

## Quality of Service Incentive Scheme – Exceptional Events

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Appointed Examiner's Report	
Reporting year	2011/12
DNO	Northern Powergrid – Yorkshire Licensed Area
Cause	Failure of two 33kV surge diverters and a 33kV busbar fault
Date of event	24 June 2011

**Submitted to:**

Ofgem and  
Northern Powergrid

**Submitted by:**

British Power International

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March 2012

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## Document Status

Title: Exceptional Events Report – Northern Powergrid (Yorkshire) – failure of two 33kV surge diverters and a 33kV busbar fault – 24 June 2011

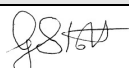
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## Authorisation

Name	Position	Signed	Date
Geoff Stott	Project Manager		25 March 2012

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## Glossary

AE	Appointed Examiner
BPI	British Power International
CB	Circuit-breaker
CI	Customer Interruptions per 100 connected customers
CML	Customer Minutes Lost per connected customer
DAR	Delayed Auto-reclose
DNO	Distribution Network Operator
EHV	Extra High Voltage – all voltages above 20kV up to but excluding 132kV
HV	High Voltage – all voltages above 1kV up to and including 20kV
NPG	Northern Powergrid
QoS	Quality of Service
RIGs	Regulatory Instructions and Guidance
SCADA	System Control and Data Acquisition
SLD	Single Line Diagram
SoF	Statement of Facts
ToR	Terms of Reference

### Notes:

Within this document:

1. The term “higher voltage” is used to indicate all voltages greater than 1kV.
2. The calculations of CI and CML within this document are adapted from the annual calculations contained in the RIGs to reflect the CI and CML generated by the actual incidents being audited. They are as follows:

CI: the number of interruptions to supply – the number of customers interrupted per 100 connected customers generated by the incidents being audited. It is calculated as:

$$CI = \frac{\text{The sum of the number of customers interrupted for incidents being audited} * 100}{\text{The total number of connected customers}}$$

CML: the duration of interruptions to supply – the number of customers interrupted per connected customer generated by the incidents being audited. It is calculated as:

$$CML = \frac{\text{The sum of the customer minutes lost for all restoration stages for incidents being audited}}{\text{The total number of connected customers}}$$

In both the formulae above, the total number of connected customers is as declared as at 30 September during the relevant reporting year. Any claims that occur and are audited prior to 30 September in the reporting year during which they occur will be audited using the total number of customers declared at 30 September in the previous reporting year.

## Summary

Ofgem has appointed British Power International (the Appointed Examiner) to audit the submission made by Northern Powergrid under the “one-off” exceptional event mechanism that the failure of two 33kV surge diverters and a 33kV busbar fault at its Doncaster Central 132/33kV Grid Substation on Friday, 24 June 2011 materially and adversely affected reported performance for its Yorkshire distribution licensed area for the reporting year 2011/12.

The Appointed Examiner (AE) has visited Northern Powergrid to audit the claim against part 1 of the “one-off” exceptional event process and finds that it passes the exceptionality threshold in terms of both CI and CML.

The AE concludes that the event falls within the category of an “other event” as defined in paragraph 8.57 of Special Licence Condition CRC 8, including meeting the exceptionality requirements set out in Appendix 3 thereof.

The AE therefore proceeded to part 2 of the “one-off” exceptional event process, assessing Northern Powergrid’s performance in mitigating the impact of the event upon its customers.

The AE also concludes that Northern Powergrid restored its customers’ supplies without delay, continuing with the contingency programme until the speedy return to service of the West Melton to Doncaster ‘B’ feed Doncaster Central n°2 132kV circuit enabled Northern Powergrid to re-energise the healthy section of the affected busbar, its 33kV infeeds to the affected Primary Substations and the remaining parts of the affected 11kV system.

The AE further concludes that Northern Powergrid began to replace the faulted section of compound-filled busbar without delay, with a view to restoring the security of supplies in the Doncaster area as quickly as possible.

The AE finally concludes that Northern Powergrid had met the criteria of Appendix 4 to paragraph 8.58 of Special Licence Condition CRC 8 and that the incident is therefore deemed to be eligible for adjustment in the DNO’s reported performance.

