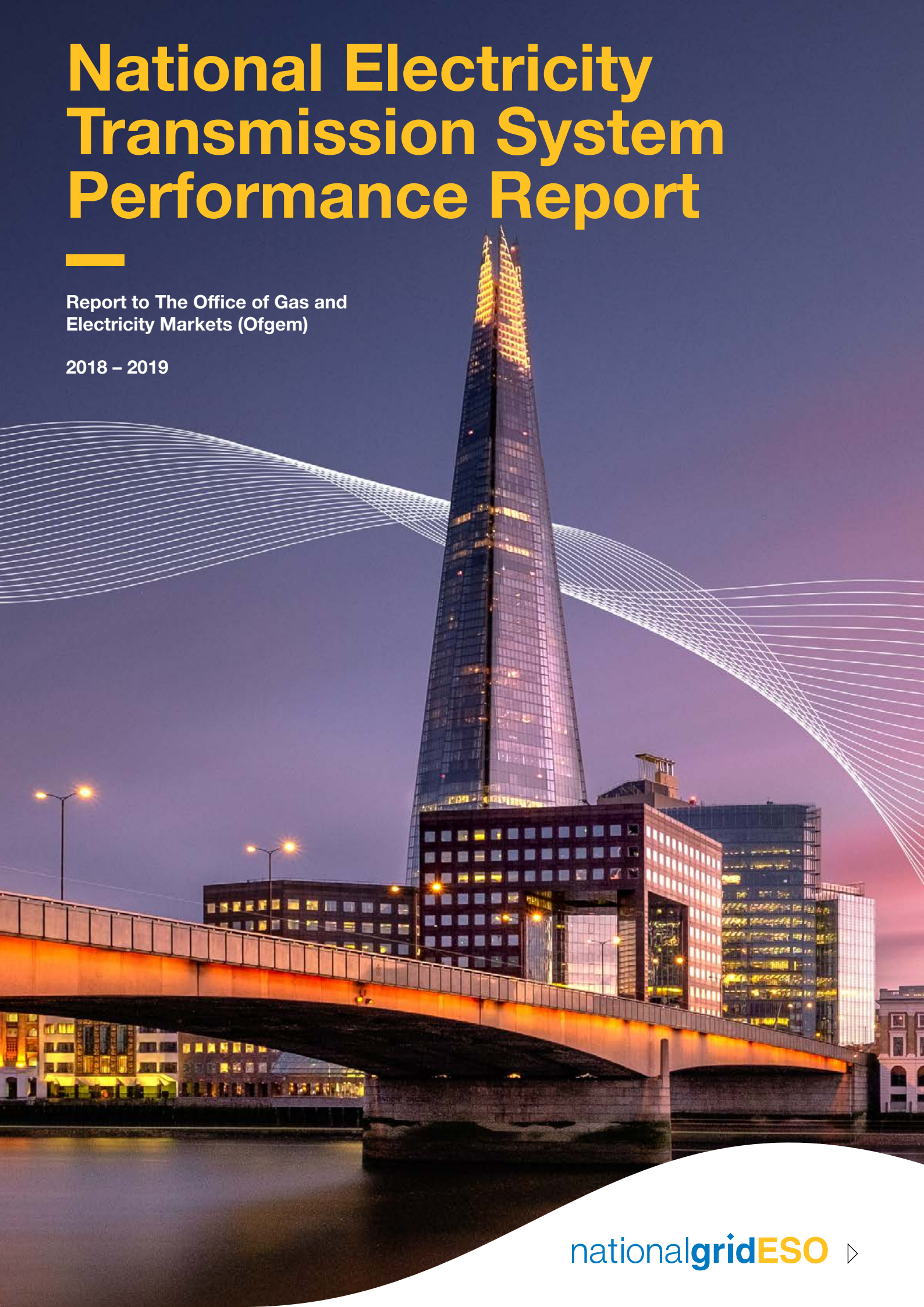
National Electricity Transmission System Performance Report

Report to The Office of Gas and Electricity Markets (Ofgem)

2018 – 2019



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Contents

Introduction 3

Section One
National Electricity Transmission System

Availability 4
Annual System Availability
Winter Peak System Availability
Monthly System Availability

Security 5
Number of Loss of Supply Incidents
Estimated Unsupplied Energy

Quality of Service 8
Voltage Excursions
Frequency Excursions
Frequency Standard Deviation

Section Two
National Grid Electricity
Transmission System 10

Availability 10
Annual System Availability
Winter Peak System Availability
Monthly System Availability
Monthly Planned and Unplanned Unavailability

Security 12
Number of Loss of Supply Incidents
Estimated Unsupplied Energy
Loss of Supply Incident Details

Section Three
Scottish Power Transmission System 16

Availability 16
Annual System Availability
Winter Peak System Availability
Monthly System Availability
Monthly Planned and Unplanned Unavailability

Security 18
Number of Loss of Supply Incidents
Estimated Unsupplied Energy
Loss of Supply Incident Details

Section Four
Scottish Hydro Electric
Transmission System 22

Availability 22
Annual System Availability
Winter Peak System Availability
Monthly System Availability
Monthly Planned and Unplanned Unavailability

Security 24
Number of Loss of Supply Incidents
Estimated Unsupplied Energy
Loss of Supply Incident Details

Section Five Interconnectors

England – France Interconnector 28
Annual Availability
Monthly Unavailability
Outages

England – Netherlands Interconnector 30
Annual Availability
Monthly Unavailability
Outages

England – Belgium Interconnector 32
Annual Availability
Monthly Unavailability
Outages

Section Six
Offshore Systems 34

Annual Availability
Annual System Availability
Winter Peak System Availability
Monthly Unavailability
Monthly Planned and Unplanned System
Unavailability

Glossary of terms 45

Introduction

This report describes the performance of the National Electricity Transmission System in Great Britain for 2018-19 and fulfils Transmission Licence Standard Condition C17: Transmission System Security Standard and Quality of Service.

The National Electricity Transmission System (NETS) in Great Britain is comprised of both onshore and offshore transmission networks.

The onshore transmission networks 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.

The offshore transmission networks are owned by Transmission Capital (TC), Blue Transmission Investments Ltd (BT), Greater Gabbard OFTO Ltd, Gwynt-Y-Mor OFTO Ltd, Thanet OFTO Ltd, Humber Gateway OFTO Ltd, West of Duddon Sands Transmission plc (WoDS) and Diamond Transmission Partners Burbo Bank Extension Ltd (DTPBBE).

Following legal separation of the Electricity System Operator from NGET on 1st April 2019, National Grid Electricity System Operator became the National Electricity Transmission System Operator (NETSO) for the onshore and offshore transmission networks.

In accordance with Standard Licence Condition C17 (Transmission System Security Standard and Quality of Service) of the Transmission Licence, the NETSO is required by the The Office of Gas and Electricity Markets, to report on the annual performance of the National Electricity Transmission System in terms of availability, system security and 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 allows for the efficient bulk transfer of power from remote generation to demand centres.

Information relating to NG Electricity Transmission plc, SP Transmission plc, SHE Transmission plc, TC Robin Rigg OFTO Ltd, TC Barrow OFTO Ltd, TC Gunfleet Sands OFTO Ltd, TC Ormonde OFTO Ltd, TC Lincs OFTO Ltd, TC Westermost Rough OFTO Ltd, TC Dudgeon OFTO Ltd, BT Walney 1 Ltd, BT Walney 2 Ltd, BT Sheringham Shoal Ltd, BT London Array Ltd, Greater Gabbard OFTO Ltd , Gwynt-Y-Mor OFTO Ltd*, Thanet OFTO Ltd*, Humber Gateway OFTO Ltd*, West of Duddon Sands Transmission plc and Diamond Transmission Partners BBE Ltd 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 transmission networks it should be recognised that this can be influenced by both the Transmission Owners and the NETSO.

The National Electricity Transmission System is connected via interconnectors to transmission systems in northern and southern Ireland, France, the Netherlands and Belgium.

The northern Ireland interconnector is regulated by the Northern Ireland Regulator (NIAUR) and southern Ireland interconnector is regulated by the Commission for Energy Regulation (CER) which both fall outside the scope of this report.

Information relating to interconnectors with France (Interconnexion France–Angleterre), the Netherlands (BritNed) and Belgium (Nemo Link) has been provided by National Grid Ventures.

*Greater Gabbard OFTO Ltd, Gwynt-Y-Mor OFTO Ltd, Thanet OFTO Ltd and Humber Gateway OFTO Ltd are operated by Balfour Beatty Power Transmission and Distribution (BB) on behalf of the respective owners.

Section One

National Electricity Transmission System (GB Network)

Availability

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

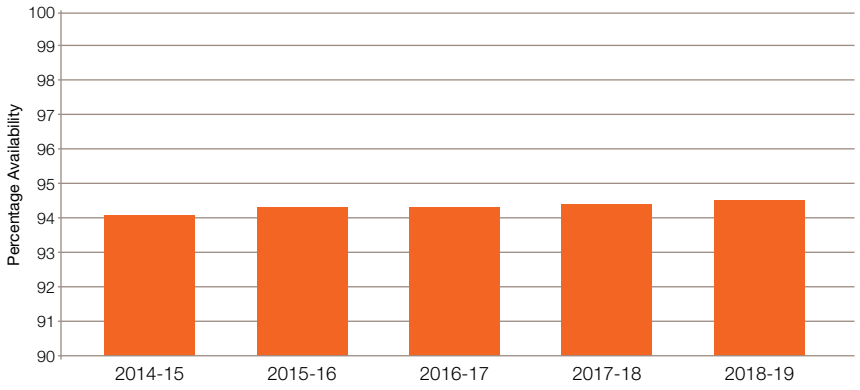
National Electricity Transmission System performance is monitored by reporting variations in Annual System Availability, Winter Peak System Availability and Monthly System Availability.

Annual System Availability

Annual System Availability of the National Electricity Transmission System for 2018-2019 was 94.55%

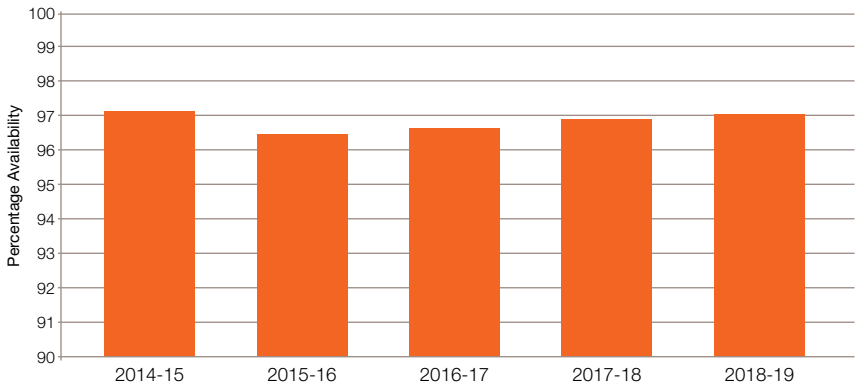
% Annual System Availability

GB % Annual System Availability				
2014-15	2015-16	2016-17	2017-18	2018-19
94.09	94.36	94.31	94.44	94.55

