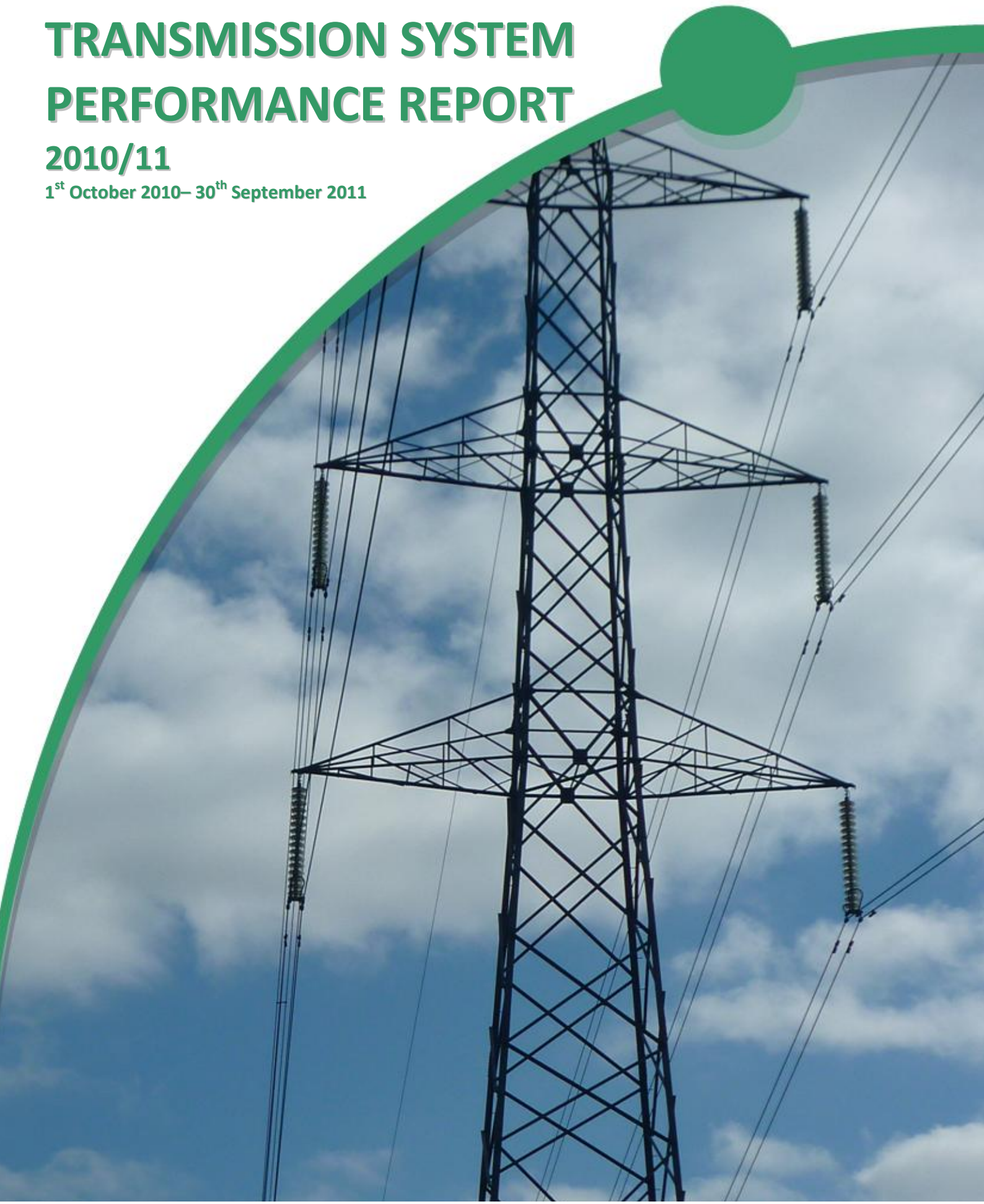
System Operator for Northern Ireland

TRANSMISSION SYSTEM PERFORMANCE REPORT

2010/11

1st October 2010– 30th September 2011



SYSTEM OPERATOR FOR NORTHERN IRELAND LTD

TRANSMISSION SYSTEM PERFORMANCE REPORT

FOR THE YEAR 2010/11
1 OCTOBER 2010 - 30 SEPTEMBER 2011

Prepared November 2011

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EXECUTIVE SUMMARY

SONI has prepared the Transmission System Performance Report (TSPR) 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 2010/11 (1st October 2010 - 30th September 2011).

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 higher winter availability of 98.45%, reflecting the fact that planned work on circuits is minimised over the winter months. The annual system availability has fallen slightly when compared with the 97.67% figure in the previous report for 2009/10.

The performance of the interconnector and tie-lines continues to vary, with Moyle Interconnector HVDC link having an annual availability of 75.16%. The average percentage since commercial operation began in April 2002 has been reduced to 84.20%. This all time low figure was caused by the lengthy planned outage which ran from September to November 2010 and moreover by the ongoing cable fault on Moyle which commenced in June. The North-South 275kV Tie Line's availability was 96.54% with a 12 year average of 97.55%. The two 110kV Tie Lines had an annual availability of 93.24%, and the 12 year average being 97.69%.

Another key measure of performance is system security, which is captured by reporting on any incidents resulting in loss of supplies to customers. In 2010/2011 there were three reported incidents.

Quality of service is measured by the number of voltage and frequency excursions over the year, that fall outside statutory limits. There were no voltage excursions over the year. When we consider frequency excursions on the same basis as previous years, using 49.5Hz as a threshold, the number of incidents has increased from 4 last year to 7 in 2009/10. This increase was caused mainly by new CCGT generating plants commissioned in RoI. We have also reduced the threshold at which frequency incidents are recorded to 49.6Hz. This change has increased the number of events that are reportable. This provides additional information for the reader following the introduction of Harmonised Ancillary Services in February 2010. There were two incidents that caused loss of load in Northern Ireland and necessitated load shedding. They were the Whitegate trips of 27/11/2010 and 5/9/2011

With the exception of the Moyle Interconnector HVDC link all system availabilities have generally remained at the same level of performance when compared to last year's report. Unfortunately during the period of this report Moyle suffered from lengthy unplanned outages and in particular the latest fault on both circuits which has continued beyond October 2011.

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, efficient and reliable 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 and tie-line availability, system security and quality of service on the 275/110kV transmission network for 2009/10.

Section 2 outlines both the month by month system availability and unavailability, 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.

Section 4 provides details of incidents that resulted in the loss of supplies, 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. For each frequency excursion, there is a data table and corresponding graph included in this report. The data table is in section 5.1 and the graphs are in Appendix A.

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.

This report covers the period 1st October 2010 - 30th September2011.

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 e.g. maintenance work, or as the result of a fault, caused, e.g., 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:

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

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 transmission overhead lines and cable circuits.

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 2010/11, the Average Annual Availability of the Northern Ireland Transmission System was 97.26%, a slight reduction on 97.67% in the 2009/10 report.

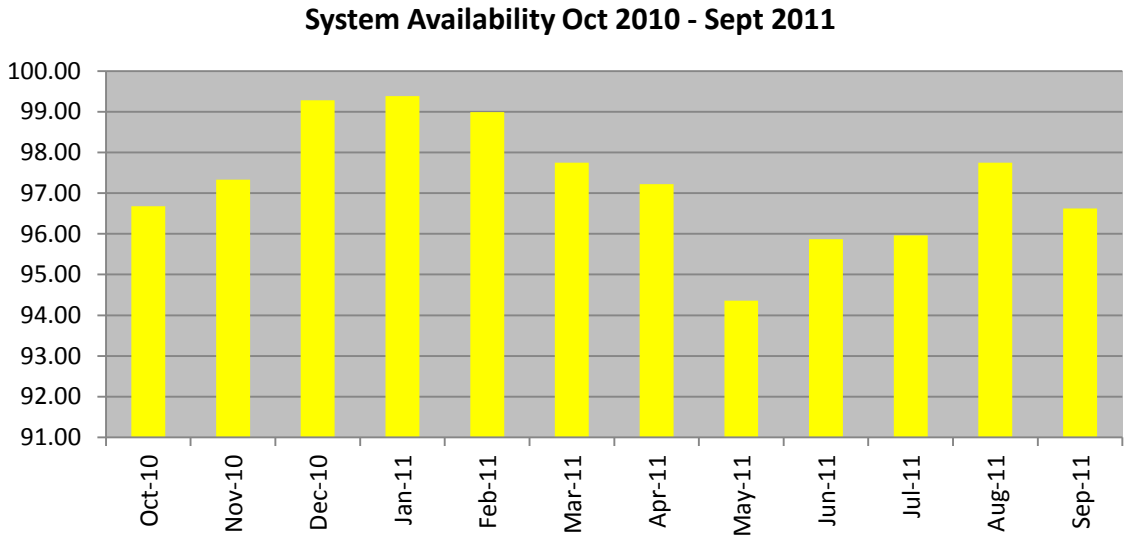
2.2.2 SUMMER AND WINTER AVAILABILITY

The Winter Peak System Availability (average system availability for the period of November 2010 to February 2011) has also decreased slightly to 98.45% from 99.02% in the 2009/10 report.

The Summer System Availability (average system availability for the period of May 2011 to August 2011) also shows a slight reduction to 95.99% from 97.29% in the 2009/10 report.

2.2.3 MONTHLY VARIATION

Figure 2.1 below shows the month by month variation in system availability in respect of the transmission network in Northern Ireland.



Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11
96.68	97.33	99.28	99.38	98.99	97.75	97.22	94.36	95.87	95.96	97.75	96.62

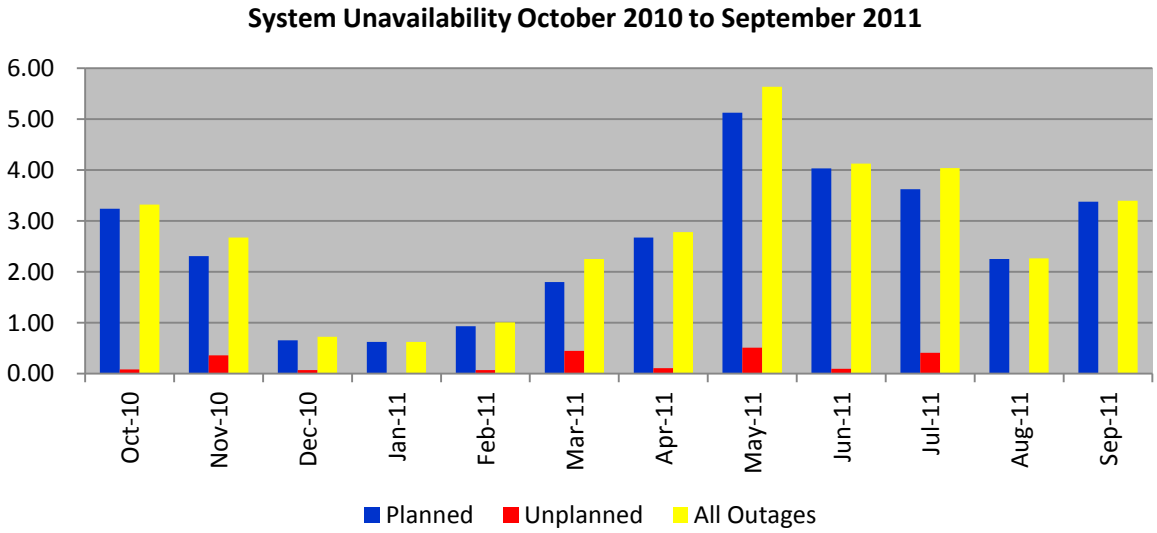
Figure 2.1: System Availability October 2010- September 2011

Overall, the availability of the system is high, particularly over the winter months, with an average of 98.45% for November 2010 – February 2011. 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. From May to August the availability is 95.99%; approximately 1.5% lower than winter value.

2.2.4 SYSTEM UNAVAILABILITY

Figure 2.2 below shows the month by month variation in planned, unplanned and total system unavailability.



	Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11
Planned	3.24	2.31	0.65	0.62	0.94	1.80	2.67	5.13	4.03	3.63	2.25	3.38
Unplanned	0.08	0.36	0.07	0.00	0.07	0.45	0.11	0.51	0.10	0.41	0.01	0.01
All Outages	3.32	2.67	0.72	0.62	1.01	2.25	2.78	5.64	4.13	4.04	2.26	3.40

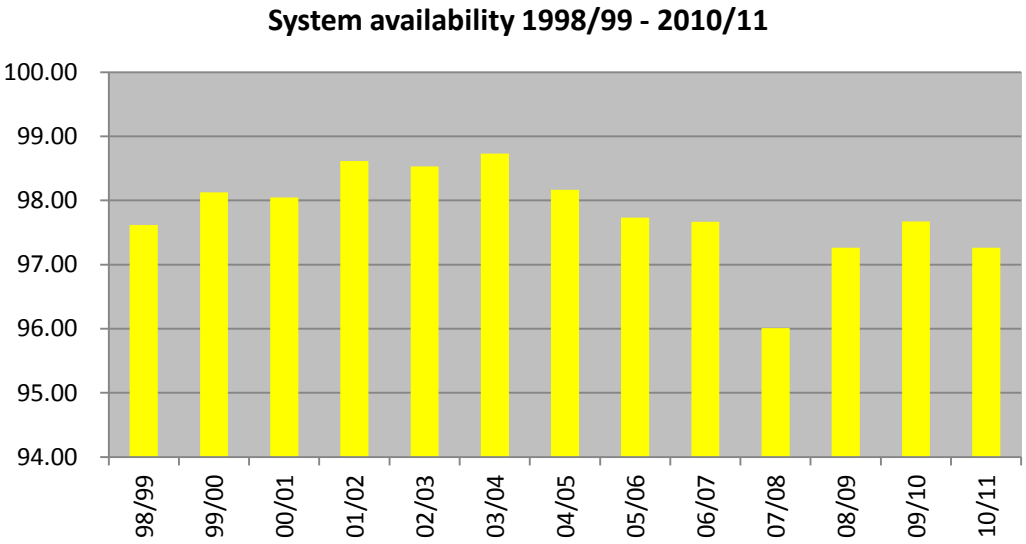
Figure 2.2: System Unavailability October 2010- September 2011

Total unavailability varied between 0.62% and 5.64% throughout the year, with the highest occurrence being in May 2011.

Figure 2.2 above shows that the majority of planned outages occurred during the summer months of May – August 2011. These four months have an average value of 4.02% for planned outages. The graph shows that planned outages far outweighed unplanned outages during the period of this report. The low unplanned outage average figure of 0.18% demonstrates how well the transmission system performed.

