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Security of Supply

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Amendments since publication

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Contents

Foreword 4
Introduction 5
1 Scope 5
2 Normative references 5
3 Terms and definitions 5
4 Recommended levels of supply 8
5 Capability of a network to meet demand 8
5.1 Capability of Circuits 8
5.2 Capability of non-circuit based capacity 8
5.3 Impact of Active Network Management, other control systems or protection systems 9
5.4 Security contribution from multiple sources 9
Table 1 10
References 12

Foreword

This Engineering Recommendation (EREC) is published by the Energy Networks Association (ENA) and comes into effect from XXX. It has been prepared under the authority of the ENA Engineering Policy and Standards Manager and has been approved for publication by the ENA Electricity Networks and Futures Group (ENFG). The approved abbreviated title of this engineering document is “EREC P2/7”, which replaces the previously used abbreviation “ER P2/6”.

Introduction

This Engineering Recommendation is a revision of Engineering Recommendation P2/6 (ER P2/6) issued in 2006, which it supersedes. It is intended as a guide to system planning. Issue 7 of this document has been written to recognise the changes to the load and generation connected to distribution networks since ER P2/6 was published in 2006. In particular it recognises that:

- some demand customers are modifying their electricity consumption in response to market signals; this means that further consideration has to be given to establishing the true demand on the network;
- in addition to providing security of supply from network assets and distributed generation, demand side services can also contribute to security of supplies; and
- the nature and type of distributed generation connected to the network mean that their contribution to security of supplies is different to that in ER P2/6.

In order to accommodate these changes the emphasis of this document is now focused on defining the minimum level of security of supply that should be achieved rather than how that level should be achieved. Guidance on the means of achieving the prescribed security of supply is set out in Engineering Report 130 [Ref 1].

1 Scope

The purpose of this Engineering Recommendation is to define the standard to which a **Group Demand** should be secured. It details the factors that should be taken into consideration to establish the magnitude of the **Group Demand** that needs to be secured and also the means of securing that demand using a combination of network assets and non-network assets. It does not detail how the **DNO** should meet the standard, however guidance on the means of achieving the prescribed security of supply is set out in Engineering Report 130 [Ref 1].

This document does not set out any minimum requirements for the security of supply for connections to a generating facility. This document deals with the security of **DNO**s distribution network. It does not apply to the security of the connection between the **DNO**s distribution network and an individual customer, which should be agreed between the **DNO** and that customer.

2 Normative references

The following referenced documents, in whole or part, are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ENA Engineering Report (EREP) 130 - Application guide for assessing the capacity of networks containing distributed generation.

ENA Engineering Report (EREP) 131 - Analysis package for assessing generation security capability – Users' guide.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
Circuit

A **Circuit** is the part of an electricity supply system between two or more circuit breakers, switches and/or fuses inclusive. It may include transformers, reactors, cables and overhead lines. Busbars are not considered as **Circuits** and are to be considered on their merits.

3.2
Circuit Capacity

The appropriate continuous rating or cyclic rating or, where it can be satisfactorily determined, the appropriate emergency rating, taking into account the relevant environmental conditions and the expected demand profile, should be used for all **Circuit** equipment and associated protection systems. **Circuit Capacity** should be assessed in MVA.

3.3
Cold Load Pickup

The difference between the **Measured Demand** on a **Circuit** following re-energisation of that **Circuit** and the demand on that **Circuit** which the **DNO** would have reasonably expected had no de-energisation occurred.

3.4
Demand Side Response (DSR)

Demand that is controlled in response to an instruction issued as part of an agreed demand side management arrangement with the **DNO** or other party.

3.5
Distributed Generation (DG)

A generating facility connected to the distribution network, where a generating facility is an installation comprising one or more generating units.

3.6
Distribution Network Operator (DNO)

The person or legal entity named in Part 1 of the Distribution Licence and any permitted legal assigns or successors in title of the named party.

3.7
First Circuit Outage (FCO)

Signifies a fault or a pre-arranged **Circuit** outage.

3.8
Generator

A person who generates electricity under licence or exemption under the Electricity Act 1989 (as amended by the Utilities Act 2000 and the Energy Act 2004).