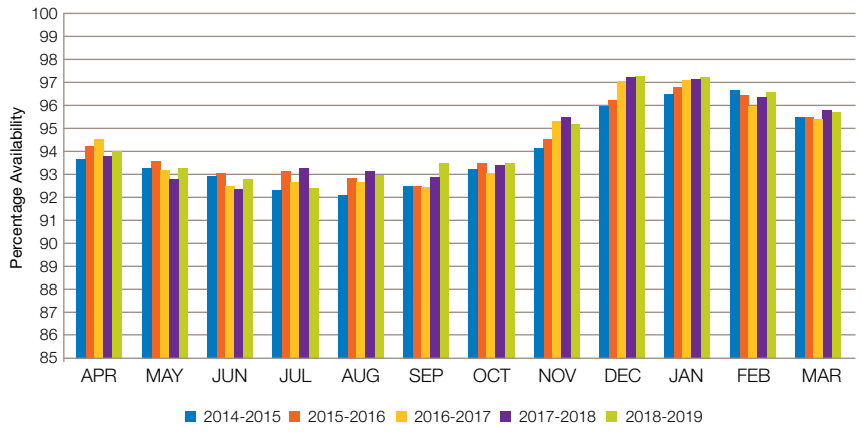


% Winter Peak System Availability

GB % Winter Peak System Availability				
2014-15	2015-16	2016-17	2017-18	2018-19
97.15	96.46	96.71	96.92	97.05



GB % Monthly System Availability



GB % Monthly System Availability					
	2014-15	2015-16	2016-17	2017-18	2018-19
Apr	93.69	94.17	94.61	93.77	94.00
May	93.24	93.51	93.12	92.78	93.39
Jun	92.87	93.03	92.52	92.35	92.80
Jul	92.44	93.15	92.61	93.27	92.39
Aug	92.06	92.90	92.70	93.16	92.97
Sep	92.51	92.56	92.47	92.83	93.55
Oct	93.26	93.47	93.02	93.35	93.52
Nov	94.14	94.63	95.34	95.55	95.26
Dec	95.95	96.22	97.03	97.23	97.24
Jan	96.51	96.80	97.08	97.14	97.29
Feb	96.68	96.44	95.97	96.37	96.58
Mar	95.57	95.51	95.31	95.82	95.74

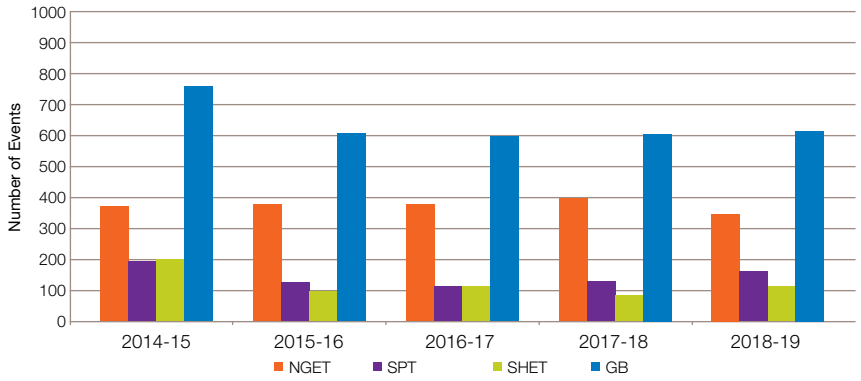
Security

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 2018-19 there were 612 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 22 resulting in loss of supplies to customers.

GB System Events

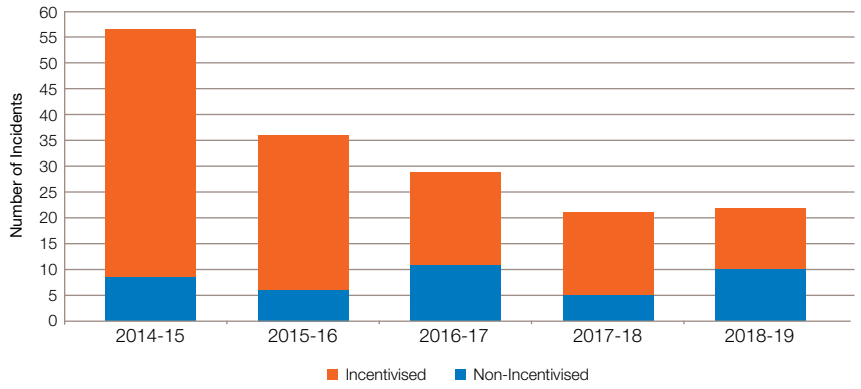


GB System Events					
	2014-15	2015-16	2016-17	2017-18	2018-19
NGET	371	374	379	398	347
SPT	190	126	108	124	157
SHET	199	104	109	85	108
GB	760	604	596	607	612

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.

GB System – Number of Incidents					
	2014-15	2015-16	2016-17	2017-18	2018-19
Incentivised	8	6	11	5	10
Non-Incentivised	49	30	18	16	12

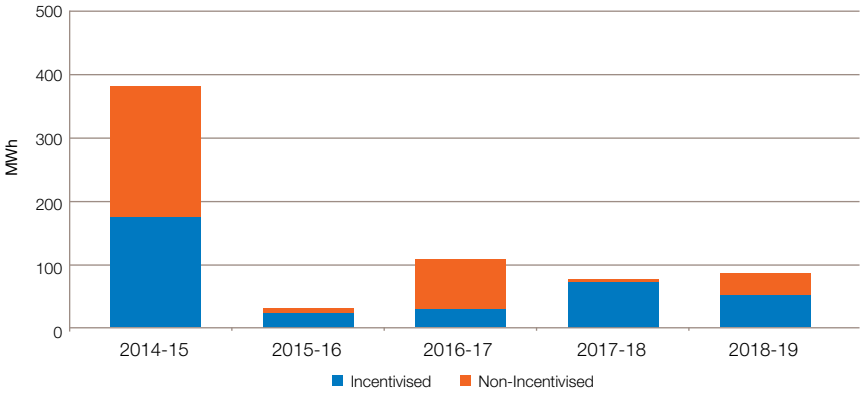


Total Estimated Unsupplied Energy

The total Estimated Unsupplied Energy from the National Electricity Transmission System during 2018-19 was: 85.45 MWh

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

GB System – Estimated Unsupplied Energy					
	2014-15	2015-16	2016-17	2017-18	2018-19
Incentivised	178.18	18.35	22.48	67.07	51.14
Non-Incentivised	196.01	1.67	82.53	0.23	34.31



Reliability of Supply

The Overall Reliability of Supply for the National Electricity Transmission System during 2018-19 was: **99.999967%**

Compared with 99.999975% in 2017-18 and 99.999962% in 2016-17.

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.

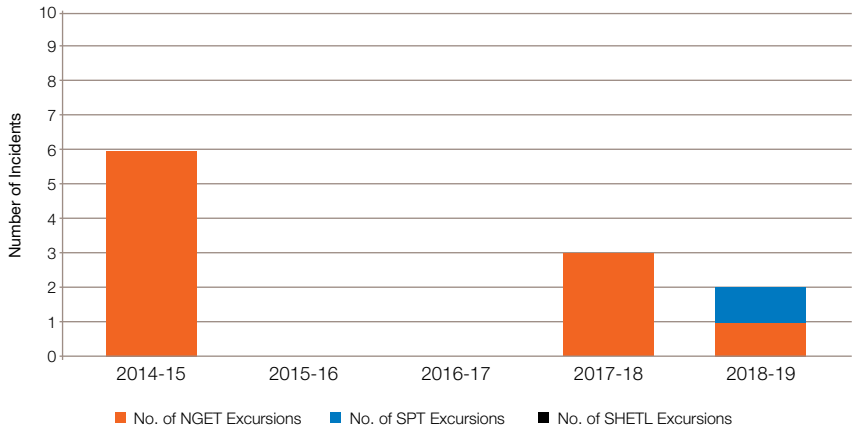
Voltage Excursions

During 2018-19 there was two 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.

GB System - Voltage Excursions					
	2014-15	2015-16	2016-17	2017-18	2018-19
Number of NGET Excursions	6	0	0	3	1
Number of SPT Excursions	0	0	0	0	1
Number of SHETL Excursions	0	0	0	0	0

GB System Voltage Excursion



GB System Voltage Excursion

Incident Date, Time and Location	Nominal Voltage	Max Voltage	Duration
30 April 2018 15:20 at Alverdiscott 400kV Substation High circuit gain due to feeder no.2 open-ended at Indian Queens.	400kV	424.13kV	15.4 mins
31 January 2019 09:23 at Newarthill 33kV Substation SGT1 tap-changer runaway.	33kV	39.4kV	79.3 mins

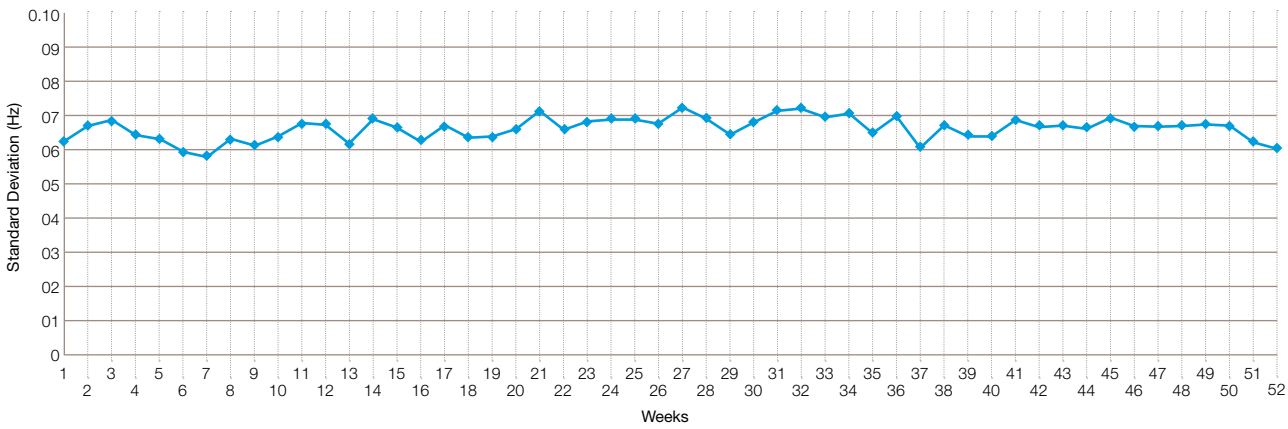
Frequency Excursions

During 2018-19 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 for the year 2018-19.



Section two

National Grid Electricity Transmission System

System Description

The National Grid Electricity Transmission System operates at 400, 275 and 132kV supplying electricity to England and Wales.

The system covers an area of approximately 151,000 square kilometres and consists of about 14,000 circuit kilometres of overhead line and 700 kilometres of underground transmission cable routes interconnecting over 340 substations.

It is connected to the SP Transmission System to the north and through four HVDC interconnectors to the Republic of Ireland, France, the Netherlands and Belgium.

There are 45 large power stations totalling 47.2GW of generation capacity connected to the England and Wales transmission system. The NGET system supplies 12 distribution networks via 132GVA of installed transformer capacity and a small number of directly connected customers such as steelworks.

In 2018-19 the maximum recorded demand on the network was 42.6GW.

