WESTERN POWER DISTRIBUTION

Serving the Midlands, South West and Wales

Company Directive

STANDARD TECHNIQUE: SD1E/5

Technical Requirements for Customer Export Limiting Schemes

Policy Summary

This Standard Technique specifies the requirements for customer owned **Export Limitation Schemes**.

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Implementation Date: March 2020

Approved by

Paul Jewell
DSO Development Manager

Date: 6 March 2020

Target Staff Group	**Staff involved with the design, specification, installation, witnessing or replacement of generator connections**
Impact of Change	**Amber – This document changes the requirements for customer Export Limitation Schemes**
Planned Assurance checks	**6 months from the issue of this document the author will interview at least one LV Planner and one HV planner in each License Area to check their understanding of clause 4.1.7 and 4.3.2.1.**

IMPLEMENTATION PLAN

Introduction

This document specifies the requirements for customer export limiting schemes.

Main Changes

The main changes are as follows; full details are included in the document revision and review table.

- The requirements for **Power Generating Modules** that are set or designed to self-limit their output have been clarified
- Guidance has been added regarding systems that pre-emptively prevent the **Agreed Export Capacity** from being exceeded.
- The requirements for reverse power protection at HV connections have been clarified
- The protection assessment process has been updated / clarified

Impact of Changes

Target Staff Group	**Staff involved with the design, specification, installation, replacement and witnessing of generator connections**
Impact of Change	**Amber – This document changes the requirements for customer Export Limitation Schemes**

Implementation Actions

Managers shall ensure that all relevant staff are aware of, and comply with, the requirements of this document.

Implementation Timetable

This document is implemented on issue for new and substantially modified connections. Where a customer has provided evidence of compliance with the previous version of this document prior to its issue then is acceptable providing the installation is completed to WPD's satisfaction before 1st September 2020.

REVISION HISTORY

Document Revision & Review Table		
Date	**Comments**	**Author**
March 2020	• Document format has been updated to comply with POL: GE1 • Section 1.6 has been added to provide guidance on interlocking and other control systems that pre-emptively prevent the **Agreed Export Capacity** from being exceeded. • The following definitions have been added: **Micro-generator**, **Power Generating Module**, **Power Park Module**, **Synchronous Power Generating Module**, **Generating Unit** and **Electricity Storage**. • The definition of **Fail Safe** has been modified. • Clause 4.1.7: The requirements for **Power Generating Modules** that are set or designed to self-limit their output have been clarified • Clause 4.1.10: The requirements for reverse power protection at HV connections have been clarified • Clause 4.3.2.1: The protection assessment requirements have been updated and clarified	Andy Hood
October 2018	• References to ENA EREC G98 and ENA EREC G99 have been added to Sections 1.4, 1.5, 4.3.2.2, 4.4.1, 4.5.4, 6.1, 6.1.1, 6.1.2, 6.1.3 and Appendix D	Matt Pope
December 2017	• Clause 4.3.2.2 has been modified to relax the requirement for an **ELS** voltage check • Section 6 has been modified to relax the commissioning requirements where the installed generation capacity is above 3.68kW per phase and no higher than 7.36kW per phase • The installation and commissioning form has been updated to reflect the changes in Section 6	Andy Hood
October 2017	• Clause 4.1.5 and clause 4.3.2.1 have been amended to align with ENA EREC G100	Andy Hood

Contents

1.0 INTRODUCTION

1.1 This document specifies the requirements for customer owned **Export Limiting Schemes** (**ELSs**) that are designed to restrict, as far as is reasonably practicable, the export at an installation in order to satisfy the **Agreed Export Capacity** by either controlling the output from the customer's **Generating Units** or by temporarily increasing the amount of demand at the site. This standard technique is based on ENA EREC G100, which shall be read in conjunction with this document.

1.3 The requirements for WPD owned Generator Constraint Panels (GCPs) are included in ST:TP18A.

1.4 The requirements for the connection of **Power Generating Modules** to Western power Distribution's (WPD's) network are specified in ENA EREC G83, ENA EREC G98, ENA EREC G59 and ENA EREC G99, as applicable.

1.5 **ELS**' are often, but not always, installed with **Electrical Storage** systems that have the ability to charge (i.e. consume **Active Power**) and then discharge (i.e. produce **Active Power**). **Electricity Storage** systems are considered as demand when consuming **Active Power** and as **Power Generating Modules** when producing **Active Power**. They must therefore satisfy the requirements of ENA EREC G83, ENA EREC G98, ENA EREC G59 or ENA EREC G99, as applicable. ST: NC1AD provides further guidance on the connection of **Electricity Storage** schemes.

