

Quality of Service Incentive Scheme – Exceptional Events

Appointed Examiner's Report	
Reporting year	2011/12
DNO	Northern Powergrid – Northeast Licensed Area
Cause	The disruptive failure of an 11kV circuit-breaker during the clearance of an 11kV cable fault
Date of event	17 December 2011

Submitted to:

Ofgem and
Northern Powergrid

Submitted by:

British Power International

British Power International
The Octagon
Colchester CO1 1TG
United Kingdom

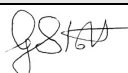
March 2012

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Name	Position	Signed	Date
Geoff Stott	Project Manager		26 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
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 disruptive failure of an 11kV vacuum-insulated circuit-breaker during the clearance of an 11kV cable fault at its Harrogate 132/11kV Primary Substation on Saturday, 17 December 2011 materially and adversely affected reported performance for its Northern 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 CML but not CI.

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 concludes that Northern Powergrid restored its customers’ supplies without delay.

The AE also concludes that Northern Powergrid replaced the damaged items of equipment without delay, thus minimising the risk to the security of supplies to its customers.

The AE 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:

	Audited number	Number above the threshold	Recommended adjustment
CI	1.53	0	0
CML	1.66	0.37	0.37

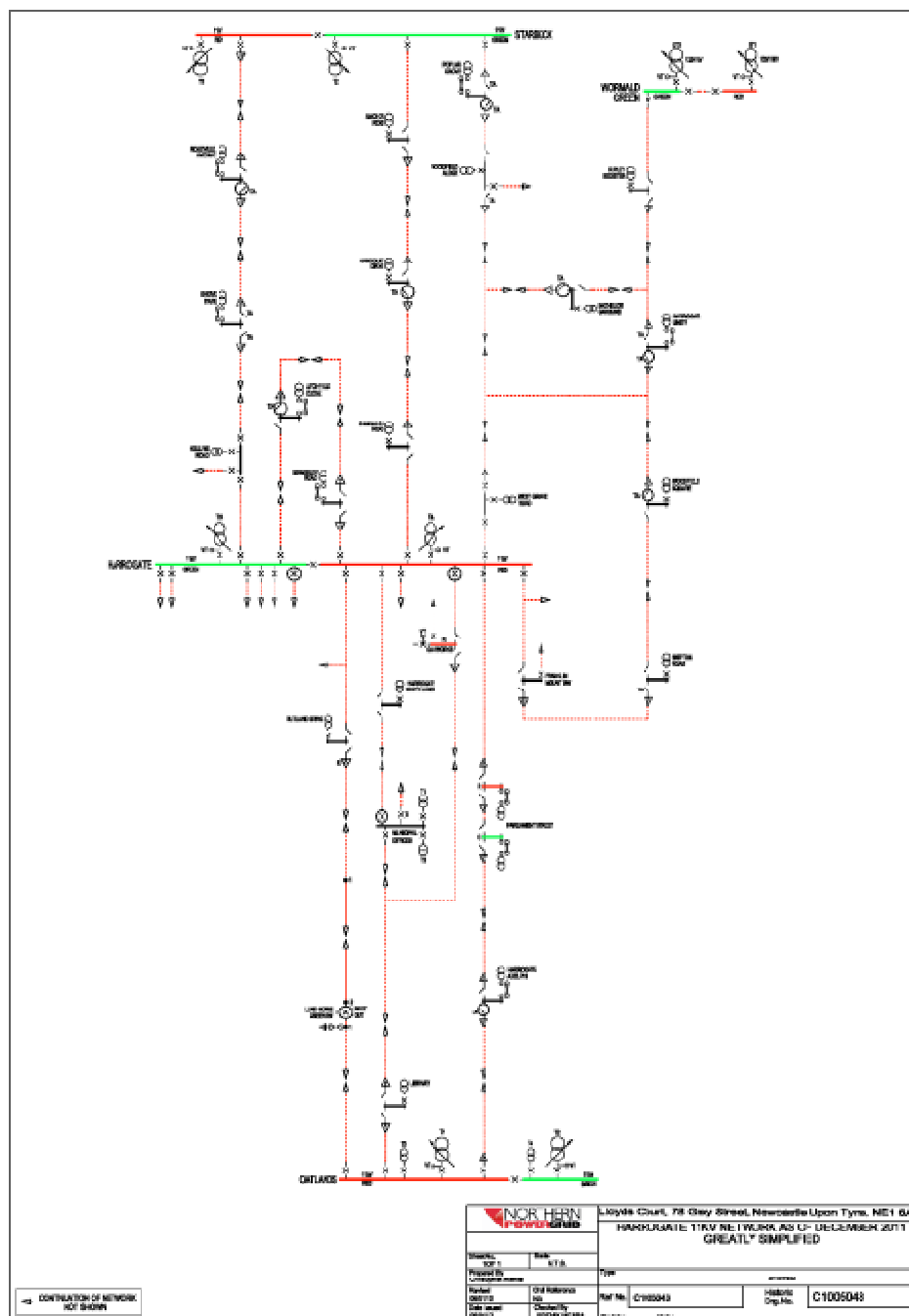
1. Audit part 1

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 an 11kV vacuum-insulated circuit-breaker disruptively failed at its Harrogate 132/11kV Primary Substation during the clearance of an 11kV feeder fault.
- 1.3 The circuit-breaker successfully tripped to clear a fault on the outgoing feeder but the failure of the vacuum interrupter on the 'red' phase of the circuit-breaker meant that fault current continued to flow.
- 1.4 The incident was cleared from Northern Powergrid's distribution system by the operation of back-up protection on the 11kV circuit-breakers of the two 132/11kV grid transformers, resulting in the loss of infeeds to the 11kV busbars at Harrogate Primary Substation.