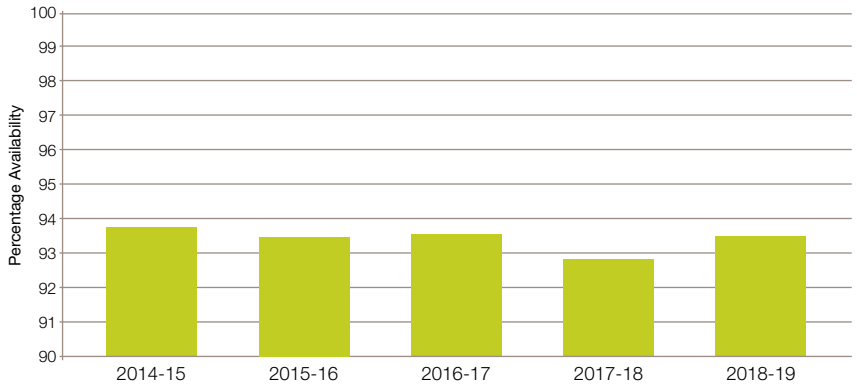
Availability

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

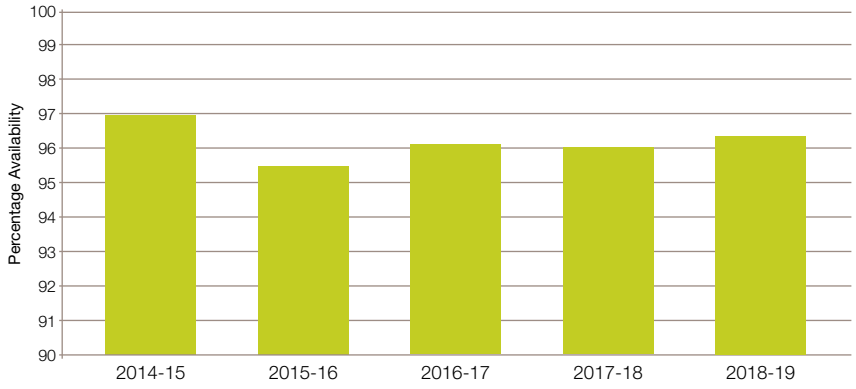
System performance is monitored by reporting variations in Annual System Availability, Winter Peak System Availability and Monthly System Availability. There is also a breakdown of Planned and Unplanned System Unavailability.

NGET % Annual System Availability				
2014-15	2015-16	2016-17	2017-18	2018-19
93.82	93.42	93.48	92.89	93.45

% Annual System Availability

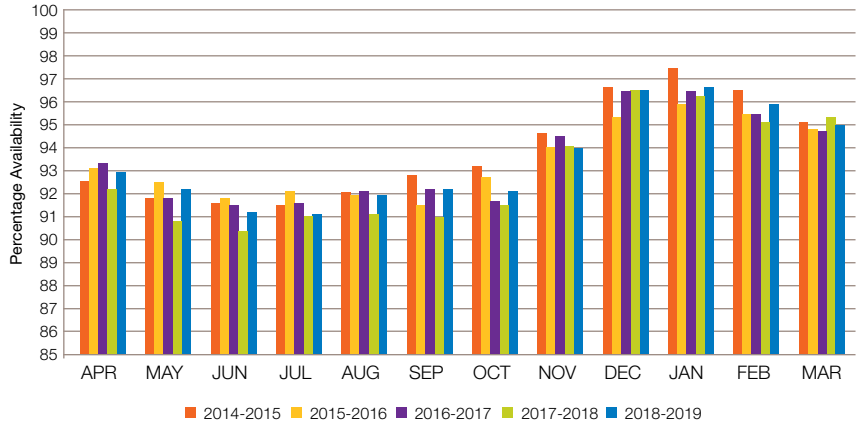


% Winter Peak System Availability



NGET % Winter Peak System Availability				
2014-15	2015-16	2016-17	2017-18	2018-19
96.93	95.51	96.13	96.02	96.37

% Monthly System Availability

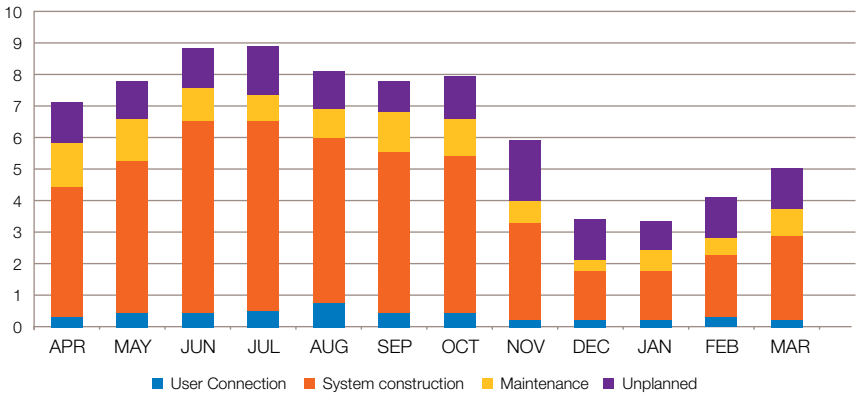


NGET % Monthly System Availability					
	2014-15	2015-16	2016-17	2017-18	2018-19
Apr	92.49	93.15	93.37	92.18	92.91
May	91.80	92.47	91.80	90.75	92.19
Jun	91.62	91.78	91.47	90.36	91.16
Jul	91.46	92.11	91.59	91.03	91.09
Aug	92.09	91.91	92.12	91.05	91.88
Sep	92.84	91.51	92.22	90.95	92.17
Oct	93.21	92.70	91.68	91.54	92.07
Nov	94.61	94.00	94.56	94.07	94.08
Dec	96.70	95.35	96.43	96.57	96.57
Jan	97.47	95.85	96.48	96.22	96.63
Feb	96.60	95.47	95.47	95.20	95.85
Mar	95.12	94.81	94.76	95.33	95.00

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) %



Planned and Unplanned Unavailability (%) for NGET Transmission System					
	User Connection	System Construction	Maintenance	Unplanned	Total
Apr	0.30	4.17	1.42	1.21	7.09
May	0.45	4.83	1.36	1.17	7.81
Jun	0.44	6.05	1.10	1.25	8.84
Jul	0.55	5.95	0.87	1.55	8.91
Aug	0.78	5.22	0.86	1.26	8.13
Sep	0.50	5.09	1.22	1.03	7.83
Oct	0.46	4.96	1.20	1.31	7.93
Nov	0.28	3.05	0.63	1.96	5.92
Dec	0.25	1.60	0.29	1.30	3.43
Jan	0.23	1.58	0.62	0.95	3.37
Feb	0.29	1.96	0.61	1.28	4.15
Mar	0.28	2.67	0.79	1.26	5.00

Security

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

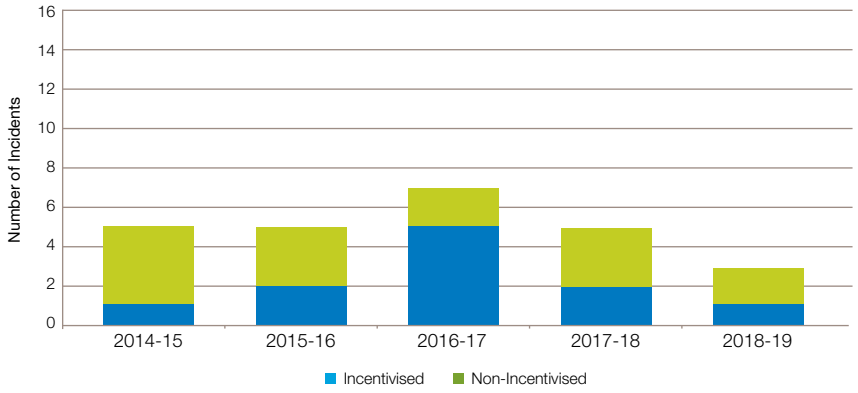
System performance is monitored by the Estimated Unsupplied Energy from the NGET Transmission System for each incident.

During 2018-19 there were 347 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 3 resulting in loss of supplies to customers.

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.

NGET System – Number of incidents					
	2014-15	2015-16	2016-17	2017-18	2018-19
Incentivised	1	2	5	2	1
Non-Incentivised	4	3	2	3	2

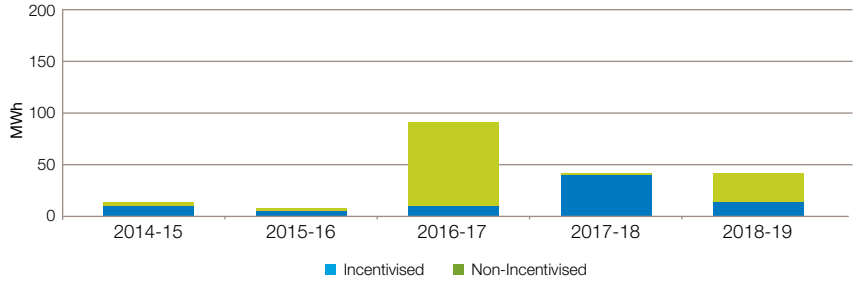


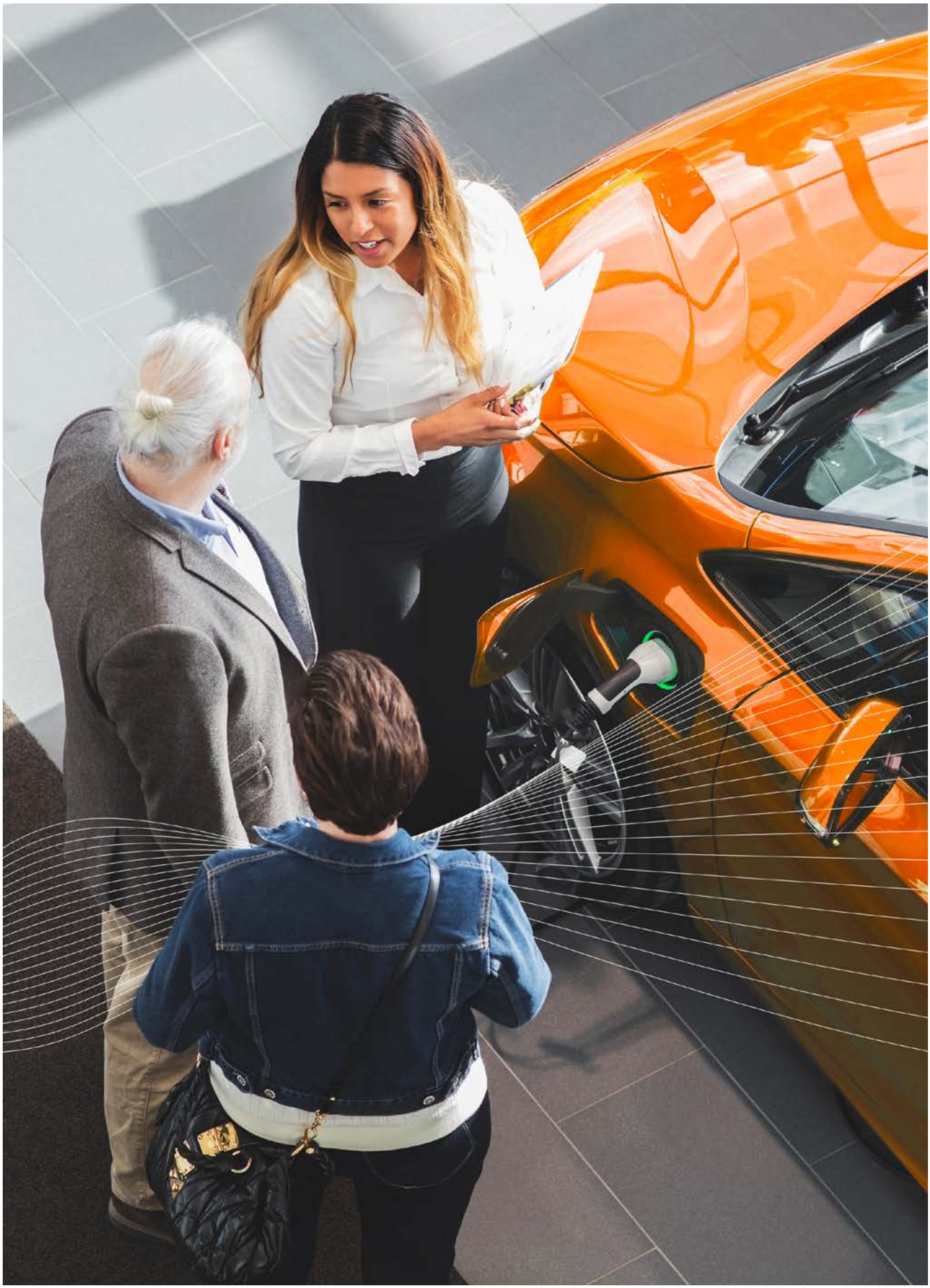
Total Estimated Unsupplied Energy

The total Estimated Unsupplied Energy from the NGET Transmission System during 2018-19 was: **37.22 MWh**

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

NGET System – Estimated Unsupplied Energy					
	2014-15	2015-16	2016-17	2017-18	2018-19
Incentivised	8.69	4.45	6.77	39.70	12.06
Non-Incentivised	1.11	0	82.49	0.23	25.16





Reliability of Supply

The Overall Reliability of Supply for the NGET Transmission System during 2018-19 was: **99.999984%**

Compared with 99.999984% in 2017-18 and 99.999964% in 2016-17.