1.6 Rather than install an **ELS** the customer may prevent the **Agreed Export Capacity** from being exceeded by installing a **Fail Safe** interlocking system or a **Fail Safe** control system that pre-emptively limits the number of **Generating Units** that may operate simultaneously. Where this is the case most of the requirements of this document are waived, including Section 4.3 associated with the aggregate **Generating Unit** capacity, as long as the system prevents the **Agreed Export Capacity** from being exceeded at all (i.e. even for fraction of a second). At HV connections, the **Fail Safe** system shall be backed up by customer owned instantaneous reverse power protection that trips the **Generating Units** should the Agreed Export Capacity be exceeded.

For example, at an HV connected site with photovoltaic **Generating Units** and **Electrical Storage** a **Fail Safe** interlocking system is proposed that prevents the **Electrical Storage** from producing any **Active Power** until a sufficient number of photovoltaic **Generating Units** have been disconnected in order to eliminate the possibility of the **Agreed Export Capacity** from being exceeded. The interlocking system will also be backed up by instantaneous reverse power protection that trips the **Electrical Storage** should the **Agreed Export Capacity** be exceeded. Given this, the requirements of section 4.3 are waived and so there is no restriction on the aggregate **Generating Unit** capacity.

2.0 SCOPE

2.1 This document applies to customer owned **ELS**' that are used to limit the exported power from the customer's installation in order for the customer to satisfy i) their **Agreed Export Capacity** and ii) the terms of their Connection Agreement.

2.2 This document applies to connections at all voltage levels (i.e. LV to 132kV) and is only applicable where the aggregate **Generating Unit** capacity minus the minimum site demand is greater than the **Agreed Export Capacity** of the connection.

2.3 **ELS'** do not, by themselves, control or restrict the fault contribution from a customer's installation.

3.0 DEFINITIONS

3.1 **Active Power**: The product of voltage and the in-phase component of alternating current measured in units of Watts (W), kilowatts (kW) or megawatts (MW)

3.2 **Agreed Export Capacity**: The maximum amount of power (expressed in kVA) that is permitted at the **Connection Point** when the **Active Power** flows into the **Distribution System** through the **Connection Point**.

3.3 **Agreed Import Capacity**: The maximum amount of power (expressed in kVA) that is permitted at the **Connection Point** when the **Active Power** flows out of the **Distribution System** through the **Connection Point**.

3.4 **Apparent Power**: The product of voltage and current at fundamental frequency, and the square root of three (in the case of three phase systems) expressed in volt-amperes (VA), kilovolt-amperes (kVA) or megavolt-amperes (MVA).

3.5 **Connection Point**: A point on the distribution system that provides the customer with a connection allowing power to flow to or from the distribution system. Typically this would be the outgoing terminals of WPDs fused cut-out or metering circuit breaker.

3.6 **Electricity Storage**: **Electricity Storage** in the electricity system is the conversion of electrical energy in to a form of energy that can be stored, the storing of that energy, and the subsequent reconversion of the energy back into electrical energy.

3.7 **Export Limitation Scheme (ELS)**: The system comprising of one or more items of equipment, sensors, control systems and control signals that interfaces with the customer's **Generating Units** and/or demand to control the net flow of electricity into the distribution system to below an agreed value.

3.8 **Fail Safe**: A design requirement that enables a **Connection Point** to limit export to the **Agreed Export Capacity** irrespective of the failure of one or more its components.

3.9 **Generating Unit**: Any apparatus that produces electricity. This includes **micro-generators** and **Electrical Storage** devices.

3.10 **Micro-generator**: A source of electrical energy and all the associated interface equipment able to be connected to an electric circuit in a low voltage electrical installation and designed to operate in parallel with a low voltage distribution network with nominal currents up to and including 16A per phase.

3.11 **Power Factor**: The ratio of **Active Power** to **Apparent Power**

3.12 **Power Generating Module:** Either a **Synchronous Power Generating Module** or a **Power Park Module**.

3.13 **Power Park Module**: A **Generating Unit** or ensemble of **Generating Units** (including **Electricity Storage** devices) generating electricity, which is either synchronously connected to the network or connected through power electronics, and that may be connected through a transformer and that also has a single **Connection Point** to a distribution network.

3.14 **Reactive Power**: The imaginary component of the **Apparent Power** at fundamental frequency expressed in vars (VARs), kilovars (kVAr) or Megavars (MVAr).

3.15 **Synchronous Power Generating Module:** As indivisible set of **Generating Units** (i.e. one or more units which cannot operate independently of each other) which can generate electricity such that the frequency of the generated voltage, the generator speed and the frequency of the network voltage are in a constant ratio and thus in synchronism.

