessary, liaise with the offshore TO to confirm the status of the connection between the onshore and offshore networks.

3.4.4.4 Where an offshore network connects within an onshore network covered by a Local Joint Restoration Plan (LJRP), NGESO shall liaise with the offshore TO to confirm the intention to implement the LJRP and the disconnection of the offshore network until the LJRP is terminated.

3.4.4.5 when implementing a Local Joint Restoration Plan, NGESO shall carry out operational liaison, with Black Start Stations and Generators party to the Local Joint Restoration Plan in accordance with the provisions of the Local Joint Restoration Plan. NGET shall carry out operational liaison, direct appropriate Operational Switching actions and issue instructions to relevant Users party to the Local Joint Restoration Plan to establish and control a Power Island in accordance with the provisions of the Local Joint Restoration Plan.

3.4.5 Power Islands:

Where possible, a Power Island should be operated in accordance with following frequency and voltage criteria:

- the frequency on the Transmission System shall be nominally 50Hz and shall be controlled within the limits 49.5 – 50.5Hz;
- the voltage on the Transmission System shall normally remain within +/- 5% of nominal. The minimum voltage is -10% and the maximum is +10% of nominal. Voltages of +10% and -5% should not prevail for more than 15 minutes.

3.4.6 During the initial stages of implementing a Local Joint Restoration Plan normal operational standards may not be appropriate or possible and the onshore TO's Transmission System may be operated outside normal voltage and frequency standards provided that it does not result in damage to Plant and/or Apparatus, or a safety hazard.

3.4.7 At any time during the implementation of the Local Joint Restoration Plan, the onshore TO shall advise NGESO of any circumstances that may require significant modification to the implementation of the Local Joint Restoration Plan. Where such modifications are required, both parties may agree a new course of action consistent with the aims of the Local Joint Restoration Plan.

3.4.8 At any time during the implementation of the Local Joint Restoration Plan and where there is good reason, NGESO may choose to terminate operation in accordance with the Local Joint Restoration Plan and manage restoration of that part of the Transmission System without the bounds of the Local Joint Restoration Plan. NGESO shall notify the relevant onshore TO and any other affected parties of the termination of the Local Joint Restoration Plan.

3.4.9 At any time during the implementation of the Local Joint Restoration Plan and where there is good reason, the onshore TO may choose to terminate operation in accordance with the Local Joint Restoration Plan. The onshore TO will advise NGESO of the termination of the Local Joint Restoration Plan. Operation and restoration of that part of the National Electricity Transmission System will return to NGESO. NGESO shall notify the relevant affected parties of the termination of the Plan.

3.4.10 The onshore TO shall keep NGESO informed of progress in establishing the Power Island(s). At any time during establishing Power Islands the onshore TO shall inform NGESO if further resources becomes available, such that additional Power Islands can be established in accordance with the relevant Local Joint Restoration Plan. NGESO and the onshore TO shall decide if and when additional Local Joint Restoration Plans should be invoked.

3.4.11 Interconnection of Power Islands

- 3.4.11.1 NGESO shall agree with the onshore TO to the interconnection of any Power Islands which are not expressly allowed for in a Local Joint Restoration Plan. Local Joint Restoration Plan operation shall terminate at this point and NGESO shall take back control of that part of the TO's Transmission System formed from the interconnected Power Islands. Onshore TOs shall not operate a Power Island that contains part of more than one TO's Transmission System unless through a prescribed Local Joint Restoration Plan Annex.
- 3.4.11.2 NGESO shall coordinate the interconnection of sub-systems including offshore transmission networks, created from the interconnection of Power Islands (or multiple Power Islands as allowed for in the Local Joint Restoration Plan), to form an integrated System. The completion of the integration of sub-systems shall eventually re-establish the TO's Transmission System or the re-connection of the relevant part of the TO's Transmission System, completing Black Start.
- 3.4.11.3 At any point during the connection of Power Islands or management of sub-systems, NGESO may request the onshore TO to resume Local Joint Restoration Plan operation of part of that onshore TO's Transmission System, providing its operation would still remain within the bounds of an applicable Local Joint Restoration Plan and would not include more than one TO's Transmission System unless through a prescribed Local Joint Restoration Plan Annex.

3.4.12 Completion of Black Start

- 3.4.12.1 When the Black Start is complete NGESO shall formally notify the TOs and Users that the Black Start is complete and normal operation has been resumed.

