

Electricity Specification 259

Issue 5 September 2023

Generation Connected to the Electricity North West Distribution Network



Amendment Summary

| ISSUE NO. DATE | DESCRIPTION |
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| <p>Issue 5 September 2023</p> | <p>Threshold for managed connects changed from 200kVA export capacity to 200kVA installed capacity for synchronous generation and 500kVA installed capacity for inverter connected / asynchronous generation.</p> <p>Managed Connections and Generation Connected to the 132/33/11/6.6kV Network</p> <p>Prepared by: Peter Twomey Approved by: Policy Approval Panel and signed on its behalf by Paul Turner, PAP Chair.</p> |

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1 Introduction

Electricity North West Limited (Electricity North West) has a duty under the Energy Act 1983 (restated in the Electricity Act 1989) to offer connection to Generators where this is practical. Where Generation equipment is connected to Electricity North West’s network (the Network), there are certain requirements to ensure the safe and secure operation of the Network and to enable Electricity North West to charge the operators of the Generation for the use of the Network for the transport of energy. In addition, all new generation must comply with European Requirements for Generators legislation from the 27th April 2019. This Electricity Specification (ES) places obligations on Generators, which enable Electricity North West to fulfil those requirements.

2 Scope

This ES describes Electricity North West’s requirements for the connection application process, the contractual and charging arrangements and the technical requirements for the connection of the Generation to the Network. This document covers all Generation equipment, ranging from Small Scale Embedded Generation through to large scale Generation intended for operation as an Alternative Connection to or in parallel operation with the Network.

3 Definitions

For the purpose of this document the following definitions shall apply:

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| Operation with Alternative Connection | The operation of Generation as an alternative to the Network connection, arrangements being such that the generating plant cannot be paralleled with the Network. |
| Competitive Connection | A new connection undertaken by an Independent Connection Provider, who is to provide and install the connection to the Network, including all equipment to be adopted by Electricity North West. |
| Distribution System Management Centre (DSMC) | The centre operated by Electricity North West for the management and control of the Network. |
| Embedded Generation | Generation that is designed to operate in parallel with the Network. Distributed Generation is an alternative term. |
| Distribution Network Operator (DNO) | The organisation, eg Electricity North West, that owns and holds a Distribution Licence to operate a network and is responsible for agreeing the connection of Generation to that Network. A DNO might also be referred to as a Distributor. |
| EHV | Extra High Voltage – a voltage of 22,000V or higher voltage. |

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| Electricity Supplier | A person supplying electricity under licence. |
| Generation | An installation comprising one or more Generating Units, where a generating unit is a source of electrical energy and all associated interface equipment. |
| Generator | A person who generates electricity under licence or exemption from Section 4.1(a) of the Electricity Act 1989. |
| Generating Unit | Any apparatus which produces electricity. This includes micro-generators and energy storage devices. |
| HV | High Voltage – a voltage of 6,600V or 11,000V. |
| Independent Connection Provider | An installer, approved by Lloyds Register, able to undertake contestable connection activities. |
| LV | Low Voltage – a voltage less than 1000V. |
| Managed Connection | A connection with an agreement in the Connection Contract that Electricity North West may curtail or disconnect the connection depending on network conditions. |
| Means of Isolation | The switch or other means, capable of being locked in the isolated position, which is intended to isolate Generation, arranged to operate in parallel with the Network, from the rest of the Generator’s network, or directly from the Network. Such Means of Isolation will normally be part of the Generator’s installation, but Electricity North West staff shall be afforded safe means of access for the application and removal of operational locks. |
| Network | The electricity distribution network owned by Electricity North West, to which Embedded Generation is to be connected. |
| n-0 | A Network that is fully intact and has no planned or unplanned outages |
| Point of Common Coupling | The point on the Network nearest to a Generator’s installation at which other customers’ loads are or may be connected. Further clarity on the definition or interpretation of the Point of Common Coupling can be found in Engineering Recommendations P28 and G5/4. |
| Point of Connection | The point, defined by Electricity North West, on the existing Network, from which a new connection to the Generation is derived. |

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| Point of Supply | The point of electrical connection between the Network and the apparatus owned by a Generator. |
| Protective Multiple Earthing (PME) | The technique of using the supply neutral conductor of the LV distribution system to provide earthing facilities for customers. |
| Micro-generator | Generation rated up to and including 16A per phase, single or multi phase 230/400Vac and designed to operate in parallel with the Network. |
| Statutory Connection | As defined under Section 16(1) of the Electricity Act 1989, is a new connection, undertaken by Electricity North West, who is to provide and install the connection to the Network, including all equipment to be adopted by Electricity North West. |
| Supervisory Control and Data Acquisition (SCADA) | A computer system that monitors digital and analogue states of plant items in a substation, and reports these back to the control engineer(s) at the DSMC. The control engineer can issue control commands via the SCADA system to the operational plant to remotely operate plant on the Network. |
| Supply Agreement | An agreement between a Generator and an Electricity Supplier. |

4 General Requirements

4.1 Acceptance of Generation onto the Network

Time limits are set to regulate how rapidly Electricity North West must respond, with terms and costs, to an application from a Generator

4.2 Technical Requirements

With exceptions described within this ES, the connection of all Generation shall comply with the relevant current version of the following documents:

Generation, other than Micro-generators - ENA Engineering Recommendation (ER) G99.

Micro-generators - ENA Engineering Recommendation G98.

Electricity Safety, Quality and Continuity Regulations 2002 (ESQCR).

The Distribution Code.

4.3 Generation Arrangements

A Generator may apply to operate Generation in accordance with one of three methods, as described below.

4.3.1 Operation with Alternative Connection to the Network

The Generator shall consume all of his generated power output within his system and have no net export requirement into the Network.

NOTE: Where systems are intended to operate as an Alternative Connection and additionally operate in parallel with the Network, in accordance with [4.3.3](#) below, the requirements associated with both operating methods shall be met.

4.3.2 Micro-generators

The generating units shall be designed for parallel operation with the Network.

4.3.3 Embedded Generation

Generation (other than Micro-generators) operating in with parallel with the Network.

Infrequent short-term paralleling that allows the connection of Generation to the Network for the purpose of maintaining the continuity of supply when changing over from one source of supply to the other shall conform to the requirements of ENA EREC G99, subsection 7.3.

NOTE: Where Generation is designed for infrequent short-term paralleling, all associated switchgear shall be fully rated for the maximum fault level, with the generation operating in parallel. There is no dispensation covering the use of fast-acting transition switches.

4.4 Earthing Arrangements

Earthing shall be provided by the Generator (or at the Generator's expense).

All earthing shall be in accordance with the principles described in ENA EREC G99 or ENA EREC G98 as applicable, dependent on the type of generation.

If the Generation is intended to operate independently of the Network, or the Network provides only a single earth path, eg single LV service or radial HV cable, the installation shall include an earthing system that is provided at the Generator's expense and does not rely upon an earthing terminal provided by Electricity North West.

In the particular case where the Network substation is on the Generator's premises, adjacent to the location of the Generation, and there is more than one earth path from the Network, Electricity North West may allow the substation earthing system to be used in place of a separate independent earthing system.

Generating plant shall not be operated in parallel with the Network while the star point of the Generation or its associated generator transformer, at the voltage of the connection with the Network, is connected to the neutral or earthing system, unless written approval has been obtained from Electricity North West. Such an approval would require precautions to be taken to limit the effects of circulating harmonic currents.

4.4.1 Network Earthing

The 132kV network is directly earthed at multiple locations.

The 33kV network is resistance earthed at bulk supply points (132/33kV substations), some of which operate in parallel with other bulk supply points.

The 11/6.6kV network is resistance earthed at primary substations, some of which operate in parallel with other primary substations.

The LV network is directly earthed and may make use of PME as allowed by The Electricity Safety, Quality and Continuity Regulations 2002.

5 Generation to Operate as an Alternative Connection

This section applies to Generators seeking to operate Generation as an alternative supply to, and not in parallel with, the Network, in order to provide standby in the event of loss of the Network connection. The Generator shall confirm that all of his generated power output will be consumed within his system, and that he has no net export requirement into the Network.

