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EREC G99 Technical Compliance Requirements

Webinar – 30th April 2019

Peter Twomey and Gill Williamson

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Welcome to our webinar



Gill Williamson
Strategic Planning



Peter Twomey
Policy

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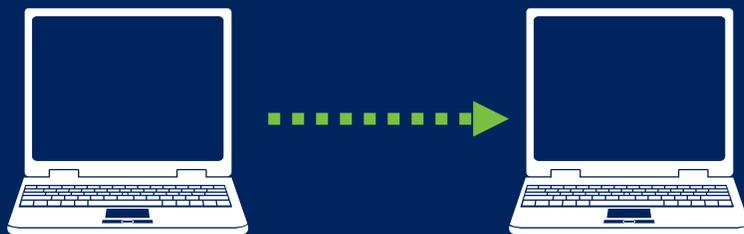
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45 minutes presentation



15 minutes
questions & answers



Please submit written
questions online during the
webinar



EREC G99
Terminology



Compliance Process



Demonstrating
Compliance



Technical
Requirements



Questions & Answers



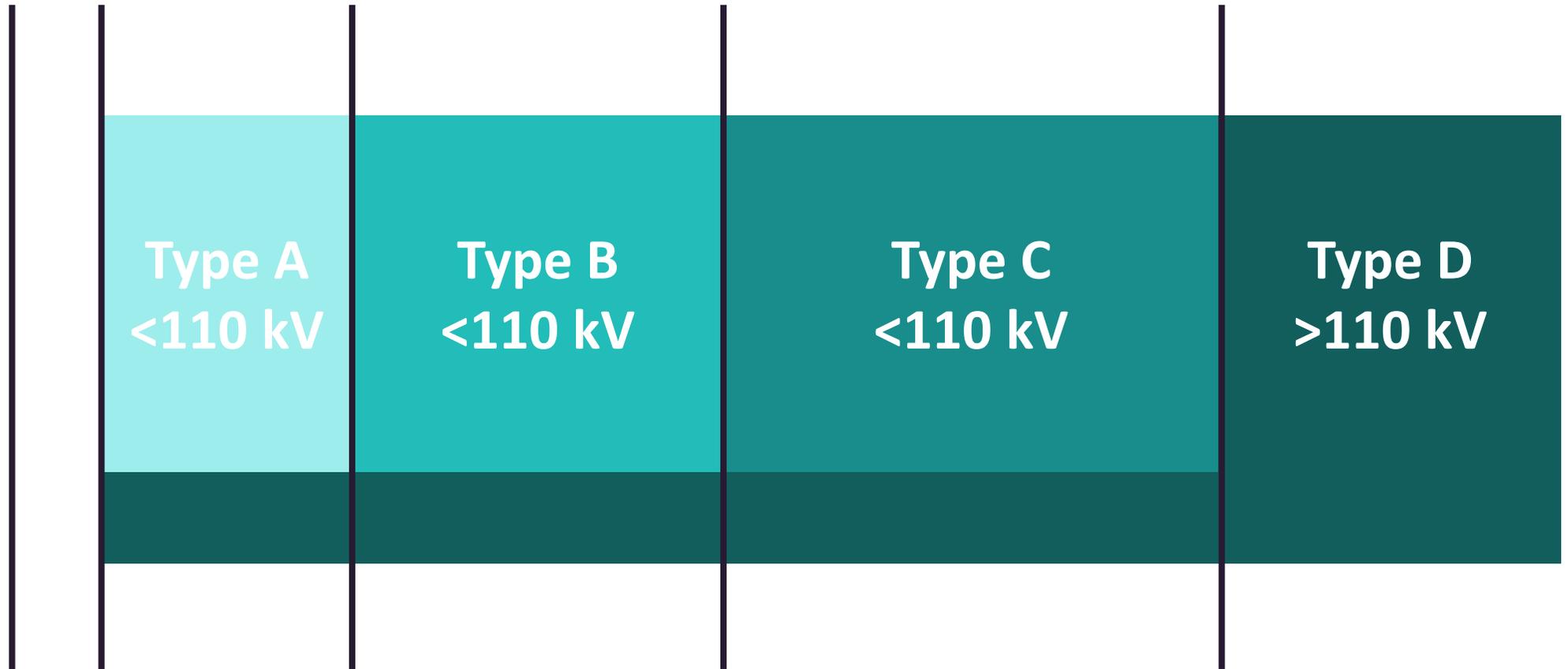
Further Information

Terminology





- Types affect technical requirements and which forms you use



Power Generating
Module
Registered Capacity

800W

1 MW

10 MW

50 MW

Compliance and Installation Process



EREC G99 - What part of the connection process is changing?



