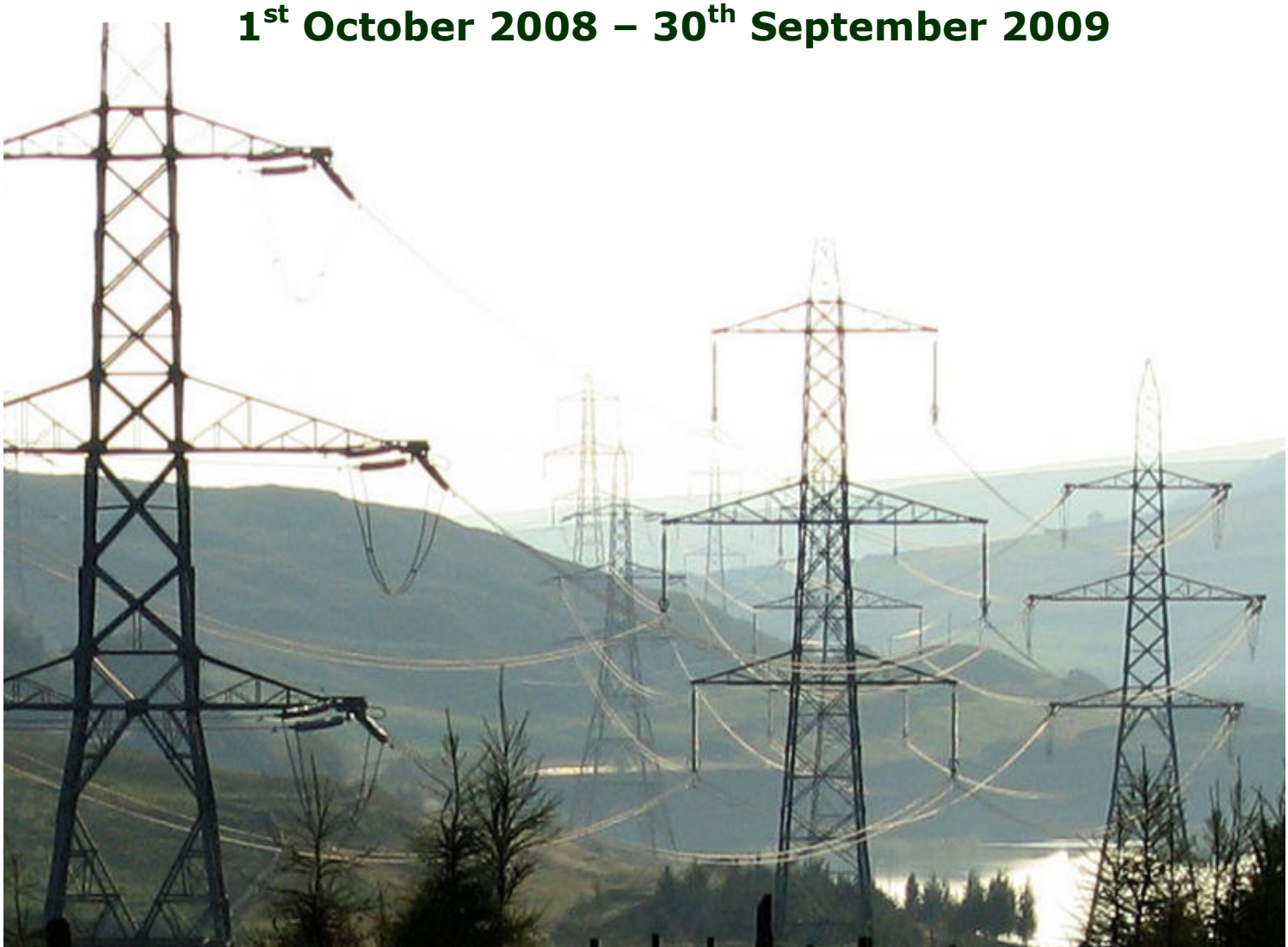
System Operator for Northern Ireland

TRANSMISSION SYSTEM PERFORMANCE REPORT

2008/09

1st October 2008 – 30th September 2009



SYSTEM OPERATOR FOR NORTHERN IRELAND LTD

TRANSMISSION SYSTEM PERFORMANCE REPORT

FOR THE YEAR 2008/09

1 OCTOBER 2008 – 30 SEPTEMBER 2009

Prepared November 2009

CONTENTS

EXECUTIVE SUMMARY

SONI has prepared the Transmission System Performance Report in accordance with Part 11 of Condition 20 of the Licence to Participate in the Transmission of Electricity. There is a requirement to produce the Report annually, two months after the completion of the financial year. This report covers the year 2008/09, starting 1st October 2008 and finishing 30th September 2009.

One of the key measures of performance is availability, both of the overall Northern Ireland transmission system, and interconnection to the system. System availability is calculated as a percentage of actual circuit hours available in relation to total possible circuit hours available. Circuit outages that result from both planned and unplanned unavailability are taken into account.

The annual system availability was 97.26%, with a winter availability of 98.44%, reflecting the fact that planned work on circuits is kept to a minimum over the winter months. The annual system availability has improved on the 2007/08 figure of 95.99%.

The performance of the interconnectors continues to vary, with Moyle HVDC link having an annual availability of 99.09%, the year on year average being 99.06% The North-South 275kV Tie Line's availability was 94.58% with a year on year average of 97.67%. The two 110kV Tie Lines had an annual availability of 97.35%, and the year on year average being 97.91%. This higher figure was due to no planned outages on either line during the year.

Another key measure of performance is system security, which reports on any incidents resulting in loss of supplies to customers. In the year of October 2008 to September 2009 there were four such incidents; this value is the same as the previous year. However, the total unsupplied energy of the incidents is greater than in previous years, reflecting the lengthy outages caused by the disruption on the Enniskillen – Aghyoule circuit.

Quality of service is also covered in this report, and is measured in terms of the number of voltage and frequency excursions over the year, in relation to statutory limits. While there were no voltage excursions over the year, there were five frequency excursions, a decrease on the previous year. None of these incidents, however, resulted in a loss of load in Northern Ireland and statutory limits were not exceeded.

1 INTRODUCTION

This Transmission System Performance Report (TSPR) has been prepared by the System Operator for Northern Ireland Ltd. (SONI) in accordance with the requirements of Part 11 of Condition 20 of the "Licence to Participate in the Transmission of Electricity.

SONI is responsible for the safe, secure and efficient operation of the Northern Ireland transmission network. The transmission network is operated at 275kV and 110kV. Its primary purpose is to transport power via overhead lines and cables from generators and interconnectors to Distribution Bulk Supply Points. The power is then transformed to lower voltages (33, 11 and 6.6kV) and distributed to customers.

This report provides information on system availability, interconnector availability, system security and quality of service on the 275/110kV transmission network.

Section 2 outlines both the month by month system availability and unavailability for 2008/09, and also provides a historic comparison of annual system availability.

Section 3 shows the historic availability and monthly unavailability for interconnection with GB and the NI-RoI Tie Lines during 2008/09.

Section 4 provides details of incidents that resulted in the loss of supplies over the year 2008/09, and compares the number of incidents and unsupplied energy over a historic ten year period.

Section 5 highlights quality of service and measures this with reference to both system voltage and frequency, and records when either criteria exceeds its statutory limits.

Reporting is carried out in accordance with the definitions and principles of the National Fault and Interruption Reporting Scheme (NAFIRS), (Engineering Recommendation G43/2). The effects of national / regional emergencies and disputes are excluded.

Unlike previous Transmission System Performance Reports all the historic data tables and graphs have been adjusted to reflect the new financial year reporting term of 1st October through to 30th September. The change in financial year reporting now aligns with SONI's licence requirements.