NOTE: Where it is intended to operate for short periods in parallel with the Network to allow for connection of the Generation for the purpose of maintaining the continuity of supply when changing over from one source of supply to the other or for routine load testing of generating units, the requirements associated with the connection of Embedded Generation given in section 7 shall be met in full and in addition to the requirements of this section.

5.1 Notification

When seeking to connect Generation to operate as an Alternative Connection to the Network the following requirements apply.

Applications for such Generation shall be in writing and forwarded to Electricity Connections, Electricity North West Limited, Frederick Road, Salford, M6 6QH.

Applications for such Generation shall be accompanied with the following information:

- Working title of project
- Name and contact details of responsible staff
- Brief description of project
- Site address of generation
- Proposed changeover arrangement
- Proposed earthing arrangement
- Proposed communications arrangements, if applicable

All connection designs shall require the approval of Electricity North West.

5.2 Changeover Requirements

5.2.1 Changeover Operated Other than at LV

Changeover requirements shall be in accordance with ENA EREC G99, clause 7.4.

The recommendation in ENA EREC G99, that two methods of interlocking are used, shall be applied in all instances, unless a break-before-make changeover switch is used.

5.2.2 Changeover Operated at LV

Changeover requirements shall be in accordance with ENA EREC G99, clause 7.4.3.

Electricity North West responsibility is limited to the approval of the type of interlocking system(s) to be used, and the methods of earthing to be adopted. Witnessing of commissioning tests shall only be required in accordance with 7.12.1

The changeover arrangements shall be as described in ENA EREC G99 and shall provide a means of isolation to completely disconnect the Generation from the Network. In addition, interlocking shall be provided to ensure the Generator's installation shall remain disconnected from the Network, while the Generator's installation is connected to any of his generating units.

Changeover devices shall be of 'fail-safe' design so that one circuit controller cannot be closed if the other circuit controller in the changeover sequence is closed, even if the auxiliary supply to any electro-mechanical devices has failed.

If automatic resetting of the protective equipment is used, there shall be a time delay to ensure healthy supply conditions exist for a continuous period of 60 seconds on underground systems and 5 minutes on overhead systems. The automatic reset shall be inhibited for faults on the Generator's installation. Staged timing may be required where more than one generating unit is connected to the same feeder within the Network.

Restoration of Generation operating in standby mode shall comply with the operation and control requirements described in [Table 1](#).

Where Loss of Mains protection, Auto Reclose or Automatic Reconnection is to be implemented, the criteria shall be as described in ENA EREC G99.

5.3 Infrequent Short-term Paralleling

Electricity North West will consider requests from Generators to allow short term paralleling without the installation of a full protection scheme required for permanent parallel operation to maintain continuity of supply when changing over from one source to the other, or for routine load testing of generating units. Permission is at the discretion of Electricity North West and would be subject to implementation by the Generator of the protection requirements of Electricity North West. Further details of the likely technical requirements can be found in ENA EREC G99, subsection 7.3.

5.4 Charges

All work carried out by Electricity North West in the preparation of formal schemes for such work is fully rechargeable to the Generator. Charges for this preparation, including any studies, can be found in the

Statement of Methodology and Charges for Connection to Electricity North West Limited's Electricity Distribution System (Licence Condition 13A).

6 Small Scale Embedded Generation

With exceptions described within this ES, the connection of all Micro-generators shall comply with the relevant current version of ENA EREC G98.

6.1 Connection Arrangements

The connection arrangements for Micro-generators shall comply with the requirements of ENA EREC G98.

6.2 Protection Requirements

The Protection requirements for Micro-generators shall comply with the requirements of ENA EREC G98.

6.3 Notification

Applications to connect Micro-generators, to and in parallel with the Network, shall comply with the connection procedure requirements of ENA EREC G98.

Connection of a single Micro-generators unit, that is compliant with the technical requirements of ENA EREC G98, may be undertaken without prior notification. Notifications shall be sent to SSEGG831@enwl.co.uk

Connection of multiple Micro-generators units, even though the single units are compliant with the technical requirements of ENA EREC G98, that are located in a close geographic region may not be undertaken without prior notification. The Generator shall apply to Electricity North West in accordance with the requirements of [section 5.1.2](#) of ENA EREC G98.

Electricity North West may need to undertake Network studies for Generation connection applications of the type detailed in this section. Charges for these studies can be found in the Statement of Methodology and Charges for Connection to Electricity North West Limited's Electricity Distribution System (Licence Condition 13A).

As provided by an exemption from ESQC Regulation 22 (2) (c) the Generator is required to ensure that the Electricity North West is made aware of any installation of single Micro-generators units within 28 days after the time of commissioning. In the majority of cases the installation of a single Micro-generator unit connected in parallel with the Network will be acceptable with no further arrangements necessary. However, the installer of the apparatus shall in all instances advise Electricity North West of the installation and complete the details required by the online form. This information shall be provided to Electricity North West within 30 days of the Micro-generator unit being commissioned.

The Design and Construction Manager, Statutory Connections shall be the contact for Electricity North West.

7 Embedded Generation

This section applies to Generators seeking to operate Generation (other than Micro-generators) that is designed for parallel operation with the Network. It applies also to Generation, for Operation with Alternative Connection that is occasionally paralleled for short periods of time, for the purpose of maintaining the

continuity of supply, when changing over from one source of supply to the other, or for routine load testing of generating units.

7.1 Connection Application Process

7.1.1 General

On initial application, the Generator, or his appointed agent, shall advise Electricity North West whether it requires a Statutory Connection or a Competitive Connection. Further information regarding the Statutory Connection and Competitive Connection options can be found in the Statement of Methodology and Charges for Connection to Electricity North West Limited's Electricity Distribution System (Licence Condition 13A).

A Generator wanting to connect Generation with an export capacity of 50MW or greater shall also apply to National Grid Electricity Transmission under the terms of the 'Connection and Use of System Code' (CUSC). It is the responsibility of the prospective Generator to make this application.

7.1.2 Application to Connect Embedded Generation

In addition to the general requirements, applications to connect Embedded Generation in parallel with the Network shall comply with the following requirements.

All applications to connect Generation in parallel with the Network shall be submitted to the Electricity North West Design and Construction Manager, Statutory Connections or such person nominated on his behalf.

Applications to connect Generation, shall be submitted on the standard application form, according to the size of the output, to be found at: <http://www.enwl.co.uk/our-services/connection-services/generation>

Electricity North West will need to undertake Network studies for all Generation connection applications, except those applying for connection of MICRO-GENERATORS, which do not form part of a multiple installation programme. Indicative charges for these studies can be found in the Statement of Methodology and Charges for Connection to Electricity North West Limited's Electricity Distribution System (Licence Condition 13A).

7.2 Data Requirements

In order to undertake Network studies for Generation connection applications, Electricity North West uses ENA ER G74 for calculating short circuit currents on the Network and assumes induction motor infeeds in accordance with that document. To provide the necessary input for these calculations:

- If the rating of the Power Generating Module that you are applying to connect is greater than 16A per phase and less than 17kW (or less than 50kW three phase), use Form A.1 in Engineering Recommendation G99.
- For Generation whose output is less than 5MW the Generator shall provide the data required in standard application form, available on the Energy Networks Association website.

NOTE: When considering a new Generation connection, Electricity North West uses a zero operating margin, ie equipment may be operated where the prospective short circuit current is less than or equal to 100% of the rating of the equipment. In considering ratings of plant, Electricity North West utilises continuous ratings in those cases where Generation has a significant effect on power flow.

7.3 Connection Agreement

Before commencing operation of the Generation, the Generator and Electricity North West shall complete a Technical & Operating Agreement and Responsibility Schedule.

The form of the Technical & Operating Agreement is shown in [Appendix B](#).

A sample Responsibility Schedule and typical interface drawings are shown in [Appendix C](#).

Any constraints or requirements that may be identified in the planning process shall be entered into the Technical & Operating Agreement.

7.4 Charges

A Generator will be liable for charges to cover:

- Scheme preparation, including the calculation of load flow, Fault Level and electrical losses and the assessment of the effect of the Generation on Network reinforcement requirements (see [section 7.4.1](#)).
- Cost of the work to be done and equipment to be installed to provide the connection and, where necessary, to maintain the security of the Network (see [sections 7.5 to 7.11](#)).
- Contribution to reinforcement costs through Generator Distribution Use of System charges (see [section 7.4.2](#)).
- Contribution to the costs of operation, repair and maintenance through Generator Distribution Use of System charges (see [section 7.4.2](#)).
- Attendance at Generation commissioning tests (see [section 7.12](#)).
- Installation and operation of suitable telemetry (SCADA) equipment, where required (see [section 7.5](#)).