2.2.5 SYSTEM HISTORIC AVAILABILITY PERFORMANCE

Figure 2.3 below shows the historic variation in system availability from 1998/99 to 2010/11 in respect of the transmission network in Northern Ireland.



98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11
97.62	98.13	98.05	98.62	98.53	98.73	98.17	97.73	97.67	96.01	97.26	97.67	97.26

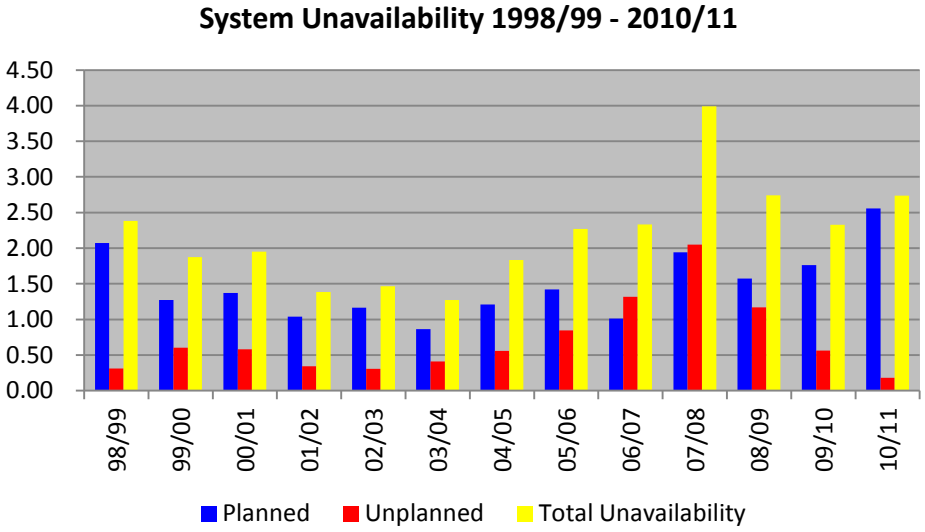
Figure 2.3: Historic System Availability 1997/98 – 2010/11

The Transmission System Performance report for 2008/09 realigned the data to cover the new financial year of 1st October to 30th September rather than 1st April to 31st March. This modification only slightly changed the historic availability figures, whilst the general trends have remained virtually unchanged.

The percentage figure of system availability for 2010/11 shows a slight reduction on the previous year, but remains ahead of the system low figure of 96.01% in 2006.07. The annual average over the period of the above graph is 97.80%. The figure of 97.26% for 2010/11 therefore is comparable with this average.

2.2.6 SYSTEM HISTORIC UNAVAILABILITY PERFORMANCE

Figure 2.4 below shows the breakdown of the system unavailability from 1997/98 to 2010/11.



	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11
Planned	2.07	1.27	1.37	1.04	1.16	0.86	1.21	1.42	1.01	1.94	1.57	1.76	2.56
Unplanned	0.31	0.60	0.58	0.34	0.30	0.41	0.56	0.85	1.32	2.05	1.17	0.56	0.18
Total Unavailability	2.38	1.87	1.95	1.38	1.47	1.27	1.83	2.27	2.33	3.99	2.74	2.33	2.74

Figure 2.4: Historic System Unavailability 1997/98 – 2010/11

As figure 2.4 demonstrates, the annual system unavailability figure for 2010/11 shows a slight decrease when compared to the 2009/10 figure. Although there was a slight increase in the percentage figure for planned outages, there was a more significant improvement in the figure for unplanned outages. The overall figure for total unavailability has increased by 0.41%.

From the above graph the overall annual average percentage for system unavailability is 2.20%. The unavailability percentage for 2010/11 although slightly than this figure remains at a level comparable to the annual average percentage.

3 INTERCONNECTOR and TIE-LINE AVAILABILITY

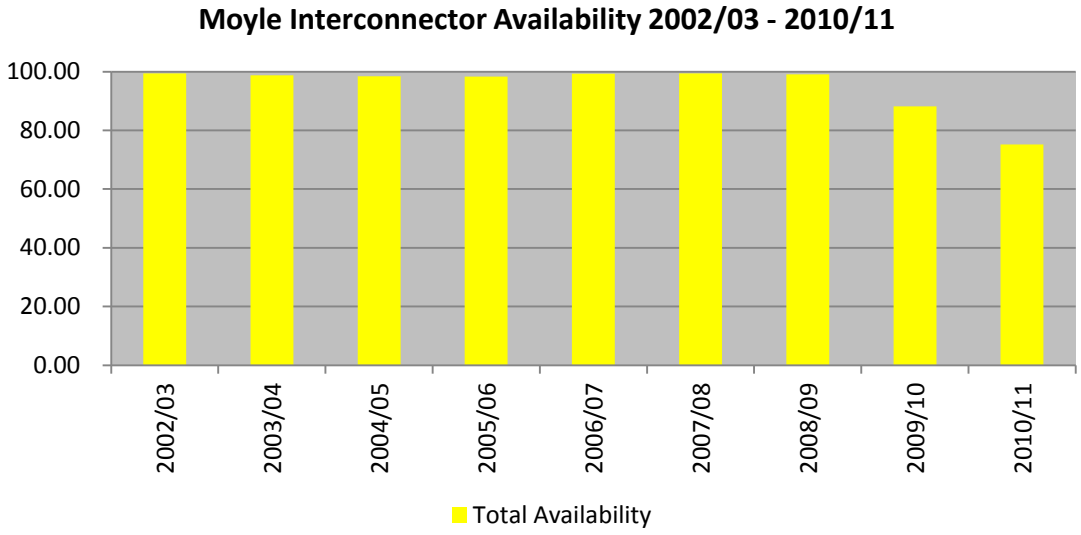
3.1 INTERCONNECTION WITH GB

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 2010/11 Annual Availability of the Moyle Interconnector was significantly reduced to an all time low of 75.16%.

Figure 3.1 below shows the historic annual variation in the Moyle Interconnector availability from 2002/03 – 2010/11. With the exception of the past two years the availability of the Moyle interconnector has remained high since its introduction in 2002, with 2007/08 remaining the highest on record.



2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
99.40	98.77	98.43	98.34	99.35	99.46	99.09	88.18	75.16

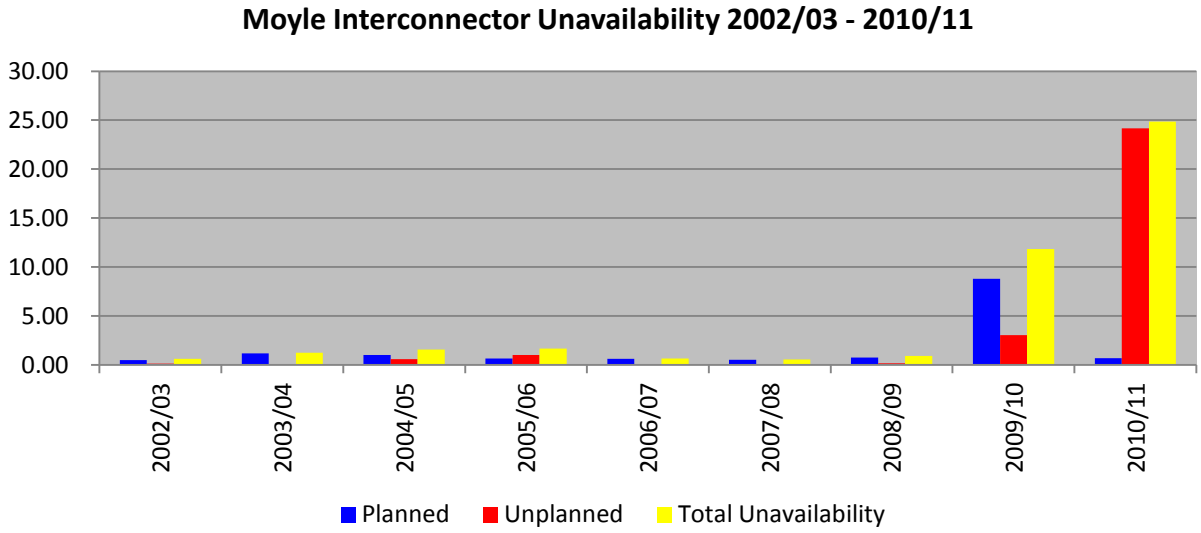
Figure 3.1: Historic Moyle Interconnector Availability 2002/03 – 2010/11

The considerable reduction of availability in 2010/11 on the Moyle Interconnector was caused by 3 significant unplanned outages. The first being the fault that occurred in September 2010 and continued into the first month of this report. The Moyle availability value was further affected by the ongoing cable faults that first occurred in June 2011 and have continued beyond the period of this report

3.1.2 MOYLE INTERCONNECTOR HISTORIC UNAVAILABILITY

The 2010/11 Annual Unavailability of the Moyle Interconnector was 24.84%.

Figure 3.2 below shows the historic annual variation in the Moyle Interconnector unavailability from 2002/03 to 2010/11.



	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Planned	0.47	1.16	1.00	0.65	0.60	0.50	0.74	8.80	0.67
Unplanned	0.13	0.07	0.57	1.02	0.05	0.05	0.17	3.01	24.17
Total Unavailability	0.60	1.23	1.57	1.66	0.65	0.54	0.91	11.82	24.84

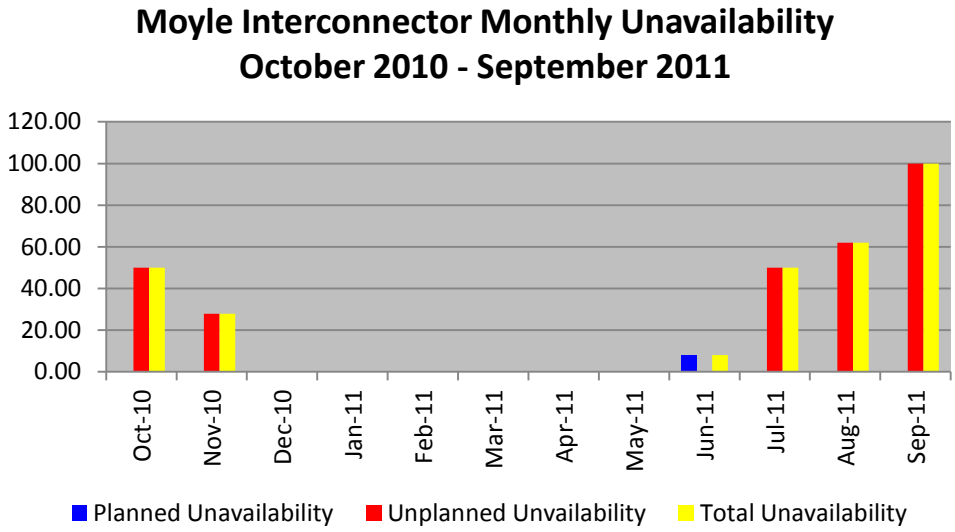
Figure 3.2: Historic Moyle Interconnector Unvailability 2002/03 – 2010/11

Until 2008/09 the average unavailability performance of the interconnector was 1.02%. Minimal outages had resulted in the low unavailability figures. However as can be seen in the graph above there is a sizable increase in the value of percentage Total Unavailability.

The increase in Moyle unavailability for 2010/10 was caused by 3 unplanned outages on the Interconnector. The first being a continuation of a previous outage covered in last year's report. The 2nd and 3rd faults commencing in July with a single circuit outage and during August there was an additional fault on the 2nd underwater cable. The loss of both circuits has caused a complete loss of import/export facility on the Moyle Interconnector. Work is continuing to seek the restoration of Moyle and reconnection will be further reported upon in the Transmission System Performance Report for 2011/12.

3.1.3 MOYLE INTERCONNECTOR MONTHLY UNAVAILABILITY

Figure 3.3 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.



	Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11
Planned	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.03	0.00	0.00	0.00
Unplanned	50.00	27.94	0.00	0.00	0.00	0.00	0.00	0.13	0.00	50.00	61.95	100.00
Total	50.00	27.94	0.00	0.00	0.00	0.00	0.00	0.13	8.03	50.00	61.95	100.00

Figure 3.3: Moyle Interconnector Unavailability 2010/11

Figure 3.3 above clearly shows how the Moyle Interconnector has been affected by the significant increases in the value of unplanned outages. The outage in October/November 2010 was a continuation of the fault that had started in September 2010. The ongoing unplanned outage caused by faults on the underwater cable began in July and has unfortunately continued beyond the period of this report. Repair work is ongoing to seek the complete restoration of Moyle and this will be reported upon in the next Transmission System Performance Report for 2011/12.

3.2 TIE- LINES WITH ROI

3.2.1 275kV TIE LINE

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 (SEM) the circuit is treated as a Tie Line.