4.0 REQUIREMENTS

4.1 Scheme Design

4.1.1 **ELS'** measure the **Active Power** at the **Connection Point** and then use this information to either restrict **Generating Unit** output or increase customer demand in order to prevent the **Agreed Export Capacity** from being exceeded.

4.1.2 **ELS'** shall meet the requirements of ENA EREC G100.

4.1.3 The **Agreed Export Capacity** is expressed as an **Apparent Power** (kVA) value at a given **Power Factor** (or over a **Power Factor** range) as measured at the **Connection Point**.

4.1.4 **ELS'** shall be designed to limit the **Active Power** only. The customer is required to control the **Power Factor** and hence the **Apparent Power** and **Reactive Power** in accordance with the Connection Agreement.

4.1.5 The **ELS** may be formed of discrete units or integrated into a single packaged scheme. Where discrete units are used they should be interconnected using metallic cables or fibre optic cables. Radio links may only be used where they use licensed frequencies (i.e. licensed by OFCOM) and have a planned availability of 99.9% or higher. Irrespective of the media used for interconnecting between the discrete units, if the communication path fails the **Generating Unit** output shall be immediately reduced to prevent the **Agreed Export Capacity** from being exceeded.

4.1.6 **ELS'** installed at premises with an aggregate **Generating Unit** capacity exceeding 16A per phase shall be **Fail Safe** and shall fully restrict excess export if any single component, including the connections communication links between the discrete units, fail or lose their power supply.

4.1.7 Individual **Power Generating Modules** and **Generating Units** may be designed or set to limit their own **Active Power** output. For the self-limited capacity to be considered by WPD the reduction in power must occur within 5s of the limit being exceeded. If this inherently prevents the **Agreed Export Capacity** from being exceeded without the need to actively measure the power flow at other points in the network then the arrangement is not considered to be an **Export Limitation Scheme** and the other aspects of this document do not apply.

4.1.8 Once installed and commissioned, the relevant **ELS**, **Power Generating Module** and **Generating Unit** settings should not be capable of being readily altered by the Customer and may only be changed with the written agreement of the DNO.

4.1.9 Exported **Active Power** at the **Connection Point** may be controlled by increasing the customer's demand within the installation, however the **ELS** must be designed to reduce the output from **Generating Units** or to disconnect the **Generating Units**, as necessary to prevent the **Agreed Export Capacity** from being exceeded, should the demand be unavailable.

4.1.10 The customer shall provide additional reverse power protection at all HV connections that include an **ELS** in order to back up the **ELS**. This reverse power protection shall either be designed to trip the relevant **Power Generating Modules** or trip the customer's incoming circuit breaker. The time delay associated with this protection shall be set at the maximum allowable operating time of the **ELS.**

4.1.11 A functional description of the scheme, its settings, and a single line diagram shall be displayed on site.

4.2 Agreed Export Capacity

4.2.1 All connections with a site specific connection agreement will have an **Agreed Export Capacity**. In some circumstances, this may be zero.

4.2.2 LV connections without a site specific connection agreement are assumed to have an **Agreed Export Capacity** of 16A per phase unless otherwise agreed.

4.3 Aggregate Generating Unit Capacity

4.3.1 **ELS'** allow the aggregate **Generating Unit** capacity at a site to exceed the **Agreed Export** capacity however there is still a limit on the maximum aggregate **Generating Unit** capacity that may be installed at the site. This is because an **ELS** takes a finite time (e.g. up to 5s) to detect an excursion and then reduce the exported power below the **Agreed Export Capacity**.

4.3.2 The aggregate **Generating Unit** capacity is restricted in order to prevent (i) protection from mal-operating and (ii) voltage ratings of equipment from being exceeded during the operating time of the **ELS**. The assessment method is described below. Detailed examples of such calculations are included in Appendix E of EREC G100.

4.3.2.1 Protection Assessment

The maximum current that flows through the **Connection Point**/s must not cause WPD fuses or overcurrent relays to operate.

(a) The simplest way to guarantee this is to ensure the aggregate **Generating Unit** capacity is no greater than the higher of 1.25 x **Agreed Import Capacity** or 1.25 x **Agreed Export Capacity** + the minimum site demand, whichever value is higher.

(b) If the simple assessment (a) fails an additional, more complex, assessment shall be carried out to check that the aggregate **Generating Unit** capacity is no greater than 1.2x the equivalent kVA value derived from the pickup value of WPDs overcurrent protection settings / cut-out fuse ratings plus the minimum site demand.

