A REVIEW OF THE STORM AFFECTING ELECTRICITY SUPPLIES IN NORTHERN IRELAND ON TUESDAY 30 MARCH 2010

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Foreword

Northern Ireland Electricity plc (NIE) undertakes an internal review of the effectiveness of its response to any event which leads to widespread disruption to electricity supplies. Any improvements identified are captured and formally incorporated into NIE's emergency plans and business processes. All reviews are formally reported and made available to the Northern Ireland Authority for Utility Regulation (the Utility Regulator)[1] as well as the Consumer Council for Northern Ireland and the Department of Enterprise, Trade and Investment (DETI).

This report deals with the disruption to electricity supplies as a result of severe weather on Tuesday 30 March 2010. The report firstly provides a factual assessment of the severe weather experienced over the evening and early hours of 30/31 March and then describes the performance of the electricity network under those severe weather conditions. It then sets out NIE's response to the damage caused to the network including mobilisation, restoration of supplies and communications with customers, authorities and the media. The report also acknowledges the crucial role played by local councils, voluntary organisations and emergency services in providing support for the worst affected in the local communities. Finally the report concludes with a summary of the main conclusions and recommendations being pursued.

[1] Also known as NIAUR.

Executive Summary

Severe Weather on 30 March 2010

1 On Tuesday 30 March 2010, Northern Ireland suffered a period of extreme weather causing significant disruption and damage to the built infrastructure including the electricity network. This severe snow storm resulted in significant damage to 125km of overhead line. Some 138,000 customers experienced a disruption to their electricity supply. Due to the extent of the damage and the problems experienced gaining access for personnel and equipment to the worst hit areas, the restoration of customers was a long and very demanding process spread over six days. Over 114,000 (83%) customers had their electricity supplies restored within 24 hours and over 136,000 (99%) customers had their supplies restored within four days. Restoration of supplies to the remaining 1,400 customers was particularly problematic and was completed during the fifth and sixth days. Supplies to 700 of these customers were restored on Sunday 4 April; 67 of which were off supply for greater than 120 hours in total.

2 The severe snow storm caused widespread disruption across the whole of Northern Ireland, affecting all but a small part of County Down in the east of the Province. Areas to the north and west of Lough Neagh were severely impacted by the storm and many roads across the Province became impassable.

How the Network Performed

3 The extreme weather of Tuesday 30 March caused over 1140 individual faults on the distribution network with the north and west of the Province being the worst affected by the storm. Over 680 of these faults resulted in physical damage requiring components to be either replaced or repaired. The number of high voltage faults equated to some 27% of that

normally[2] experienced during a whole year. The 11kV distribution network bore the brunt of the storm. In addition, the transmission line network experienced an unprecedented 138 faults but only sustained damage to one earthwire as a result of the storm. None of the transmission faults resulted in loss of supplies to customers.

4 The network components affected were mainly poles and conductors and, in some cases, entire sections of overhead line needed to be rebuilt.

5 Damage was primarily due to wet snow accretion, up to 150mm in diameter, forming on overhead line conductors, resulting in conductors being stretched, causing them to clash or break. In addition, the additional stress placed on these conductors, which was greater than any previous or current overhead line design standard or specification, caused the wood poles to break.

6 The worst affected areas included the greater Cloughmills region of North Antrim where damage at multiple locations on every 11kV circuit within an area of 270 square miles necessitated extensive and prolonged rebuilding and repair of the overhead line infrastructure.

NIE's Response to the Severe Weather

7 The early Met Office Planning Forecasts, used by the Duty Incident Team for their risk assessment on Friday 26 March 2010, did not reflect the severity of the weather to come on Tuesday 30 March. Between 04:29 hours on Monday 29 March and the escalation of NIE staff at 12:53 hours on Tuesday 30 March, a combination of updated weather forecasts and warnings issued by the Met Office, as well as conference calls between NIE and the Met Office, mapped the rapidly deteriorating view of the severity of the weather which was forecast to come. This

[2] Average year with no major storms.

gave NIE some prior warning and enabled four-wheel drive vehicles to be positioned and staff to be alerted to the possibility of an escalation.

8 In response to the severe weather warning received at 11:47 hours on Tuesday, a rapid mobilisation of resources was organised in line with NIE's emergency response process. In total a field resource of approximately 300 were on standby for mobilisation at 16:00 hours on Tuesday 30 March. This represented an appropriate response to the predicted weather. Further resources were mobilised during the course of the event as required.

9 At the peak, resources totalling over 860 employees and subcontractors were deployed in the repair of storm damage. By Saturday 3 April, NIE was supported by over 300 overhead line contractors from Great Britain, Isle of Man and the Republic of Ireland. Five helicopters were also deployed during the event.

10 Given the overall scale of the event, the restoration of customer supplies was well executed with resources being effectively deployed. In particular, the advanced escalation of Local Incident Teams and call handlers was key to the efficiency of the restoration process. As a result of the efficient execution of the emergency plan, over 114,000 customers had their electricity supply restored within 24 hours and only 1% of affected customers remained off supply beyond 96 hours.

Customer Call Handling

11 Over 72,000 telephone calls were answered during the event by a combination of call handlers and the High Volume Call Answering (HVCA) system. Up to 95 call handlers were deployed to answer the peak level of customer calls over the first three days and by lunchtime on Friday telephone calls were being answered almost entirely by call handlers. By Saturday the volume of calls received was greatly reduced and the number of call handlers was stepped down gradually as a result.

Critical Care Customers

12 During the event, calls from Critical Care customers were given priority and call handlers provided these customers with the best available information on restoration times. The purpose of this was to enable these customers to make informed choices such as whether they should move to relatives, friends or if necessary go to their local hospital. During the period 30 March to 4 April, NIE contacted around 400 Critical Care customers who were off supply to provide them with the best information available. Exceptionally, based on specific personal circumstances, a generator is provided to a Critical Care customer; 60 small generators were installed and maintained at the homes of Critical Care customers during this event.

Communications with Key Groups

13 The Utility Regulator, DETI and the Consumer Council were contacted and regularly appraised of progress of the restoration process during the course of the event. Major customers were contacted where appropriate during the course of the event. NIE also dealt with 330 separate media enquiries. Energy Minister, Arlene Foster also visited NIE's Major Incident Centre at Craigavon.

Emergency Reception Centres

14 NIE acknowledges the significant role of District Councils, Community Centres and voluntary organisations who partnered with us to provide vital respite for customers who had been without power supplies for several days. For example, in the Loughguile Millennium Centre over 160 dinners were provided to the local community on Easter Sunday.

15 District Councils enacted their emergency plans as appropriate enlisting the support of various statutory bodies and voluntary groups in the operation of emergency centres as necessary. Support was provided by

the Red Cross, Community Search and Rescue, local community representatives and Health and Social Services. These organisations provided a vital outreach into the wider communities and were able to help identify and aid vulnerable people in need of assistance.

The Severe Weather on 30 March 2010

16 On Tuesday 30 March 2010, Northern Ireland suffered a period of extreme weather causing significant disruption and damage to the built infrastructure including the electricity network. The extreme weather manifested itself as several hours of severe snow storms lying to a depth of 50cm with drifting in areas due to the prevailing north to north-westerly winds. The press reported snow drifts of up to 2.5 metres in the Plumbridge area.

17 Across the Province there was disruption on the roads due to the drifting snow, with conditions in some areas beyond the capabilities of most 4x4 vehicles. Motorists were advised by the authorities not to travel unless the journey was absolutely necessary. The BBC reported that on the Glenshane Pass, over 150 motorists were trapped in their cars and had to be rescued by the emergency services. Police, Mountain Rescue Service and the Coastguard were involved in the operation.

18 These weather conditions resulted in wet snow being blown by a relatively consistent north to north-westerly wind travelling at a speed of up to 35 knots with temperatures at or just above freezing point. Whilst other regions of the UK and Ireland experienced the effects of this storm, albeit to a lesser extent, the particular climatic conditions leading to wet snow accretion on conductors appears to have been concentrated in Northern Ireland. This had the following impact on the electricity overhead line network.

19 For smaller diameter conductors[3] with lower torsional stiffness, these weather conditions can cause the conductor to rotate through several complete revolutions. This exacerbates the extent of accretion of snow to the conductor and increases the probability of conductor failure. Permanent damage is sustained when the conductors are stretched until

[3] Such as 25mm^2 conductors that are widely used on the distribution network.

they clash against each other, touch the ground or break under the weight of accreted snow. In each case, the resulting electrical fault causes a circuit trip and the potential loss of supplies to customers.

20 Visual evidence from the areas worst affected by the storm confirmed a heavy accumulation of wet snow of up to 150mm diameter accreted around the conductors and on some spans which did not fail, the conductors were weighted down to within 300mm of the ground.

How the Network Performed

Distribution Network

21 The Report now deals with the impact of the storm on 30 March 2010. The number of faults and customers affected are set out in table 1 below.

	HV[4]	LV	TOTAL
Approximate No. of Faults	629	512	1141
Approximate No. of Customers Affected	135,492	2,531	138,023

Table 1: Fault Summary

22 To place in context the degree of disruption caused by this event, the 629 high voltage faults equated to some 27% of that normally experienced during a whole year. Furthermore, the high voltage distribution network experienced an unprecedented 1250 trips of circuit breakers as a result of the storm.

23 Table 2 below further disaggregates these faults into transient faults (non-damage faults – typically, for example only fuse replacement is required) and permanent faults (faults requiring substantial repairs to equipment).

	HV	LV	TOTAL
Transient faults	182	276	458
Permanent faults	447[5]	236	683

Table 2: Fault Types

[4] The high voltage (HV) network is used for the bulk transfer of electricity from major substations to tens of thousands of distribution transformers. Individual customers are generally supplied from the low voltage (LV) network that connects their premises to the local distribution transformer. In general, a fault on the HV network will therefore affect a much greater number of customers than a fault on the LV network.

[5] A significant number of these permanent faults had multiple damages.

