nationalgrid

National Electricity Transmission System Performance Report 2015 – 2016

Report to the Gas and Electricity Markets Authority

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National Electricity Transmission System Performance Report

Introduction

The electricity transmission networks in Great Britain are owned by National Grid Electricity Transmission plc (NGET) in England and Wales, SP Transmission plc (SPT) in South and Central Scotland and Scottish Hydro Electric Transmission plc (SHE Transmission) in the North of Scotland. These three networks form the Onshore Transmission System. The Offshore Transmission networks are owned by Transmission Capital (TC), Blue Transmission Investments Limited (BT), Greater Gabbard OFTO Ltd, Thanet OFTO Ltd, Gwynt-Y-Mor OFTO Ltd and West of Duddon Sands Transmission plc (WoDS). The National Electricity Transmission System (NETS) is comprised of the Onshore and Offshore Transmission System.

In addition to its role as the Transmission Owner in England and Wales, NGET became the Great Britain System Operator (GBSO) on 1 April 2005, and subsequently on 24th June 2009, National Electricity Transmission System Operator (NETSO) which includes the Offshore Transmission System.

In accordance with Standard Licence Condition C17 (Transmission System Security, Standard and Quality of Service) of its Transmission Licence, NGET, as NETSO, is required by the Gas and Electricity Markets Authority, to report National Electricity Transmission System performance in terms of availability, system security and the quality of service.

The Onshore and Offshore Transmission System broadly comprises circuits operating at 400, 275 and 132kV. The formal definition of the National Electricity Transmission System is contained in the NETS Grid Code and NETS Security and Quality of Supply Standard (NETS SQSS). The fully interconnected transmission system provides a consistently high quality of supply and also allows for the efficient bulk transfer of power from remote generation to demand centres.

Information relating to SP Transmission plc, Scottish Hydro Electric Transmission plc, TC Robin Rigg OFTO Limited, TC Barrow OFTO Limited, TC Gunfleet Sands OFTO Limited, TC Ormonde OFTO Limited, TC Lincs OFTO Limited, TC Westermost Rough OFTO Limited, BT Walney 1 Limited, BT Walney 2 Limited, BT Sheringham Shoal Limited, BT London Array Limited, BB† Greater Gabbard OFTO Ltd, BB† Thanet OFTO Ltd, BB†Gwynt-Y-Mor OFTO Ltd and West of Duddon Sands Transmission plc have been provided by the Transmission Owners in accordance with Licence Condition D3 (Transmission System Security Standard and Quality of Service) of their Transmission Licences.

When considering the performance of the Scottish transmission networks it should be recognised that this can be influenced by both the Scottish Transmission Owners and the NETSO.

The National Electricity Transmission System is connected via interconnectors to transmission systems in France, Northern and Southern Ireland and Netherlands. The Northern Ireland Interconnector is regulated by the Northern Ireland Regulator (NIAUR) and Southern Ireland is regulated by the Commission for Energy Regulation (CER) which both fall outside the scope of this report.

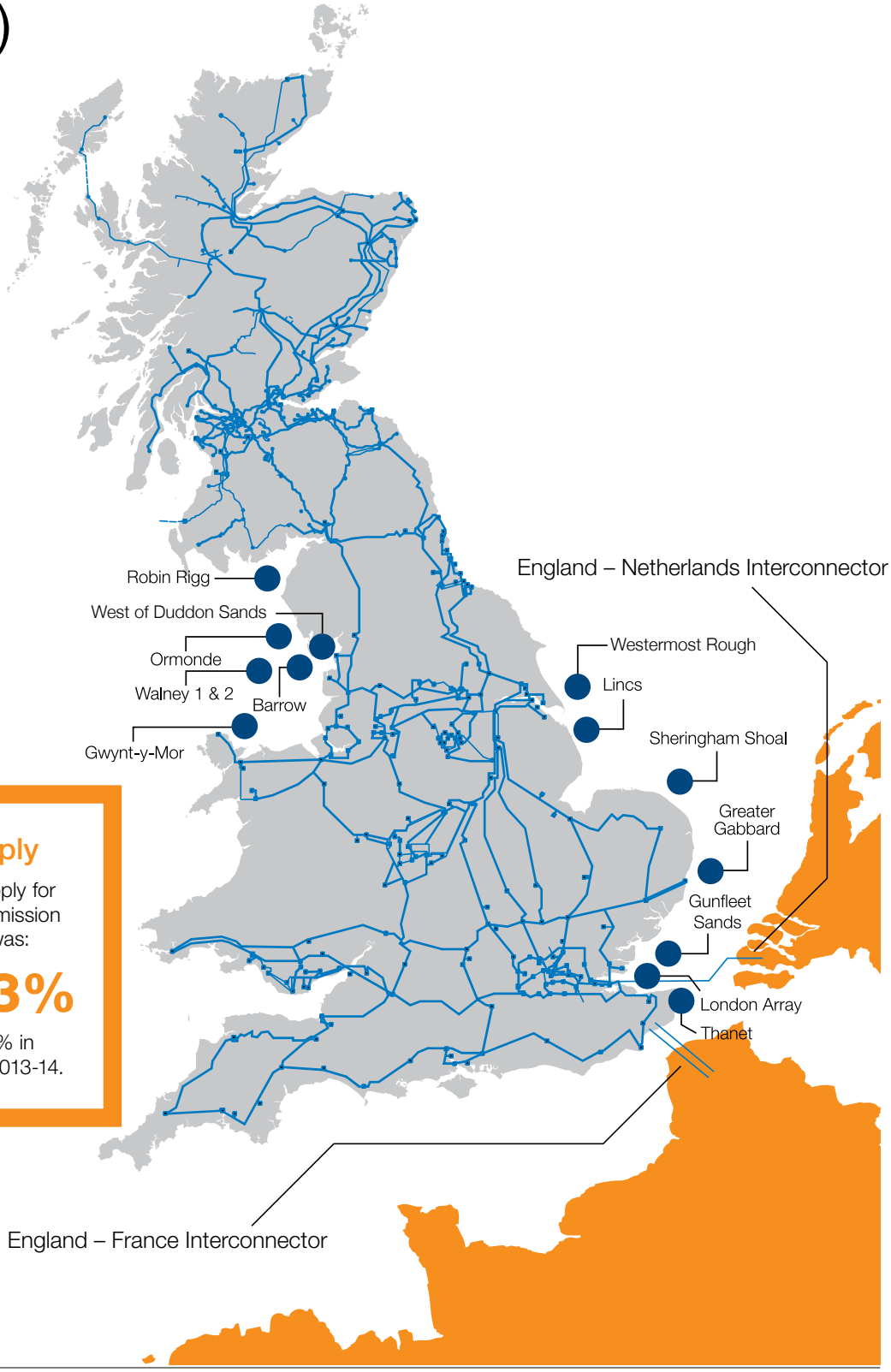
Information relating to the Interconnexion France – Angleterre (IFA) has been provided by National Grid Interconnectors Limited (NGIC) in accordance with Licence Condition D5 (Transmission System Security Standard and Quality of Service) of the NGIC Transmission Licence.

Information relating to the Interconnector between England and the Netherlands (BritNed) has been provided by National Grid Interconnectors in conjunction with TenneT due to the joint ownership of the equipment.

†. Greater Gabbard OFTO, Thanet OFTO and Gwynt-Y-Mor OFTO are operated by Balfour Beatty (BB).

Section One

National Electricity Transmission System (GB Network)



Reliability of Supply

The Overall Reliability of Supply for the National Electricity Transmission System during 2015-16 was:

99.999993%

compared with 99.99987% in 2014-15 and 99.99991% in 2013-14.

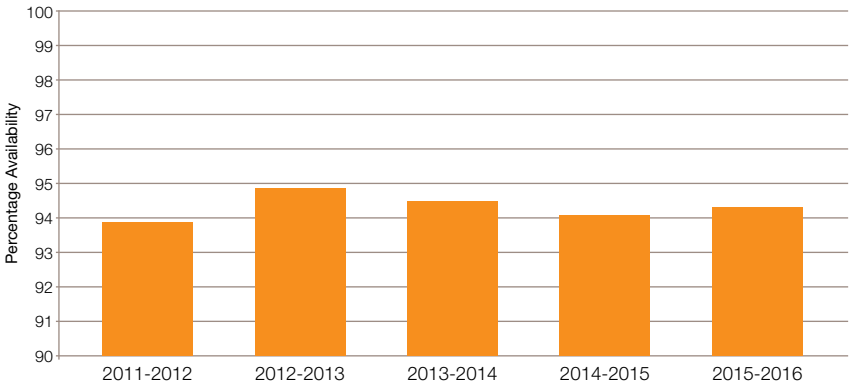
Availability

The definitions and criteria for system availability can be found in the Glossary of Terms at the end of this report.

National Electricity Transmission System performance is monitored by reporting variations in Annual System Availability, Winter Peak System Availability and Monthly System Availability.

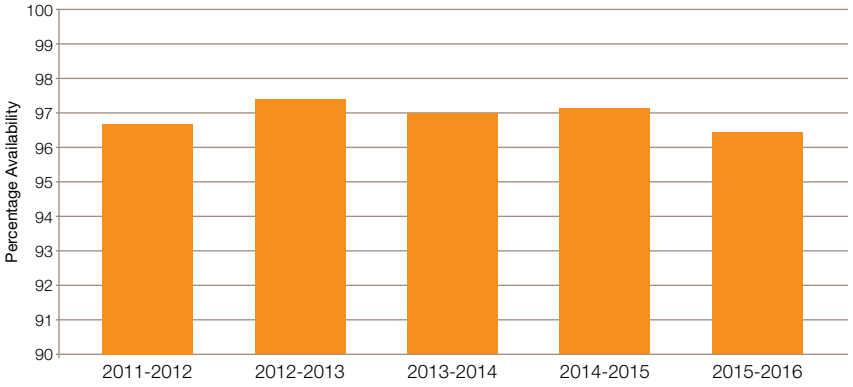
Lovedean Substation

% Annual System Availability



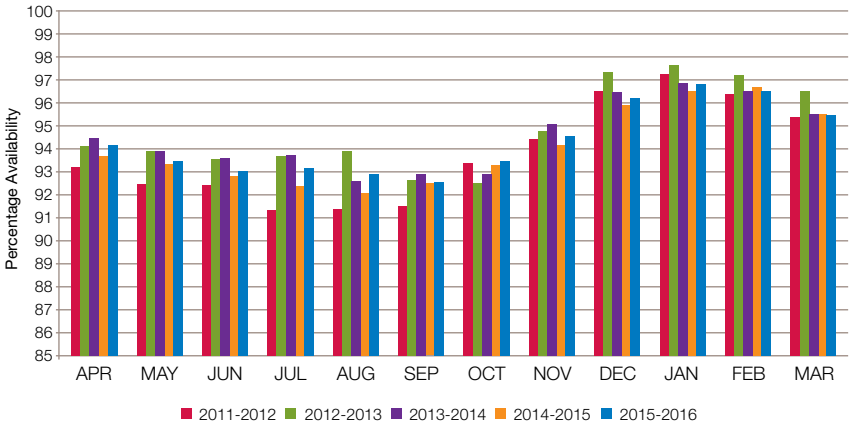
2011-12	2012-13	2013-14	2014-15	2015-16
93.78	94.75	94.50	94.09	94.36

% Winter Peak System Availability



2011-12	2012-13	2013-14	2014-15	2015-16
96.71	97.40	96.98	97.15	96.46

% Monthly System Availability



	2011-12	2012-13	2013-14	2014-15	2015-16
Apr	93.25	94.12	94.43	93.69	94.17
May	92.51	93.87	93.88	93.24	93.51
Jun	92.39	93.59	93.61	92.87	93.03
Jul	91.36	93.72	93.73	92.44	93.15
Aug	91.30	93.87	92.67	92.06	92.90
Sep	91.43	92.65	92.87	92.51	92.56
Oct	93.35	92.49	92.98	93.26	93.47
Nov	94.45	94.77	95.03	94.14	94.63
Dec	96.48	97.32	96.45	95.95	96.22
Jan	97.26	97.68	96.77	96.51	96.80
Feb	96.38	97.17	96.43	96.68	96.44
Mar	95.38	96.46	95.58	95.57	95.51

Annual System Availability

Annual System Availability of the National Electricity Transmission System for 2015-2016 was:

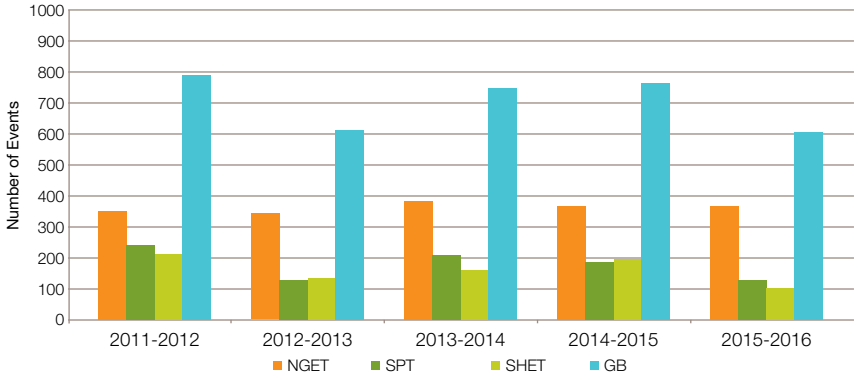
94.36%

Security

The definitions and criteria for system security can be found in the Glossary of Terms at the end of this report.

System performance is monitored by the Estimated Unsupplied Energy from the National Electricity Transmission System for each incident.

During 2015-16 there were 604 NETS events where transmission circuits were disconnected either automatically or by urgent manual switching. The vast majority of these events had no impact on electricity users with only 36 resulting in loss of supplies to customers.

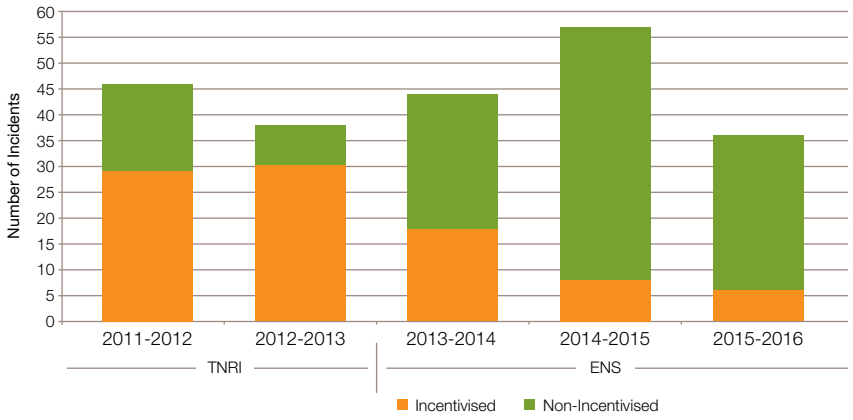


	2011-12	2012-13	2013-14	2014-15	2015-16
NGET	351	351	384	371	374
SPT	236	130	204	190	126
SHET	209	133	160	199	104
GB	796	614	748	760	604

Electricity National Control Centre, UK

Number of Loss of Supply Incidents

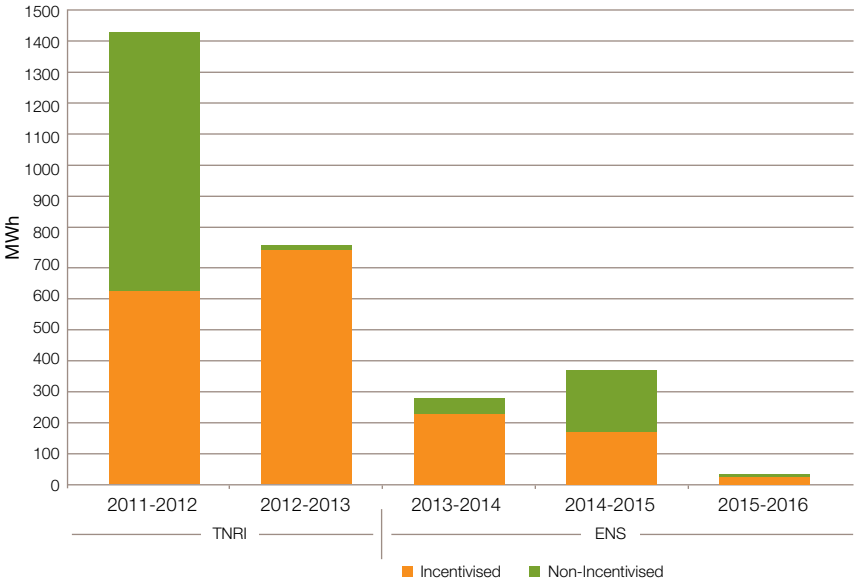
The chart shows the annual comparison of the numbers of Loss of Supply Incidents that occurred within the National Electricity Transmission System. The chart separates the TNRI (2005 – 2013) and ENS (2013 to date) schemes for clarification.