7.4.1 Scheme Preparation

Electricity North West will undertake a Network study for all Generation connection applications. The study is required to investigate whether the power, which a Generation facility can deliver, may be accepted at the proposed Point of Connection (over the range of daily and annual load variations within the part of the Network affected, within limits of Network control acceptable to Electricity North West). Electricity North West will charge a Generator for the provision of Network studies on acceptance of the terms for connection. A Network study needs to be carried out regardless of the voltage of connection. The charge also includes a Fault Level study where one is necessary. A Fault Level study is required to investigate whether all the Network components, including protective devices, will perform correctly and within their capabilities under the most severe fault conditions with the Generation facility connected at the proposed point. A Fault Level study needs to be carried out for any proposed Generation facility for connection at 6.6 kV or more. A range of indicative charges for Fault Level studies is obtainable from the Design and Construction Manager, Statutory Connections.

Where the study indicates that reinforcement of the Network is necessary to allow connection of the Generation, the reinforcement work is the responsibility of Electricity North West and is classed as a non-contestable activity. The Generator shall pay the proportion of the reinforcement costs as outlined in the 'Charging Methodology and Charges for Connection to Electricity North West's Electricity Distribution System' (Licence Condition 4B Statement).

7.4.2 Generator Distribution Use of System Charges (GDUoS)

Electricity North West will charge the Supplier for GDUoS for SVA metered sites and the Generator for CVA metered sites. Charging guidance from Ofgem has been adopted by Electricity North West. The Generator Distribution Use of System charges allow Electricity North West to recover either from the individual generator or the population of generators. Details may be found in Electricity North West's Statement of Charging Methodology for Use of Electricity North West Limited's Electricity Distribution Network - Licence Condition 4 Statement.

7.4.2.1 Generators Connected Prior to 1 April 2005

No Generator Distribution Use of System charges will be levied in relation to generators connected prior to 1 April 2005, unless such a Generator makes a significant alteration to his installed generation capacity. Only the incremental increase in capacity will be charged Generator Distribution Use of System.

7.4.2.2 Electricity Distribution Use of System Rebates

Electricity North West currently is not proposing to provide a rebate to Generators.

7.5 Managed Connections

All new connections where Generation installed capacity exceeds 200kVA for synchronous or 500kVA inverter connected / asynchronous shall be based on Generators exporting to an intact Network only (n-0), unless the Generator chooses to pay for a more secure connection arrangement. These connections shall be Managed Connections. Electricity North West shall have the facility to either disconnect Generators or curtail their output in response to network outages or abnormalities. This disconnection or curtailment shall be achieved automatically in response to any relevant Network outage. A relevant Network outage is a planned or unplanned outage to Network affected by the Generation and will be defined at the planning stage. Relevant Network may be at a voltage higher than the point of connection voltage. Generation shall automatically be inhibited from reconnecting or exporting until the network is restored to normal, intact conditions. Schemes shall be designed such that reconnection times defined in ER G59 may be achieved automatically once the Network is restored to normal conditions. The maximum reconnection time following restoration of the Network to normal conditions shall be 180 seconds.

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7.6 Standard Connection Arrangements

Electricity North West shall provide only one Point of Connection for the Embedded Generation site.

7.6.1 Generation Connected to the LV Network

The connection arrangement will depend upon the import and export capacity requirements of the installation. As an approximate guide, a single-phase service connection from the LV network can be expected to provide a maximum import or export capacity of 20kVA, a three-phase service connection a capacity in the range 20kVA to 300kVA and a direct connection from a substation on or immediately adjacent to the

Generator's premises a capacity in the range 200kVA to 1MVA. However, in all instances the Generator shall provide as part of his installation a Generator circuit breaker.

Where connection is provided from an Electricity North West LV circuit breaker this circuit breaker shall not be operated by the Generator's protection.

7.6.2 Generation Connected to the 132/33/11/6.6kV Network

The Point of Supply will normally be the bolted connections in the outgoing cable box of a single circuit breaker (or switch-fuse), which provides the interface between the Network and the Generator's network. The normal arrangement will allow the circuit breaker (but not a switch-fuse) to be tripped from the Generator's protection. However, such a circuit breaker shall not be used by the Generator for the purposes of synchronising his generating unit(s) with the Network. Electricity North West will carry out a risk assessment on the duty on the circuit breaker and the protection and, where this is unduly arduous, Electricity North West may require the Generator to install a circuit breaker in series, controlled by the Generator's protection system.

NOTE: The use of a Pole Mounted Recloser instead of a ground mounted circuit breaker is not currently permitted. This position will be reviewed on the outcome of trials to assess the viability of using a Pole Mounted Recloser as a metering circuit breaker.

All new generation with an installed capacity exceeding 200kVA (synchronous) or 500kVA (inverter / asynchronous) connected to the 132/33/11/6.6kV network shall be controlled by a circuit breaker that can be operated by the Electricity North West SCADA system. This shall be designed so that the Generator can operate as a Managed Connection. A representation of the functional requirements is illustrated in [Appendix E](#).

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The following network data measured at the circuit breaker shall be provided to the SCADA system:

- (a) Directional real and reactive power flow
- (b) Directional current flow
- (c) Network voltage
- (d) Circuit breaker status

Real and reactive power flows, current and voltage data shall be configured so that historic half hour average values can be viewed in ENW's Network Management System (NMS) and Feeder Load Analysis. This data and the circuit breaker status shall also be visible in real time by Control Engineers.

The design and operation of the telecontrol and related equipment shall be included within the Technical & Operating Agreement.

All telecontrol and related equipment shall utilise DNP3 over IP or IEC60870-5-104 protocol. Input / Output mapping shall be compatible with ENW's SCADA system. Further guidance is provided in CP 320 SCADA Input / Output Data Standards.

The installation of any telecontrol or related equipment is contestable work. Connection of the outstation into ENW's SCADA system and final commissioning shall be non-contestable work.

The communications method to the ENW SCADA system shall be via GPRS/3G on ENW's private APN (Access Point Node), or via a currently available communications method which is approved for connection to the system.

Unless the emergency trip facility, referred to in [7.13](#), disconnects the whole of the Generator's installation (by tripping the Network interface circuit breaker at the Point of Supply), the Generator will require an additional emergency trip facility, which will disconnect the whole of his installation. This Generator's emergency trip is in order to enable the Generator to comply with the Electricity at Work Regulations 1989 and will normally include a trip button at the Point of Supply. Any remote emergency trip button, in addition to the emergency trip button located at the Point of Supply, shall be provided at the Generator's expense, with the following requirements:

- (a) This trip facility shall operate an interposing relay that shall be located adjacent to the emergency trip button at the Point of Supply. The relay shall have the following features:
- (b) A flag indicator to indicate operation of the remote emergency trip button.
- (c) Clean pairs of contacts, one normally closed and one normally open.
- (d) A lockable relay case suitable for accommodating an Electricity North West provided lock.
- (e) For connection provided by an 11/6.6kV switch fuse the remote trip facility shall be manually operated. Switch-fuses are not rated to break fault current (except by means of the fuses) and, therefore, no automatic trip facility, which might operate to clear a fault, is acceptable.

Alternative connection arrangements agreed between Electricity North West and the Generator are acceptable. In each case, a Site Responsibility Schedule shall be drawn up. Examples of such a Schedule and connection layouts are shown in [Appendix C](#).

7.7 DC Supply

Where the connection is at 6.6kV or higher voltage and both Electricity North West and the Generator require a DC supply for protection or control purposes, the parties may agree that only one battery is necessary, for the purposes of both. In that case, Electricity North West will provide the necessary battery and charger and be responsible for their monitoring and maintenance. The low voltage (240V) supply to the charger will be derived from the permanent wiring installation within the substation. It is normally expected that this supply will be provided from the Generator's electrical installation. In any particular case, all these responsibilities shall be set out in the Site Responsibility Schedule.