The AE therefore recommends that an adjustment to Northern Powergrid’s 2011/12 reported distribution system performance is made, in line with the part 1 audited CI and CML figures as shown in the following table:

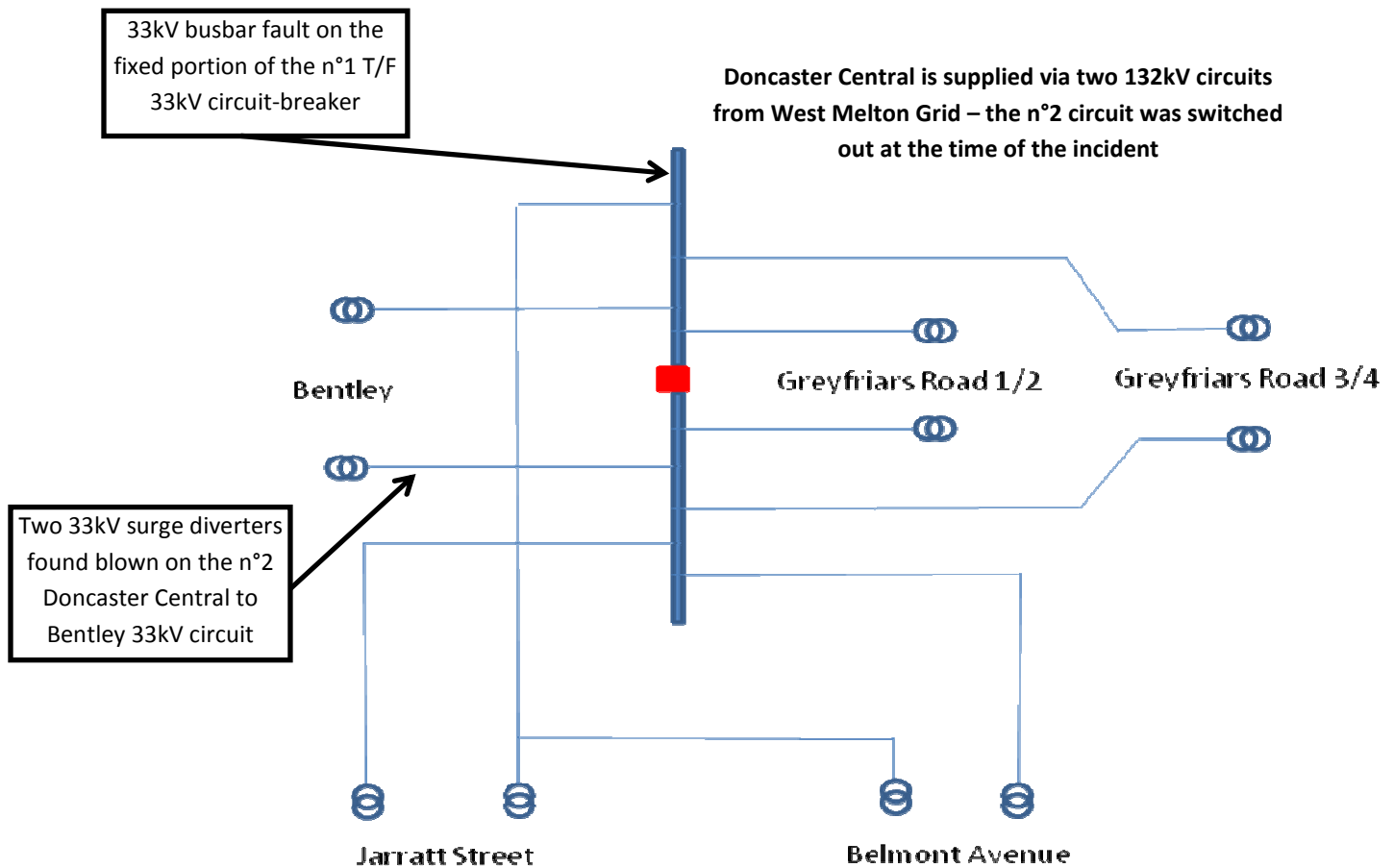
	<b>Audited number</b>	<b>Number above the threshold</b>	<b>Recommended adjustment</b>
<b>CI</b>	1.97	0.87	0.87
<b>CML</b>	1.49	0.59	0.59