	2011-12	2012-13	2013-14	2014-15	2015-16
Incentivised	29	30	17	8	6
Non-Incentivised	17	8	27	49	30

Total Estimated Unsupplied Energy

The chart shows the annual comparison of the Estimated Unsupplied Energy for Loss of Supply Incidents that occurs within the National Electricity Transmission System.



	2011-12	2012-13	2013-14	2014-15	2015-16
Incentivised	628.88	760.53	212.93	178.18	18.35
Non-Incentivised	788.70	6.90	45.37	196.01	1.67

Total Estimated Unsupplied Energy

The total Estimated Unsupplied Energy from the National Electricity Transmission System during 2015-16 was:

20.02 MWh

Reactor

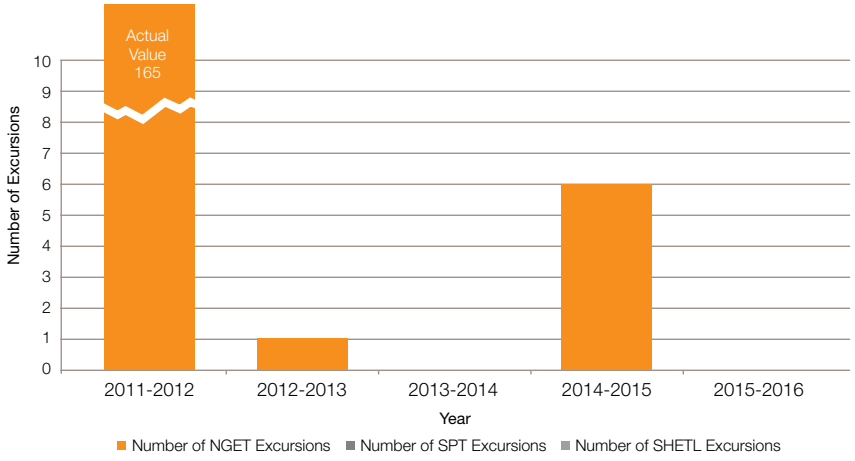
Quality of Service

Quality of service is measured with reference to system Voltage and Frequency. The criteria for reportable Voltage and Frequency Excursions can be found in the Glossary of Terms at the end of this report.

Voltage Excursions

During 2015-16 there were zero reportable Voltage Excursions within the National Electricity Transmission System.

The chart below summarises the reportable Voltage Excursions that have occurred on the National Electricity Transmission System within England and Wales during 2015-16.



	2011-12	2012-13	2013-14	2014-15	2015-16
Number of NGET Excursions	165	1	0	6	0
Number of SPT Excursions	0	0	0	0	0
Number of SHETL Excursions	0	0	0	0	0

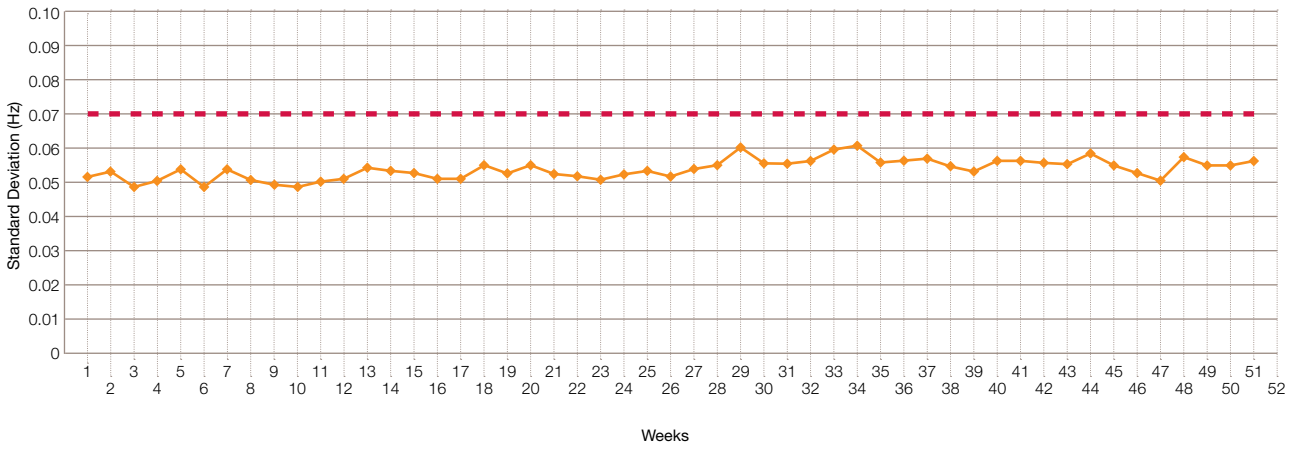
Frequency Excursions

During 2015-16 there has been no reportable Frequency Excursion within the National Electricity Transmission System.

The last reported Frequency Excursion was in 2008-09 reporting period.

Frequency Standard Deviation

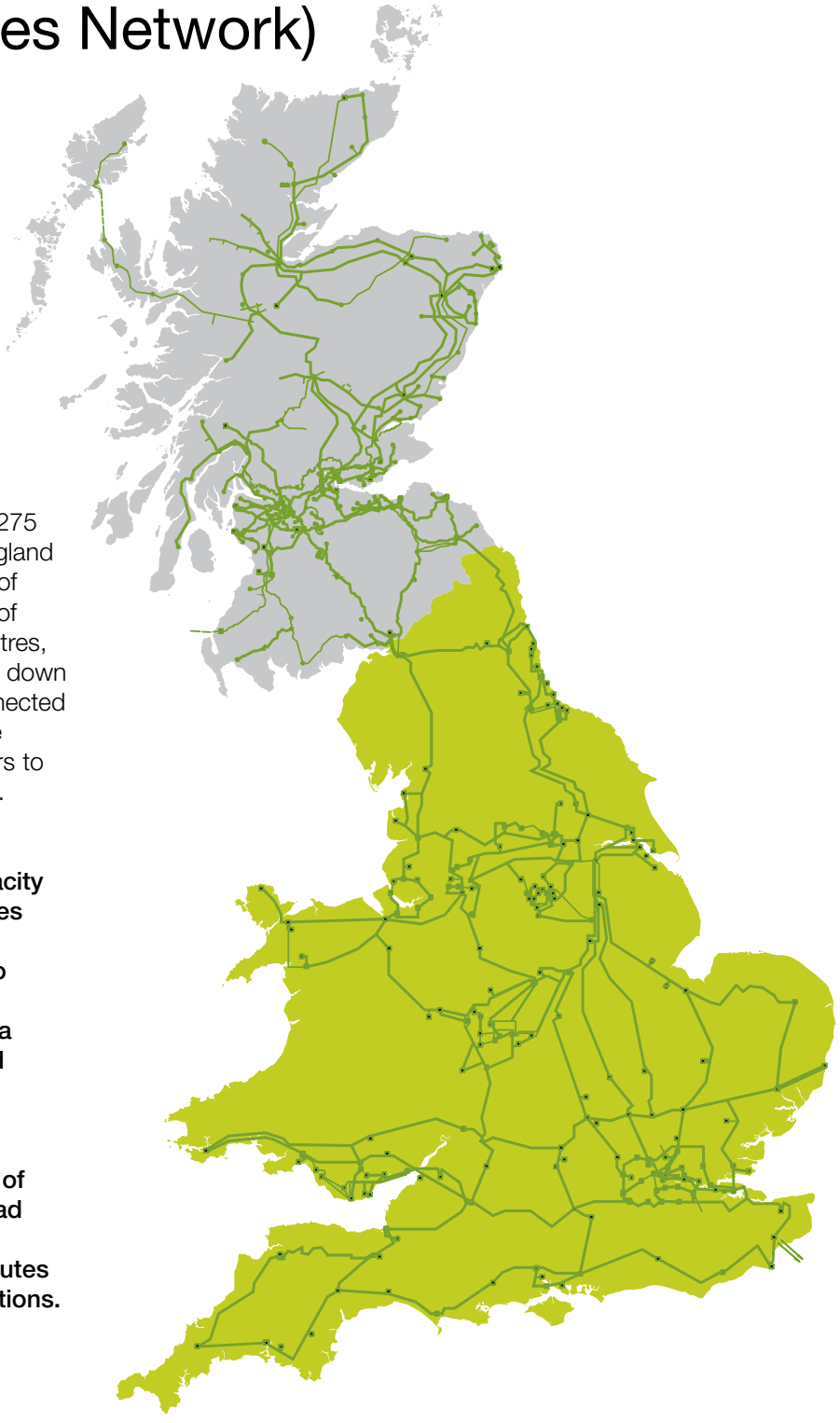
The chart below displays the recorded Frequency Standard Deviation from 50Hz on a weekly basis with a target Standard Deviation of 0.07Hz for the year 2015-16.



Live Line Inspection

Section Two

NGET System (England & Wales Network)



System Description

The NGET network operates at 400, 275 and 132kV supplying electricity to England and Wales with a maximum demand of 46.3GW. The system covers an area of approximately 151,000 square kilometres, in accordance with the standards laid down in the Transmission Licence. It is connected to the SP Transmission System to the North and three HVDC Interconnectors to Southern Ireland, France and Holland.

There are 45 large power stations totalling 47.6GW of generation capacity connected to the England and Wales transmission system. There are 12 Distribution Networks connected to the NGET system via 145.8GVA of installed transformer capacity and a small number of directly connected customers such as Network Rail and steelworks.

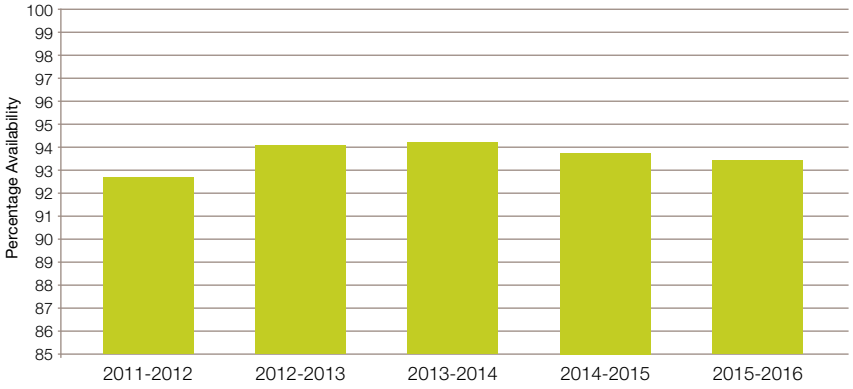
The Transmission System consists of 14,165 circuit kilometres of overhead line and 652 circuit kilometres of underground transmission cable routes interconnecting around 300 substations.

Availability

The definitions and criteria for system availability can be found in the Glossary of Terms at the end of this report.

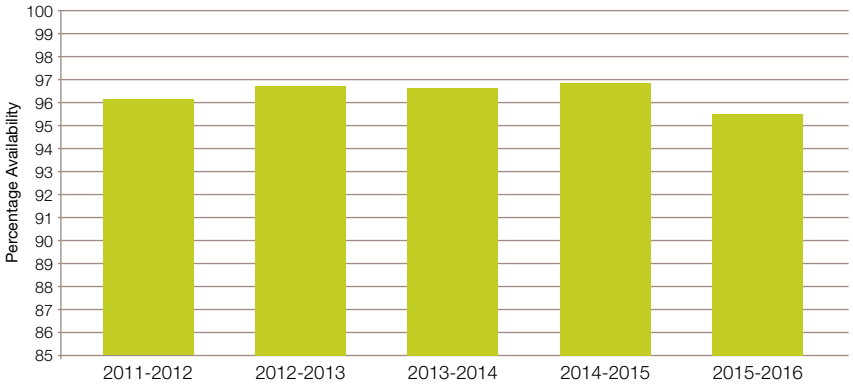
System performance is monitored by reporting variations in Annual System Availability, Winter Peak System Availability and Monthly System Availability. There is also a breakdown of Planned and Unplanned System Unavailability.

% Annual System Availability



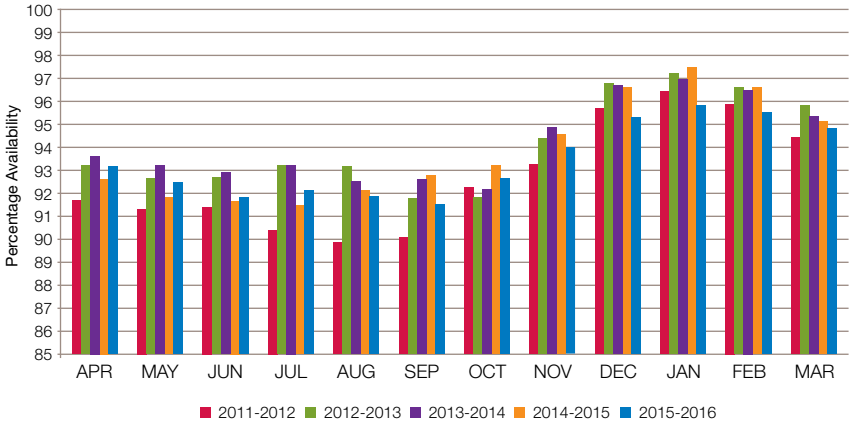
2011-12	2012-13	2013-14	2014-15	2015-16
92.71	94.03	94.16	93.82	93.42

% Winter Peak System Availability



2011-12	2012-13	2013-14	2014-15	2015-16
96.01	96.89	96.75	96.93	95.51

% Monthly System Availability

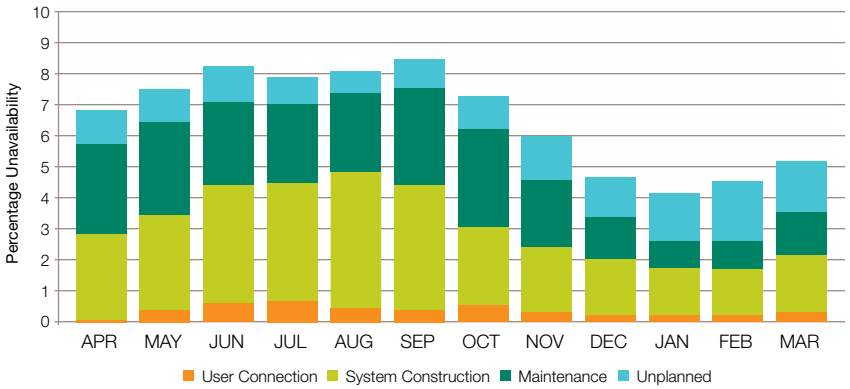


	2011-12	2012-13	2013-14	2014-15	2014-15
Apr	91.81	93.16	93.56	92.49	93.15
May	91.33	92.68	93.22	91.80	92.47
Jun	91.42	92.72	92.92	91.62	91.78
Jul	90.41	93.12	93.14	91.46	92.11
Aug	89.88	93.15	92.52	92.09	91.91
Sep	90.03	91.82	92.58	92.84	91.51
Oct	92.25	91.86	92.18	93.21	92.70
Nov	93.24	94.42	94.89	94.61	94.00
Dec	95.71	96.82	96.77	96.70	95.35
Jan	96.40	97.20	96.97	97.47	95.85
Feb	95.91	96.60	96.51	96.60	95.47
Mar	94.44	95.87	95.33	95.12	94.81

Planned and Unplanned System Unavailability

The table and the chart show the monthly variation in Planned and Unplanned System Unavailability.