NOTE: Electricity North West may provide a fused supply from the battery at the request of the Generator, provided that DC circuits are not extended outside the site boundary, that the drain imposed on the battery by Generator's equipment is fixed and specifically agreed, and that the battery charger is fitted with an alarm connected to the Electricity North West' telecontrol system (where connected). However Electricity North West will recover any costs associated with a failure of the battery charger as a result of any failure on the Generator's system.

7.8 Means of Isolation

Permanent notices, fixed at the Point of Supply, shall draw attention to the existence of Generation, arranged for parallel operation, and shall describe the nature and location of the Means of Isolation of the Generation.

The Means of Isolation shall normally be under the ownership and control of the Generator, who shall provide safe access Electricity North West staff, for the application and removal of operational locks.

Means of Isolation shall be arranged as further described in ENA EREC G99, clause 14.2.

Where Generation operates in parallel with the Network, the switchgear controlling the Point of Supply shall carry the warning label - "PARALLEL GENERATION - CONFIRM GENERATION DISCONNECTED FROM THE POINT OF SUPPLY BEFORE OPENING OR CLOSING".

The Generator shall grant Electricity North West a right of access to the Means of Isolation without undue delay. In default Electricity North West shall have the right to disconnect the Generator's infed from the Network at any time, if required by conditions on the Network.

7.9 Protection

The protection requirements for Embedded Generation (other than MICRO-GENERATORS) are defined in ENA EREC G99, section 10.

7.9.1 Protection Settings

It is the responsibility of the Generator to determine the correct protection settings and submit them to the Electricity North West Design and Construction Manager, Statutory Connections or such person nominated on his behalf for agreement prior to testing or commissioning.

For LV Generation under 150kVA the settings shall generally be as shown in ENA EREC G99 subsection 10.5.7. Any additional settings shall be referred to Electricity North West for agreement prior to testing or commissioning.

Where a Generator wishes to operate in standby mode in the event of loss of the Network connection, refer to [sub-section 5.3](#).

7.10 Metering Requirements

The Generator is required to enter into a Supply Agreement.

It is the responsibility of the Generator, through his Supplier, to arrange for appropriate metering and all associated facilities to be installed. The cost of installing or adapting metering equipment shall be borne by the Generator.

Export metering shall be accurate to 0.5% real power (MWh) and 1.0% reactive power (MVarh).

The appointed Supplier shall ensure that a Meter Point Administration Number (MPAN) is registered.

The Generator shall notify the Electricity North West' Design and Construction Manager, Statutory Connections or such person nominated on his behalf of the registered MPAN. Connection to the Network cannot be energised until the Design and Construction Manager, Statutory Connections has been notified.

7.11 Disturbance and Interference

Criteria shall be as described in ENA EREC G99.

7.12 Power Factor

Power Factor correction shall be as described in ENA EREC G99.

7.13 Testing, Commissioning and Compliance

EREC G99 introduces a suite of new technical requirements, largely from the Requirements for Generators. Generators are responsible for demonstrating compliance with these requirements, and EREC G99 allows different methods to demonstrate compliance. These include type testing, witnessed testing, equipment certification, manufacturer's information, simulation studies, or any combination of these. The commissioning and compliance processes in EREC G99 vary according to the rating of the Power Generating Module, and references are provided below. New connections shall comply with the procedures detailed in EREC G99 in all times.

Power Generating Modules with rating greater than 16A per phase but less than 1MW shall be commissioned in accordance with EREC G99 Annex A subsection A.2.

Power Generating Modules with a rating of 1MW or greater shall be commissioned in accordance with Annex B subsection B.2. Generators shall describe the commissioning regime within the Power generating Module Document (PGMD). The PGMD defines how the Generator will demonstrate compliance with each individual requirement of EREC G99, either by type testing, witness testing, equipment certification, simulation study, or manufacturer's information.

Power Generating Modules with a rating of 10MW or greater shall be commissioned in accordance with Annex C subsection C.2. Generators shall describe the commissioning regime within the Power generating Module Document (PGMD). The PGMD defines how the Generator will demonstrate compliance with each individual requirement of EREC G99, either by type testing, witness testing, equipment certification, simulation study, or manufacturer's information.

Where required by the PGDM, tests on the protective equipment shall be carried out to the satisfaction of Electricity North West. These tests are the responsibility of the Generator and shall be carried out by him. The tests shall be witnessed by a representative of Electricity North West, unless, in any particular case, Electricity North West has notified the Generator that such witnessing is not required. Witness testing of LV connections is not required except for changeover type connections with a total generator nameplate capacity in excess of 100kVA.

Other than type tests, all tests shall be carried out on site. Tests performed before delivery and installation are not acceptable.

The Generator shall keep a written record of all protection settings and of test results. A copy of the protection test results and settings shall be available for inspection near the Point of Supply.

Periodic testing of the protection by the Generator is recommended at intervals not exceeding two years.

7.14 Communications

Electricity North West shall provide the Generator with (an) appropriate 24-hour emergency telephone number(s) and contact details.

The Generator shall provide Electricity North West with the names and telephone numbers of “Authorised Persons” at least one of whom shall be available at all times, while Generation is operating in parallel with the Network, and have the capability to arrange the attendance on site of a person with the authority to act to the instruction of the Electricity North West control engineer at the DSMC within one hour of a request.

Where it is deemed necessary, the Generator shall provide a telephone, at or near to the Point of Supply, but agreement to use mobile phone(s), for example, can be considered as a suitable alternative. All appropriate contact details shall be clearly available on site to both the Generator’s staff and Electricity North West staff, and at DSMC (to be kept up to date).

Where Generation is to operate in parallel with the Network during times when the Generator does not have an Authorised Person on site, a fail safe emergency trip facility, arranged to disconnect the Generation from the Network, with lockable reset, to which Electricity North West has access, shall be provided. A suitable layout and wiring diagram is included in [Appendix D](#).

Network studies may have shown the necessity to install SCADA equipment to disconnect the Generator at very short notice (within ten minutes).

NOTE: Even where Electricity North West has control of the Generation, as described in [7.13](#), the need for the one-hour attendance condition in [7.13](#) cannot be waived, as attendance for isolation may be required.

7.15 Operational Requirements

Where design considerations indicate that the system to be operated in parallel with the Network could affect the safe operation of the Network (e.g. voltage, Fault Level, circuit capacity, circuit configuration etc), no operations may be carried out on the Generator’s installation without the prior agreement of the appropriate Electricity North West control engineer, irrespective of the size, type or operating voltage of the Generation.

In all other cases, control and operation requirements normally shall be in accordance with [Table 1](#).

7.15.1 Synchronising Criteria

Criteria shall be as described in ENA EREC G99, such that the voltage fluctuation on the Network during synchronising shall not normally exceed 3% at the Point of Common Coupling. However, where the mode of operation of generation is such that synchronising of a machine or machines will occur at intervals of less than two hours, the voltage fluctuation during synchronising shall not exceed 1%.

7.15.2 Work on Equipment

Work on the Network equipment at the interface between Electricity North West and the customer’s equipment shall be carried out strictly in accordance with Electricity North West Distribution Safety Rules.

Where busbars at the Point of Supply or all Network circuits associated with parallel Generation are taken out of service either under planned or fault conditions, one point of isolation shall always be at the Generator’s protective device closest to the Point of Supply. This shall generally be the first point of isolation to be

established and the last to be restored. No operation of the circuit breaker, switch or fuse links at this point shall be carried out until the operator is satisfied that the Generation is not connected to that circuit breaker, switch or links.

Where control contact is required, this shall be person to person. Electronic signalling is not an acceptable communication medium.

