nationalgrid

# National Electricity Transmission System Performance Report 2014 – 2015

Report to the Gas and Electricity Markets Authority

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## Report to the Gas and Electricity Markets Authority

# Contents

# 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 Partners Limited (TC), Balfour Beatty (plus their investor partners Equitix and AMP) (BB) and Blue Transmission Investments Limited (BT). 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 24 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, Blue Transmission Limited and Balfour Beatty Utility Solutions have been provided by the Transmission Owners in accordance with Licence Condition D3 or Licence Condition E16 (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.

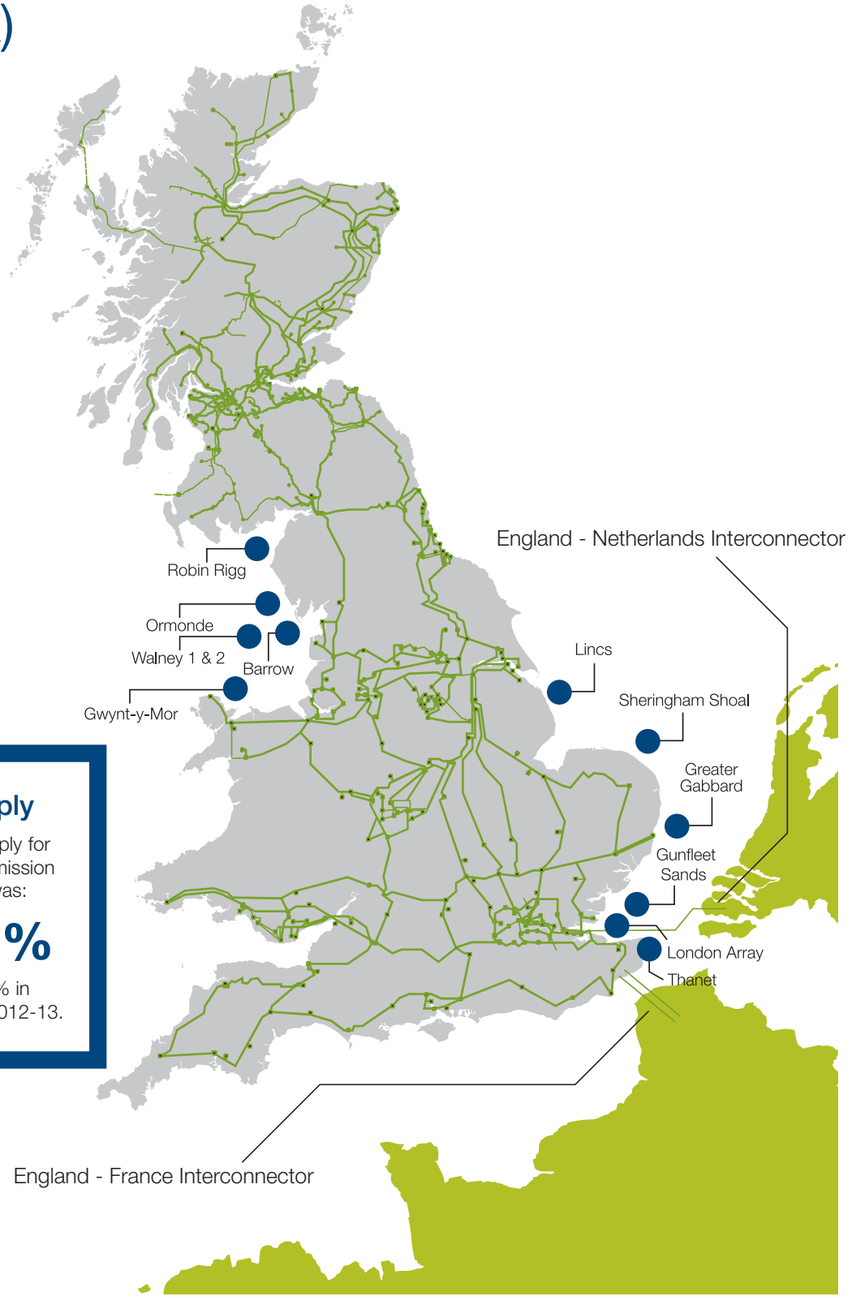
The National Electricity Transmission System is connected via interconnectors to transmission systems in France, Northern and Southern Ireland and Netherlands. The Northern Ireland Interconnector is regulated by the Northern Ireland Regulator (NIAUR) and Southern Ireland is regulated by the Commission 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 in conjunction with TenneT due to the joint ownership of the equipment.

# Section One

## National Electricity Transmission System (GB Network)




### Reliability of Supply

The Overall Reliability of Supply for the National Electricity Transmission System during 2014-15 was:

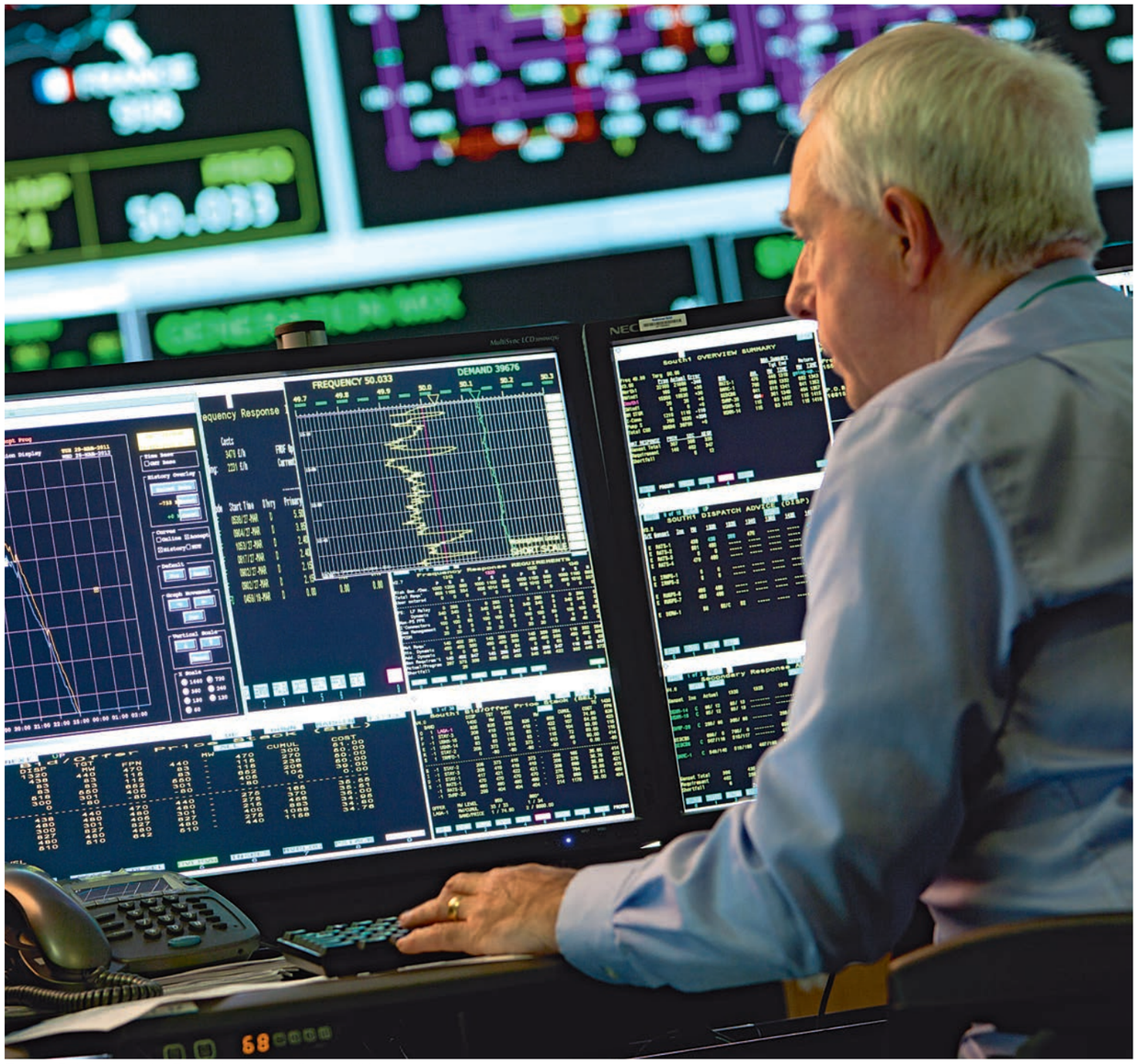
**99.99987%**

compared with 99.99991% in 2013-14 and 99.99975% in 2012-13.

## Availability

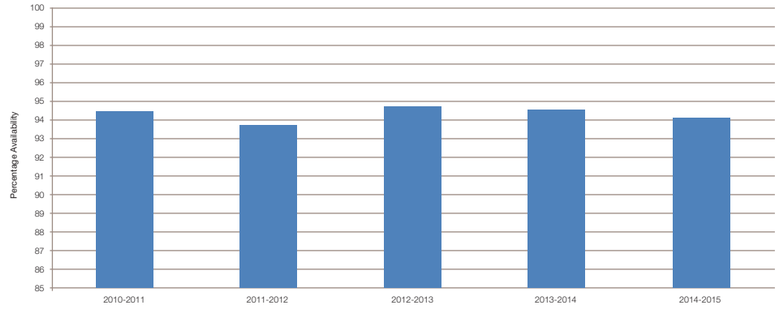
The definitions and criteria for system availability can be found in the Glossary of Terms at the end of this report.

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



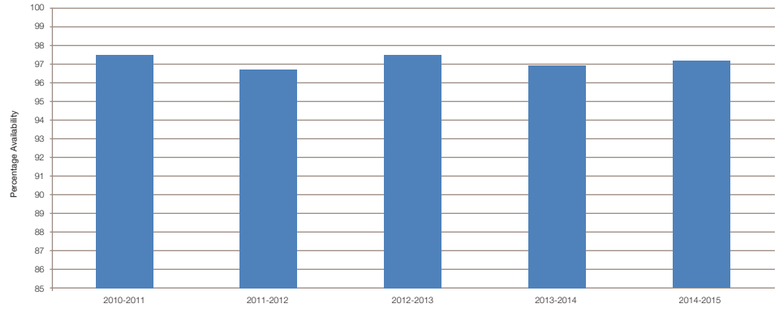
Energy Balancing at the Electricity Control Centre, UK

## % Annual System Availability



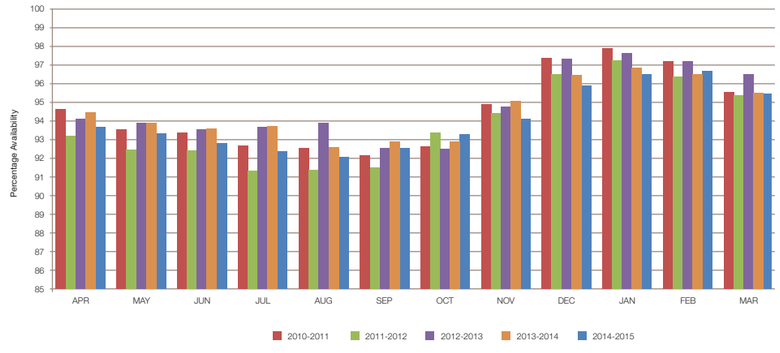

| 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 |
|---|---|---|---|---|
| 94.47 | 93.78 | 94.75 | 94.50 | 94.09 |

## % Winter Peak System Availability




| 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 |
|---|---|---|---|---|
| 97.45 | 96.71 | 97.40 | 96.98 | 97.15 |

## % Monthly System Availability




| | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 |
|---|---|---|---|---|---|
| April | 94.65 | 93.25 | 94.12 | 94.43 | 93.69 |
| May | 93.55 | 92.51 | 93.87 | 93.88 | 93.24 |
| June | 93.04 | 92.39 | 93.59 | 93.61 | 92.87 |
| July | 92.79 | 91.36 | 93.72 | 93.73 | 92.44 |
| August | 92.50 | 91.30 | 93.87 | 92.67 | 92.06 |
| September | 92.12 | 91.43 | 92.65 | 92.87 | 92.51 |
| October | 92.60 | 93.35 | 92.49 | 92.98 | 93.26 |
| November | 94.97 | 94.45 | 94.77 | 95.03 | 94.14 |
| December | 97.40 | 96.48 | 97.32 | 96.45 | 95.95 |
| January | 97.82 | 97.26 | 97.68 | 96.77 | 96.51 |
| February | 97.12 | 96.38 | 97.17 | 96.43 | 96.68 |
| March | 95.55 | 95.38 | 96.46 | 95.58 | 95.57 |

### Annual System Availability

Annual System Availability of the National Electricity Transmission System for 2014 - 2015 was:

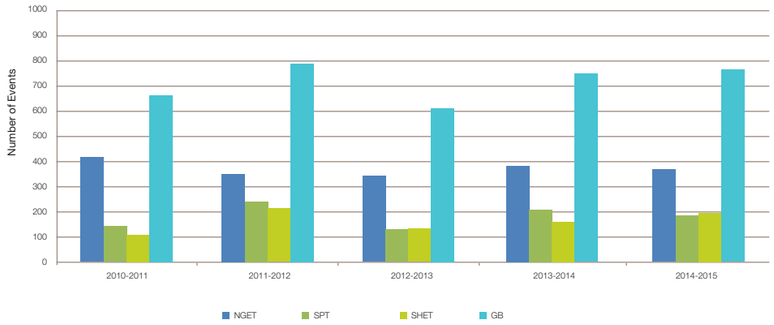
**94.09%**

## 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 2014-15 there were 760 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 57 resulting in loss of supplies to customers.**



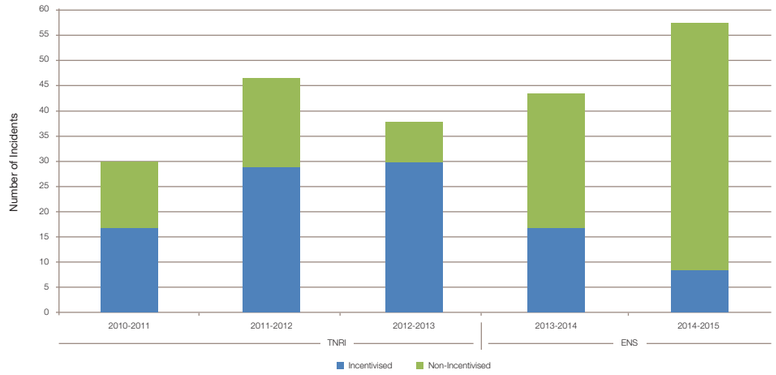

| | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 |
|---|---|---|---|---|---|
| NGET | 407 | 351 | 351 | 384 | 371 |
| SPT | 144 | 236 | 130 | 204 | 190 |
| SHET | 107 | 209 | 133 | 160 | 199 |
| GB | 658 | 796 | 614 | 748 | 760 |

Overhead line apprentices at Eakring Training Facility in the UK



## Number of Loss of Supply Incidents

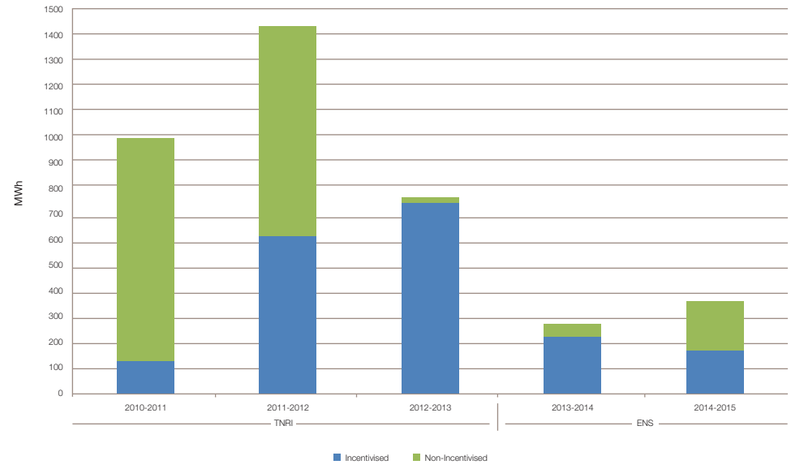
The chart shows the annual comparison of the numbers of Loss of Supply Incidents that occurred within the National Electricity Transmission System. The chart separates the TNRI (2010 – 2013) and ENS (2013 to date) schemes for clarification.




| | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 |
|---|---|---|---|---|---|
| Incentivised | 16 | 29 | 30 | 17 | 8 |
| Non-Incentivised | 14 | 17 | 8 | 27 | 49 |

## 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.




| | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 |
|---|---|---|---|---|---|
| Incentivised | 120.54 | 628.88 | 760.53 | 212.93 | 178.18 |
| Non-Incentivised | 863.10 | 788.70 | 6.90 | 45.37 | 196.01 |

### Total Estimated Unsupplied Energy

The total Estimated Unsupplied Energy from the National Electricity Transmission System during 2014-15 was:

**374.19MWh**

Staythorpe 400kV Bus Section

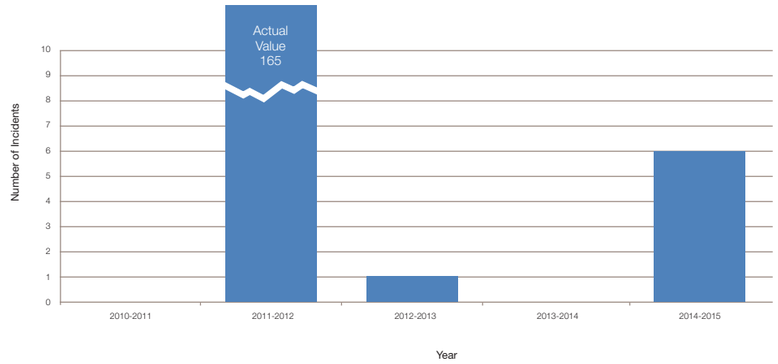
## Quality of Service

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 2014-15 there were six 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 2010-15.




| | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 |
|---|---|---|---|---|---|
| Number of NGET Excursions | 0 | 165 | 1 | 0 | 6 |
| Number of SPT Excursions | 0 | 0 | 0 | 0 | 0 |
| Number of SHETL Excursions | 0 | 0 | 0 | 0 | 0 |

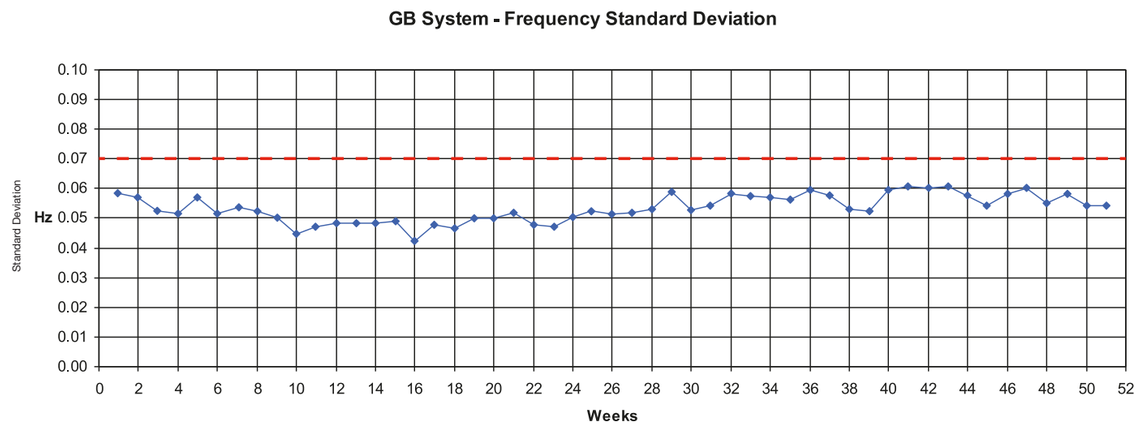
## Frequency Excursions

During 2014-15 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

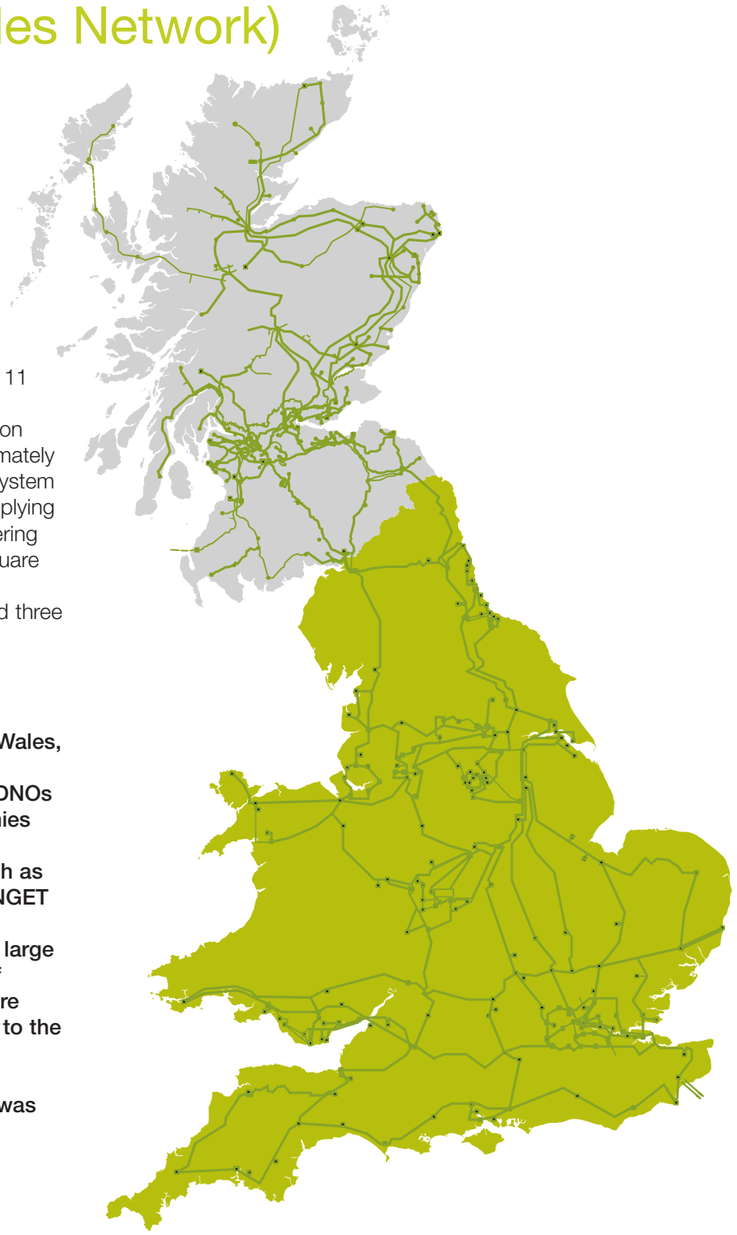
The chart below displays the recorded Frequency Deviation from 50Hz on a weekly basis with a target Standard Deviation of 0.07Hz for the year 2014-15.




Overhead line apprentice in the UK

# Section Two

## NGET System (England & Wales Network)



### System Description

The NGET System comprises of 14,111 kilometres of overhead line and 643 kilometres of underground transmission cable routes interconnecting approximately 300 substations. The Transmission System operates at 400, 275 and 132kV supplying electricity to England and Wales covering an area of approximately 151,000 square kilometres. It is connected to the SP Transmission System to the north and three HVDC Interconnectors to Republic of Ireland, France and Holland.

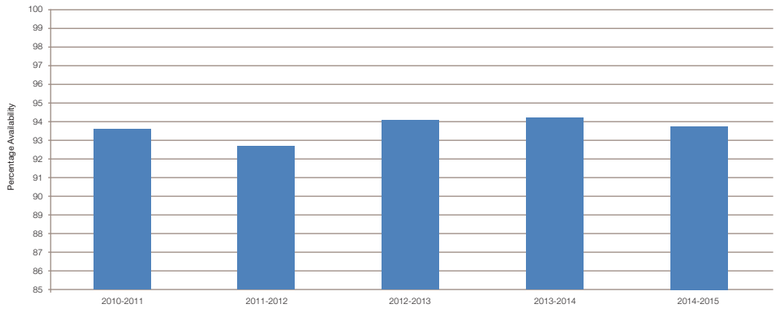
**There are 12 Distribution Network Operators (DNOs) in England and Wales, each is responsible for a regional distribution services area. The 12 DNOs are owned by six different companies and along with a small number of directly connected customers, such as steelworks, are connected to the NGET system via 133GVA of installed transformer capacity. There are 67 large power stations totalling 57.8GW of generation capacity and 12 Offshore Transmission networks connected to the England and Wales Transmission System. In 2014-15 the maximum recorded demand on the network was 47.4GW.**

## Availability

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

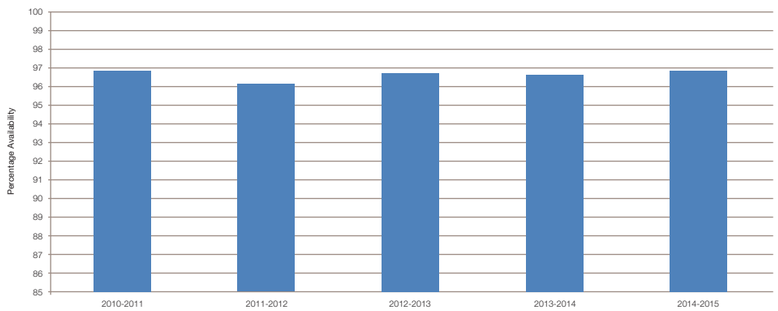
**System performance is monitored by reporting variations in Annual System Availability, Winter Peak System Availability and Monthly System Availability. There is also a breakdown of Planned and Unplanned System Unavailability**