Loss of Supply Incident Details

NGET Loss of Supply Incidents – Incentivised

Incident Date, Time and Location	MW Lost	Mins	MWh Unsupplied
22 July 2018 17:55 at Rugeley 132kV Substation Busbar protection operation on reserve busbar section 1A/1B during switching due to mechanical failure of the blue phase busbar ceiling support.	28.94	25	12.06
Total			**12.06 MWh**

NGET Loss of Supply Incidents – Non-Incentivised

Incident Date, Time and Location	MW Lost	Mins	MWh Unsupplied
28 November 2018 16:46 at Tremorfa 33kV Substation Aberthaw-Tremorfa-Uskmouth-Whitson circuit trip resulting in loss of supply to steelworks connected at Tremorfa 33kV substation.	40.8	37	25.16
30 March 2019 15:22 at Culham Jet 400kV Substation SGT1C protection operated, opening circuit breaker X110. This was as a result of a voltage dip caused by a trip of the Bramley – West Weybridge 1 circuit. There was a fire underneath the overhead line at the time of the trip.	0	158	0
Total			**25.16 MWh**

Section three

Scottish Power Transmission System

System Description

The SP Transmission System comprises approximately 4,000 circuit kilometres of overhead line and cable and 154 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 14.5GVA of installed transformer capacity. There is approximately 6.5GW of directly connected and Large Embedded generation capacity connected in the SP Transmission area, including 36 power stations directly connected to the SP Transmission system. In 2018-19 the maximum recorded demand on the network was 5.9GW.

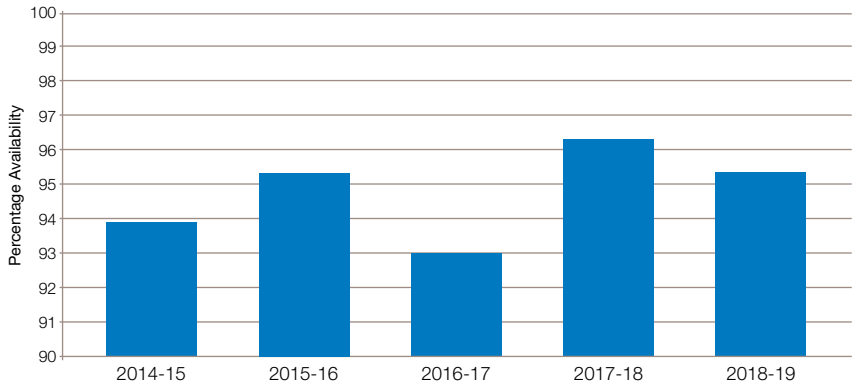
Availability

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

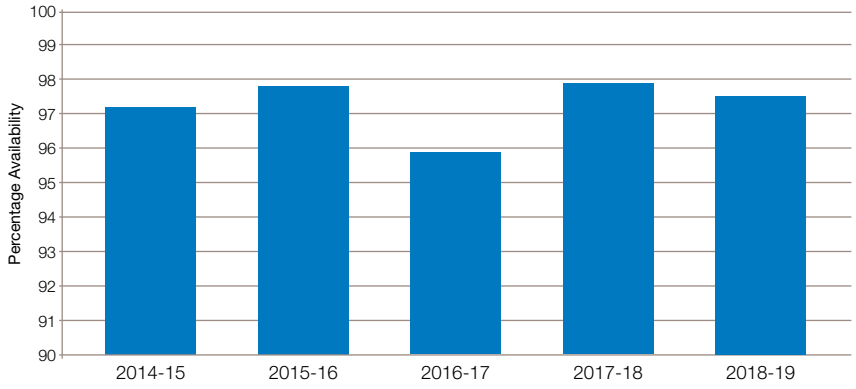
System performance is monitored by reporting variations in Annual System Availability, Winter Peak System Availability and Monthly System Availability. There is also a breakdown of Planned and Unplanned System Unavailability.

SPT % Annual System Availability				
2014-15	2015-16	2016-17	2017-18	2018-19
93.88	95.29	93.01	96.29	95.31

% Annual System Availability

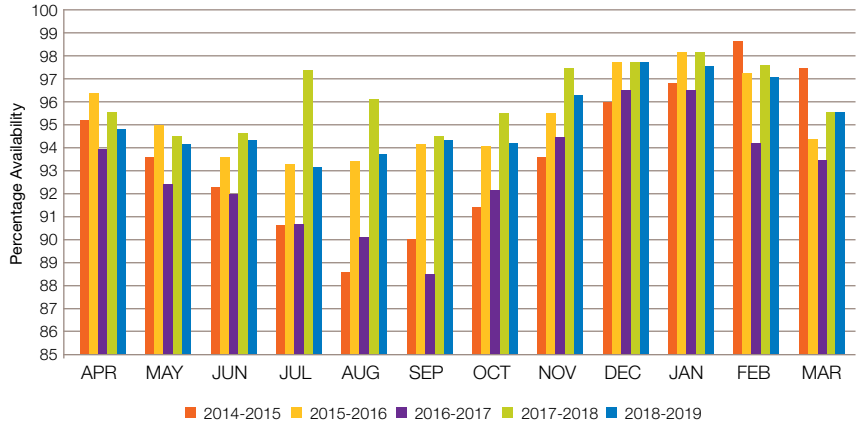


% Winter Peak System Availability



SPT % Winter Peak System Availability				
2014-15	2015-16	2016-17	2017-18	2018-19
97.13	97.80	95.82	97.88	97.55

% Monthly System Availability

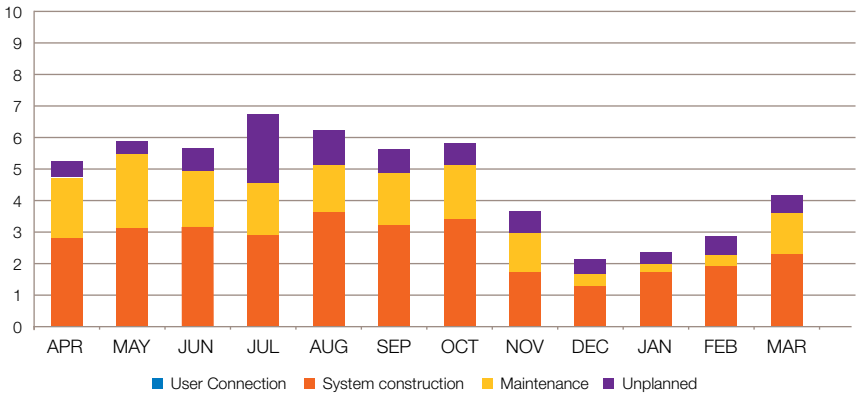


SPT % Monthly System Availability					
	2014-15	2015-16	2016-17	2017-18	2018-19
Apr	95.26	96.39	93.94	95.64	94.80
May	93.69	94.99	92.45	94.63	94.16
Jun	92.35	93.70	91.99	94.73	94.35
Jul	90.70	93.37	90.69	97.38	93.24
Aug	88.65	93.48	90.24	96.09	93.79
Sep	90.00	94.12	88.59	94.65	94.41
Oct	91.50	94.06	92.21	95.55	94.27
Nov	93.61	95.55	94.67	97.59	96.36
Dec	95.99	97.86	96.60	97.87	97.87
Jan	96.83	98.20	96.54	98.14	97.58
Feb	98.73	97.32	94.17	97.78	97.17
Mar	97.58	94.49	93.51	95.65	95.69

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) %



Planned and Unplanned Unavailability (%) for SP Transmission System					
	User Connection	System Construction	Maintenance	Unplanned	Total
Apr	0	2.86	1.87	0.47	5.20
May	0	3.09	2.38	0.37	5.84
Jun	0	3.18	1.76	0.70	5.65
Jul	0	2.86	1.64	2.26	6.76
Aug	0	3.64	1.54	1.03	6.21
Sep	0	3.23	1.64	0.73	5.59
Oct	0	3.44	1.62	0.67	5.73
Nov	0	1.70	1.18	0.76	3.64
Dec	0	1.21	0.38	0.54	2.13
Jan	0	1.58	0.30	0.54	2.42
Feb	0	1.78	0.57	0.48	2.83
Mar	0	2.31	1.33	0.67	4.31

Security

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

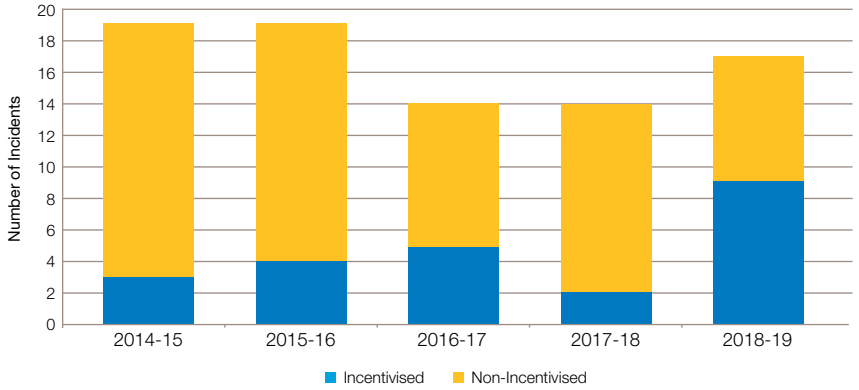
System performance is monitored by the estimated unsupplied energy from the SP Transmission System for each incident.

During 2018-19 there were 157 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 17 resulting in loss of supply to customers.

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.

SPT System – Number of incidents					
	2014-15	2015-16	2016-17	2017-18	2018-19
Incentivised	3	4	5	2	9
Non-Incentivised	16	15	9	12	8

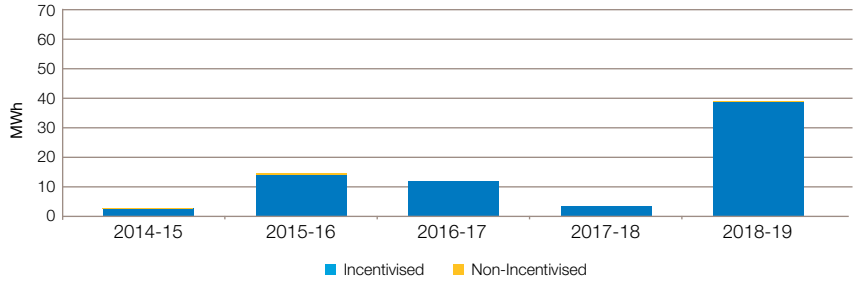


Total Estimated Unsupplied Energy

The total Estimated Unsupplied Energy from the SP Transmission System during 2018-19 was: **39.43 MWh**

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

SPT System – Estimated Unsupplied Energy					
	2014-15	2015-16	2016-17	2017-18	2018-19
Incentivised	2.80	13.90	11.31	3.04	39.08
Non-Incentivised	0.20	0.80	0.04	0	0.35



Reliability of Supply

The Overall Reliability of Supply for the SP Transmission System during 2018-19 was: **99.999772%.**

Compared with 99.999984% in 2017-18 and 99.999939% in 2016-17.