Table 1 – Embedded Generation Control and Operation Requirements

| TYPE OF GENERATION | OPERATIONS TO ELECTRICITY NORTH WEST CONTROL ENGINEERS INSTRUCTION | |
|---|--|---|
| | IN/OUT ^[1] OF SYNCHRONISM | EMERGENCY DISCONNECTION ARRANGEMENT REQUIRED ^[2] |
| Running in parallel to meet Customers requirements only. Only nominal export to Electricity North West controlled by reverse power protection | | |
| (a) Synchronised at LV | No | Yes ^[3,4] |
| (b) Synchronised at 132/33/11/6.6kV | Yes | Yes |
| Running in parallel to meet own demand with capability to export Generation capacity to Electricity North West or running in parallel for export purposes only. | | |
| (a) LV Customer Generation <400kVA | No | Yes ^[3,4] |
| (b) LV Customer Generation >400kVA | Yes ^[5] | Yes ^[3,4] |
| (c) 11/6.6kV Customer Generation <1.5MVA. Synchronised at LV | No | Yes |
| (d) 11/6.6kV Customer Generation >1.5MVA. Synchronised at LV | Yes | Yes |
| (e) 132/33/11/6.6kV Customer Generation. Synchronised at 132/33/11/6.6kV | Yes | Yes |

NOTE:

- (a) There are circumstances whereby Electricity North West may remove the requirement for the synchronising to be carried out under the instruction of a control engineer subject to a formal risk assessment.
- Possible situations are:
- Where synchronising is required several times per day.
 - The circuit breaker is not controlled by a SCADA outstation.
 - Protection is provided to prevent closure when out-of-synchronisation.
- (b) In an emergency a Generator's authorised person may open a circuit breaker, switch or fuse links without prior agreement in order to avoid danger.
- (c) Communication with Generator's authorised person shall be provided so that attendance at site by a Generator's representative with the authority to act to the instructions of the Electricity North West control engineer can be achieved within 1 hour of the request, at any time, while the Generation is operating in parallel with the Network.
- (d) A suitable emergency trip button with lockable reset facility shall satisfy the control requirements in this case.
- (e) This refers to the paralleling with the Network of the first generating set of multi-generating set installation and breaking parallel of the last set on disconnection from the Network.

7.16 Outage Constraints

Where the Network connection comprises a single circuit at LV or HV, the export will be intrinsically constrained to zero in the event of an outage of that circuit.

Where the Network connection is such that alternative circuits are normally available, the export capacity may be constrained to that available after a first circuit outage.

In appropriate circumstances Electricity North West might accept an export capacity in excess of that described in [7.15](#) above. However, in such a case, automatic means shall be provided, at the expense of the Generator, to ensure that, in the event of an outage, the actual export is constrained to an appropriate level and within an appropriate time.

7.17 As Installed Records

The Generator shall submit to Electricity North West for approval and then display at the Point of Supply, the following up to date information, as required by ENA EREC G99:

A Network diagram showing all electrical infeeds and limits of demarcation.

A schedule showing who controls and maintains the electrical plant, who is the occupier and whose safety rules shall apply (i.e. Responsibility Schedules).

A schedule of agreed protection relays and their normal settings.

The method of communications between Electricity North West and the Generator (and shall include any relevant telephone numbers).

Any changes to the above shall be agreed with Electricity North West before implementation.

A sample Responsibility Schedule and typical Interface Diagrams are shown in [Appendix C](#).

8 Competition in Connections

8.1 General

With the introduction of competition for the provision of connections, Electricity North West distinguishes between those activities that must be carried out by Electricity North West (or its agents) and those activities that may be done by other approved parties. Those activities that remain the responsibility of Electricity North West are classed as non-contestable and those activities that may be carried out by Electricity North West or other approved parties are classed as contestable.

8.2 Statutory Connection or Competitive Connection

A Generator may choose to request Electricity North West to provide his connection, in which case the connection is classified as a Statutory Connection. The provision of a Statutory Connection may include reinforcement works to the Network.

Alternatively, the Generator may request an Independent Connections Provider to provide his connection, in which case the connection is classified as a Competitive Connection. The provision of a Competitive Connection may require reinforcement works to the Network, but as the reinforcement is classified as non-contestable, this work may only be undertaken by Electricity North West (or its agents).

8.3 Provision of Information

When an Independent Connections Provider (or third party) acting on behalf of the Generator requests a Competitive connection from Electricity North West, then Electricity North West shall determine:

- Point of Connection; and
- Reinforcement assets (i.e. those existing assets that are in need of reinforcement for the provision of the connection), where applicable. These are generally referred to the non-contestable works. In addition, any 'Reinforcement Re-apportionment Charge' from reinforcement assets provided for under previous projects relating to the site.

8.4 Adoption

When Electricity North West adopts the extension, assets constructed by the Independent Connections Provider the contractual arrangements between the Generator, the Independent Connections Provider and Electricity North West shall be governed by an Adoption Agreement, which specifies the terms under which Electricity North West will adopt the new assets installed by the Independent Connection Provider.

8.5 Customer Contribution

The cost of providing any new connection relating to an extension to the Network shall be payable in full by the Generator. This can be in the form of a customer contribution to Electricity North West relating to a Statutory Connection or a payment to an Independent Connection Provider.

Capitalised Operation and Maintenance, on the excess costs of a scheme (that which is above the minimum design cost scheme), shall be payable in full by the Generator for a Statutory Connection and by the Independent Connection Provider for a Competitive Connection.

Other charges, including those for Point of Connection provision, design approval, inspection and monitoring, final connection (initial jointing and energisation) and the witnessing of commissioning tests, shall be payable in full by the Generator for a Statutory Connection and by the Independent Connections Provider for a Competitive Connection.

9 Documents Referenced

| DOCUMENTS REFERENCED | |
|--|---|
| Energy Act 1983 | |
| Electricity Act 1989 | |
| Electricity Safety, Quality and Continuity Regulations 2002 | |
| Electricity at Work Regulations 1989 | |
| The Distribution Code | The code produced by the licensed Distribution Network Operators of Great Britain (a copy of which is available free of charge from the Distribution Code website, www.dcode.org.uk or alternatively a paper copy is available for £50 plus packing, postage and VAT from the Electricity Commercial Policy, Electricity North West). |
| The Grid Code of England and Wales | Connection and Use of System Code (CUSC). |
| Electricity North West Limited's Electricity Distribution Licence | Statement of Charging Methodology for Use of Electricity North West Limited's Electricity Distribution Network (Licence Condition 4 Statement). |

| | |
|--|---|
| Electricity North West Limited's Electricity Distribution Licence | Charging Methodology and Charges for Connection to Electricity North West's Electricity Distribution System' (Licence Condition 4B Statement). |
| ENA Engineering Recommendation G59/2 | Recommendations for the Connection of Generating Plant to the Distribution Systems of Distribution Network Operators. |
| ENA Engineering recommendation G74 | Procedure to Meet the Requirements of IEC909 for the Calculation of Short-circuit Currents in Three-phase AC Power Systems. |
| ENA Engineering Recommendation G83/2 | Recommendation for the Connection of Small-Scale Embedded Generators (up to 16A per phase) in parallel with the Public Low-Voltage Distribution Networks. |

10 Keywords

Connection; Earthing; Generation; Generator.

Appendix A – Generation Standard Application Form

Refer to the energy networks association’s website for the current version of the standard application form.

Appendix B

REPLACE TEXT IN ITALICS WITH DETAILS SPECIFIC TO THE PARTICULAR JOB

TECHNICAL & OPERATING AGREEMENT

FOR THE OPERATION OF PRIVATELY OWNED GENERATION IN PARALLEL WITH THE ELECTRICITY NORTH WEST DISTRIBUTION SYSTEM

THIS AGREEMENT is made the DATE day of MONTH, YEAR BETWEEN Insert Generator's name here ("the Generator"), and whose Registered Office is at Address and Electricity North West Limited ("Electricity North West") whose Registered Office is at 304 Bridgewater Place, Birchwood Park, Warrington, WA3 6XG

B1 Definitions

In this Agreement the following words and phrases have the following meanings:

"the Distribution Network Services Provider" ("the DNSP") means Electricity North West and its successors;

"the Generator" and "Electricity North West" include their successors in title respectively to the Generating Plant and to the terminals of the electrical apparatus on the Electricity North West electricity distribution network to which the Generating Plant is connected;

"the Generating Plant" is the plant specified in [Schedule 1](#) of this Agreement;

"Statutory Requirements" are: -

the Electricity Safety, Quality and Continuity Regulations;

the Electricity at Work Regulations 1989;

the Health and Safety at Work Act 1974 and any Regulations and Codes of Practice made thereunder;

the Electricity Act 1989 [and any predecessor statutes currently in force].

The Distribution Code

B2 Context of this Agreement

The Generator proposes to operate the Generating Plant at his premises at *Insert Generator's address here* in parallel with the Electricity North West electricity distribution network.

B3 Parties' Obligations

The means of synchronisation between the separate sources of energy shall be *Insert means here*.