- 1.5 The arc products from the failed vacuum interrupter melted the components of the cast resin assembly and the inter-phase barriers of the circuit-breaker, catching them alight, the smoke from which filled the 11kV switchroom.
- 1.6 Northern Powergrid's control engineers began immediate restoration via tele-controlled switching.
- 1.7 During the restoration process the intruder alarm at Harrogate Primary Substation operated and supply restoration had to be halted until Northern Powergrid's field personnel got to site.
- 1.8 Upon arriving on site, Northern Powergrid's personnel reported smoke coming from the 11kV switchroom and the fire brigade were requested to attend site.
- 1.9 To allow safe inspection of the 11kV switchboard and safe access to the fire brigade, all restored circuits were switched out from fault-breaking devices, resulting in re-interruptions to those customers whose supplies had been restored. The safe isolation was achieved by opening the remote circuit-breakers at Primary Substations providing the alternative switched supplies, thus interrupting Northern Powergrid's customers who were normally supplied from the alternative circuits.
- 1.10 Following the extinguishing of the fire, ventilation of the switchroom and a close inspection by Northern Powergrid's personnel, one half of the 11kV busbars (the 'green' section) at Harrogate Primary Substation was restored.
- 1.11 The failed circuit-breaker was in the 'red' section of the 11kV busbars, which were isolated from all sources of supply pending repair. Supplies to the outgoing feeders from the 'red' section were restored by closing 11kV network open points.

- 1.12 24,203 of Northern Powergrid's customers' supplies were interrupted for periods of up to five hours. Due to the nature of this incident, some of these customers suffered three separate interruptions before final restoration was achieved.
- 1.13 A simplified view of the section of Northern Powergrid's 11kV network affected by this event is shown in Figure 1.

Figure 1 – Simplified Network Diagram of Northern Powergrid's 11kV distribution network affected by the incident



Note:

For clarity, only the salient items of switchgear are shown.

Exceptionality requirements

Does the event qualify for exclusion?