2 SYSTEM AVAILABILITY

2.1 CALCULATION METHODOLOGY

System Performance is monitored by reporting monthly variations in system availability, winter peak and average annual system availability, together with planned and unplanned system availability.

Availability is reduced whenever a circuit is taken out of operation, either for planned purposes for example maintenance work, or as the result of a fault, caused, for example, by lightning strikes, high winds, equipment failure etc.

SONI is required under its licence to operate the transmission system in accordance with the Transmission and Distribution System Security and Planning Standards, and the Grid Code.

Planned work is necessary to facilitate new user connections, network development and the maintenance of network assets necessary to deliver acceptable levels of system security and reliability.

The outages of transmission circuits either planned outages or faults resulting in forced outages have the net effect of reducing system availability to less than 100%. System availability is defined by the formula:

$$\textbf{System Availability} = \frac{\textbf{The sum of all circuit hours actually available x 100\%}}{\textbf{(No. of circuits) x (No. of hours in one year)}}$$

A circuit is defined as the overhead line, cable, transformer or any combination of these that connects two system bus bars together or connects the system to a User's busbar. Network bus bars are located in transmission substations; the bus bars, circuits and network configuration are described in the current SONI Transmission Seven Year Statement.

There are approximately 150 transmission (275kV and 110kV) circuits in the Northern Ireland transmission system, covering a total length of circa 2130km in the form of overhead lines and cable circuits at 275kV and 110kV.

Planned unavailability - is defined as outages that are required to maintain transmission network assets. These are planned in excess of seven days prior to the outage. This also includes outages to facilitate user connections (generators etc.) and also general network maintenance that benefits all users.

Unplanned unavailability - is due to an outage which occurs as a result of breakdown, i.e. outages required and taken immediately upon request or planned at less than seven days notice.

2.2 RESULTS

2.2.1 ANNUAL SYSTEM AVAILABILITY

For 2008/09, the Average Annual Availability of the Northern Ireland Transmission System was 97.26%.

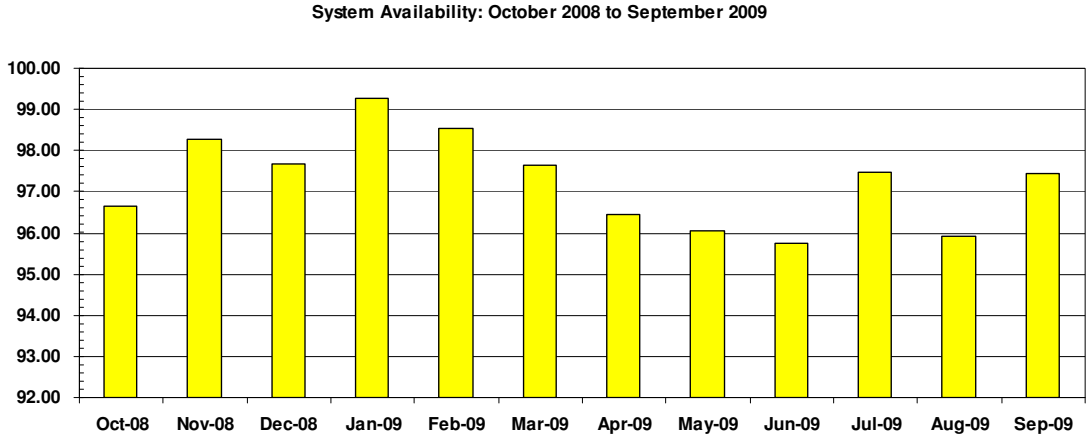
2.2.2 SUMMER AND WINTER AVAILABILITY

The Winter Peak System Availability (average system availability for the period of November 2008 to February 2009) was 98.44%.

The Summer System Availability (average system availability for the period of May 2009 to August 2009) was 96.30%.

2.2.3 MONTHLY VARIATION

The chart and table below show the month by month variation in system availability in respect of the transmission network in Northern Ireland.

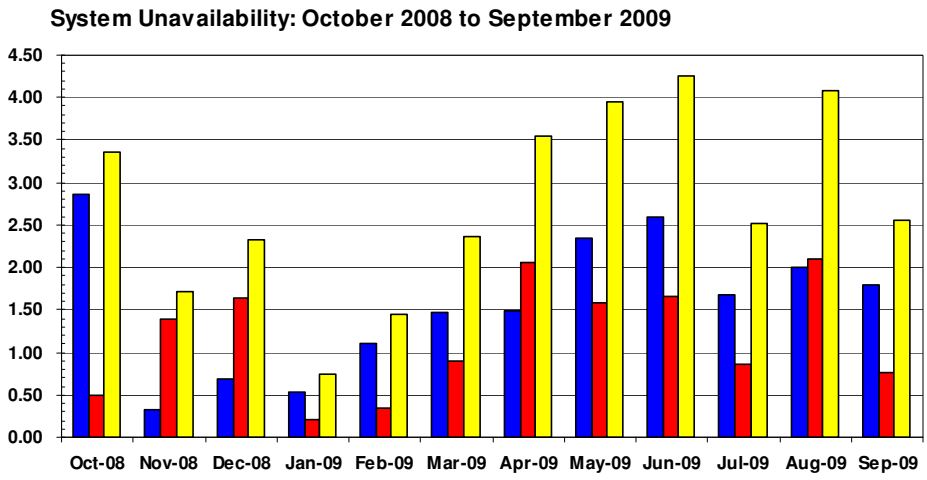


	Oct 08	Nov 08	Dec 08	Jan 09	Feb 09	Mar 09	Apr 09	May 09	Jun 09	Jul 09	Aug 09	Sep 09
Total Availability	96.64	98.29	97.67	99.25	98.55	97.64	96.45	96.06	95.74	97.48	95.91	97.44

Overall, the availability of the system is high, particularly over the winter months, 98.44%. The higher availability over the winter months is because planned outages are usually scheduled to take place over the summer months when network loading is generally lower. This is reflected in the fact that from May to August the availability is 96.3%, approximately 2% lower than winter.

2.2.4 SYSTEM UNAVAILABILITY

The chart and table below shows the month by month variation in planned, unplanned and total system unavailability.



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Planned	2.86	0.32	0.69	0.53	1.10	1.46	1.48	2.35	2.60	1.67	2.00	1.80
Unplanned	0.50	1.39	1.65	0.21	0.35	0.90	2.06	1.59	1.66	0.85	2.09	0.77
Total Unavailability	3.36	1.71	2.33	0.75	1.45	2.36	3.55	3.94	4.26	2.52	4.09	2.56

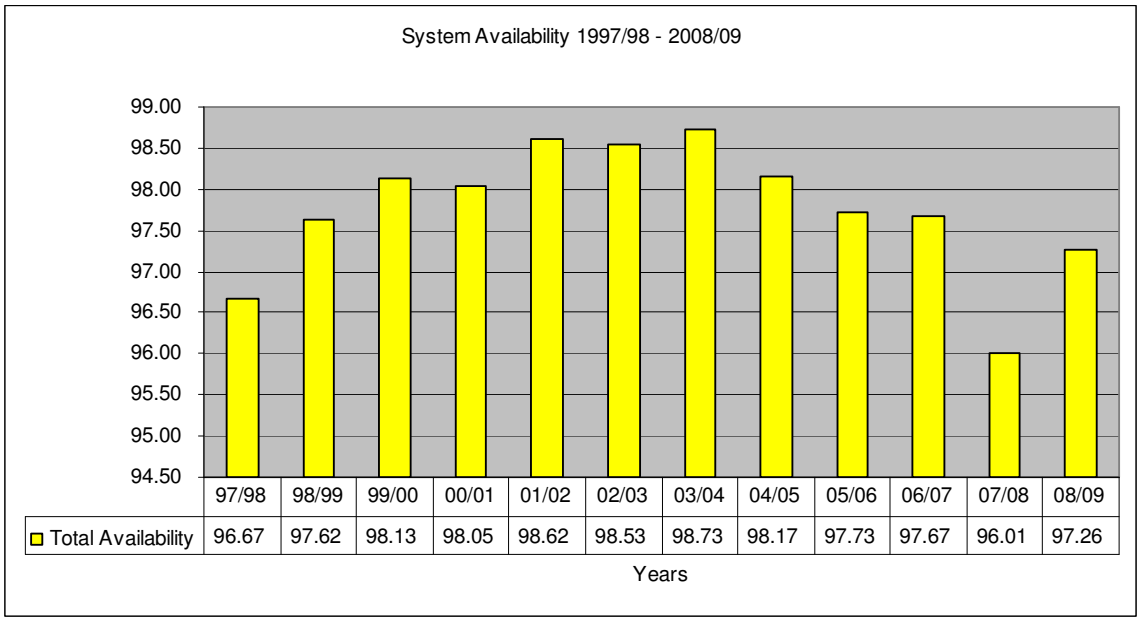
Total unavailability varies between 0.75% and 4.26% throughout the year, with the highest occurrences being 4.26% and 4.09% in June and August, respectively.