The nominal voltage (i.e. 230V phase to neutral or 6.6kV, 11kV, 33kV, 66kV or 132kV phase to phase) is assumed when calculating the equivalent kVA values.

Where a connection does not have an **Agreed Import Capacity** a value of 15kVA (i.e. 65.2A) per phase is assumed and where a connection does not have an **Agreed Export Capacity** a value of 3.68kVA (16.0A) per phase is assumed. In the absence of other information WPD's cut-out fuses should be assumed to be 80A.

When assessing the minimum demand consideration must be given to shut-down / holiday periods etc.

If both of the above assessments fail the proposal is not acceptable, however, it may be possible to increase the **Agreed Export Capacity** to accommodate the proposed **Power Generating Module**/s without the need to reinforce the network.

WPD Fuse ratings and overcurrent protection settings are dictated by the protection requirements rather than load requirements. It is not normally acceptable to increase these ratings / settings simply to allow a higher aggregate **Generating Unit** capacity without also increasing the rating of the associated WPD cables, overhead lines and/or other plant and equipment. Where it is proposed to change fuse ratings or protection settings an assessment shall be carried out by the Planner or by Engineering Design, as applicable, to ensure protection requirements are satisfied.

4.3.2.2 Voltage Assessment

The aggregate **Generating Unit** capacity must also be limited to prevent the highest network voltage from exceeding the upper statutory voltage limit by more than 1% of the nominal voltage, during the operating time of the **ELS**.

For LV networks, the voltage during the operating time of the **ELS** shall be no higher than 253V + (1% of 230V) = 255.3V.

Where the aggregate **Generating Unit** capacity is no more than 32A (7.36kW) / phase, the export is limited to 16A (3.68kW) / phase or less and the **Power Generating Modules** consist entirely of units that have been type tested to ENA EREC G83 or ENA EREC G98 (as applicable), a voltage assessment is not required.

Where WinDebut is used to carry out **ELS** voltage assessment, the LV network is modelled normally (including any existing demand and **Power Generating Modules**) and the aggregate **Generating Unit** capacity at the connection being considered is increased until a voltage rise of 2.4% (of 240V) is reached. At this point, the aggregate **Generating Unit** capacity modelled at the connection is deeded to be the maximum acceptable value.

For 11kV and 6.6kV networks, the voltage during the operating time of the **ELS** shall not exceed the maximum network voltage (derived from POL: SD4) by more than 1% (of nominal voltage). These limits are summarised in Table 1 and Table 2.

Location	Maximum Voltage from POL:SD4	Maximum Voltage During the ELS Operating Time
At 11kV Connections		
All	11.66kV	11.77kV
On the HV side of 11kV Distribution Transformers		
+7.5% Tap	11.66kV	11.77kV
+5% Tap	11.59kV	11.70kV
+2.5% Tap	11.31kV	11.42kV
Nominal Tap	11.04kV	11.15kV
-2.5% Tap	10.76kV	10.87kV
-5% Tap	10.49kV	10.60kV

Table 1 ELS Voltage Limits – 11kV Networks

Location	Maximum Voltage (from POL:SD4)	Maximum Voltage During the ELS Operating Time
At 6.6kV Connections		
All	7.00kV	7.07kV
On the HV side of 6.6kV Distribution Transformers		
+8.4% Tap	7.00kV	7.07kV
+5% Tap	6.95kV	7.02kV
+4.2% Tap	6.90kV	6.97kV
+2.5% Tap	6.79kV	6.86kV
Nominal Tap	6.62kV	6.69kV
-2.5% Tap	6.46kV	6.53kV
-4.2% Tap	6.35kV	6.42kV
-5% Tap	6.29kV	6.36kV
-8.4% Tap	6.07kV	6.14kV

Table 2 ELS Voltage Limits – 6.6kV Networks

4.3.3 Other Restrictions

It is possible that other factors may restrict the maximum aggregate **Generating Unit** capacity at a connection, for example fault level contribution, or possible transmission system related restrictions. Where this is the case the Planner shall notify the customer of the reason for the restriction.

4.4 Maximum Capacity of Actively Controlled Demand

4.4.1 Where the **Agreed Export Capacity** is limited by actively controlling flexible on-site demand the **Agreed Import Capacity** could be exceeded if **Generating Units** are suddenly disconnected, for example if the G59 or G99 protection operates. This could potentially cause thermal (load) ratings to be exceeded or voltage disturbance (flicker or rapid voltage change) limits to be breached. In order to prevent these issues the maximum demand of the site, including any actively controlled demand, shall not exceed 1.25 x the **Agreed Import Capacity** of the site**.**

4.4.2 Where a site does not have an **Agreed Import Capacity** the maximum demand of the site, including any actively controlled demand, shall be based on the rating of the cut-out fuse or the overcurrent protection settings applied to the metering circuit breaker. In the absence of other data an 80A cut-out fuse shall be assumed.