Loss of Supply Incident Details

SPT Loss of Supply Incidents – Incentivised

Incident Date, Time and Location	MW Lost	Mins	MWh Unsupplied
27 June 2018 22:12 on Glenlee-Tongland 132kV Circuit Transient Trip/DAR on TONG/GLLE 132kV circuit. Auto switching incomplete. MC4 CB 420 and EARL11 CB Grid 2 manually closed.	0.1	21	0.03
21 August 2018 16:13 at Livingstone East 132kV Substation Grid 1 opened via directional overcurrent protection operation. Grid 2 out of service on planned outage.	19.4	8	2.58
17 October 2018 16:51 on Currie-Sighthill 275kV Circuit CURR-SIGH 1 tripped while testing was taking place at CURR2 on S20/S30.	58.0	101*	23.80
28 November 2018 18:02 at Wishaw 275kV Substation Wishaw GSP SGT5 circuit inadvertent trip.	0.1	10	0.02
15 December 2018 13:19 on Kendoon-New Cumnock 132kV Circuit NECU-KEOO circuit tripped and DAR. KEOO T2 closed by telecommand.	0.3	6	0.03
15 December 2018 13:31 on Kendoon-New Cumnock 132kV Circuit NECU-KEOO circuit tripped and DAR.	0.3	4	0.02
21 January 2019 14:15 on Hunterston-Hunterston Farm-Saltcoats 132kV Circuit Circuit tripped when attempting to restore HUNF T1.	27.4	28*	4.39
31 January 2018 10:41 at Newarthill and Coatbridge 275kV Substations Urgent GSP outages due to tap change issue on Newarthill SGT1. GSP outages at both Newarthill SGT1 and Coatbridge SGT1 with the associated GSP's SGT2 transformers out of service due to major works at Wishaw 275kV Substation.	110.7	4*	8.21
23 March 2019 18:06 at Kendoon 132kV Substation Kendoon T2 transformer protection operated. T2 auto isolated and main 132kV circuit restored.	0.2	4	0.01
Total			**39.08 MWh**

SPT Loss of Supply Incidents – Non-Incentivised

Incident Date, Time and Location	MW Lost	Mins	MWh Unsupplied
10 April 2018 10:00 on Blackcraig-New Cumnock 132kV Circuit NECU SGT3B and SGT3A tripped on transformer protection – no fault monitor alarms.	0	1905	0
26 June 2018 10:42 at Whitelee Extension Windfarm SF6 gas density low on CB L10 at Whitelee Extension.	0	174	0
3 July 2018 10:19 at Harestanes Windfarm MOFF-HARE 132kV circuit trip. Main protection operated on red phase C.S.E failure at HARE1.	0	55508	0
25 September 2018 16:01 at Berwick 132kV Substation Grid 2 directional over-current protection operated. T1 out of service at time on outage.	10.5	2	0.35
13 October 2018 11:39 at South Beach 25kV Substation SACO 25kV feeder 1 tripped.	0.1	2	0
28 October 2018 23:56 on Arecleoch-Auchencrosh-Coylton-Mark Hill 132kV Circuit MAHI-KILG-AREC-GLAP Windfarms tripped off due to High speed auto-reclose protection operating at AUCC.	0	41	0
4 December 2018 at Fallago 400kV Substation SF6 top-up of GCB X410.	0	37	0
15 December 2018 13:19 on Blackcraig-Blackcraig South-New Cumnock 132kV Circuit Circuit trip during amber weather (snow).	0	41	0
Total			**0.35 MWh**

*Minutes quoted is the overall time following staged restoration to customers.

Section four

Scottish Hydro Electric Transmission System

System Description

The SHE Transmission System comprises of 4,882 circuit kilometres of overhead line and over 275 circuit kilometres of underground transmission cable routes interconnecting 143 substations operating at 400, 275 and 132kV. A new HVDC 163km link has been commissioned this year connecting Caithness to the Moray coast. The system covers 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 2018-19 the maximum recorded demand on the network was 1.47GW.

There is over 7.5GW of generation capacity in the SHE Transmission area and 1 major customer supplied directly from the SHE Transmission System. The majority of the load is taken by approximately 0.78 million customers connected to the Scottish Hydro Electric Power Distribution Network via 8.39GVA of installed transformer capacity. There are 41 Large Power Stations directly connected to the SHE Transmission system.

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 275kV and 400kV and as such may have lower security standards applied.

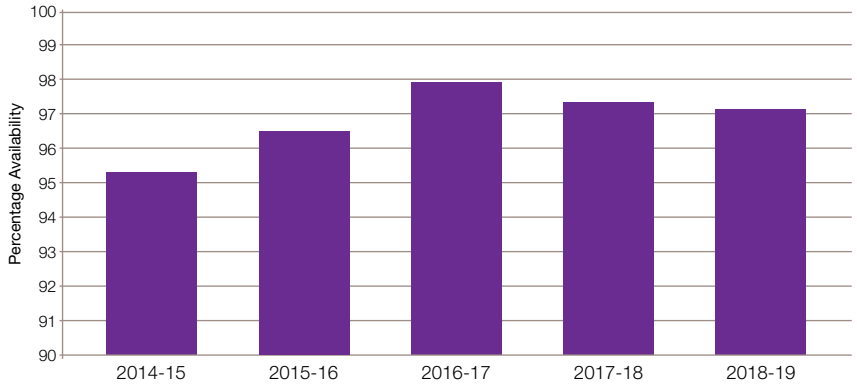
Availability

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

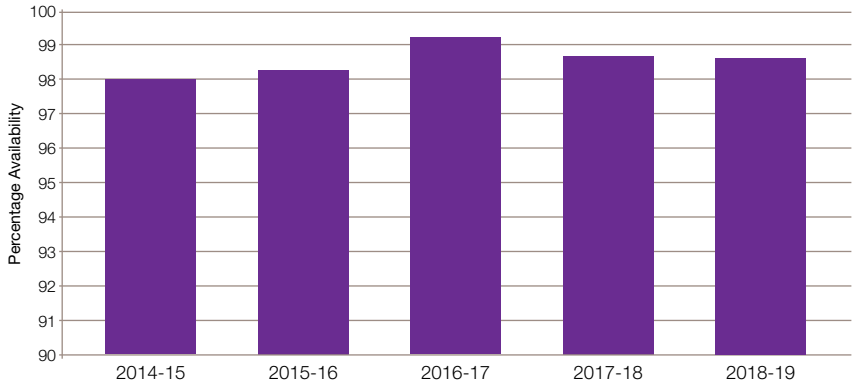
System performance is monitored by reporting variations in Annual System Availability, Winter Peak System Availability and Monthly System Availability. There is also a breakdown of Planned and Unplanned System Unavailability.

SHE Transmission % Annual System Availability				
2014-15	2015-16	2016-17	2017-18	2018-19
95.32	96.53	97.92	97.29	97.09

% Annual System Availability

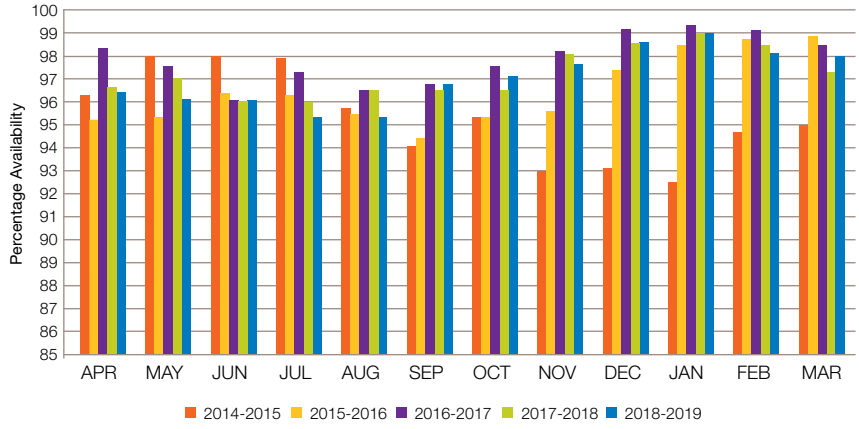


% Winter Peak System Availability



SHE Transmission % Winter Peak System Availability				
2014-15	2015-16	2016-17	2017-18	2018-19
97.97	98.21	99.22	98.68	98.61

% Monthly System Availability

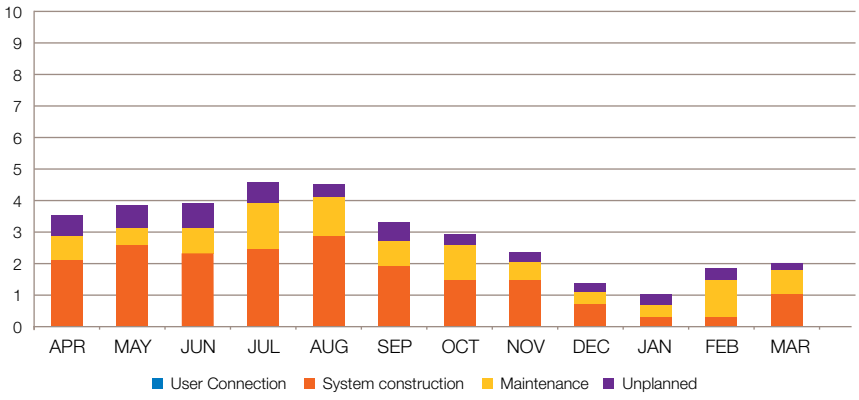


SHE Transmission % Monthly System Availability					
	2014-15	2015-16	2016-17	2017-18	2018-19
Apr	96.34	95.29	98.41	96.73	96.48
May	97.99	95.45	97.62	97.06	96.19
Jun	98.03	96.44	96.08	96.01	96.14
Jul	97.96	96.30	97.33	96.03	95.39
Aug	95.73	95.56	96.66	96.67	95.42
Sep	94.09	94.44	96.81	96.69	96.81
Oct	95.42	95.40	97.67	96.61	97.07
Nov	93.01	95.74	98.25	98.04	97.72
Dec	93.13	97.42	99.19	98.58	98.62
Jan	92.66	98.50	99.34	98.93	98.99
Feb	94.70	98.74	99.12	98.53	98.17
Mar	94.98	98.81	98.58	97.44	97.99

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) %



Planned and Unplanned Unavailability (%) for SHE Transmission System for 2018-19					
	User Connection	System Construction	Maintenance	Unplanned	Total
Apr	0	2.07	0.83	0.62	3.52
May	0	2.52	0.59	0.70	3.81
Jun	0	2.36	0.79	0.72	3.86
Jul	0.03	2.38	1.48	0.72	4.61
Aug	0	2.90	1.23	0.45	4.58
Sep	0	1.91	0.84	0.44	3.19
Oct	0	1.52	1.07	0.34	2.93
Nov	0	1.42	0.57	0.30	2.28
Dec	0	0.59	0.50	0.29	1.38
Jan	0	0.23	0.41	0.38	1.01
Feb	0	0.21	1.32	0.31	1.83
Mar	0	1.02	0.76	0.24	2.01

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 2018-19 there were 108 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 2 resulting in loss of supplies to customers.

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.