Unavailability is defined as (100 – Availability) %



	User Connection	System Construction	Maintenance	Unplanned	Total
Apr	0.02	2.83	2.94	1.07	6.85
May	0.41	3.02	3.04	1.06	7.53
Jun	0.66	3.76	2.70	1.10	8.22
Jul	0.73	3.77	2.53	0.86	7.89
Aug	0.51	4.35	2.54	0.69	8.09
Sep	0.41	4.03	3.11	0.94	8.49
Oct	0.57	2.55	3.09	1.09	7.30
Nov	0.31	2.08	2.21	1.40	6.00
Dec	0.29	1.79	1.28	1.29	4.65
Jan	0.29	1.48	0.89	1.50	4.15
Feb	0.29	1.45	0.92	1.88	4.53
Mar	0.31	1.90	1.30	1.67	5.19

UK Construction Stella West Substation Project Site

Security

The definitions and criteria for system security can be found in the Glossary of Terms at the end of this report.

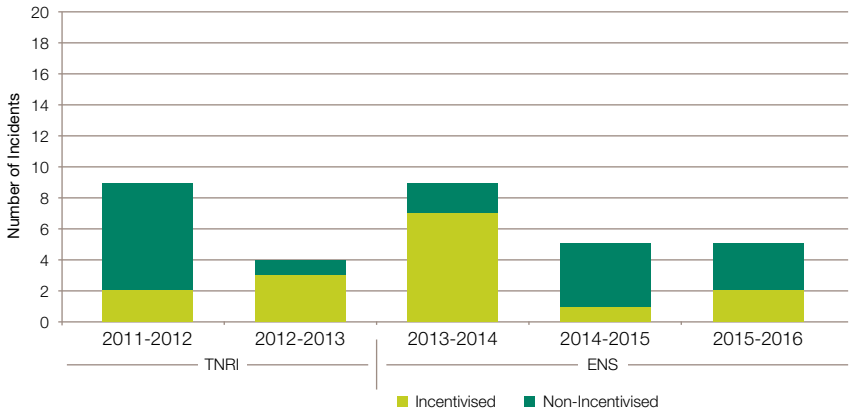
System performance is monitored by the Estimated Unsupplied Energy from the NGET Transmission System for each incident.

During 2015-16 there were 374 NGET system events where transmission circuits were disconnected either automatically or by urgent manual switching. The vast majority of these events had no impact on electricity users with only 5 resulting in loss of supplies to customers.

Silhouettes on overhead lines

Number of Loss of Supply Incidents

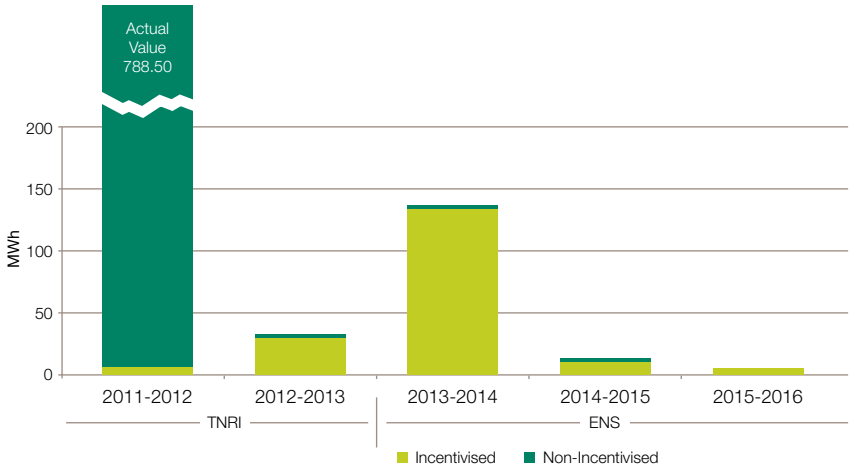
The chart shows the annual comparison of the numbers of Loss of Supply Incidents that occurred within the NGET Transmission System.



	2011-12	2012-13	2013-14	2014-15	2015-16
Incentivised	2	3	7	1	2
Non-Incentivised	7	1	2	4	3

Total Estimated Unsupplied Energy

The chart shows the annual comparison of the Estimated Unsupplied Energy for Loss of Supply Incidents that occur within the NGET Transmission System.



	2011-12	2012-13	2013-14	2014-15	2015-16
Incentivised	2.50	31.50	135.03	8.69	4.45
Non-Incentivised	788.50	1.50	0.87	1.11	0.00

Total Estimated Unsupplied Energy

The total Estimated Unsupplied Energy from the NGET Transmission System during 2015-16 was:

4.45 MWh

Reliability of Supply

The Overall Reliability of Supply for the NGET Transmission System during 2015-16 was:

99.999998%

compared with 99.999996% in 2014-15 and 99.99995% in 2013-14.

Loss of Supply Incident Details

NGET Loss of Supply Incidents – Incentivised

Incident Date, Time & Location	MW Lost	Mins	MWh Unsupplied
11 September 2015 09:16 at Imperial Park 400kV substation The Imperial Park – Cilfynydd circuit tripped, resulting in a loss of supply for 3 minutes and 40 seconds.	**5.0**	**4**	**0.31**
20 October 2015 15:14 at Killingholme 400kV substation Killingholme B Module 2 generator disconnected, whilst taking auxiliary supplies from the grid, resulting in a loss of supply for 10 hours and 21 minutes.	**0.4**	**621**	**4.14**
		Total	**4.45 MWh**

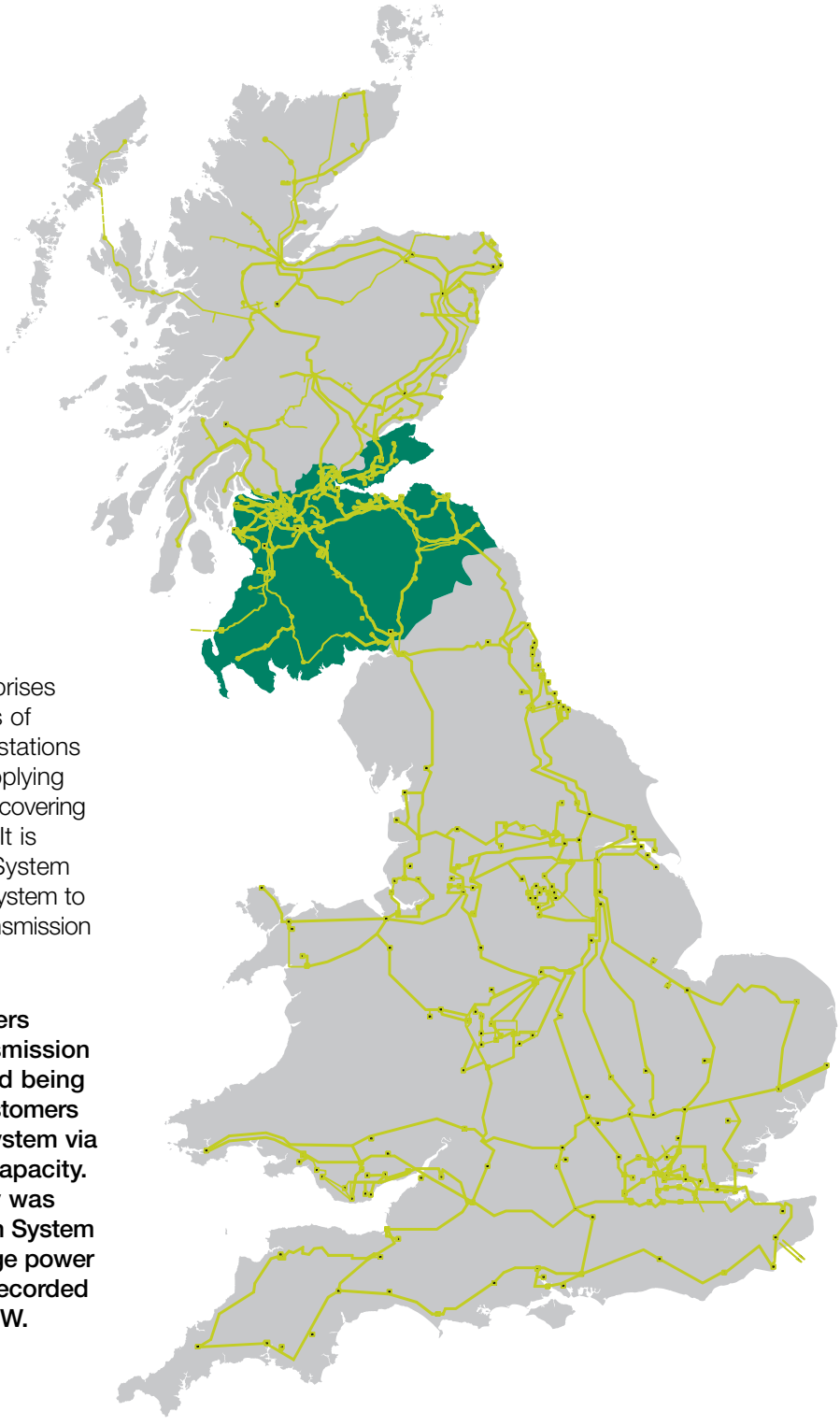
NGET Loss of Supply Incidents – Non-Incentivised

Incident Date, Time & Location	MW Lost	Mins	MWh Unsupplied
4 July 2015 01:16 at Leighton Buzzard 25kV substation The Cowley – Leighton Buzzard – Sundon 400kV circuit and SGT1 tripped, resulting in a loss of supply for 2 minutes and 25 seconds.	**0.0**	**2**	**0.0**
31 July 2015 05:25, Penhros 132kV substation A circuit tripped due to a transient fault, resulting in a loss of supply for 33 seconds.	**0.0**	**0**	**0.0**
20 October 2015 15:14 at Killingholme 400kV substation Killingholme A generator disconnected, whilst taking auxiliary supplies from the grid, resulting in a loss of supply for 5 seconds.	**1.7**	**0**	**0.0**
		Total	**0.0 MWh**

Cowley Substation

Section Three

SP Transmission System



System Description

The SPTL Transmission System comprises approximately 4,000 circuit kilometres of overhead line and cable and 148 substations operating at 400, 275 and 132kV supplying approximately 2 million customers and covering an area of 22,951 square kilometres. It is connected to the SHE Transmission System to the north, the NGET Transmission System to the south and the Northern Ireland Transmission System via an HVDC interconnector.

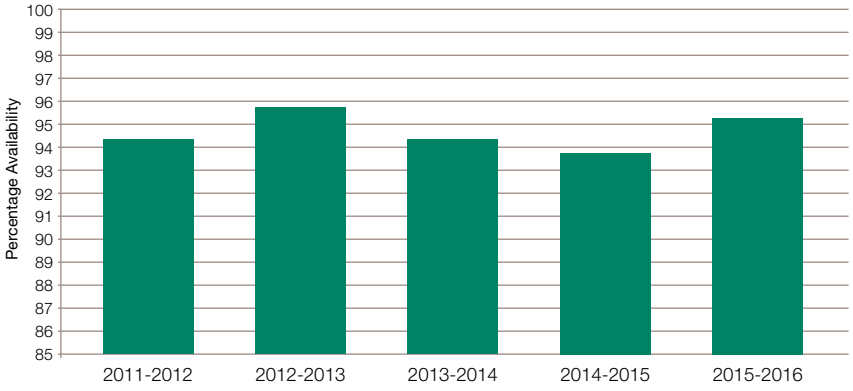
There are 9 major demand customers supplied directly from the SP Transmission System with the majority of the load being taken by approximately 2 million customers connected to the SP Distribution System via 14.2 GVA of installed transformer capacity. Over 7.3GW of generation capacity was connected to the SPTL Transmission System in 2015-16, including twenty one large power stations. In 2015-16 the maximum recorded demand on the network was 3.66GW.

Availability

The definitions and criteria for system availability can be found in the Glossary of Terms at the end of this report..

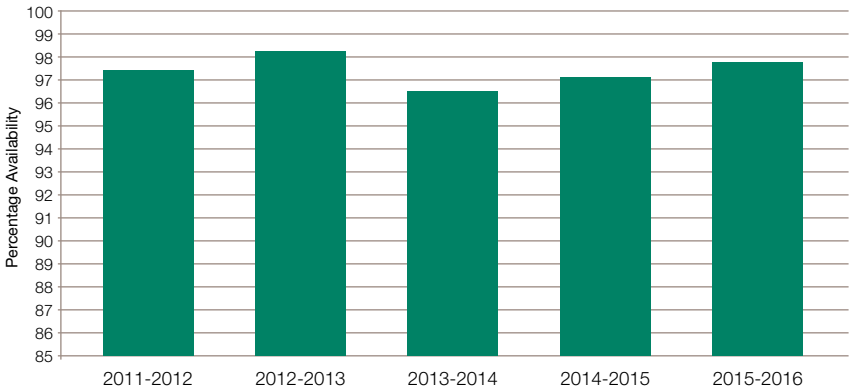
System performance is monitored by reporting variations in Annual System Availability, Winter Peak System Availability and Monthly System Availability. There is also a breakdown of Planned and Unplanned System Unavailability.