Now



From Generator Concept to Connection

After 27 April 2019



Changing



Technical requirements
vary with Type

Generators can choose
how they demonstrate
compliance

Type Testing is expected
to be used for Type A

Type B, C & D Compliance
is tracked in the PGMD

DNO approval is required

EREC G99 Connection Process

Compliance forms – Type A



- *For Type A, the form depends on the use of type testing*

Type A	Manufacturer's Information	Site Tests
Fully Type Tested	No specific form Reference is made in the installation form to the registration on ENA website	Form A2-4 completed if site compliance tests are being undertaken for some or all of Type A generator requirements and if Interface Protection is not Type Tested Installation forms: Form A3-1 Type A PGMs Form A3-2 Integrated micro generation and storage
Partially Type Tested	Form A2-1 Synchronous PGM $\leq 50\text{kW}$ Form A2-2 Synchronous PGM $> 50\text{kW}$ Form A2-3 Inverter connected PGMs	

EREC G99 Connection Process

Compliance forms – Types B, C & D



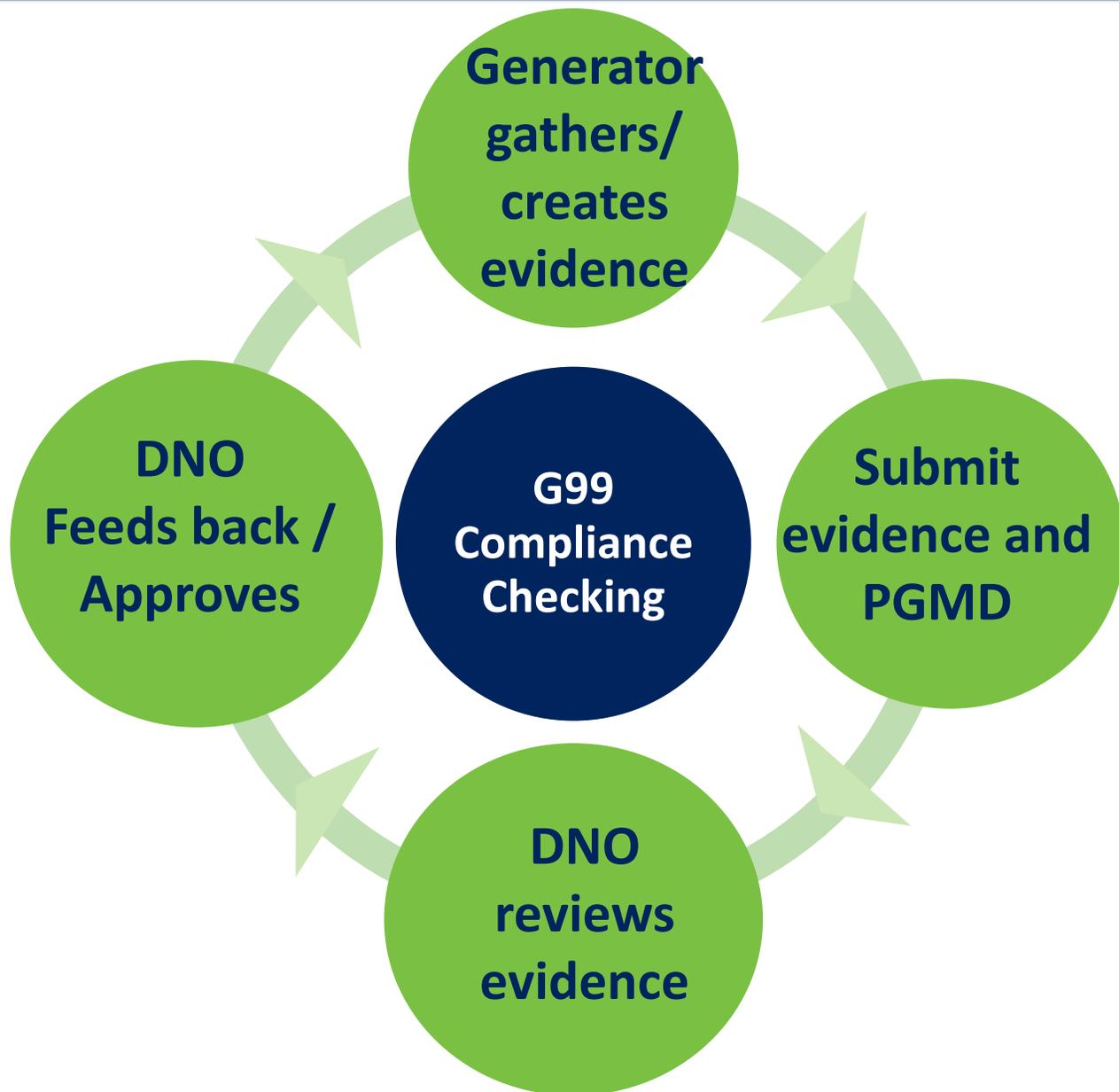
- We expect compliance methods and the submission programme will be agreed between the Generator and DNO soon after acceptance of the Connection Offer.