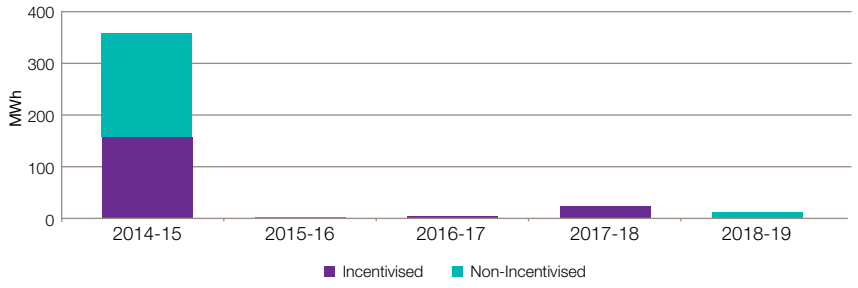
SHE Transmission System – Number of Incidents					
	2014-15	2015-16	2016-17	2017-18	2018-19
Incentivised	4	0	1	1	0
Non-Incentivised	29	12	7	1	2

Total Estimated Unsupplied Energy

The total Estimated Unsupplied Energy from the SHE Transmission System during 2018-19 was: **8.80 MWh**

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

SHE Transmission System – Estimated Unsupplied Energy					
	2014-15	2015-16	2016-17	2017-18	2018-19
Incentivised	166.69	0	4.40	24.33	0
Non-Incentivised	194.70	0.87	0	0	8.80



Reliability of Supply

The Overall Reliability of Supply for the SHE Transmission System during 2018-19 was: **99.999837%.**

Compared with 99.999555% in 2017-18 and 99.999925% in 2016-17.

Loss of Supply Incident Details

SHE Transmission Loss of Supply Incidents – Incentivised

Incident Date, Time and Location	MW Lost	Mins	MWh Unsupplied
None	0	0	0
Total			**0 MWh**

SHE Transmission Loss of Supply Incidents – Non-Incentivised

Incident Date, Time and Location	MW Lost	Mins	MWh Unsupplied
12 November 2018 Quoich/Broadford/Edinbane/Dunvegan/Ardmore/Harris/ Stornaway 132kV Substations The Fort Augustus – Broadford – Quoich 132kV circuit faulted due to a landslip. This caused loss of supply to the Western Isles and a number of generating sites. Demand was restored from local generation within the group.	9.0	53	8.0
2 February 2019 Fort Augustus 132kV Substation The Fort Augustus Grid Transformer 1 tripped due to low gas pressure on its circuit breaker. This disconnected the demand at Fort Augustus. Supplies were restored via the distribution network and the circuit breaker was returned to service some hours later, following re-gassing.	4.0	20*	0.8
Total			**8.8 MWh**

*Minutes quoted is the overall time following staged restoration to customers.

Section five

Interconnectors

England – France Interconnector

System Description

The NGET transmission system is interconnected with France via a 70km cross-channel HVDC link owned and operated jointly by National Grid and Réseau de Transport d'Electricité (RTE); the French transmission system owner.

The total capability of the Interconnector is 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.

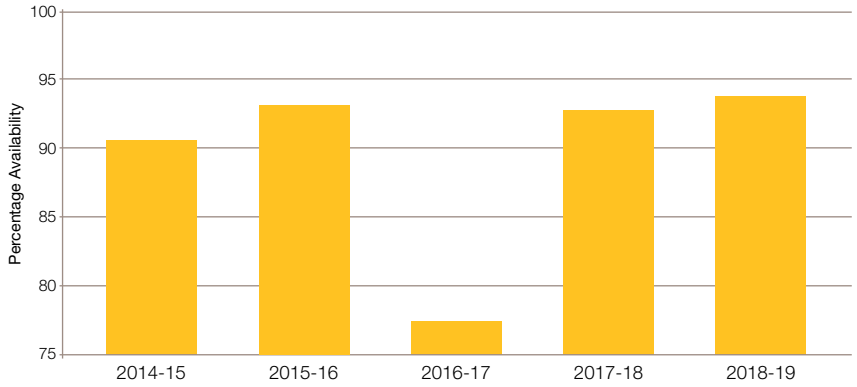
Annual Availability

Annual Availability of England – France Interconnector – 93.86 %

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

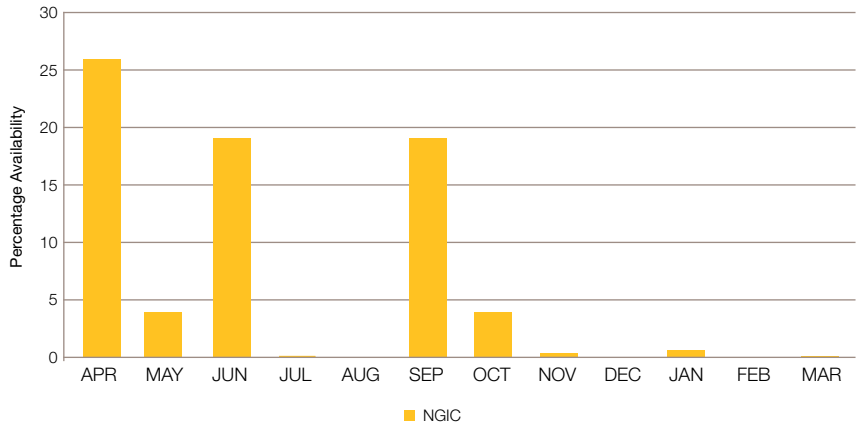
England – France Interconnector % Annual Availability				
2014-15	2015-16	2016-17	2017-18	2018-19
90.46	92.94	77.54	92.61	93.86

% Annual System Availability



Monthly Unavailability

% England – France Interconnector Monthly Unavailability

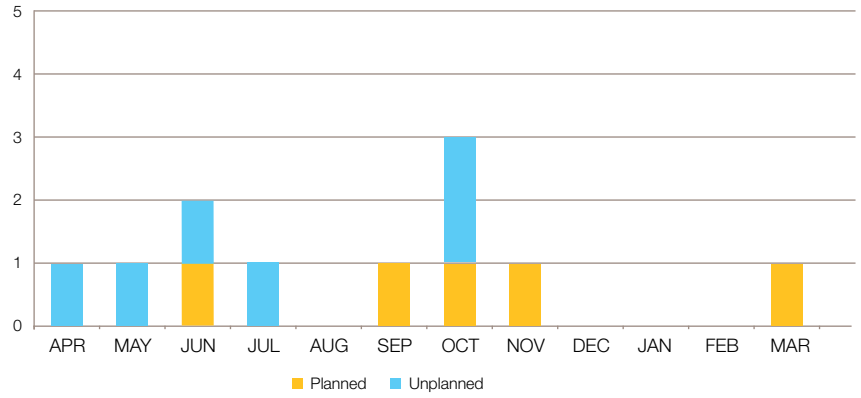


England – France Interconnector % Monthly Unavailability	
	NGIC
April	26.20
May	4.10
June	19.00
July	0.20
August	0
September	19.00
October	3.90
November	0.50
December	0
January	0.80
February	0
March	0.10
Average	6.15

Outages 2018 – 19 (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.

The chart below shows the Interconnector Planned and Unplanned Outages on a per month basis.



Interconnector Planned and Unplanned Outages		
	Planned	Unplanned
April	0	1
May	0	1
June	1	1
July	0	1
August	0	0
September	1	0
October	1	2
November	1	0
December	0	0
January	0	0
February	0	0
March	1	0
Total	5	6

England – Netherlands Interconnector

System Description

The NGET transmission system is interconnected with The Netherlands via a 260km subsea cable owned and operated by BritNed Development Limited ("BritNed"). The total capability of BritNed is 1000MW and is made up of two 'poles', 500MW each.

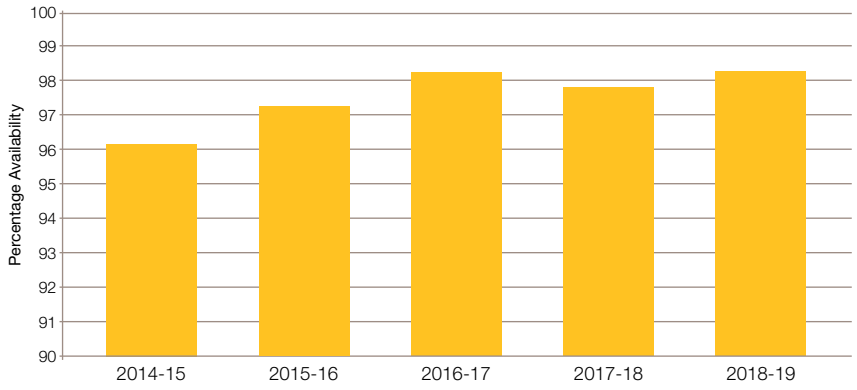
Annual Availability

Annual Availability of England – Netherlands Interconnector – 98.22%

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

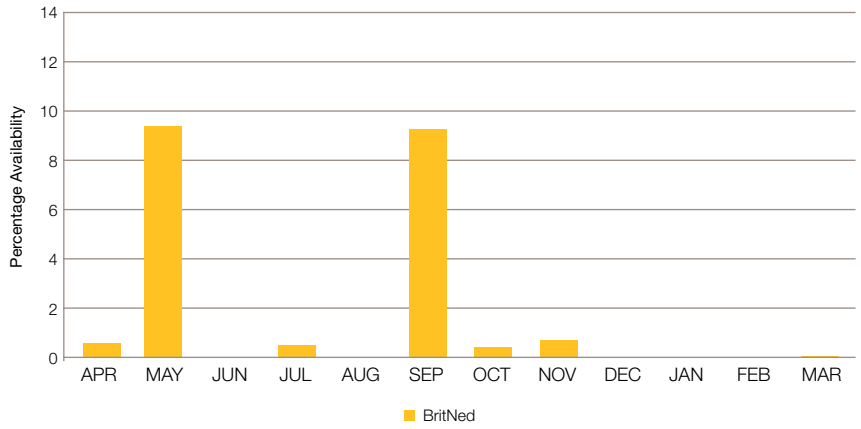
England – Netherlands Interconnector % Annual Availability				
2014-15	2015-16	2016-17	2017-18	2018-19
96.15	97.22	98.2	97.78	98.22

% Annual System Availability



Monthly Unavailability

% England – Netherlands Interconnector Monthly Unavailability

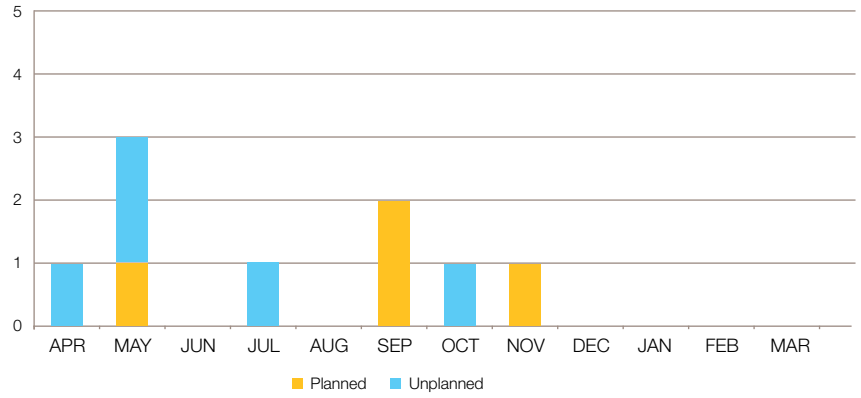


England – Netherlands Interconnector % Monthly Unavailability	
	BritNed
April	0.67
May	9.49
June	0
July	0.58
August	0
September	9.43
October	0.40
November	0.78
December	0
January	0
February	0
March	0
Average	1.78

Outages 2018 – 19 (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.

The chart below shows the Interconnector Planned and Unplanned Outages on a per month basis.