Several events have, in particular, contributed to the increased unavailability figure. These are identified in the above graph for October 2008 and June 2009. The June figure was caused by Transformer maintenance at Castlereagh and bushing failure on the Kilroot – Kells B circuit

It has been necessary to carryout some significant planned outages outside the summer period. This is evidenced by the October 2008 planned unavailability of 2.86%. This was caused by lengthy outages at Hannahstown to Castlereagh and Creagh to Dungannon for circuit breaker replacement and line work.

2.2.5 SYSTEM HISTORIC AVAILABILITY PERFORMANCE

The chart and table below show the historic variation in system availability from 1997/98 to 2008/09 in respect of the transmission network in Northern Ireland.



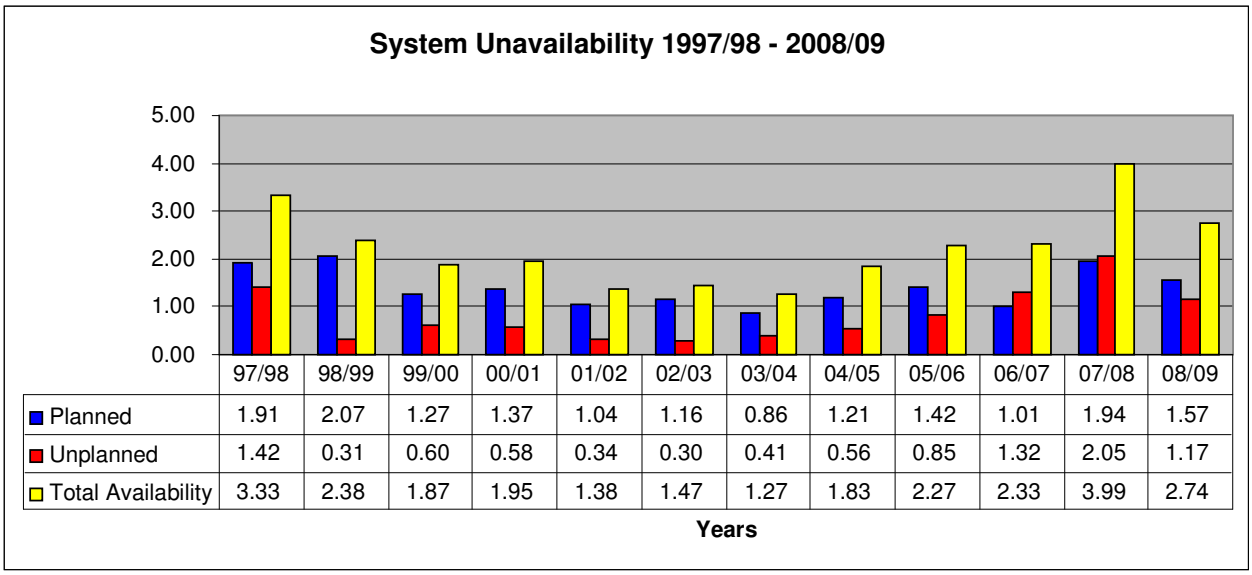
	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09
Total Availability	96.67	97.62	98.13	98.05	98.62	98.53	98.73	98.17	97.73	97.67	96.01	97.26

To ensure consistency, all the historic system availability figures have been realigned to cover the new financial year of 1st October to 30th September. In previous statements the data was presented on the basis of April to March. This modification has only marginally changed the historic availability figures. However, the general trends have remained virtually unchanged.

The significant decrease in availability in 2007/08 has been reversed with a marked improvement of 1.25% in 2008/09. However, the general trend from 2003/04 to 2008/09 remains a slight decline in system availability from 98.73% in 2003/04 to 97.26% in 2008/09

2.2.6 SYSTEM HISTORIC UNAVAILABILITY PERFORMANCE

The chart and table below show the breakdown of the system unavailability from 1997/98 to 2008/09.



	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09
Planned	1.91	2.07	1.27	1.37	1.04	1.16	0.86	1.21	1.42	1.01	1.94	1.57
Unplanned	1.42	0.31	0.60	0.58	0.34	0.30	0.41	0.56	0.85	1.32	2.05	1.17
Total Availability	3.33	2.38	1.87	1.95	1.38	1.47	1.27	1.83	2.27	2.33	3.99	2.74

After a trend of reduced unavailability around 1997/98 – 2003/04, it can be seen in the graph above a slight increase in unavailability during the years 2003/04 – 2008/09 has occurred. There has been a slight increase in both planned and unplanned outages over the period contributing to the higher unavailability figures. On the positive side the 2008/09 figure 2.74% for unavailability is much improved compared with the 2007/08 figure of 3.99%. Total unavailability reducing by 1.25%

3 INTERCONNECTOR AVAILABILITY

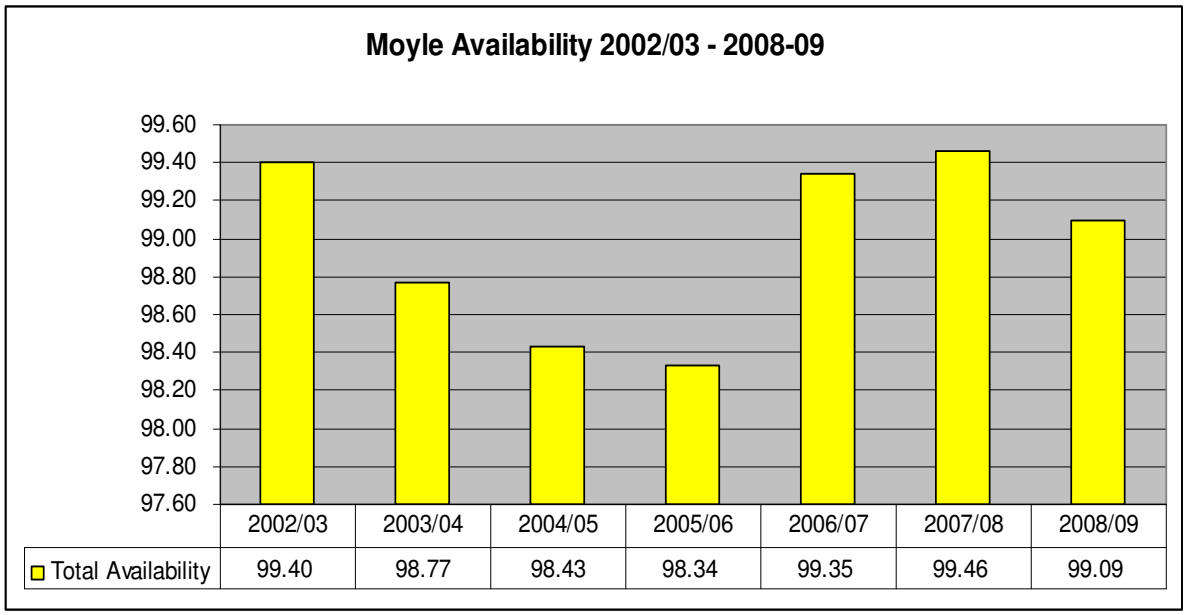
3.1 INTERCONNECTION WITH GB

The Moyle interconnector, NI-GB, commenced commercial operation in 2002 and is constructed as a dual monopole HVDC link with two coaxial undersea cables from Ballycronan More, Islandmagee to Auchencrosh, Ayrshire, Scotland. The 500MW link is operated by SONI, and the performance of this link falls under the scope of this report.