Outages are planned between the connected 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

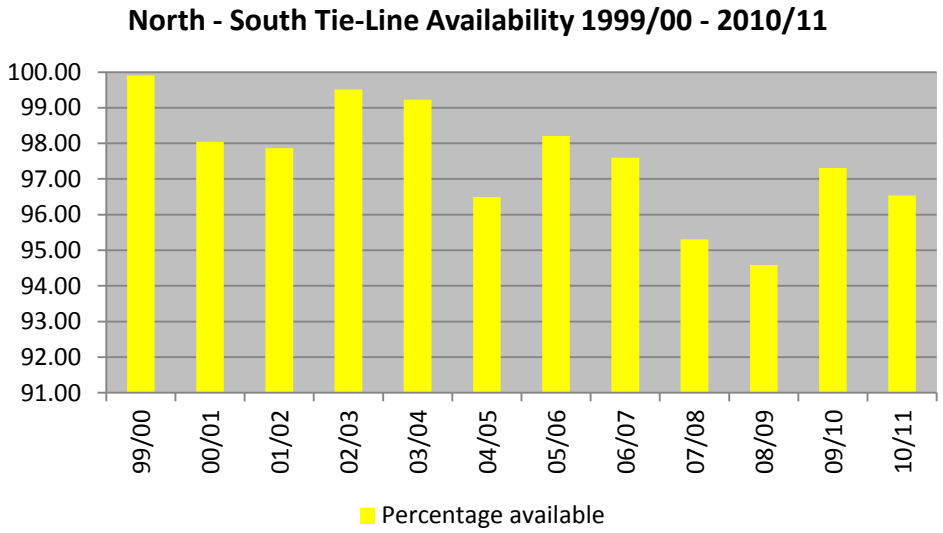
Until 2001, both circuits operated in a standby mode, but were then converted into permanent connections by the deployment of power flow controllers, rated at 125MW. The power flow controllers are normally adjusted to maintain a 0MW transfer, but can be set to any desired value to support either system 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 Strabane – Letterkenny Tie Line is 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 96.54%. Figure 3.4 below shows the annual variation in the availability of the Tie Line from 1999/2000 to 2010/11



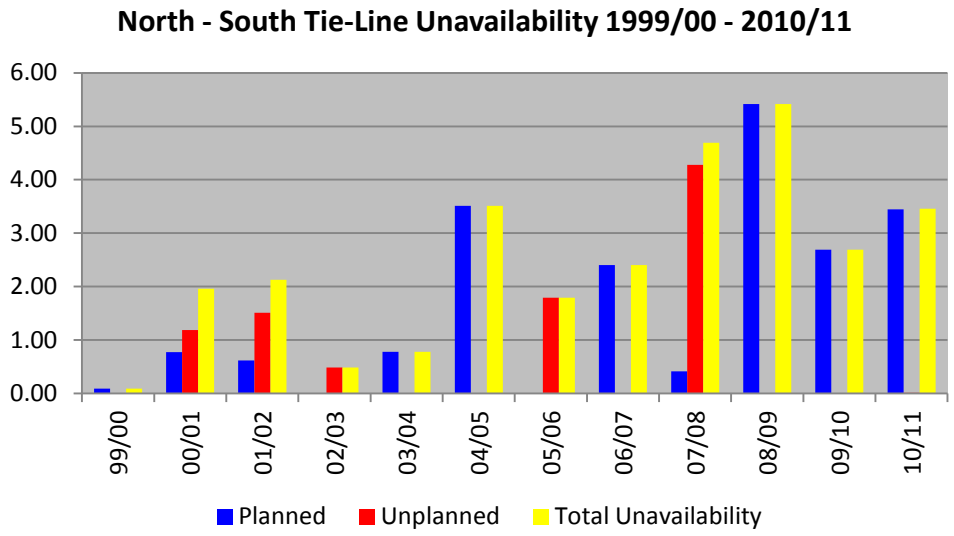
	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11
Availability	99.91	98.04	97.87	99.51	99.22	96.49	98.21	97.60	95.31	94.58	97.31	96.54

Figure 3.4: Historic North-South Tie Line Availability 1999/00 – 2010/11

The 2010/11 availability figure of 96.54% is a slight reduction on last year's report but remains ahead of the record low figure of 2008/09 which was 94.58%. For the third successive year there were no unplanned outages on the North – South tie line. The 12 year average for the 275kV Tie Line is 97.55% and the table above shows that the 2010/11 figure of 96.54% is of a comparable level

3.2.4 275kV NORTH-SOUTH TIE LINE ANNUAL UNAVAILABILITY

Figure 3.5 below shows how the total unavailability for the years 1999/00 to 2010/11 is split between planned and unplanned outages.



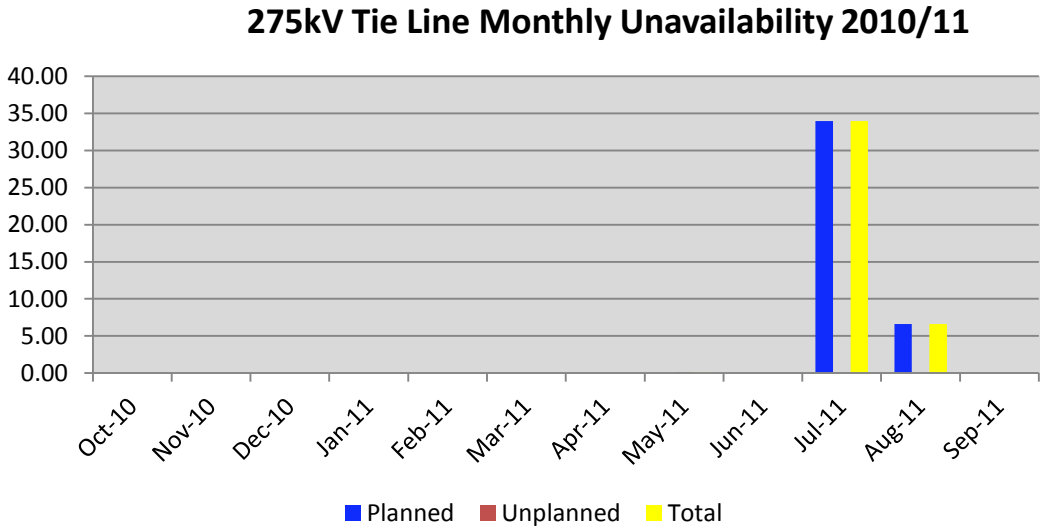
	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11
Planned	0.09	0.77	0.62	0.00	0.78	3.51	0.00	2.40	0.41	5.42	2.69	3.45
Unplanned	0.00	1.18	1.51	0.49	0.00	0.00	1.79	0.00	4.28	0.00	0.00	0.01
Total	0.09	1.96	2.13	0.49	0.78	3.51	1.79	2.40	4.69	5.42	2.69	3.46

Figure 3.5: Historic North-South Tie Line Unavailability 1999/00 – 2010/11

The level of unavailability for the North – South tie line for 2010/11 of 3.46%, although a slight rise on 2009/10, is still 2% lower than the all time high figure of 5.42% for 2008/09. This is a result of the zero value of unplanned outages on the 275kV Tie Line in the past 3 years

3.2.5 275kV NORTH-SOUTH TIE LINE MONTHLY UNAVAILABILITY

Figure 3.6 below shows the month by month variation of unavailability of the North-South Tie Line.



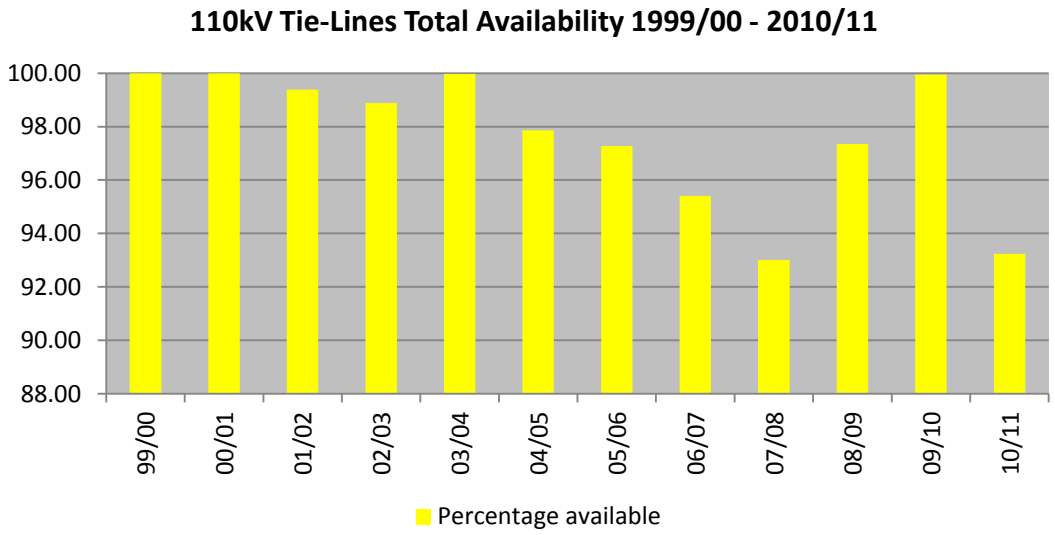
	Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul- 11	Aug-11	Sep-11
Planned	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.97	6.63	0.00
Unplanned	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	33.97	6.63	0.00

Figure 3.6: North-South Tie Line Monthly Unavailability 2010/11

Figure 3.6 highlights that the total percentage unavailability on the 275kV Tie Line for the period October 2010 – September 2011 was due almost entirely to a planned outage carried out in July and August 2011.

3.2.6 110kV TIE LINES ANNUAL AVAILABILITY

The availability of the 110kV Tie Lines was 93.24% for the period October 2010 to September 2011. Figure 3.7 below shows the annual variation in the availability of the Tie Lines from 1999/00 to 2010/11.



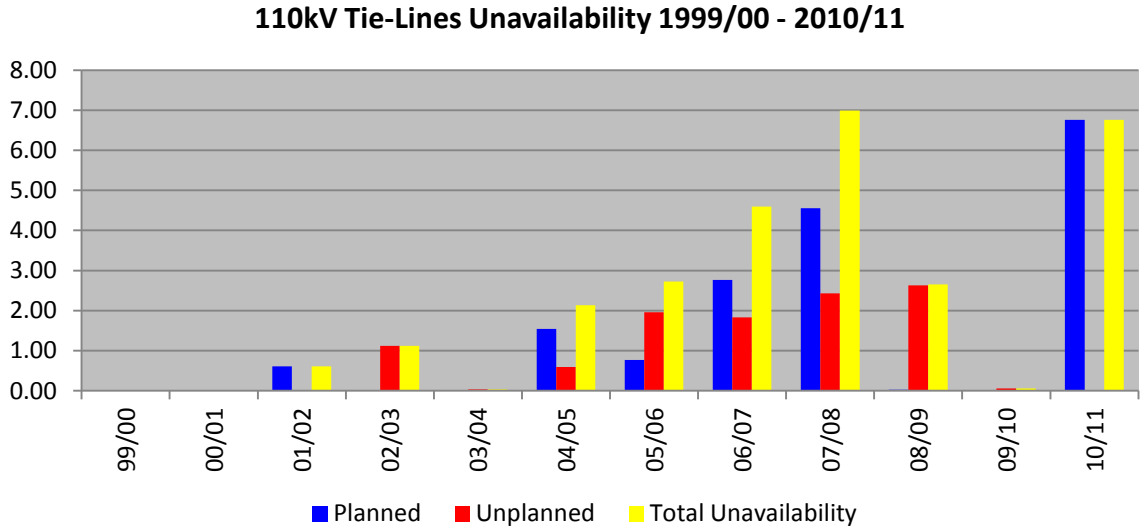
	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11
Availability	100.00	100.00	99.39	98.88	99.97	97.87	97.27	95.41	93.01	97.35	99.94	93.24

Figure 3.7: Historic 110kV Tie Line Availability 1999/00 – 2009/10

The period of this report shows a significant decrease of 6.7% on the previous 2009/10 annual report. This reduction in availability was caused was caused by a series of planned outages carried out between October, December 2010 and March 2011. See section 3.2.8

3.2.7 110kV TIE LINES ANNUAL UNAVAILABILITY

The unavailability of the 110kV Tie Lines was 6.76% for the period October 2010 to September 2011. Figure 3.8 below shows the annual variation in the unavailability of the Tie Lines from 1999/00 – 2009/10.



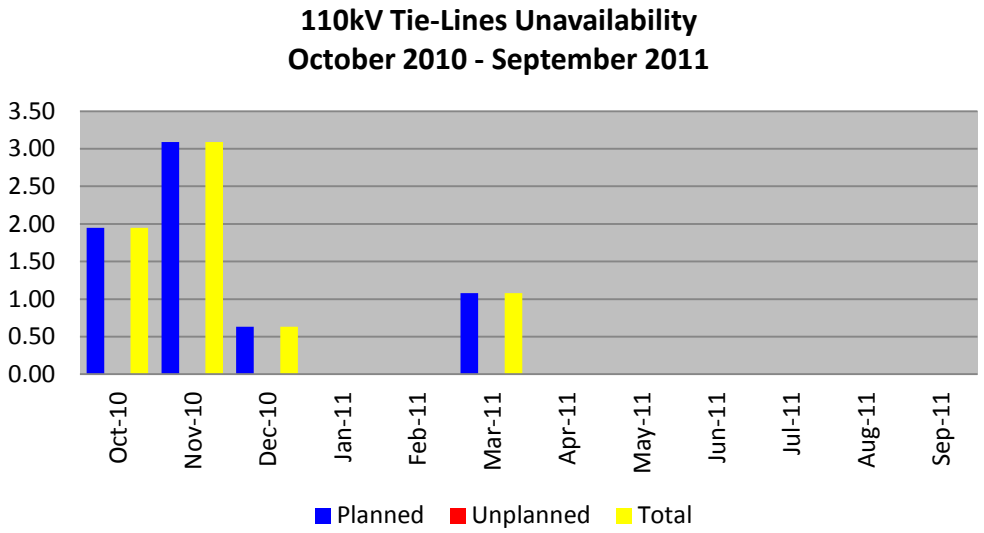
	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11
Planned	0.00	0.00	0.61	0.00	0.00	1.54	0.77	2.76	4.56	0.02	0.00	6.76
Unplanned	0.00	0.00	0.00	1.12	0.03	0.59	1.96	1.83	2.43	2.63	0.06	0.00
Unavailability	0.00	0.00	0.61	1.12	0.03	2.13	2.73	4.59	6.99	2.65	0.06	6.76

Figure 3.8: Historic 110kV Tie Line Unavailability 1999/00 – 2010/11

As can be seen in figure 3.8 above, there is a significant increase in annual percentage unavailability of the 110kV Tie Line. This increase was caused solely by the amount of planned outages carried out during the period of this report.

3.2.8 110kV TIE LINES MONTHLY UNAVAILABILITY

Figure 3.9 below shows the month by month variation of unavailability of the 110kV Tie Lines.



	Oct- 10	Nov-10	Dec-10	Jan -11	Feb -11	Mar-11	Apr-11	May-11	Jun-11	Jul -11	Aug -11	Sep -11
Planned	1.96	3.09	0.63	0.00	0.00	1.08	0.00	0.00	0.00	0.00	0.00	0.00
Unplanned	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	1.96	3.09	0.63	0.00	0.00	1.08	0.00	0.00	0.00	0.00	0.00	0.00

Figure 3.9: 110kV Tie Line Unavailability 2010/11

Figure 3.9 above shows the extent of outages on the 110kV Tie Lines during October 2010 to September 2011. There were no unplanned outages during this period. Planned outages were restricted to October 2010-December 2010 and March 2011

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 three events that resulted in a loss of supply. This number is an increase on the single incident of 2009/10

The unsupplied energy from the Northern Ireland system during 2010/11 was estimated to be 159.52MWh, which despite having more incidents is a decrease on the value of 2009/10.

4.2 INCIDENTS FOR OCTOBER 2010 - SEPTEMBER 2011

Table 4.1 below lists the incidents that are required to be included in this report.