- 1.14 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.
- 1.15 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

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

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

Number of incidents attributed to the event	Claimed number	Audited number
132kV	0	0
EHV	0	0
HV	5	5
LV	0	0
Total	5	5

- 1.17 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	1.6	1.53	1.53	Fail	0
CML exceptionality	1.3	1.66	1.67	Pass	0.37

Notes:

1. Ofgem's CI and CML exceptionality criteria are set out in the AE's ToR¹.
2. The audited CI and CML used in the exceptionality test have been determined from the number of incidents attributed to the event.
3. 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.
4. 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

- 1.18 Commissioned in 1990, the vacuum switchgear at Northern Powergrid's Harrogate Primary Substation provides the main 11kV supplies to its customers in the centre of the town.
- 1.19 The 11kV switchboard, which runs with the bus section circuit-breaker normally closed, is fed by two 132/11kV transformers. The two sections of 11kV busbar are designated 'red' and 'green'.
- 1.20 At 13:32 on Saturday, 17 December 2011, the Parliament Street 11kV vacuum circuit-breaker, which is situated on the 'red' section of the 11kV busbar, tripped but failed to fully clear a fault on the outgoing 11kV feeder and fault current continued to flow.
- 1.21 The incident was cleared from Northern Powergrid's distribution network by the operation of the back-up protection on the 11kV sides of the two 132/11kV transformers which tripped the two 11kV transformer circuit-breakers, thus de-energising the 11kV busbars at Harrogate Primary Substation.

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

- 1.22 Northern Powergrid's control engineers rapidly analysed the alarms generated by the incident, opened the 11kV bus section circuit-breaker and re-energised the 'green' section of the 11kV busbars at Harrogate Primary Substation via tele-controlled switching.
- 1.23 Having opened all the outgoing feeder breakers on the 'red' section of the 11kV busbars at Harrogate Primary Substation via tele-controlled switching, the control engineer attempted to close the associated incoming 11kV transformer circuit-breaker, which immediately tripped.
- 1.24 Northern Powergrid's control engineers continued to restore supplies via tele-switching of 11kV network open points until halted on the grounds of safety by the operation of the intruder alarm at Harrogate Primary Substation.
- 1.25 Northern Powergrid's field personnel arrived at Harrogate Primary Substation at 14:29 and immediately reported smoke coming from the 11kV switchroom.
- 1.26 The fire brigade attended the site to extinguish the fire, during which time the 'green' section of the 11kV busbars plus all the live incoming feeders on the 'red' section of the 11kV busbars were de-energised for safety. All equipment was de-energised from fault-interrupting switchgear, resulting in both re-interruptions and in further loss of supplies.
- 1.27 Following an inspection of the 11kV switchboard and an 'all-clear', the above equipment was re-energised. The remaining customers' supplies were all restored by 18:35 on 17 December 2011.
- 1.28 Northern Powergrid considers that the protection applied to the 11kV Parliament Street vacuum circuit-breaker and that applied to the 11kV circuit-breakers associated with the two 132/11kV transformers at its Harrogate Primary Substation operated correctly to clear the initial feeder fault and the subsequent circuit-breaker failure from its distribution system.
- 1.29 Northern Powergrid considers that its duty control engineers reacted well in assessing the alarms generated by the event and initially restoring supplies to the 'green' section busbar within twelve minutes of the initial fault alarm.
- 1.30 Northern Powergrid considers that its engineering team did well in replacing the damaged 11kV vacuum circuit-breaker and in repairing the minor damage to the fixed portion of the switchboard.
- 1.31 Northern Powergrid also considers that it acted appropriately in re-interrupting supplies to allow safe access for the fire brigade at Harrogate Primary Substation.

Northern Powergrid's answers to questions on its performance

- 1.32 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.