24 Table 2 illustrates that 71% of the high voltage faults and 46% of the low voltage faults resulted in physical damage to equipment. Analysis of the damaged components causing the high voltage faults is illustrated in chart 1 (below)

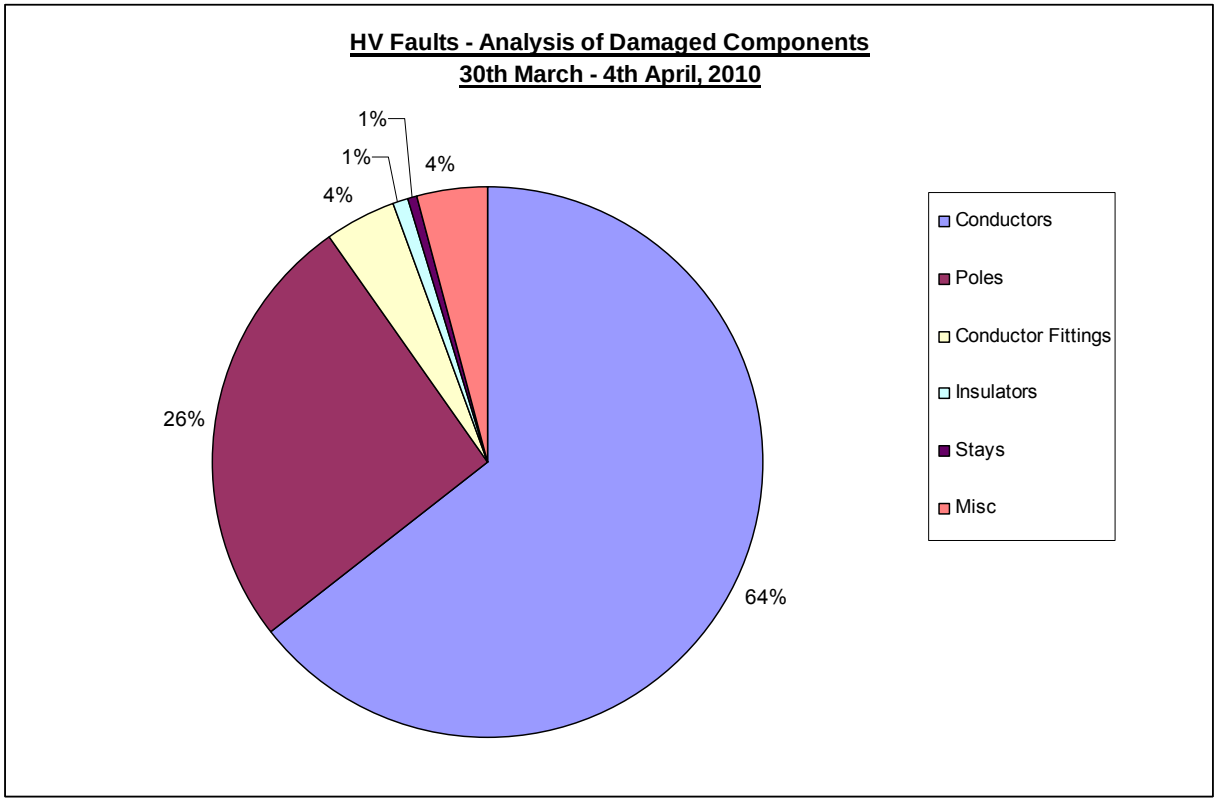

Chart 1: – Analysis of Damaged Components (HV Faults)

25 Chart 1 illustrates that 90% of the damage caused to the high voltage distribution network involved broken conductors and broken poles. During the storm, extensive re-construction was carried out on approximately 125km of overhead line network where we replaced almost 400 poles and used some 45km of new overhead line conductor.

Damage to the high voltage network

26 Across the whole 11kV network, 95% of the poles that were broken were found to be in sound condition as a result of our overhead line refurbishment programme. Likewise our tree-cutting programme ensured that there were only two tree-related faults.

27 It is also notable that overall, almost 90% of the faults affected circuits constructed with the smaller 25mm^2 conductor size[6] although, in the worst affected greater Cloughmills area (ref: appendix 1), 20% of the faults were on circuits with 50mm^2 conductor, albeit with considerably fewer individual damage locations relative to the 25mm^2 conductor.

28 As a result of wet snow accretion, this storm caused much greater damage per fault than would generally be the case for events associated with severe winds. With those severe weather events associated primarily with high winds, while there may be a similar high overall number of faulted lines as was experienced during this event, it would be expected that each faulted line would have suffered relatively little damage, with this possibly confined to a single location. In contrast, for some of the areas worst affected by wet snow accretion during this snow storm, the number of individual circuits that suffered severe damage spread over multiple locations was much greater than has ever been experienced in Northern Ireland. On one 11kV circuit alone in the Cloughmills area, the network was damaged at in excess of 200 locations necessitating extensive and prolonged rebuild and repair of the overhead line infrastructure.

29 The specific climatic nature of this storm was quite unique on such a widespread basis in Northern Ireland and led to the accretion of wind-driven wet snow on overhead line conductors. As a result of this, these conductors were then subjected to mechanical loadings beyond any

[6] Approximately 15,000km (75%) of our 11kV overhead line network is 25mm^2 ACSR construction

current or previous overhead line design specifications and in the case of the distribution network, resulted in extensive damage to conductors and wood poles (ref: appendix 2).

30 Overhead line patrols carried out since the storm have identified a significant number of locations where conductors appear to have been permanently stretched. This will require further and more immediate investigation and potential consideration of a major rebuild repair programme (ref: appendix 2).

Damage to the low voltage network

31 Analysis of the damaged components resulting in low voltage faults is illustrated in chart 2 (following page). As with the high voltage network, broken conductors were the major contributors to low voltage faults.

32 Although there were 512 low voltage faults, the extent of damage to the low voltage network was small relative to the high voltage network. This was most probably due to the characteristics of the low voltage network, for example, shorter conductor span lengths, the shelter afforded by local buildings and the lower height of low voltage construction, as well as the smaller number of low voltage lines in the worst affected areas. This analysis is supported by the fact that in the areas worst affected by the storm, the proportion of faults on the low voltage network reduced to 20% of the total faults and similarly, the extent of damage did not result in the same necessity for multiple repairs that was apparent on the 11kV network.

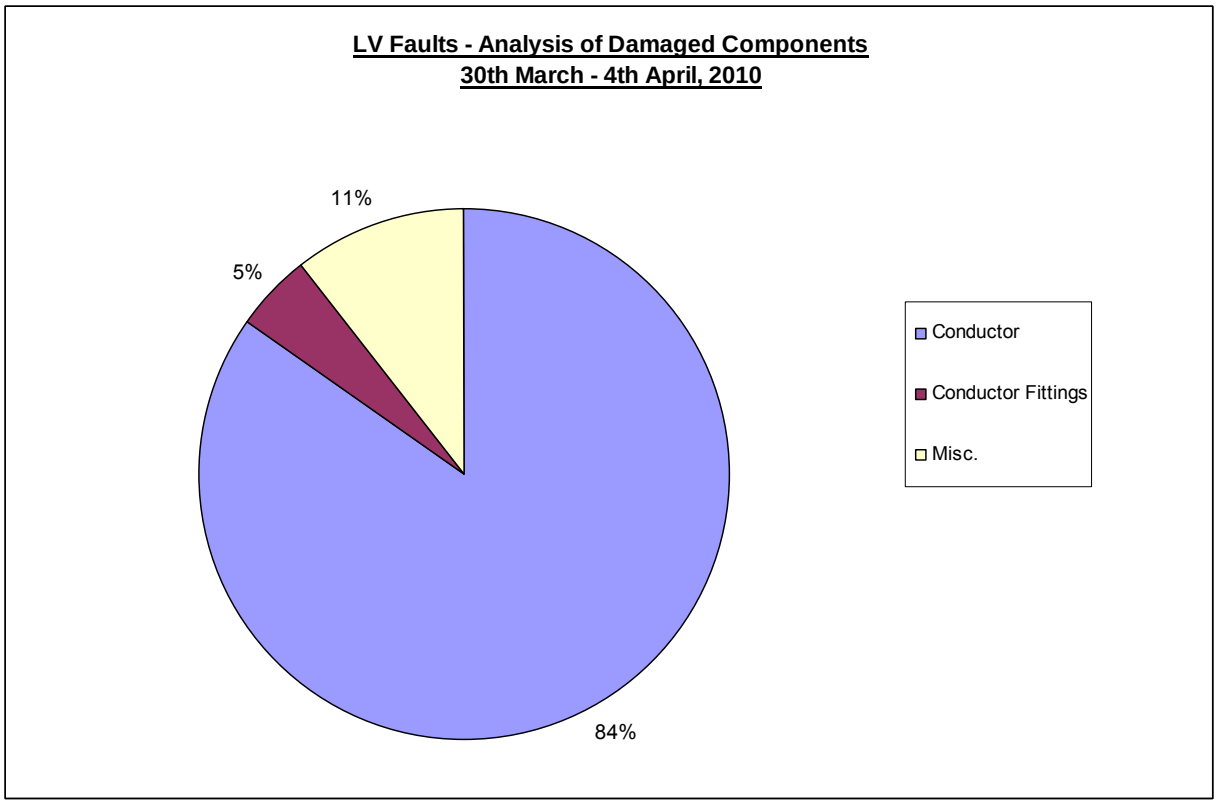

Chart 2: – Analysis of Damaged Components (LV Faults)

Fault Location by Local Incident Centre

33 During normal operations, when the number of faults on the network is relatively low, repair teams are dispatched to faults by the staff in NIE's central Distribution Service Centre. However, this is neither practical nor efficient during a major storm. In an event such as that experienced on Tuesday 30 March, in line with NIE's emergency response process, 12 Local Incident Centres are mobilised. The Local Incident Centres all have access to the fault management and dispatch system (Trouble Management system) enabling local dispatch of repair teams to faults in the most effective manner.

34 The following charts (charts 3 and 4) illustrate the impact of the storm on each of the Local Incident Centres in terms of both the number of faults and number of customers affected. The higher number of faults in

Coleraine, Ballymena, Dungannon, Omagh and Campsie Local Incident Centres reflects the fact that these locations bore the brunt of the storm. Coleraine and Ballymena Local Incident Centres cover different parts of the greater Cloughmills region where the highest concentration of damage occurred.

35 The relatively high number of customers affected per number of faults in Newry was due to the loss of two primary distribution substations[7] at Rathfriland and Dromore, both of which were restored within a few minutes using the SCADA[8] system to remotely operate the network from the central Distribution Control Centre at Craigavon.