% Annual System Availability



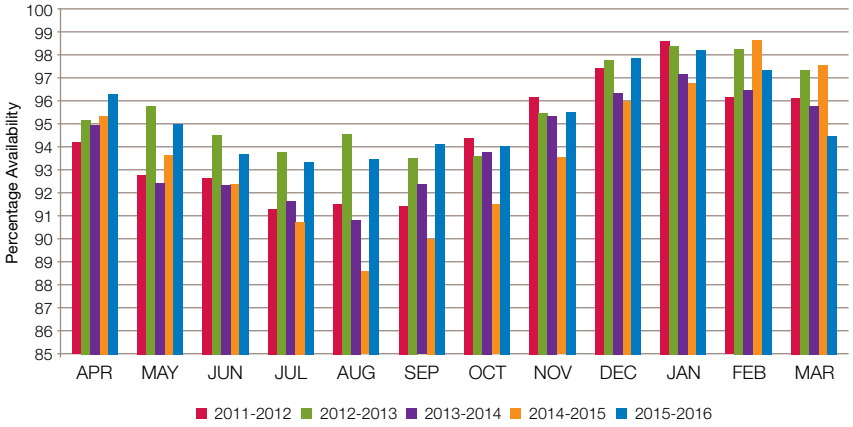
2011-12	2012-13	2013-14	2014-15	2015-16
94.41	95.72	94.14	93.88	95.29

% Winter Peak System Availability



2011-12	2012-13	2013-14	2014-15	2015-16
97.46	98.19	96.68	97.13	97.80

% Monthly System Availability

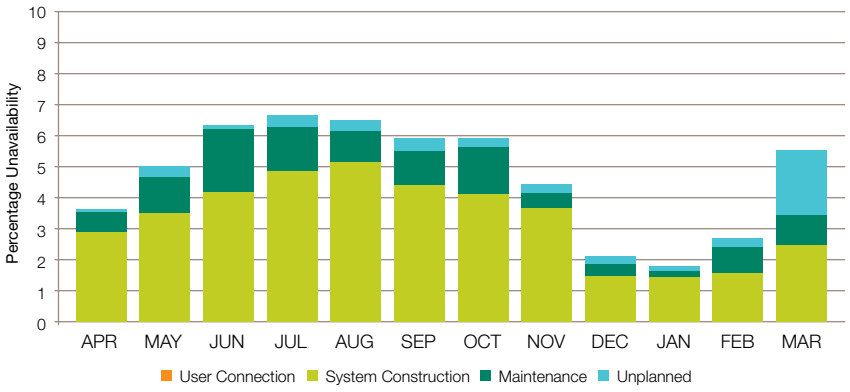


	2011-12	2012-13	2013-14	2014-15	2014-15
Apr	94.19	95.17	94.97	95.26	96.39
May	92.70	95.80	92.44	93.69	94.99
Jun	92.72	94.61	92.31	92.35	93.70
Jul	91.27	93.85	91.70	90.70	93.37
Aug	91.69	94.57	90.88	88.65	93.48
Sep	91.48	93.56	92.41	90.00	94.12
Oct	94.26	93.62	93.85	91.50	94.06
Nov	96.07	95.49	95.31	93.61	95.55
Dec	97.51	97.83	96.33	95.99	97.86
Jan	98.70	98.46	97.21	96.83	98.20
Feb	96.08	98.28	96.48	98.73	97.32
Mar	96.11	97.39	95.85	97.58	94.49

Planned and Unplanned System Unavailability

The table and the chart show the monthly variation in Planned and Unplanned System Unavailability.

Unavailability is defined as (100 - Availability) %



	User Connection	System Construction	Maintenance	Unplanned	Total
Apr	0.00	2.96	0.62	0.03	3.61
May	0.00	3.51	1.16	0.34	5.01
Jun	0.00	4.20	1.99	0.11	6.30
Jul	0.00	4.91	1.41	0.31	6.63
Aug	0.00	5.17	1.00	0.35	6.52
Sep	0.00	4.44	1.12	0.32	5.88
Oct	0.00	4.14	1.47	0.33	5.94
Nov	0.00	3.69	0.47	0.29	4.45
Dec	0.00	1.54	0.34	0.26	2.14
Jan	0.00	1.45	0.25	0.10	1.80
Feb	0.00	1.56	0.83	0.29	2.68
Mar	0.00	2.52	0.92	2.07	5.51

Denny North Substation

Security

The definitions and criteria for system security can be found in the Glossary of Terms at the end of this report.

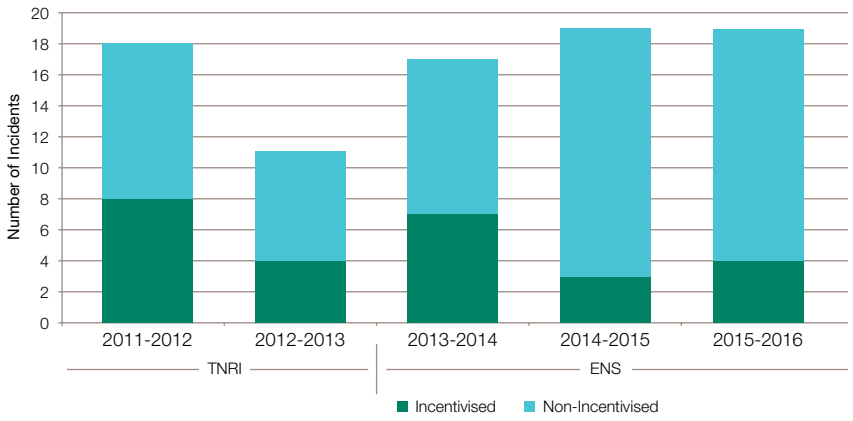
System performance is monitored by the estimated unsupplied energy from the SP Transmission System for each incident.

During 2015-16 there were 126 SPT system events where transmission circuits were disconnected either automatically or by urgent manual switching. The vast majority of these events had no impact on electricity users with only 19 resulting in loss of supply to customers.

Overhead Line Work at Strathaven

Number of Loss of Supply Incidents

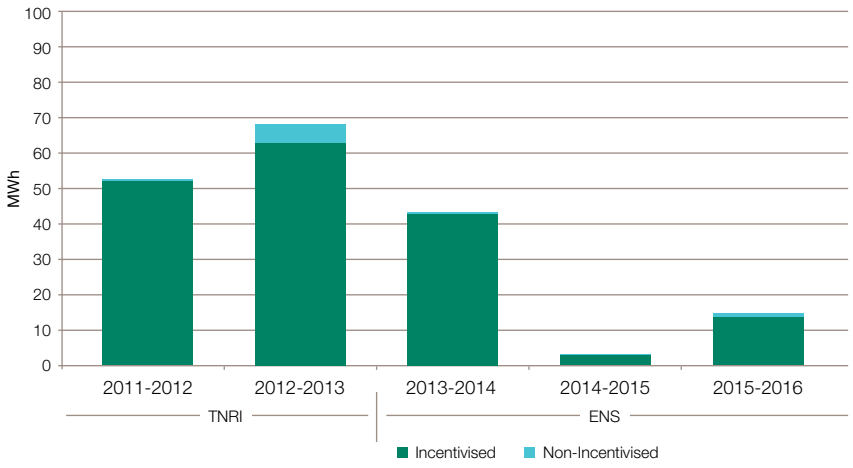
The chart shows the annual comparison of the numbers of Loss of Supply Incidents that occurred within the SP Transmission System.



	2011-12	2012-13	2013-14	2014-15	2015-16
Incentivised	8	4	7	3	4
Non-Incentivised	10	7	10	16	15

Total Estimated Unsupplied Energy

The chart shows the annual comparison of the Estimated Unsupplied Energy, incentivised, for Loss of Supply Incidents that occur within the SP Transmission System.



	2011-12	2012-13	2013-14	2014-15	2015-16
Incentivised	52.50	62.80	42.30	2.80	13.90
Non-Incentivised	0.20	5.40	0.10	0.20	0.80

Total Estimated Unsupplied Energy

The total Estimated Unsupplied Energy from the SP Transmission System during 2015-16 was: :

14.70 MWh

Reliability of Supply

The Overall Reliability of Supply for the SP Transmission System during 2015-16 was:

99.999920%

compared with 99.99998% in 2014-15 and 99.99979% in 2013-14

Loss of Supply Incident Details

SPT Loss of Supply Incidents – Incentivised

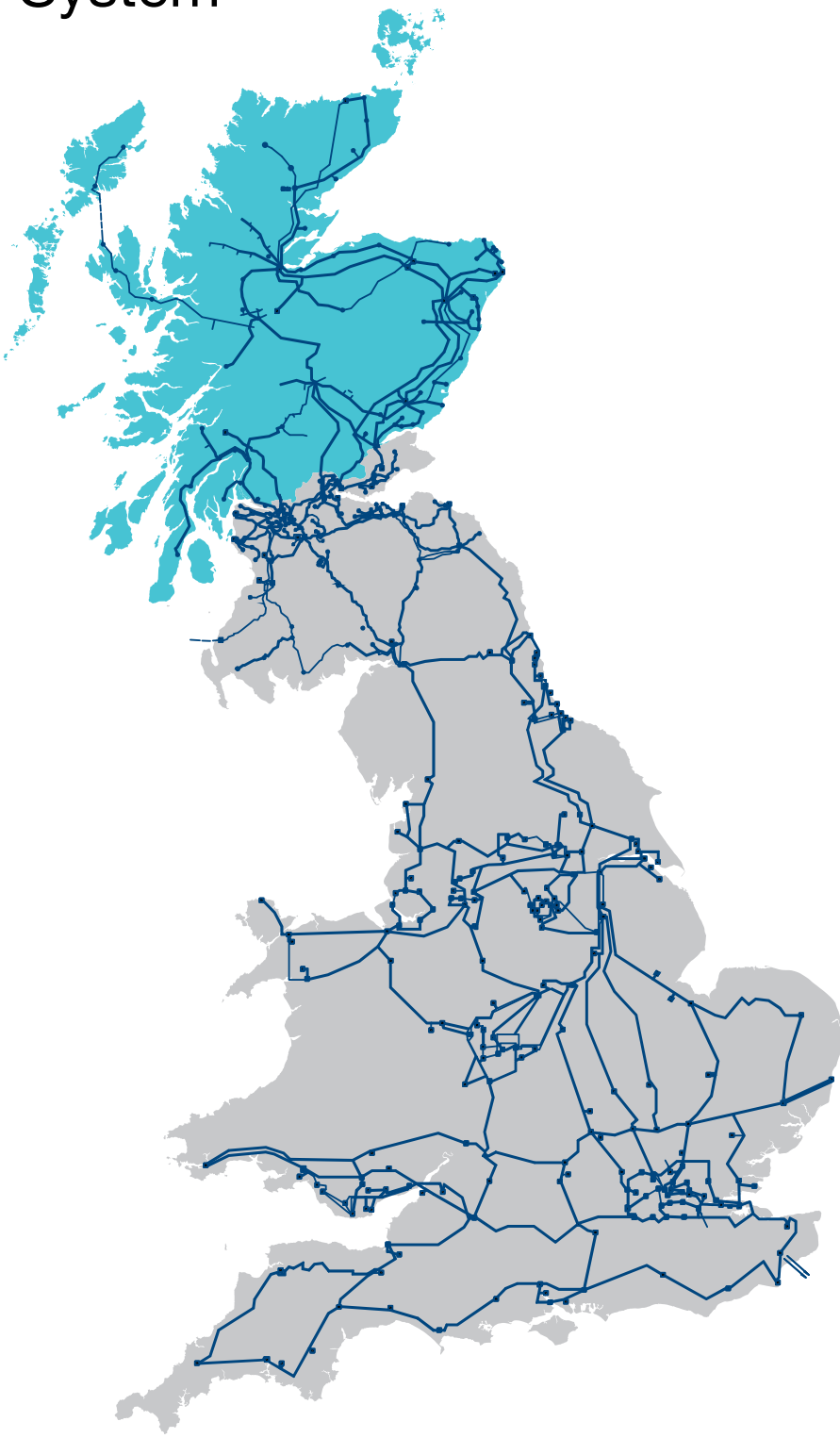
Incident Date, Time & Location	MW Lost	Mins	MWh Unsupplied
2 July 2015 00:49 at Portobello Trackside Feeder Station A lightning strike caused the Smeaton-Portobello-Shrubhill No.2 circuit to trip and re-close, this resulted in supplies being lost to one customer for 6 minutes.	5.6	6	0.3
8 August 2015 13:35 at Easterhouse GSP The Clydesmill-Easterhouse-Newarthill circuit tripped due to an error during commissioning work on the alternate circuit feeding Easterhouse GSP, this resulted in supplies being lost to 33,412 customers for 13 minutes.	26.1	13	5.7
26 January 2016 12:39 at Whitehouse GSP The loss of Low Voltage AC supplies at Dewar Place GSP caused the Kaimes-Whitehouse-Dewar Place No.1 circuit to trip while the No.2 circuit was on outage for construction work. This resulted in supplies being lost to 36,212 customers at Whitehouse GSP for 9 minutes.	51.0	9	7.7
3 February 2016 13:15 at Glenlee GSP A 33kV cable sealing end fault at Glenluce GSP caused the Glenlee-Newton Stewart-Glenluce No.2 circuit to trip, this resulted in supplies to 638 customers at Glenlee GSP being lost for 8 minutes.	2.0	8	0.3
		Total	**13.9 MWh**

SPT Loss of Supply Incidents – Non-Incentivised

Incident Date, Time & Location	MW Lost	Mins	MWh Unsupplied
22 April 2015 21:07 at Whitelee 275kV Substation A faulty protection relay caused all three supergrid transformers at Whitelee 275kV Substation to trip, this resulted in supplies being lost to 1 customer for 14 minutes.	0.0	14	0.0
7 May 2015 12:23 at Portobello GSP A 33kV cable fault at Shrubhill GSP caused the Smeaton-Portobello-Shrubhill No.1 circuit to trip while Portobello SGT2A was on outage for construction work. This resulted in supplies being lost to 58,734 customers at Portobello GSP for 31 seconds.	48.4	0.5	0.8
29 July 2015 21:30 at Glenluce GSP A bird strike at Glenluce GSP caused the No.1 Busbar to trip, this resulted in supplies being lost to 2,957 customers for 30 seconds and 1 windfarm, which was generating at the time of the trip, for 1 hour and 52 minutes.	0.0	0.5	0.0
7 August 2015 11:41 at Markhill 275kV Collector Station An external communications fault caused the Kilmarnock South-Ayr-Coylton No.2 circuit to trip causing, in turn, a correct operation of the Ayrshire Operational Intertrip, which had been set up to account for construction work in the area at the time. This resulted in supplies being lost to two windfarms for 46 and 48 minutes.	0.0	47	0.0
8 September 2015 13:33 at Whitelee Extension 275kV Substation The East Kilbride South-Whitelee Extension 275kV circuit was switched out of service to allow an urgent defect to be rectified, this resulted in supplies being lost to one customer for 1 hour and 16 minutes.	0.0	76	0.0
18 September 2015 04:31 at Crystal Rig 400kV Substation A fault on equipment at the customer's site caused the Crystal Rig-Crystal Rig Windfarm 132kV circuit to trip, this resulted in supplies being lost to one customer for 8 hours and 59 minutes.	0.0	539	0.0
13 October 2015 19:15 at Whitelee Extension 275kV Substation The East Kilbride South-Whitelee Extension 275kV circuit was switched out of service to allow an urgent defect to be rectified, this resulted in supplies being lost to one customer for 3 hours and 35 minutes.	0.0	215	0.0
10 November 2015 12:12 at Hadyard Hill Windfarm The overload protection on the Kilmarnock South-Coylton-Maybole circuit operated due to generator outputs being above agreed limits, this resulted in supplies being lost to one customer for 30 minutes.	0.0	30	0.0
16 November 2015 15:08 at Hadyard Hill Windfarm The overload protection on the Kilmarnock South-Coylton-Maybole circuit operated due to generator outputs being above agreed limits, this resulted in supplies being lost to one customer for 48 minutes.	0.0	48	0.0
2 December 2015 07:21 at Hadyard Hill Windfarm The overload protection on the Kilmarnock South-Coylton-Maybole circuit operated due to generator outputs being above agreed limits, this resulted in supplies being lost to one customer for 26 minutes.	0.0	26	0.0
21 December 2015 14:24 at Hadyard Hill Windfarm The overload protection on the Kilmarnock South-Coylton-Maybole circuit operated due to generator outputs being above agreed limits, this resulted in supplies being lost to one customer for 47 minutes.	0.0	47	0.0
1 February 2016 12:52 at Hadyard Hill Windfarm The overload protection on the Kilmarnock South-Coylton-Maybole circuit operated due to generator outputs being above agreed limits, this resulted in supplies being lost to one customer for 8 minutes.	0.0	8	0.0
8 February 2016 17:21 at Hadyard Hill Windfarm The overload protection on the Kilmarnock South-Coylton-Maybole circuit operated due to generator outputs being above agreed limits, this resulted in supplies being lost to one customer for 8 minutes.	0.0	8	0.0
1 March 2016 15:59 at Hadyard Hill Windfarm The overload protection on the Kilmarnock South-Coylton-Maybole circuit operated due to generator outputs being above agreed limits, this resulted in supplies being lost to one customer for 38 minutes.	0.0	38	0.0
4 March 2016 15:59 at Hadyard Hill Windfarm The overload protection on the Kilmarnock South-Coylton-Maybole circuit operated due to generator outputs being above agreed limits, this resulted in supplies being lost to one customer for 32 minutes.	0.0	32	0.0
		Total	**0.8 MWh**

Section Four

SHE Transmission System



System Description

The SHE Transmission System comprises of over 5,100 circuit kilometres of overhead line and cable and 121 substations operating at 400, 275 and 132kV covering an area of approximately 55,000 square kilometres or 24% of the Great Britain land mass. It is connected to the SP Transmission System to the South. In 2015-16 the maximum recorded demand on the network was 1.59GW.