Type	Manufacturer's Information	Site Tests
Type B	Form B2-1 Power Generating Module Document (PGMD)	Form B2-2 completed if generator Interface Protection is not Type Tested and other compliance tests that are being undertaken on site. Form B3 Installation and Commissioning Confirmation
Type C & D	Form C2-1 Power Generating Module Document (PGMD)	Form C2-2 completed if generator Interface Protection is not Type Tested and other compliance tests that are being undertaken on site. Form C3 Installation and Commissioning Confirmation

Methods for Demonstrating Compliance



EREC G99 Connection Process Compliance Options



S – Simulation study

P – Design data

MI – Manufacturers information

D – correspondence or other documents confirming requirements are met

T – Site tests or monitoring to demonstrate compliance (may be witnessed)

TV – Type Test reports



Non Type Tested Protection Site Tests - Forms A2-4, B2-2, C2-2

Calibration, accuracy and stability tests:-

- Over and under voltage protection
- Over and under frequency
- Loss of mains protection (ROCOF)



Installation Checks - Installation forms A3-1 or A3-2, B3, C3

Check the requirements of BS7671 (IET Wiring Regulations) are satisfied

Check points of isolation between the PGMs and the rest of the Generator's Installation

Check labels have been installed at all points of isolation

Check that settings schedule has been provided and settings applied correctly

Check interlocking that prevents PGMs being connected in parallel with the DNO system

Check that the PGM successfully synchronises , runs in parallel and disconnects

Check that interface Protection operates and disconnects the DNO's Distribution Network quickly (within 1s) when switch opens between the PGM and the DNO and remains disconnected for 20s.



We will not normally witness site checks for fully type tested

We may witness Partially Type Tested Type A >100kW

Exceptions include new installer, random checks or quality concerns

We will witness all Type B, C & D site tests

Electricity North West Witness Test Requirements

Technical Requirements





Section 8	Section 9	Section 10
All Types - Earthing	All Types - Network Connection Design & Operation	All Types - Protection
Section 11	Section 12	Section 13
Type A	Type B	Type C & D



Section 8	Section 9	Section 10
Earthing <i>Minor changes</i>	Network Connection Design & Operation <i>Minor changes</i>	Protection <i>Moderate changes</i>

Sections 11, 12 & 13

Significant changes & new material

- Control
- Frequency Response
- Fault Ride Through
- Voltage Limits & Control
- Reactive Capability
- Fast Fault Current Injection
- Black Start
- Operational Monitoring



Protection

Changed

Type A	10
Type B	
Type C&D	

Demonstration



Methods

- MI
- TV
- T



Technical Requirements

▶ Same for all Types

There are different protection settings depending on the PGM connection voltage (LV or HV)

- Under Voltage (1 stage);
- Over Voltage (2 stage);
- Under Frequency (2 stage);
- Over Frequency (1 stage);
- Loss of Mains (LoM).
- No change to short term parallel settings.



Control

New

Type A	11.1.3
Type B	12.1.3
Type C&D	13.1.3

Demonstration



Methods

➤ MI

➤ TV



Technical Requirements

➤ **Type A** PGM will have **logic interface** (input port) to **cease** Active Power output within 5s

➤ **Type B** PGM will have **communication** interface (input port) to **reduce** Active Power output

➤ **Type C** PGM shall be capable of **adjusting** the Active Power setpoint in accordance with instructions issued by the DNO



Frequency Withstand

Changed

Type A	11.2.1
Type B	12.2.1
Type C&D	13.2.1

Demonstration



Methods

- MI
- TV



Technical Requirements

▶ Same for all Types

Frequency Range	Time
47 Hz – 47.5 Hz	20s
47.5 Hz – 49.0 Hz	90minutes
49.0Hz – 51.0 Hz	Continuous
51.0 Hz – 51.5 Hz	90minutes
51.5 Hz – 52 Hz	15minutes



Rate of Change of Frequency Withstand

Changed

Type A	11.2.2
Type B	12.2.2
Type C&D	13.2.2



Demonstration

Methods

➤ via
protection
settings



Technical Requirements

▶ Same for all Types

“capable of staying connected to the **Distribution Network** and operate at rates of change of frequency up to 1 Hzs^{-1} as measured over a period of 500 ms”