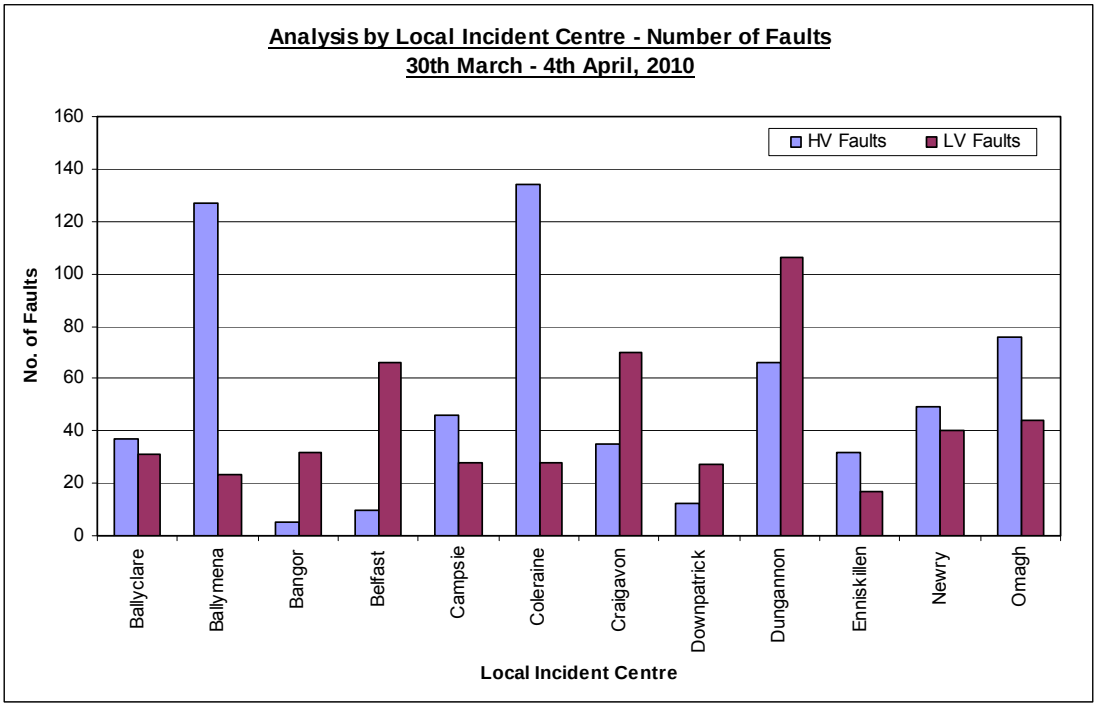

Chart 3: – Number of Faults per Local Incident Centre

[7] Affecting c.9,000 customers.
[8] Supervisory Control and Data Acquisition.

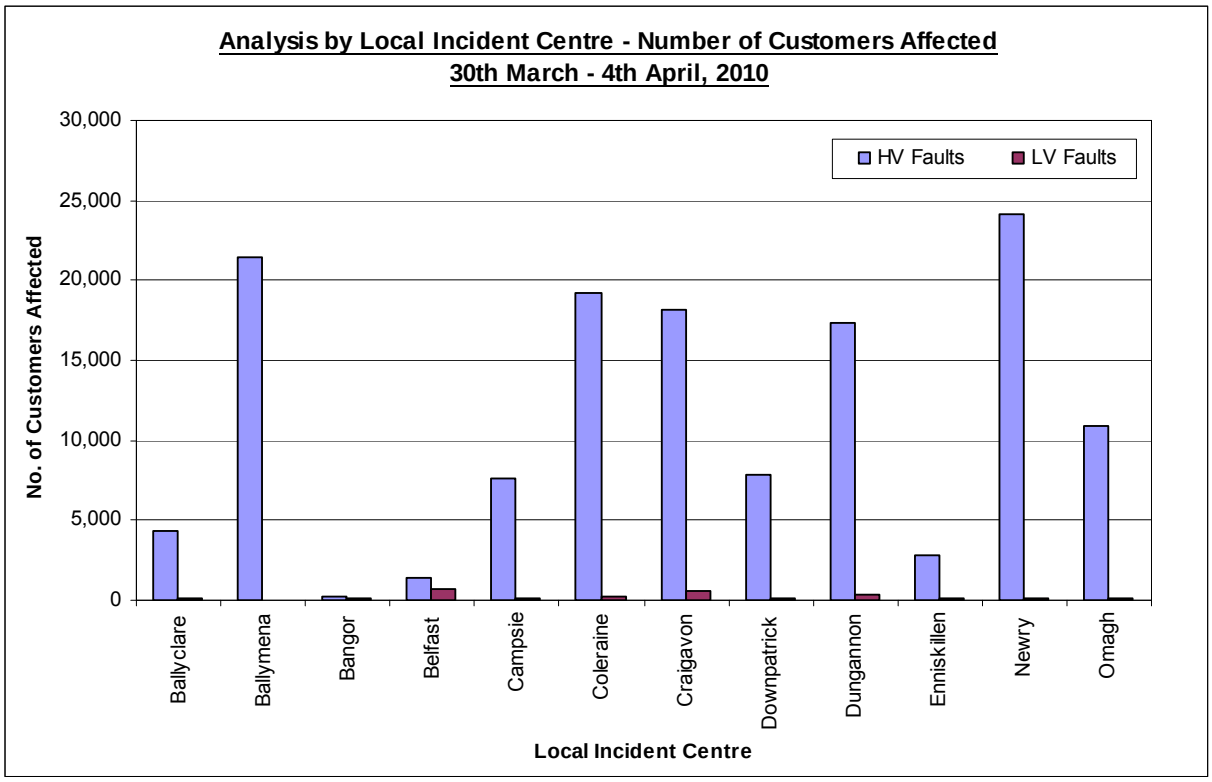

Chart 4: - Number of Customers Affected per Local Incident Centre

Transmission Network

36 During the period of the snow storm, the transmission network experienced an unprecedented 138 faults, equating to 400 circuit breaker trip operations. The worst duty cycle was experienced by 275kV circuit breakers at Kells Grid Substation, where up to 42 fault trips were cleared by one circuit breaker. None of the transmission faults resulted in loss of supplies to customers.

37 Whilst most of the 275kV line faults cleared and were reclosed[9], three of the faults became permanent and required the circuits to be patrolled, prior to being returned to service. Reports from patrols on two of the three permanent 275kV line faults confirmed that conductors had a cylindrical build-up of snow up to 100mm in diameter, consistent with wet snow accretion on a rotating conductor, which on some spans

[9] Auto-reclosed from the DAR (Delayed Auto Reclose) protection systems, or were switched in from SCADA (Supervisory Control and Data Acquisition)

weighed the middle conductors down to within 300mm of the bottom conductors.

38 The only permanent damage evident from patrolling on the transmission line network was on the earthwire associated with the Coolkeeragh to Magherafelt 275kV towerline circuits. Both layers of aluminium strands were broken, leaving only the stranded steel core holding the earthwire. This damage is now repaired. The only other concern about possible permanent damage would be the extremes to which the conductors on the Coolkeeragh to Magherafelt circuits were stretched. It is planned to carry out measurements on these spans to confirm that the conductors have returned to the correct sag and have not been overstretched.

39 The fact that worn conductor clamps and selected suspension string fittings were replaced on the 275kV overhead network during the current regulatory period (RP4) will have ensured that the effects of this extreme event were minimised and that no conductors dropped from their supports.

40 Similarly, the recent replacement of 275kV air-blast circuit breakers with modern spring-operated SF_6 breakers across the network has also ensured the optimum performance of the 275kV system when faced with as many multiple transient trip-close cycles as was experienced during this event. This was especially relevant at Kilroot and Kells Grid substations, where it is likely that the old compressed air operated systems would have struggled to cope with such an extreme event.

41 One circuit breaker at Ballylumford supplying the Kells circuit developed a fault after several successful trip operations and failed to re-close, necessitating repairs to be carried out. This is a known failure mode on these circuit breakers.

42 A full report on the impact of the storm on the transmission network is provided in appendix 3.

NIE's Response to the Severe Weather

Weather Forecasts for the Days Preceding the Storm

43 The Met Office Planning Forecast, issued on Friday 26 March 2010 and noted in the NIE Duty Incident Team weekly risk assessment, had warned of the possibility of strong winds and wintery showers over hills but did not reflect the weather which was to come on Tuesday 30 March. By 04:29 hours on Monday 29 March, the Met Office issued an updated Planning Forecast, which suggested snow over hills and strong north to north-easterly winds.

44 Following a conference call between NIE and the Met Office at 12:00 hours on Monday, the Met Office once again confirmed the prediction of snow over high ground accompanied by strong winds but their key issue was the combination of high rainfall levels, accompanied by high tides, bringing a high risk of flooding. Shortly after the conference call, at 12:45 hours, the Met Office issued a Severe Weather Warning, reflecting the conversation that had just taken place. However, the warning did now include the possibility of drifting snow in the increasingly strong winds and the likelihood that the snow would have a high water content, bringing some risk to power lines. (Wet snow accretion is more likely when snow has a high water content).

45 This gave the Duty Incident Manager some pre-warning of the weather to come and enabled him to arrange for four-wheel drive vehicles to be positioned and for Local Incident Centre Managers to be alerted to the possibility of an escalation. Plans were also put in place for additional call handling, should it be needed.

46 By 14:28 hours on Monday, the Met Office added an Ice Accretion Warning to the previous forecasts, predicting accumulations of snow up to 30cm at levels above 150m, with drifting in the strong to gale force winds through Tuesday and into Wednesday.

47 The NIE Duty Incident Manager circulated this warning by email to the NIE Emergency Circulation list with a note that he would continue to monitor the weather throughout Tuesday. Local Incident Centre managers were advised to remain alert to the risks and watch for updates.

Weather Forecast for Tuesday 30 March 2010

48 On the early morning of Tuesday 30 March at 01:01 hours, the Met Office issued a High Gusts Warning for the period from 06:00 hours on Tuesday to 09:00 on Wednesday 31 March. This forecast a 100% probability of gusts in excess of 45knots at Ballykelly, Ballypatrick and Orlock Head, with an 80% probability of gusts in excess of 55knots. This type of weather forecast, if it materialised, would result in limited damage to the electricity network.

49 At 11:47 hours on Tuesday 30 March, the Met Office Public Weather Service Advisor (PWSA) issued a Severe Weather Update. This weather update highlighted that rainfall totals for the preceding 24 hours stood at 25-55mm and that these totals would double during the period to Wednesday morning. In addition, it highlighted that snow was falling to increasingly low levels in the west and already some places at just 750 feet were reporting snow depths of 16cm and accumulating. The weather update also highlighted an expectation that conditions would deteriorate steadily with snow descending to ever lower levels across western counties during the day and eastern counties that evening. Winds were expected to become increasingly strong, reaching gale or severe gale strength in all areas by tea-time and through much of the evening. The report suggested that this would result in blizzard conditions and severe drifting of lying snow on high ground but that atrocious conditions may well descend to lower ground at times. Furthermore, it flagged up that wet snow and very high winds historically posed a significant risk to power supplies. The update ended by stating

that they were preparing to issue an Emergency Flash for Exceptionally Severe Weather on the web.