## 1. Audit part 1

### Summary of main facts

- 1.1 The AE's headline information log for this event is set out in Table A-1 at Appendix A. In addition, the following paragraphs summarise the main facts of the event.
- 1.2 Northern Powergrid has furnished evidence to support its claim that the failure of two 33kV surge diverters on the Doncaster Central to Bentley 33kV overhead line and a simultaneous fault on the 33kV busbar at Doncaster Central Grid Substation resulted in the loss of all supplies from its Doncaster Central Grid Substation at 07:01 on Friday, 24 June 2011.
- 1.3 Northern Powergrid's Doncaster Grid Substation is supplied via two 132kV circuits from West Melton Grid. The n°2 132kV circuit had been switched out on 04 June 2011 and was undergoing essential tower painting, minor repair work and tree cutting.
- 1.4 Supplies to the customers fed from five of Northern Powergrid's Primary Substations were interrupted.
- 1.5 Northern Powergrid's control engineer tried to re-energise the n°1 circuit but it tripped immediately.
- 1.6 30,542 of Northern Powergrid's customers' supplies were interrupted as a consequence of the two 33kV incidents. The first supplies were restored at 07:16 and the final ones at 12:17 on 24 June 2011.
- 1.7 Supplies were restored via the 11kV network using a combination of tele-controlled and manual switching.
- 1.8 Two of the alternative 11kV circuits failed during the course of restoration, interrupting a further 14,019 customers.
- 1.9 The work on the n°2 circuit was stopped and the circuit returned to service at 10:21 on 24 June 2011.
- 1.10 A simplified view of the section of Northern Powergrid's 33kV network affected by this event is shown in Figure 1.

**Figure 1 – Simplified Network Diagram of Northern Powergrid's 33kV distribution network affected by the incident**



**Notes:**

1. Apart from the outage of the West Melton to Doncaster Central teed Doncaster 'B' n°2 132kV circuit, Northern Powergrid's distribution system affected by this incident was running normally at the time of the incident.
2. Initial supplies were restored via tele-controlled switching using Northern Powergrid's pre-prepared contingency plans.
3. The restoration continued, greatly helped by the speedy return to service of the West Melton to Doncaster Central teed Doncaster 'B' n°2 circuit which provided 33kV infeeds into the affected area thus enabling final restoration of the affected parts of the 11kV system.
4. For clarity, only the salient items of switchgear are shown.

## Exceptionality requirements

### Does the event qualify for exclusion?

- 1.11 The AE considers that the event falls within the category of an “other event” as defined in paragraph 8.57 of Special Licence Condition CRC 8, and meets the exceptionality requirements set out in Appendix 3 thereof.
- 1.12 The AE therefore considers that, subject to meeting the requirements of Appendix 4 to CRC 8, the event qualifies for possible exclusion under the “one-off” exceptional events process.

### Exceptionality test results

- 1.13 The number of incidents attributed to the event is shown in Table 1-1.

**Table 1-1: Number of incidents attributed to the event**

<b>Number of incidents attributed to the event</b>	<b>Claimed number</b>	<b>Audited number</b>
<b>132kV</b>	0	0
<b>EHV</b>	2	2
<b>HV</b>	2	2
<b>LV</b>	0	0
<b>Total</b>	<b>4</b>	<b>4</b>

- 1.14 The results calculated by the AE to test this claim against Ofgem's exceptionality criteria are shown in Appendix A. A summary of the results is shown in Table 1-2.



**Table 1-2: Summary of exceptionality test results**

Test	Threshold	Claimed number	Audited number	Pass / Fail	Amount above threshold
CI exceptionality	1.1	1.98	1.97	Pass	0.87
CML exceptionality	0.9	1.48	1.49	Pass	0.59

## Notes:

1. Please see the footnote to Table A-2 regarding the slight differences between the claimed and the audited figures for CI and CML.
2. Ofgem's CI and CML exceptionality criteria are set out in the AE's ToR<sup>1</sup>.
3. The audited CI and CML used in the exceptionality test have been determined from the number of incidents attributed to the event.
4. Where the event passes either or both the exceptionality thresholds, the amount(s) above threshold is/are carried forward into the Audit part 2 assessment of DNO performance.
5. In accordance with guidance from Ofgem, the AE's calculations use the threshold values contained in the current Distribution Price Control and the number of customers connected to the DNO's network relevant to the date on which the incident occurred.