- 1.33 Northern Powergrid's SoF indicates that it has sent the damaged vacuum circuit-breaker for forensic analysis to the current owners of the switchboard manufacturers. The AE therefore included a discussion on what information Northern Powergrid had received in this regard.
- 1.34 The AE confirms that Northern Powergrid's emergency procedures provide for the type of event being examined here.
- 1.35 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.
- 1.36 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.
- 1.37 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 site.
- 1.38 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 the incident affecting the Holmfield area occurred on 09 August 2011?**
- A1. No material change has been made to the plans. Main changes fall around trigger levels and the Major Incident Management Plan structure.
- Q2 What is NPG's policy for the periodic testing of 11kV busbars associated with indoor metalclad switchgear?**
- A2. MNT/005 – 'Policy for the Inspection and Maintenance of Ground Mounted Plant', Version 3.0, June 2011, section 3.3.4. The scheduled overhaul (which includes inspection of busbars) has a close visual examination and operating timing test every three years and scheduled overhaul every twenty four years (Includes OV test of vacuum interrupters).
- 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 start of this initiative in 2006 there are no records of any problems being detected at Harrogate Primary Substation.
- Q3. What evidence can NPG provide to show that the policy has been invoked at its Harrogate 132/11kV Primary Substation?**
- A3. The maintenance records for Harrogate Primary Substation, showing compliance with Northern Powergrid's policy were made available to the AE during the audit visit. *[AE's note: there were no outstanding issues].*

Q4. At Harrogate Primary Substation, what protection schemes are installed on:

(a) The 11kV outgoing circuit to Parliament Street Substation?

(b) The 11kV busbars? and

(c) The 11kV sides of the two 132/11kV grid transformers?

A4. The complete protection scheme details and associated settings for Harrogate Primary Substation were 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].**

Q5. What settings are applied to the above protection schemes?

A5. The complete protection scheme details and associated settings for Harrogate Primary Substation were 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].**

Q6. NPG's SoF reports that the failed equipment is with the present owner of its original manufacturer for forensic examination. What has NPG learned from this forensic examination?

A6. The Interim report confirms a vacuum bottle failed. The remaining intact bottle is now being checked. All vacuum bottles at Harrogate have been over-voltage tested to confirm their integrity.

Q7. What learning points has NPG incorporated into its procedures as a result of this incident?

A7. Northern Powergrid's review of the incident confirmed that the company's procedures cater for incidents such as this.

Northern Powergrid's review also concluded that all vacuum 'bottles' on the 11kV switchboard at Harrogate Primary Substation should be tested for electrical integrity. Northern Powergrid can confirm this has been done with no signs of further problems being found.

Q8. What further learning points should be considered as a result of the application of the revised Exceptional Event Claims process?

A8. None

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

- discussion regarding the forensic investigation that Northern Powergrid has commissioned via the current owners of the type of circuit-breaker that failed;
- sight of the maintenance records for Harrogate Primary Substation showing everything is up-to-date with no outstanding defects;
- a discussion regarding the use of the go / no-go partial discharge equipment during routine substation inspections;
- a copy of the protection schemes and their settings for the affected parts of Northern Powergrid's distribution system;
- the details of Northern Powergrid's SCADA alarms received during this incident as included in its SCADA log;
- copies of Northern Powergrid's incident reports for this event;
- a representation of the incident on Northern Powergrid's SCADA system; and
- a simplified single line diagram (SLD) of the affected sections of Northern Powergrid's distribution system affected by the event.