3.1.1 MOYLE INTERCONNECTOR HISTORIC AVAILABILITY

The 2008/09 Annual Availability of the Moyle Interconnector was 99.09%.

The chart below shows the historic annual variation in the Moyle Interconnector availability from 2002/03 – 2008/09. The availability of the Moyle interconnector has remained high since its introduction in 2002, with the 2007/08 figures being the highest on record.



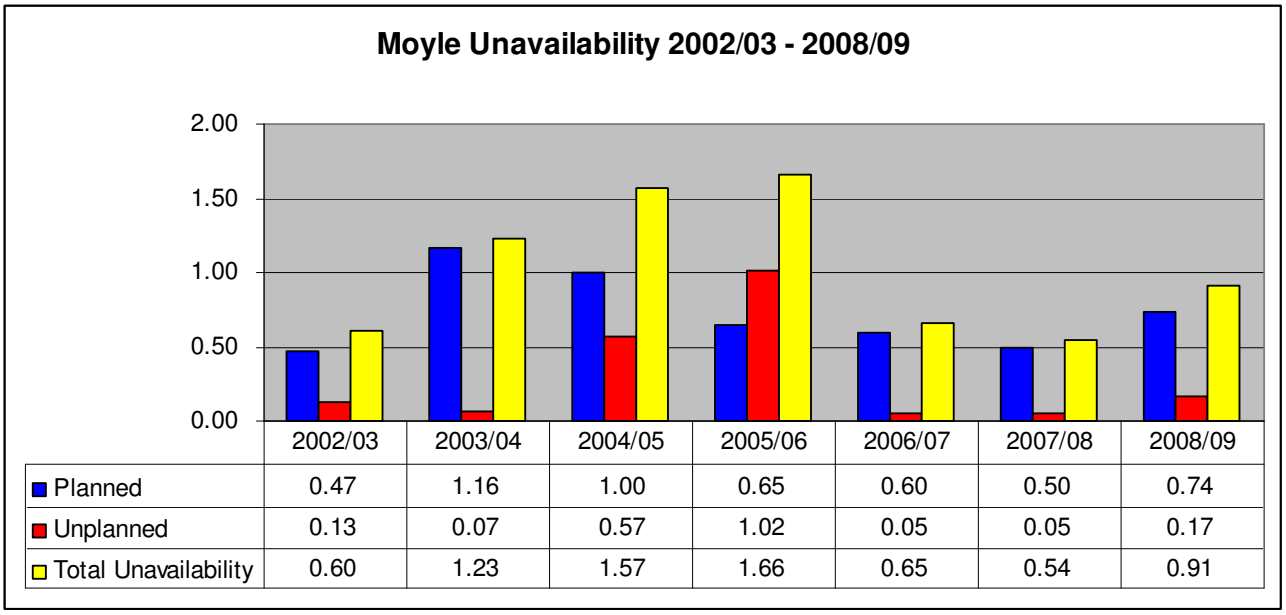
	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09
Total Availability	99.40	98.77	98.43	98.34	99.35	99.46	99.09

The slight reduction in Moyle availability for 2008/09 in comparison to 2007/08 was mainly caused by the planned outage to allow for the connection of a new windfarm site on the Scottish side

3.1.2 MOYLE INTERCONNECTOR HISTORIC UNAVAILABILITY

The 2008/09 Annual Unavailability of the Moyle Interconnector was 0.91%.

The chart below shows the historic annual variation in the Moyle Interconnector unavailability from 2002/03 to 2008/09.



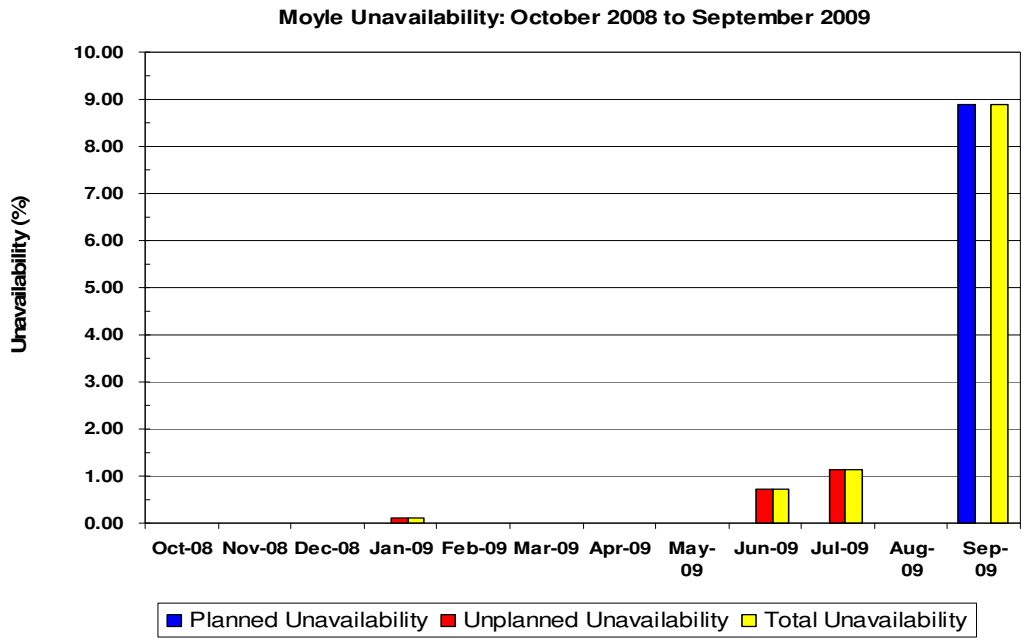
	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09
Planned	0.47	1.16	1.00	0.65	0.60	0.50	0.74
Unplanned	0.13	0.07	0.57	1.02	0.05	0.05	0.17
Total Unavailability	0.60	1.23	1.57	1.66	0.65	0.54	0.91

The performance of the interconnector has been good. Minimal outages have resulted in low unavailability figures. From 2006/07 the unavailability has been dominated by planned outages.

The Moyle Interconnector outages, either planned or unplanned also include outages on the Scottish side.

3.1.3 MONTHLY UNAVAILABILITY

The chart below shows the month by month variation of unavailability of the interconnector. The graph indicates during which months that maintenance has been undertaken by Moyle.



From the graph it can be clearly seen that although there was some unplanned availability on the Moyle in January, June and July, the largest value is in September with the planned unavailability to facilitate the connection of a new windfarm in Scotland.

The Moyle Interconnector outages, either planned or unplanned also include associated outages on the Scottish side.

3.2 INTERCONNECTION WITH ROI

3.2.1 275kV TIE LINE

The Northern Ireland transmission system was reconnected with RoI in March 1995. The synchronous interconnection is via the double circuit 275kV North-South Tie Line between Tandragee and Louth. Since the introduction of the Single Electricity Market, the circuit is treated as a Tie Line.

Outages are planned between the interconnected parties to allow work to be undertaken in an efficient manner.