There is 1 major customer supplied directly from the SHE Transmission System with the majority of the load being taken by approximately 0.76 million customers connected to the Scottish Hydro Electric Power Distribution Network via 8.2GVA of installed transformer capacity. Over 5.97GW of generation capacity is connected to the SHE Transmission System including 46 Large Power Stations.

80% of these transmission assets form the main interconnected transmission system whilst the remaining 20% radially supply the more remote areas of the territory including the outlying islands. Some connections, mainly in the more remote areas, can involve non-standard connection or running arrangements chosen by the customer.

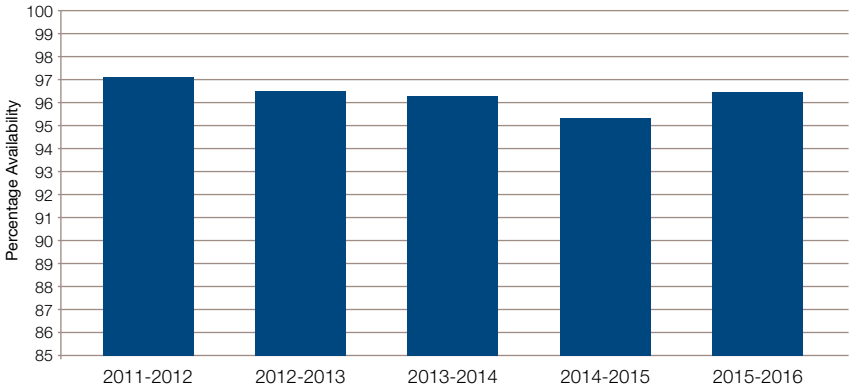
When considering 132kV systems as transmission voltages it should be borne in mind that amounts of power transmitted at this voltage level are generally lower than at 275 and 400kV and as such may have lower security standards applied.

Availability

The definitions and criteria for system availability can be found in the Glossary of Terms at the end of this report.

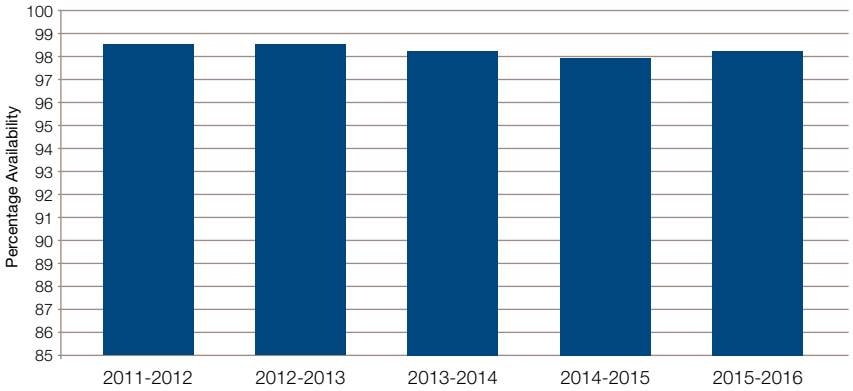
System performance is monitored by reporting variations in Annual System Availability, Winter Peak System Availability and Monthly System Availability. There is also a breakdown of Planned and Unplanned System Unavailability.

% Annual System Availability



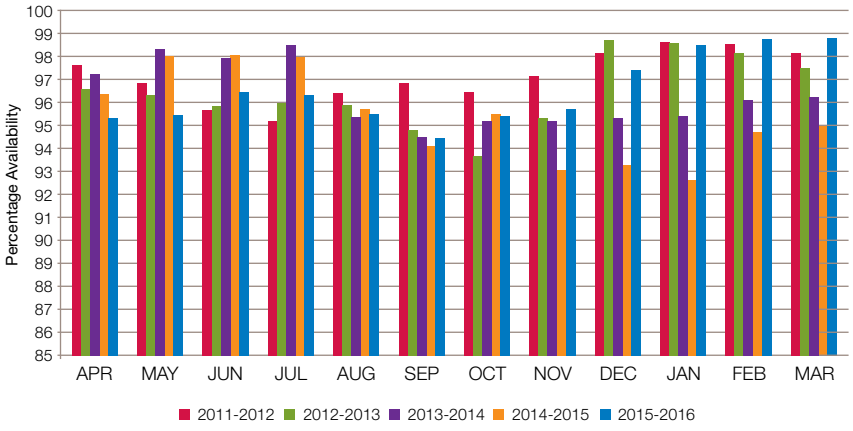
2011-12	2012-13	2013-14	2014-15	2015-16
97.14	96.48	96.29	95.32	96.53

% Winter Peak System Availability



2011-12	2012-13	2013-14	2014-15	2015-16
98.47	98.50	96.26	97.97	98.21

% Monthly System Availability

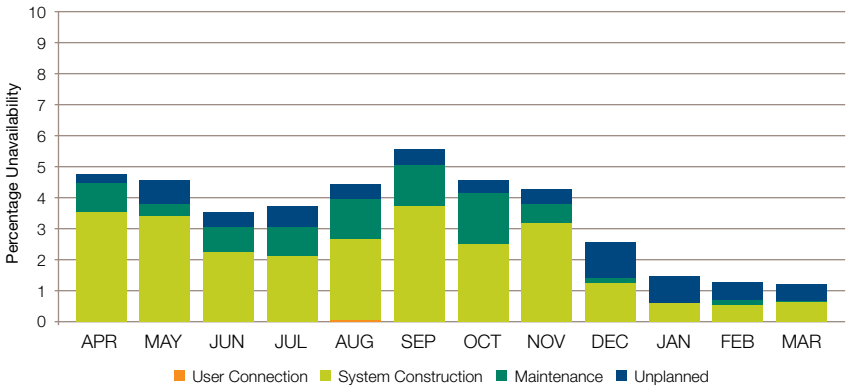


	2011-12	2012-13	2013-14	2014-15	2014-15
Apr	97.66	96.67	97.26	96.34	95.29
May	96.89	96.36	98.29	97.99	95.45
Jun	95.76	95.83	97.94	98.03	96.44
Jul	95.19	95.96	98.55	97.96	96.30
Aug	96.36	95.91	95.39	95.73	95.56
Sep	96.87	94.85	94.58	94.09	94.44
Oct	96.49	93.67	95.17	95.42	95.40
Nov	97.06	95.32	95.22	93.01	95.74
Dec	98.12	98.74	95.30	93.13	97.42
Jan	98.73	98.66	95.46	92.66	98.50
Feb	98.59	98.10	96.04	94.70	98.74
Mar	98.09	97.68	96.26	94.98	98.81

Planned and Unplanned System Unavailability

The table and the chart show the monthly variation in Planned and Unplanned System Unavailability.

Unavailability is defined as (100 - Availability) %



	User Connection	System Construction	Maintenance	Unplanned	Total
Apr	0.00	3.53	0.89	0.30	4.71
May	0.00	3.39	0.36	0.80	4.55
Jun	0.00	2.25	0.79	0.52	3.56
Jul	0.00	2.09	0.93	0.68	3.70
Aug	0.01	2.67	1.25	0.51	4.44
Sep	0.00	3.72	1.32	0.52	5.56
Oct	0.00	2.52	1.57	0.50	4.60
Nov	0.00	3.14	0.61	0.52	4.26
Dec	0.00	1.25	0.13	1.19	2.58
Jan	0.00	0.57	0.01	0.93	1.50
Feb	0.00	0.54	0.07	0.64	1.26
Mar	0.00	0.57	0.06	0.56	1.19

The highest altitude tower in the UK, where the Beauly Denny line crosses the Corrieyairack Pass

Security

The definitions and criteria for system security can be found in the Glossary of Terms at the end of this report.

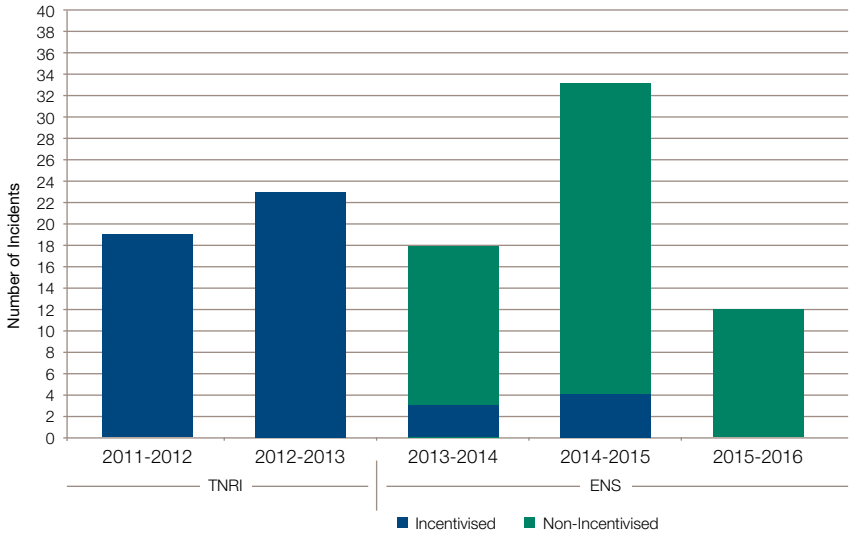
System performance is monitored by the Estimated Unsupplied Energy from the SHE Transmission System for each incident.

During 2015-16 there were 104 SHE Transmission system events where transmission circuits were disconnected either automatically or by urgent manual switching. The vast majority of these events had no impact on electricity users with 12 resulting in loss of supplies to customers.

The GIS Hall at Sloy

Number of Loss of Supply Incidents

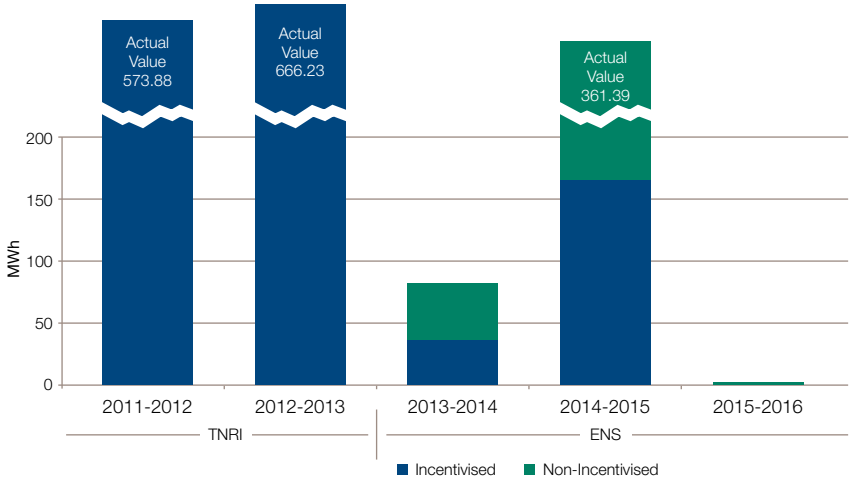
The chart shows the annual comparison of the numbers of Loss of Supply Incidents that occurred within the SHE Transmission System.



	2011-12	2012-13	2013-14	2014-15	2015-16
Incentivised	19	23	3	4	0
Non-Incentivised	0	0	15	29	12

Total Estimated Unsupplied Energy

The chart shows the annual comparison of the Estimated Unsupplied Energy for Loss of Supply Incidents that occur within the SHE Transmission System.



	2011-12	2012-13	2013-14	2014-15	2015-16
Incentivised	573.88	666.23	35.60	166.69	0
Non-Incentivised	0	0	44.40	194.70	0.865

Total Estimated Unsupplied Energy

The total Estimated Unsupplied Energy from the SHE Transmission System during 2015-16 was:

0.87 MWh

Reliability of Supply

The Overall Reliability of Supply for the SHE Transmission System during 2015-16 was:

99.999987%

compared with 99.99452% in 2014-15 and 99.99885% in 2013-14.