Active power output with falling frequency

New

Type A 11.2.3

Type B 12.2.3

Type C&D 13.2.3

Demonstration



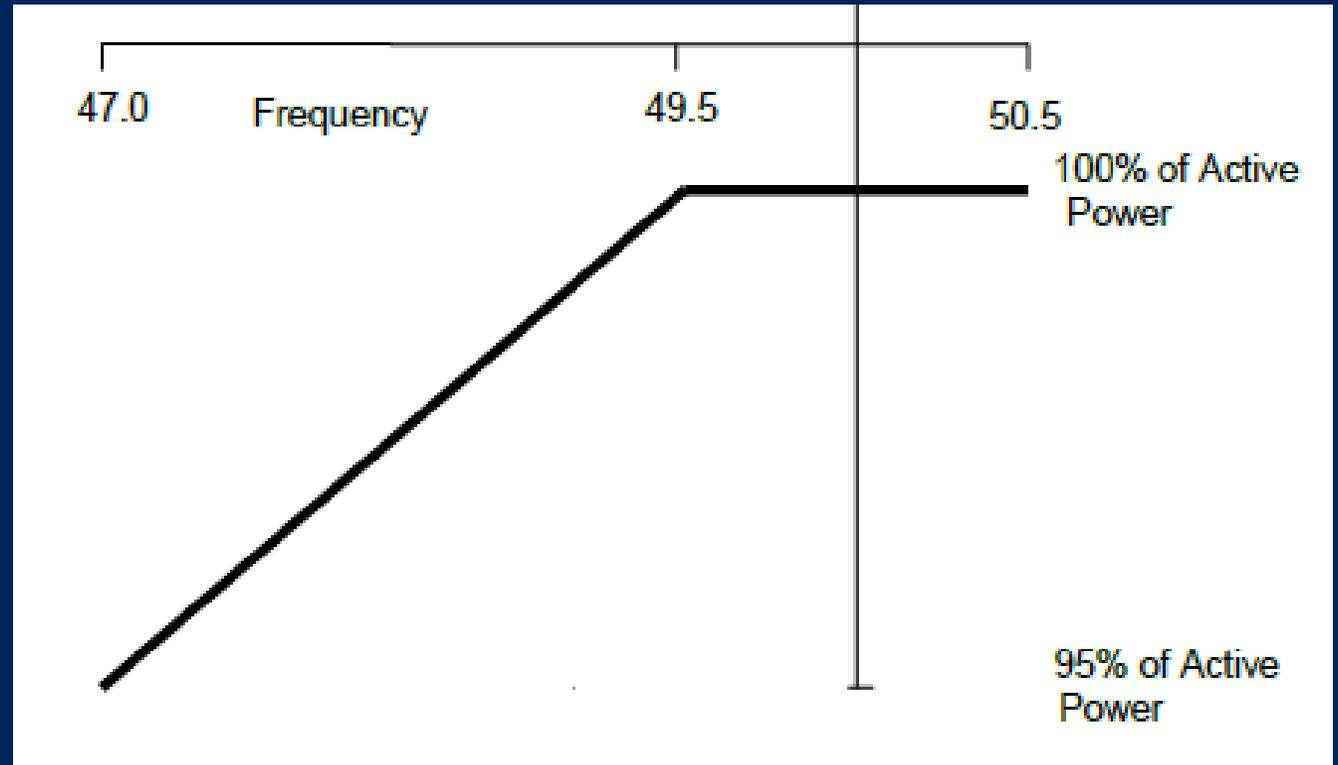
Methods

- T
- MI
- TV



Technical Requirements

▶ Same for all Types





Limited Frequency Sensitive Mode–Over Frequency

New

Type A 11.2.4

Type B 12.2.4

Type C&D 13.2.4

Demonstration Methods



➤ S