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 its Parliament Street vacuum circuit-breaker at Harrogate Primary Substation was free from defect and therefore capable of safely interrupting a fault on the outgoing 11kV feeder.
- 2.2 It is practically impossible to detect a latent defect in an 11kV vacuum interrupter, apart from subjecting the device to an over-voltage test at preventative maintenance intervals and using partial discharge equipment to 'listen' for any abnormality.
- 2.3 An examination of Northern Powergrid's maintenance records for the 11kV vacuum switchboard at Harrogate Primary Substation show that everything was up-to-date with no defects awaiting rectification.
- 2.4 Furthermore, the Parliament Street 11kV vacuum circuit-breaker had successfully cleared an 11kV feeder fault on 21 June 2011, indicating that the vacuum interrupters were intact at that time.
- 2.5 The AE has discussed the fault history of this type of switchgear with Northern Powergrid and is satisfied that Northern Powergrid's database shows no previous incidents of any kind.
- 2.6 Photograph 1 shows the damage to the Parliament Street 11kV vacuum circuit-breaker. *[AE's note: the cast resin assembly and plastic phase dividers have been burnt away during the incident. The blue-phase vacuum interrupter is 'stuck' in the fixed portion of the switchgear whereas it should be fastened to the hinged panel of the circuit-breaker].*
- 2.7 Photograph 2 shows the damage to the fixed portion of the Parliament Street 11kV vacuum circuit-breaker housing. *[AE's note: the feeder spouts are the upper set of fixed contacts and the busbar spouts the lower set. The blue phase isolating contact from the vacuum interrupter is still attached to the fixed portion of the switchgear housing].*
- 2.8 Photograph 3 shows the damage to the cover plates on the top of the fixed portion of the 11kV switchboard.
- 2.9 Northern Powergrid's measurement systems confirm the tripping of the Parliament Street 11kV circuit-breaker at 13:23 on 17 December 2011 in response to the 11kV feeder fault.

- 2.10 Northern Powergrid's measurement systems also confirm the continuing neutral earth fault alarms, the tripping of the 11kV circuit-breaker on the number 3 132/11kV grid transformer at 13:34 and the eventual clearance of the faulted Parliament Street circuit-breaker by the tripping of the 11kV circuit-breaker on the number 2 132/11kV grid transformer at 13:41 on 17 December 2011.
- 2.11 The AE concludes that Northern Powergrid had done all it could reasonably have been expected to do in considering that its Parliament Street 11kV vacuum circuit-breaker at Harrogate Primary Substation was free from latent defects and that the circuit-breaker was capable of safely interrupting fault current.

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

- 2.12 Northern Powergrid's incident reports show the cause of the initial incident to be a fault on the Parliament Street 11kV feeder out of Harrogate Primary Substation.
- 2.13 Northern Powergrid's incident reports also show the cause of the protracted incident to be the failure of the Parliament Street 11kV vacuum circuit-breaker at Harrogate Primary Substation to safely clear the above fault from Northern Powergrid's distribution system.
- 2.14 The photographs of the failed equipment and the operation of the back-up protection at Harrogate Primary Substation are consistent with the failure of the Parliament Street 11kV vacuum circuit-breaker to safely interrupt the fault current generated by the incident on the 11kV feeder.
- 2.15 The AE has discussed the running arrangements and protection schemes associated with the affected section of Northern Powergrid's 11kV distribution network with Northern Powergrid's engineering personnel.
- 2.16 The examination of the protection arrangements at Harrogate Primary Substation shows that Northern Powergrid's protection schemes operated correctly to clear the incidents from its distribution network.
- 2.17 Consistent with providing safe access to the fire brigade and Northern Powergrid's personnel, the AE concludes that Northern Powergrid did all it could to restore supplies as expeditiously as possible, thereby minimising the duration of the interruption to its customers.
- 2.18 The AE commends Northern Powergrid's control engineers in analysing this complex incident and beginning to restore supplies within ten minutes of the initial incident.
- 2.19 The AE is pleased to note that Northern Powergrid is seeking to learn the precise mechanism of failure of the faulted vacuum interrupter from its manufacturers with a view to determining any further action necessary to ensure the integrity of other similar equipment in use on its distribution system and, via the Electricity Network Association, the rest of the UK Electricity Supply Industry.

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)

	Amount above threshold	Audit part 2 recommendation
CI	0	0
CML	0.37	0.37

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 disruptive failure of the Parliament Street 11kV vacuum circuit-breaker at its Harrogate Primary Substation.

2.22 In viewing Northern Powergrid's performance in preventing this event, the AE has taken into account the inherent reliability of 11kV vacuum interrupters.