Interconnector Planned and Unplanned Outages		
	Planned	Unplanned
April	0	1
May	1	2
June	0	0
July	0	1
August	0	0
September	2	0
October	0	1
November	1	0
December	0	0
January	0	0
February	0	0
March	0	0
Total	4	5

England – Belgium Interconnector

System Description

The NGET transmission system is interconnected with Belgium via a 140km subsea cable owned and operated by Nemo Link Limited ("Nemo Link"). The total capability of the link is 1000MW and is a single 1000MW monopole design.

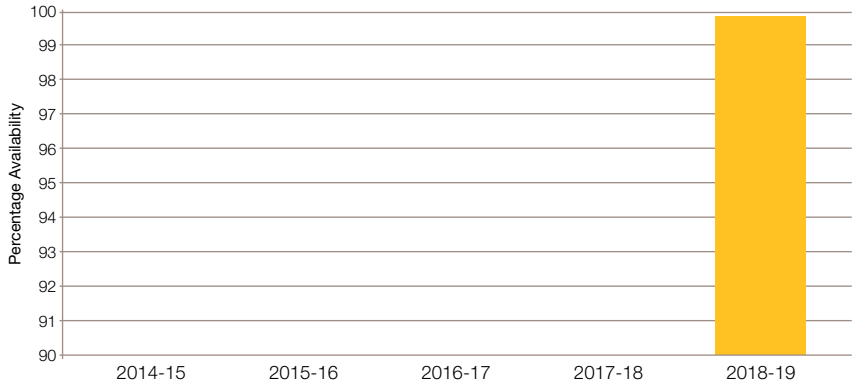
Annual Availability

Annual Availability of England – Belgium Interconnector – 99.86%

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

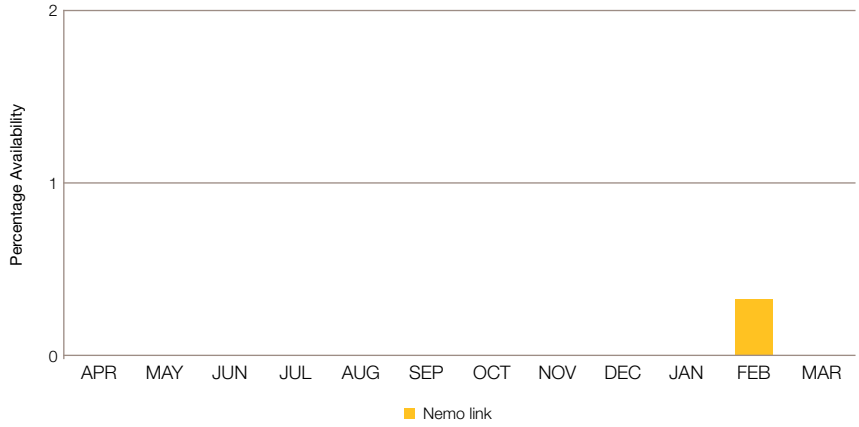
England – Belgium Interconnector % Annual Availability				
2014-15	2015-16	2016-17	2017-18	2018-19
N/A	N/A	N/A	N/A	99.86

% Annual System Availability



Monthly Unavailability

% England – Belgium Interconnector Monthly Unavailability

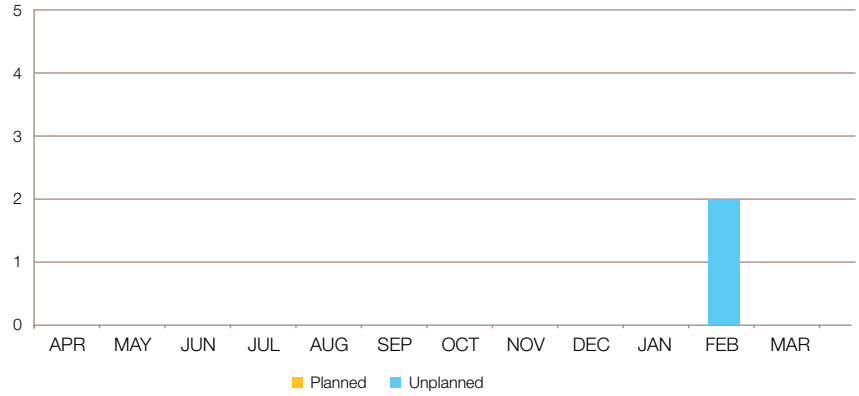


England – Belgium Interconnector % Monthly Unavailability	
	Nemo Link
April	N/A
May	N/A
June	N/A
July	N/A
August	N/A
September	N/A
October	N/A
November	N/A
December	N/A
January	0
February	0.30
March	0
Average	0.10

Outages 2018 – 19 (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.

The chart below shows the Interconnector Planned and Unplanned Outages on a per month basis.



Interconnector Planned and Unplanned Outages		
	Planned	Unplanned
April	0	0
May	0	0
June	0	0
July	0	0
August	0	0
September	0	0
October	0	0
November	0	0
December	0	0
January	0	0
February	0	2
March	0	0
Total	0	0

Section six
Offshore Systems

System Description

The following section contains details of the currently connected offshore networks; Robin Rigg OFTO (TC†), Gunfleet Sands OFTO (TC), Barrow OFTO (TC), Ormonde OFTO (TC), Lincs OFTO (TC), Westermost Rough OFTO (TC), Dudgeon OFTO (TC), Walney 1 OFTO (BT‡), Walney 2 OFTO (BT), Sheringham Shoal OFTO (BT), London Array OFTO (BT), Greater Gabbard OFTO (EQ§), Gwynt-Y-Mor OFTO (BBE**), Thanet OFTO (BBE), Humber Gateway OFTO (BBE), West of Duddon Sands OFTO (WoDS) and Burbo Bank Extension OFTO (DTPBBE). The offshore network consists of 1202 kilometres of circuit, connecting to 17 offshore substations totalling over 4.99GW of generating capacity.

Offshore Transmission Networks

Offshore Transmission Networks

	Go Live	Number of Circuits	Circuit Length km	Generating Capacity MW	Connection Voltage	Interfacing Party
TC Robin Rigg	02/03/11	2	28.8	184	132 kV	DNO
TC Gunfleet Sands	19/07/11	1	12.76	163.9	132 kV	DNO
TC Barrow	27/09/11	1	30.1	90	132 kV	DNO
TC Ormonde	10/07/12	1	44.3	150	132 kV	DNO
TC Lincs	11/11/14	2	122.6	250	400 kV	Transmission
TC Westermost Rough	11/02/16	1	26.16	210	275 kV	Transmission
TC Dudgeon	13/11/18	2	89	400	400kV	Transmission
BT Walney 1	31/10/11	1	48	182	132 kV	Transmission
BT Walney 2	04/10/12	1	49	182	132 kV	DNO
BT Sheringham Shoal	05/07/13	2	88	315	132 kV	DNO
BT London Array	18/09/13	4	216	630	400 kV	Transmission
EQ Greater Gabbard	29/11/13	3	135	500	132 kV	Transmission
BBE Gwynt Y Mor	17/02/15	4	126.8	574	132kV	Transmission
BBE Thanet	17/12/14	2	28.9	300	132kV	DNO
BBE Humber Gateway	15/09/16	2	78	219	275kV	Transmission
West of Duddon Sands	25/08/15	2	43	382	400kV	Transmission
DTP Burbo Bank Extension	27/04/18	1	35.3	258	400kV	Transmission

† TC: Transmission Capital
‡ BT: Blue Transmission Investments Limited
§ EQ: Equitix
** BBE: Balfour Beatty and Equitix Consortium
DTPBBE: Diamond Transmission Partners BBE Ltd

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. OFTO provides availability information 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

	2014-15	2015-16	2016-17	2017-18	2018-19
TC Robin Rigg	100	99.99	99.99	100	100
TC Gunfleet Sands	99.53	100	99.95	99.81	99.97
TC Barrow	100	99.88	100	99.99	100
TC Ormonde	99.93	100	99.59	100	100
TC Lincs	100	100	99.93	99.78	100
TC Westermost Rough	N/A	100	100	100	99.73
TC Dudgeon	N/A	N/A	N/A	N/A	100
BT Walney 1	100	100	99.62	99.70	100
BT Walney 2	100	92	100	100	91.42
BT Sheringham Shoal	99.84	100	99.95	99.23	99.40
BT London Array	99.90	99.98	98.88	99.80	99.94
EQ Greater Gabbard	100	100	98.78	99.61	99.82
BBE Gwynt Y Mor	82.59	82.58	99.73	100	99.84
BBE Thanet	82.47	83.05	96.15	100	100
BBE Humber Gateway	N/A	N/A	100	93.75	100
West of Duddon Sands	N/A	100	99.64	99.45	100
DTP Burbo Bank Extension	N/A	N/A	N/A	N/A	98.15

% Winter Peak System Availability

Offshore Transmission Networks % Winter Availability					
	2014-15	2015-16	2016-17	2017-18	2018-19
TC Robin Rigg	100	100	100	100	100
TC Gunfleet Sands	100	100	100	100	100
TC Barrow	100	100	100	100	100
TC Ormonde	100	100	100	100	100
TC Lincs	100	100	100	99.87	100
TC Westermost Rough	N/A	100	100	100	100
TC Dudgeon	N/A	N/A	N/A	N/A	100
BT Walney 1	100	100	100	100	100
BT Walney 2	100	3.87	100	100	100
BT Sheringham Shoal	100	100	100	99.99	100
BT London Array	100	100	100	100	99.99
EQ Greater Gabbard	100	100	100	99.79	99.68
BBE Gwynt Y Mor	100	76.24	99.94	100	99.61
BBE Thanet	96.93	100	100	100	100
BBE Humber Gateway	N/A	N/A	100	86.55	100
West of Duddon Sands	N/A	100	100	100	100
DTP Burbo Bank Extension	N/A	N/A	N/A	N/A	100

% Monthly System Availability

Offshore Transmission Networks % Monthly System Availability												
	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
TC Robin Rigg	100	100	100	99.99	100	100	100	100	100	100	100	100
TC Gunfleet Sands	100	100	100	99.63	100	100	100	100	100	100	100	100
TC Barrow	100	100	100	100	100	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	100	100	100	100	100	100	100
TC Westermost Rough	100	100	100	96.71	100	100	100	100	100	100	100	100
TC Dudgeon	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100	100	100	100	100
BT Walney 1	100	100	100	100	100	100	100	100	100	100	100	100
BT Walney 2	100	27.02	71.06	100	100	100	100	100	100	100	100	100
BT Sheringham Shoal	100	98.94	93.80	100	100	100	100	100	100	100	100	100
BT London Array	100	100	99.76	99.57	100	100	99.91	100	100	100	100	100
EQ Greater Gabbard	100	100	99.70	100	100	100	98.10	100	100	100	100	100
BBE Gwynt Y Mor	100	100	100	100	100	100	99.15	100	100	100	98.83	100
BBE Thanet	100	100	100	100	100	100	100	100	100	100	100	100
BBE Humber Gateway	100	100	100	100	100	100	100	100	100	100	100	100
West of Duddon Sands	100	100	100	100	100	100	100	100	100	100	100	100
DTP Burbo Bank Extension	40.29	92.72	100	99.88	88.10	100	100	100	100	100	100	100

Annual Availability of Offshore Networks for 2018-19 was 99.50%.