4.5 Power Quality

4.5.1 The installation shall comply with all relevant power quality requirements including but not limited to:

- ENA EREC P28 (voltage disturbances)
- ENA EREC G5 (voltage distortion / harmonics)
- ENA EREC P29 (voltage unbalance)
- BS EN 61000-3-2 (voltage distortion limits for ≤ 16A/phase equipment)
- BS EN 61000-3-3 (voltage disturbance limits for ≤ 16A/phase equipment)
- BS EN 61000-3-11 (voltage disturbance limits for ≤75A/phase equipment)
- BS EN 61000-3-12 (voltage distortion limits for ≤ 75A/phase equipment)

4.5.2 Compliance of individual components does not guarantee the installation as a whole will satisfy the power quality requirements.

4.5.3 Customers shall provide suitable information at the time of application to allow the planner to assess for power quality before connection. Further guidance can be found in ST: SD6J, which covers equipment rated ≤ 75A per phase and ST: SD6F, which applies to equipment rated greater than 75A per phase.

4.5.4 If single-phase **Generating Units** are installed within a 3 phase or split phase installation they shall, as far as possible, be balanced across the phases. The difference in **Generating Unit** output between each pair of phases shall not exceed 16A, in accordance with EREC G59 or EREC G99, as applicable.

4.5.5 The installation shall maintain the agreed **Power Factor** and **Power Factor** range at the **Connection Point**.

4.6 Accuracy, Thresholds and Response Rates

4.6.1 The overall accuracy of **ELS** with regard to measurement and control of **Active Power** and, where applicable, voltage, shall be determined by the manufacturer of the system and published within its operating manual. These tolerances should, as far as possible, take account of sensing / measurement errors, processing errors, communication errors and control errors. Consideration should also be given to environmental factors (e.g. the expected ambient temperature range).

4.6.2 The settings applied to the **ELS** shall take account of the published tolerances to ensure the required export limits and voltage limits are maintained. For example, if an **ELS** is required to limit the export to 100kW and it has an overall tolerance of +/-5% at this value, it should be set to limit the **Active Power** to 95kW (i.e. 95% of the required value).

4.6.3 The **ELS** should detect an excursion and reduce the export to the **Agreed Export Capacity** or less, within 5 seconds.

4.6.4 At LV connections with an aggregate **Generating Unit** capacity exceeding 16A per phase, where communication delays (between the **ELS** and the **Generating Units** (e.g. inverters) mean that the 5 second operating time cannot be guaranteed, reverse power protection shall be installed that operates within 5s and trips the **Generating Units.**

4.6.5 At HV, EHV and 132kV connections, back up reverse power protection is required, irrespective of the maximum operating time of the **ELS**.

4.6.6 Where backup reverse power protection is installed it shall measure the **Active Power** at the intake position/s and trip the **Generating Units** if the **Agreed Export Capacity** is exceeded for more than 5s. This backup system should have an **Active Power** accuracy of +/-3% or better.

4.6.7 Where an **ELS** relies on a backup disconnection systems to achieve the 5s requirement the arrangement must satisfy the power quality requirements, including the voltage disturbance requirements in EREC P28.

5.0 APPLICATION AND ACCEPTANCE

5.1 Customers / installers shall provide WPD with information on the proposed **ELS** to enable the impact on the network to be assessed. An application form is provided in Appendix B. In addition, the following information is required:

- Single line diagram of **ELS** that shows the position and function of each component of the **ELS**.
- An explanation of the **ELS** operation
- Description of any **Failsafe** functionality (i.e. interruption of sensor signals, load, loss of power, internal fault detection etc.)

5.2 WPD will assess the **ELS** using the process described in Appendix C and, where an **ELS** is acceptable will determine the maximum aggregate **Generating Unit** capacity.

6.0 COMMISSIONING, TESTING AND WITNESSING

6.1 Commissioning requirements and recommended test sequences are specified in ENA EREC G100. The generator commissioning, test and witnessing requirements (defined in ENA EREC G83, G98, G59 and G99) must also be satisfied. Where a **Fail Safe** interlocking system or **Fail Safe** control system is installed that pre-emptively prevents the Agreed Export Capacity from being exceeded this shall also be commissioned, tested and where required by Western Power Distribution, witnessed to ensure it meets the requirement of this document.