The compatibility of the means of connecting those sources with earth shall be: - *Phrases such as in accordance with EREC G99 (actual details shall comply with EPD259, CP259 and associated Engineering Recommendations) and then details listed below:*

Electricity North West's Earthing system.

Customer's Earthing system.

The following records of plant maintenance and failure :-

Routine maintenance, plant failure

Routine protection testing and maintenance, in accordance with the requirements of G59/2 (actual details shall comply with EPD259, CP259 and associated Engineering Recommendations)

shall be made and kept by *Insert Generator's name here*, (The Generator).

The following means of connection and disconnection are to be employed (manual, automatic and emergency).

Wording as necessary along the following lines: Manual - for routine operations

Automatic - for fault disconnection and planned connections.

Emergency - by protection in accordance with G59/2 protection and emergency trip button

The following are the "reasonable precautions" which the Generator is to take to ensure continuance of safe conditions if any neutral point connected with earth in any apparatus operated by him at high voltage becomes disconnected from earth.

Wording as necessary along the following lines: Protection in accordance with Engineering Recommendation G59/2 (actual details shall comply with EPD259, CP259 and associated Engineering Recommendations).

The Generator shall at all times ensure that no apparatus used by him introduces or promotes a level of harmonics or voltage fluctuations into the Electricity North West electricity distribution network such as to cause damage, loss or inconvenience to Electricity North West or any of its customers.

THE FOLLOWING PARAGRAPH CAN CAUSE LEGAL PROBLEMS. IF CHALLENGED, IT CAN BE REMOVED, AND RELIANCE MADE ON THE CONNECTION AGREEMENT. CHECK THAT THE CONNECTION AGREEMENT IS ADEQUATE!

The Generator shall indemnify Electricity North West and its customers against any loss, damage or injury arising from the operation of the Generator's Generating Plant: except to the extent that such loss, damage or injury has been caused or contributed to by the negligence of Electricity North West.

The Generator agrees to operate his plant at all times without undue or improper interference with the supply to other customers of Electricity North West and in the event of such interference to remove his equipment from the interconnected electricity distribution network at the request of Electricity North West without delay.

The requirements of these clauses are detailed in the Connection Agreement between *Insert Generator's name here* and Electricity North West.

Whilst the Generator is operating his Generating Plant in parallel with the electricity distribution network, the Generator shall:-

Operate his system in accordance with the appropriate Statutory Requirements;

Comply with such of the DNSP's operating rules and procedures as have been communicated to him and are relevant;

Establish and operate rules and procedures governing the safe operation and maintenance of his electrical system and the means of connecting that system to the electricity distribution network;

Ensure that all persons carrying out operations on any part of his electrical lines are authorised persons and competent to carry out such operations;

Ensure that there are adequate and reliable means of communication with any interconnected owner;

Inform any interconnected owner of any condition, occurrence or incident which could affect the safety of that owner's personnel or the maintenance of his lines or apparatus and shall make and keep records of such information, and when it was communicated, and by, and to whom;

Designate persons with authority to act and communicate on his behalf and inform every interconnected owner of the names of the persons so designated and where they may be reached;

Arrange for the attendance at site of a person with the authority to operate his equipment in an emergency within one hour and keep appropriate records of such operation and of the nature of the emergency;

Ensure that, in respect of every source of energy, there is a manually operated means of disconnection; and that the settings, if any, on any automatic means of disconnection at any part of interconnection shall not be altered without the express agreement of the owner of any lines interconnected at that point;

Ensure that electric lines under his control are capable of withstanding the prospective fault current associated with all sources of energy;

Take all reasonable precautions to limit the occurrence and effects of circulating currents in respect of the neutral points connected with earth of any interconnected electricity network;

Ensure that there are displayed at the Point(s) of Supply or, if that is impracticable, at the nearest most appropriate place:-

A diagram showing all electrical infeeds and the limits of responsibility of, or control by, the respective owners;

A schedule showing by whom all apparatus connected to any of the lines so interconnected is controlled and maintained;

A schedule of agreed settings on any automatic means of disconnection;

A description of the method of communication between persons designated for the purpose of Clause 3.9.5;

The above to be submitted for agreement by the DNSP prior to display; and

Inform the DNSP of any condition of particular incident, which could affect the safe operation, or maintenance of any electrical plant, which forms part of the electricity distribution network.

The Generator will not connect any additional (power factor correction) capacitors to his system without prior notification to the DNSP and the re-setting of the protection at the Point of Supply.

B4 The Following Operational Conditions Apply:

(restrictions on operations, control requirements etc.)

Insert/modify the following clauses & schedules as necessary.

The Generator shall contact the DNSP control engineer before making/breaking parallel with the electricity distribution network.

The Generator shall contact the DNSP control engineer before switching in the first generating unit and before switching out the last generating unit.

B4.1 Fault Level Control

Prior to synchronising any of the *generating units*, the Generator shall contact the DNSP control engineer to ensure that arrangements are in place for Fault Level control.

Other operating arrangements may be applied by the DNSP control engineer depending on the requirements of the electricity distribution network.

B4.2 Export into the Electricity Distribution Network

Electricity North West's electricity distribution network at the point of common connection does not have sufficient capacity to enable any export at normal operating conditions.

Any level of export will require to be agreed with the DNSP's Distribution System Management Centre (DSMC).

B4.3 24 Hour Contact

DSMC.

See [schedule 2](#)

Insert Generator's name here.

See [schedule 2](#)

B4.4 Routine Maintenance Contacts

DNSP

See [schedule 2](#)

Long Term

See [schedule 2](#)

Insert Generator's name here

See [schedule 2](#)

B4.5 Agreed Export Capacity:

Details as per [schedules 3](#).

B4.6 Agreed Import Capacity:

Details as per [schedule 3](#)

Circuit State Certificate (CSC) will be used for operations at the control interface.

B4.7 Control & Ownership Boundary

Outgoing busbar connections in Electricity North West xxkV circuit breaker at *Insert relevant substation*

Load details (Amps, MW, MVar) and circuit breaker indications are available on the Electricity North West xxkV cb at *Insert Substation name here*

G59/2 protection will trip *Insert Generator's name here* circuit breakers associated with the Gas Turbines. The G59/2 protection settings as agreed between Electricity North West and *Insert Generator's name Plc.* are as per [schedule 4](#).

Details of Generating Plant given in [schedule 1](#) (attached).

Operational requirements at the *Insert Generator's name here* substations are covered in [Appendix 1](#).

The schematic arrangement is shown as per Attached Drawing No *09-A3-xxxx-xxxx*.

B4.8 Island Mode

Include paragraph here with details of island mode, synchronising etc.

Signed..... Date..... on behalf of Electricity North West.

Signed..... Date..... on behalf on *Insert Generator's name plc.*

Schedule 1 – Schedule of Generating Plant (to include number, rating, voltage, frequency, method of synchronisation etc.)

| GENERATING UNIT | NO 1 | NO 2 | ETC |
|--|------|------|-----|
| Rating (MVA) | | | |
| Voltage (kV) | | | |
| Frequency(Hz) | | | |
| Synchronisation (also on T11 & T12 11kV CBs) | | | |
| Power Factor | | | |
| Prime Mover | | | |
| Alternator Type | | | |

Schedule 2 – Communication Between Insert Generators Name Here and the DNSP

| CONTROL ENGINEERS/ CUSTOMERS AUTHORISED PERSONS | MON/FRI 08.30/17.00 | | WEEKENDS & OUT OF HOURS | |
|--|---|---------------|---|---------------|
| | Telephone Number | Fax Number | Telephone Number | Fax Number |
| Control/Operations Control Engineer | 0161 236 3615 | | | |
| | 132/33kV 08433113477 | | | |
| | Ashton 08433113471 | | | |
| | Bolton 08433113472 | | | |
| | Carlisle 08433113473 | 0161 247 0020 | 0161 236 3615 | 0161 247 0020 |
| | Kendal 08433113474 | | | |
| | Manchester 08433113475 | | | |
| Preston 08433113476 | | | | |
| <i>Insert Generator's Name</i> | | | | |
| Maintenance Short Term Operational Planning Engineer | 0161 236 00130161 236 0012 0161 236 0010 | 0161 247 0066 | 0161 236 0013 0161 236 0012 0161 236 0010 | 0161 247 0066 |
| <i>Insert Generator's Name.</i> | | | | |

| | | | | |
|--------------------------------------|--|----------------------|--|----------------------|
| | | | | |
| Long Term | | | | |
| Operational Planning Engineer | | | 0161 236 0013 0161 236 0012 0161 236 0010 | |
| <i>Insert Generator's name</i> | 0161 236 0013 0161 236 0012 0161 236 0010 | 0161 257 0066 | | 0161 247 0066 |

Schedule 3

As in Appendix B of the “Contract for the provision of an xxkV Point of Supply (Exit Point) for *insert name and address of connectee here.*”

Agreed Export Capacity

xx MVA. Subject to Para 4.4. (*for example*)

Agreed Import Capacity

xx MVA.