% Monthly Planned and 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 Non-OFTO (e.g. Generator)

		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
TC Robin Rigg	**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	0.51	0	1.33	8.48	0	0	8.60	0	0.10	0.57	1.85
		Apr	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
TC Gunfleet Sands	**OFTO Planned**	0	0	0	0.37	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	0.19	0	0	0	0	0	0	0	0
		Apr	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
TC Barrow	**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	0.39	0	0	17	0	0	0	0	0	0	0	0
		Apr	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
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	0	0	0	0	0	0	0.44	0	0	0
		Apr	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
TC Lincs	**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
		Apr	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
TC Westermost Rough	**OFTO Planned**	0	0	0	3.29	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	3.83	0	0	0	0	0	0	0	0
		Apr	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
TC Dudgeon	**OFTO Planned**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	0	0	0	0
	OFTO Unplanned	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	0	0	0	0
	Non-OFTO	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	0	0	0	0
		Apr	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
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	0.77	32.14	26.32	0	0	0	0	0	0	0	0	0

% Monthly Planned and Unplanned Unavailability

		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
BT Walney 2	**OFTO Planned**	0	4.43	0	0	0	0	0	0	0	0	0	0
	OFTO Unplanned	0	68.55	29.94	0	0	0	0	0	0	0	0	0
	Non-OFTO	0	0	0.10	0	0	0	0	0	0	0	0	0
		Apr	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
BT Sheringham Shoal	**OFTO Planned**	0	1.06	6.20	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
		Apr	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
BT London Array	**OFTO Planned**	0	0	0.24	0.22	0	0	0	0	0	0	0	0
	OFTO Unplanned	0	0	0	0.21	0	0	0.09	0	0	0	0	0
	Non-OFTO	0	0	0	0	0	8.65	22.86	11.86	0	17.48	22.86	11.67
		Apr	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
EQ 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
		Apr	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
BBE Gwynt Y Mor	**OFTO Planned**	0	0	0	0	0	0	0	0	0	0	0	0
	OFTO Unplanned	0	0	0	0	0	0	0.85	0	0	0	1.17	0
	Non-OFTO	0	0	0	0	0	0	0	0	0	0	0	0
		Apr	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
BBE Thanet	**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
		Apr	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
BBE Humber Gateway	**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
		Apr	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
West of Duddon 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	0	0	0	0	0	0	0	0
		Apr	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
DTP Burbo Bank Extension	**OFTO Planned**	59.71	7.28	0	0.12	11.9	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

Outage Details

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

TC Robin Rigg

Outage Date and Time	Reason	Days and Hours	MWh
12 May 2018 06:34 DNO fault outage (Robin Rigg East)	Non-OFTO	7.60 hours	699.20
03 July 2018 08:05 Generator maintenance outage (Robin Rigg East)	Non-OFTO	9.07 hours	834.10
04 July 2018 08:01 Generator maintenance outage (Robin Rigg West)	Non-OFTO	10.65 hours	979.80
07 July 2018 17:04 Unplanned circuit trip (Robin Rigg East)	OFTO	0.18 hours	16.80
06 August 2018 09:31 DNO planned maintenance outage (Robin Rigg West)	Non-OFTO	5 days 6.23 hours	11613.00
05 November 2018 08:27 DNO planned maintenance outage (Robin Rigg East)	Non-OFTO	5 days 5.27 hours	11524.00
03 January 2019 08:35 DNO planned maintenance outage (Robin Rigg East)	Non-OFTO	0.92 hours	84.00
03 January 2019 16:03 DNO planned maintenance outage (Robin Rigg East)	Non-OFTO	1.42 hours	130.30
27 February 2019 08:34 DNO planned maintenance outage (Robin Rigg East)	Non-OFTO	1.17 hours	107.00
27 February 2019 15:05 DNO planned maintenance outage (Robin Rigg East)	Non-OFTO	7.67 hours	704.00
01 March 2019 08:23 DNO planned maintenance outage (Robin Rigg East)	Non-OFTO	8.98 hours	826.50
04 March 2019 08:29 DNO planned maintenance outage (Robin Rigg West)	Non-OFTO	8.35 hours	768.20
17 March 2019 09:54 DNO planned maintenance outage (Robin Rigg West)	Non-OFTO	6.90 hours	634.80
17 March 2019 16:49 DNO planned maintenance outage (Robin Rigg East)	Non-OFTO	3.33 hours	306.00
Total			**29227.70 MWh**

TC Gunfleet Sands

Outage Date and Time	Reason	Days and Hours	MWh
24 July 2018 09:16 DNO outage to maintain CB205	Non-OFTO	1.38 hours	207.00
24 July 2018 09:16 OFTO alignment outage to repair fibre optic earthing connection	OFTO	2.78 hours	417.00
Total			**624.00 MWh**

TC Barrow

Outage Date and Time	Reason	Days and Hours	MWh
12 April 2018 14:48 OFTO circuit trip during Generator switching activity	Non-OFTO	2.18 hours	196.50
20 April 2018 10:21 DNO outage to re-configure circuit following civil works	Non-OFTO	0.68 hours	61.50
09 July 2018 08:47 DNO forced outage to repair and top-up CT	Non-OFTO	5 days 2.4 hours	11016.00
Total			**11274 MWh**

TC Ormonde

Outage Date and Time	Reason	Days and Hours	MWh
12 December 2018 10:27 DNO outage request to top-up CTs adjacent to CB405	Non-OFTO	3.30 hours	495.00
Total			**495 MWh**

TC Lincs

Outage Date and Time	Reason	Days and Hours	MWh
None			

TC Westermost Rough

Outage Date and Time	Reason	Days and Hours	MWh
03 July 2018 10:19 Generator outage for interlock work	Non-OFTO	1 day 4.45 hours	5974.50
03 July 2018 10:19 OFTO maintenance work	OFTO	1 day 0.55 hours	5155.50
Total			**11130 MWh**

TC Dudgeon

Outage Date and Time	Reason	Days and Hours	MWh
None			

BT Walney 1

Outage Date and Time	Reason	Days and Hours	MWh
30 April 2018 06:43 Generator fault GT2 trip	NON-OFTO	54 days 6.77 hours	72941.00
Total			**72941 MWh**

BT Walney 2

Outage Date and Time	Reason	Days and Hours	MWh
09 May 2018 09:01 Maintenance	OFTO	1 day 8.98 hours	5541.00
10 May 2018 18:00 132kV Disconnector flashover	OFTO	29 days 22.35 hours	120683.00
26 June 2018 09:17 DNO Request	NON-OFTO	0.68 hours	115.00
06 July 2018 15:33 DNO Request	NON-OFTO	0.78 hours	131.00
12 November 2018 09:56 DNO Request	NON-OFTO	0.76 hours	129.00
15 November 2018 14:06 DNO Request	NON-OFTO	1.22 hours	204.00
Total			**126803 MWh**

BT Sheringham Shoal

Outage Date and Time	Reason	Days and Hours	MWh
31 May 2018 08:17 Maintenance	OFTO	4 days 9.18 hours	16544.00
23 October 2018 07:00 DNO Switching	NON-OFTO	3.85 hours	606.00
26 October 2018 15:05 Top up SF6 in 34kV Busbar Section	NON-OFTO	0.86 hours	225.00
Total			**17375 MWh**

BT London Array

Outage Date and Time	Reason	Days and Hours	MWh
26 June 2018 08:52 Maintenance	OFTO	7.7 hours	1109.00
05 July 2018 07:51 Maintenance	OFTO	7.02 hours	10100
31 July 2018 06:06 Bird strike	OFTO	6.9 hours	994.00
19 September 2018 15:36 Generator fault GT3 Busducts	OFTO	57 days 21.98 hours	200158.00
26 October 2018 09:10 SVC Trip on X290	OFTO	1.27 hours	399.00
08 January 2019 15:23 Generator fault GT2 Busducts	OFTO	56 days 1.6 hours	193767.00
11 January 2019 10:24 Generator 33kV inspection on GT4	OFTO	5.35 hours	770.00
12 January 2019 09:34 Generator 33kV inspection on GT1	OFTO	2.98 hours	430.00
18 March 2019 10:18 Generator 33kV repair on GT1	OFTO	11 days 2.92 hours	38436.00
Total			**437073 MWh**

Equitix Greater Gabbard

Outage Date and Time	Reason	Days and Hours	MWh
03 October 2018 18:25 Transformer low oil trip and suspected surge damage.	OFTO	1 day 22.65 hours	2379.00
09 October 2018 07:12 Transformer low oil trip and suspected surge damage.	OFTO	11.40 hours	1904.00
16 October 2018 08:20 Oil top-up, circuit 1 out of service.	OFTO	7.03 hours	1175.00
17 October 2018 11:31 Oil top-up, circuit 2 out of service.	OFTO	4.87 hours	813.00
18 October 2018 10:25 Oil top-up, circuit 3 out of service.	OFTO	4.80 hours	802.00
Total			**7073 MWh**

BBE Gwynt-Y-Mor

Outage Date and Time	Reason	Days and Hours	MWh
16 October 2018 15:29 Unexpected inter-trip of SGT1 from SVC during routine works. 50% loss in Availability. 25% restored at 17:12 but problem with not being able to close CB 510 offshore meant 25% remained unavailable.	OFTO	1.71 hours	492.49
16 October 2018 17:12 25% reduction in Availability until CB 510 reclosed locally at 15:03.	OFTO	21.85 hours	3135.48
12 February 2018 13:13 44% reduction in Availability as a result of loss of LVAC supply to SGT pumps and fans.	OFTO	17.70 hours	4515.02
Total			**8142.98 MWh**

BBE Thanet

Outage Date and Time	Reason	Days and Hours	MWh
None			

BBE Humber Gateway

Outage Date and Time	Reason	Days and Hours	MWh
None			

West of Duddon Sands

Outage Date and Time	Reason	Days and Hours	MWh
None			

DTP Burbo Bank Extension

Outage Date and Time	Reason	Days and Hours	MWh
27 April 2018 21:12 Transfer Agreement Orsted SCADA SAT / snagging works (Outage already in place prior to asset transfer).	OFTO	1 day 18.6 hours	10684.23
09 May 2018 08:22 Transfer Agreement Orsted SCADA SAT / snagging works.	OFTO	2 days 6.2 hours	13600.02
09 July 2018 17:07 Point on Wave snagging works as required by the Transfer Agreement between DTPBBE and Orsted.	OFTO	0.9 hours	230.08
07 August 2018 05:50 SCADA SAT / snagging works as required by the Transfer Agreement between DTPBBE and Orsted	OFTO	3 days 16.6 hours	22230.23
Total			**46744.57 MWh**

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 following 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:

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

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:

$$\frac{\text{(Total MWh system is capable of delivering – MWh unavailable)}}{\text{(Total MWh system is capable of delivering)}} \text{ x 100\%}$$

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 400kV and 275kV transmission voltages than for 132kV. Additionally, the 132kV network is, in parts, less interconnected than the higher voltage systems and so losses of 132kV 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 the date, time and location of the event, duration, demand lost, an estimate of unsupplied energy and relevant factual information relating to the event.

Since 1st April 2013, loss of supply incidents are governed by the Energy Not Supplied (ENS) scheme. The scheme aims to incentivise the Transmission Licensees to minimise the impact of any loss of supply to their customers, that is, to restore supplies as soon as possible after an incident.

Glossary of terms

Loss of Supply Incidents – Incentivised

An Incentivised loss of supply event is an event on the Licensee's Transmission System that causes electricity not to be supplied to a customer, subject to the exclusions defined in the Special Conditions of the Transmission Licence.

Loss of Supply Incidents – Non Incentivised

The Non-Incentivised category covers loss of supply incidents that are less than 3 minutes in duration, the energy not supplied is calculated and recorded but not included in the incentivised energy not supplied figure and is reported separately. The Non-Incentivised category also applies to 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 initiated on a DNO network are not included 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 132kV 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 400kV 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 50Hz: a range of 49.5 to 50.5Hz. 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 50.2Hz.

Frequency may, however, move outside these limits under fault conditions or when abnormal changes to operating conditions occur. Losses of generation between 1320 and 1800MW 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 49.5Hz within 60 seconds.

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