3.5 Voice Communication Failure

- 3.5.1 In the event of a total communication failure between the onshore TO and NGESO during Black Start conditions the onshore TO where possible, may choose to invoke the LJRP(s) for its Transmission System and operate within those provisions
- 3.5.2 Where voice communication failure is protracted, the onshore TO, where possible may consider the interconnection of established Power Islands as allowed for in the Local Joint Restoration Plan(s).
- 3.5.3 The onshore TO must seek to inform NGESO as soon as reasonably practicable of all actions they have taken and the status of the restoration after communication is re-established.

3.6 Black Start Training

- 3.6.1 NGESO shall carry out and make available appropriate and regular training for TO staff, to allow them to carry out their roles and responsibilities under a Black Start condition. The TO shall make available appropriately skilled personnel to complete the prescribed Black Start training.

3.7 Black Start Testing

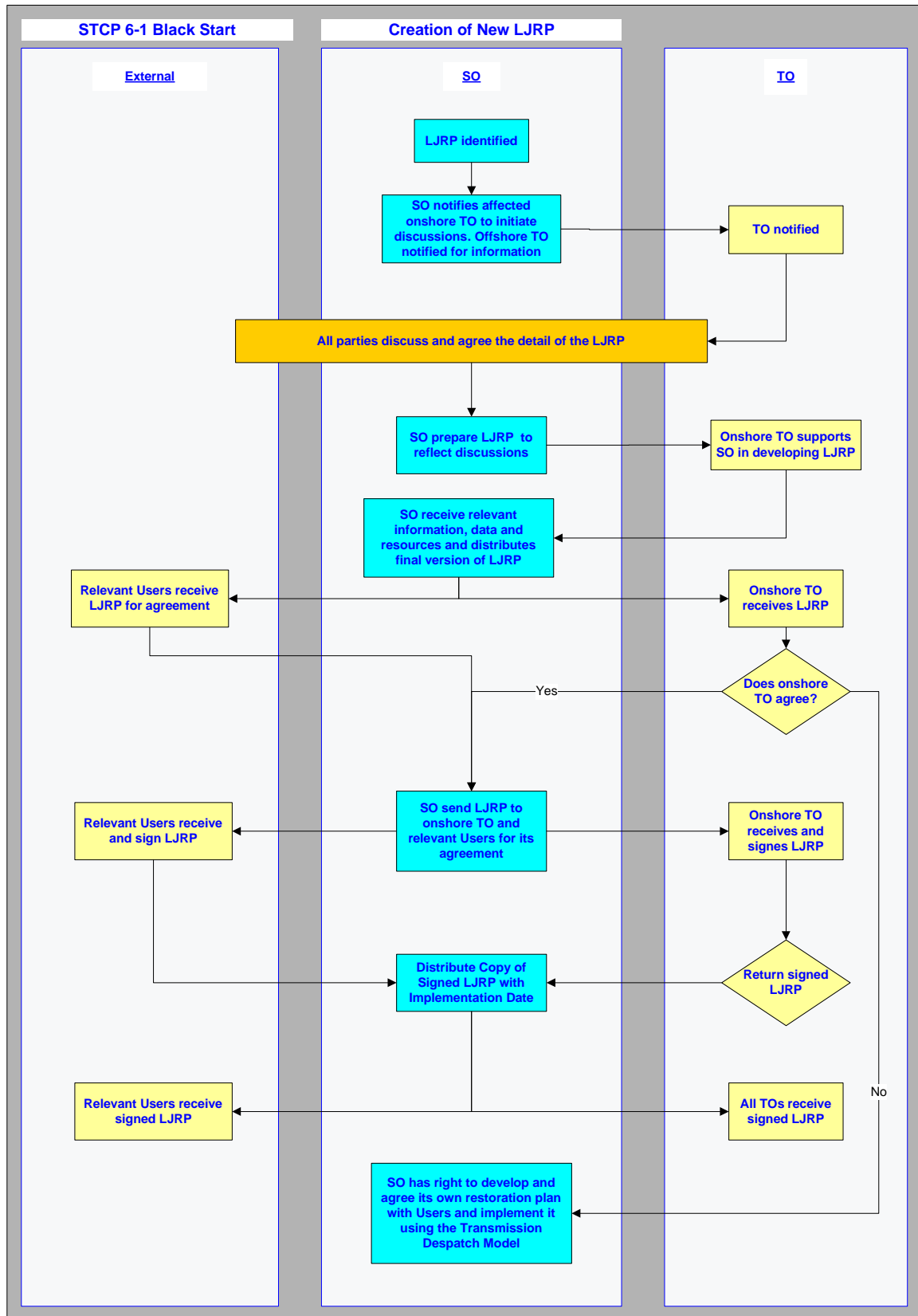
- 3.7.1 NGESO shall carry out Black Start and other related Tests on a routine basis. All Black Start or related Tests shall be carried out in accordance with the provision of STCP 08-3 Operational Tests and System Tests.