6.1.1 Aggregate **Generating Unit** Capacity up to 3.68kW / phase:

In this case ENA EREC G100 relaxes the **ELS** commissioning and witnessing requirements and the installer should follow the manufacturer's installation and commissioning instructions instead. It is not necessary for the installer to submit the **ELS** installation / commissioning test form to WPD, however generator installation / commissioning confirmation forms must still be provided within 28 days, in accordance with ENA EREC G83, G98, G59 and G99 (as applicable). WPD do not normally witness the **ELS** tests.

6.1.2 Aggregate **Generating Unit** Capacity above 3.68kW / phase and up to 7.36kW / phase

In this case ENA EREC G100 commissioning tests shall be carried out, with the exception of the fail-safe tests. The installer shall submit the **ELS** and generator installation / commissioning confirmation forms to WPD within 28 days, in accordance with ENA EREC G100 and G59 or G99 (as applicable).

WPD do not normally witness these tests if the Power Generating Modules (including the any **Electricity Storage**) have been type tested to G83, G98, G59 or G99.

6.1.3 Aggregate **Generating Unit** Capacity above 7.36kW / phase

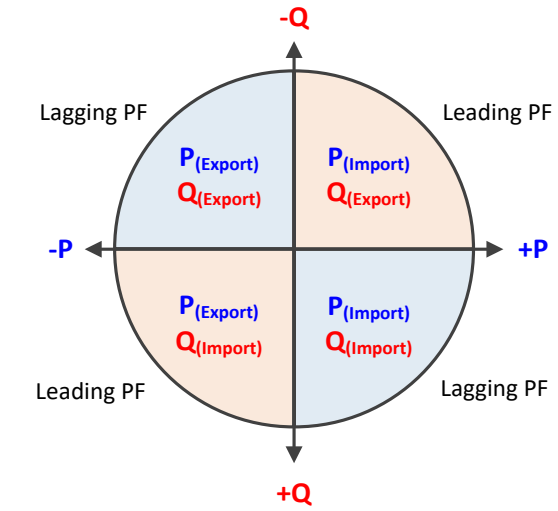
In this case the ENA EREC G100 and G59 or G99 (as applicable) shall be carried out, including the G100 fail-safe tests. Installation and commissioning confirmation forms shall be completed by the installer and submitted to WPD within 28 days.

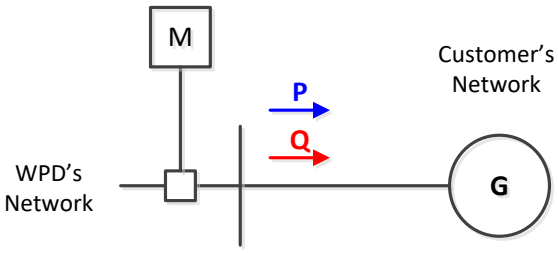
WPD do not normally witness these tests where the aggregate **Generating Unit** capacity is less than 50kW (3 phase) and 17kW (single phase) and all the **Power Generating Modules** have been type tested to G83, G98, G59 or G99.

Where the aggregate **Generating Unit** capacity is above 17kW per phase (50kW 3 phase) WPD normally witness the **ELS** commissioning tests carried out by the installer, however, this requirement may be waived at WPD's discretion.

6.2 An **ELS** Installation and Commissioning form is provided in Appendix D.

POWER FLOW CONVENTION





P = Active Power (kW)
Q = Reactive Power (kVAr)

Active Power (P) is deemed to be positive (+ve) when it flows into the customer's installation from the distribution system.

Reactive Power (Q) is deemed to be positive (+ve) when lagging VARs flow into the customer's installation from the distribution system.