## % Annual System Availability



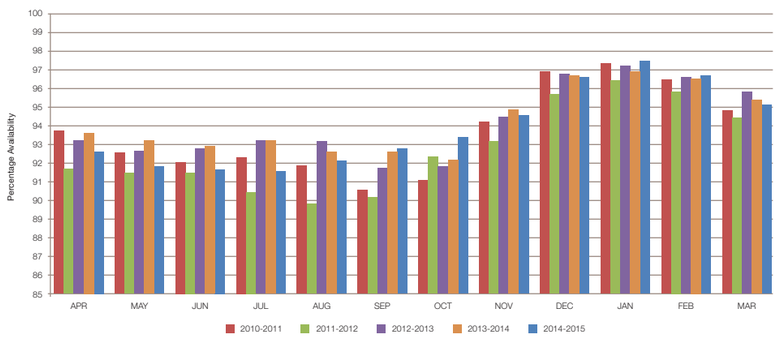

| 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 |
|---|---|---|---|---|
| 93.60 | 92.71 | 94.03 | 94.16 | 93.82 |

## % Winter Peak System Availability




| 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 |
|---|---|---|---|---|
| 96.95 | 96.01 | 96.89 | 96.75 | 96.93 |

## % Monthly System Availability



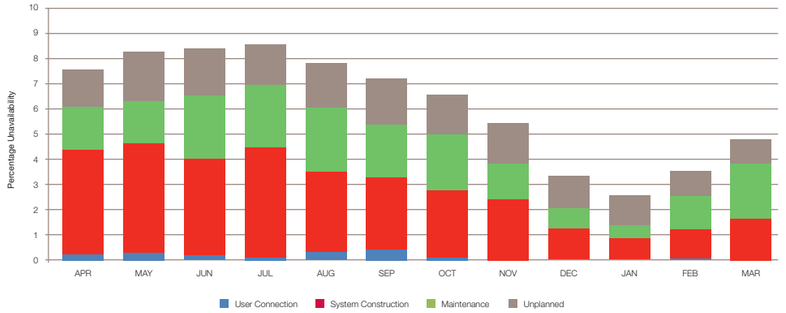

| | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 |
|---|---|---|---|---|---|
| April | 93.74 | 91.81 | 93.16 | 93.56 | 92.49 |
| May | 92.48 | 91.33 | 92.68 | 93.22 | 91.80 |
| June | 92.05 | 91.42 | 92.72 | 92.92 | 91.62 |
| July | 92.28 | 90.41 | 93.12 | 93.14 | 91.46 |
| August | 91.94 | 89.88 | 93.15 | 92.52 | 92.09 |
| September | 90.42 | 90.03 | 91.82 | 92.58 | 92.84 |
| October | 91.08 | 92.25 | 91.86 | 92.18 | 93.21 |
| November | 94.18 | 93.24 | 94.42 | 94.89 | 94.61 |
| December | 96.92 | 95.71 | 96.82 | 96.77 | 96.70 |
| January | 97.36 | 96.40 | 97.20 | 96.97 | 97.47 |
| February | 96.53 | 95.91 | 96.60 | 96.51 | 96.60 |
| March | 94.79 | 94.44 | 95.87 | 95.33 | 95.12 |



## Monthly 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 |
|---|---|---|---|---|---|
| April | 0.19 | 4.22 | 1.74 | 1.37 | 7.51 |
| May | 0.22 | 4.44 | 1.65 | 1.90 | 8.21 |
| June | 0.14 | 3.96 | 2.52 | 1.76 | 8.38 |
| July | 0.07 | 4.47 | 2.42 | 1.58 | 8.54 |
| August | 0.27 | 3.24 | 2.59 | 1.80 | 7.91 |
| September | 0.36 | 2.94 | 2.02 | 1.85 | 7.16 |
| October | 0.07 | 2.86 | 2.31 | 1.56 | 6.79 |
| November | 0.00 | 2.34 | 1.49 | 1.56 | 5.39 |
| December | 0.00 | 1.29 | 0.87 | 1.15 | 3.30 |
| January | 0.00 | 0.85 | 0.63 | 1.05 | 2.53 |
| February | 0.05 | 1.07 | 1.29 | 0.99 | 3.40 |
| March | 0.00 | 1.64 | 2.25 | 0.99 | 4.89 |

Spennymoor OHL Project Site

## Security

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

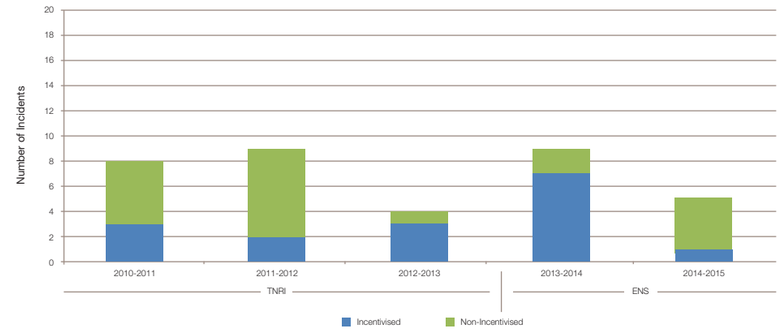
**System performance is monitored by the Estimated Unsupplied Energy from the NGET Transmission System for each incident.**

**During 2014-15 there were 371 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.**

Overhead line apprentices at Eakring

## Number of Loss of Supply Incidents

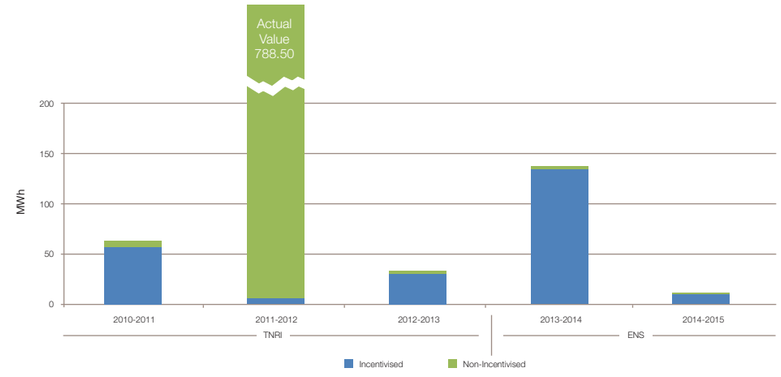
The chart shows the annual comparison of the numbers of Loss of Supply Incidents that occurred within the NGET Transmission System. The chart separates the TNRI (2010 – 2013) and ENS (2013 to date) schemes for clarification.




| | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 |
|---|---|---|---|---|---|
| Incentivised | 3 | 2 | 3 | 7 | 1 |
| Non-Incentivised | 5 | 7 | 1 | 2 | 4 |

## 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.




| | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 |
|---|---|---|---|---|---|
| Incentivised | 59.50 | 2.50 | 31.50 | 135.03 | 8.69 |
| Non-Incentivised | 3.00 | 788.50 | 1.50 | 0.87 | 1.11 |

### Total Estimated Unsupplied Energy

The total Estimated Unsupplied Energy from the NGET Transmission System during 2014-15 was:

**9.80MWh**

### Reliability of Supply

The Overall Reliability of Supply for the NGET Transmission System during 2014-15 was:

**99.999996%**

compared with 99.99995% in 2013-14 and 99.99999% in 2012-13

## Loss of Supply Incident Details (April 2014-March 2015)

### NGET Loss of Supply Incidents - Incentivised

| Incident Date, Time & Location | MW Lost | Mins | MWh Unsupplied |
|---|---|---|---|
| **18 November 2014, 09:05, Poppleton 275kV Substation**<br>SGT1B tripped due to a protection mal-operation, resulting in a loss of supply for 37 minutes. Demand restored in stages. | **29.1** | **37** | **8.7** |
| | | Total | **8.7MWh** |

### NGET Loss of Supply Incidents - Non-Incentivised

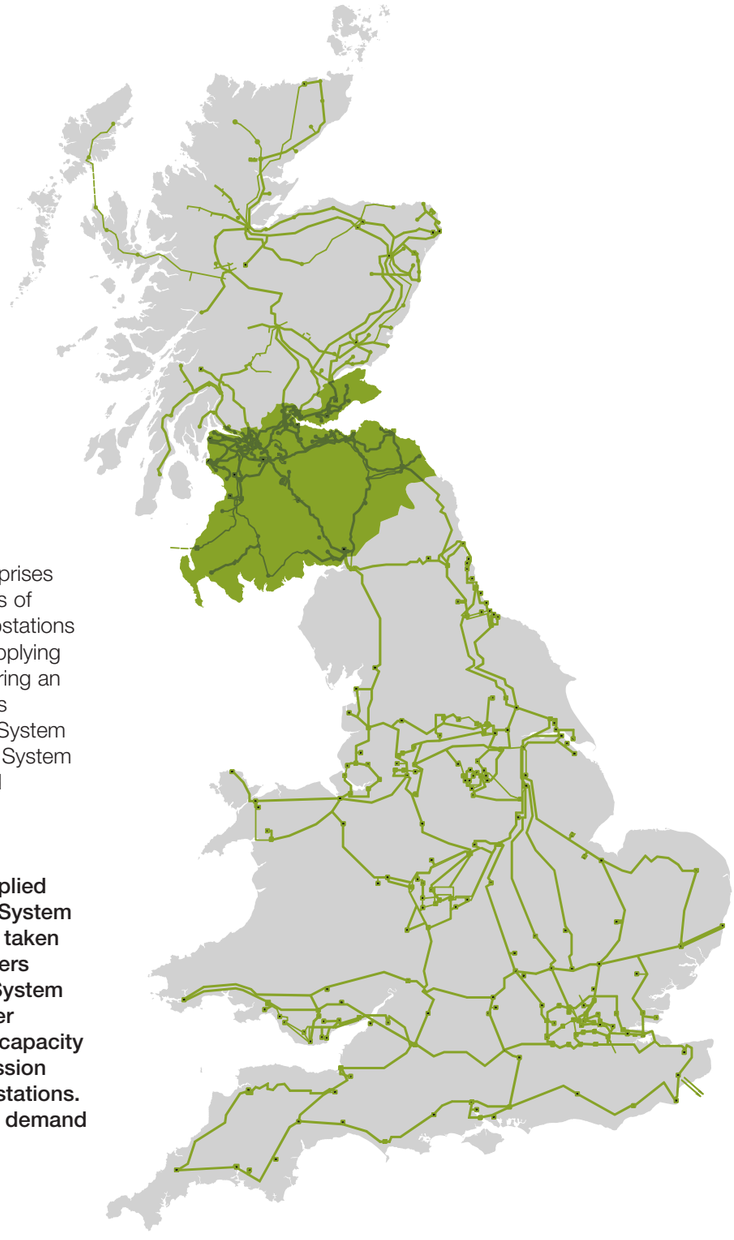
| Incident Date, Time & Location | MW Lost | Mins | MWh Unsupplied |
|---|---|---|---|
| **18 July 2014, 02:31, Culham Jet 400kV Substation**<br>Circuit breaker X110 operated during adverse weather conditions, resulting in a loss of supply for 155 minutes. | **0.0** | **155** | **0.0** |
| **9 October 2014, 06:27, Penrhos 132kV Substation**<br>Circuit tripped and re-energised during adverse weather conditions, resulting in a loss of supply for 12 seconds. | **0.0** | **0** | **0.0** |
| **22 December 2014, 19:10, Tremorfa 33kV Substation**<br>A circuit tripped due to a transient fault, resulting in a loss of supply for 31 seconds. | **0.0** | **1** | **0.0** |
| **26 December 2014, 23:59, Axminster 132kV Substation**<br>Circuit tripped due to mal-operation, resulting in a loss of supply for 40 seconds. | **100** | **1** | **1.1** |
| | | Total | **1.1MWh** |

Supergrid Transformer



# Section Three

## SP Transmission System



### System Description

The SPTL Transmission System comprises approximately 4,000 circuit kilometres of overhead line and cable and 142 substations operating at 400, 275 and 132kV supplying almost 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.