Incident Date, Time and Location	MW Lost	Mins	MWh Unsupplied	Customers affected
05/09/2011 Ballynahinch surrounding area Area around Ballymena (excluding town) Under frequency of load shedding due to trip of generation in NI or RoI	67	15	16.75	57,384
08/07/2011 Dungannon, Pomeroy,Cookstown, Magherafelt,Toome and surrounding areas Lightning strike on 110kV overhead line whilst project and maintenance work being carried out	82	88	120.27	48,859
27/11/2010 Bangor and the Ards peninsula, Lisburn City Under frequency load shedding due to loss of 2 large generating units in RoI	90	15	22.5	69,500

Table 4.1: Transmission System Incidents 2010/11

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

Figure 4.1 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, whist the blue line is the average duration of each incident.

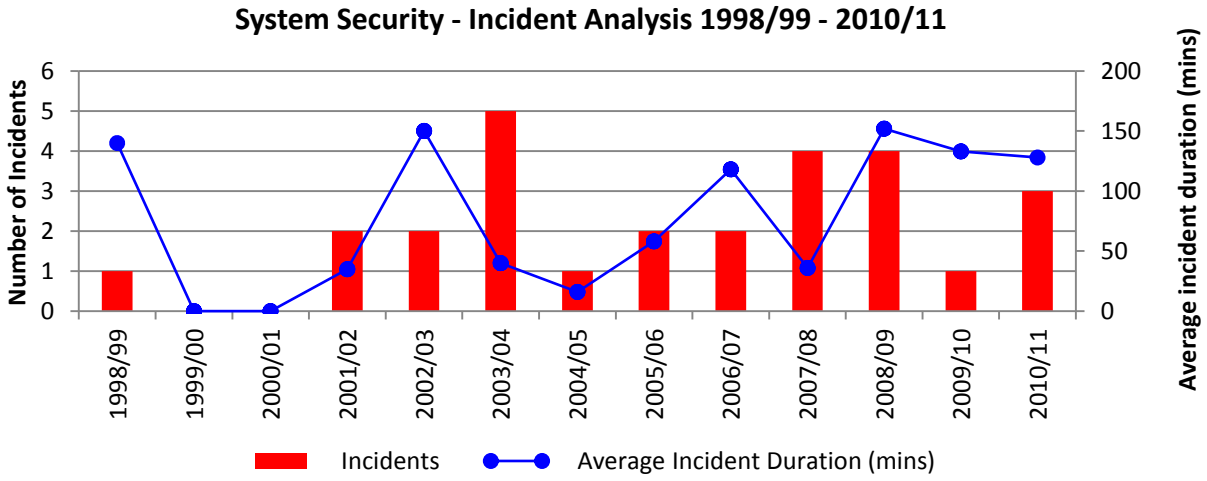


Figure 4.1: Historic System Security 1998/99 – 2010/11

As seen in Figure 4.1 above, the number of incidents has increased to three, from the previous year's single incident. The average incident time however reduced slightly on the previous year.

4.2.2 SYSTEM SECURITY - UNSUPPLIED ENERGY

Figure 4.2 below shows the historic amount of unsupplied energy to Northern Ireland customers. The red bars are the total for each year in MWh and the blue line is the average amount of unsupplied energy per incident.

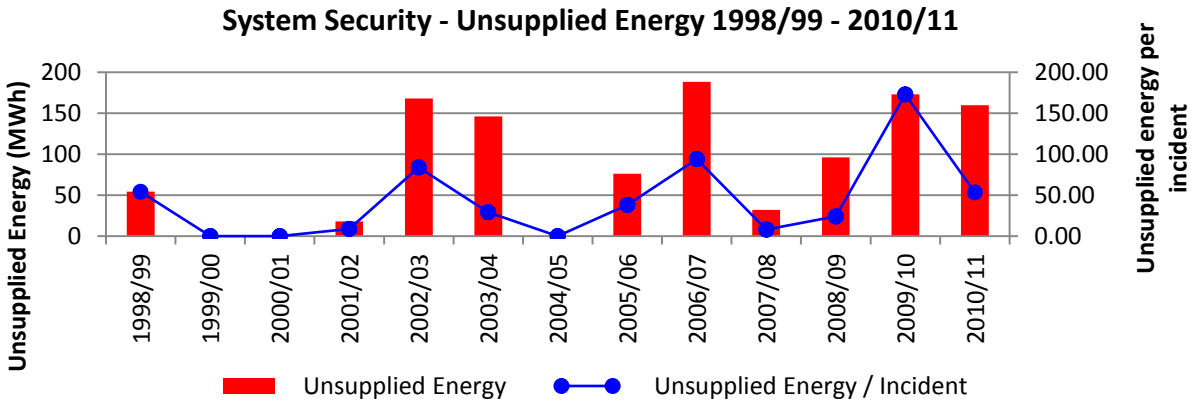


Figure 4.2: Historic Unsupplied Energy 1998/99 – 2010/11

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 10% for voltages of 110 kV and higher (Regulation 31.2B).

SONI must keep the voltage within these limits, apart from under abnormal conditions e.g. a system fault. The Northern Ireland Transmission & Distribution Security and Planning Standards state that the voltage should not vary by more than 6% following a single contingency event.

For the purpose of this report the 6% limit is used.

5.2 VOLTAGE EXCURSIONS

During 2010/11, there were no voltage excursions exceeding these limits and indeed there have not been any since 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 (Regulation 31.2A).

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 previous reports the SONI Grid Code limits are used when reporting excursions.

For the purposes of this report SONI have decided that they will report on any frequency excursions that impact below a 49.6 Hz or greater than 50.5 Hz threshold. This will increase the number of reportable events providing more information. It was felt that this information would be useful in the light of the changing generation plant portfolio and the introduction of Harmonised Ancillary Services agreements with generators on 1 February 2010.

Table 5.1 provides detailed information for each frequency excursion including maximum rate of change of frequency, minimum frequency reached and time below 49.6 Hz.

As both the NI and RoI transmission networks are connected with 275kV and 110kV Tie Lines to form a synchronous network. Poor generation reliability in either jurisdiction will have a negative impact on its neighbour

The individual frequency event graphs appear in Appendix A in this report.

5.4 FREQUENCY EXCURSIONS

In accordance with SONI's decision to report on any frequency excursion in excess of 49.6 Hz, there were 17 reportable frequency excursions during 2009/10. Table 5.1 below details these excursions. If SONI had reported on the normal 49.5 Hz there would only have been 7 reportable incidents.

Cause of Incident	Date	Generator Capacity MW	Pre-incident Frequency Hz	Minimum Frequency - Entire Event Hz	Minimum Frequency - POR Hz	Maximum Rate of Change of Frequency		t< 49.6 Hz (secs)	System Load			Wind			N - S Tie-Line Flow (MW)	Moyle Interconnection Flow (MW)
						Max df/dt Hz/sec	Average df/dt Hz/sec		RoI	NI	Total	RoI	NI	Total		
Whitegate Trip	13/10/2010	445	50.07	49.59	49.62	-0.28	-0.04	1.80	3477.51	1276.56	4754.07	6.26	3.34	9.60	57.35	247.68
Whitegate Trip	27/11/2010	445	49.99	48.85	49.35	-0.28	-0.09	17.00	2870.39	1233.05	4103.44	205.93	66.35	272.28	-84.50	456.66
Coolkeeragh C30	12/12/2010	402	49.96	49.59	49.66	-0.17	-0.03	0.30	3767.85	1317.12	5084.97	554.92	80.92	635.84	-34.26	475.92
Coolkeeragh C30	23/12/2010	402	49.37	49.59	49.76	-0.08	0.00	0.00	4259.16	1516.00	5775.16	111.92	23.31	135.23	-182.16	454.80
Coolkeeragh C30	02/01/2011	402	49.88	49.50	49.72	-0.12	-0.02	1.10	2262.08	811.49	3073.57	45.77	0.29	46.06	-165.01	474.60
Moneypoint	13/01/2011	283	50.05	49.47	49.59	-0.12	-0.04	3.20	4218.05	1534.66	5752.71	273.90	94.77	368.67	82.21	450.86
Dublin Bay	23/01/2011	403	49.98	49.47	49.47	-0.18	-0.07	8.00	3334.81	1091.61	4426.42	66.25	12.78	79.03	-175.33	450.80
Aghada AD2	11/02/2011	432	50.01	49.57	49.62	-0.23	-0.03	2.60	3578.41	1350.27	4928.68	205.87	30.93	236.80	187.06	451.52
Dublin Bay	22/02/2011	403	49.93	49.50	49.75	-0.02	0.00	0.00	3521.34	1305.54	4826.88	118.58	61.77	180.35	77.60	149.46
Moyle	25/05/2011	450	50.02	49.23	49.23	-0.28	-0.10	20.20	3486.01	1151.65	4637.66	937.39	236.63	1174.02	-340.29	413.00
Dublin Bay	25/05/2011	403	50.02	49.44	49.46	-0.29	-0.07	11.30	3367.97	1147.71	4515.68	648.66	134.99	783.65	-289.57	411.00
Coolkeeragh C30	28/05/2011	402	49.95	49.85	49.55	-0.13	-0.05	4.30	2448.17	685.48	3133.65	658.27	158.84	817.11	-120.43	100.06
Coolkeeragh C30	01/06/2011	402	49.95	49.45	49.61	-0.23	-0.04	2.10	2519.96	859.97	3379.93	689.49	74.37	763.86	-244.91	386.14
Dublin Bay	14/07/2011	403	49.98	49.56	49.59	-0.21	-0.04	3.70	2010.79	589.49	2600.28	45.45	29.16	74.61	17.16	63.00
Moneypoint	12/08/2011	283	50.02	49.47	49.47	-0.19	-0.06	8.60	3329.28	1123.90	4453.18	475.07	164.19	639.26	-51.63	249.66
Dublin Bay	13/08/2011	403	49.93	49.47	49.49	-0.23	-0.06	7.80	1898.46	613.99	2512.45	386.20	111.57	497.77	-37.49	34.34
Whitegate Trip	05/09/2011	445	50.07	49.4	49.40	-0.31	-0.08	8.8	2997.95	968.72	3966.67	216.84	2.84	219.68	75.42	0.00

Table 5.1: Frequency Excursions in NI in 2010/11

- **Note 1: NS and Interconnection flows, VE+ represents an import to Northern Ireland**
- **Note 2: The System Load figures are in generated metered sent out terms**

Event Definitions.

Time 0 seconds	-	Considered to be when the frequency falls through 49.8 Hz
Pre Incident frequency	-	Average system frequency between t - 60seconds and t -30 seconds
Minimum Frequency (Entire Event)	-	Minimum system frequency from t 0 to t + 6 minutes
Minimum Frequency (POR)	-	Minimum frequency during POR period from t + 5 seconds to t + 15 seconds
Maximum Rate of Change of Frequency	-	Maximum negative rate of change of frequency during the period t – 5 seconds to t + 30 seconds (This is calculated from a five point moving average with a sample rate of 100 milliseconds)
Average Rate of Change of Frequency	-	This is the rate of change of frequency observed between two points in time. The first point being when the frequency passes through 49.8 Hz and the second when the frequency nadir is observed between t + 5 seconds and t + 15 sceonds (See HAS agreement)

5.4.1 ANNUAL FREQUENCY EXCURSIONS

Figure 5.1 below shows the number of frequency excursions from 1998/99 to 2010/11. The significant increase to 29 incidents is due the decision to change the criteria for reporting frequency excursions to any incident under 49.6 Hz. To compare against previous years criteria of only including frequency excursions below 49.5Hz, there would have been 12 incidents in the 2010/11 period.

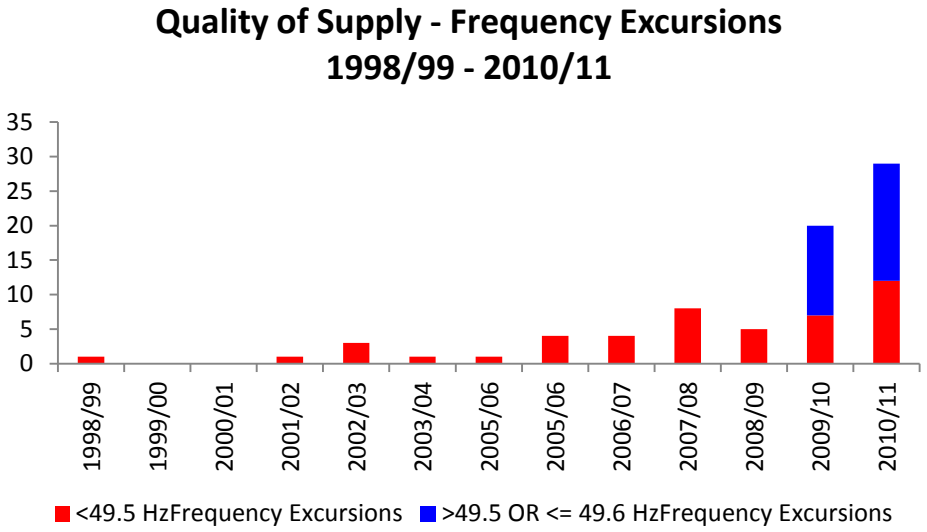


Figure 5.1: Historic Frequency Excursions 1998/99 – 2010/11

In recent years, a number of large combined cycle gas turbine (CCGT) units have been commissioned on the island of Ireland. 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, there is an increased possibility that frequency excursions will occur. However, during 2010/11 there were no incidents where the Electricity Supply Regulations (Northern Ireland) 1991 statutory limit of 2.5% was exceeded, and no customer disconnections occurred. It should be noted that, during 2009/10, two new CCGTs were commissioned in the Republic of Ireland - at Aghada and Whitegate. The required testing of these new machines led to a number of frequency excursions in Northern Ireland, as demonstrated in last year's report, trips of both Aghada and Whitegate made up just over 50% of all incidents.

6 CONCLUSIONS

- The annual system availability has fallen slightly when compared with the 97.67% figure in the previous report for 2009/10.

- The considerable reduction of availability in 2010/11 on the Moyle Interconnector was caused by 3 significant unplanned outages. The first being the fault that occurred in September 2010 and continued into the first month of this report. The Moyle availability value was further affected by the ongoing cable faults that first occurred in June 2011 and have continued beyond the period of this report. SONI have requested that Northern Ireland Energy Holdings produce a report on the cable failures following repair and recovery of the faulty sections.

- The 2010/11 availability figure of 96.54% for the 275kV tie-line is a slight reduction on last year's report but remains ahead of the record low figure of 2008/09 which was 94.58%. This was due to planned refurbishment.

- There is a significant increase in annual percentage unavailability of the 110kV Tie Line. This increase was caused solely by the amount of planned outages carried out during the period of this report.