50 The Met Office issued a National Severe Weather Warning at 12:34 hours on Tuesday 30 March with the warning applying to counties Derry, Fermanagh and Tyrone for the period from 15:00 hours on Tuesday through to 06:00 hours on Wednesday. This predicted severe blizzards, severe drifting snow and a very heavy snowfall. Typical snow accumulations of 15cm were suggested, with drifts of 30 or 40cm expected for upland areas such as the Glenshane Pass. The public were advised to take extra care on the roads and to check for further advice on road conditions.

51 The Met Office issued an additional National Severe Weather Warning at 14:42 hours on Tuesday 30 March, extending the severe weather predictions to counties Antrim, Armagh and Down from 17:00 hours on Tuesday through to 06:00 hours on Wednesday (Met Office reports are detailed in appendix 4).

Escalation Plan

52 At 12:53 hours on Tuesday 30 March, in response to the Severe Weather Warnings received, the NIE Duty Incident Manager issued an escalation plan. The plan called for all Local Incident Centre (LIC) Managers to confirm their availability and readiness to escalate and for the LICs at Omagh, Dungannon, Enniskillen and Campsie to escalate from 16:00 hours on Tuesday afternoon. In addition, the LIC Managers were to ensure that all four-wheel drive vehicles were available for use. Meanwhile, the Duty Incident Manager would continue to monitor the situation, with a particular focus on weather updates.

53 In addition to the escalation plan for the LICs, additional call handlers, dispatch personnel and Distribution Control Centre engineers were planned to be in place by 15:30 hours on Tuesday.

Mobilisation of Resources at 16:00 hours on Tuesday 30 March

54 The Major Incident Centre in Craigavon was opened at 16:00 hours on Tuesday, along with the LICs at Omagh, Dungannon, Enniskillen and Campsie. In addition, the call handling resource was increased to address the expected increase in call volumes. The Duty Incident Manager was in place by 16:00 hours and assumed responsibility for the mobilisation process.

55 The NIE stores were advised to retain resources in each main stores location (Carn & Ballymena) until at least 18:30 hours and to prepare for a 06:00 start the following morning. Also NIE's external overhead line contractor was contacted to ensure that their staff were available if required that evening or the following morning, once the extent of the storm movement was known.

56 By 16:55 hours on Tuesday, when it became evident that the storm was moving eastwards across the Province, a call was made for all remaining Local Incident Centres to mobilise with immediate effect. As news of mobilisation difficulties was starting to emerge, a call was made to our vehicle suppliers for additional four wheel drive vehicles for use by key engineering and managerial personnel.

57 By 23:00 hours on Tuesday, when it became evident that the extent of the snow was preventing access and proper assessment of the network damage, contact was made with NIE's contracted helicopter patrol company. They were unable to confirm their availability until the following morning at 08:00 hours, when they could properly assess the suitability of the weather for flying.

58 On this evening, the number of resources peaked at 23:00 hours. A repair resource of 303 was mobilised, supported by around 50 other staff in their various emergency roles (for example, Distribution Control engineers, call handlers etc.). The repair resource included 15 external

contract lines staff, who were already working on the NIE network. Due to the severity of the conditions and associated safety risks, priority was given to repairing major faults and dangerous situations in the first instance.

59 NIE's Major Incident Centre remained staffed throughout the night, making assessments of the fault data and planning for an early mobilisation the following day.

Mobilisation of Resources on Wednesday 31 March

60 On Wednesday 31 March, all 12 Local Incident Centres were mobilised from 06:00 hours. Some of the expected imported resources were delayed in their arrival from Scotland until late morning, due to their ferry sailings out of Scotland being cancelled during the night because of the bad weather.

61 On this day, the number of resources peaked at 15:00 hours, when a repair resource of 581 was mobilised, supported by around 70 other staff in their various emergency roles. The repair resource included 54 external contract lines staff brought in from Great Britain (GB) and the Republic of Ireland (ROI).

62 Only two helicopters were in a position to assist on Wednesday due to the weather conditions, and one only flew for two hours. However, plans were made for four to be in position by the following morning to start patrolling from 09:00 hours onwards.

63 The Major Incident Centre remained staffed throughout the night, making assessments of the fault data and planning for an early mobilisation the following day.

Mobilisation of Resources on Thursday 1 April

64 On Thursday 1 April, 11 of the 12 Local Incident Centres were mobilised from 06:00 hours. Bangor had completed all repairs in their area and therefore their teams were re-deployed to other locations.

65 On this day, the number of resources peaked at 16:00 hours, when a repair resource of 762 was mobilised, supported by around 100 other staff in their various emergency roles. The repair resource included 222 external contract lines staff from GB and ROI. The repair resource also included 30 pole erection contractors from across the Province.

66 From 09:00 hours onwards, four helicopters were employed patrolling distribution and transmission lines, one of which had a 650kg payload and was utilised to transport materials as required.

67 The Major Incident Centre remained staffed throughout the night, making assessments of the fault data and planning for an early mobilisation the following day.

Location	Local Incident Teams	Authorised Staff	Linesmen	Field Support Staff	Total Resource
Major Incident Centre	8	0	0	0	8
Ballymena/Ballyclare	25	28	102	50	205
Bangor	0	0	0	0	0
Belfast	8	3	8	11	30
Campsie	11	13	41	25	90
Coleraine	11	18	70	35	134
Craigavon	12	9	11	20	52
Downpatrick	8	1	12	5	26
Dungannon/Omagh	17	31	66	28	142
Enniskillen	3	6	29	1	39
Newry	10	7	14	5	36
Total Resource	113	116	353	180	762

Table 3: Deployment of repair resource by Local Incident Centre on Thursday 1 April

Mobilisation of Resources on Friday 2 April

68 On Friday 2 April, 10 of the 12 Local Incident Centres were mobilised from 06:00 hours. In addition to Bangor, Newry had completed all repairs in their area and therefore their teams were re-deployed in other locations. Craigavon and Enniskillen were also well progressed with their repairs and so started to move their resources to the worst affected areas, holding back only a small number of staff.

69 On this day, the number of resources peaked at 15:00 hours, when a repair resource of 736 was mobilised, supported by around 110 other staff in their various emergency roles. The repair resource continued to be supplemented by external contracted resources, including 247 lines staff from GB, ROI and Isle of Man (IOM), as well as 30 pole erection contractors from across the Province.

70 From 08:30 hours, five helicopters were deployed. Due to the extreme numbers of overhead line mid-span joints being used on repairs, two of the helicopters had to be utilised for the collection of line joints and other materials from suppliers in GB. Friday 2 April was a bank holiday in GB and one supplier brought staff in from holiday to manufacture extra mid-span joints for NIE. The remaining helicopters continued to patrol lines in the Plumbridge, Carrickfergus and Cloughmills areas.

71 The Major Incident Centre remained staffed throughout the night, making assessments of the fault data and planning for an early mobilisation the following day.

Mobilisation of Resources on Saturday 3 April

72 On Saturday 3 April, 5 of the 12 Local Incident Centres were mobilised from 06:00, Ballymena, Ballyclare, Campsie, Coleraine and Downpatrick. Due to the extent of the damages experienced in the Coleraine LIC area

and the large numbers of resources now operating there, the area was split into four distinct work areas and managed by four dedicated groups. The majority of Downpatrick LIC staff were utilised in one of these areas and the Downpatrick LIC remained mobilised, directing repairs from their base at Ballynahinch. The other three Coleraine work areas were directed from their LIC in Coleraine.

73 On this day, the number of resources peaked at 10:00 hours, when a repair resource of 692 was mobilised, supported by around 80 other staff in their various emergency roles. The number of customer calls had by this stage dropped off and the number of call handlers was reduced throughout the day to reflect this. The repair resource continued to include 303 external contract lines staff and 30 pole erection contractors.

Mobilisation of Resources on Sunday 4 April

74 On Sunday 4 April, 3 of the 12 Local Incident Centres were mobilised from 06:00 hours, Ballymena, Ballyclare and Coleraine.

75 On this day, the number of resources peaked at 07:00 hours, when a repair resource of 639 was mobilised, supported by around 30 other staff in their various emergency roles. The number of customer calls had by this stage further dropped off and the number of call handlers was significantly reduced to reflect this. The repair resource continued to include 303 external contract lines staff as well as 30 pole erection contractors.

76 NIE's material procurement, stores and logistics systems ensured that throughout the duration of the storm, materials were available for all repair teams and in many cases these were delivered directly to damage repair sites. Due to the high volume of conductor damages, two helicopters were utilised to obtain additional conductor tension joints direct from an overhead line materials manufacturer in England. The quantity of joints used during the storm equalled typical usage patterns

across all of NIE over a three year period. During the storm period, 400 poles were delivered to site along with conductor drums totalling 45km of new overhead line conductor and in addition, a vast and diverse range of associated overhead line construction materials. A measure of this overall materials management and logistics success was that there were no instances, on any repair sites, of materials unavailability giving rise to delays in fault repairs.

Restoration of Supplies

77 The 629 high voltage faults resulting from the 30 March storm was equivalent to some 27% of the total number of high voltage faults normally experienced during a whole year. From chart 5 below, it can be seen that the majority of electricity supply failures occurred between 16:00 hours on Tuesday 30 March and 06:00 hours on Wednesday 31 March. These failures occurred during the period of the most severe weather.