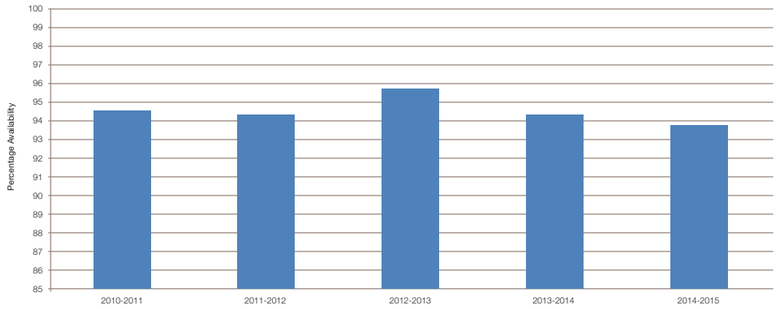
**There are 17 major customers supplied directly from the SP Transmission System with the majority of the load being taken by approximately 2 million customers connected to the SP Distribution System via 14.3GVA of installed transformer capacity. Over 7GW of generation capacity is connected to the SPTL Transmission System, including 20 large power stations. In 2014-15 the maximum recorded demand on the network was 3.76GW.**

## Availability

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

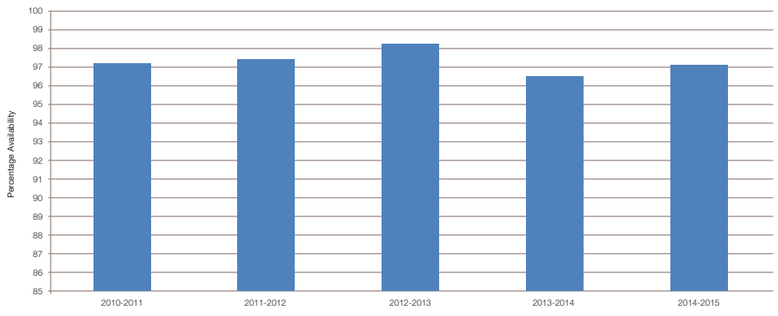
**System performance is monitored by reporting variations in Annual System Availability, Winter Peak System Availability and Monthly System Availability. There is also a breakdown of Planned and Unplanned System Unavailability.**

### % Annual System Availability



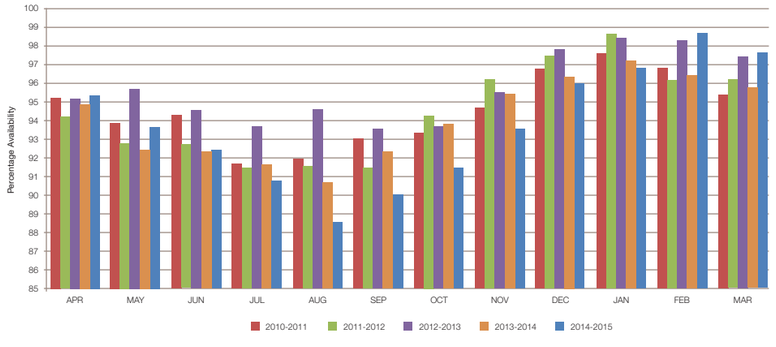

| 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 |
|---|---|---|---|---|
| 94.62 | 94.41 | 95.72 | 94.14 | 93.88 |

### % Winter Peak System Availability




| 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 |
|---|---|---|---|---|
| 97.17 | 97.46 | 98.19 | 96.68 | 97.13 |

### % Monthly System Availability

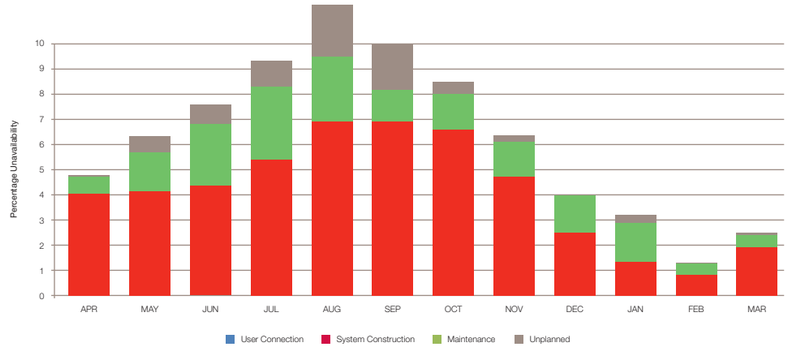



| | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 |
|---|---|---|---|---|---|
| April | 95.22 | 94.19 | 95.17 | 94.97 | 95.26 |
| May | 93.87 | 92.70 | 95.80 | 92.44 | 93.69 |
| June | 94.31 | 92.72 | 94.61 | 92.31 | 92.35 |
| July | 91.82 | 91.27 | 93.85 | 91.70 | 90.70 |
| August | 91.97 | 91.69 | 94.57 | 90.88 | 88.65 |
| September | 93.02 | 91.48 | 93.56 | 92.41 | 90.00 |
| October | 93.37 | 94.26 | 93.62 | 93.85 | 91.50 |
| November | 94.87 | 96.07 | 95.49 | 95.31 | 93.61 |
| December | 96.94 | 97.51 | 97.83 | 96.33 | 95.99 |
| January | 97.63 | 98.70 | 98.46 | 97.21 | 96.83 |
| February | 96.94 | 96.08 | 98.28 | 96.48 | 98.73 |
| March | 95.46 | 96.11 | 97.39 | 95.85 | 97.58 |

## Monthly 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 |
|---|---|---|---|---|---|
| April | 0.00 | 4.01 | 0.65 | 0.08 | 4.74 |
| May | 0.00 | 4.06 | 1.54 | 0.71 | 6.31 |
| June | 0.00 | 4.24 | 2.75 | 0.66 | 7.65 |
| July | 0.00 | 5.33 | 2.94 | 1.03 | 9.30 |
| August | 0.00 | 6.95 | 2.54 | 1.86 | 11.35 |
| September | 0.00 | 6.94 | 1.27 | 1.79 | 10.00 |
| October | 0.00 | 6.69 | 1.33 | 0.48 | 8.50 |
| November | 0.00 | 4.77 | 1.30 | 0.32 | 6.39 |
| December | 0.00 | 2.34 | 1.55 | 0.12 | 4.01 |
| January | 0.00 | 1.40 | 1.57 | 0.20 | 3.17 |
| February | 0.00 | 0.85 | 0.41 | 0.01 | 1.27 |
| March | 0.00 | 1.97 | 0.34 | 0.11 | 2.42 |

Overhead line work at Strathaven

## 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 2014-15 there were 190 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.**


Installing a 400kV Busbar at Moffat Substation

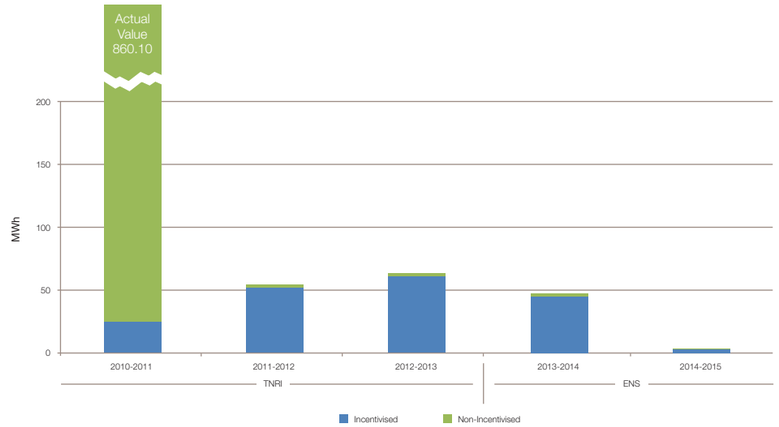
## Number of Loss of Supply Incidents

The chart shows the annual comparison of the numbers of Loss of Supply Incidents that occurred within the SP Transmission System. The chart separates the TNRI (2010 – 2013) and ENS (2013 to date) schemes for clarification.


| | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 |
|---|---|---|---|---|---|
| Incentivised | 1 | 8 | 4 | 7 | 3 |
| Non-Incentivised | 9 | 10 | 7 | 10 | 16 |

## Estimated Unsupplied Energy

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




| | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 |
|---|---|---|---|---|---|
| Incentivised | 25.70 | 52.50 | 62.80 | 42.30 | 2.80 |
| Non-Incentivised | 860.10 | 0.20 | 5.40 | 0.10 | 0.20 |

### Total Estimated Unsupplied Energy

The total Estimated Unsupplied Energy from the SP Transmission System during 2014-15 was:

**3 MWh**

### Reliability of Supply

The Overall Reliability of Supply for the SP Transmission System during 2014-15 was:

**99.99998%**

compared with 99.99979% in 2013-14 and 99.99968% in 2012-13

## Loss of Supply Incident Details (April 2014-March 2015)

### SPT Loss of Supply Incidents - Incentivised

| Incident Date, Time & Location | MW Lost | Mins | MWh Unsupplied |
|---|---|---|---|
| **22 April 2014, 17:29 at Kendoon GSP**<br>A transformer fault at Kendoon GSP caused the Coylton-Kendoon-Maybole circuit to trip, this resulted in supplies being lost to 224 customers for 9 minutes. | 0.3 | 9 | 0.0 |
| **16 July 2014, 05:03 at Maybole GSP**<br>A faulty cable sealing end on the Coylton leg of the Coylton-Kendoon-Maybole circuit caused the circuit to trip while the Coylton-Kilmarnock South-Maybole circuit was on outage. This resulted in supplies being lost to 10,465 customers for 21 minutes. | 7.5 | 21 | 2.6 |
| **11 December 2014, 04:04 at Kendoon GSP**<br>Lightning caused the Coylton-Kendoon-Maybole circuit to trip, this resulted in supplies being lost to 226 customers for 21 minutes. | 0.4 | 21 | 0.1 |
| | | Total | **2.8 MWh** |

### SPT Loss of Supply Incidents - Non-Incentivised

| Incident Date, Time & Location | MW Lost | Mins | MWh Unsupplied |
|---|---|---|---|
| **13 April 2014, 14:33, Arecleoch Windfarm**<br>The Mark Hill-Arecleoch circuit was switched out of service due to a problem on the Arecleoch Grid T1B Transformer tap-changer control relay. This resulted in supplies being lost to 1 customer for 9 minutes. | 0.0 | 9 | 0.0 |
| **18 April 2014, 05:02, Arecleoch Windfarm**<br>The Mark Hill-Arecleoch circuit was switched out of service due to a problem on the Arecleoch Grid T1A Transformer tap-changer control relay. This resulted in supplies being lost to 1 customer for 11 minutes. | 0.0 | 11 | 0.0 |
| **17 July 2014, 11:53, Clyde South Windfarm**<br>A cable fault caused the Elvanfoot-Clyde South circuit to trip, this resulted in the supplies to 1 customer being lost for 64 days, 3 hours and 36 minutes. | 0.0 | 92376 | 0.0 |
| **8 August 2014, 17:38, Whistlefield GSP**<br>A transient fault out with the Scottish Power Transmission area caused the Windyhill-Whistlefield-Dunoon-Sloy E1 circuit to trip and re-close while the Windyhill-Whistlefield-Dunoon-Sloy W2 circuit was out of service. This resulted in the grid infeed being lost to 2 customers for 3 minutes although no supplies were lost as both customers were running on their own generation at the time of the trip. | 0.0 | 3 | 0.0 |
| **16 November 2014, 04:35, Mark Hill and Arecleoch Windfarms**<br>An unknown overhead line fault caused the Coylton-Mark Hill-Auchencrosh circuit to trip. High speed auto-reclosers closed the circuit breakers at the Coylton and Auchencrosh ends but the Mark Hill circuit breaker remained open, as it was designed to do. This resulted in supplies being lost to Mark Hill and Arecleoch Windfarms for an average of 36 minutes. | 0.0 | 36 | 0.0 |
| **20 November 2014, 15:39, Mark Hill Windfarm**<br>Mark Hill SGT1, which feeds Mark Hill Windfarm, was switched out of service due to a problem on its tap-changer. This resulted in supplies being lost to 1 customer for 14 minutes. | 0.0 | 14 | 0.0 |
| **7 December 2014, 17:35, Arecleoch Windfarm**<br>The Mark Hill-Arecleoch circuit was switched out of service due to tap-changer problems on both the Arecleoch Grid T1A and T1B Transformers. This resulted in supplies being lost to 1 customer for 18 minutes. | 0.0 | 18 | 0.0 |
| **9 December 2014, 16:06, Hadyard Hill Windfarm**<br>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 25 minutes. | 0.0 | 25 | 0.0 |
| **10 December 2014, 11:14, Spango Valley GSP**<br>Lightning caused both the the Devol Moor-Spango Valley No.1 and 2 circuits to trip and re-close on Delayed Auto Reclose. This resulted in supplies being lost to 21,482 customers for less than a minute. | 23.2 | 0.0 | 0.2 |
| **10 December 2014, 15:35, Mark Hill and Arecleoch Windfarms**<br>Lightning caused the Coylton-Mark Hill-Auchencrosh circuit to trip. High speed auto-reclosers closed the circuit breakers at the Coylton and Auchencrosh ends but the Mark Hill circuit breaker remained open, as it was designed to do. This resulted in supplies being lost to Mark Hill and Arecleoch Windfarms for an average of 26 minutes. | 0.0 | 26 | 0.0 |
| **11 December 2014, 01:37, Mark Hill and Arecleoch Windfarms**<br>Lightning caused the Coylton-Mark Hill-Auchencrosh circuit to trip. High speed auto-reclosers closed the circuit breakers at the Coylton and Auchencrosh ends but the Mark Hill circuit breaker remained open, as it was designed to do. This resulted in supplies being lost to Mark Hill and Arecleoch Windfarms for an average of 29 minutes. | 0.0 | 29 | 0.0 |
| **11 December 2014, 02:49, Arecleoch Windfarm**<br>An over-voltage protection operation within the customer's network caused both feeding circuit breakers at Arecleoch 132kV substation to open. This resulted in supplies being lost to one customer for 26 minutes. | 0.0 | 26 | 0.0 |
| **11 December 2014, 04:09, Whistlefield GSP**<br>Lightning caused a transient fault outwith the Scottish Power Transmission area, which caused both the Windyhill-Whistlefield-Dunoon-Sloy E1 and W2 circuits to trip and re-close. This resulted in the grid infeed being lost to 2 customers for 12 minutes although no supplies were lost as both customers were running on their own generation at the time of the trip. | 0.0 | 12 | 0.0 |
| **18 December 2014, 09:53, Hadyard Hill Windfarm**<br>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 19 minutes. | 0.0 | 19 | 0.0 |
| **16 January 2015, 00:46, Bathgate Railtrack Feeder Station**<br>The Bonnybridge-Bathgate-Drumcross No.1 circuit tripped when high winds caused earthing to be blown onto the busbars at Bathgate GSP. This resulted in supplies being lost to 1 customer for 1 minute. | 0.1 | 1 | 0.0 |
| **3 March 2015, 11:21, Mark Hill and Arecleoch Windfarms**<br>The Coylton-Mark Hill-Auchencrosh circuit was switched out of service in order to repair a low hanging conductor. This resulted in supplies being lost to Mark Hill and Arecleoch Windfarms for an average of 1 day, 4 hours and 4 minutes. | 0.0 | 1684 | 0.0 |
| | | Total | **0.2 MWh** |