**Northern Powergrid's views of its performance**

- 1.15 Northern Powergrid has a robust, commercially confidential risk assessment policy that details the various checks that must be carried out during the process of requesting a system outage at or above Extra High Voltage (EHV). **[AE's note: The AE has seen Northern Powergrid's risk assessment policy. Northern Powergrid does not wish the inherent security arrangements of its policy to become public knowledge – hence the commercially confidential classification].**
- 1.16 Prior to the outage of the West Melton to Doncaster Central teed Doncaster 'B' n°2 132kV circuit, Northern Powergrid is satisfied that its policy was fully applied and that its personnel had no reason to suspect the electrical integrity of the remaining portions of its 33kV system.
- 1.17 The outage on the West Melton to Doncaster Central teed Doncaster 'B' n°2 132kV circuit commenced as scheduled on Saturday 04 June 2011. As part of Northern Powergrid's contingency plans, the n°2 circuit was available for restoration within a set time scale of 4 hours.

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<sup>1</sup> Audits of Electricity Distribution Network Operators' One-off Exceptional Events Claims for 2011/12

- 1.18 In addition, Northern Powergrid's contingency programme included re-arrangements of its 11kV network to enable some supplies to be restored via tele-controlled switching.
- 1.19 In accordance with good engineering practice, several items of equipment were scheduled for essential refurbishment during the outage on the n°2 circuit.
- 1.20 In parallel with trying back the n°1 grid transformer 33kV circuit-breaker at Doncaster Central Grid Substation, Northern Powergrid's control engineers began supply restoration via the already available tele-controlled alternative 11kV circuits.
- 1.21 Following the immediate trip on the n°1 grid transformer 33kV circuit-breaker at Doncaster Central Grid Substation, the engineer in charge of the work on the West Melton to Doncaster Central n°2 132kV circuit was requested to make safe and to cancel all safety documentation to enable the circuit to be brought back into service.
- 1.22 The n°2 circuit was brought back into service in just over three hours, thus facilitating the final restoration of the interrupted supplies.
- 1.23 Northern Powergrid considers that the protection applied to its 33kV system at Doncaster Central Grid Substation operated correctly to clear the two 33kV faults from its distribution system.
- 1.24 Northern Powergrid also considers that the protection applied to its 11kV system in the Doncaster area operated correctly to clear the two 11kV faults from its distribution system.
- 1.25 Northern Powergrid considers that its duty control engineers reacted well in assessing the alarms generated by the event, trying the n°1 circuit back and beginning to restore supplies in sixteen minutes, completing the task when the incident on the 11kV overhead line backfeed had been repaired and once the n°2 circuit had been returned to service.
- 1.26 Northern Powergrid considers that its engineering team did well in returning the n°2 circuit to service in just over three hours.

### **Northern Powergrid's answers to questions on its performance**

- 1.27 Within the last four years, the AE has reviewed Northern Powergrid's design standards, construction methods and maintenance procedures during previous visits to audit exceptional event claims and found them fit for purpose.
- 1.28 The AE confirms that Northern Powergrid's emergency procedures provide for the type of event being examined here.
- 1.29 To aid understanding of the background to Northern Powergrid's SoF, the AE prepared a list of initial questions regarding this incident. These questions were used as the basis for the examination of Northern Powergrid's claim.
- 1.30 The initial questions were discussed during the AE's visit to Northern Powergrid's Leeds Control Centre on 14 February 2012 when the records of Northern Powergrid's SCADA system, the incident report and other information were made available.

1.31 Given the information and photographic evidence provided by Northern Powergrid and the AE's personal knowledge of installations of this type, it was considered to be unnecessary to visit the site of the blown surge diverters or Doncaster Central Grid Substation.

1.32 Northern Powergrid has provided answers to the AE's initial list of questions. For ease of reference, the AE's questions are printed in bold font with Northern Powergrid's answers being printed in normal font.

**Q1. What changes, if any, has Northern Powergrid (NPG) made to its emergency plans and procedures since BPI last visited to audit the exceptional event claim concerning the loss of supplies at Annfield 132/66kV Substation that occurred on 26 June 2010?**

A1. No material change has been made to the plans. Main changes fall around trigger levels and MIMP structure.

**Q2 What type of 33kV switchgear is installed at NPG's Doncaster Central Grid Substation?**

A2. The 33kV indoor metal-clad switchboard at Doncaster Central Grid Substation is a mixture of AEI and South Wales Switchgear manufacture. The fixed portion in which the busbar failure occurred is an AEI type VSLP15F/P.

**Q3. When was the switchboard commissioned?**

A3. The section of the 33kV indoor metal-clad switchboard which faulted was commissioned in 1967.

**Q4. What is NPG's policy for the periodic testing of 33kV busbars associated with indoor metal-clad switchgear?**

A4. Whilst the compound-filled busbars of metal-clad switchgear are not in themselves subject to preventative maintenance, Northern Powergrid's inspection and maintenance personnel are issued with a go/no-go partial discharge indicator which, for personal safety reasons, is used each time a switchroom is entered.