3.2.2 110kV TIE LINES

110kV connections with RoI are as follows:

- Strabane – Letterkenny 110kV circuit.
- Enniskillen – Corraclassy 110kV circuit

Until 2001, both circuits operated in a standby mode, but were then converted into permanent interconnections by the deployment of power flow controllers, rated at 125MW. The power flow controllers are normally adjusted to maintain a 0MW transfer, but can be set to any desired value to support either system during abnormal operating conditions. Since the introduction of SEM, the circuits are treated as Tie Lines.

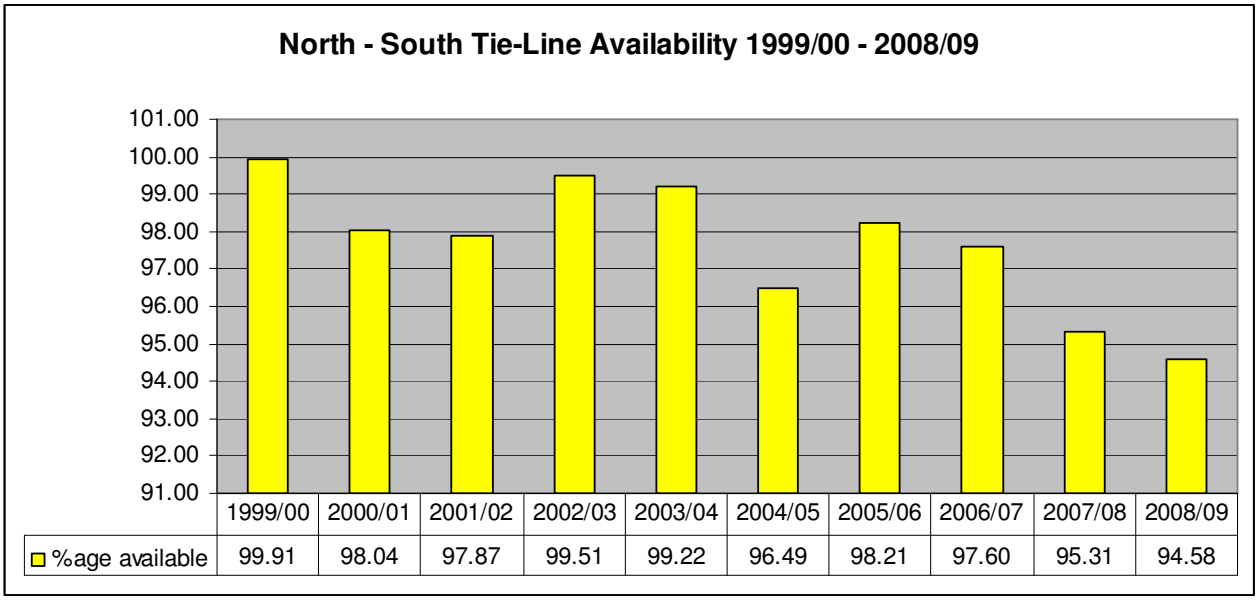
The two circuits are automatically taken out of service during the outage of both 275kV circuits on the North-South Tie Line. This is to ensure that the All-Island network operates in a stable manner.

The power flows on the 110kV Tie Lines are normally adjusted to support either network when planned or unplanned outages occur in either NI or RoI.

The Tie Lines are now also used to import excess wind from Donegal on a regular basis.

3.2.3 275kV NORTH-SOUTH TIE LINE ANNUAL AVAILABILITY

The annual availability of the 275kV North-South Tie Line was 94.58%. The chart and table below show the annual variation in the availability of the Tie Line from 1998/99 to 2008/09

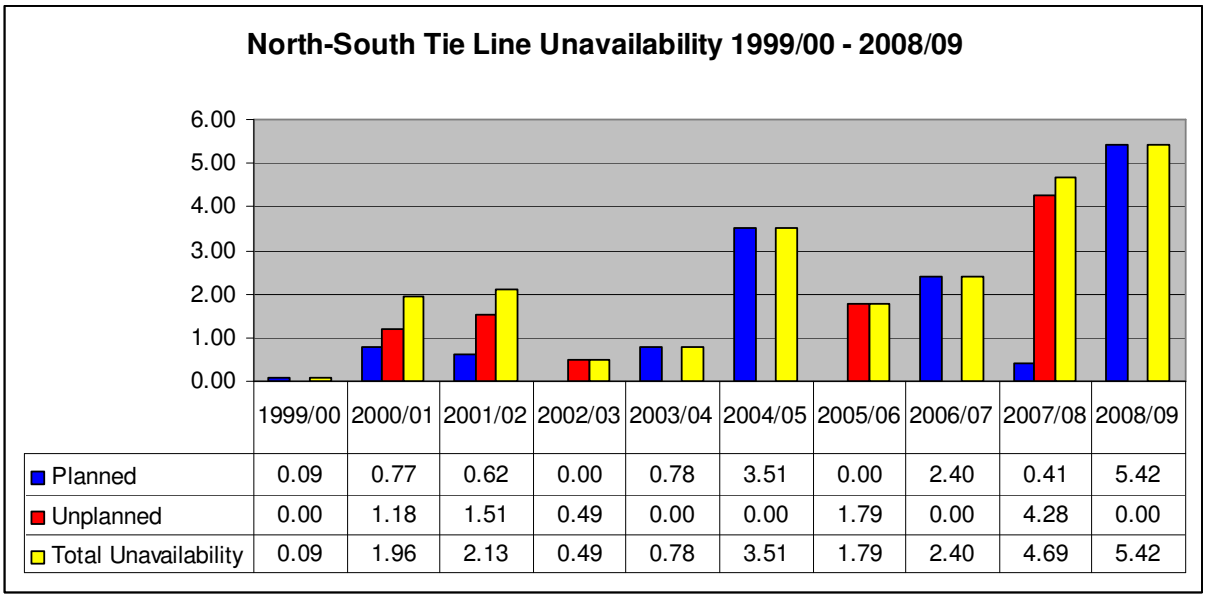


	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09
%age available	99.91	98.04	97.87	99.51	99.22	96.49	98.21	97.60	95.31	94.58

The 2008/09 availability figure is the lowest on record for the North-South Tie Line. This was primarily caused by the planned outages over the months of June, July and August 2009.

3.2.4 275kV NORTH-SOUTH TIE LINE ANNUAL UNAVAILABILITY

The chart and table below show how the total unavailability is split for the years 1999/00 to 2008/09 between planned and unplanned outages.