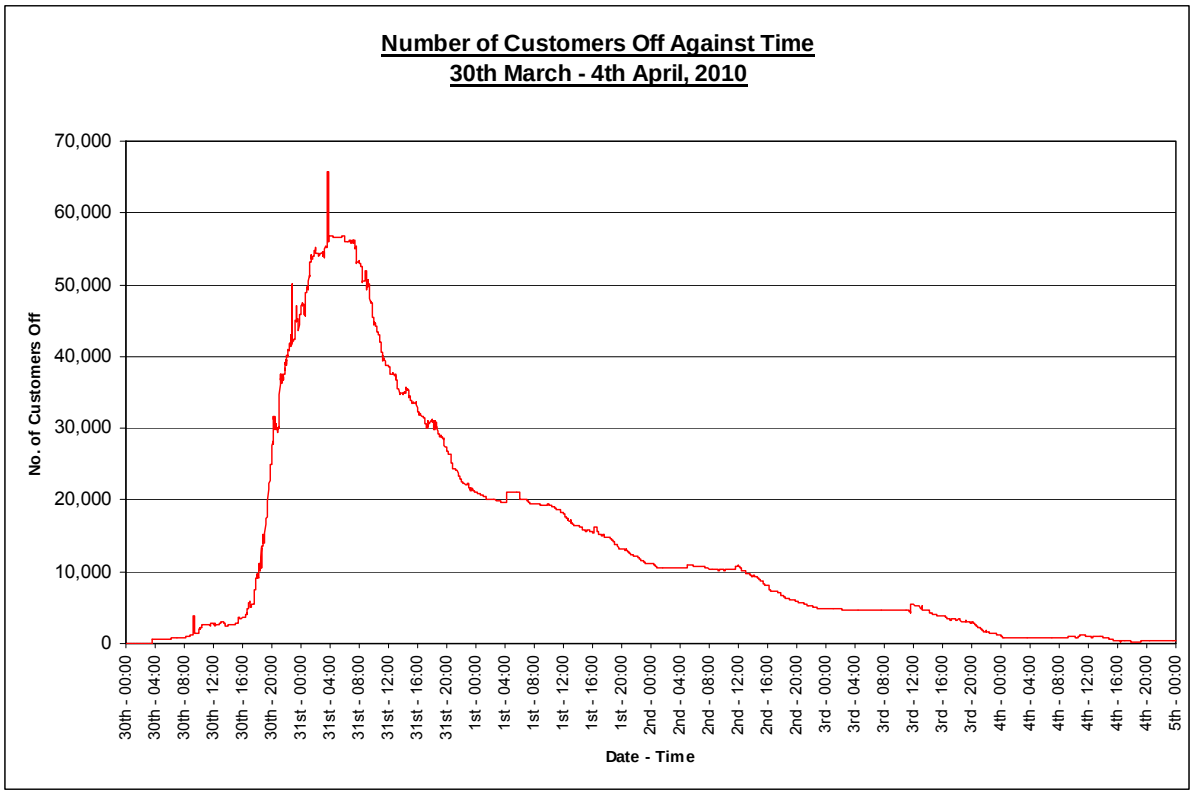

Chart 5: – Number of customers off supply, against time (30 March - 4 April 2010)

78 In the early stages of any major event, supply can be restored quickly if the fault does not necessitate a physical repair. Restoration is undertaken by utilising SCADA[10] to remotely operate the network from the central Distribution Control Centre at Craigavon or alternatively by authorised staff[11] physically operating the network at source. Restoration by this means was limited, however, due to the number of damage[12] faults resulting from the impact of the storm on 30 March. The SCADA system was utilised in the restoration of supplies to over 57,000 customers representing over 40% of the supply interruptions associated with faults on the high voltage network. A summary of the restoration times set against customer numbers is detailed in table 4 (below).

Estimated Restoration Times	**Percentage of Total Customer Interruptions**	**Number of Customers Restored**
Supply Restoration < 3 Hours	43.6%	60,119
Supply Restoration < 6 Hours	51.7%	71,361
Supply Restoration < 12 Hours	66.7%	92,120
Supply Restoration < 24 Hours	83.0%	114,551
Supply Restoration < 48 Hours	90.91%	125,476
Supply Restoration < 72 Hours	96.0%	132,509
Supply Restoration < 96 Hours	99.0%	136,622
Supply Restoration > 96 Hours	1.0%	1,401
Supply Restoration >120 Hours	0.1%	67

Table 4: Restoration times by number of customers

[10] Supervisory Control and Data Acquisition.
[11] Authorised – employees that are authorised to make the network safe for repairs. This comprises of engineers and authorised industrial staff.
[12] Damage faults – are faults where a repair is necessary to restore supplies e.g. broken conductor. Non-damage faults are of a transient nature resulting in the tripping of a circuit breaker or operation of a fuse. Examples would include lightning or tree branches blowing against conductors during high winds. Because no fault repairs are necessary, supplies to all customers affected can be restored by closing the circuit breaker or restoration of a fuse.

79 Supply restoration activity was severely hampered in some regions by difficulty in getting access due to impassable snowdrifts. This not only prevented engineers and repair crews reaching the damaged sections of the network to effect repairs but also severely hampered the collection of comprehensive and accurate information on the full extent of the damage.

80 These conditions led to many key NIE staff having to employ hired 4x4 vehicles to supplement NIE's existing four wheel drive fleet in order to get to their emergency bases. Five helicopters were utilised to ferry resources to damaged sections of overhead line and to carry out line patrol activities on worst affected circuits and regions to ascertain the extent and nature of damage repairs required.

81 As demonstrated in chart 1 (page 9), most damage was caused to overhead line conductors and poles. Replacing these components was time consuming usually requiring the co-ordination and utilisation of a repair team, heavy lifting and tracked digging machinery. Initial focus always has to be on repairing high voltage faults because this ensures the largest possible numbers of customers are reconnected in the shortest possible time. Once high voltage faults are repaired the focus moves to repairing faults on the low voltage network[13]. Typically a number of low voltage faults do not become evident until the high voltage network supplying a wider area has been repaired. The initial effort on 30 March and early subsequent days was, therefore, directed towards repairing faults on the high voltage network. Many of these high voltage faults related to multiple damage sites necessitating significant line rebuild repair in the worst affected areas. Repairs involving the replacement of broken poles and conductors are time consuming and particularly in the early days of the repairs, the adverse weather and snow conditions made access to ascertain the extent of damage and subsequent repair activities particularly challenging. Helicopters and

[13] Where possible in the earlier stages of an event, field support staff are utilised to identify faults on the low voltage network and restore supplies caused by non-damage faults.

dedicated line patrol staff were utilised to determine and quantify the damage in order to prioritise repairs and associated resources. Once the repair teams had addressed the high voltage faults in local areas they were systematically redirected to repair faults on the low voltage network or, in many cases, to other priority damage locations on the high voltage network. As repairs were completed across the Province, this enabled significant numbers of repair crews to be redirected to the greater Cloughmills area from other parts of the Province as each day progressed. These were supported by further Electricity Utility and Contractor overhead line resource from GB, IOM and ROI. The high number of damage faults and widespread nature of this storm event gave rise to repair activities lasting through to Sunday 4 April for worst affected customers.