3.9
Group Demand

The **DNO**'s estimate of the maximum demand of the group being assessed for EREC P2/7 compliance with appropriate allowance for diversity. When estimating the maximum demand of the group the **DNO** should, where necessary, take into consideration (but not be limited to) the following: the **Latent Demand** due to **DG**, the **Latent Demand** due to **DSR**, the **Latent Demand** due to storage, the effect of **Suppliers** time of use tariffs, the effect of **Network Operator** price signals, the effects of **Cold Load Pickup** and, data granularity implications (instantaneous peak vs time averaged flow). The **Group Demand** at grid supply points must be consistent with the demand data submitted to a transmission company under the terms of the GB Grid Code.

NOTE: Further advice on estimating **Group Demand** is given in EREP 130 [Ref 1].
NOTE: **Group Demand** is the sum of the **Latent Demand** and the **Measured Demand**.

3.10
Latent Demand

Demand that would appear as an increase in **Measured Demand** if the **DG** was not operating, the **DSR** was not implemented or other means (eg time of use tariff, export from electricity storage devices) of suppressing the **Measured Demand** within the network (for which the **Group Demand** is being assessed) was not operating.

3.11
Measured Demand

Summated demand measured at the normal (network) infeed points to the network for which **Group Demand** is being assessed.

3.12
Network Operator

A **Distribution Network Operator** or a **Transmission System Operator**.

3.13
Second Circuit Outage (SCO)

Signifies a fault following a pre-arranged **Circui**t outage.

NOTE: The recommended levels of security are not intended at all times to cater for a first fault outage followed by a second fault outage or for a simultaneous double fault outage. Nevertheless, in many instances, depending upon switching and/or loading/generating arrangements, they will do so.

3.14
Secured Outage

A **First Circuit Outage** or **Second Circuit Outage** after which a defined level of demand should be supplied.

3.15
Supplier

(a) A person supplying electricity under an Electricity Supply Licence; or
(b) A person supplying electricity under exemption under the Electricity Act 1989 (as amended by the Utilities Act 2000 and the Energy Act 2004).

In each case acting in its capacity as a supplier of electricity to customers in Great Britain.

3.16
System Security

The capability of a system to maintain supply to a defined level of demand under defined outage conditions.

3.17
Transmission System Operator

The entity that operates the high voltage electricity transmission system.

3.18
Transfer Capacity

The capacity of an adjacent network which can be made available within the times stated in Table 1. **Transfer Capacity** will be limited by **Circuit Capacity** or other practical limitations on power flow.

4 Recommended levels of supply

Table 1 sets out the normal levels of security required for distribution networks classified in ranges of **Group Demand**. If it is known that higher voltage reinforcement is expected in the near future, the improvement in security resulting from this reinforcement may enable lower voltage reinforcement to be deferred[1]. Any departure from the recommended normal level of security of supply defined in this document may require detailed risk and economic studies to be undertaken including any costs of generation operation. An instance where a departure would be justified is for Class E, where the characteristics of the demand curve are such that normal maintenance procedure would entail risk of consumer disconnection. In these cases earlier reinforcement would be required unless alterations to maintenance procedures could be made economically.

5 Capability of a network to meet demand

Demand can be secured using **Circuits** or a combination of **Circuits** and other means.

When carrying out a security assessment consideration should be given to ensure that the **Circuit Capacity**, the capability of other means and the value of demand used correspond with the same point in time.

Guidance on best practice in respect of determining the contribution of the following means of meeting **Group Demand** after **First Circuit Outages** and **Second Circuit Outages** is detailed in EREP 130. Factors contributing to meeting **Group Demand** include:

- The appropriate rating of the remaining **Circuits** which normally supply the **Group Demand**, following outage of the most critical **Circuit** (or **Circuits**); plus
- **Transfer Capacity** which can be made available from alternative sources; plus
- For demand groups containing **DG**, **DSR**, or other means, the security contribution of the **DG**, **DSR,** or other means of providing network capability.

Due consideration shall be given to ensure voltage limits are maintained during **Secured Outages**.

5.1 Capability of Circuits

A **Circuit** should not be loaded to a point where it would suffer unacceptable loss of life.