Loss of Supply Incident Details

SHE Transmission Loss of Supply Incidents – Incentivised

Incident Date, Time & Location	MW Lost	Mins	MWh Unsupplied
None			
		Total	**0.0 MWh**

SHE Transmission Loss of Supply Incidents – Non-Incentivised

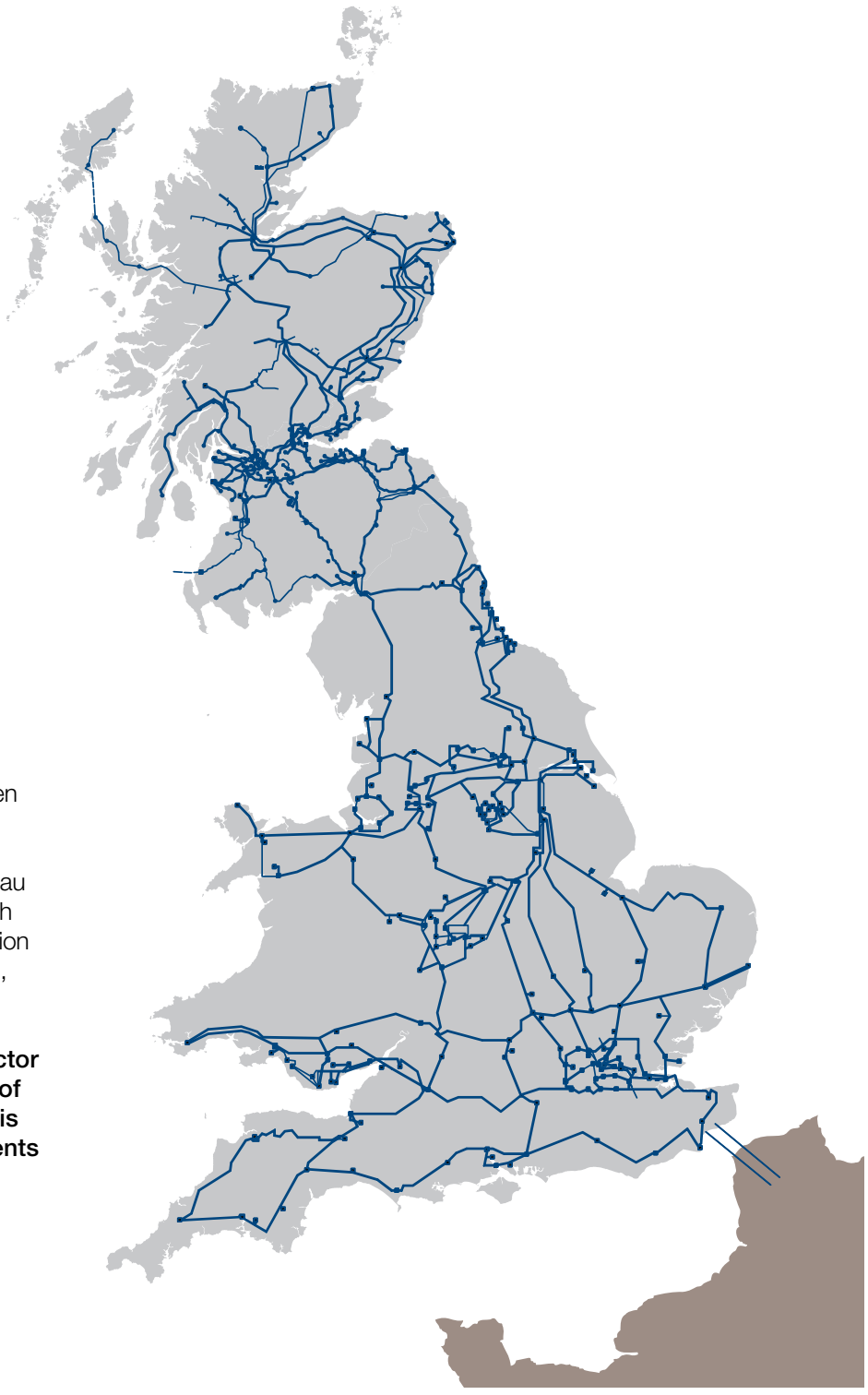
Incident Date, Time & Location	MW Lost	Mins	MWh Unsupplied
7 April 2015 06:30 at Orrin 132kV Substation Orrin GT2 tripped on Restricted Earth Fault due to damaged insulators.	**0.0**	**4954**	**0.00**
11 April 2015 23:16 at Fort Augustus 132kV Substation The Fort Augustus - Fort William - Ardmore 132kV circuit tripped and auto-reclosed during a period of high winds and lightning activity.*	**5.3**	**19.3**	**0.05**
29 April 2015 18:26 at Grudie Bridge 132kV Substation The Corriemoillie - Grudie Bridge 132kV circuit tripped due to a protection mal-operation.	**0.0**	**400**	**0.00**
14 July 2015 07:18 at Inveraray 132kV Substation The Inveraray - Port Ann - Carradale West 132kV circuit tripped and auto-reclosed due to an unknown transient fault.	**0.0**	**0.5**	**0.00**
10 August 2015 14:07 at Inveraray 132kV Substation The Inveraray - Port Ann - Carradale West 132kV circuit tripped and auto-reclosed due to an unknown transient fault.	**0.0**	**0.5**	**0.00**
10 August 2015 21:08 at Dunbeath 132kV Substation The Shin - Brora - Mybster East 132kV circuit tripped to clear a fault on the DNO network.	**0.0**	**0.25**	**0.00**
19 August 2015 11:03 at Carradale 132kV Substation Carradale GT4 tripped due to a protection mal-operation.	**0.0**	**112**	**0.00**
22 August 2015 09:43 at Shin 132kV Substation The Shin Reserve Busbar tripped during main bar outage. Demand restored in stages.*	**3.89**	**18**	**0.82**
29 September 2015 06:54 at Mybster 132kV Substation The Mybster - Thurso - Dounreay 132kV circuit trippd, coincident with a 275kV fault.	**0.0**	**86**	**0.00**
13 November 2015 00:41 at Harris 132kV Substation The Harris - Stornoway 132kV circuit tripped during severe gales and lightning.	**0.0**	**3901**	**0.00**
29 December 2015 20:21 at Blackhillock 275kV substation The Blackhillock - Dallas - Knocknagael 275kV circuit tripped and auto-reclosed during period of high winds.	**0.0**	**0.65**	**0.00**
29 December 2015 20:21 at Blackhillock 275kV substation The Blackhillock - Berryburn - Knocknagael 275kV circuit tripped and auto-reclosed multiple times during period of high winds.	**0.0**	**1**	**0.00**
		Total	**0.87**

*The incident was due to customer choice of connection non-compliant to SQSS

Section Five

Interconnectors

England – France Interconnector



System Description

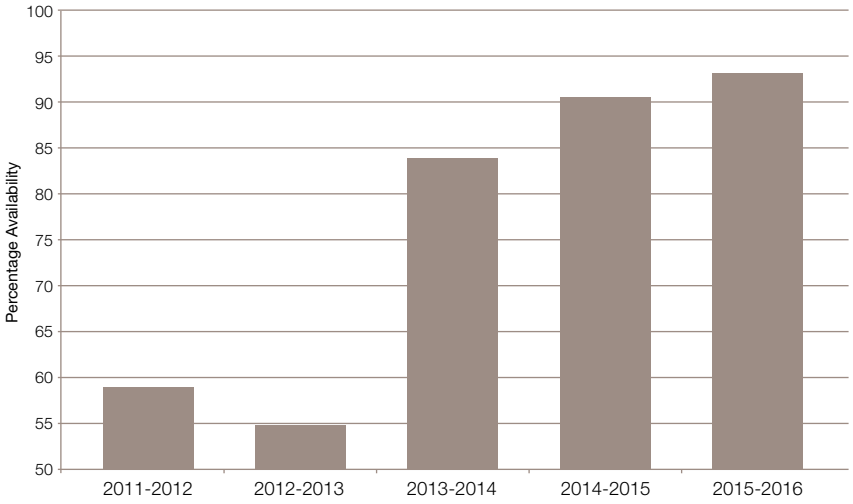
The National Grid interconnection between the English and French transmission systems is jointly owned by National Grid Interconnectors Limited (NGIC) and Réseau de Transport d'Electricité (RTE) the French transmission system owner. The information in this report has been provided by NGIC, the Interconnector Licence holder.

The total capability of the Interconnector is nominal 2000MW. This is made up of four 'circuits', each of 500MW. There is no redundancy of the major components making up each circuit, hence all outages effect real time capability.

Annual Availability

The definitions and criteria for system availability can be found in the Glossary of Terms at the end of this report.

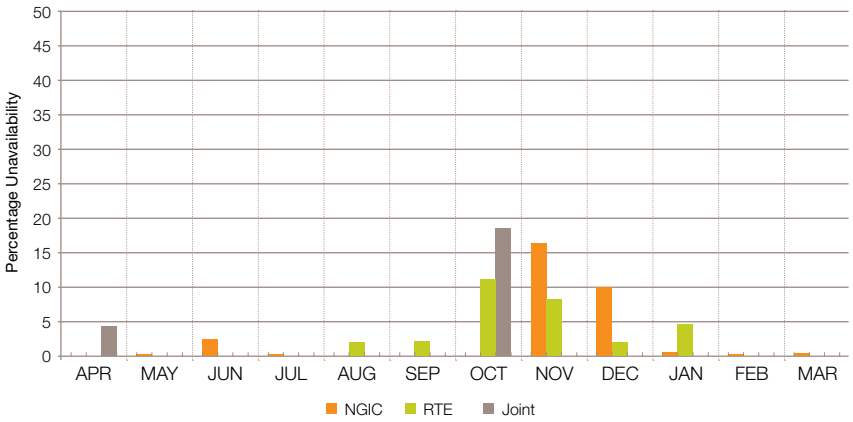
The chart below shows the annual comparison of availability of the England – France Interconnector.



2011-12	2012-13	2013-14	2014-15	2015-16
59.09	54.90	83.84	90.46	92.94

Monthly Unavailability

% England – France Interconnector Monthly Unavailability



	NGIC	RTE	Joint
Apr	0.0	0.0	4.44
May	0.15	0.0	0.0
Jun	2.49	0.0	0.0
Jul	0.33	0.0	0.0
Aug	0.0	2.10	0.0
Sep	0.0	2.36	0.0
Oct	0.0	11.56	18.35
Nov	16.76	8.02	0.0
Dec	9.91	2.17	0.0
Jan	0.55	4.68	0.0
Feb	0.15	0.0	0.0
Mar	0.26	0.0	0.0
Average	2.55	2.57	1.90

Annual System Availability

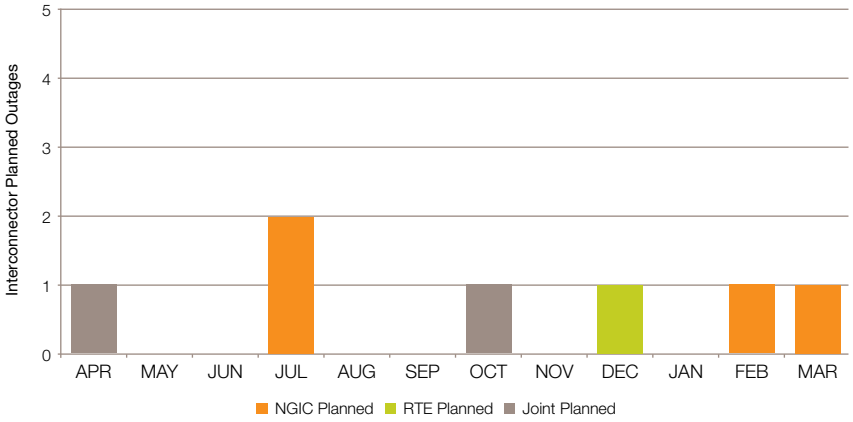
Annual Availability of
England – France Interconnector:

92.94%

Outages 2015-16 (April - March)

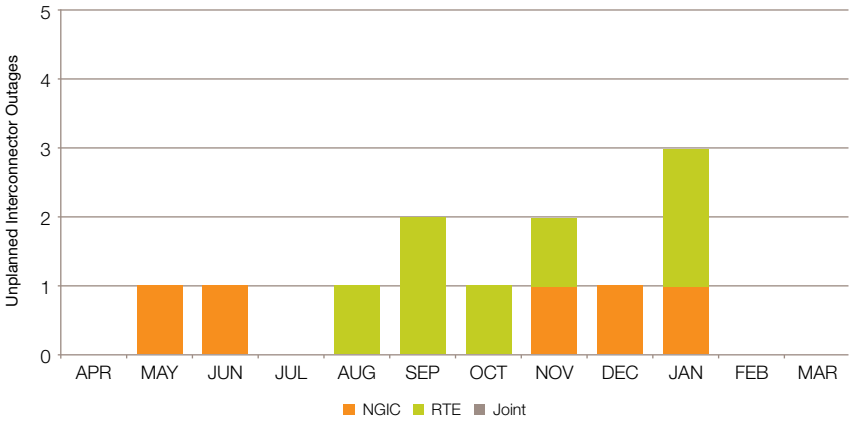
Notes: The charts below refer to Planned and Unplanned Outages. In this context Planned are notified prior to Day Ahead. Unplanned are notified at Day Ahead or within Contract Day.

Chart 1 below shows the Interconnector Planned Outages on a per month basis.



NGIC	4
RTE	1
Joint	2
Total	**7**

Chart 2 below shows the Interconnector Unplanned Outages on a per month basis.

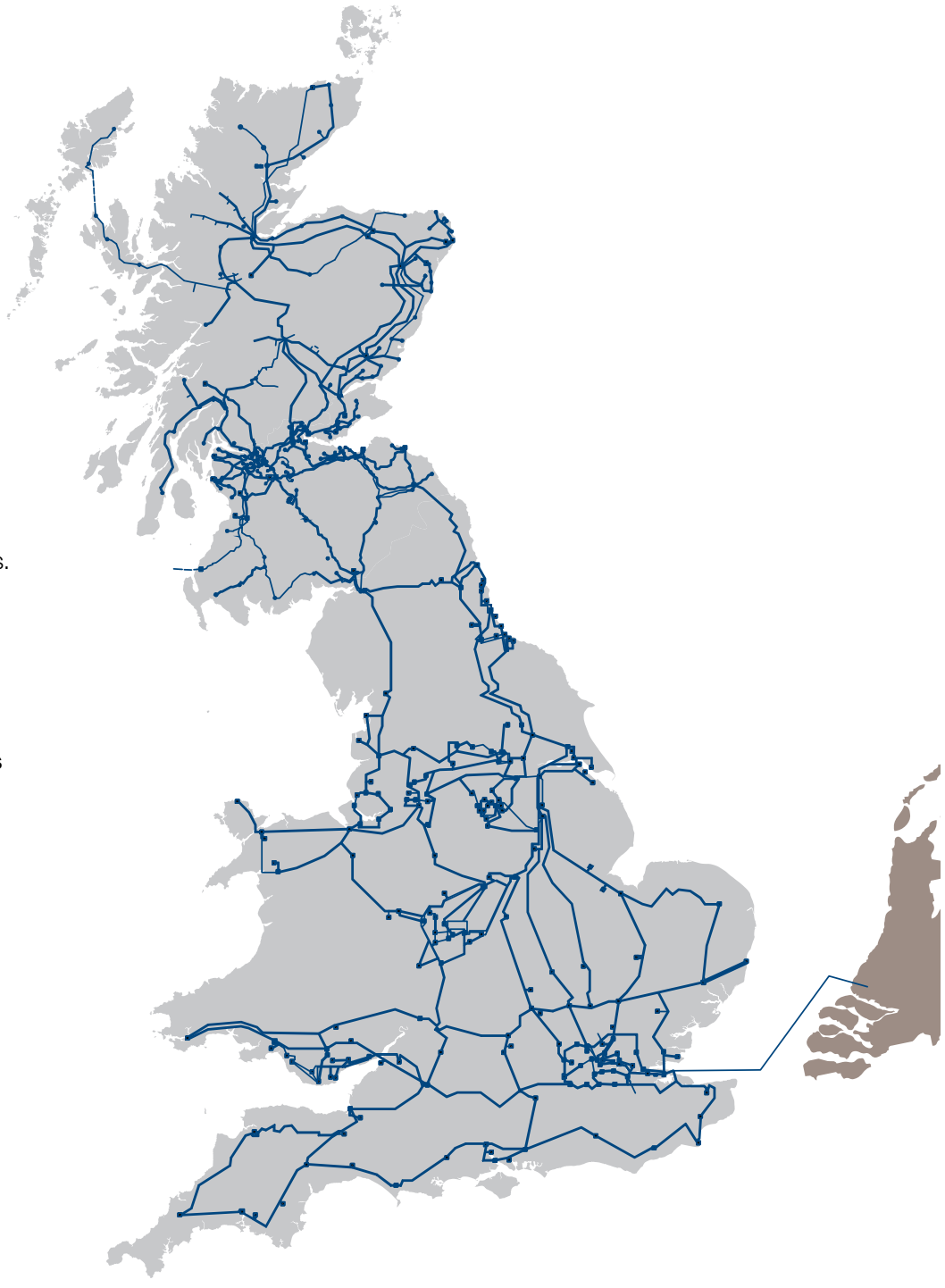


NGIC	5
RTE	7
Joint	0
Total	**12**

BritNed work in progress

Interconnectors

England – Netherlands Interconnector



System Description

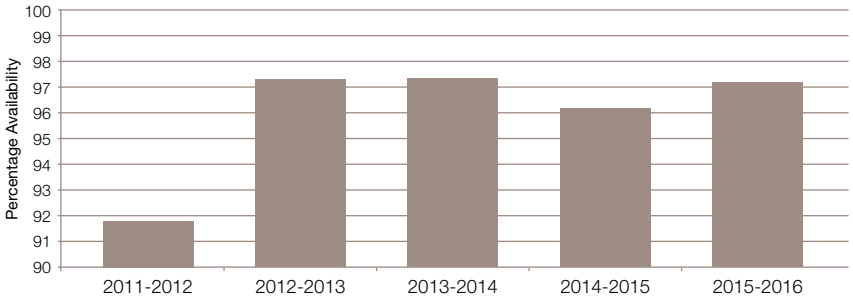
The NGET transmission system has a 260 km long interconnection with Dutch operator TenneT in the Netherlands. The total capability of BritNed is 1000 MW and is made up of two ‘poles’, 500 MW each.