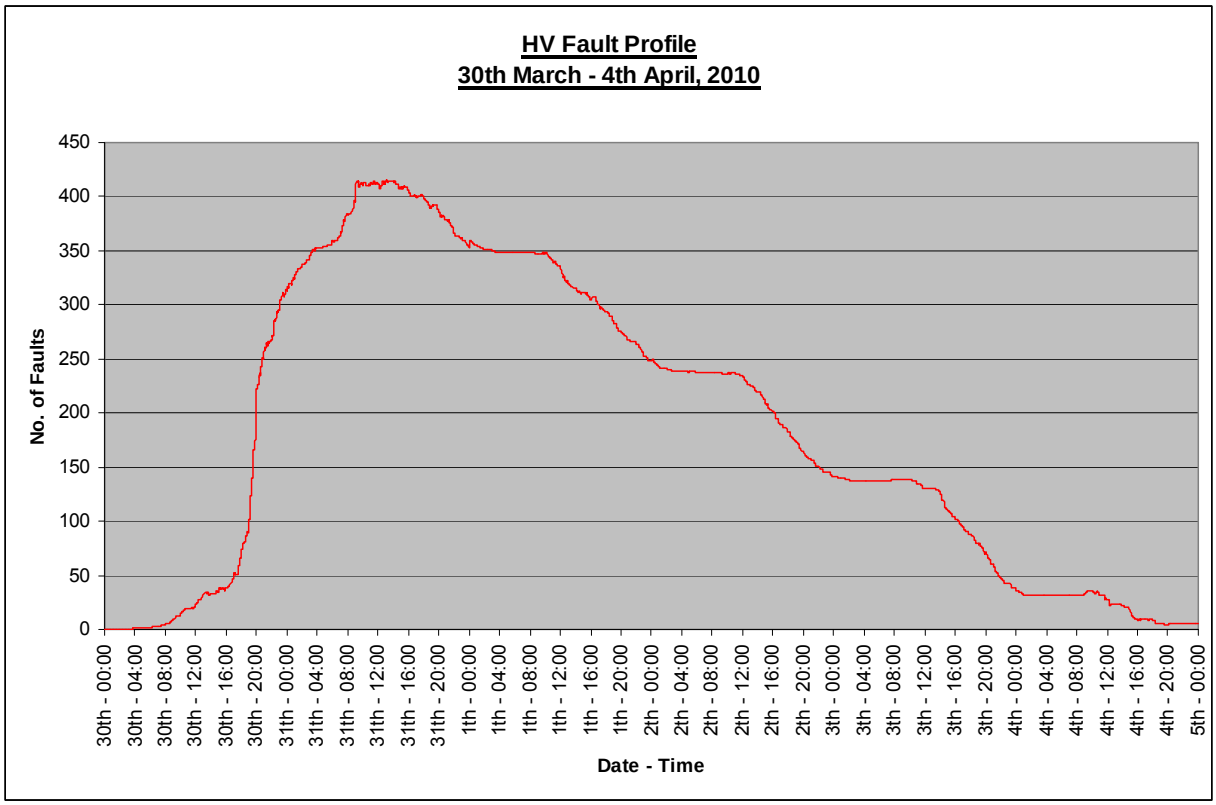

Chart 6: – Restoration of HV Faults

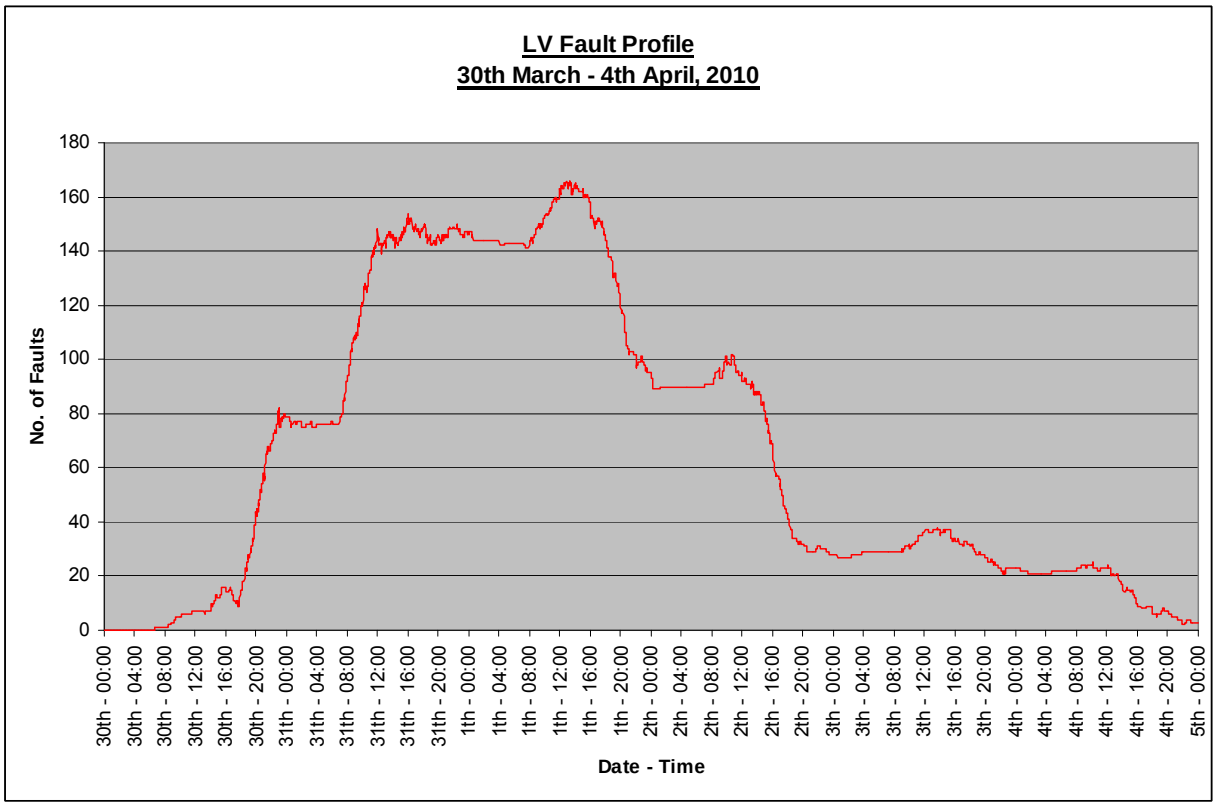

Chart 7: – Restoration of LV Faults

82 Table 4 (page 25) illustrates that 83% of supplies lost following the 30 March storm were restored within 24 hours, with over 99% of supplies restored within four days. Restoration of supplies to the remaining 1,400 (1%) customers was particularly problematic and was completed during the fifth and sixth days. Supplies to 700 of these customers were restored on Sunday 4 April; 67 of which were off supply for greater than 120 hours.

83 A dedicated team maintained contact with the Critical Care customers affected and NIE installed portable generators and revisited to fuel same at 140 properties. This included 60 Critical Care customers, vulnerable customers and customers worst affected in the Cloughmills area.

84 The restoration of supplies following the 30 March storm was made possible by the effective deployment of resources and the efficient execution of the emergency plan. It was also aided once again by the

considerable dedication shown by NIE employees in making themselves available to respond to this event over a prolonged period leading up to Easter. Further assistance obtained from external power utility contractor staff and other GB, IOM and ROI electricity companies ensured that the extent of repairs and line rebuild, which under normal work circumstances would have taken several weeks, was completed within five days.

Customer Call Handling

Call Handling Strategy

85 NIE was the first utility in the United Kingdom to implement High Volume Call Answering (HVCA[14]). This technology is used by over 70 utilities worldwide, including 8 of the 10 largest electricity utilities in the USA. The interactive system allows customers to both listen to fault specific messages, and also to record the fact they are off supply without having to speak directly with a call handler. This permits the efficient flow of large quantities of up-to-date information significantly faster and on a scale that could not be dealt with by call handlers.

86 Disruption to electricity supplies results in a high volume of customers seeking to make contact with NIE to report the fact that their electricity supply has failed. HVCA is key to NIE's ability to deal with a high volume of calls. This system makes available very useful information which is a key factor in maintaining customer confidence. In the early stage of such an event it is important to be able to provide customers with the ability to register the fact that they are off supply and allow them to access the best information available. Information is often extremely limited in the early stages of an event. The system does provide for the diversion of Hazard and Priority calls[15] directly to call handlers. The level of call handling is maintained so that in the latter stages of a storm related event most customers are able to speak to a personal call handler.

Call Handling during this event (30 March to 4 April 2010)

87 HVCA was employed to deal with the high volume of calls received in the early stages of this event. On 30 March, 14,115 calls were answered, 11,520 by HVCA and 2,595 by call handlers of which there

[14] See appendix 5.
[15] Priority calls – Emergency Services, Critical Care Customers and Elected Representatives.

were a maximum of 22 on this date. The highest volume of calls were received between 17:30 and 22:00 hours.

88 For those calls answered by HVCA, customers would have received either the default message or a fault specific message depending on whether or not the fault had already been logged on the Trouble Management system[16] by an earlier call from a customer. These messages are automatically updated as information on estimated restoration times and cause of damage becomes available. As referred to previously, HVCA is key to NIE's ability to deal with a high volume of calls, particularly in the early stages of an event.

89 On 31 March a maximum of 64 call handlers were deployed. In total 37,907 calls were answered, 29,320 by HVCA and 8,587 by call handlers.

90 On 1 April, a maximum of 64 call handlers were deployed. They answered the majority of the calls received (8,477) with 3,372 calls being answered by HVCA.

91 On 2 April, a maximum of 95 call handlers were deployed. They answered the overwhelming majority of the calls received (4,687), with only 58 calls being answered by HVCA. The situation was similar on 3 and 4 April when the overwhelming majority of the calls received on these dates (3,292) were answered by call handlers with only 14 calls being answered by HVCA.

92 During the event approximately 72,000 calls were answered, 44,000 by HVCA and 28,000 by call handlers. A total of 746 priority calls were answered from the Emergency Services (39), elected representatives (307) and Critical Care customers (400). In addition, the call handlers

[16] Trouble Management System – see appendix 5.

contacted some 2,800 customers in relation to Hazard reports logged on to 'web call-back report'[17] throughout Saturday and Sunday.

93 The following chart illustrates the number of calls answered by call handlers and calls answered by HVCA from Wednesday 30 March to Sunday 4 April.

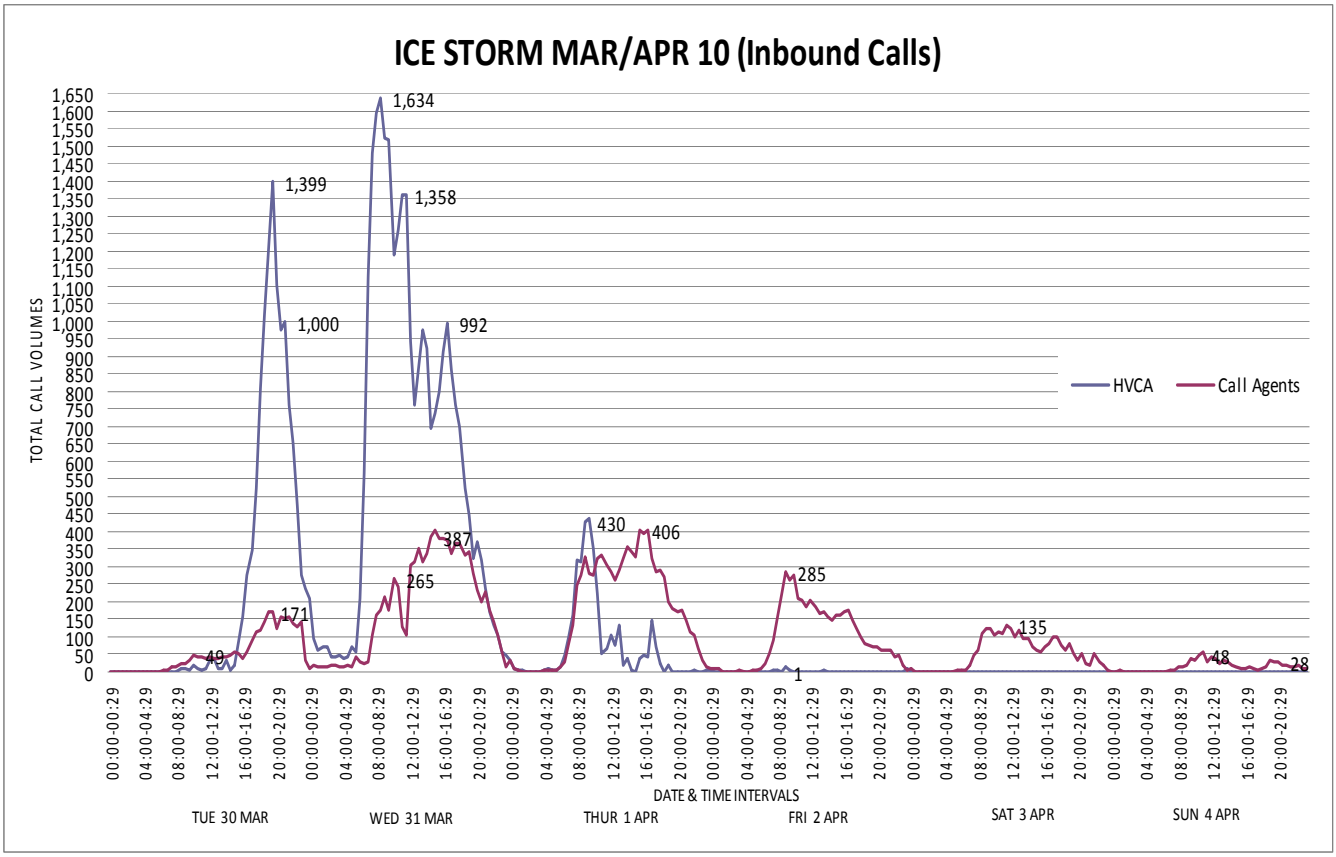

Chart 8: –Calls answered by Call Handlers and High Volume Call Handling

[17] Web call-back report – see appendix 5, High Volume Call Answering.

Critical Care Customers

94 NIE offers a critical care information service to Critical Care customers[18] who are dependent on life supporting electrical equipment. There are approximately 2,800 customers currently on the Critical Care Register. When customers on the register contact NIE during a fault, the system recognises their number and their call is given priority; customers will either speak directly to a call agent or will be asked to leave contact details in which case they will be called back.

95 During the storm NIE was also contacted by some customers medically dependent on electrical equipment but not on the Critical Care Register. These customers were also given priority, managed in the same way as existing critical care customers and subsequently added to the register.

96 At the start of the escalation, a team was set up to manage these customers and this continued for the duration of the event. During the event, call handlers provided these customers with the best available information on restoration times and kept them updated throughout the duration of the power cut affecting their premises. The purpose of this was to enable these customers to make informed choices such as whether they should move to relatives, friends or if necessary go to their local hospital.

97 During the period 30 March to 4 April 2010, NIE contacted around 400 Critical Care customers who were off supply to provide them with the best information available. Exceptionally, based on specific personal circumstances, a generator is provided to a Critical Care customer; 60 small generators were installed and maintained at the homes of Critical Care customers during the course of this event.

[18] Critical Care Customers – customers who are medically dependent on electrical equipment can register for a critical care information service.