- Of the three incidents which caused interruption of supplies to customers, two were caused by trips of two generating units in quick succession when it is normal to carry sufficient reserve for the loss of one unit.

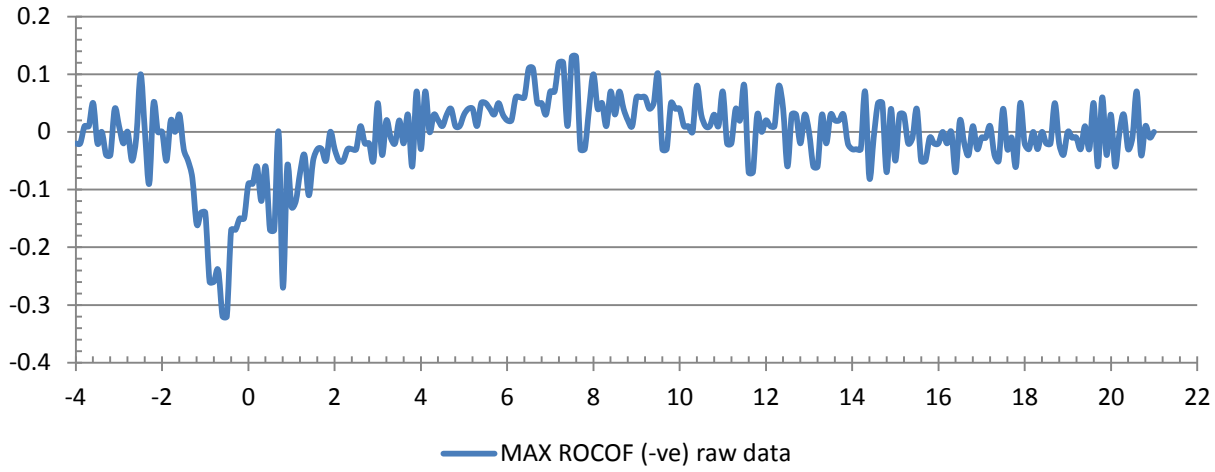
- The number of frequency excursions below 49.6Hz remained high due to commissioning tests on new generating units.

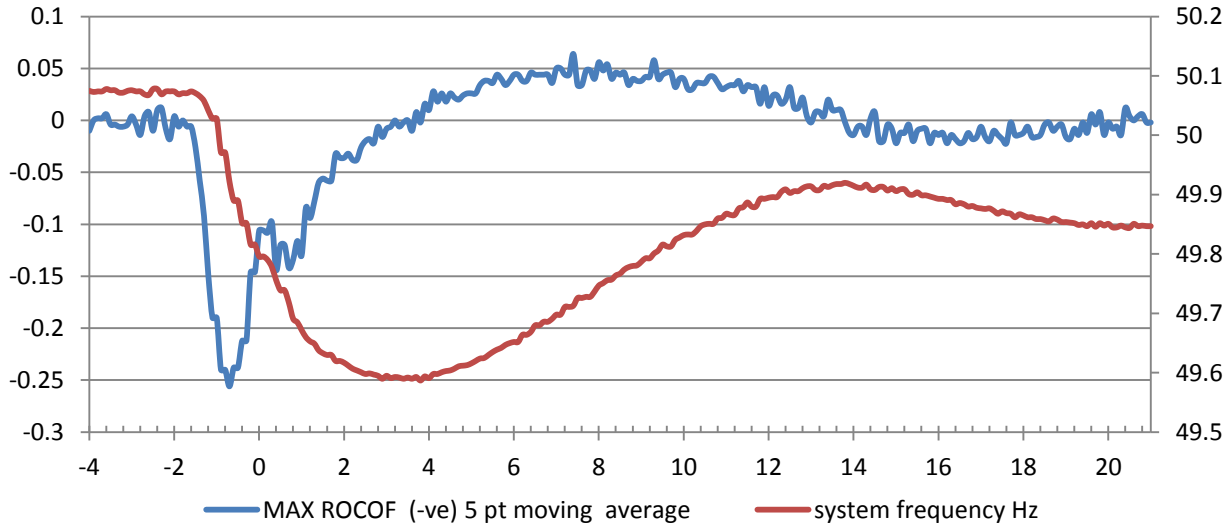
APPENDIX A FREQUENCY EXCURSION GRAPHS

The following is a list of graphs contained in this section.

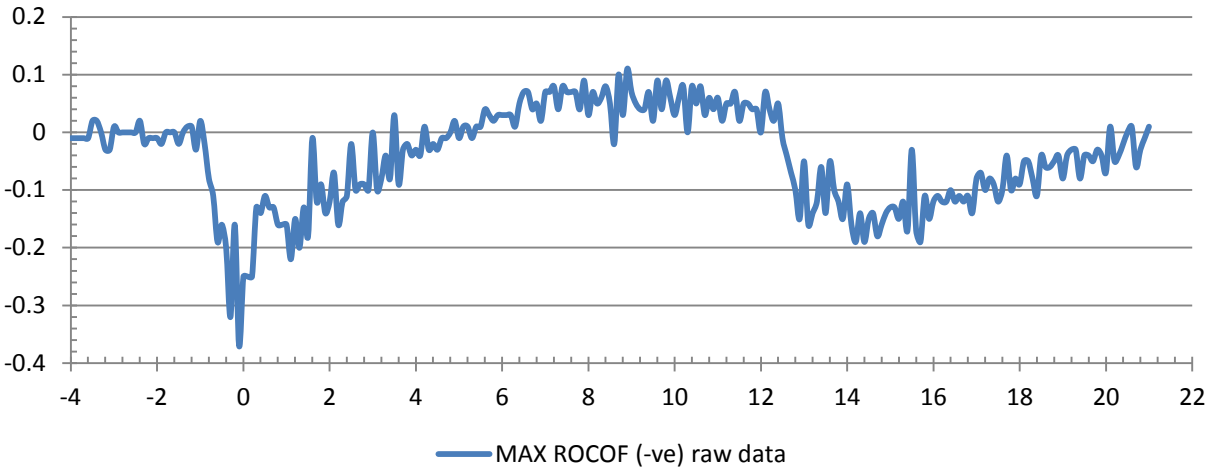
N.B. On all the following graphs the term ROCOF means Rate of Change of Frequency