# Section Four

## SHE Transmission System

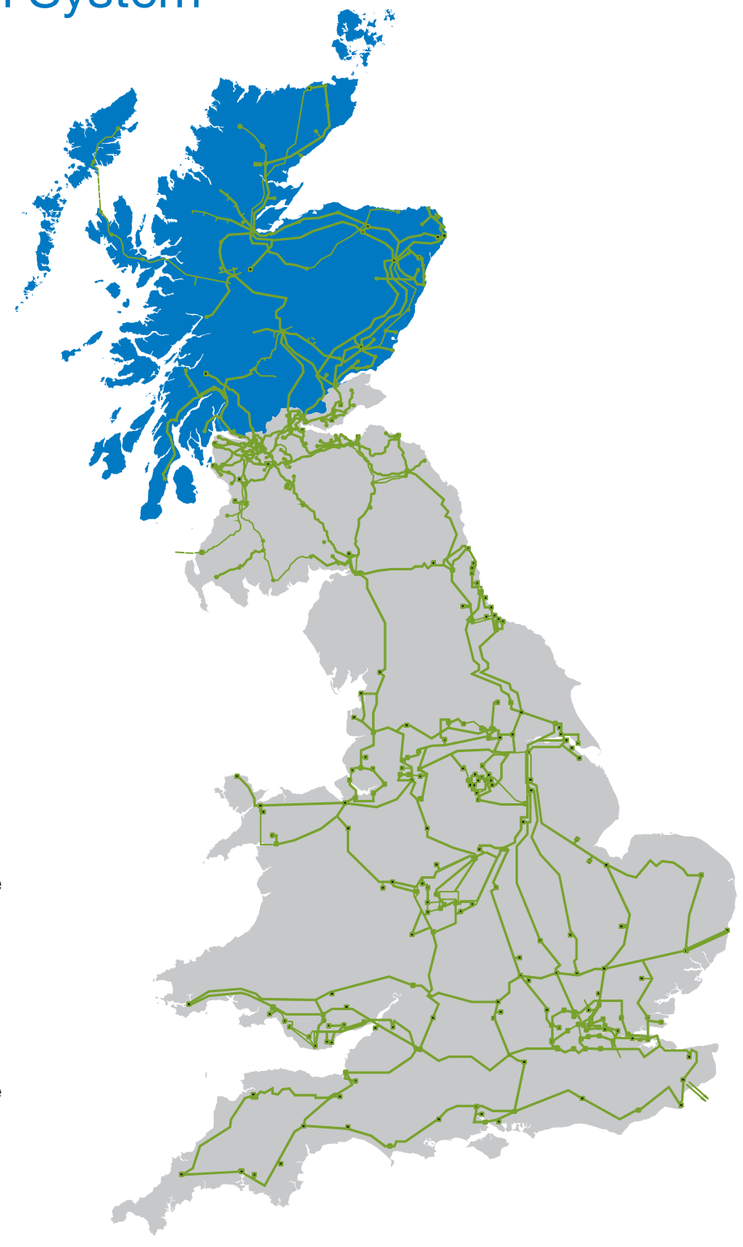
### System Description

The SHE Transmission System comprises of over 4,800 circuit kilometres of overhead line and cable and 117 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 2014-15 the maximum recorded demand on the network was 1.5GW.

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 7.6GVA of installed transformer capacity. Over 7.4GW of generation capacity is connected to the SHE Transmission System including 37 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.**

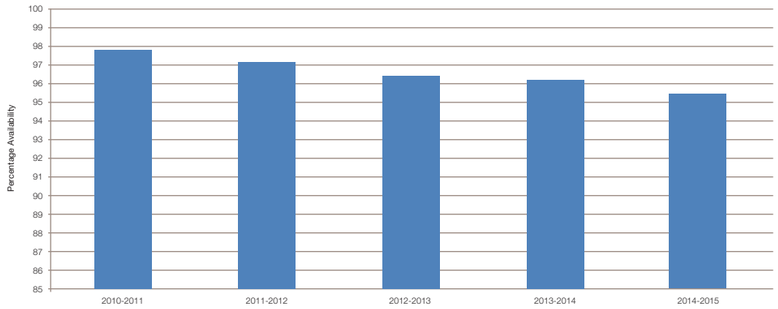


## Availability

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

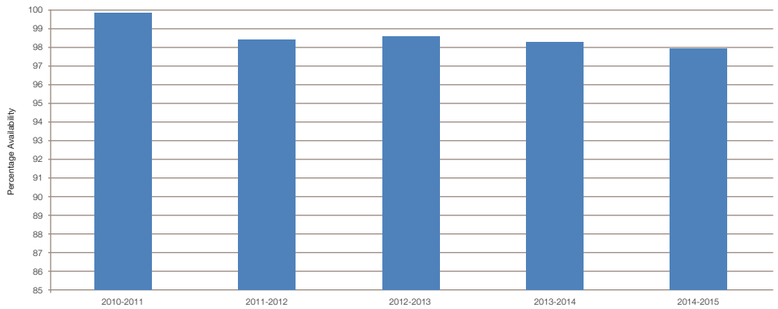
**System performance is monitored by reporting variations in Annual System Availability, Winter Peak System Availability and Monthly System Availability. There is also a breakdown of Planned and Unplanned System Unavailability.**

### % Annual System Availability



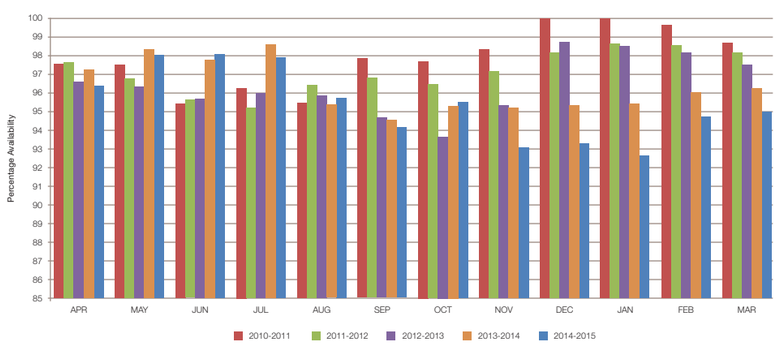

| 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 |
|---|---|---|---|---|
| 97.89 | 97.14 | 96.48 | 96.29 | 95.32 |

### % Winter Peak System Availability




| 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 |
|---|---|---|---|---|
| 99.90 | 98.47 | 98.50 | 98.26 | 97.97 |

### % Monthly System Availability



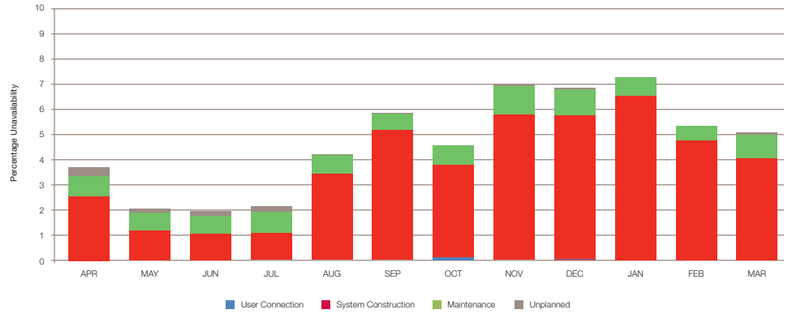

| | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 |
|---|---|---|---|---|---|
| April | 97.64 | 97.66 | 96.67 | 97.26 | 96.34 |
| May | 97.53 | 96.89 | 96.36 | 98.29 | 97.99 |
| June | 95.40 | 95.76 | 95.83 | 97.94 | 98.03 |
| July | 96.19 | 95.19 | 95.96 | 98.55 | 97.96 |
| August | 95.50 | 96.36 | 95.91 | 95.39 | 95.73 |
| September | 97.91 | 96.87 | 94.85 | 94.58 | 94.09 |
| October | 97.85 | 96.49 | 93.67 | 95.17 | 95.42 |
| November | 98.37 | 97.06 | 95.32 | 95.22 | 93.01 |
| December | 99.97 | 98.12 | 98.74 | 95.30 | 93.13 |
| January | 99.95 | 98.73 | 98.66 | 95.46 | 92.66 |
| February | 99.76 | 98.59 | 98.10 | 96.04 | 94.70 |
| March | 98.76 | 98.09 | 97.68 | 96.26 | 94.98 |



## Monthly 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 |
|---|---|---|---|---|---|
| April | 0.00 | 2.50 | 0.72 | 0.44 | 3.66 |
| May | 0.00 | 1.14 | 0.61 | 0.26 | 2.01 |
| June | 0.00 | 1.01 | 0.59 | 0.37 | 1.97 |
| July | 0.00 | 1.06 | 0.79 | 0.19 | 2.04 |
| August | 0.00 | 3.42 | 0.84 | 0.01 | 4.27 |
| September | 0.00 | 5.10 | 0.79 | 0.02 | 5.91 |
| October | 0.05 | 3.71 | 0.83 | 0.00 | 4.58 |
| November | 0.00 | 5.89 | 1.10 | 0.01 | 6.99 |
| December | 0.01 | 5.90 | 0.95 | 0.01 | 6.87 |
| January | 0.00 | 6.55 | 0.79 | 0.00 | 7.34 |
| February | 0.00 | 4.76 | 0.51 | 0.03 | 5.30 |
| March | 0.00 | 4.04 | 0.91 | 0.07 | 5.02 |

## Security

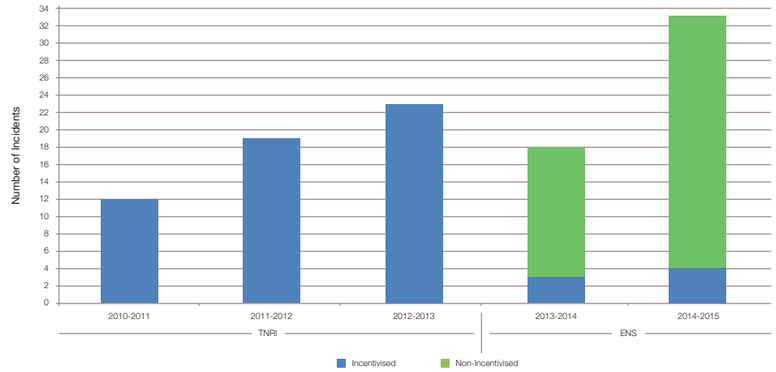
The definitions and criteria for system security can be found in the Glossary of Terms at the end of this report.

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

**During 2014-15 there were 199 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 33 resulting in loss of supplies to customers.**

## Number of Loss of Supply Incidents

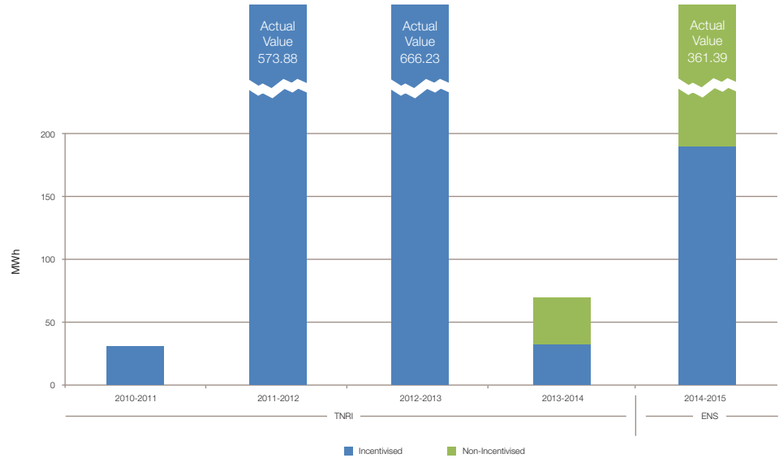
The chart shows the annual comparison of the numbers of Loss of Supply Incidents that occurred within the SHE Transmission System. The chart separates the TNRI (2010 – 2013) and ENS (2013 to date) schemes for clarification.




| | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 |
|---|---|---|---|---|---|
| Incentivised | 12 | 19 | 23 | 3 | 4 |
| Non-Incentivised | 0 | 0 | 0 | 15 | 29 |

## 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.




| | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 |
|---|---|---|---|---|---|
| Incentivised | 35.34 | 573.88 | 666.23 | 35.60 | 166.69 |
| Non-Incentivised | 0 | 0 | 0 | 44.40 | 194.70 |

### Total Estimated Unsupplied Energy

The total Estimated Unsupplied Energy from the SHE Transmission System during 2014-15 was:

**361.39MWh**

### Reliability of Supply

The Overall Reliability of Supply for the SHE Transmission System during 2014-15 was:

**99.99452%**

compared with 99.99885% in 2013-14 and 99.99123% in 2012-13.