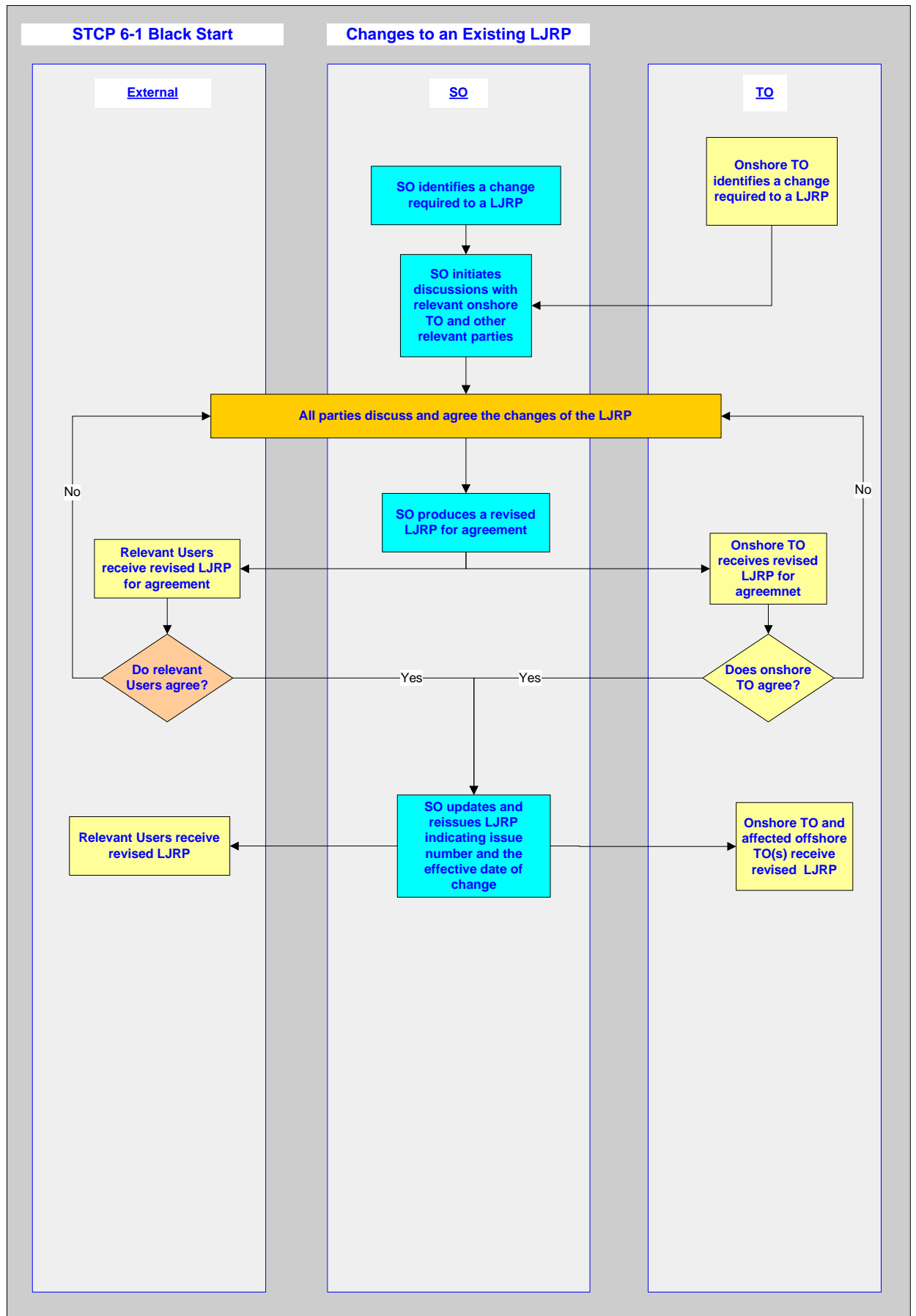
3.8 Black Start Test Bookings

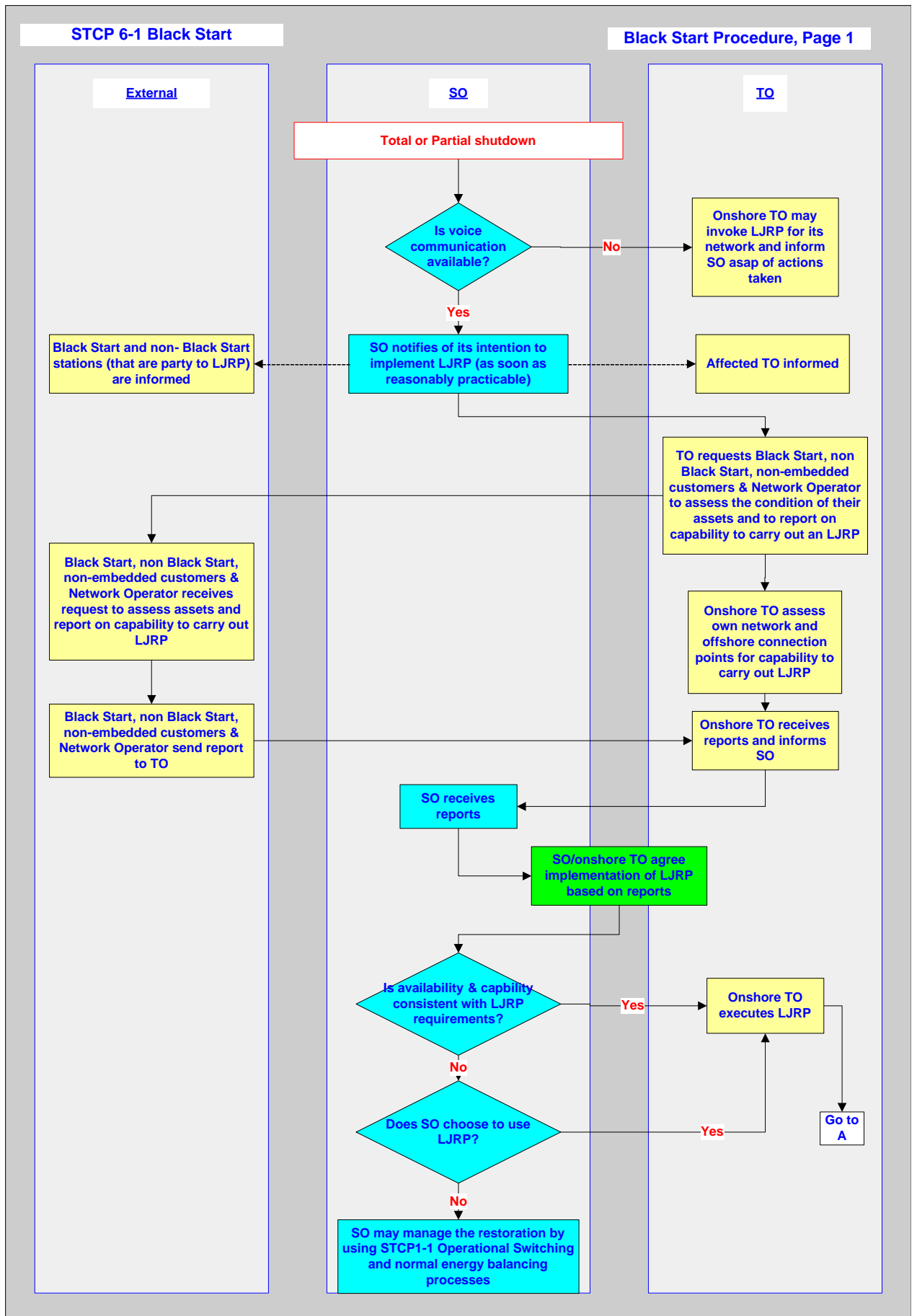
- 3.8.1 Black Start Tests shall be booked in the Outage database by NGESO for information. Booking requests shall be agreed in accordance with STCP 11-1 Outage Planning.