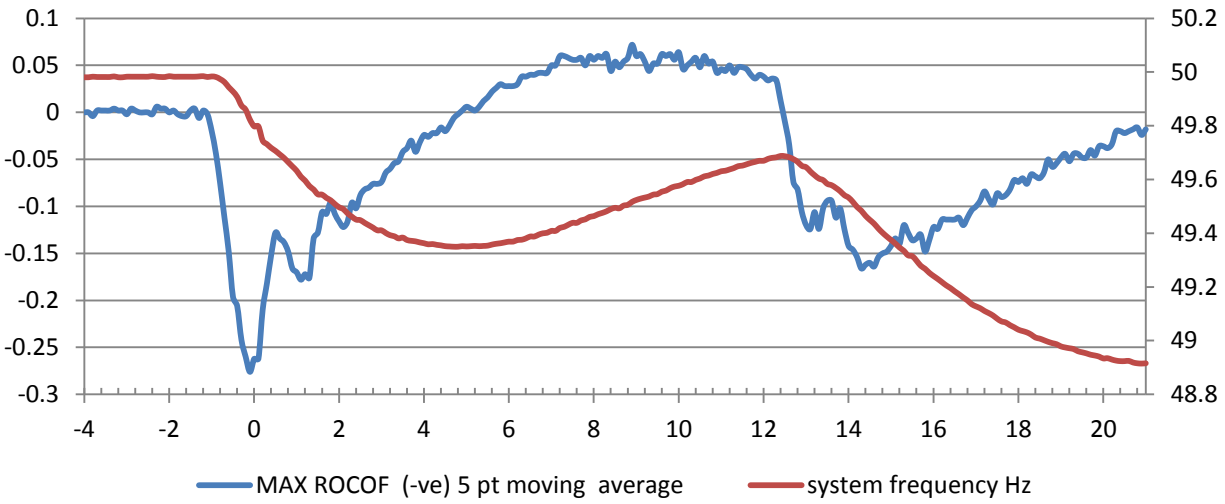
Whitegate 13/10/2010



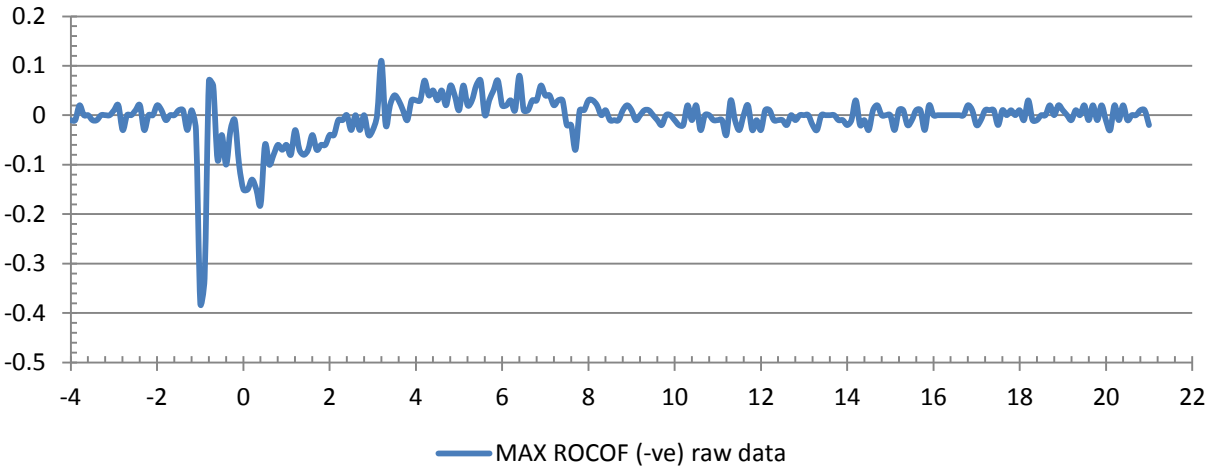


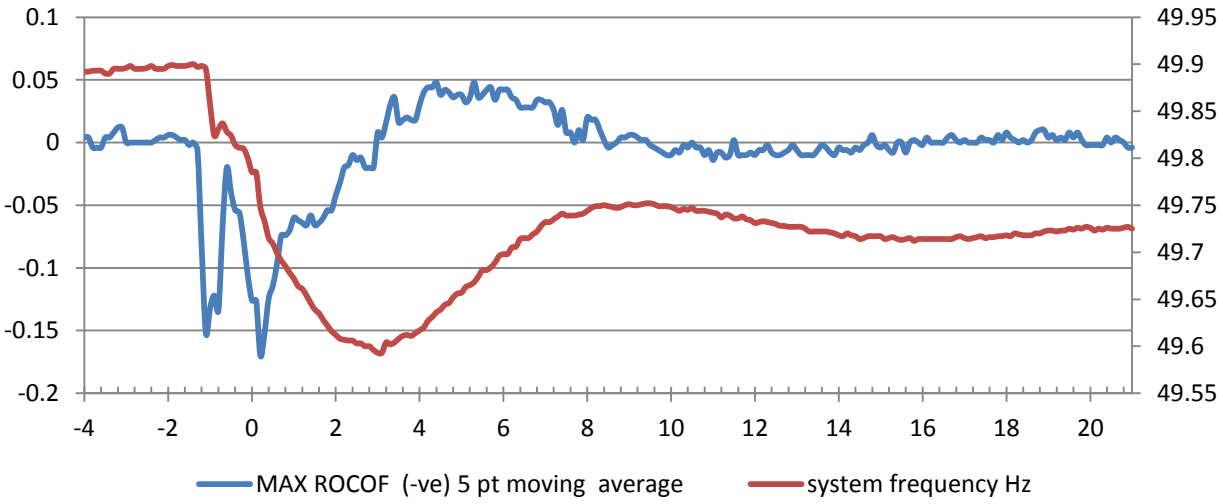
Whitegate 27/11/2010



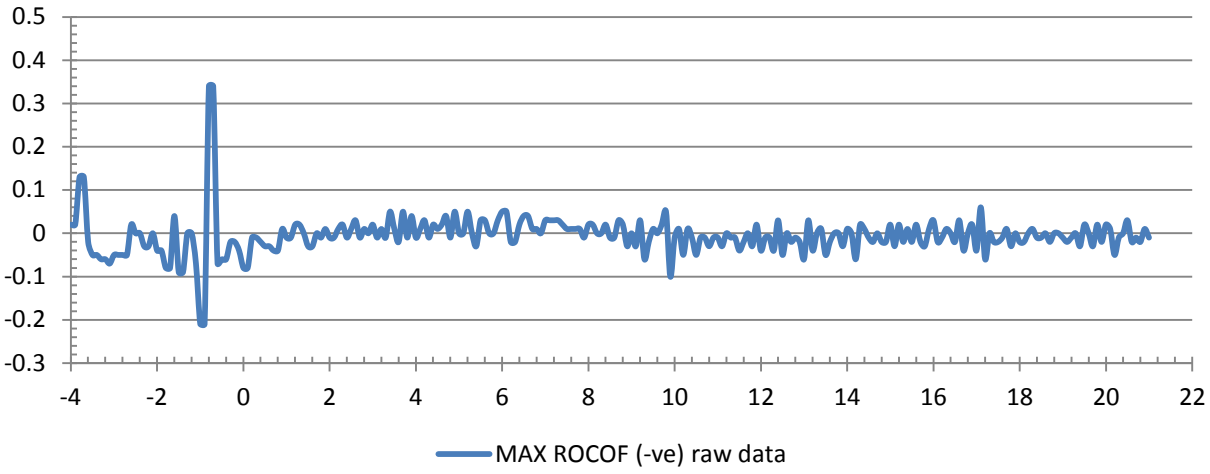


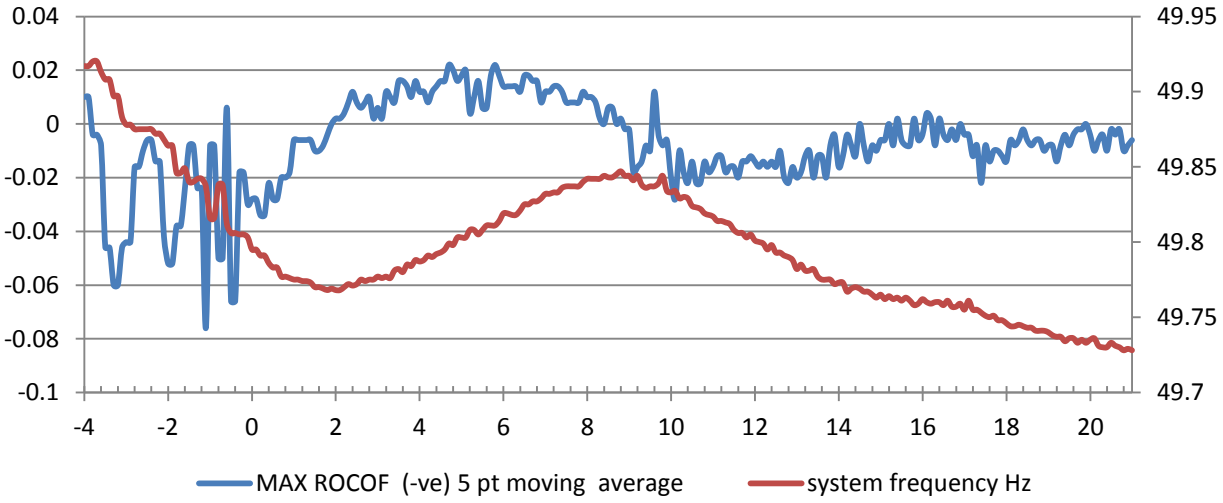
Coolkeeragh C30 12/12/2010



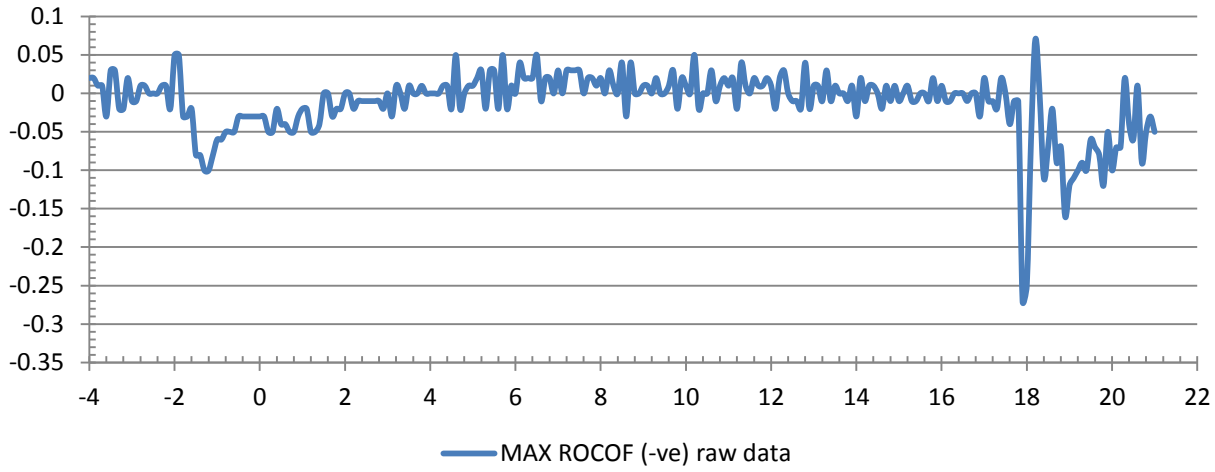


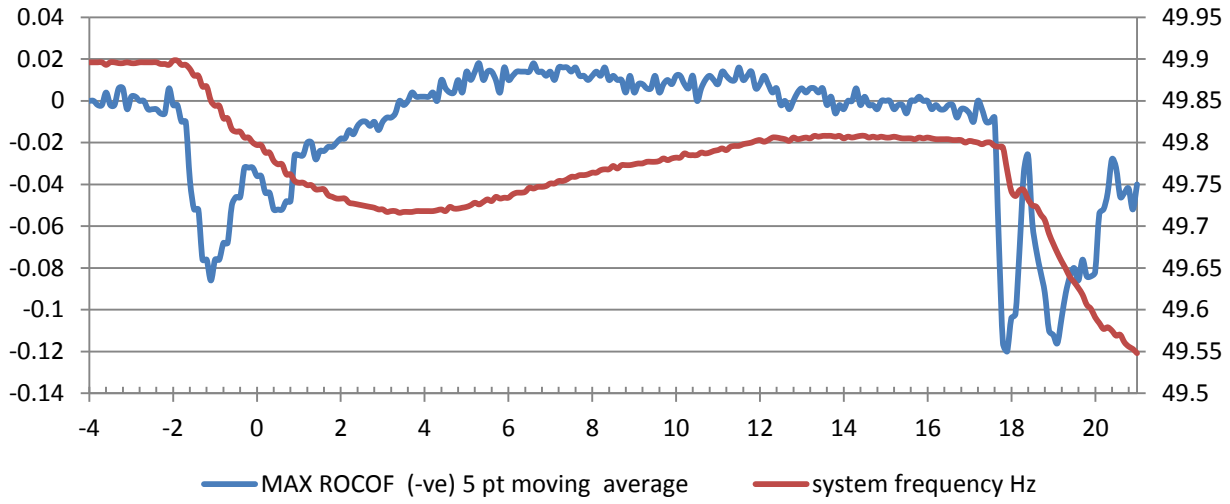
Coolkeeragh C30 23/12/2010



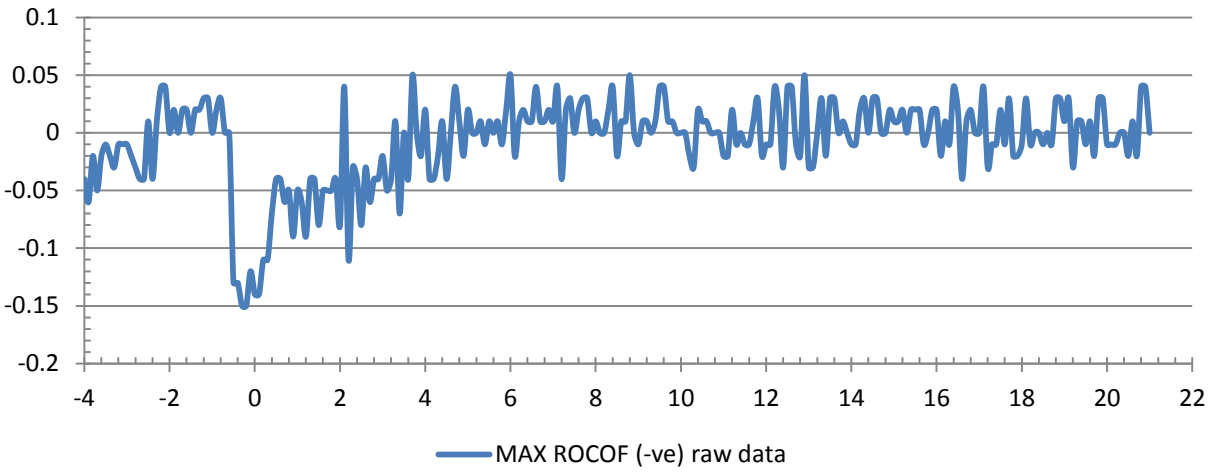


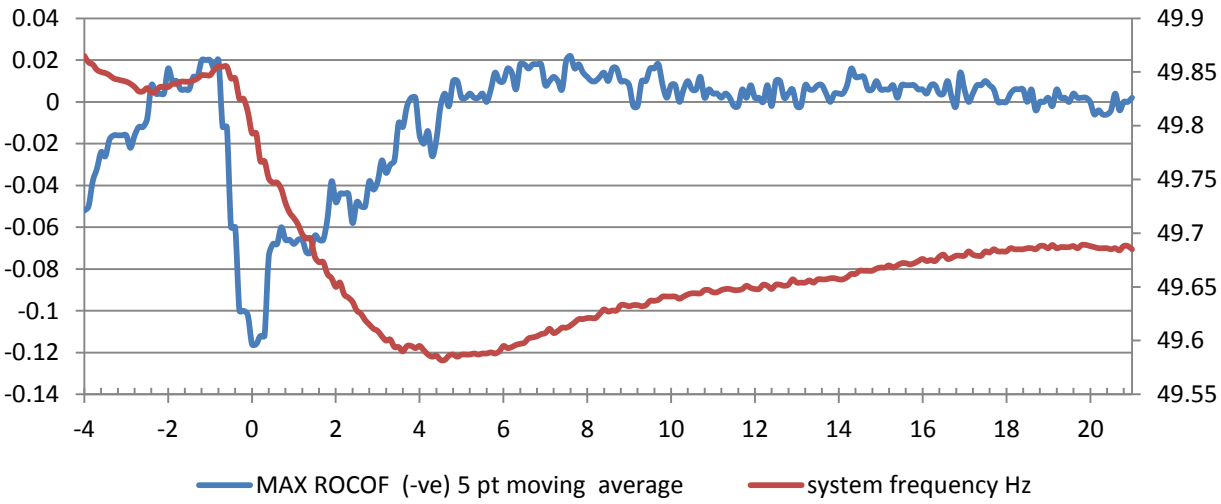
Coolkeeragh C30 02/01/2011