For **First Circuit Outages**, the **Circuit Capacity** will normally be based on the rating corresponding to when the **Group Demand** occurs.

For **Second Circuit Outages**, the **Circuit Capacity** will normally be based on the rating corresponding with the time when a pre-arranged **First Circuit Outage** is likely.

The existence and possible provision of **Transfer Capacity** should always be considered when assessing the need for reinforcement.

5.2 Capability of non-circuit based capacity

The loss of a single **DG** security contribution, **DSR** security contribution or single point failure of any other system providing a security contribution should not have a greater impact on **System Security** than the loss of a **Circuit(s)**.

NOTE: Whilst **DG** and **DSR** can be used as a contribution to network capability, this contribution may be less than its contribution towards **Latent Demand.**

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[1] Such a deferment may require a derogation to be sought from Ofgem. Ofgem publishes guidance on the need for derogations on its website.

5.3 Impact of Active Network Management, other control systems or protection systems

Where **DG** security contribution or **DSR** security contribution is associated with an Active Network Management (ANM) system, other control system or protection system, consideration should be given to the most material common mode failure of that ANM, control or protection system. Such a failure could have an impact on the security contribution from the **DG** or **DSR**.

DNOs should not assume all generation or **DSR** can or will be manageable via an ANM scheme.

5.4 Security contribution from multiple sources

Where security of supply is provided by means other than **Circuits,** consideration shall be given to the availability and scheduling of planned outages of the asset providing those security contributions.

Table 1

		Minimum demand to be met after*		
Class of supply	**Range of Group Demand**	**First Circuit Outage**	**Second Circuit Outage**	**Notes**
A	Up to 1MW	In repair time: **Group Demand**	Nil	Where demand is supplied by a single 1000kVA transformer the "Range of Group Demand" may be extended to cover the overload capacity of that transformer.
B	Over 1MW and up to 12MW	(a) Within 3 hours: **Group Demand** minus 1MW (b) In repair time: **Group Demand**	Nil	
C	Over 12MW and up to 60MW	(a) Within 15 minutes: Smaller of (**Group Demand** minus 12MW); and 2/3 of **Group Demand** (b) Within 3 hours: **Group Demand**	Nil	**Group Demand** will be normally supplied by at least two normally closed **Circuits** or by one **Circuit** with supervisory or automatic switching of alternative **Circuits**.
D	Over 60MW and up to 300MW	(a) Immediately: **Group Demand** minus up to 20MW (automatically disconnected) (b) Within 3 hours: **Group Demand**	(c) Within 3 hours; For **Group Demands** greater than 100MW: Smaller of (**Group Demand** minus 100MW); and 1/3 **Group Demand** (d) Within time to restore arranged outage: **Group Demand**	A loss of supply not exceeding 60 sec is considered as an immediate restoration. The Recommendation is based on the assumption that the time for restoration of **Group Demand** after a **Second Circuit Outage** will be minimised by the scheduling and control of planned outages, and that consideration will be given to the use of rota load shedding to reduce the effect of prolonged outages on consumers.

E	Over 300MW and up to 1500MW	(a) Immediately: **Group Demand**	(b) Immediately: All consumers at 2/3 **Group Demand** (c) Within time to restore arranged outage: **Group Demand**	The provisions of Class E apply to infeeds to the distribution system but not to systems regarded as part of the interconnected Supergrid to which the provisions of Class F apply. For the system covered by Class E consideration can be given to the feasibility of providing for up to 60 MW to be lost for up to 60 seconds on **First Circuit Outage** if this leads to significant economies. This provision is not intended to restrict the period during which maintenance can be scheduled. The provision for a **Second Circuit Outage** assumes that normal maintenance can be undertaken when demand is below 67%. Where the demand during the maintenance period is greater than 67% of the **Group Demand**, the requirement in (b) should be increased to match the maintenance period demand.
F	Over1500 MW	In accordance with the relevant transmission company licence security standard		

* for the purpose of complying with the requirement to supply the ‘minimum demand to be met’, activation of DSR is equivalent to restoration of demand.

References

1. Engineering Report 130: Application Guide for Assessing the Capacity of Networks Containing Distributed Generation.

2. Engineering Report 131: Analysis Package for Assessing Generation Security Capability – Users' Guide.