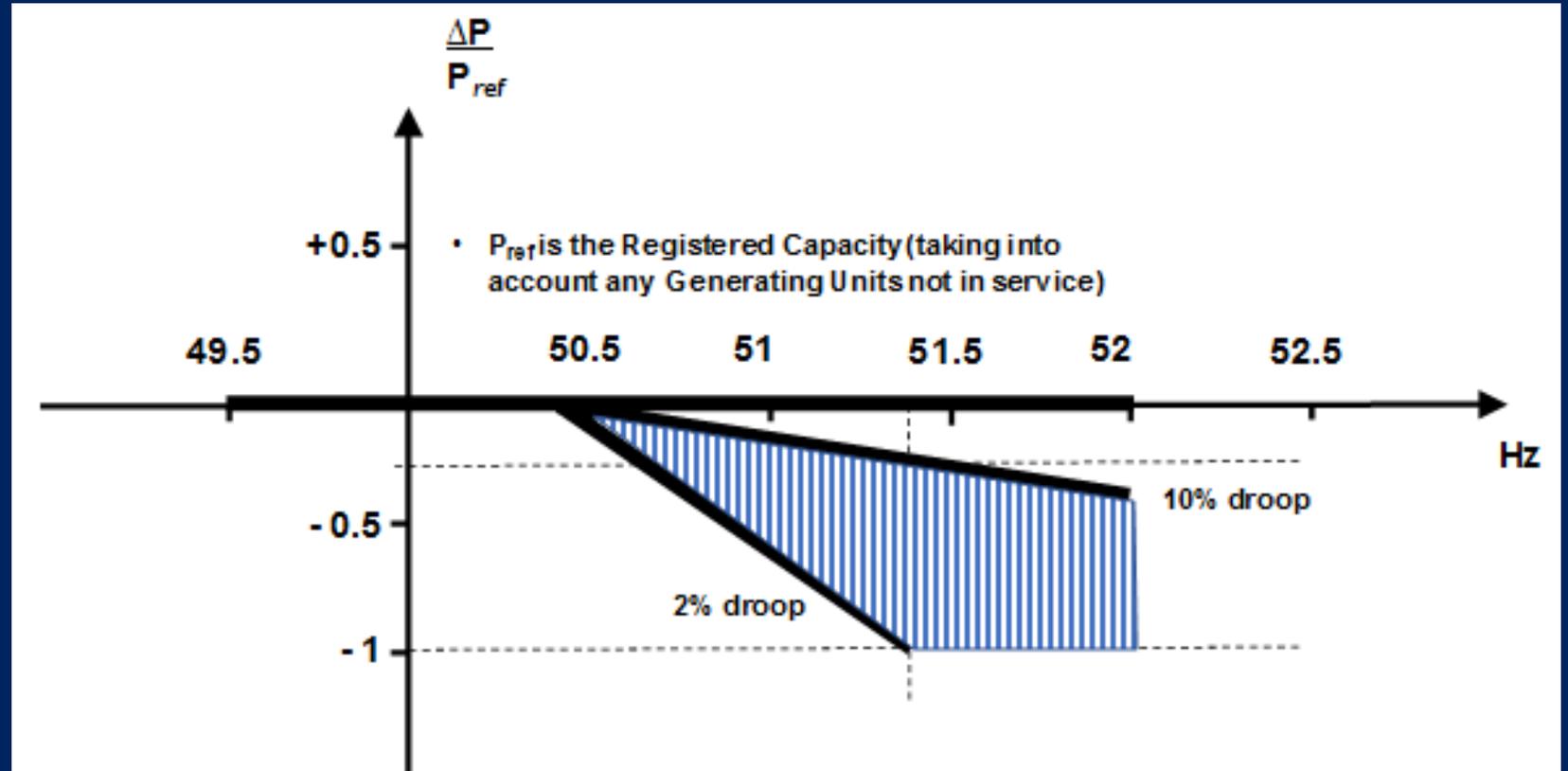
➤ MI

➤ TV



Technical Requirements

▶ Similar for all Types





Limited Frequency Sensitive Mode-Under Frequency

New

Type A	-
Type B	-
Type C&D	13.2.5

Demonstration



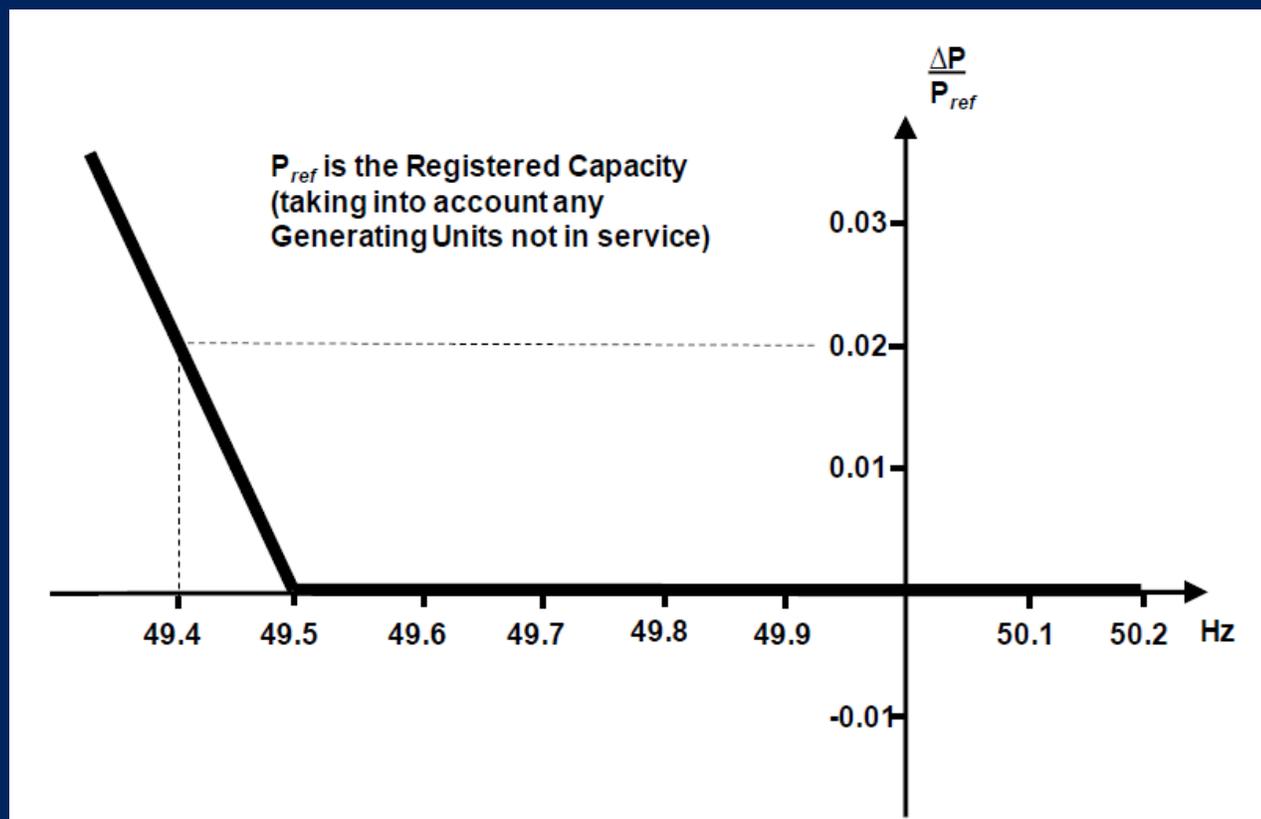
Methods

- S
- MI
- TV



Technical Requirements

- ▶ Type C & D – respond without undue delay





Frequency Sensitive Mode