Communication with Key Groups

98 During the course of the event, DETI, the Utility Regulator and the Consumer Council were provided with regular email updates, copies of all press releases issued and twice daily phone briefings detailing the restoration efforts, the extent of storm damage, the number of customers affected and the deployment of resources. Major customers were contacted where appropriate during the course of the event.

99 NIE's Communications Department adopted a proactive approach to keeping customers, public representatives and media advised throughout the duration of the event. Details of media coverage and press releases are contained in appendix 7.

100 To ensure the provision of realistic expectations to customers and the media, communications from the early stages of the event highlighted that it would take a number of days to restore supplies to the worst affected areas. At least three press releases were issued daily and multiple TV, radio and press interviews were provided. Many of the TV interviews were in the field with engineers and repair teams, which helped convey to the public the reality of the severe weather and the considerable restoration effort being expended.

101 In total the press team dealt with over 330 press enquiries over the storm event.

102 All communications going to the media were also used by call agents to ensure that customers received a consistent message.

103 Every year NIE issues a letter to all public representatives advising them of a dedicated hotline number for their use. This is a priority line to NIE call handling and ensures that public representatives have the facility to contact NIE directly at any time. During the event, NIE responded to 300 calls from public representatives through this dedicated number. In

addition, numerous calls from public representatives were also received directly by NIE customer relations managers. Following specific requests, NIE press release updates were emailed to public representatives to keep them up to date on the restoration effort.

104 Energy Minister, Arlene Foster visited NIE's Major Incident Centre in Craigavon to view the round-the-clock efforts to restore power to homes. During the storm, MLAs in North Antrim, the worst affected area, were provided with regular updates on progress and representatives of Mervyn Storey MLA's office visited Coleraine Local Incident Centre to experience first hand the extent of damage involved and NIE's efforts in supply restoration.

Goodwill Payments

105 The Guaranteed Standards framework provides for an exemption to be applied in circumstances of severe weather. NIE has claimed such an exemption for this event which the Utility Regulator has now approved[19].

106 Not withstanding that an exemption to these standards has been applied, NIE considered it was appropriate to make automatic goodwill payments to approximately 700 customers whose supplies were not restored until Easter Sunday, 4 April 2010.

107 NIE have made donations to voluntary groups who were an integral part of efforts to support members of the local community during the event.

[19] Letter to NIE dated 14 April 2010.

Emergency Reception Centres

108 Throughout this event, NIE reviewed on a daily basis the damage to the network, assessing the time to repair faults and restore electricity to the areas affected. Due to the extent of the damage in certain areas, NIE considered it was realistic that the work required to repair and restore supplies to certain areas could continue until Easter Sunday, 4 April.

109 On Thursday 1 April, NIE identified the worst affected community areas and liaised with emergency planning contacts in local District Councils, who were able to identify suitable council-run facilities that could provide respite for local people. In some of the worst affected areas, council-run facilities were not available and councils approached local community groups, for example, the Millennium Centre in Loughguile.

110 Where necessary, NIE fitted generators to the identified centres and ensured that a member of staff was present at each location to liaise with and provide information to local people. The joint operation ensured that emergency centres could provide support, assistance, hot food and respite to local communities.

111 Ballymoney District Council enacted its emergency plan which enlisted the support of various statutory bodies and voluntary groups in the operation of emergency centres. Such support was provided by the Red Cross, Community Search and Rescue, local community representatives and Health and Social Services. These organisations provided a vital outreach into the wider communities and were able to help identify vulnerable people in need of assistance.

112 The emergency centres operated from 09:00 on Friday 2 April until the areas affected had their electricity supplies restored. Emergency centres were opened in the following areas:

Ballymoney area:

- Joey Dunlop Centre, Garryduff Road (open 24 hours)
- Millennium Centre in Loughguile

Ballymena area:

- Martinstown Parochial Hall
- Glarryford Young Farmers Hall
- Neillsbrook Community Centre, Randalstown

Cookstown area:

- Loughry College, Dungannon Road

Strabane area:

- Amity House, Donemana

Omagh area:

- An Creagain Centre

Limavady area:

- Dungiven Community Centre

113 Media updates issued by NIE and District Councils provided details of the emergency centres. In some locations leaflets were distributed at local churches and shops to raise awareness within the community about the emergency centres. In meetings following this event, it has been agreed that any future communications of this sort should be carried out jointly.

114 By Saturday 3 April, detailed maps of the electricity network in the locality were provided in the emergency centres. These were placed on

notice boards within the centres to assist the local community's understanding of the restoration information being provided to them by NIE.

115 NIE representatives were also on hand to discuss any queries from local people and provide advice where required.

116 Media, local councillors and MLAs visited some of the emergency centres to offer support to the local communities. NIE kept the councillors and MLAs updated as to when electricity supplies were expected to be restored via on site representatives and calls to MLAs directly or to their constituency offices.

Conclusions and Recommendations

(Recommendations in bold)

The Severe Weather on 30 March 2010

117 The specific climatic nature of this storm was quite unique on such a widespread basis in Northern Ireland and led to the accretion of wind-driven wet snow on overhead line conductors and other components of the network. Whilst fairly widespread across the Province, the weather conditions experienced on Tuesday 30 March 2010 were particularly extreme in the Cloughmills area.

NIE will liaise with the Met Office to ascertain the probability and frequency of a similar climatic condition occurring again and the probability that the conditions experienced in the Cloughmills area could be more widespread.

How the Network Performed

Distribution System

118 As a result of the accreted snow conductors were subjected to mechanical loadings beyond any current or previous overhead line design specifications and, in the case of the distribution network, resulted in extensive damage to conductors and wood poles. This was particularly prevalent on the 11kV network with 25mm^2 conductor worst affected. Since 31 March 2008 our construction policy is to use only conductor size of 50mm^2 and above on new overhead line build.

119 Post storm patrolling has identified a significant number of locations where conductors appear to have been permanently stretched. This will require further analysis and potential consideration of a major rebuild

repair programme. Furthermore, sections of conductor which have been repaired using several mid-span joints will also be assessed.

120 The highest concentration of damage occurred in the greater Cloughmills region. In different circumstances, had the extent of damage witnessed in Cloughmills been more widespread, this would have had the potential for a more prolonged event.

121 Our tree cutting programmes have proved successful in relation to this storm event and ensured that there were only two tree related faults.

122 The severity of the snow accretion was such that in addition to circuits constructed with the smaller 25mm^2 conductor, which was worst affected, damage also occurred on other 'backbone' main lines with 50mm^2 conductor, albeit with fewer multiple damage locations. One of these main backbone lines had been extensively rebuilt in recent years.

123 Instances of damage on the 33kV network were small, though in worst affected areas the wind and wet snow accretion caused some of these lines to also fail. One newly constructed 33kV line supporting our largest distribution conductor size (200mm^2) was damaged and failed as a result of the storm's severity.

124 The low voltage network, whilst experiencing a large number of individual faults, did not necessitate such extensive, prolonged and multiple repairs as was the case on the 11kV network.

NIE will investigate the approach taken by other electricity utility companies with respect to overhead line design and mitigation against ice and wet snow accretion.

NIE will carry out further analysis of those spans of conductor that we suspect have been stretched by the weight of snow during this event to determine their tensile strength and anticipated lifespan.

NIE will investigate the case for replacing stretched conductor and develop a replacement programme and investment proposal. To the extent that these more urgent requirements may need to be initiated during the current regulatory period (RP4), we will discuss our proposals with the Utility Regulator in the context of its impact on NIE's capital expenditure budget for RP4.

NIE will continue with the current refurbishment strategy of replacing 25mm^2 conductor on the main line sections of circuits to the latest design standard.

NIE will investigate the case for expanding and accelerating its programme of replacement of 25mm^2 conductor to cater for both main line and spur line circuits. We will include our proposals within our proposed capital investment plan for the fifth regulatory period (RP5) for discussion with the Utility Regulator in the context of the RP5 price control review.

Transmission System

125 Although the 275kV transmission line network experienced over 130 transient faults over the period of the snow storm, it is notable that only three of these faults led to a prolonged outage and only one showed evidence of a damaged component. NIE's asset replacement programmes include the targeted replacement of worn fittings on transmission overhead lines; no fittings failed and no conductors came down during this storm.

126 It is notable that, for the faults that were observed on site, all occurred on long spans greater than 330m in length and in exposed geographic areas at elevations above 170m. Indeed some of the highest and most exposed spans are up to 480m in length. Due to their vulnerability to ice/snow accretion and galloping, many of these also tend to be the

spans that have been de-spacered in the past. As faults occurred on both type L2 towers, with crossarms of uniform length, and on type L8 towers, with an extended middle crossarm, it is felt that the advantage of the L8 tower design in these circumstances was marginal.

127 The recently completed programme to replace the population of ageing 275kV air-blast circuit breakers with modern spring-operated SF_6 breakers across the network also ensured the optimum performance of the 275kV system when faced with as many transient faults as were experienced during this event. In particular, it is our belief that the old compressed air operated systems previously in place at Kilroot and Kells Grid substations would have struggled to cope with the number of fault duty operations during this event and may otherwise have led to more widespread outages on the transmission network.

128 The failure of the Ballylumford circuit breaker to re-close after several successful trip operations was the result of a known failure mode and similar circuit breakers at Ballylumford are subject to an ongoing mechanism refurbishment program which should eliminate this risk for future events.

NIE will continue to assess the condition of all components on the transmission overhead line network and implement appropriate programmes of replacement to further improve the resilience of the transmission network to severe weather events.

NIE will investigate the approach taken by other electricity utility companies with respect to transmission overhead tower line design and mitigation against ice and wet snow accretion for both existing and future line builds. NIE will further investigate the case for addressing the specific risks associated with severe ice/snow loading on long 275kV line spans or sections in exposed locations.

Based on its performance during this and other recent events, NIE will investigate the case for replacing conductors on the double circuit 275kV towerline between Coolkeeragh and Magherafelt.

Circuit breaker replacement programmes, now completed on the 275kV network, will continue as appropriate on the 110kV network to ensure optimum network performance during such events.

To the extent that these considerations may impact on investment requirements for the next regulatory period (RP5), we will discuss our proposals with the Utility Regulator in the context of the RP5 price control review.

NIE's Response to the Severe Weather

129 The extreme weather of Tuesday 30 March 2010 represented an exceptional event which caused considerable damage to the electricity network. The 629 high voltage faults which occurred as a result of the severe weather was equivalent to approximately 27% of that normally experienced in a whole year.

130 The vast majority of faults resulted in permanent damage necessitating physical repair. Many of these related to multiple damages necessitating significant line rebuild repair in the worst affected areas. Repairs involving the replacement of broken poles and conductors are time consuming and, particularly in the early days of the repairs, the adverse weather and snow conditions made access and repair activities particularly challenging.