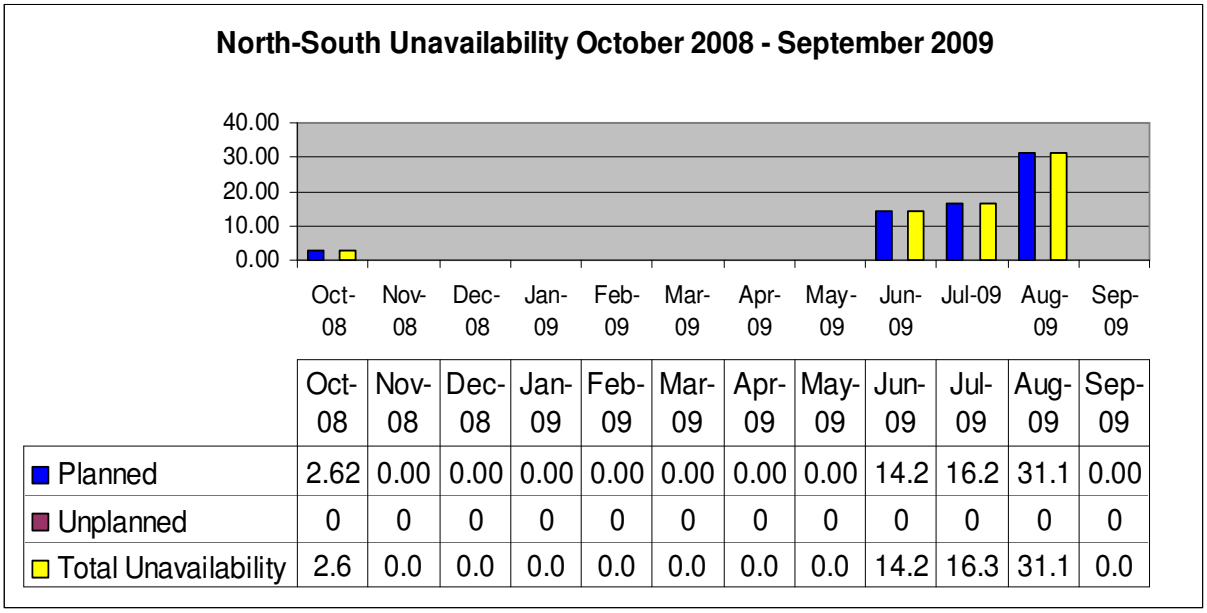


	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09
Planned	0.09	0.77	0.62	0.00	0.78	3.51	0.00	2.40	0.41	5.42
Unplanned	0.00	1.18	1.51	0.49	0.00	0.00	1.79	0.00	4.28	0.00
Total Unavailability	0.09	1.96	2.13	0.49	0.78	3.51	1.79	2.40	4.69	5.42

The highest recorded level of total unavailability in 2008/09 for the North- South Tie Line is clearly shown on the above graph. The level of unavailability was entirely caused by planned outages.

3.2.5 275kV NORTH-SOUTH TIE LINE MONTHLY UNAVAILABILITY

The chart and table below show the month by month variation of unavailability of the North-South Tie Line.

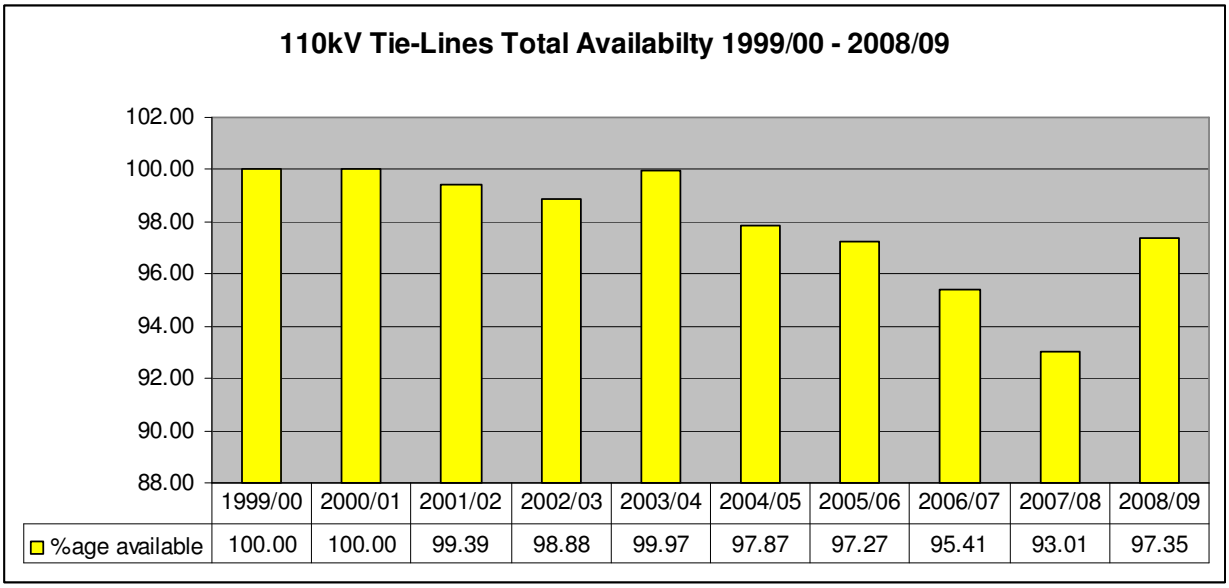


	Oct-08	Nov-08	Dec-08	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09
Planned	2.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.2	16.2	31.1	0.00
Unplanned	0	0	0	0	0	0	0	0	0	0	0	0
Total Unavailability	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.2	16.3	31.1	0.0

The results shown in the graph above shows that the unavailability on the North – South Tie Line was entirely caused by planned outages during the summer months of June, July and August. There was also a small planned outage in October 2008.

3.2.6 110kV TIE LINES ANNUAL AVAILABILITY

The availability of the 110kV Tie Lines was 97.35% for the period October 2008 to September 2009. The chart and table below show the annual variation in the availability of the Tie Lines from 1999/00 to 2008/09.

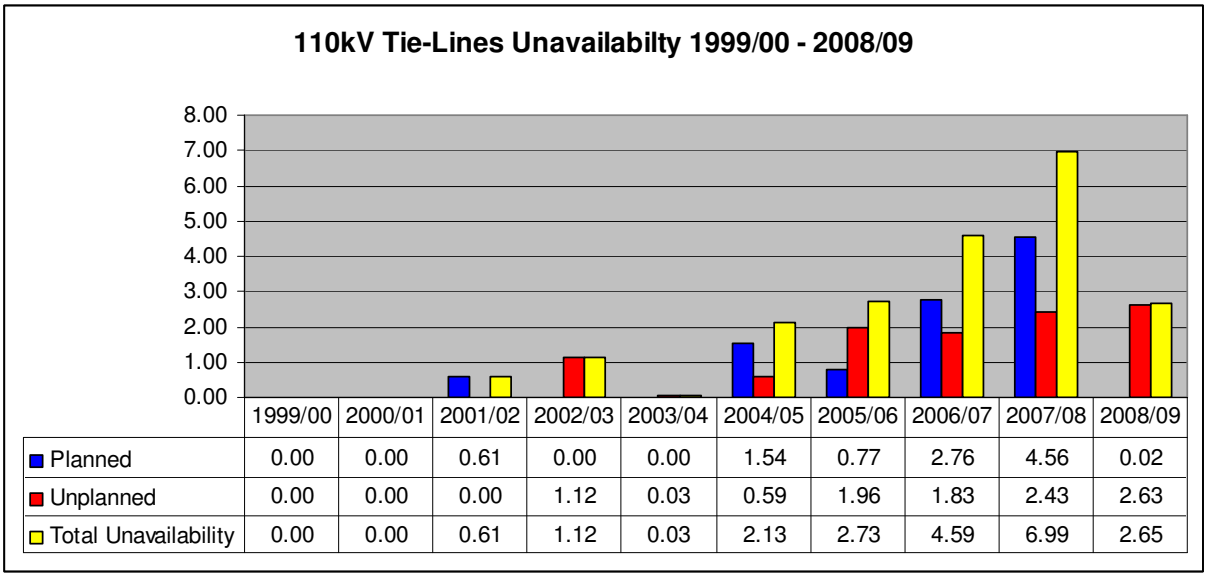


	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09
%age available	100.00	100.00	99.39	98.88	99.97	97.87	97.27	95.41	93.01	97.35

The graph highlights a significant improvement in availability in 2008/09 as compared to 2005/06 – 2007/08

3.2.7 110kV TIE LINES ANNUAL UNAVAILABILITY

The unavailability of the 110kV Tie Lines was 2.65% for the period October 2008 to September 2009. The chart and table below show the annual variation in the unavailability of the Tie Lines from 1999/00 – 2008/09