# Loss of Supply Incident Details (April 2014-March 2015)

## SHE Transmission Loss of Supply Incidents - Incentivised

| Incident Date, Time & Location | MW Lost | Mins | MWh Unsupplied |
|---|---|---|---|
| **8 April 2014, 12:30, Carradale 132kV Substation**<br>The Inveraray - Port Ann - Carradale East 132kV circuit tripped on overload during an outage of the west circuit. | 0 | 10 | 0 |
| **16 April 2014, 20:35, Blackhillock 275kV Substation**<br>The Blackhillock - Knocknagael 275kV circuit tripped due to protection fault. Demand restored in stages. | 172.3 | 279 | 133.9 |
| **17 July 2014, 23:03, Sloy 132kV Substation**<br>The Sloy - Dunoon West 132kV circuit tripped due to an unknown transient fault. Circuit manually restored. | 8.9 | 13.45 | 2.0 |
| **14 August 2014, 13:20, Fort Augustus 132kV Substation**<br>Fort Augustus 132kV circuits tripped due to a busbar protection fault. Demand restored in stages. | 53.5 | 8.05 | 30.8 |
| | | Total | **166.6MWh** |

## SHE Transmission Loss of Supply Incidents - Non-Incentivised

| Incident Date, Time & Location | MW Lost | Mins | MWh Unsupplied |
|---|---|---|---|
| **8 April 2014, 15:47, Carradale 132kV Substation**<br>The Inveraray - Port Ann - Carradale East 132kV circuit tripped on overload during an outage of the West circuit. | 0.0 | 0.3 | 0.0 |
| **16 April 2014, 02:29, Killin 132kV Substation**<br>The Killin - St Fillians 132kV circuit tripped due to a cable fault. Demand restored via DNO network. | 0.0 | 0.0 | 0.0 |
| **6 May 2014, 05:53, Inveraray 132kV Substation**<br>The Inveraray - Port Ann - Carradale West 132kV circuit tripped and auto-reclosed due to an unknown transient fault. | 3.7 | 0.3 | 0.2 |
| **14 May 2014, 23:02, Windyhill 132kV Substation**<br>The Windyhill - Dunoon - Sloy 132kV circuit tripped due to an unknown transient fault. Circuit restored by telecontrol. | 9.3 | 0.0 | 0.0 |
| **10 June 2014, 17:21, Knocknagael 275kV Substation**<br>The Knocknagael - Berryburn - Blackhillock 275kV circuit tripped and auto-reclosed during lightning activity. | 0.0 | 0.0 | 0.0 |
| **3 July 2014, 06:23, Inveraray 132kV Substation**<br>The Inveraray - An Suidhe - Port Ann - Carradale 132kV circuit tripped and auto-reclosed due to an unknown transient fault. | 8.5 | 0.3 | 0.0 |
| **3 July 2014, 18:51, Inveraray 132kV Substation**<br>The Inveraray - An Suidhe - Port Ann - Carradale 132kV circuit tripped and auto-reclosed due to an unknown transient fault. | 8.7 | 0.4 | 0.0 |
| **25 July 2014, 01:53, Shin 132kV Substation**<br>The Shin - Mybster - Thurso 132kV circuit tripped and auto-reclosed due to unknown transient fault. | 24.8 | 0.3 | 0.1 |
| **31 July 2014, 19:58, Inveraray 132kV Substation**<br>The Inveraray - An Suidhe - Port Ann - Carradale 132kV circuit tripped and auto-reclosed due to an unknown transient fault. | 9.9 | 0.3 | 0.1 |
| **8 August 2014, 17:38, Sloy 132kV Substation**<br>The Windyhill - Dunoon - Sloy East 132kV circuit tripped and partial auto-reclosure during lightning activity. | 6.6 | 2.6 | 0.3 |
| **27 September 2014, 14:03, Fort Augustus 132kV Substation**<br>The Fort Augustus - Broadford - Ardmore 132kV circuit tripped due to unknown fault. Demand restored in stages. | 15.0 | 259.0 | 24.6 |
| **18 October 2014, 16:17, Broadford 132kV Substation**<br>The Broadford - Dunvegan - Ardmore 132kV circuit tripped and auto-reclosed during a period of lightning activity. | 7.1 | 0.5 | 0.1 |
| **28 October 2014, 12:17, Dunbeath 132kV Substation**<br>Dunbeath 2T0 tripped and auto-reclosed due to unknown transient fault. | 0.0 | 0.0 | 0.0 |
| **10 December 2014, 03:17, Broadford 132kV Substation**<br>The Broadford - Dunvegan - Ardmore 132kV circuit tripped and auto-reclosed during a period of lightning activity. | 2.7 | 0.5 | 0.0 |
| **10 December 2014, 04:26, Fort Augustus Substation**<br>The Fort Augustus - Broadford - Ardmore 132kV circuit tripped and auto-reclosed during a period of high winds and lightning activity. | 1.2 | 0.5 | 0.0 |
| **10 December 2014, 06:21, Errochty 132kV Substation**<br>The Errochty - Braco - Bonnybridge East 132kV circuit tripped and auto-reclosed during a period of lightning activity. | 0.0 | 0.4 | 0.0 |
| **10 December 2014, 13:48, Fort Augustus Substation**<br>The Fort Augustus - Broadford - Ardmore 132kV circuit tripped and auto-reclosed during a period of high winds and lightning activity. | 24.4 | 0.5 | 0.2 |
| **10 December 2014, 16:09, Inveraray 132kV Substation**<br>The Inveraray - Taynuilt West 132kV circuit tripped and auto-reclosed during a period of high winds and lightning activity. | 0.0 | 0.3 | 0.0 |

## SHE Transmission Loss of Supply Incidents - Non-Incentivised continued

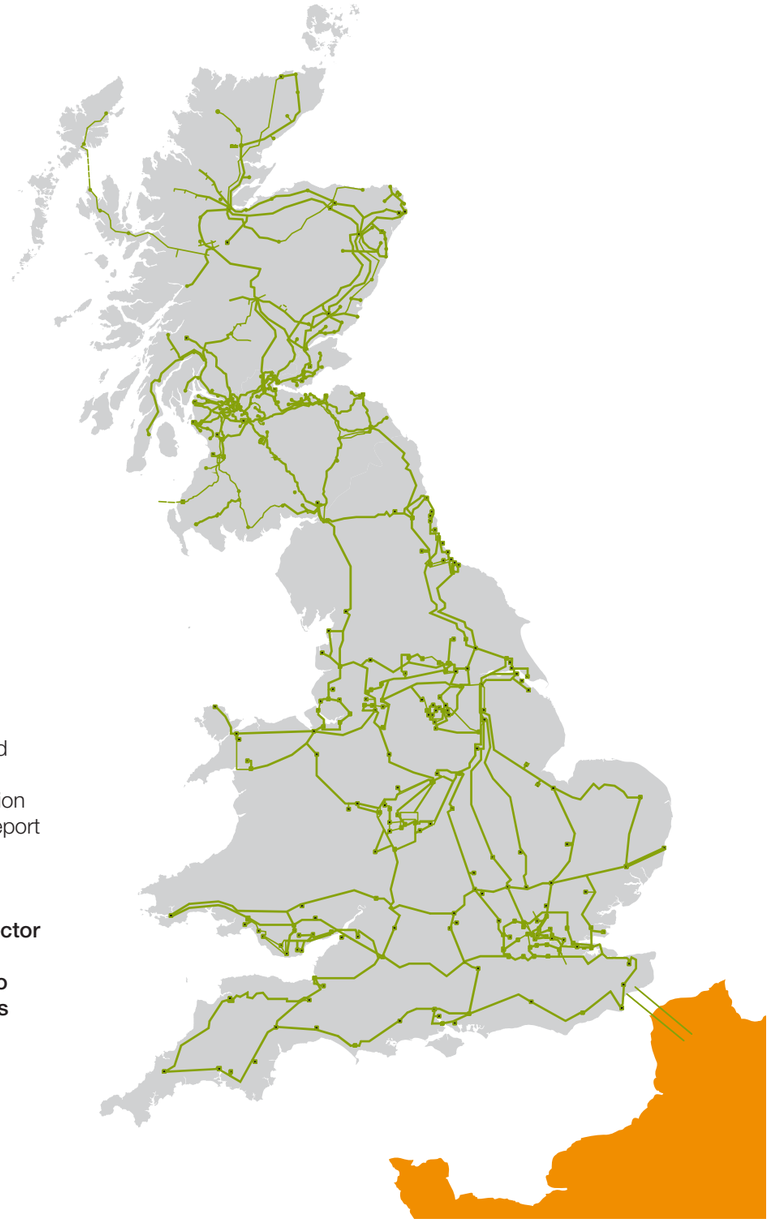
| Incident Date, Time & Location | MW Lost | Mins | MWh Unsupplied |
|---|---|---|---|
| **11 December 2014, 03:41, Inveraray 132kV Substation**<br>The Inveraray - Port Ann - Carradale West 132kV circuit tripped during a period of high winds and lightning activity. Demand restored in stages. | 9.6 | 0.3 | 0.1 |
| **11 December 2014, 04:09, Sloy 132kV Substation**<br>The Sloy - Windyhill - Dunoon East 132kV circuit tripped and auto-reclosed during a period of high winds and lightning activity. | 9.5 | 0.4 | 0.1 |
| **11 December 2014, 09:01, Fort Augustus 132kV Substation**<br>The Fort Augustus - Fort William - Ardmore 132kV circuit tripped during a period of high winds and lightning activity. Demand restored in stages. | 15.4 | 127.0 | 16.1 |
| **24 December 2014, 15:44, Inveraray 132kV Substation**<br>The Inveraray - Taynuilt East 132kV circuit tripped and auto-reclosed during a period of high winds. | 0.0 | 0.3 | 0.0 |
| **9 January 2015, 00:46, Broadford 132kV Substation**<br>The Broadford - Dunvegan - Ardmore 132kV circuit tripped during a period of high winds and lightning activity. Demand restored in stages. | 14.2 | 7.5 | 88.9 |
| **9 January 2015, 15:21, Beauly Substation**<br>The Beauly - Alness - Shin East 132kV circuit switched out for emergency tree clearance. Demand restored in stages. | 17.5 | 218.5 | 63.7 |
| **15 January 2015, 07:41, Fort Augustus 132kV Substation**<br>The Fort Augustus - Fort William - Kinlochleven 132kV circuit tripped and partially auto-reclosured during lightning activity and blizzard. | 0.0 | 1.0 | 0.0 |
| **23 February 2015, 13:53, Fort Augustus 132kV Substation**<br>The Fort Augustus - Broadford - Ardmore 132kV circuit tripped and auto-reclosed during lightning activity. | 8.8 | 0.5 | 0.1 |
| **9 March 2015, 22:09, Shin 132kV Substation**<br>The Shin - Brora - Mybster East 132kV circuit tripped and auto-reclosed due to an unknown transient fault. | 13.1 | 0.4 | 0.1 |
| | | Total | **194.7MWh** |

Electricity interconnector cables

# Section Five

## Interconnectors

## England - France Interconnector



### System Description

The National Grid transmission system 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.