BritNed is jointly owned and operated by National Grid Interconnectors and TenneT, as a commercial Interconnector separate from their regulated activities.

Annual Availability

The definitions and criteria for system availability can be found in the Glossary of Terms at the end of this report.

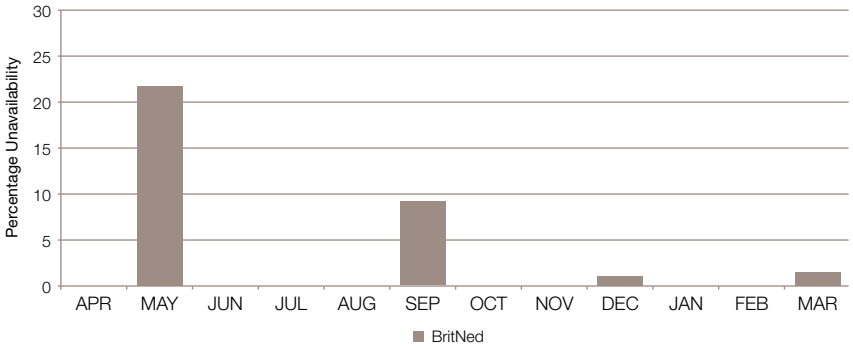
The chart below shows the availability of the England – Netherlands Interconnector.



2011-12	2012-13	2013-14	2014-15	2015-16
91.82	97.32	97.37	96.15	97.22

Monthly Unavailability

% England - Netherlands Interconnector Monthly Unavailability

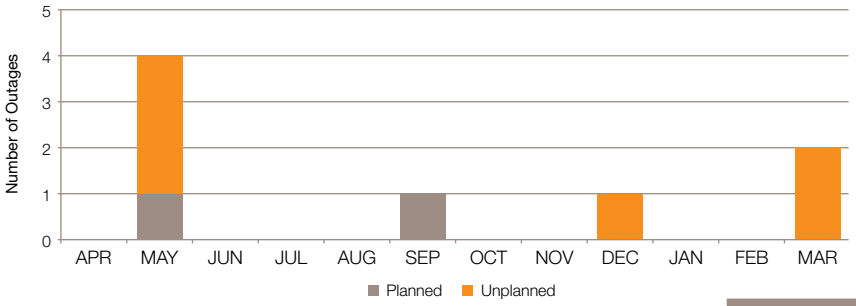


	BritNed
Apr	0.0
May	22.19
Jun	0.0
Jul	0.0
Aug	0.0
Sep	9.04
Oct	0.0
Nov	0.0
Dec	0.45
Jan	0.0
Feb	0.0
Mar	1.47
Average	2.76

Outages 2015-16 (April – March)

The chart refers to Planned and Unplanned Outages. In this context Planned are notified prior to Day Ahead and Unplanned are notified at Day Ahead or within the Contract Day.

Chart 1 below shows the Interconnector Planned and Unplanned Outages on a per month basis.



	Planned	Unplanned
Apr	0	0
May	1	3
Jun	0	0
Jul	0	0
Aug	0	0
Sep	1	0
Oct	0	0
Nov	0	0
Dec	0	1
Jan	0	0
Feb	0	0
Mar	0	2
Total	2	6

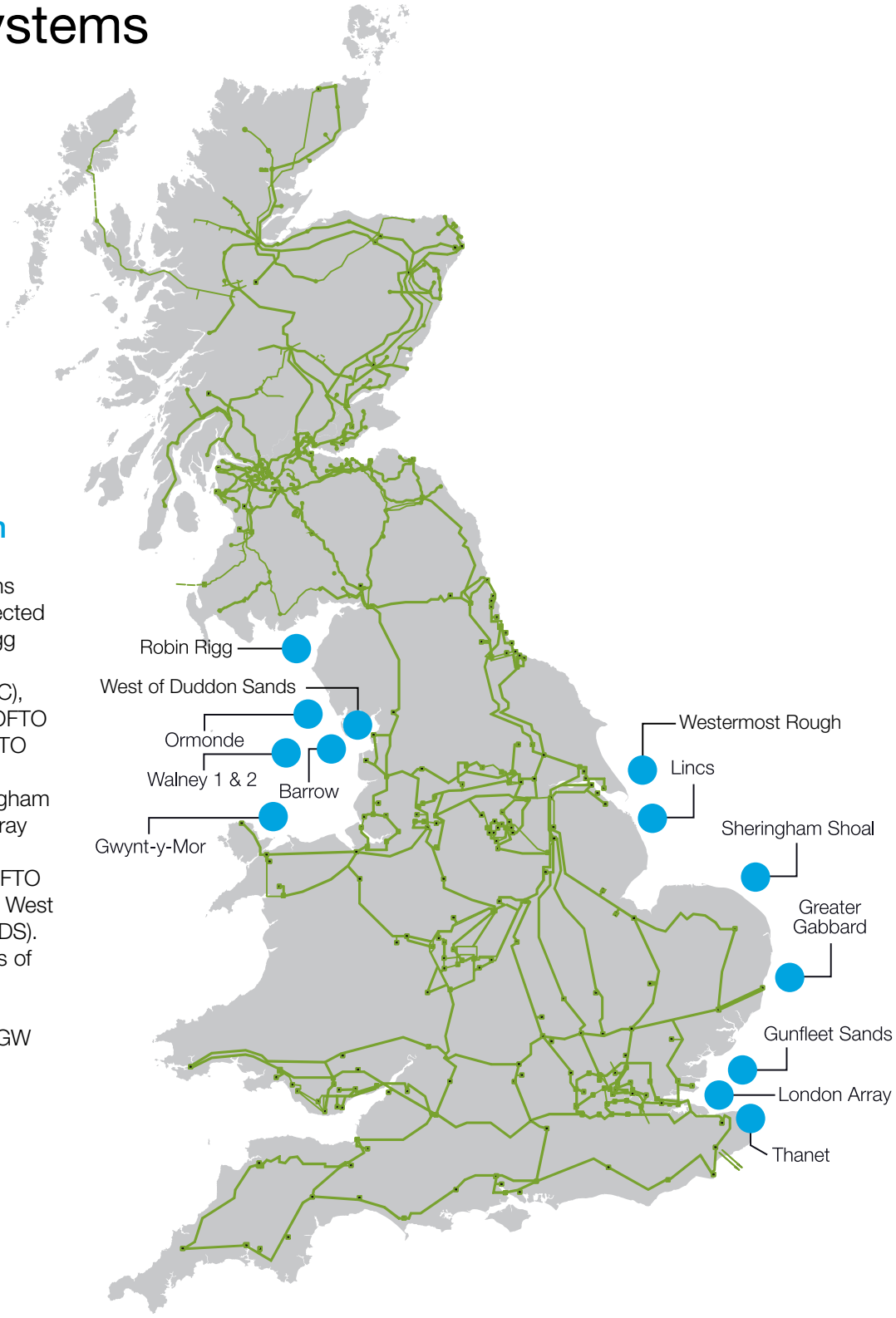
Annual System Availability

Annual Availability of
England – Netherlands Interconnector:

97.22%

Section Six

Offshore Systems



System Description

The following section contains details of the currently connected offshore networks; Robin Rigg OFTO (TC)[Δ], Gunfleet Sands OFTO (TC), Barrow OFTO (TC), Ormonde OFTO (TC), Lincs OFTO (TC), Westermost Rough OFTO (TC), Walney 1 OFTO (BT)[¥], Walney 2 OFTO (BT), Sheringham Shoal OFTO (BT), London Array OFTO (BT), Greater Gabbard OFTO (BB)[∑], Gwynt Y Mor OFTO (BB), Thanet OFTO (BB) and West of Duddon Sands OFTO (WoDS). The offshore network consists of 699 kilometres of circuit, connecting to 14 offshore substations totalling over 4.1GW of generating capacity.

Δ. TC: Transmission Capital ¥. BT: Blue Transmission Investments Limited ∑. BB: Balfour Beatty

Offshore Transmission Networks

Offshore Transmission Networks						
	Go Live	Number of Circuits	Circuit Length km	Generating Capacity MW	Connection Voltage	Interfacing Party
TC Robin Rigg	02/03/2011	2	28.8	184	132 kV	DNO
TC Gunfleet Sands	19/07/2011	1	12.76	163.9	132 kV	DNO
TC Barrow	27/09/2011	1	30.1	90	132 kV	DNO
TC Ormonde	10/07/2012	1	44.3	150	132 kV	DNO
TC Lincs	11/11/2014	2	122.6	250	400 kV	Transmission
TC Westermost Rough	11/02/2016	1	26.16	210	275 kV	Transmission
BT Walney 1	31/10/2011	1	48	182	132 kV	Transmission
BT Walney 2	04/10/2012	1	49	182	132 kV	DNO
BT Sheringham Shoal	05/07/2013	2	88	315	132 kV	DNO
BT London Array	18/09/2013	4	216	630	400 kV	Transmission
BB Greater Gabbard	29/11/2013	3	135	500	132 kV	Transmission
BB Gwynt Y Mor	17/02/2015	4	126.8	574	132kV	Transmission
BB Thanet	17/12/2014	2	28.9	300	132kV	DNO
West of Duddon Sands	25/08/2015	2	43	382	400kV	Transmission

Annual Availability

Offshore Transmission Systems are radial and only connect offshore generation to the wider NETS. OFTOs' performance to be subject to regulatory incentivisation is different from that for onshore TOs', and is based on availability rather than loss of supply. NGET have calculated availability for OFTOs including all outages originating on an OFTO's system, but excluding outages that originate elsewhere, for example on a generator, DNO or TO's system. The OFTO availability incentive would adjust the outage data differently to calculate incentivised performance for each OFTO.

System performance is monitored by reporting variations in Annual System Availability, Winter Peak System Availability and Monthly System Availability. There is also a breakdown of Planned and Unplanned System Unavailability.

% Annual System Availability

Offshore Transmission Networks % Annual Availability			
	2013-14	2014-15	2015-16
TC Robin Rigg	99.85	98.19	99.99
TC Gunfleet Sands	100	99.53	100
TC Barrow	99.64	100	99.88
TC Ormonde	100	99.93	100
TC Lincs	N/A	100	99.96
TC Westermost Rough	N/A	N/A	100
BT Walney 1	99.99	100	100
BT Walney 2	94.89	100	92.47
BT Sheringham Shoal	99.20	99.84	100
BT London Array	99.97	99.90	99.98
BB Greater Gabbard	99.81	100	100
BB Gwynt Y Mor	N/A	82.59	82.58
BB Thanet	N/A	82.47	83.05
West of Duddon Sands	N/A	N/A	100

% Winter Peak System Availability

Offshore Transmission Networks % Winter Availability			
	2013-14	2014-15	2015-16
TC Robin Rigg	100	100	100
TC Gunfleet Sands	100	100	100
TC Barrow	100	100	100
TC Ormonde	100	100	100
TC Lincs	N/A	100	100
TC Westermost Rough	N/A	N/A	100
BT Walney 1	100	100	100
BT Walney 2	100	100	3.87
BT Sheringham Shoal	99.01	100	100
BT London Array	99.98	100	100
BB Greater Gabbard	100	100	100
BB Gwynt Y Mor	N/A	100	76.24
BB Thanet	N/A	96.93	100
West of Duddon Sands	N/A	N/A	100

% Monthly System Availability

Offshore Transmission Networks												
	April	May	June	July	August	September	October	November	December	January	February	March
TC Robin Rigg	100	100	100	100	99.91	100	99.95	100	100	100	100	78.68
TC Gunfleet Sands	100	100	100	100	100	100	100	100	100	100	100	100
TC Barrow	100	100	100	100	98.53	100	100	100	100	100	100	100
TC Ormonde	100	100	100	100	100	100	100	100	100	100	100	100
TC Lincs	100	100	100	100	100	99.55	100	100	100	100	100	100
TC Westermost Rough	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100	100
BT Walney 1	100	100	100	100	100	100	100	100	100	100	100	100
BT Walney 2	100	100	100	100	100	100	100	100	11.38	0	0	41.88
BT Sheringham Shoal	100	100	100	100	100	100	100	100	100	100	100	100
BT London Array	100	100	99.72	100	100	100	100	100	100	100	100	100
BB Greater Gabbard	100	100	100	100	100	100	100	100	100	100	100	100
BB Gwynt Y Mor	75	75	86.78	80.39	100	95.03	75	75	75	75	78.73	100
BB Thanet	50	50	50	89.55	100	100	100	100	100	100	100	57.08
West of Duddon Sands	N/A	N/A	N/A	N/A	100	100	100	100	100	100	100	100

WoDS Onshore substation 155kV switchgear

Monthly Planned & Unplanned Unavailability

The table shows the monthly variation in Planned and Unplanned System Unavailability for the Offshore Transmission Networks.

The unavailability has been classified by network responsibility i.e. OFTO or as a result of Non-OFTO.