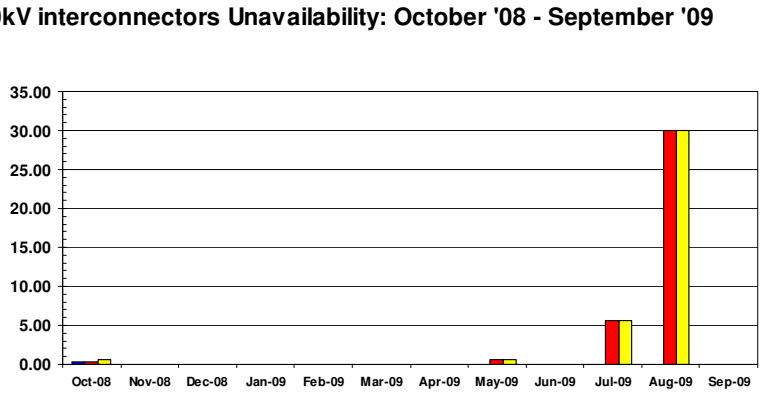


	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09
Planned	0.00	0.00	0.61	0.00	0.00	1.54	0.77	2.76	4.56	0.02
Unplanned	0.00	0.00	0.00	1.12	0.03	0.59	1.96	1.83	2.43	2.63
Total Unavailability	0.00	0.00	0.61	1.12	0.03	2.13	2.73	4.59	6.99	2.65

There were no significant planned outages on the 110kV Tie Lines in 2008/09. Whilst unplanned outages remained similar to the previous year at circa 2.5%

3.2.8 110kV TIE LINES MONTHLY UNAVAILABILITY

The chart and table below show the month by month variation of unavailability of the 110kV Tie Lines.



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Planned Unavilability	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Unplanned Unavilability	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.58	0.00	5.56	30.05	0.00
Total Unavailability	0.56	0.00	0.00	0.00	0.00	0.00	0.00	0.58	0.00	5.56	30.05	0.00

There were no planned outages on the 110kV Tie Line during the year. Unplanned outages occurred in October, May, July and August. The outage in August 2009 was the main contributor to the 2008/09 unavailability figure of 2.65%

4 SYSTEM SECURITY

All Transmission System related events that occurred in Northern Ireland that resulted in a loss of supplies are reported individually, giving information concerning the nature and cause of the incident and location, duration and an estimate of energy unsupplied.

An incident is defined as any system event that results in a single or multiple loss of supply.

4.1 NUMBER OF INCIDENTS AND ESTIMATED UNSUPPLIED ENERGY

Within the Northern Ireland system there were four events that resulted in a loss of supplies, for the period October 2008 to September 2009. This number remains unchanged from 2007/08

The unsupplied energy from the Northern Ireland system during 2008/09 was estimated to be 95.73 MWh, which is considerably higher than the value for 2007/08. However, the higher value was caused primarily by an incident on the Enniskillen to Aghyoule circuit in July 2009 (see below).

4.2 INCIDENTS FOR OCTOBER 2008 - SEPTEMBER 2009

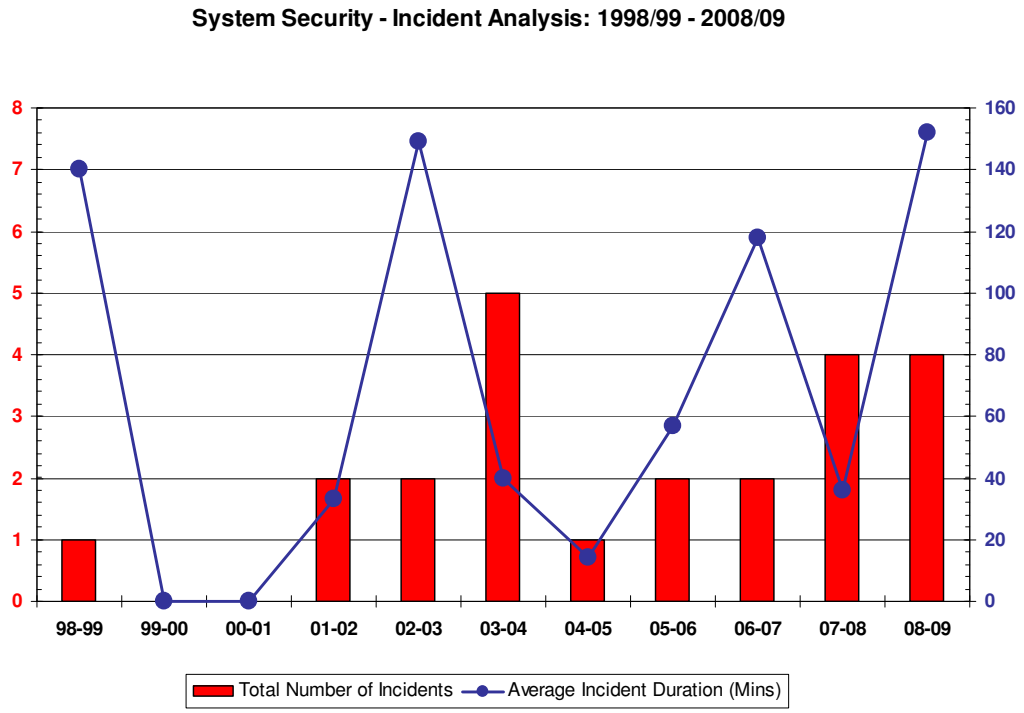
Incident Date, Time and Location	MW Lost	Mins	MWh Unsupplied	Customers affected
6/11/2008 Tandragee- Newry Double circuit tripped	59.0	14	13.77	35300
30/03/2009 Castlereagh - Newtownards circuit tripped with mal-operation of protection	42.0	22	15.40	28000
28/7/2009 Enniskillen - Aughyoule Circuit failure due to landslide	7.0	570	66.50	Losses on distribution circuits
19/08/2009 Carnmoney main Transformer B Tripped	4.0	1	0.07	Losses on distribution circuits

The criterion for reporting incidents is specified in Schedule 4, paragraph 35, of the Electricity Supply Regulations (Northern Ireland) 1991. An incident shall be reported if there has been:

- Any single interruption of supply to one or more consumers of 20MW or more for a period of one minute or longer; or
- Any single interruption of supply to one or more consumers of 5MW or more for a period of one hour or longer; or
- Any single interruption of supply to 5,000 or more consumers for a period of one hour or longer.

4.2.1 SYSTEM SECURITY - INCIDENT ANALYSIS

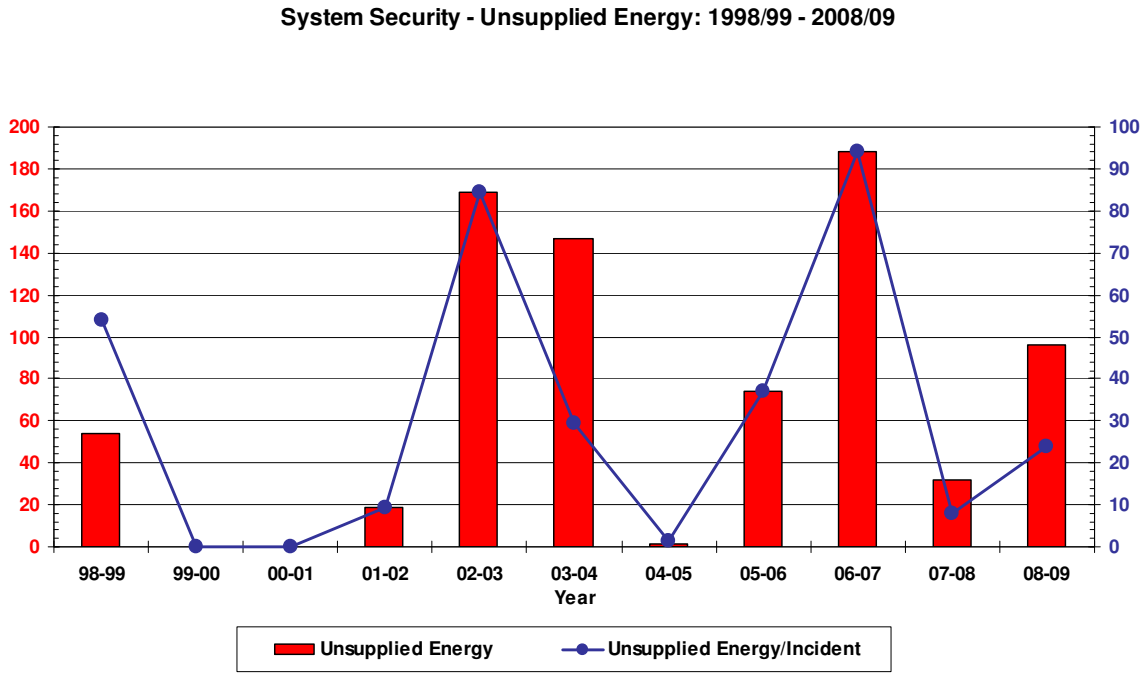
The graph below shows the number of incidents which occurred historically in Northern Ireland. The red bars on the graph below represent the number of incidents each year, while the blue line is the average duration of each incident.