Since the inception of this initiative in 2006 there are no records of any partial discharge problems being detected at Doncaster Grid Substation.

**Q5. At Doncaster Central BSP, what protection schemes are installed on:**

- a. the 33kV circuits feeding Bentley Primary Substation?
- b. the 33kV busbars? and
- c. the 33kV sides of the two 132/33kV transformers?

A5. A full list of the protection schemes and their settings was made available to the AE during the audit visit. *[AE's note: The AE is satisfied that the protection schemes installed on the affected section of Northern Powergrid's network are appropriate].*

**Q6. What settings are applied to the above protection schemes?**

- a. the 33kV circuits feeding Bentley Primary Substation?
- b. the 33kV busbars? and
- c. the 33kV sides of the two 132/33kV transformers?

- A6. A full list of the protection schemes and their settings was made available to the AE during the audit visit. *[AE's note: The AE is satisfied that the settings applied to the protection schemes installed on the affected section of Northern Powergrid's network are appropriate].*
- Q7. When did the outage on the West Melton to Doncaster Central teed Doncaster 'B' number 2 132kV circuit begin?**
- A7. Saturday 04 June 2011 as scheduled.
- Q8. Given that Northern Power Grid considers the most likely start of this incident is two failed 33kV surge diverters, what photographic or other evidence has NPG retained to support this view?**
- A8. Unfortunately the personnel who attended the site of the failed surge diverters did not take any photographs of the damaged equipment.
- Q9. Where is the associated terminal pole located? (E.g. rural setting or edge of conurbation)?**
- A9. The terminal poles of both 33kV overhead circuits are situated on the edge of a conurbation as demonstrated to the AE during the audit visit.
- Q10. At what frequencies are NPG's 132kV lines normally inspected by helicopter and by ground patrol?**
- A10. Helicopter 2 years, thermal 4 years, ground patrol 10 years and high resolution helicopter 10 years.
- Q11. What evidence can NPG provide to demonstrate its line patrol procedures have been correctly applied in the case of the Doncaster Central to Bentley 33kV circuits?**
- A11. Both the helicopter log and the thermal imaging log were shown to the AE during the audit visit. It was confirmed there were no outstanding defects to be dealt with.
- Q12. When were the Doncaster Central to Bentley 33kV circuits last inspected?**
- A12. As demonstrated to the AE during the audit visit, the most recent helicopter patrol was carried out on 21 February 2011 and the most recent thermal imaging patrol was carried out on 09 March 2011. As above, no issues were identified.
- Q13. What learning points has Northern Powergrid incorporated into its procedures as a result of this incident?**
- A13. Northern Powergrid's review of the incident confirmed that the company's procedures cater for incidents such as this.
- Northern Powergrid's review concluded that its comprehensive pre-outage preparations and checks were properly carried out prior to the outage on the West Melton to Doncaster Central teed Doncaster 'B' n°2 132kV circuit.
- Q14. What further learning points should be considered as a result of the application of the revised Exceptional Event Claims process?**
- A14. None

1.33 Northern Powergrid also provided further information during the audit visit. This includes:

- discussion regarding the review that Northern Powergrid carried out after this incident to ensure that its policies and procedures are appropriate and were correctly invoked prior to this incident occurring;
- a discussion regarding the relative reliabilities of Northern Powergrid's circuits at the higher voltage levels;
- a discussion regarding the use of the go / no-go partial discharge equipment during routine substation inspections;
- a discussion regarding the protection schemes on the 33kV metal-clad switchgear at Doncaster Central Grid Substation;
- the details of Northern Powergrid's SCADA alarms received during this incident as included in its SCADA log;
- a copy of Northern Powergrid's incident reports for the event;
- a copy of the pre-outage request and risk assessment for the n°2 circuit;
- a representation of the incident on Northern Powergrid's SCADA system;
- a simplified single line diagram (SLD) of the affected sections of Northern Powergrid's 33V networks showing the five Primary Substations affected by the loss of the 132kV infeeds to Doncaster Central 132/33kV Grid Substation; and
- a discussion regarding the replacement of the faulted fixed portion of compound-filled busbars, the first Permit to Work for which was issued at 09:29 on 26 June 2011.