Generation operated by *insert generator’s name and address*

1 x machine A

1 x machine B

etc

Normal Operating Regime

At the xxkV substation.

T11 & T12 transformer cbs closed.

Bus-section cb closed – for example

Voltage Control

Insert wording such as:

The voltage control regime should be agreed between the generator and DSMC with the objective of avoiding interactions between the generator’s AVR and the transformer AVC.

The generator’s Automatic Voltage Control and transformer tap position should be arranged to limit VAR imports, subject to generation capability, and may be set in either:-

(a) Constant voltage mode with transformers Txx & Txy on manual control

or

(b) In constant power factor mode with transformers Txx & Txy on automatic control

Schedule 4

G59/2 Protection as agreed between *Insert Generator's name* and Electricity North West.

Over Voltage

Under Voltage

Under Frequency

Over Frequency

Rate of change

of frequency

or

Vector Surge

Schedule 5

Electricity North West's 33/11kV Transformer Protection at *insert connectee's substation name* Substation

insert details such as:

- *pole, 2 stage 33kV overcurrent protection, voltage - controlled from the 11 kV electricity distribution network (Relay type GEC MCVG61).*
 - *Stage 1 trips the 11 kV transformer circuit breaker.*
 - *Stage 2, as stage 1 times plus a fixed time delay, trips*
- *the 33kV supply to the transformer.*
- *600/400/1 33kV C.T. ratio - settings to be advised.*
- *pole 11 kV directional overcurrent and earth - fault protection.*
- *1200/5 11kV CT ratio - settings to be advised.*
- *kV transformer - neutral standby earth fault protection.*
- *1000/5 Amp. 11 kV CT ratio - settings to be advised.*

NOTE: For example:

Both T11 and T12 11kV transformer circuit breakers can be tripped via intertrip receive relays from the customer's protection scheme and / or emergency trip button facility.

There is a one shot auto reclose scheme associated with the 33kV supply to T11 transformer. Provided any 33kV-line fault is transient, T11 transformer will automatically resume service.

Both T11 and T12 have HV and LV restricted earth fault protection schemes.

Appendix 1 to the Technical and Operating Agreement

Operational Requirements for Electricity North West / *Insert Generator's name* interface at

Insert Substation name xxkV substation

General

The DNSP shall prepare and agree with *Insert Generator's name* a Responsibility Schedule in accordance with requirements of DPC 5.4.1, DPC 5.4.3 and DOC 8.7. The last requires that schedules shall be jointly agreed by PES and the appropriate User for each location where an operational interface exist.

The DNSP is the Site Manager for *insert substation name* xxkV substation. Therefore, only the DNSP's Distribution Safety Rules apply. If the Generator needs to work on the Generator's equipment on this site, he needs to be authorised by the DNSP as a Competent Person.

Access to *insert substation name* xxkV substation is restricted to persons in possession of valid access passes issued by the DNSP or the Health and Safety Executive.

Safety Co-ordination

DNSP owned switchgear shall be controlled and operated only by the DNSP and *Insert Generator's name* owned switchgear shall be controlled and operated only by *Insert Generator's name*.

The document for use for the certification of the isolation and earthing of circuits between the DNSP control engineer and *Insert Generator's name* control engineer is the DNSP's Circuit State Certificate (CSC).

For the purpose of this document *Insert Generator's name* control engineer is as below: -

See attached [Schedule 2](#)

Safety Management System: *Insert Generator's name* Safety Rules.

For the purpose of this document the DNSP's control engineer is as below: -

See attached [Schedule 2](#)

Safety Management System:

the DNSP's Distribution Safety Rules.

Safety Management

The DNSP 's equipment shall be controlled only by the DNSP's control engineer and shall be operated only by an Authorised Person, authorised by the DNSP.

All operational work by the DNSP shall be done in accordance with the DNSP's Distribution Safety Rules and, in particular, in accordance with a switching programme.

The *Insert Generator's name* authorised person (who will be a *Insert Generator's name* employee authorised by him) will operate the Generator's equipment. The *Insert Generator's name* control engineer will control the Generator's equipment. In this case the same person may carry out both functions.

In case of work on the *Insert Generator's name* equipment, if in order to make dead, isolate and earth such equipment it is necessary to operate switchgear controlled by the DNSP then the *Insert Generator's name* control engineer will initiate a CSC.

Contrariwise, in the case of work on the DNSP equipment, if in order to make dead, isolate and earth such equipment is necessary to operate switchgear controlled by *Insert Generator's name* then the DNSP's control engineer will initiate a CSC.

The keys to safety locks applied to points of isolation and earthing shall be deposited in a key safe. The key safe shall be secured by the DNSP's Senior Authorised Person (SAP) and *Insert Generator's name* authorised person each with his own safety lock.

When the equipment to be worked on has been made dead, isolated and earthed, safety documents will be issued by the *Insert Generator's name* authorised person in case of work on the Generator's equipment or the DNSP's SAP in case of work on the DNSP's equipment.

Safety documents (Permit to Work /Sanction For Test) issued by the *Insert Generator's name authorised* person to the DNSP's personnel shall be counter signed by the DNSP's SAP, who should check the safety arrangements prior to signature. Alternatively, the DNSP's SAP may accept the *Insert Generator's name* Safety document and then issue a DNSP Safety document to the staff under his control.

In the case of work by *Insert Generator's name*, if the equipment is to be subsequently re-energised by the DNSP SAP, the latter shall have the opportunity of witnessing the associated tests

Appendix C – Sample Responsibility Schedule

Schedule Showing Control Engineer, Occupier, Safety Rules and Ownership Applicable to the Operation & Maintenance of Electrical Plant