2.23 The AE is also conscious of the fact that a visual inspection of the device, an over-voltage tests and a partial discharge test are the only practicable forms of preventative maintenance and that these items were up-to-date at Northern Powergrid's Harrogate Primary Substation.

2.24 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.

2.25 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 The AE considers that the preventative measures employed by Northern Powergrid at its Harrogate Primary Substation are in accordance with current industry practice.

2.27 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 complex incident, quickly restoring as many supplies as possible via tele-controlled switching.

2.28 The AE is conscious that these supplies had to be re-interrupted and other customers' supplies interrupted to provide safe access to the fire brigade and Northern Powergrid's personnel at Harrogate Primary Substation.

2.29 The AE commends Northern Powergrid's control engineer for rapidly restoring supplies once the 'all-clear' was given.

- 2.30 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.
- 2.31 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.
- 2.32 The AE therefore concludes that Northern Powergrid's claim is justified and recommends to Ofgem that the amount of CML above the threshold value 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 (NE)
Date of event	17 December 2011
Cause	Disruptive failure of an 11kV vacuum-insulated circuit-breaker during the clearance of an 11kV cable fault
Notification to Ofgem	21 December 2011
SoF received	12 January 2012
SoF information	<ul style="list-style-type: none"> the Parliament Street 11kV vacuum CB at Harrogate Primary Substation tripped at 13:32 on 17 December 2011 to clear a fault on the 11kV feeder; the circuit-breaker failed to clear the fault and fault current continued to flow until the back-up protection on the two 132/11kV grid transformers tripped the 11kV circuit-breakers, de-energising the busbars at 13:41; Northern Powergrid's duty control engineers: <ul style="list-style-type: none"> opened the bus section and restored the 'green' section of the 11kV busbars via tele-controlled switching at 13:43; cleared the 'red' busbar and tried in the associated 11kV T/F CB; upon this instantly tripping, set about tele-controlled closing of 11kV network open points; de-energised the 11kV 'green' busbar and all the live 11kV incoming feeders on the 'red' busbar so that the fire brigade could extinguish the fire and the switchboard could be inspected; following the 'all-clear', restored as many supplies as possible via tele-controlled switching; and directed manual switching to restore the remaining supplies. Northern Powergrid's personnel attending site: <ul style="list-style-type: none"> reported the smoke in the switchroom; assisted the fire brigade; and inspected the 11kV switchboard (concluding that it was safe to re-energise the 'green' section of the switchboard and the incoming feeder ways of the 'red' section).
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 1.38 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>Information provided during and subsequent to the audit visit</p>	<p>Comprehensive documentation / information including:</p> <ul style="list-style-type: none"> the protection arrangements for the affected parts of Northern Powergrid's distribution system; the use of the go / no-go partial discharge equipment during routing substation inspections. <i>[AE's note: there are no adverse reports noted on Northern Powergrid's database];</i> copies of the relevant 132kV and 11kV SLDs; further photographs of the failed 11kV circuit-breaker and its fixed housing; a copy of the maintenance history for the Parliament Street 11kV circuit-breaker; sight of the incident report of 21 June 2011 showing that the Parliament Street 11kV circuit-breaker correctly cleared a feeder fault; the SCADA switching log showing the loss of supplies from Harrogate 132/11kV Primary Substation at 13:33 on 17 December 2011; the normal network running arrangements were demonstrated; copies of Northern Powergrid's 'IRIS' incident reports that show: <ul style="list-style-type: none"> the number of customers affected by the incident to be 24,203; and the customer minutes lost to be 2,635,374. the AE confirms that these figures agree with those quoted in Northern Powergrid's SoF; using Northern Powergrid (NE)'s total connected customers at 30 September 2011 of 1,581,420 the number of customers affected equates to a CI of 1.53. $[24,203 \times 100 / 1,581,420]$; similarly, the customer minutes lost for this event equate to a CML of 1.67. $[2,635,374 / 1,581,420]$; and a copy of Northern Powergrid's internal post-incident investigation into the incident. <p>Northern Powergrid's photographs show the disruptive failure of the Parliament Street 11kV vacuum circuit-breaker</p> <p>Discussed the protection that operated to clear the initial cable fault and then the failure of the circuit-breaker.</p> <p>Confirmed protection operation consistent with the above.</p> <p>Discussed post-fault learning points, including Northern Powergrid having re-tested all other vacuum interrupters on the switchboard.</p> <p>Discussed the fault history of 11kV vacuum interrupters - very reliable - no previous history of disruptive failures nationally.</p> <p>Inspection and preventative maintenance activities – all up-to-date.</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	0	0	0	0
HV	1.53	1.53	1.66	1.67
LV	0	0	0	0
Total	1.53	1.53	1.66	1.67
Northern Powergrid Threshold (total)	1.6		1.3	
Part 1 Exceptionality Test	Fail		Pass	
Part 1 Precondition of eligibility (meets App 3 to paragraph 8.57 of CRC 8)	Pass			