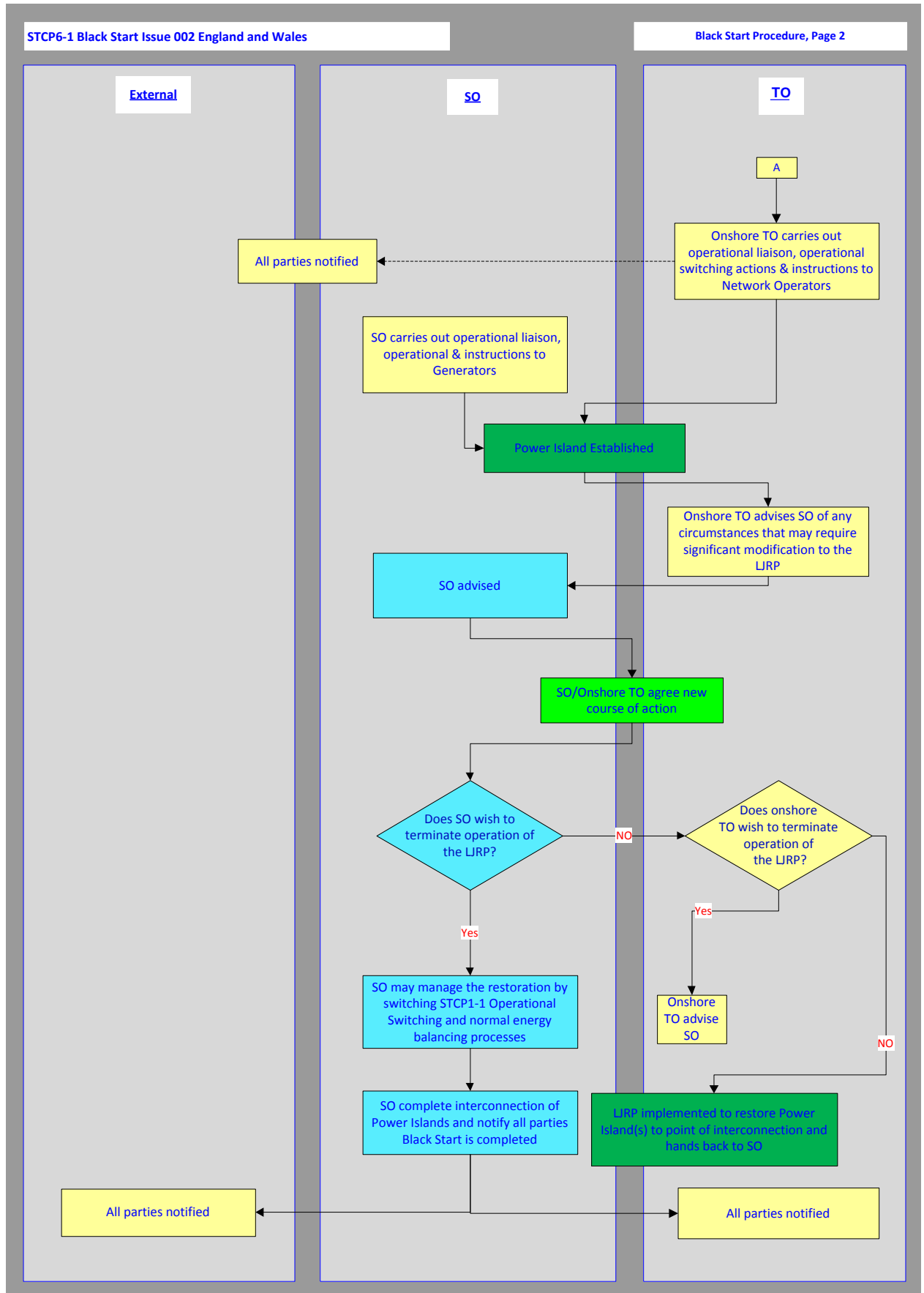
Appendix A – Process Diagrams

Note that the Process Diagrams shown in this Appendix A are for information only. In the event of any contradiction between the process represented in this Appendix and the process described elsewhere in this STCP, then the text elsewhere in this STCP shall prevail.









Appendix B – LJRPs

This Appendix has been removed from this version of the STCP on the grounds of Confidentiality, in accordance with the decision taken by the STC Committee in July 2005.

For further information please e-mail STC.Team@nationalgrid.com