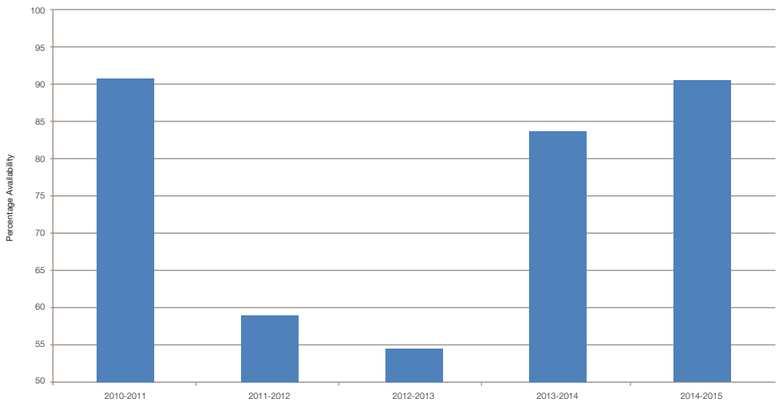
**The total capability of the Interconnector is 2000MW. This is made up of four 'circuits', each of 500MW. There is no redundancy of the major components making up each circuit, hence all outages effect real time capability.**

## 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.

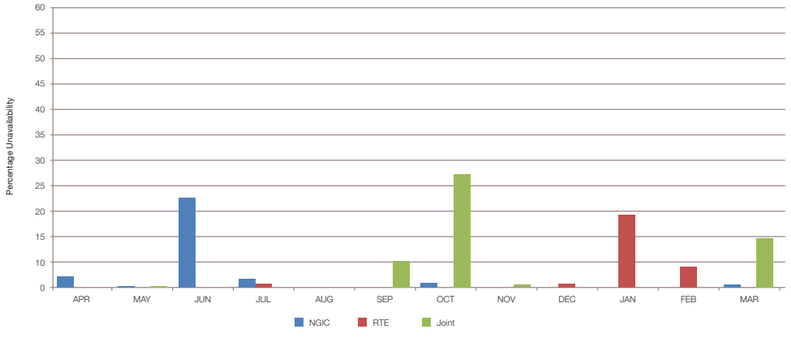
% England - France Interconnector Annual System Availability




| 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 |
|---|---|---|---|---|
| 91.25 | 59.09 | 54.90 | 83.84 | 90.46 |

## Monthly Unavailability

% England - France Interconnector Monthly Unavailability




| | NGIC | RTE | Joint |
|---|---|---|---|
| April | 4.02 | 0.0 | 0.0 |
| May | 0.81 | 0.0 | 0.29 |
| June | 22.26 | 0.0 | 0.0 |
| July | 2.59 | 0.20 | 0.0 |
| August | 0.0 | 0.0 | 0.0 |
| September | 0.0 | 0.0 | 9.92 |
| October | 1.08 | 0.0 | 26.89 |
| November | 0.0 | 0.0 | 0.52 |
| December | 0.0 | 2.13 | 0.0 |
| January | 0.0 | 18.75 | 0.0 |
| February | 0.0 | 8.16 | 0.0 |
| March | 0.66 | 0.0 | 14.05 |
| Average | 2.62 | 2.44 | 4.31 |

### Annual System Availability

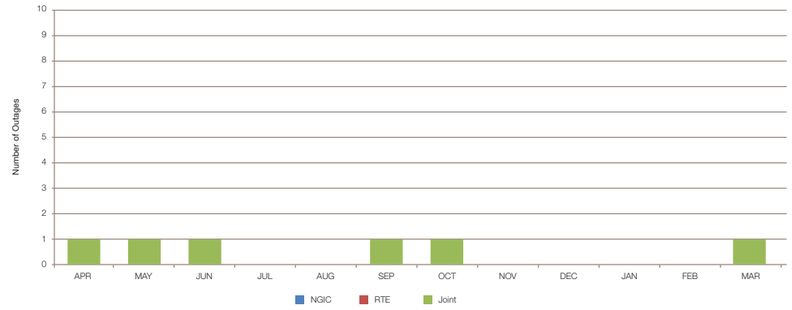
Annual Availability of
England – France Interconnector:

**90.46%**

## Outages 2014-15 (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.

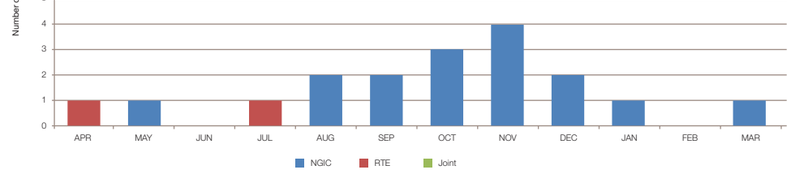
Chart 1 below shows the Interconnector Planned Outages on a per month basis




| | |
|---|---|
| NGIC | 0 |
| RTE | 0 |
| Joint | 6 |
| **Total** | 6 |

Chart 1

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



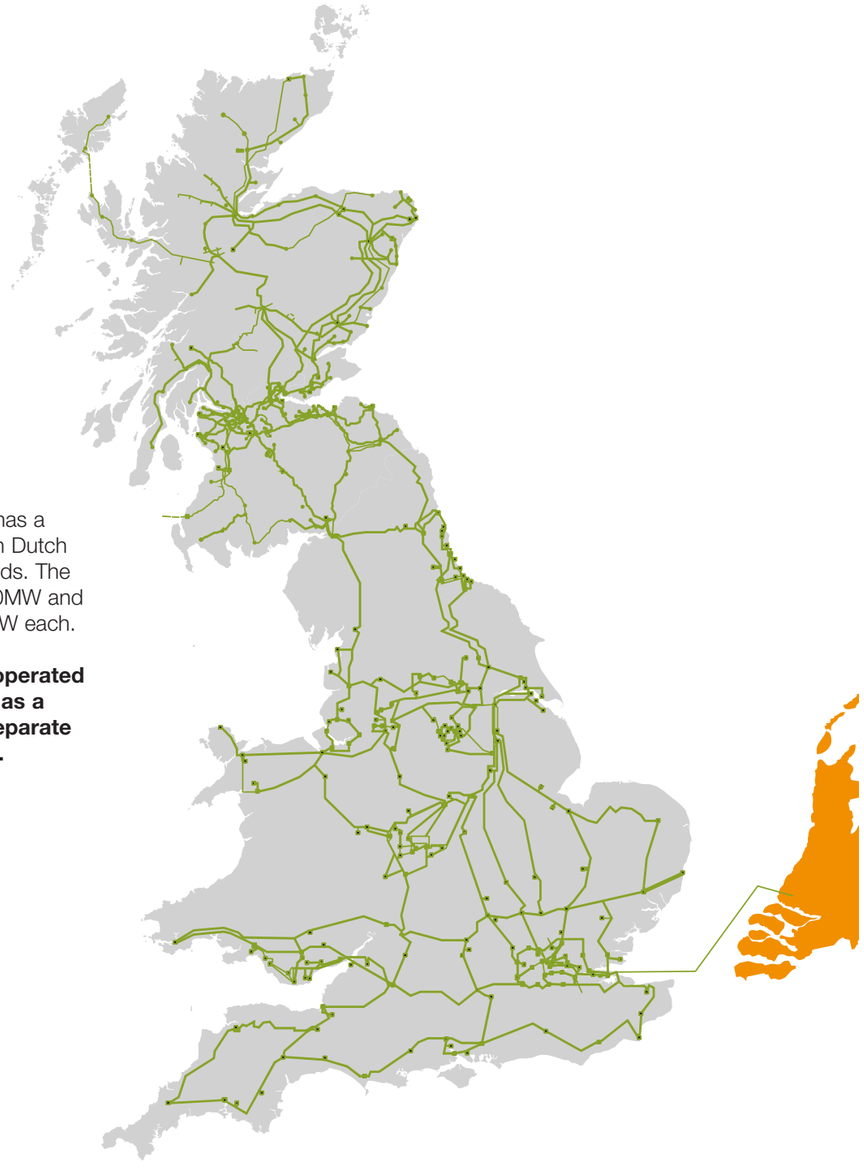

| | |
|---|---|
| NGIC | 16 |
| RTE | 2 |
| Joint | 0 |
| **Total** | 18 |

Chart 2

# Section Five

## 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 1000MW and is made up of two ‘poles’, 500MW each.

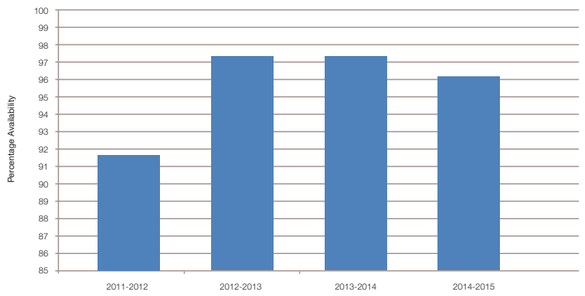
**BritNed is jointly owned and operated by National Grid and TenneT, as a commercial Interconnector separate from their regulated activities.**

## 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.

% England - Netherlands Interconnector Annual System Availability

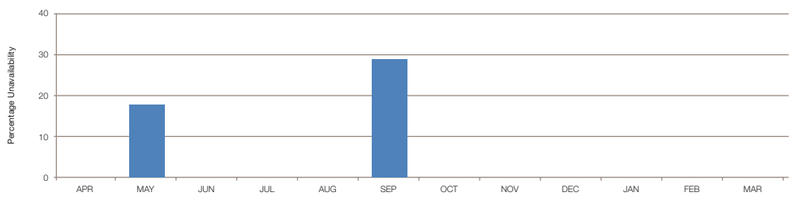



**England - Netherlands Interconnector % Annual Availability**

| 2011- 2012 | 2012 - 2013 | 2013 - 2014 | 2014 - 2015 |
|---|---|---|---|
| 91.82 | 97.32 | 97.37 | 96.15 |

## Monthly Unavailability

% England - Netherlands Interconnector Monthly Unavailability



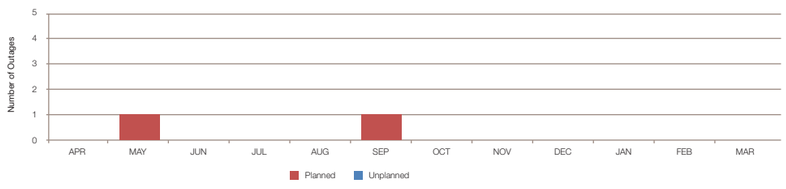

**England - Netherlands Interconnector % Monthly Unavailability**

| | BritNed |
|---|---|
| April | 0.00 |
| May | 17.25 |
| June | 0.00 |
| July | 0.00 |
| August | 0.00 |
| September | 28.99 |
| October | 0.00 |
| November | 0.00 |
| December | 0.00 |
| January | 0.00 |
| February | 0.00 |
| March | 0.00 |
| Average | 3.85 |

## Outages 2014-15 (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 |
|---|---|---|
| April | 0 | 0 |
| May | 1 | 0 |
| June | 0 | 0 |
| July | 0 | 0 |
| August | 0 | 0 |
| September | 1 | 0 |
| October | 0 | 0 |
| November | 0 | 0 |
| December | 0 | 0 |
| January | 0 | 0 |
| February | 0 | 0 |
| March | 0 | 0 |
| Average | 2 | 0 |

Where availability is shown as less than 100% but there is no corresponding planned or unplanned outage recorded, this is as a result of reduced flow capacity rather than a full station outage.

### Annual System Availability

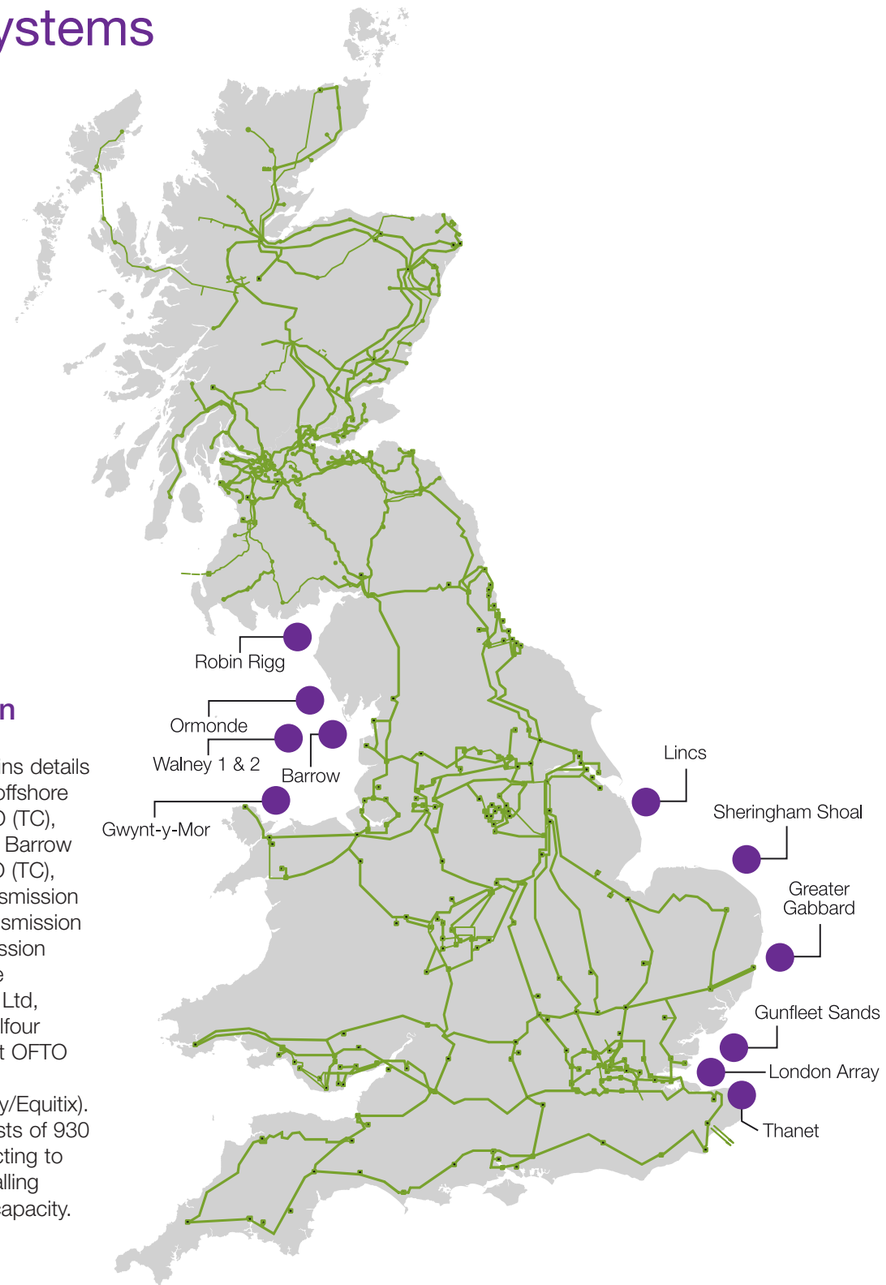
Annual Availability of
England – Netherlands Interconnector:

**96.15%**



# 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), Blue Transmission Walney 1 Ltd and Blue Transmission Walney 2 Ltd, Blue Transmission Sheringham Shoal Ltd, Blue Transmission London Array Ltd, Greater Gabbard OFTO (Balfour Beatty/Equitix/AMP), Thanet OFTO (Balfour Beatty/Equitix) and Gwynt-y-Mor (Balfour Beatty/Equitix). The offshore network consists of 930 kilometres of circuit, connecting to 18 offshore substations totalling over 3.5GW of generating capacity.