APPENDIX B

EXPORT LIMITATION SCHEME APPLICATION FORM

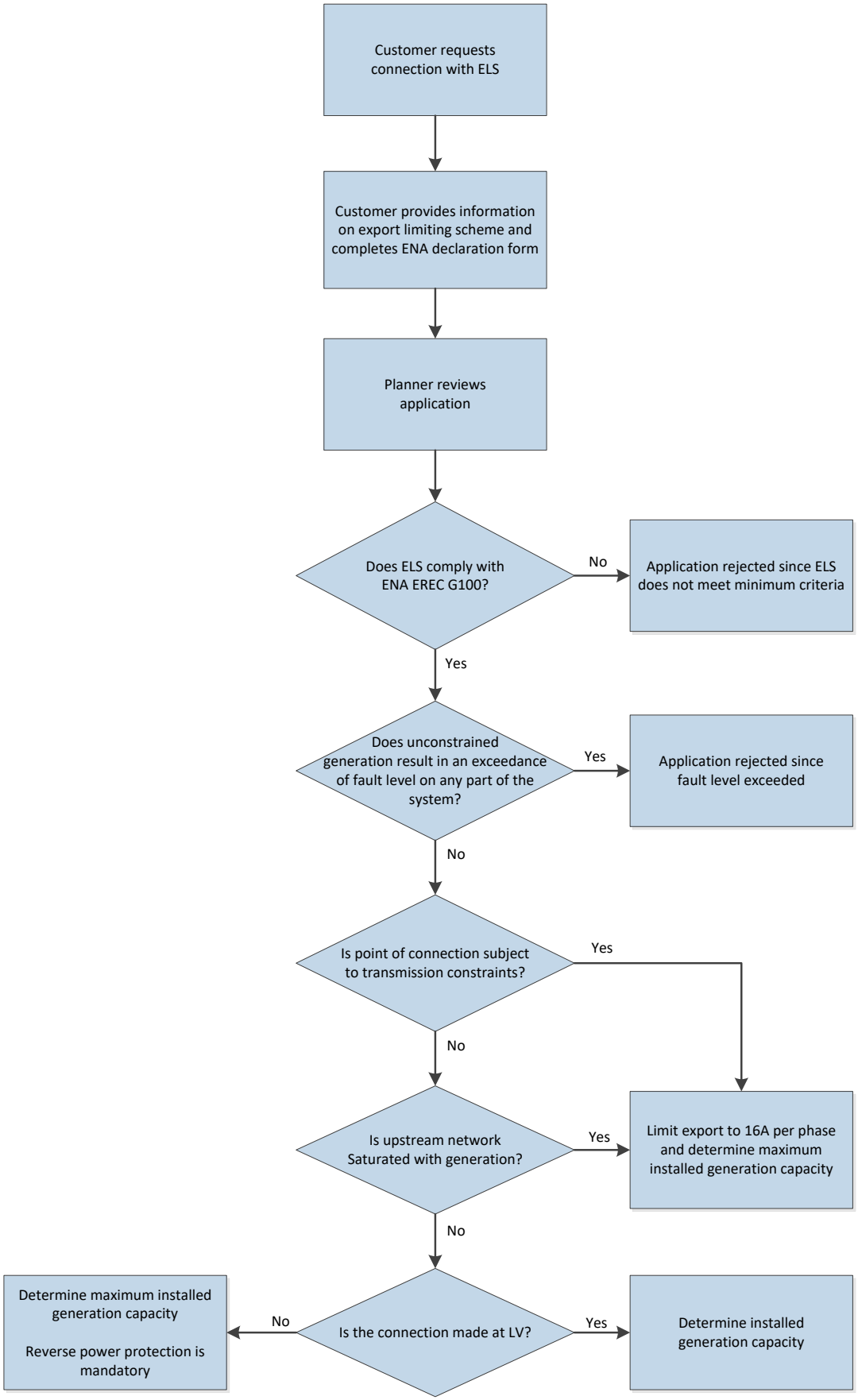
This form should be used by all applicants considering installing an **ELS** as part of their connection application. This form should accompany the application for a connection.

Customer Name	**Project Name** :
Application Submission Date: _ _ / _ _ / _ _ _ _	**WPD CROWN Ref No**

The following information shall be submitted with the enquiry:

Copy of Single Line Diagram of **Export Limitation Scheme**
Explanation / description of **Export Limitation Scheme** operation including a description of the fail-safe functionality e.g. the response of the scheme following failure of a: • **Power Monitoring Unit** • **Control Unit** • **Generator Interface Unit** • **Demand Control Unit** • **Communication Equipment** *Note, fail-safe operation is not mandatory where the installation has an aggregate **Generating Unit** capacity of 16A (i.e. 3.68kW) per phase or less.*
Is additional reverse power protection to be provided (mandatory for connection voltages above 1,000V) Yes / No* * (delete as necessary)
Required Import Capacity (kW):
Proposed Export Capacity (kW) if known:
Total Power Station Capacity** (kW): ** aggregate kW rating of all the electrical energy sources (**Generating Units** including **Electrical Storage**)

EXPORT LIMITATION SCHEME ACCEPTABILITY CRITERIA



APPENDIX D

EXPORT LIMITATION SCHEME INSTALLATION AND COMMISSIONING TESTS

Commissioning test requirements for **ELS** with an aggregate **Generating Unit** capacity exceeding 3.68kW, in addition to **Power Generating Module** tests required by ENA EREC G83, G98, G59 or G99.