Monthly Planned & Unplanned Unavailability													
		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
TC Robin Rigg	OFTO Planned	0	0	0	0	0.09	0	0.05	0	0	0	0	0
	OFTO Unplanned	0	0	0	0	0	0	0	0	0	0	0	0
	Non-OFTO	0	0	0	11.45	0	0	0	0	12.06	1.13	0	0
TC Gunfleet Sands	OFTO Planned	0	0	0	0	0	0	0	0	0	0	0	0
	OFTO Unplanned	0	0	0	0	0	0	0	0	0	0	0	0
	Non-OFTO	0	0	0	0.50	0	0	0	0	0	0	0	0
TC Barrow	OFTO Planned	0	0	0	0	1.47	0	0	0	0	0	0	0
	OFTO Unplanned	0	0	0	0	0	0	0	0	0	0	0	0
	Non-OFTO	0	0	0	0	0	0.34	0	0	0	0	0	0.58
TC Ormonde	OFTO Planned	0	0	0	0	0	0	0	0	0	0	0	0
	OFTO Unplanned	0	0	0	0	0	0	0	0	0	0	0	0
	Non-OFTO	0	0	1.90	0.69	0	0	0.09	0.29	0	0.91	0	0
TC Lincs	OFTO Planned	0	0	0	0	0	34.09	0	0	0	0	0	0
	OFTO Unplanned	0	0	0	0	0	0.45	0	0	0	0	0	0
	Non-OFTO	0	0	0	0	0	0	0	0	0	0	0	0
TC Westermost Rough	OFTO Planned	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	0
	OFTO Unplanned	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	0
	Non-OFTO	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	0
BT Walney 1	OFTO Planned	0	0	0	0	0	0	0	0	0	0	0	0
	OFTO Unplanned	0	0	0	0	0	0	0	0	0	0	0	0
	Non-OFTO	0	0	0	0	0	0	0	0	0	0	0	0
BT Walney 2	OFTO Planned	0	0	0	0	0	0	0	0	0	0	0	0
	OFTO Unplanned	0	0	0	0	0	0	0	0	88.62	100	100	51.82
	Non-OFTO	0	0	0	0	0	0	0	0	0	0	0	0
BT Sheringham Shoal	OFTO Planned	0	0	0	0	4.59	4.737	2.96	2.61	0	0	0	0
	OFTO Unplanned	0	0	0	0	0	0	0	0	0	0	0	0
	Non-OFTO	0	0	0	0	0	0	0	0	0	0	0	0
BT London Array	OFTO Planned	0	0	0.28	0	0	0	0	0	0	0	0	0
	OFTO Unplanned	0	0	0	0	0	0	0	0	0	0	0	0
	Non-OFTO	0	0	0	0	0	0	0	0	0	0	0	0
BB Greater Gabbard	OFTO Planned	0	0	0	0	0	0	0	0	0	0	0	0
	OFTO Unplanned	0	0	0	0	0	0	0	0	0	0	0	0
	Non-OFTO	0	0	0	0	0	0	0	0	0	0	0	0
BB Gwynt Y Mor	OFTO Planned	0	0	0	0	0	0	0	0	0	0	0	0
	OFTO Unplanned	25	25	13.22	19.61	0	4.97	25	25	25	25	21.27	0
	Non-OFTO	0	0	0	0	0	0	0	0	0	0	0	0
BB Thanet	OFTO Planned	0	0	0	0	0	0	0	0	0	0	0	0
	OFTO Unplanned	50	50	50	10.45	0	0	0	0	0	0	0	42.92
	Non-OFTO	0	0	0	0	0	0	0	0	0	0	0	0
West of Duddon Sands	OFTO Planned	N/A	N/A	N/A	N/A	0	0	0	0	0	0	0	0
	OFTO Unplanned	N/A	N/A	N/A	N/A	0	0	0	0	0	0	0	0
	Non-OFTO	N/A	N/A	N/A	N/A	0	0	0	0	0	0	0	0

Outage Details

Offshore system outages are calculated using MW of offshore transmission capacity unavailable not generation lost.

TC Robin Rigg Outages			
Outage Date & Time	**Reason**	**Days & Hours**	**MWh**
8 July 2015 09:39 Generator maintenance outage	Non-OFTO	1 days 8.3 hours	5949.27
14 July 2015 10:19 Generator maintenance outage	Non-OFTO	2 days 4.9 hours	9727.53
13 August 2015 12:00 Outage for the restoration of onshore reactive power compensation system	OFTO	0.67 hours	122.73
28 October 2015 11:32 Outage for the restoration of onshore reactive power compensation system	OFTO	0.4 hours	73.6
13 December 2015 06:04 DNO line fault	Non-OFTO	3.07 hours	564.33
26 December 2015 09:20 DNO line fault	Non-OFTO	3.18 hours	585.67
27 December 2015 14:26 DNO line fault	Non-OFTO	20.1 hours	3698.4
28 December 2015 10:32 Outage at request of Generator	Non-OFTO	2 days 15.35 hours	11656.4
2 January 2016 09:00 Outage at request of DNO to carry out protection repairs	Non-OFTO	8.42 hours	1548.67
		Total	33926.6 WWh

TC Gunfleet Sands Outages			
Outage Date & Time	**Reason**	**Days & Hours**	**MWh**
7 July 2015 16:41 DNO pilot cable fault	Non-OFTO	3.68 hours	603.69
		Total	603.69 MWh

TC Barrow outages			
Outage Date & Time	**Reason**	**Days & Hours**	**MWh**
11 August 2015 09:23 Outage for planned maintenance	OFTO	10.97 hours	987.03
7 September 2015 10:44 Outage to allow DNO to carry out works on their circuit	Non-OFTO	2.17 hour	195.03
18 September 2015 13:21 Outage to allow DNO to bring their circuit back online	Non-OFTO	0.25 hours	22.5
3 March 2016 16:30 Outage caused by generator's switching activity	Non-OFTO	4.3 hours	387
		Total	1591.56 MWh

TC Ormonde Outages			
Outage Date & Time	**Reason**	**Days & Hours**	**MWh**
30 June 2015 05:47 Generator performed work to progress harmonic filter works on OFTO assets	Non-OFTO	13.7 hours	2055
23 July 2015 11:08 Outage to allow DNO to carry out works on their circuit	Non-OFTO	5.12 hours	767.51
12 October 2015 07:50 Generator performed work to progress harmonic filter works on OFTO assets	Non-OFTO	0.42 hours	62.5
15 October 2015 16:37 Generator performed work to progress harmonic filter works on OFTO assets	Non-OFTO	0.25 hour	37.5
15 November 2015 12:40 National Grid sent an unplanned inter-trip signal to OFTO while carrying out switching activity	Non-OFTO	2.1 hours	315
13 January 2016 08:14 Generator performed work to progress harmonic filter works on OFTO assets	Non-OFTO	6.8 hour	1020
		Total	**4257.51 MWh**

TC Lincs Outages			
Outage Date & Time	**Reason**	**Days & Hours**	**MWh**
19 September 2015 09:40 A faulty component on the cable sealing end oil booster tank resulted in a circuit trip	OFTO	3.22 hours	804.17
21 September 2015 07:56 Outage to replace bursting discs on the 400kV GIS, exclusion agreed under licence	OFTO	10 days 5.47 hours	61366.68
		Total	**62170.84 MWh**

TC Westermost Rough			
Outage Date & Time	**Reason**	**Days & Hours**	**MWh**
-None-			
		Total	**0MWh**

BT Walney 1 Outages			
Outage Date & Time	**Reason**	**Days & Hours**	**MWh**
-None-			
		Total	**0MWh**

BT Walney 2 Outages			
Outage Date & Time	**Reason**	**Days & Hours**	**MWh**
4 December 2015 12:39 Export cable fault, investigation then repair continued until March 2016	OFTO	105 days 6.8 hours	120010.8
		Total	**120010.8 MWh**

BT Sheringham Shoal Outages

Outage Date & Time	Reason	Days & Hours	MWh
27 August 2015 07:12 132kV Export No.1 cct for Harmonic filter installation, exclusion agreed under licence	OFTO	1 day 11.6 hours	5607.00
29 August 2015 08:37 132kV Export No.2 cct for Harmonic filter installation, exclusion agreed under licence	OFTO	1 day 8.88 hours	5152.87
9 September 2015 06:49 132kV Export No.1 cct for Harmonic filter installation, exclusion agreed under licence	OFTO	1 day 10.80 hours	5481.00
14 September 2015 08:21 132kV Export No.2 cct for Harmonic filter installation, exclusion agreed under licence	OFTO	1 day 9.42 hours	5263.12
26 October 2015 07:05 132kV Export No.1 cct for Harmonic filter installation, exclusion agreed under licence	OFTO	1 day 14.23 hours	6021.75
31 October 2015 06:03 132kV Export No.1 cct for Harmonic filter installation, exclusion agreed under licence	OFTO	1.82 hours	286.12
3 November 2015 11:08 132kV Export No.2 cct for Harmonic filter installation, exclusion agreed under licence	OFTO	1 day 11.93 hours	5659.5
8 November 2015 06:04 132kV Export No.2 cct for Harmonic filter installation, exclusion agreed under licence	OFTO	0.52 hours	81.37
10 November 2015 17:35 132kV Export No.2 cct for Harmonic filter installation, exclusion agreed under licence	OFTO	0.48 hours	76.13
10 November 2015 18:39 132kV Export No.1 cct for Harmonic filter installation, exclusion agreed under licence	OFTO	0.58 hours	91.87
		Total	**33720.73 MWh**

BT London Array

Outage Date & Time	Reason	Days & Hours	MWh
4 June 2015 08:12 GT3 Remedial work, Transformer HV bushing inspection and remediation work	OFTO	8.85 hours	1274
		Total	**1274 MWh**

Balfour Beatty Greater Gabbard

Outage Date & Time	Reason	Days & Hours	MWh
-None-			
		Total	**0MWh**

Balfour Beatty Gwynt Y Mor

Outage Date & Time	Reason	Days & Hours	MWh
1 April 2015 00:00 (continued from previous year) - Export Cable 1 Primary System Fault	OFTO	76 days 20.62 hours	264702.41
1 July 1016 12:29 Primary Switchgear Failure	OFTO	24 days 7.65 hours	83753.77
25 September 2016 00:49 Export Cable 2 Primary System Fault	OFTO	153 days 15.38 hours	529139.03
		Total	**877595.21 MWh**

Balfour Beatty Thanet			
Outage Date & Time	**Reason**	**Days & Hours**	**MWh**
1 April 2015 00:00 (continued from previous year) - Export Cable 1 Primary System Fault	**OFTO**	**97 days 11.5 hours**	**350924.87**
2 September 2015 11:45 Generator requested outage on Export Cable 1 for OTS work	**Non-OFTO**	**3.88 hours**	**582.5**
2 September 2015 11:45 Generator requested outage on Export Cable 2 for OTS work	**Non-OFTO**	**21.42 hours**	**3212.5**
5 March 2016 09:23 Export Cable 2 Primary System Fault	**OFTO**	**28 days 11.42 hours**	**95792.45**
		Total	**450512.32 MWh**

West of Duddon Sands			
Outage Date & Time	**Reason**	**Days & Hours**	**MWh**
-None-			
		Total	**0MWh**

Annual System Availability

Annual Availability of Offshore Networks for 2015-16 was:

95.99%

Gunfleet Sands Offshore substation platform

Glossary of Terms

This glossary provides explanations and definitions for common terms used throughout this report.

System Availability

System availability is reduced whenever a circuit is taken out of operation for either planned purposes or as a result of a fault.

Planned outages are required for system construction and new user connections in addition to the maintenance necessary to retain a high level of system reliability to ensure that licence standards of security are met.

System Availability is calculated by the formula:

$$\left(\frac{\text{The sum for all circuits of hours available}}{\text{(No. of circuits) x (No. of hours in period)}} \right) \times 100\%$$

A circuit is defined as equipment on the transmission system, e.g. overhead line, transformer or cable which either connects two bussing points or connects two or more circuit breakers/disconnectors, excluding busbars.

Winter Peak Availability is defined as the average System Availability over the three months of December, January and February.

System Unavailability

System Unavailability is calculated by the formula:

(100 - Availability) %

Unavailability falls into 4 categories, 3 of which are planned and the other unplanned:

- Maintenance Outages are planned outages required for maintenance;
- System Construction Outages are planned outages required to construct or modify assets which are not provided for the exclusive benefit of specific users;
- User Connection Outages are planned outages required to construct or modify assets which are provided to facilitate connection for the exclusive benefit of specific system users; and
- Unplanned Unavailability is due to outages occurring as a result of plant or equipment failure, i.e. outages required and taken at less than 24 hours' notice.

Offshore System Availability

OFTO availability is calculated using the formula:

$$\left(\frac{\text{Total MWh system is capable of delivering - MWh unavailable}}{\text{Total MWH system is capable of delivering}} \right) \times 100\%$$

NETS Grid Code and NETS Security and Quality of Supply Standard

The NETS Grid Code and NETS Security and Quality of Supply Standard (NETS SQSS) define the required security level to which the system is planned. The required security level at a substation increases with the amount of demand connected to the substation and so the planned level of demand security is normally higher for 400 kV and 275 kV transmission voltages than for 132 kV. Additionally, the 132 kV network is, in parts, less interconnected than the higher voltage systems and so losses of 132 kV transmission circuits (for example due to weather related transient faults) are more likely to lead to temporary losses of supply.

Loss of Supply Incidents

A loss of supply incident is defined as any incident on the transmission system that results in an actual unsupplied energy incident to a customer or customers including pumped storage units operating in pump mode.

All transmission system incidents that resulted in a loss of supplies are reported individually giving information about the cause of the incident, its location, duration and an estimate of unsupplied energy.

Loss of Supply Incidents at '3 or less customers' sites

(TNRI* – 2005-2013)

The TNRI '3 or less customers' category covers locations where major industrial customers are directly connected to the transmission system. The customer could be a steelworks, refinery or other large industrial processing site. Connection arrangements are chosen by the customer and often have a level of design and operational security below that normally required to satisfy the NETS SQSS. This may be reflected in a reduced cost of the connection. In some cases, customers have also chosen to secure their supplies using their own generation to compensate for this reduced level of transmission system security. Distribution Network Operators and domestic customers do not come within this category.

Loss of Supply Incidents – Non-Incentivised

(ENS – 2013 to date)**

The ENS 'Non-Incentivised' category covers only connection arrangements that are chosen by the customer and often have a level of design and operational security below that normally required to satisfy the NETS SQSS. This may be reflected in a reduced cost of the connection. In some cases customers have also chosen to secure their supplies using their own generation to compensate for this reduced level of transmission security. Loss of supply incidents that are less than 3 minutes in duration are also part of the ENS 'Non-Incentivised' category. Distribution Network Operators and domestic customers do not come within this category.

Overall Reliability of Supply

The Overall Reliability of Supply for a transmission system is calculated using the formula:

$$\left[1-\left(\frac{\text{Estimated Unsupplied Energy}}{\text{Total energy that would have been supplied by the transmission system}}\right)\right]\times 100\%$$

Voltage Excursions

The Electricity Safety, Quality and Continuity Regulations 2002 permit variations of voltage not exceeding 10% above and below the nominal at voltages of 132 kV and above and not exceeding 6% at lower voltages. Any Voltage Excursions in excess of 15 minutes will be reported.

The NETS Grid Code reflects these limits, and imposes a further constraint for the 400 kV system in that voltages can only exceed +5% for a maximum of 15 minutes.

Consumers may expect the voltage to remain within these limits, except under abnormal conditions e.g. a system fault outside of the limits specified in the NETS SQSS.

Normal operational limits are agreed and monitored individually at connection points with customers to ensure that voltage limits are not exceeded following the specified credible fault events described in NETS SQSS.

Frequency Excursions

The Electricity Safety, Quality and Continuity Regulations 2002 permit variations in frequency not exceeding 1% above and below 50 Hz: a range of 49.5 to 50.5 Hz. Any frequency excursions outside these limits for 60 seconds or more will be reported.

The system is normally managed such that frequency is maintained within operational limits of 49.8 and 50.2 Hz.

Frequency may, however, move outside these limits under fault conditions or when abnormal changes to operating conditions occur. Losses of generation between 1320 and 1800 MW are considered abnormal and a maximum frequency change of 0.8Hz may occur, although operation is managed so that the frequency should return within the lower statutory limit of 49.5 Hz within 60 seconds.

*TNRI – Transmission Network Reliability Incentive Scheme

**ENS – Energy Not Supplied Scheme replaced TNRI since 2013

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