## 2. Audit part 2

### Northern Powergrid's performance in preventing the event

- 2.1 In viewing Northern Powergrid's performance in preventing this event, the AE has considered what more Northern Powergrid could have reasonably done to ensure that the 33kV surge diverters on the Doncaster Central to Bentley 33kV overhead lines were intact and fit for purpose.
- 2.2 The AE has also considered what more Northern Powergrid could reasonably do to ensure the integrity of the 33kV compound-filled busbars within its 33kV metal-clad switchgear at Doncaster Central Grid Substation.
- 2.3 The AE has discussed Northern Powergrid's experience of incidents affecting surge diverters at the higher voltage levels and concludes that there is no cause for concern regarding their fault history.
- 2.4 The AE has also discussed Northern Powergrid's experience of operating the type of 33kV metal-clad switchgear that failed at Doncaster Central Grid Substation and the absence of any problems being detected when Northern Powergrid's personnel have used the go / no-go partial discharge detectors.
- 2.5 Photograph 1, copied from Northern Powergrid's SoF shows the damage to the busbar cover plates above the faulted fixed portion of 33kV busbars at Doncaster Central Grid Substation.
- 2.6 Photograph 2, also copied from Northern Powergrid's SoF shows an internal view of the faulted 33kV busbar chamber.
- 2.7 Northern Powergrid's measurement systems confirm the tripping of circuit-breakers to clear the two 33kV incidents from its system at 07:01 on 24 June 2011 as reported in Northern Powergrid's SoF.
- 2.8 Northern Powergrid's measurement systems also confirm the failure of the underground cable providing the alternative 11kV source from Brodsworth designated as "Brodsworth Temporary" at 08:08 on 24 June 2011 and its subsequent repair at 18:00 on the same day.
- 2.9 Northern Powergrid's measurement systems also confirm the failure of the overhead line providing the alternative 11kV source from Brodsworth designated as "Brodsworth Green Lane" at 08:08 on 24 June 2011 and its subsequent repair at 11:41 on the same day. This circuit was then re-used to increase the security of the 11kV backfeeds to the affected area.
- 2.10 An examination of Northern Powergrid's confidential documentation shows that its outage planning / risk assessment policy is robust and that it was rigorously applied during the planning of the outage of the West Melton to Doncaster Central teed Doncaster 'B' n°2 132kV circuit.

2.11 Northern Powergrid's documentation also shows that there was no reason to believe that there were any latent defects within its 33kV system in the Doncaster area.

2.12 The AE concludes that Northern Powergrid had no reason to suspect the integrity of either its 33kV or its 11kV system in and around the Doncaster area.

### **Northern Powergrid's performance in mitigating the effects of the event**

2.13 The AE has discussed the running arrangements and protection schemes associated with the affected section of Northern Powergrid's 132/33kV distribution network with Northern Powergrid's engineering personnel.

2.14 The examination of the protection arrangements at Doncaster Central Grid Substation shows that Northern Powergrid's protection schemes operated correctly to clear the 33kV faults from its network.

2.15 Similarly, the two consecutive 11kV faults were correctly cleared from Northern Powergrid's 11kV system.

2.16 The AE concludes that Northern Powergrid did all it could to restore supplies as expeditiously as possible, thereby minimising the duration of the interruption.

2.17 The AE commends Northern Powergrid's control engineers in analysing the developing situation and restoring all supplies as quickly as possible.

2.18 The AE also commends Northern Powergrid's personnel for restoring the West Melton to Doncaster Central teed Doncaster 'B' n°2 132kV circuit to service in just over three hours of the incident occurring.

2.19 The AE is pleased to note that Northern Powergrid has reviewed this incident and concluded that its pre-outage procedures are robust and that they were invoked prior to the outage on the West Melton to Doncaster Central teed Doncaster 'B' n°2 132kV circuit.

### **Recommended performance adjustment(s)**

2.20 The AE's recommendations to Ofgem are shown in Table 2-1.

**Table 2-1: Audit part 2 recommended adjustment(s)**

	<b>Amount above threshold</b>	<b>Audit part 2 recommendation</b>
<b>CI</b>	0.87	0.87
<b>CML</b>	0.59	0.59

### **Detailed justification**

2.21 In reaching a judgement on a recommendation, the AE has firstly considered whether or not Northern Powergrid could have reasonably taken any different course of action that would have prevented the incidents occurring on its 33kV and 11kV networks.