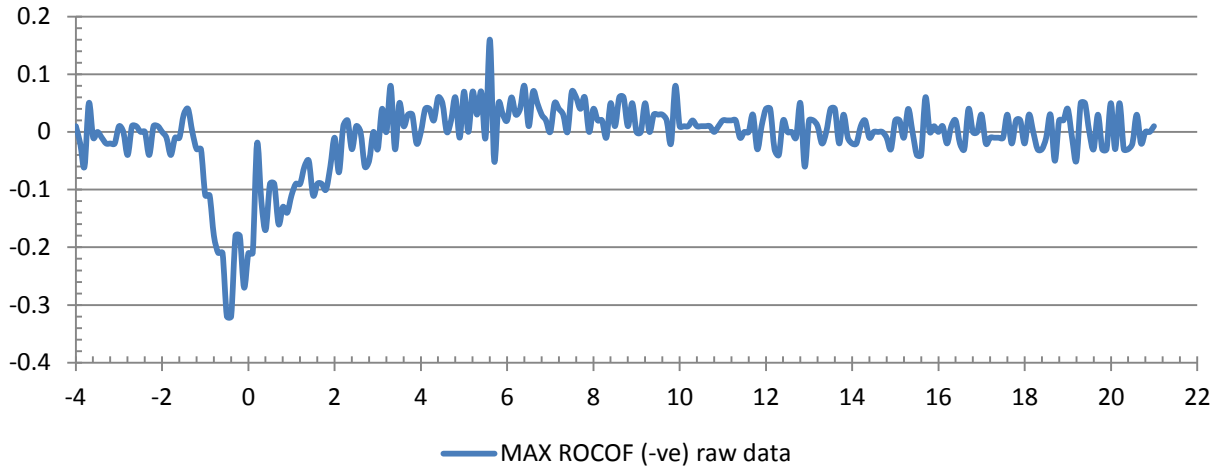


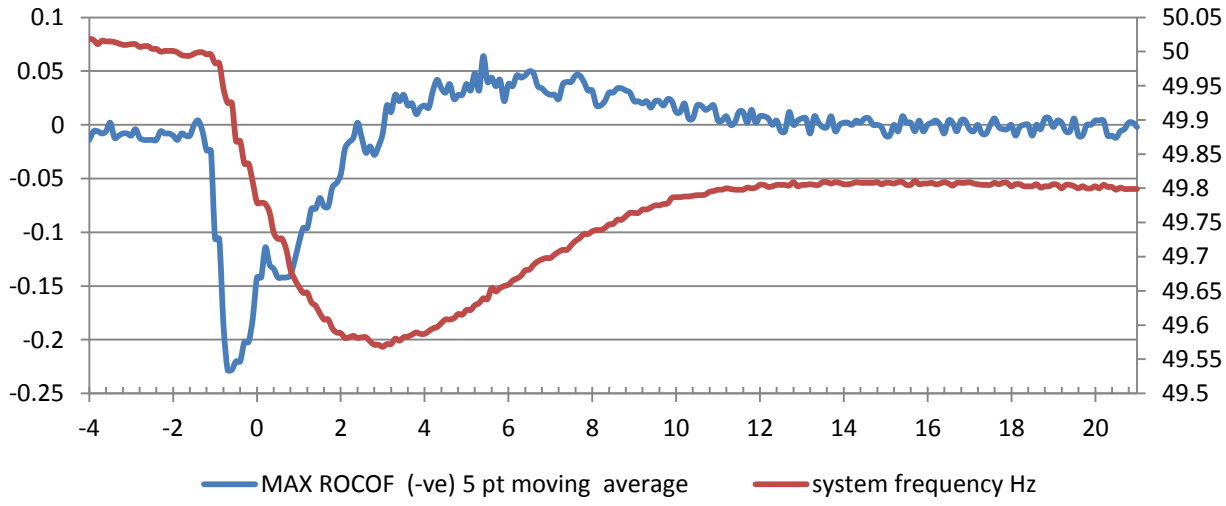
Moneypoint Unit 2 13/01/2011



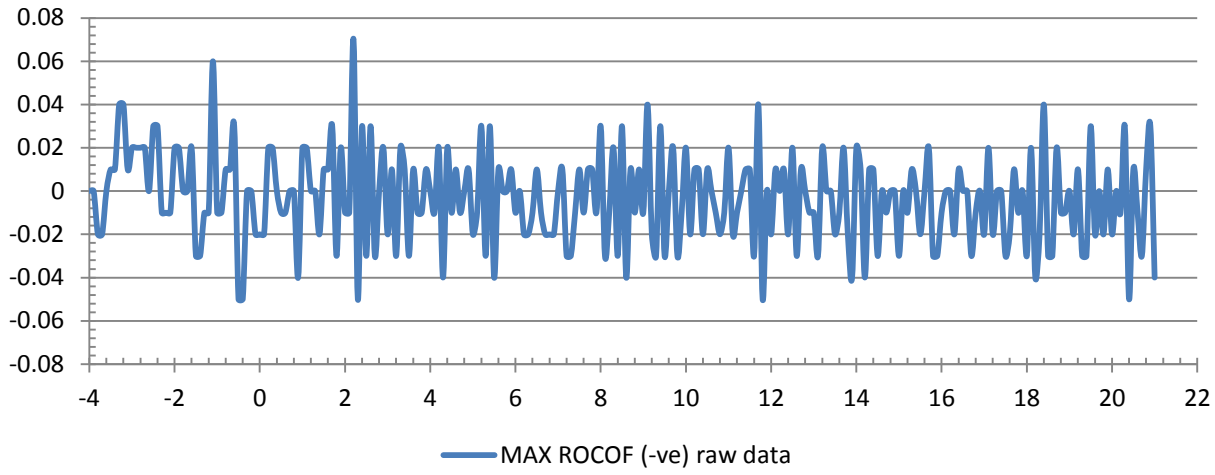


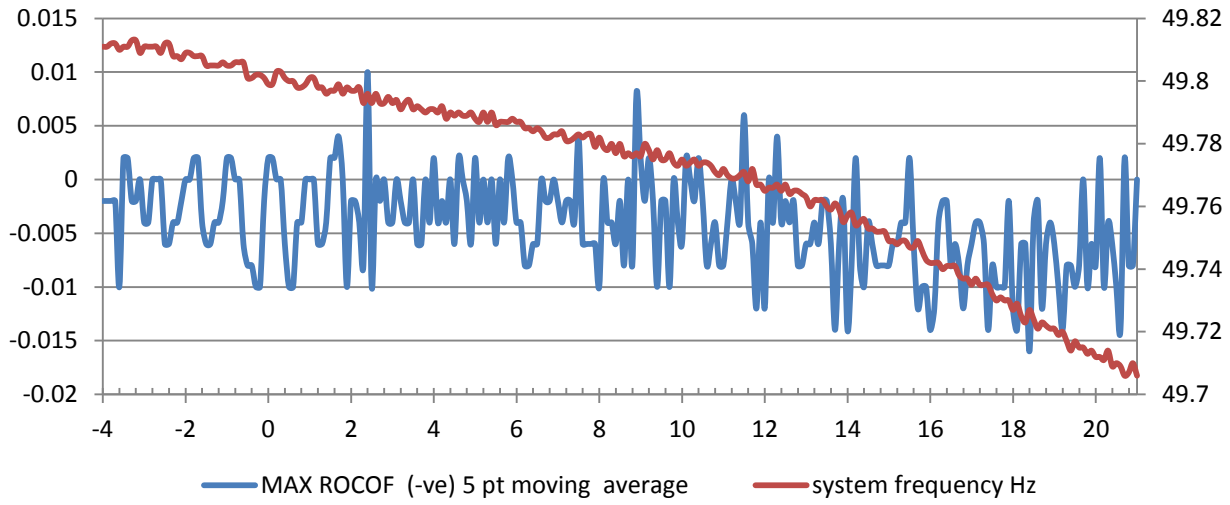
Aghada Unit 2 11/02/2011



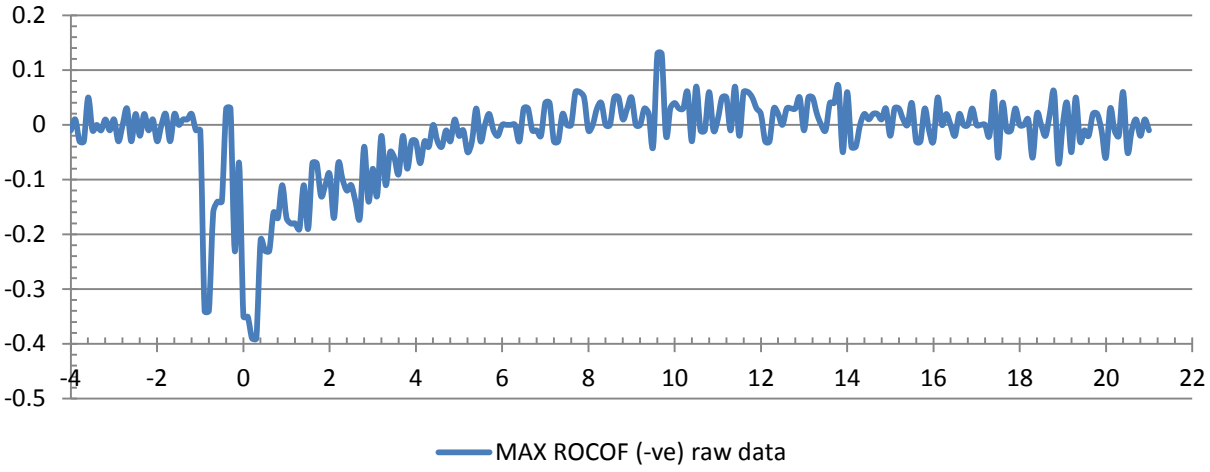


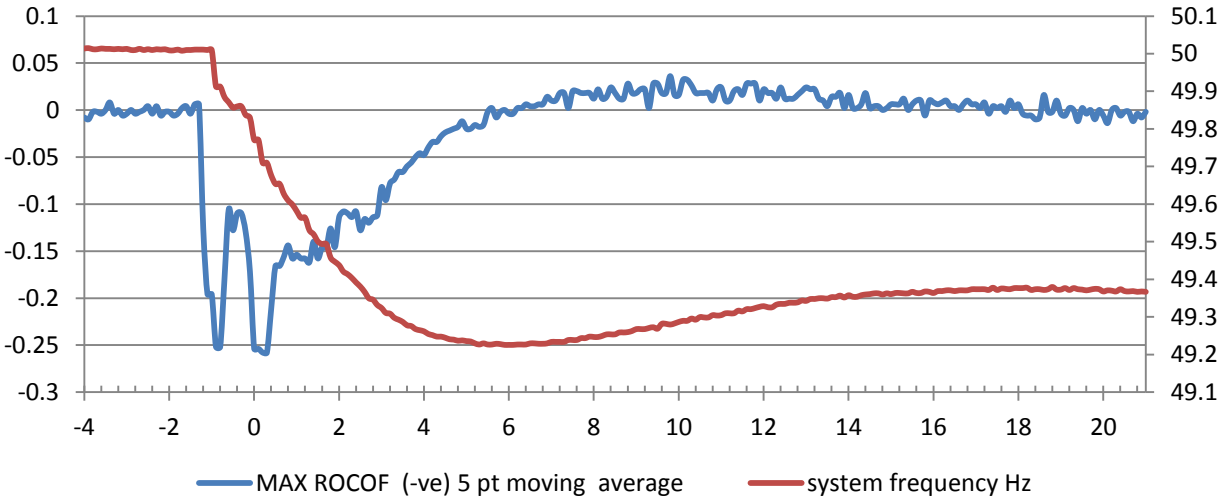
Dublin Bay 22/02/2012



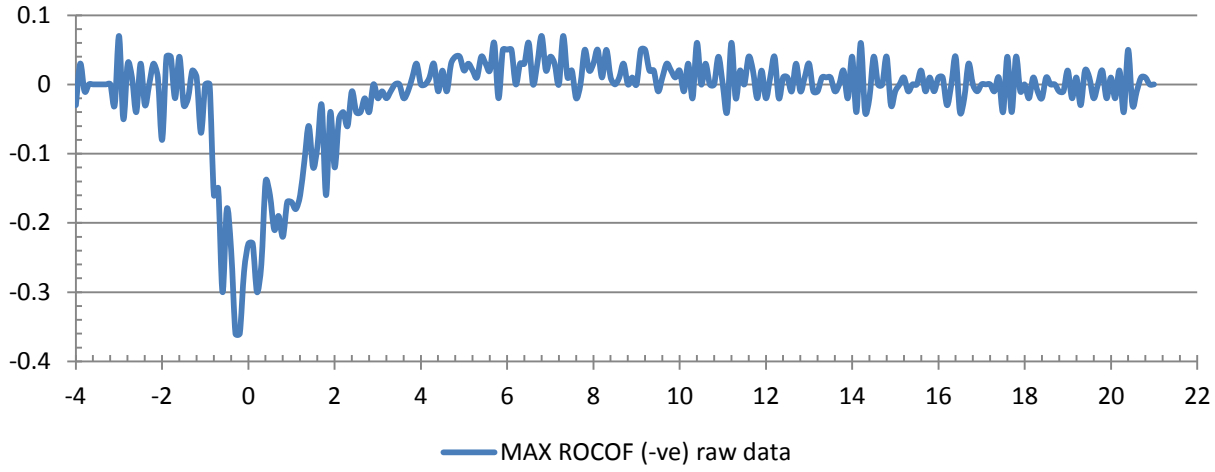


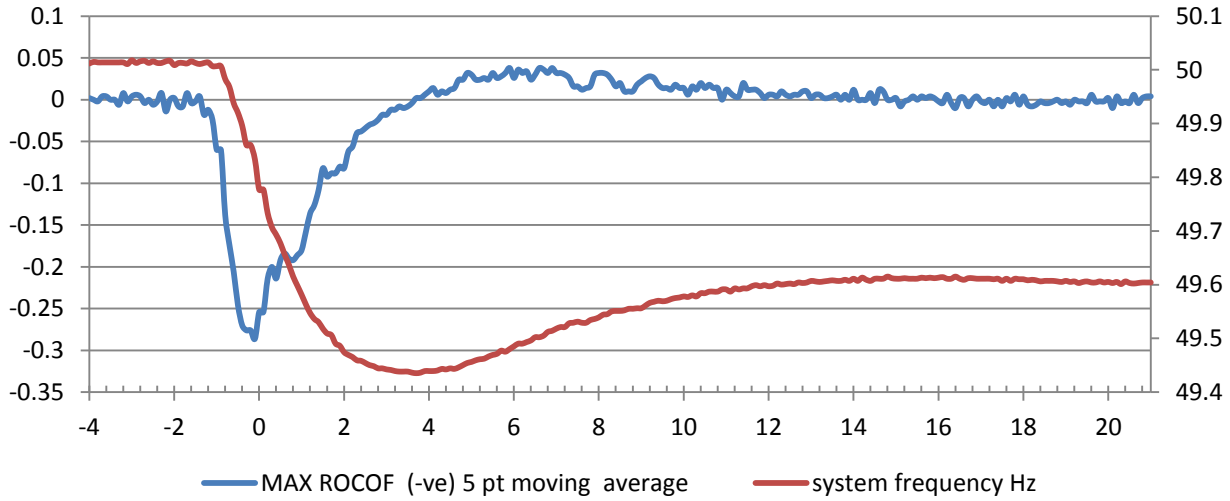
Moyle 25/05/2011



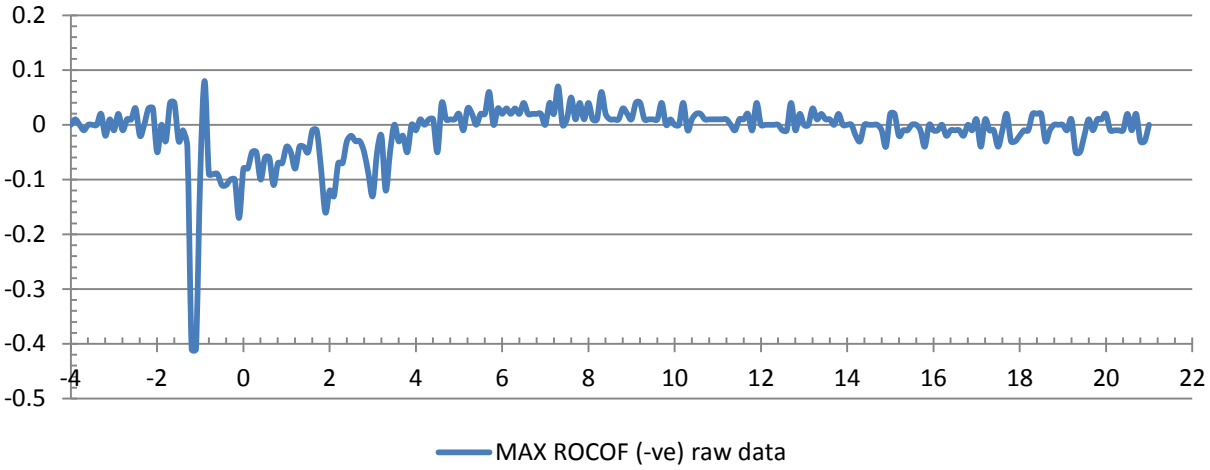


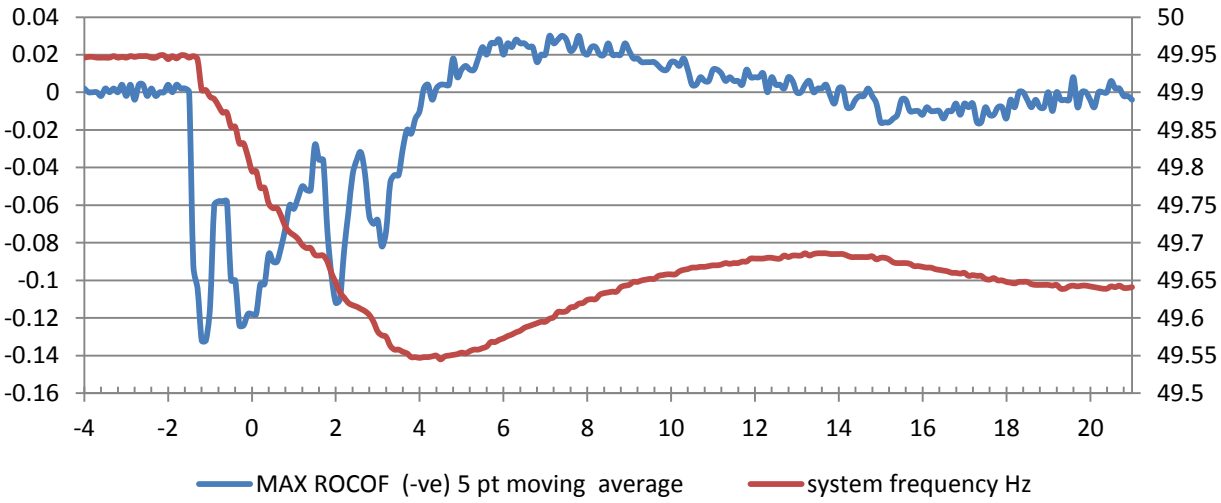