Grid Code

Type A	-
Type B	-
Type C&D	13.2.6

Demonstration



Methods

- S(model validation)
- MI
- TV
- T



Technical Requirements

▶ Type C & D – only activated if providing ancillary service to National Grid

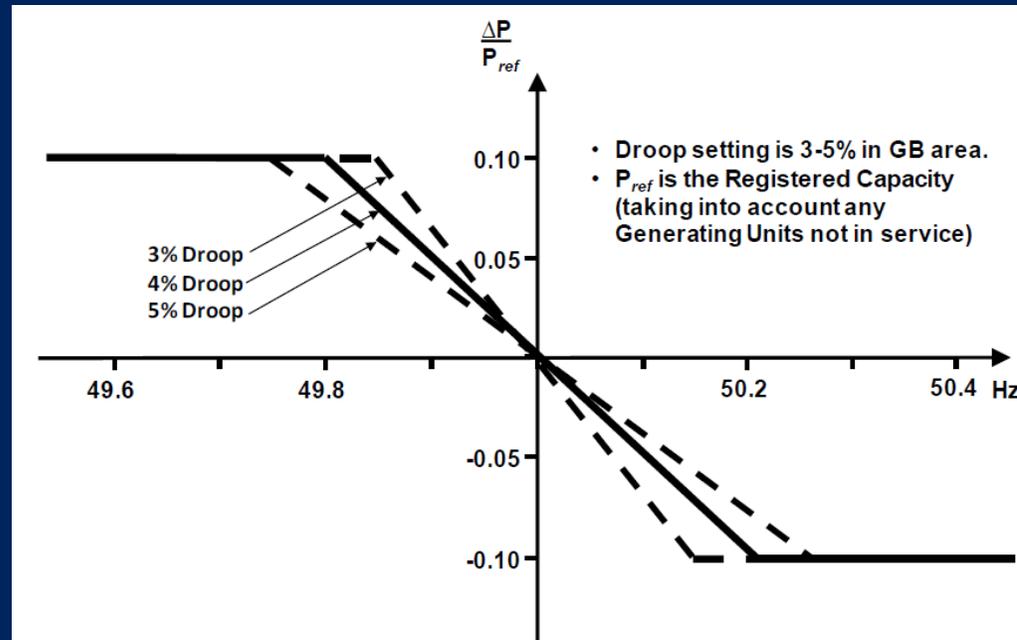


Figure 13.4 – Frequency Sensitive Mode capability of Power Generating Modules and Power Park Modules