## Offshore Transmission Networks

| | Go Live | Number of Circuits | Circuit Length KM | Generating Capacity MW | Connection Voltage | Interfacing Party |
|---|---|---|---|---|---|---|
| TC Robin Rigg | 2/03/2011 | 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 |
| BT Walney 1 | 31/10/2011 | 1 | 48 | 182 | 132 kV | Transmission |
| BT Walney 2 | 4/10/2012 | 1 | 49 | 182 | 132 kV | DNO |
| BT Sheringham Shoal | 5/07/2013 | 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 | 132 kV | Transmission |
| BB Thanet | 17/12/2014 | 2 | 28.9 | 300 | 132 kV | DNO |

## Annual Availability

Offshore Transmission Systems are radial and connect offshore generation to the wider NETS. OFTO's 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 | | | |
|---|---|---|---|
| | 2012-13 | 2013-14 | 2014-15 |
| TC Robin Rigg | 99.89 | 99.85 | 98.19 |
| TC Gunfleet Sands | 100 | 100 | 99.53 |
| TC Barrow | 100 | 99.64 | 100 |
| TC Ormonde | 100 | 100 | 99.93 |
| TC Lincs | N/A | N/A | 100 |
| BT Walney 1 | 97.47 | 99.99 | 100 |
| BT Walney 2 | 100 | 94.89 | 100 |
| BT Sheringham Shoal | N/A | 99.20 | 99.84 |
| BT London Array | N/A | 99.97 | 99.90 |
| BB Greater Gabbard | N/A | 99.81 | 100 |
| BB Gwynt Y Mor | N/A | N/A | 82.59 |
| BB Thanet | N/A | N/A | 82.47 |

## % Winter Peak System Availability

| Offshore Transmission Networks % Winter Availability | | | |
|---|---|---|---|
| | 2012-13 | 2013-14 | 2014-15 |
| 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 | N/A | 100 |
| BT Walney 1 | 100 | 100 | 100 |
| BT Walney 2 | 100 | 100 | 100 |
| BT Sheringham Shoal | N/A | 99.01 | 100 |
| BT London Array | N/A | 99.98 | 100 |
| BB Greater Gabbard | N/A | 100 | 100 |
| BB Gwynt Y Mor | N/A | N/A | 100 |
| BB Thanet | N/A | N/A | 96.93 |

## % Monthly System Availability

| | April | May | June | July | August | September | October | November | December | January | February | March |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TC Robin Rigg | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 78.68 |
| TC Gunfleet Sands | 100 | 100 | 96.21 | 98.16 | 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 | 99.16 | 100 | 100 | 100 | 100 |
| TC Lincs | 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 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| BT Sheringham Shoal | 100 | 100 | 99.38 | 98.66 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| BT London Array | 100 | 100 | 99.16 | 100 | 99.66 | 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 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 100 | 76.41 |
| BB Thanet | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 100 | 90.33 | 50 |

London Array Grid Transformer

## 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, ie OFTO or as a result of Non-OFTO.

| | | 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 | 21.32 |
| | Non-OFTO | 0 | 0 | 0.37 | 22.99 | 0 | 0.49 | 0 | 0.54 | 0 | 0 | 0.69 | 0 |
| TC Gunfleet Sands | OFTO Planned | 0 | 0 | 3.79 | 1.84 | 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 |
| 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 | 0 | 0 | 0 | 0 | 0.66 | 0 | 0.48 | 0 | 7.76 | 8.64 | 0 |
| 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 | 0.84 | 0 | 0 | 0 | 0 |
| | Non-OFTO | 0 | 0.39 | 0 | 8.34 | 1.11 | 0 | 0.03 | 0 | 0 | 0 | 0.38 | 0.06 |
| TC Lincs | 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 |
| 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 | 0.09 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Non-OFTO | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| BT Sheringham Shoal | OFTO Planned | 0 | 0 | 0.62 | 1.34 | 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 London Array | OFTO Planned | 0 | 0 | 0.84 | 0 | 0.34 | 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 | 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 | 23.59 |
| | Non-OFTO | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 0 | 0 |
| BB Thanet | OFTO Planned | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 0 | 0 | 0 | 0 |
| | OFTO Unplanned | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 0 | 0 | 9.67 | 50 |
| | Non-OFTO | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 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 |
|---|---|---|---|
| **23 June 2014, 10:32**<br>Switching time outage at request of DNO. | Non-OFTO | 5 hours | 484.53 |
| **8 July 2014, 14:17**<br>Generator requested outage to facilitate work on their assets offshore. | Non-OFTO | 9 days | 20177.13 |
| **24 July 2014, 08:22**<br>Generator requested outage to facilitate work on their assets offshore. | Non-OFTO | 5 days | 11291.47 |
| **10 September 2014, 06:48**<br>Switching time outage at request of DNO. | Non-OFTO | 1.5 hours | 131.87 |
| **10 September 2014, 18:36**<br>Switching time outage at request of DNO. | Non-OFTO | 0.5 hours | 42.93 |
| **15 September 2014, 08:44**<br>Switching time outage at request of DNO. | Non-OFTO | 5 hours | 474 |
| **28 November 2014, 08:43**<br>Outage at request of DNO for work on their OHL. | Non-OFTO | 7.5 hours | 709.93 |
| **16 February 2015, 09:49**<br>Switching time outage at request of DNO. | Non-OFTO | 1 hour | 101.20 |
| **19 February 2015, 09:15**<br>Outage at request of DNO to repair their isolator. | Non-OFTO | 7.5 hours | 696.13 |
| **20 February 2015, 16:26**<br>Switching time outage at request of DNO. | Non-OFTO | 0.5 hour | 53.67 |
| **1 March 2015, 13:05**<br>132kV export cable fault. | OFTO | 13 days | 29181 |
| | | Total | 63343.53MWh |

### TC Gunfleet Sands Outages

| Outage Date & Time | Reason | Days & Hours | MWh |
|---|---|---|---|
| **12 June 2014, 07:24**<br>Outage to repair 132kV cable sealing end. | OFTO | 1 day | 4472 |
| **23 July 2014, 10:50**<br>Outage for planned maintenance. | OFTO | 1 day | 2177 |
| | | Total | 6649MWh |

### TC Barrow outages

| Outage Date & Time | Reason | Days & Hours | MWh |
|---|---|---|---|
| **2 September 2014, 08:39**<br>Outage at request of DNO to allow them to conduct work on their assets. | Non-OFTO | 4.5 hours | 426 |
| **3 November 2014, 11:24**<br>DNO switching time outage. | Non-OFTO | 0.5 hour | 44 |
| **4 November 2014, 00:19**<br>Outage due to fault on DNO network. | Non-OFTO | 2.5 hours | 244 |
| **5 November 2014, 10:50**<br>DNO switching time outage. | Non-OFTO | 0.3 hours | 25 |
| **5 January 2015, 07:25**<br>Outage at request of DNO to allow them to conduct work on their assets. | Non-OFTO | 2 days 9 hours | 5194 |
| **2 February 2015, 07:10**<br>Outage at request of DNO to allow them to conduct work on their assets. | Non-OFTO | 2 days and 10 hours | 5226 |
| | | Total | 11160MWh |

## TC Ormonde Outages

| Outage Date & Time | Reason | Days & Hours | MWh |
|---|---|---|---|
| **15 May 2014, 09:19**<br>DNO outage for their work. | Non-OFTO | 3 hours | 432 |
| **7 July 2014, 06:17**<br>Generator performed work to progress project to install harmonic filter on OFTO assets. | Non-OFTO | 2 days 10 hours | 8717 |
| **29 July 2014, 15:04**<br>Generator performed work to progress project to install harmonic filter on OFTO assets. | Non-OFTO | 4 hours | 588 |
| **14 August 2014, 11:04**<br>Generator caused protection mal-operation during their harmonic filter work. | Non-OFTO | 0.3 hour | 50 |
| **27 August 2014, 09:02**<br>Generator performed work to progress project to install harmonic filter on OFTO assets. | Non-OFTO | 8 hours | 1193 |
| **1 October 2014, 08:09**<br>Generator performed work to progress project to install harmonic filter on OFTO assets. | Non-OFTO | 0.25 hour | 37 |
| **29 November 2014, 19:20**<br>Transformer T2 offshore taken out of service in an emergency to prevent risk of damage and fire after tapchanger issue. | OFTO | 17 hours | 912 |
| **5 February 2015, 12:53**<br>Emergency outage at request of DNO due to an issue on their network. | Non-OFTO | 3 hours | 382 |
| **23 March 2015, 16:05**<br>Generator performed work to progress project to install harmonic filter on OFTO assets. | Non-OFTO | 0.5 hour | 67 |
| | | Total | **12379MWh** |

## TC Lincs Outages

| 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 |
|---|---|---|---|
| **22 July 2014, 08:18**<br>ENW requested outage for switching. | Non-OFTO | 0 | 118 |
| **25 July 2014, 17:25**<br>ENW requested outage for switching. | Non-OFTO | 0 | 193 |
| | | Total | **311MWh** |

## BT Sheringham Shoal Outages

| Outage Date & Time | Reason | Days & Hours | MWh |
|---|---|---|---|
| **30 June 2014, 10:33**<br>Planned maintenance. | OFTO | 8 hours | 1399.12 |
| **10 June 2014, 07:30**<br>Generator requested outage. | Non-OFTO | 1 day 6 hours | 763.56 |
| **1 July 2014, 09:08**<br>Planned maintenance. | OFTO | 10 hours | 1580.25 |
| **2 July 2014, 09:43**<br>Planned maintenance. | OFTO | 10 hours | 1561.88 |
| | | Total | **5304.81MWh** |



## BT London Array

| Outage Date & Time | Reason | Days & Hours | MWh |
|---|---|---|---|
| **2 June 2014, 07:29**<br>Maintenance SGT1A, Export Cable 1 and GT1. | OFTO | 5 hours | 754 |
| **2 June 2014, 13:20**<br>Maintenance SGT2A, Export Cable 2 and GT2. | OFTO | 3.5 hours | 506 |
| **3 June 2014, 08:15**<br>Maintenance SGT1B, Export Cable 3 and GT3. | OFTO | 9.5 hours | 1342 |
| **4 June 2014, 08:09**<br>Maintenance SGT2B, Export Cable 4 and GT4. | OFTO | 8.5 hours | 1219 |
| **20 August 2014, 05:43**<br>Inspection of Cable Crossing HV2. | OFTO | 11 hours | 1608 |
| | | Total | **5429MWh** |

## 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 |
|---|---|---|---|
| **2 March 2015, 18:05**<br>Export Cable 1 Primary System Fault. | OFTO | 29d 6hrs (702hrs) | 100724 |
| | | Total | **100724MWh** |

## Balfour Beatty Thanet

| Outage Date & Time | Reason | Days & Hours | MWh |
|---|---|---|---|
| **23 February 2015, 12:52**<br>Export Cable 1 Primary System Fault. | OFTO | 36d 11hrs (875.17hrs) | 131276 |
| | | Total | **131276MWh** |

### Annual System Availability

Annual Availability of Offshore Networks for 2014-15 was:

**95.52%**

London Array Transfer Vessel

# Glossary of Terms

# 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:

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

A circuit is defined as equipment on the transmission system, eg 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, ie outages required and taken at less than 24 hours' notice.

## Offshore System Availability

OFTO availability is calculated using the formula:

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

## 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 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:

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

## 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, eg 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 1000 and 1320MW 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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