Green Road 33kV Substation

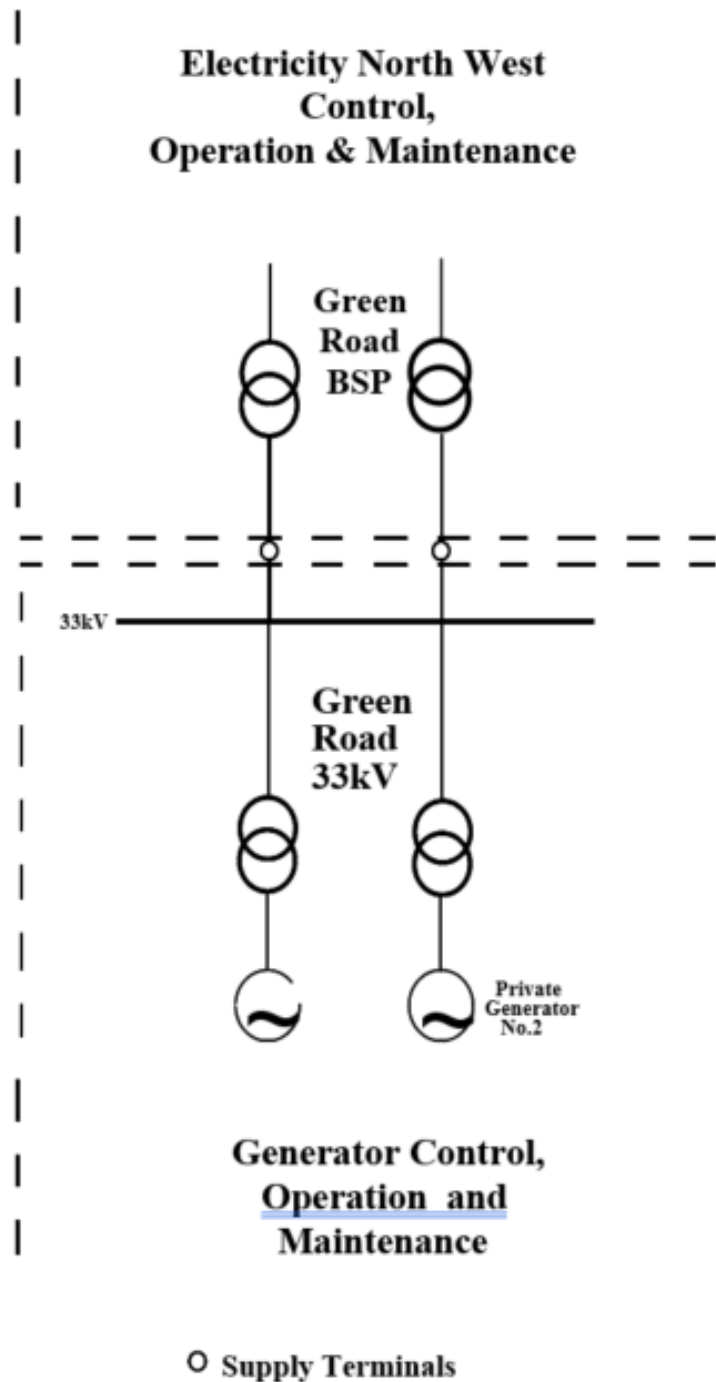
| PLANT ITEM | CONTROL ENGINEER | OCCUPIER | SAFETY RULES | OWNED BY | OPERATED & MAINTAINED BY |
|--|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| CIRCUITS 132kV cables and overhead line between Horsley & Green Road Substation | Electricity North West | Electricity North West | Electricity North West | Electricity North West | Electricity North West |
| Green Road 132kV Substation All plant including Bulk Supply Transformers 1 & 2 33kV Cables | Electricity North West | Electricity North West | Electricity North West | Electricity North West | Electricity North West |
| Green Road 33kV Substation GT 1 & 2 Circuit Breakers, Busbar VT, Associated 33kV Cables and Metering | Electricity North West | Electricity North West | Electricity North West | Electricity North West | Electricity North West |
| 33kV Busbars, Bus-Couplers, Bus-Section circuit breakers, associated Isolators and all remaining plant | Generator | Generator | Generator | Generator | Generator |

Operation of plant on the Bulk Supply Transformer circuit at 132kV and 33kV may be carried out by the Generator's authorised personnel acting under specific instructions from the Electricity North West control engineer.

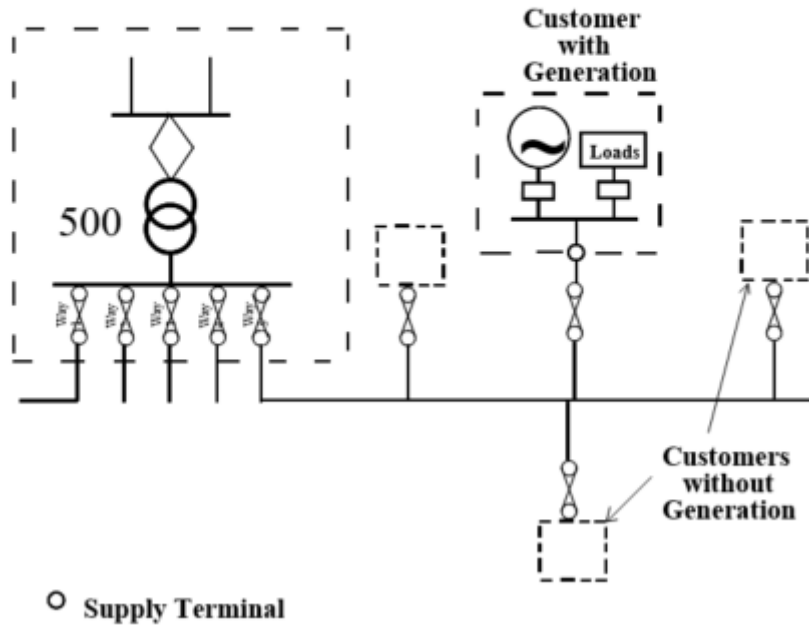
Operations by Private Generator's personnel on 132kV plant shall only be carried out from the Private Generator's Control Room.

Operations by Private Generator's personnel on 33kV plant shall normally be carried out from the Private Generator's Control Room but may also be carried out from the substation.

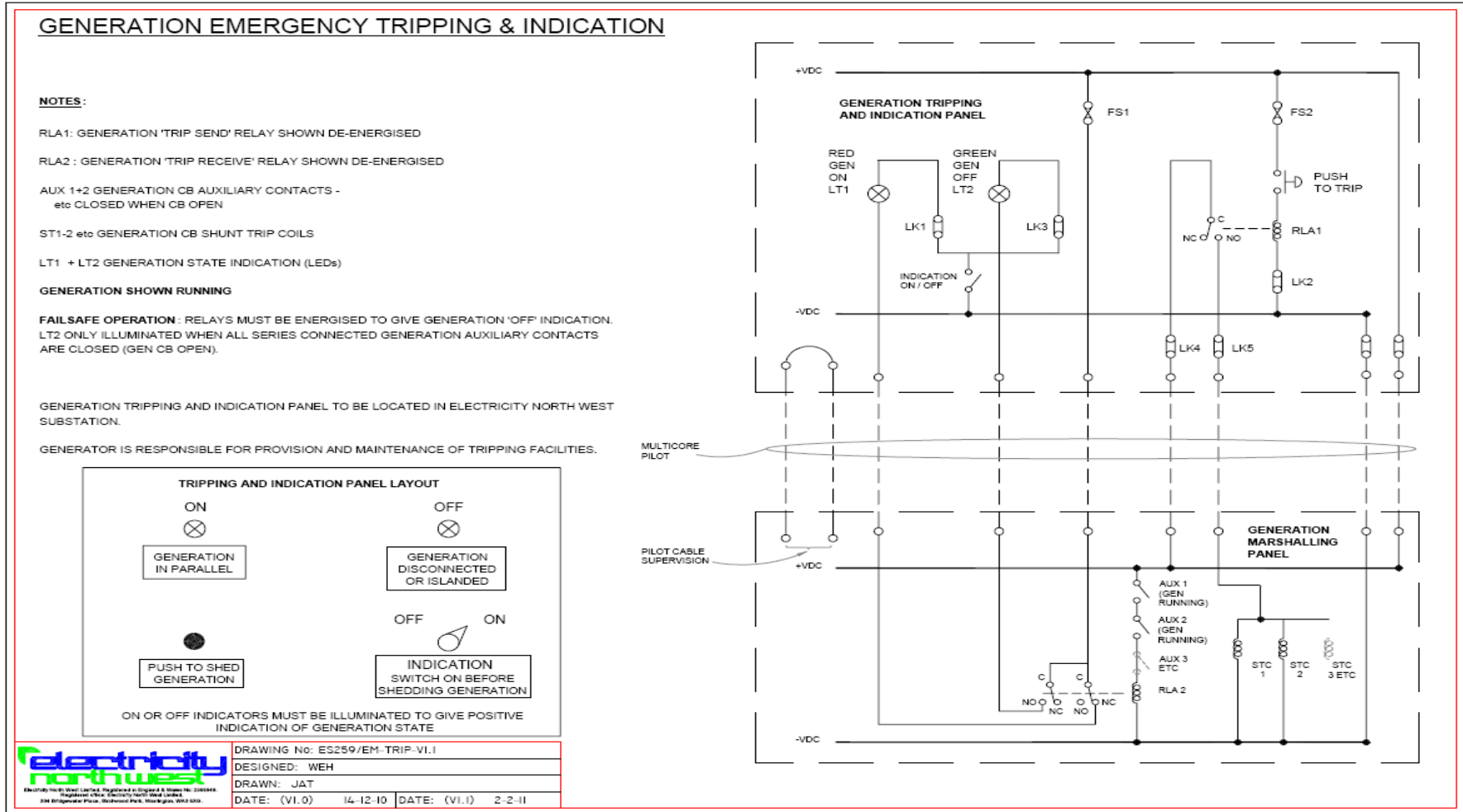
Example of an Electricity North West & Generator Interface



Example of an Electricity North West & Generator LV Interface



Appendix D



Appendix E