Fault Ride Through

New

Type A 11.3

Type B 12.3

Type C&D 13.3

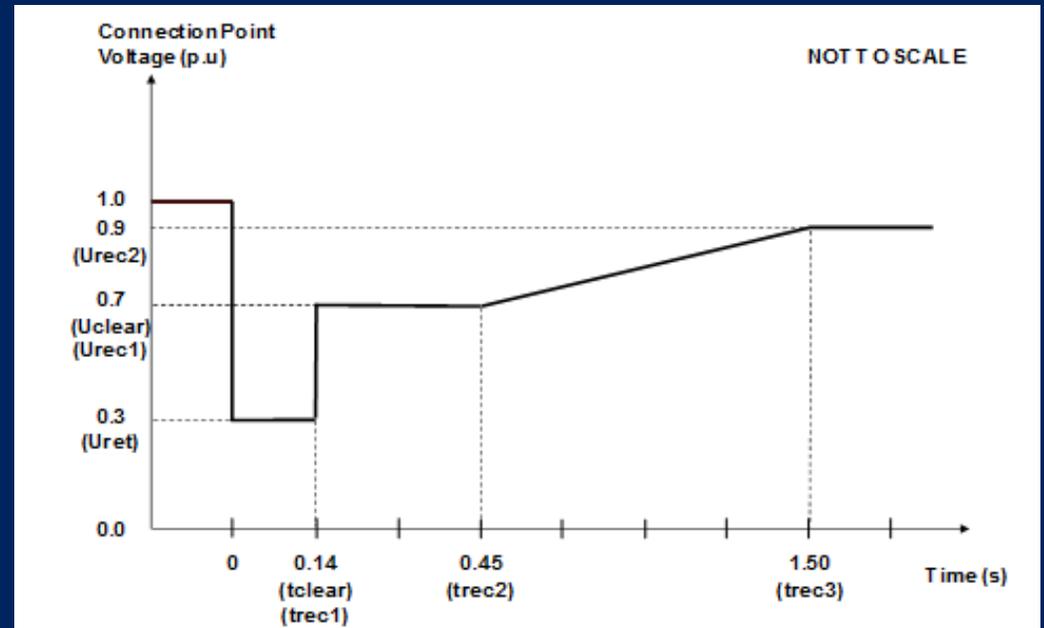


Technical Requirements

▶ Definite requirements for Types B, C & D

Different Voltage vs Time curves for different Types and technologies

e.g.



Demonstration



Methods

➤ S

➤ MI

➤ TV



Voltage Control

New

Type A	11.4
Type B	12.4
Type C&D	13.4

Demonstration



Methods

➤ S

➤ MI

➤ TV



Technical Requirements

▶ Not Type A

Ability to control voltage and contribute, as agreed with the DNO, to voltage control or Reactive Power control or Power Factor control at the Connection Point.



Reactive Capability

New

Type A	11.1.5
Type B	12.5
Type C&D	13.5

Demonstration



Methods

- S
- MI
- TV



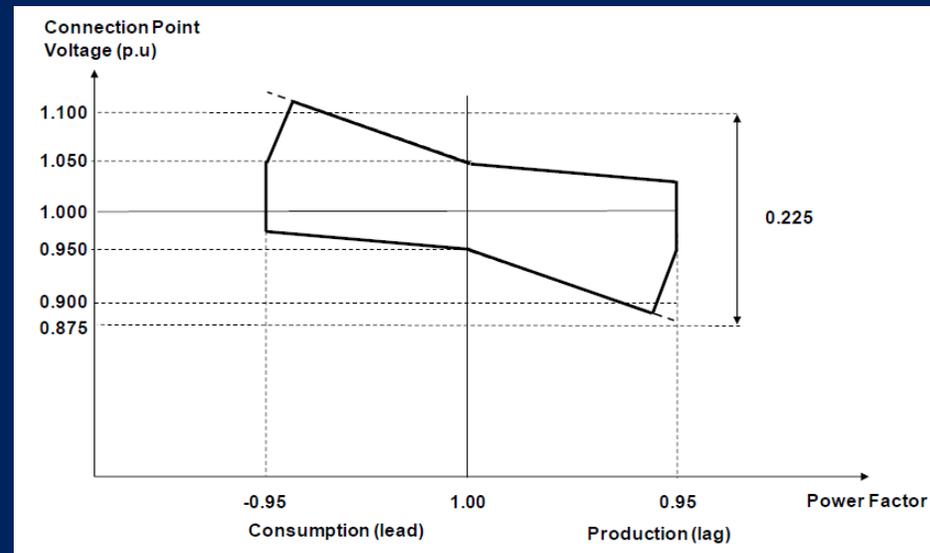
Technical Requirements

▶ Different requirements depending on Type, Technology & Voltage.

Type A & B ± 0.95 PF at Registered Capacity

Type C & D requirements depend on technology & voltage

e.g.





Fast Fault Current Injection

From Grid Code

Type A	-
Type B	12.6
Type C&D	13.6



Technical Requirements

► Applicable to Type B, C & D PPMs

Requirements depend on voltage depression duration.