- 2.22 In viewing Northern Powergrid's performance in preventing this event, the AE has taken into account the lack of any previous incidents on the affected 33kV metal-clad busbars and the infrequent failure of 33kV surge diverters.
- 2.23 The AE notes and commends Northern Powergrid's initiative in purchasing go / no-go partial discharge equipment and its regular use on substation inspection and maintenance activities.
- 2.24 The AE has also taken into account Northern Powergrid's reliability statistics for its higher voltage circuits that show the 132kV circuits to be more reliable per kilometre than the HV / EHV voltage levels. The AE is therefore satisfied that the circuit configuration adopted during the outage of the n°2 circuit was the most reliable option and therefore afforded the most system security to Northern Powergrid's customers.
- 2.25 The AE has also discussed this incident with his colleagues who have considerable operational experience of incidents with many differing causes; they agree with the visiting auditor's conclusions and recommendations.
- 2.26 In considering Northern Powergrid's restoration strategy, the AE is conscious that Northern Powergrid's duty control engineers acted with commendable skill and speed in analysing the SCADA alarms and indications for this series of incidents, initially trying the faulted 132kV circuit back as part of the restoration strategy.
- 2.27 Similarly, Northern Powergrid's operational personnel are to be commended for the speed in which the n°2 circuit was brought back into service in just over three hours of the incident occurring.
- 2.28 The AE is satisfied that the affected sections of Northern Powergrid's distribution network comply with the requirements of Security of Supply Standard P2/6.
- 2.29 The AE has discussed Northern Powergrid's review of this incident and is pleased to note that Northern Power's robust pre-outage procedures were fully invoked prior to the outage on the n°2 circuit.
- 2.30 The AE is satisfied that Northern Powergrid has met the criteria for preventative and mitigating actions set out in Appendix 4 to paragraph 8.58 of Special Licence Condition CRC8.
- 2.31 The AE therefore concludes that Northern Powergrid's claim is justified and recommends to Ofgem that the amount of CI and CML above the threshold values should be excluded from Northern Powergrid's performance for regulatory reporting year 2011/12.



## Appendix A Record of Audit part 1

**Table A-1: Appointed Examiner's Information Log**

"One-Off" Exceptional Event	Reporting Year 2010/11
Licensed Area	Northern Powergrid (Y)
Date of event	24 June 2011
Cause	Failure of two 33kV surge diverters and a 33kV busbar fault
Notification to Ofgem	07 July 2011
SoF received	02 August 2010
SoF information	<ul style="list-style-type: none"> <li>supplies from Doncaster Central 132/33kV Grid Substation were interrupted at 07:01 on Friday 24 June 2011 when the 33 kV circuit-breaker of the n°1 132/33kV grid transformer tripped simultaneously with the tripping of the Doncaster Central to Bentley n°2 33kV CB;</li> <li>the n°2 132/33kV grid transformer at Doncaster Central was de-energised at the time of the incident for essential tower painting, minor remedial work and tree trimming being carried out on the 132kV line between West Melton and Doncaster Central Grid Substations;</li> <li>no 33kV interconnection, therefore supplies had to be restored at 11kV.</li> <li>2 of the 11kV back feeds failed, one was repaired and re-used the other (cable fault) was isolated for subsequent location and repair;</li> <li>Northern Powergrid's duty control engineers: <ul style="list-style-type: none"> <li>tried the n°1 grid T/F back at 07:03 – it tripped immediately;</li> <li>restored first supplies via tele-control at 07:16;</li> <li>called for the restoration of the n°2 132kV circuit. <b>[AE's note: it was re-energised at 10:21 and loaded at 10:24];</b></li> <li>managed the two incidents resulting from the failures of two 11kV back feeds; and</li> <li>managed the restoration of all supplies, the final ones being re-connected via manual switching at 12:17.</li> </ul> </li> </ul>
Additional pre-visit information provided	Based on the SoF the AE drew up a list of initial questions. These were discussed during the audit visit. This initial list of questions, together with Northern Powergrid's response, is contained in paragraph 1.32 of the report.
Location of audit visit	Northern Powergrid's Leeds Control Centre
Date of audit visit	14 February 2012
Visiting Auditor	Geoff Stott (BPI)
Northern Powergrid's Representatives	Neil Dunn-Birch, Tony Ingham, Jeremy Meara, Jim Morrell, and Ian Punshon