The number of incidents has not changed from the previous year (2007/08) remaining at four however, the average incident duration increased owing to the length time spent on the Enniskillen – Aghyoule circuit outage.

4.2.2 SYSTEM SECURITY - UNSUPPLIED ENERGY

Below is a graph which shows the amount of unsupplied energy to N.I. customers, historically. The red bars are the total for each year in MWh and the blue line is the average amount of unsupplied energy per incident.



The increase in unsupplied energy and unsupplied energy per incident has risen during 2008/09 primarily due to the unplanned outage on the Enniskillen – Aghyoule circuit.

5 QUALITY OF SERVICE

Quality of service is measured with reference to system voltage and frequency.

5.1 VOLTAGE

The Electricity Supply Regulations (Northern Ireland) 1991 permit variations of voltage not exceeding 6% for voltages of 110 kV.

Consumers may expect the voltage to remain within the limits, apart from under abnormal conditions e.g. a system fault.

5.2 VOLTAGE EXCURSIONS

During 2008/09, there were no voltage excursions exceeding the agreed reporting criteria and indeed there have not been any from 1998/99.

5.3 FREQUENCY

The Electricity Supply Regulation (Northern Ireland) 1991 permit variations in frequency not exceeding 2.5% above and below 50Hz, a range of 48.75Hz to 51.25Hz.

The SONI Grid Code (CC5.3) imposes a more arduous criterion to within 1% of 50Hz, a range of 49.5Hz to 50.5Hz. In this report the SONI Grid Code limits are used when reporting excursions.

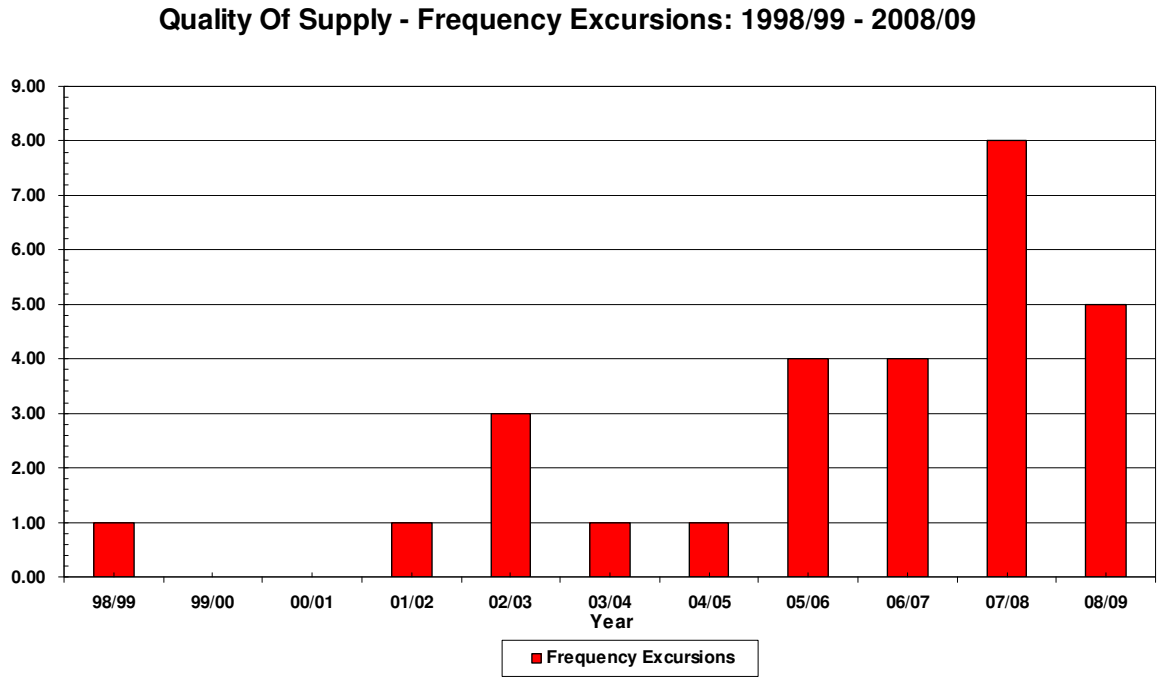
5.4 FREQUENCY EXCURSIONS

During 2008/09 there were five reportable frequency excursions. The following table details these excursions.

Date	Time	Min/Max Frequency (Hz)	Duration outside reporting criteria <49.5: >50.5 Hz	Duration outside statutory limits <48.75: >51.25 Hz	Cause	Unit Load Pre-incident (MW)
22-Nov-08	11:18	49.37	00:05:18		Huntstown Unit 2 Trip	401
18-Jan-09	10:04	49.46	00:00:30		Moneypoint 2	282.5
08-Jun-09	12:52	49.24	00:00:12		Moyle double pole	500
16-Jun-09	16:18	49.43			Huntstown Unit 2	401
30-Jun-09	16:14	49.45			Moneypoint 2	282.5

5.4.1 ANNUAL FREQUENCY EXCURSIONS

The following chart shows the number of frequency excursions from 1998/99 to 2008/09.



In recent years, a number of large combined cycle gas turbine (CCGT) units have been commissioned on the Island. These units tend to be base load, higher efficiency plant, generating for a high proportion of the time. As the all-island generating plant portfolio tends towards a smaller number of larger units, then there is an increased possibility that frequency excursions will occur. It should be noted, however, during 2008/09 there were no incidents where the Electricity Supply Regulations (Northern Ireland) 1991 statutory limit of 2.5% was exceeded, and no customer disconnections occurred. The number of frequency excursions has reduced in 2007/08 to 5 in 2008/09

6 CONCLUSIONS

- System availability has generally declined over recent years. However, compared to 2007/08 (96.01%), there is a marked improvement in availability in 2008/09 (97.26%).

- The Moyle Interconnector with Great Britain continues to perform well, with availability greater than 99%. There is a slight reduction in 2008/09 availability compared to 2007/08, caused by a lengthy outage to accommodate the connection of a windfarm in Scotland.

- The 275kV Tie Line availability has continued to fall and in 2008/09 dropped to a figure of 94.58%. This was caused by significant planned outages over the summer months of 2009.

- The 110kV Tie Lines availability improved to 97.35% during 2008/09 an improvement on the previous years availability of 93.01%

- While incidents resulting in loss of supply have remained at four in 2008/09. The value of MWh unsupplied energy rose owing to lengthy unplanned outages on the Enniskillen – Aghyoule circuit

- While there were no reported voltage excursions, frequency excursions dropped to five in 2008/09 from eight in 2007/08. None of these frequency excursions exceeded statutory limits.