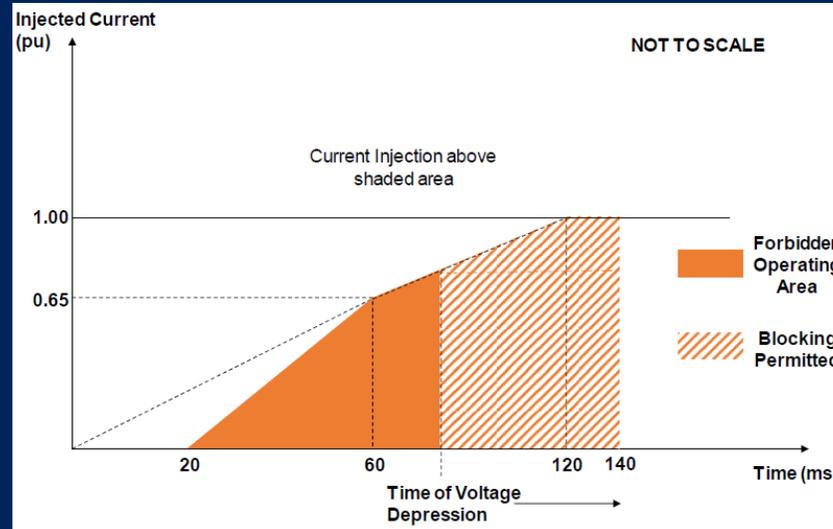
Demonstration Methods



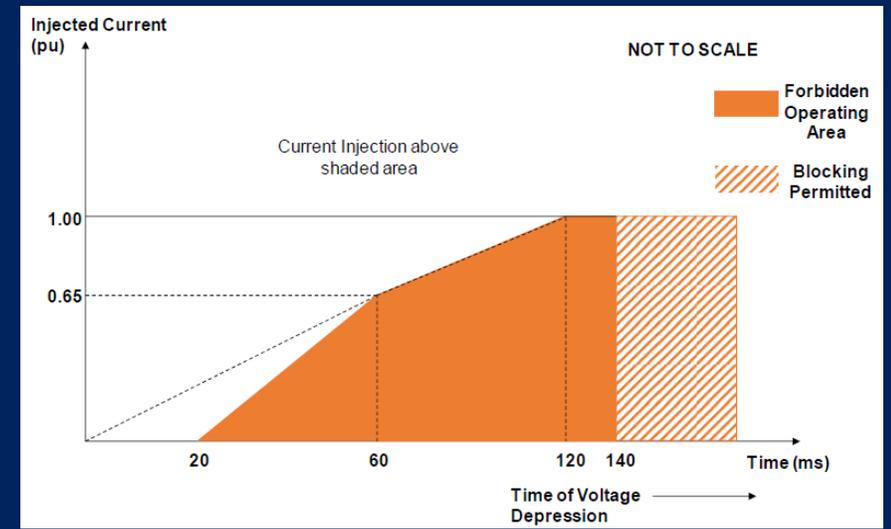
➤ S

➤ MI

➤ TV



<140ms



>140ms



Operational Monitoring

New

Type A	-
Type B	12.7
Type C&D	13.9, C.6



Demonstration Methods



Technical Requirements

▶ Applicable to Type B, C & D PPMs

Type B – DNO Telecontrol/SCADA outstation

Type C & D - fault recording and voltage, Active Power, Reactive Power, frequency measurements and potentially power quality to be agreed with the DNO.



Reconnection

No Change

Type A	10.3
Type B	
Type C&D	

Demonstration



Methods

- T
- MI
- TV



Technical Requirements

- ▶ All Types

Reconnection sequence starts after a minimum delay of 20 s for restoration of voltage and frequency

Installation of automatic reconnection systems for **Type B, Type C and Type D** shall be subject to prior authorisation by the **DNO**



Power Quality

No Change

Type A	A2-1, 2-2,2-3
Type B	B2
Type C&D	C2

Demonstration



Methods

- MI
- D
- TV



Technical Requirements

▶ Harmonics & Voltage Fluctuation/Flicker

EN 61000 series apply up to 50kW

EREC G5 and P28 apply above 50kW

Compliance is recorded in PGMD for Types B,C&D so evidence is necessary before FON can be issued

Electricity North West's Next Steps





FAQs on website



Individual surgery
sessions

<https://www.enwl.co.uk/about-us/engaging-with-our-stakeholders/stakeholder-engagement-events-calendar/>



**Gillian
Williamson**
Strategic
Planning



**Peter
Twomey**
Policy



**Submit written questions online
Please complete the post-
webinar survey after the Q&A
session**



Electricity North West Website

<https://www.enwl.co.uk/get-connected/new-connection/generation-connection/engineering-recommendation-g99>

ENA Website

<http://www.energynetworks.org/electricity/engineering/distributed-generation/engineering-recommendation-g59.html>

DG Connection Guides

<http://www.energynetworks.org/electricity/engineering/distributed-generation/dg-connection-guides.html>

Distribution Code DPC7

covers requirements for embedded generator including G99

<http://www.dcode.org.uk/>



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