Dublin Bay 25/5/2011



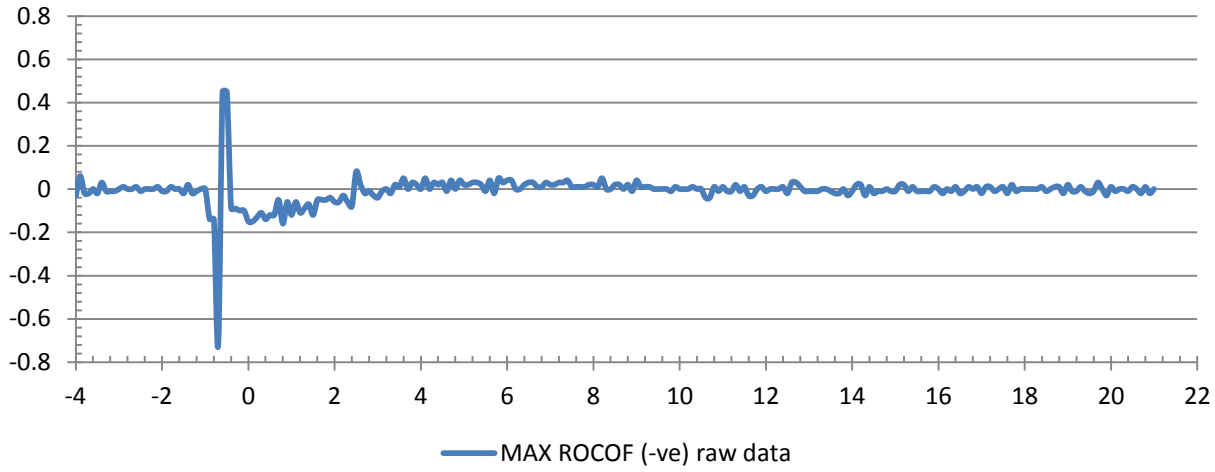


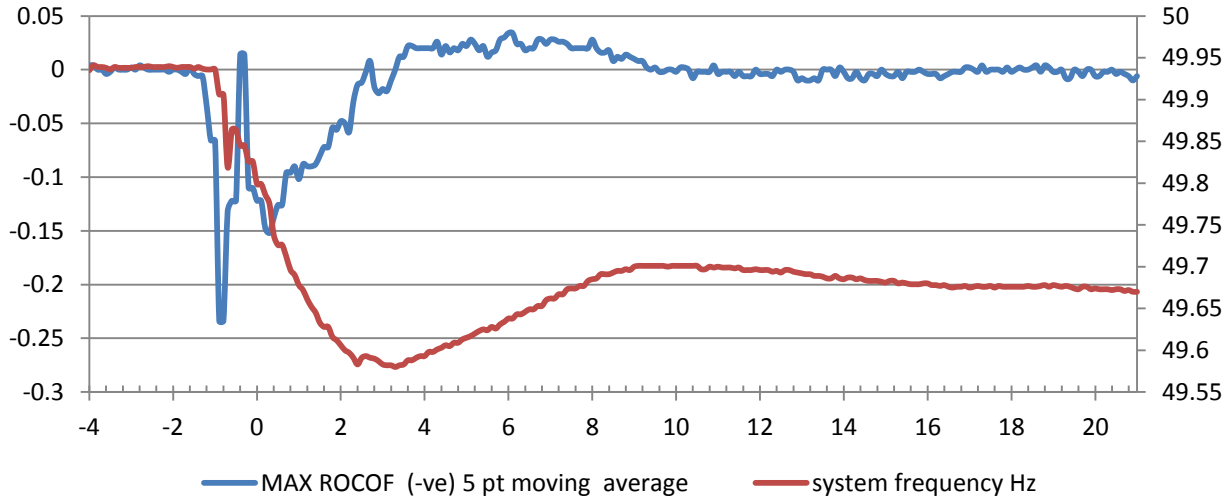
Coolkeeragh C30 28/5/2011



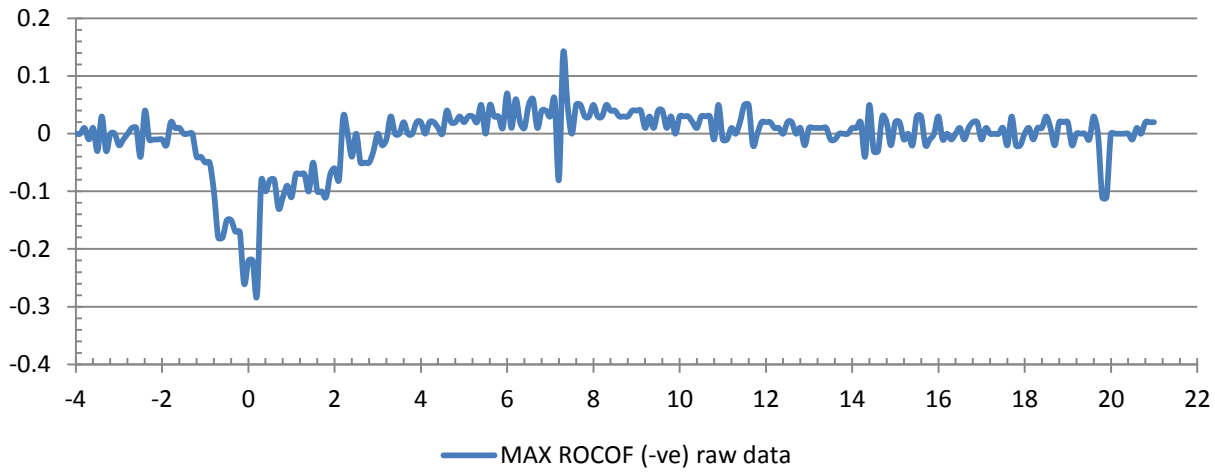


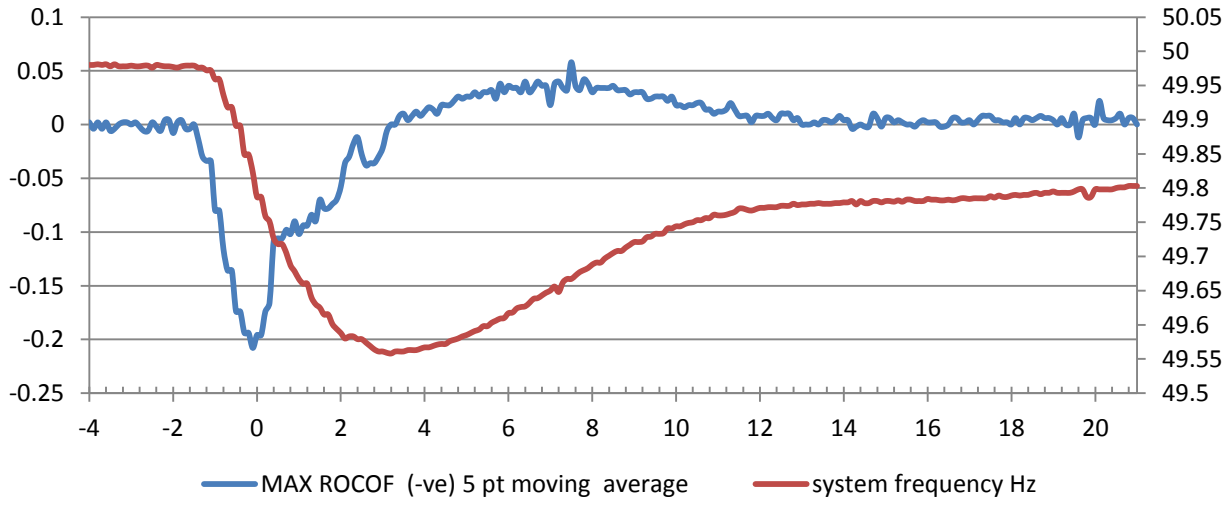
Coolkeeragh C30 11/6/2011



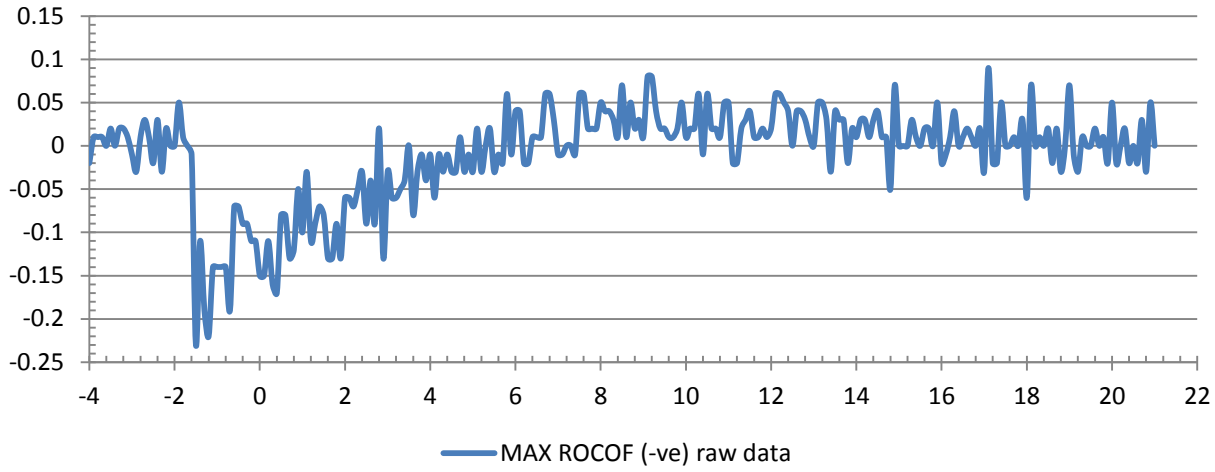


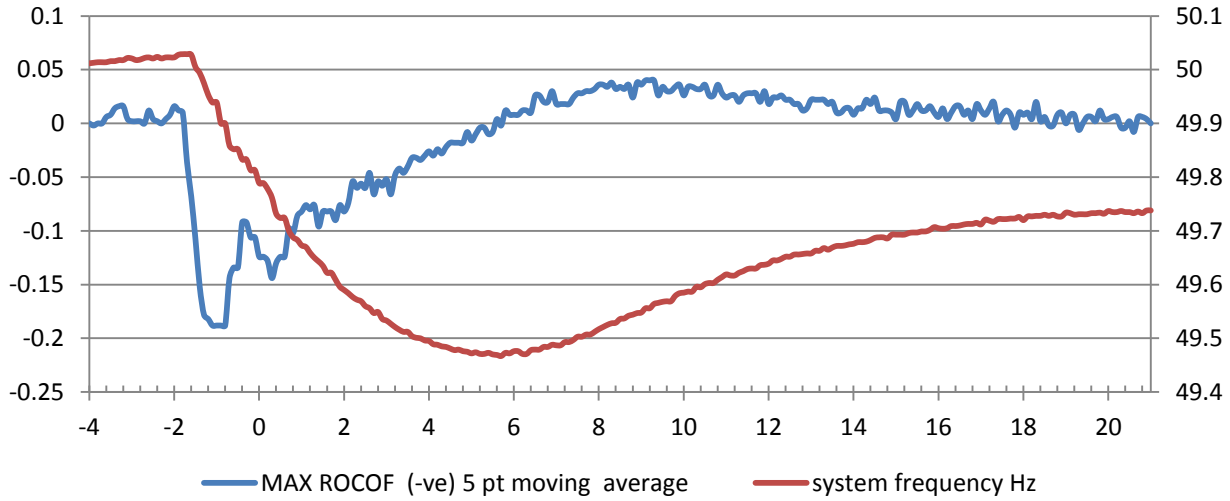
Dublin Bay 14/7/2011



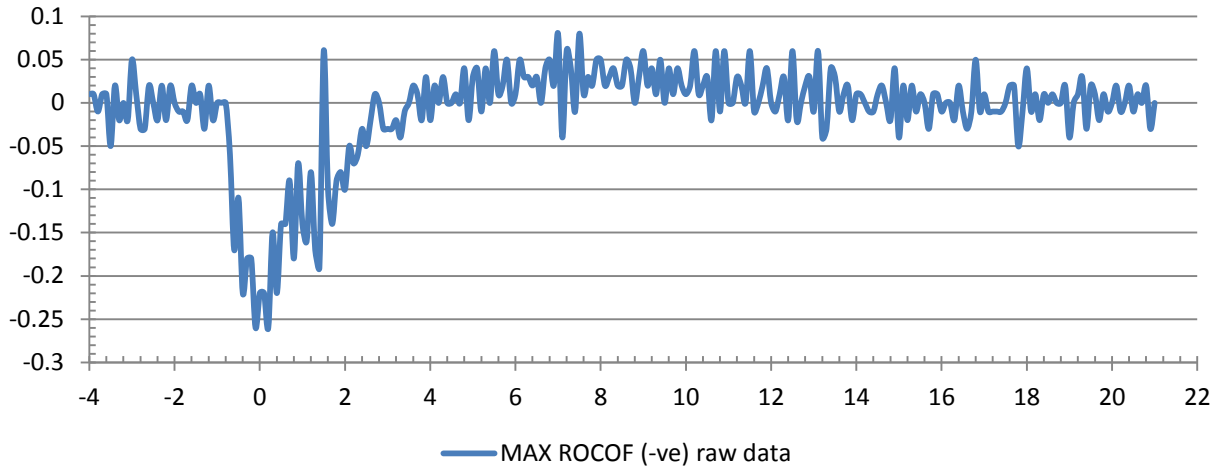


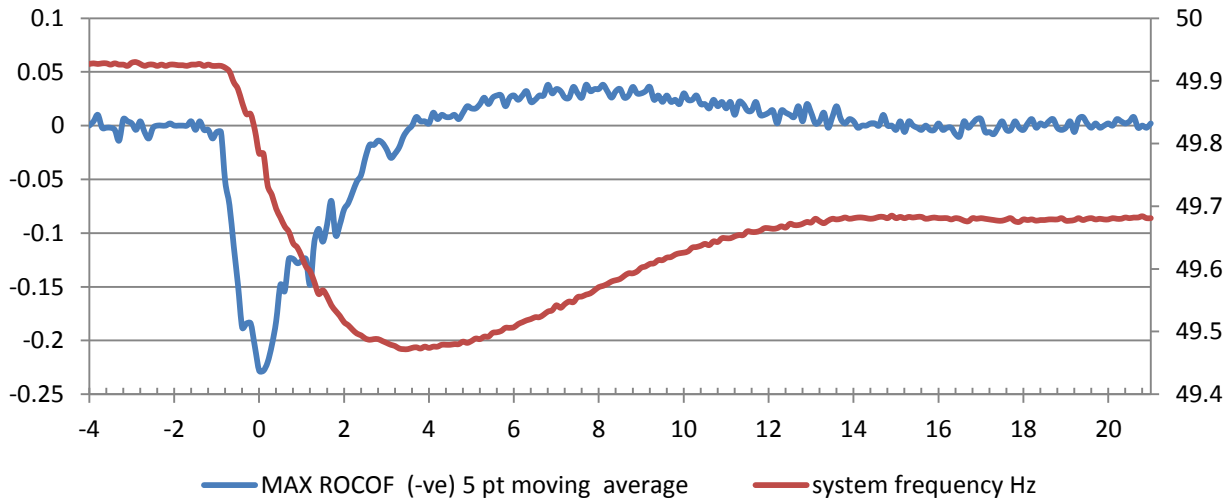
Moneypoint Unit 2 12/8/2011





Dublin Bay 13/8/2011





Whitegate 5/9/2011