<p><b>Information provided during and subsequent to the audit visit</b></p>	<p>Comprehensive documentation / information including:</p> <ul style="list-style-type: none"> <li>• no lightning at the time;</li> <li>• the protection arrangements for the 33kV network radiating from Doncaster Central 132/33kV Grid Substation;</li> <li>• the use of the go / no-go partial discharge equipment during routing substation inspections. <b>[AE's note: there are no adverse reports noted on Northern Powergrid's database];</b></li> <li>• the protection arrangements at Doncaster Central 132/33kV Grid Substation;</li> <li>• copies of the relevant 132kV and 33kV SLDs;</li> <li>• sight of the most recent foot patrol report for the Doncaster Central to Bentley 33kV overhead line circuits – nothing noted regarding the surge diverters that failed;</li> <li>• the SCADA switching log showing the loss of supplies from Doncaster Central 132/33kV Grid Substation at 07:01 on 24 June 2011;</li> <li>• the normal network running arrangements were demonstrated;</li> <li>• copies of Northern Powergrid's 'IRIS' incident reports that show: <ul style="list-style-type: none"> <li>○ the number of customers affected by the 33kV incidents to be 36,628 and 8,004 by the 11kV incidents;</li> <li>○ the customer minutes lost to be 2,906,698.2 at 33kV and 445,338 at 11kV.</li> </ul> </li> <li>• the AE confirms that these figures agree with those quoted in Northern Powergrid's SoF;</li> <li>• using Northern Powergrid's total connected customers at 30 September 2010 of 2,258,404 the number of customers affected equates to a CI of 1.62 <math>[36,628 \times 100 / 2,258,404]</math> at 33kV and 0.35 <math>[8,004 \times 100 / 2,258,404]</math> at 11kV;</li> <li>• similarly, the customer minutes lost for this event equate to a CML of 1.29 <math>[2,906,698.2 / 2,258,404]</math> at 33kV and 0.20 <math>[445,338 / 2,258,404]</math> at 11kV;</li> <li>• a summary of the on-going review of Northern Powergrid's various policy documents;</li> <li>• a copy of the outage request for the number 2 circuit, including the responsible engineer's check list;</li> <li>• a copy of Northern Powergrid's post-incident internal report;</li> <li>• the geographic location of the 33kV terminal poles near Bentley; and</li> <li>• sight of Northern Powergrid's investigatory report into the incident.</li> </ul> <p>Northern Powergrid's photographs show the faulted 33kV busbar at Doncaster Central Grid Substation.</p> <p>Discussed the reliability of surge diverters and Northern Powergrid's statistical analysis of the low failure rate across the various higher voltage levels.</p> <p>Discussed the protection that operated – whilst a faulty bus zone CT was found at Doncaster Central it had no bearing on the incident - confirmed protection operation consistent with the incidents.</p> <p>Discussed Northern Powergrid's risk assessment / outage planning / request policy – documents show the outage request on the n°2 circuit was fully compliant.</p>
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	<p>Statistical reliability 132kV vis-à-vis 11kV and contingencies put in place as part of the outage on the n°2 circuit.</p> <p>Confirmed P2/6 compliant.</p> <p>The list of initial questions was discussed.</p> <p>Northern Powergrid provided answers to the initial questions plus additional information both during and subsequent to the audit visit.</p> <p>Ok regarding compliance with Appendix 4 of Paragraph 8.58 of CRC 8.</p>
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**Table A-2: Impact on CI and CML**

	CI		CML	
	Claimed	Audited	Claimed	Audited
132kV	0	0	0	0
EHV	1.98*	1.62	1.48*	1.29
HV		0.35		0.20
LV	0	0	0	0
Total	1.98	1.97	1.48	1.49
Northern Powergrid(Y) Threshold (total)	1.1		0.9	
Part 1 Exceptionality Test	Pass		Pass	
Part 1 Precondition of eligibility (meets App 3 to paragraph 8.57 of CRC 8)	Pass			

**AE's note:** Northern Powergrid combined its Customers Affected and Customer Minutes Lost before calculating the CI and CML figures quoted in its SoF. The disaggregation by voltage shown in Table A-1 results in the slight differences shown in Table A-2.

Northern Powergrid's measurement systems are subject to QoS audits for accuracy of reporting and it is not within the AE's ToR to repeat that work as part of the examination of exceptional event claims, although any consequential adjustments to reporting accuracy will be reflected in Ofgem's final adjudication of reported performance for regulatory reporting year 2011/12.

## Appendix B Photographs



**Photograph 1 – The cover plates above the faulted busbar**



**Photograph 2 – The faulted busbar chamber**