WPD CROWN Ref. No.: _ _ _ _ _ _ _	**MPAN (21/13-digits):** _
Customer Name	
Address of ELS (where equipment will be used)	
Installer	
Installer Address	

Information to be Provided	
Description	**Confirmation**
Final copy of Single Line Diagram of **Export Limitation Scheme**	Yes / No*
Explanation of **Export Limitation Scheme** operation	Yes / No*
Description of the fail-safe functionality (Interruption of sensor signals, disconnection of load, loss of power, internal fault detection etc.) *Note, fail-safe operation is not mandatory where the installation has an aggregate **Generating Unit** capacity of 16A (i.e. 3.68kW) per phase or less.*	Yes / No*
Agreed Export Capacity as provided by the **DNO**	_____kW
Export Limitation Scheme export setting	_____kW
The **Export Limitation Scheme** has secure communication links between the various component parts of the **Export Limitation Scheme** as specified in section 5.1.3 of ENA EREC G100	Yes / No*

Commissioning Checks	
The **Export Limitation Scheme** is fail-safe and limits export if any of the discrete units or communication links that comprise the **Export Limitation Scheme** fail or lose their source of power. All components have been tested in line with section 7 of ENA EREC G100. *Fail-safe tests are not applicable where the aggregate **Generating Unit** capacity is below 7.36kW.*	N/A / Yes / No*
When the **Export Limitation Scheme** operates it reduces the exported **Active Power** to a value that is equal to, or less than, the **Agreed Export Capacity** within 5s.	Yes / No*
A reverse power relay is fitted which will disconnect the **Power Generating Modules** if the export goes 5% above the **Agreed Export Capacity** for longer than 5s (not required for fail-safe **LV** metered connections).	N/A / Yes / No* <u>Setting</u> Power: _____kW Time: _____Sec
On completion of commissioning, all settings are restored to normal operating values and password protected or sealed to prevent **Customer** access. A description of the scheme, its settings, and a single line diagram is displayed on site.	Yes / No*

* Circle as appropriate. If "No" is selected the **Power Station** is deemed to have failed the commissioning tests and the **Generating Units** shall not be put in service.

Additional Comments / Observations:

Insert here any additional tests which have been carried out

Declaration – to be completed by Generator or Generators' Appointed Technical Representative.	
I declare that the **Export Limiting Scheme** and the installation comply with the requirements of ENA EREC G100 and the additional commissioning checks noted above have been successfully completed in addition to those required by EREC G83, G98, G59 or G99	
Signature:	Date:
Position:	
Declaration – to be completed by DNO Witnessing Representative	
I confirm that I have witnessed the tests specified in this document on behalf of _____and that the results are an accurate record of the tests.	
Signature:	Date:

This form should be appended to the relevant generator installation / commissioning confirmation documents specified in ENA EREC G83, G59, G98 and G99.

APPENDIX E

SUPERSEDED DOCUMENTATION

This document supersedes ST: SD1E/4 dated October 2018 which has now been withdrawn.

APPENDIX F

RECEORD OF COMMENT DURING CONSULTATION

No comments received.

APPENDIX G

ASSOCIATED DOCUMENTATION

POL: SD4	11kV and 6.6kV System Design
ST: SD6F	Dealing with Potentially Disturbing Electrical Loads/Equipment
ST: SD6J	Connection design – potentially disturbing electrical equipment rated ≤75A/phase subject to conditional connection
ST: NC1AD	Process for the connection of energy storage schemes
EREC G5	Planning levels for harmonic voltage distortion and connection of non-linear equipment to transmission systems and distribution networks in the United Kingdom
EREC G59	Recommendations for the connection of generation plant to the distribution systems of licensed distribution network operators
EREC G83	Recommendations for the Connection of Type Tested Small-scale Embedded Generators (Up to 16A per Phase) in Parallel with Low-Voltage Distribution Systems
EREC G98	Requirements for the connection of Fully Type Tested micro-generators (up to and including 16 A per phase) in parallel with public Low Voltage Distribution Networks on or after 27 April 2019
EREC G99	Requirements for the connection of generation equipment in parallel with public distribution networks on or after 27 April 2019
EREC G100	Technical Requirements for Customer Export Limiting Schemes
EREC P28	Planning Limits for Voltage Fluctuations Caused By Industrial, Commercial and Domestic Equipment in the UK
EREC P29	Planning Limits for Voltage Unbalance in the United Kingdom
BS EN 61000-3-2	Limits for harmonic current emissions (equipment input current ≤16 A per phase)
BS EN 61000-3-3	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection

BS EN 61000-3-11	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems – Equipment with rated current ≤ 75A and subject to conditional connection
BS EN 61000-3-12	Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current >16 A and ≤ 75 A per phase.

APPENDIX H

KEY WORDS

Connection, Generator, SSEG, **Export Limiting Scheme**, **ELS**, Reverse Power, G100.