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.

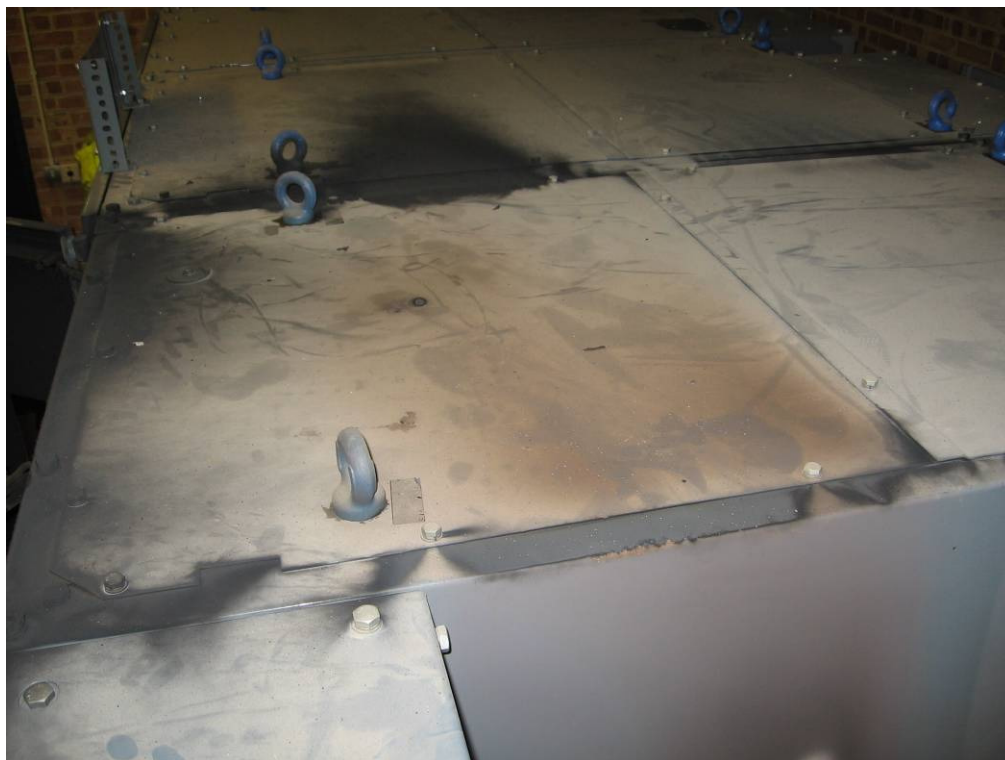
Appendix B Photographs



Photograph 1 – The damaged 11kV vacuum circuit-breaker



Photograph 2 – The damage to the fixed portion of the Parliament Street 11kV circuit-breaker housing



Photograph 3 – The damage to the cover plates on the top of the 11kV switchboard