131 Over 114,000 (83%) customers had their electricity supplies restored within 24 hours with over 136,000 (99%) customers having their supplies restored within four days. Restoration of supplies to the remaining 1,400 customers was particularly problematic and was completed during the

fifth and sixth days. Supplies to 700 of these customers were restored on Sunday 4 April; 67 of which were off supply for greater than 120 hours.

132 Repair crews and support staff worked through hazardous and extreme conditions throughout the entire period of the storm to ensure all customer supplies were restored in as short a timescale as practicable. It was to our advantage that the storm occurred during late March, when the hours of daylight permitted work into the late evening and the post storm weather was favourable. Had the storm occurred during the winter months of December/January, the repair time may have been extended due to adverse weather and shorter daylight hours.

133 In different circumstances, had the extreme level of damage experienced in the greater Cloughmills area been reflected in a more widespread manner across the Province, our stock of overhead line components may have been inadequate, which would have had an adverse impact on the overall restoration process.

We will continue to refine appropriately our tried and tested emergency response processes and incorporate any experiences gained from our response to the 30 March storm. We will also continue to systematically and regularly rehearse our emergency response processes by the use of simulated exercises.

In reviewing the probability of a future more widespread event, we will discuss with the Utility Regulator the levels of strategic stock holding appropriate for managing the risk of future storms.

NIE will ensure that their emergency plan incorporates the importance of involving District Councils and local service groups as part of the response to severe events affecting the electricity network.

Customer Call Handling

134 The HVCA system is designed to answer the high volumes of calls which customers make, particularly in the initial stages of a major storm. The HVCA system performed well during the severe weather of 30 March – 4 April 2010 and at the peak managed some 2,600 calls within one hour. During the event, approximately 72,000 calls were answered, 44,000 by HVCA and 28,000 by call handlers.

Critical Care Customers

135 During the Easter Ice Storm, 400 customers on the NIE Critical Care Register were kept updated with information for the duration of the storm. During this period however, NIE was contacted by a number of customers, dependent on life supporting electrical equipment, but not on the NIE Critical Care Register.

NIE will review its Critical Care Register in conjunction with the Consumer Council, the Utility Regulator and the Health Trusts. Our priority is to have the right customers on the register so that they can benefit from this priority information service should their electricity supply be affected during a power cut or a planned interruption.

When this scheme was first set up, the Health Trusts were integral in assisting NIE to identify the essential life supporting equipment provided for home use. As part of our review of the scheme, we will request the support of the Trusts to help us re-assess the current equipment list to ensure that we are continuing to meet the critical needs of our customers. We will also be seeking the guidance of the Trusts to help us to promote and maintain the scheme to ensure that those who meet the scheme's criteria can benefit from this priority service.

Communication with Key Groups

136 During the storm NIE focused its communications efforts on providing accurate and up to the minute information to the media. We issued regular press releases and provided spokespeople for radio and TV interviews. Interviews were recorded on site (where repairs were taking place) and in local incident centres.

137 NIE senior managers kept in regular contact with the Utility Regulator and the Northern Ireland Consumer Council. Priority phone numbers provided to elected representatives and the emergency services were manned at all times and took approximately 346 calls.

Following consultation with groups involved in the relief efforts, NIE has expanded the distribution list for its email update press releases to include MLAs and Council Chief Executives as well as the media.

NIE will undertake a review of the media messages utilised during this storm in respect of their timing, wording and audience.

NIE will improve the co-ordination of media communications with Councils and other organisations involved in the emergency relief centres.

NIE will write to all elected representatives to remind them of their priority information number. This will also be followed up by an invitation to Councils to visit NIE's Distribution Service Centre to gain a better understanding of the Company's response to storms and severe weather events.

Emergency Reception Centres

138 This was the first escalation during which Emergency Reception Centres were used. The concept was initiated by the Duty Incident Manager and implemented following discussions with local Council Emergency Planners.

139 In order to best meet the needs of the local community, it was important to identify suitable reception centres, both in terms of location and available facilities, even though some of the centres used were not Council run.

NIE will assimilate the learning from the initiation and operation of the emergency reception centres during this storm. This will be used as a model moving forward and built into the Emergency Plan. Further discussions will take place with Council Emergency Planners to agree how best to initiate and maintain suitable emergency reception centres where required during future escalations.

APPENDICES:

1. **Analysis of storm damage in the greater Cloughmills area**

2. **Distribution Network – Overhead Line Design Specification and Post Storm Patrols**

3. **Transmission Network Overview**

4. **Weather Warnings**

5. **Distribution Service Centre and Key Systems**

6. **HVCA Messages**

7. **Sample Press Releases**

8. **Photographs**

9. **Storm Comparisons**

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APPENDIX 1

ANALYSIS OF STORM DAMAGE IN THE GREATER CLOUGHMILLS[1] AREA.

[1] Greater Cloughmills area - a region centred on Cloughmills village extending North to Ballycastle via Loughguile and Armoy, West to Ballymoney, South West to Dunloy and Glarryford, South to Rasharkin, South East to Buckna and East to Clough, Martinstown and Newtowncrommelin villages.

The area of network worst affected by the snow storm of 30 March 2010 was centred on the 11kV overhead line network in the greater Cloughmills area of North Antrim. This region covers an area of approximately 270 square miles and includes the villages of Cloughmills, Clough, Dunloy, Rasharkin, Glarryford, Martinstown, Newtowncrommelin, Cargan, Armoy, Loughguile, associated hamlets and the entire dispersed rural communities totalling over 8,000 customers.

The region is located predominately on the western upper slopes of the Antrim Mountains with summits up to 500m. Typically, the overhead lines and customers worst affected in the area were those situated at 150m – 200m+ above sea level. The severity of the wind and snow, allied to the particular climatic conditions experienced on 30 March, led to the accretion of wet snow to conductors comprising the overhead line network. As a result of the damage, none of the eleven individual 11kV circuits supplying this vast region remained intact. These eleven circuits are comprised of some 1,500km of overhead line.

Extensive damage required multiple fault repairs on all 11kV circuits within this region. Entire sections of conductor spans and wood poles were damaged due to wet snow accretion to such an extent that in some areas, there were more faulted poles and conductors than those sections of line left standing. One particular circuit which had in excess of 200 damage locations had undergone a major rebuild in years 2002/03 during which the vast majority of main line poles were replaced to facilitate construction with a newly installed, larger conductor size (50mm^2 Aluminium) along the entire main line circuit length.

In addition to the extensive 11kV network damage, there was also conductor damage to the two 33kV overhead lines supplying the central Cloughmills region which necessitated priority repairs. There was further damage to a newly built 33kV overhead line supplying a recently connected wind farm in the same region. This line was constructed last year to the highest design specification of conductor size (200mm^2), pole types and span lengths that exist anywhere on the 33kV overhead line infrastructure Province wide.

Closer analysis of damage in the greater Cloughmills region that was worst affected shows the following observations:

- Pole Damage:-

85% of all pole damages were associated with conductor damage. This was primarily due to the conductor undergoing excessive stress loading beyond its design limits resulting from the effects of the storm winds and wet snow accretion causing the pole support and conductor to break.

70% of pole damage related to poles breaking with the remaining 30% failing as a result of the poles being pulled from the ground due to the increasing weight of wet snow accretion.

- Conductor Damage:-

The predominant conductor in use on the network in the region is Aluminium Conductor Steel Reinforced (ACSR). 99% of conductor damage related to ACSR.

Excluding 33kV overhead lines, main line conductors were typically 50mm^2 ACSR with spur line conductors being 25mm^2 ACSR. 79% of conductors which failed were 25mm^2 with the remaining 21% being 50mm^2. There were however considerably fewer multiple damage locations on the 50mm^2 conductor.

In the case of main line conductors, those lines which traversed predominately in a west–east direction in the region were most extensively damaged. Main lines traversing predominately north-south were much less affected. This is as a probable result of the prevailing storm wind and resultant wet snow accretion on conductors being generally perpendicular to the west-east traversing lines, exposing these conductors to the greatest force and mechanical stress loading as the volume of wet snow accretion increased rapidly.

In general (92%) of overhead line span lengths which failed are not classified as ‘long spans’.

The conductor in 99% of occasions is classified as average condition for its age, albeit the age profile of many of these spur lines is quite old.

APPENDIX 2

DISTRIBUTION NETWORK – OVERHEAD LINE DESIGN SPECIFICATION AND POST STORM PATROLS

Overhead Line Design specification

A substantial proportion of the NIE overhead distribution network was constructed in the period from the late 1950's to mid 1970's as rural customers were connected to the system through new rural electrification schemes. The majority of conductor breakages during the 30 March storm shows that the smallest conductor size, 25mm^2, which was used extensively during these periods of high network infrastructure growth, experienced the most faults.

The overhead lines constructed during that period were designed to meet the requirements of the statutory Overhead Line Design Regulations and the national specifications in force at the time of construction. Over time these designs have been subject to review and improvement in light of operational experience.

Since the mid 1970's, the overhead network has continued to expand with the building of additional lines to connect new customers to the system. These lines were designed and built to a UK standard (ENA-TS 43-10). Since 2007, all new lines are constructed to the current NIE Overhead Line Design Specification which is based on the requirements of BSEN40423 and ENA-TS 43-40.

It should be noted that neither the 1950's, 1970's nor the latest design specification would be sufficient to cater to up to 150mm wet snow/ice accretion as was witnessed in the worst affected areas of the Province. The prevailing weather on the 30 March resulted in distribution overhead line conductors being loaded well beyond their design limits, even by modern day standards.

Post Storm Patrols

In the greater Cloughmills area worst affected by the storm, NIE has patrolled 1558 km of overhead line and 115km of 33kV overhead line in the period following the storm.

These post storm patrols have identified 56 further locations of significant and potentially dangerous defects. Some of these needed to be repaired under emergency shutdowns.

In addition, a further 260 sites have been identified where conductors appear to have been permanently stretched. Some of these overhead line sites are more than 1km in length and will be subject to further inspection and conductor analysis.

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APPENDIX 3

TRANSMISSION NETWORK OVERVIEW

General

During the period of the snow storm between c. 15:00 hours on Tuesday 30 March 2010 and c. 10:00 hours on Wednesday 31 March, the transmission network experienced an unprecedented 139 circuit trips, equating to 400 circuit breaker trip operations. The worst duty cycle was experienced by 275kV circuit breakers at Kells Grid Substation, where up to 42 fault trips were cleared by one circuit breaker. At one stage, due to the configuration of the substation, both 275/110kV interbus transformers were isolated from the system.

All but one of the faults experienced were phase to phase faults, on double circuit tower lines, predominantly between the middle and bottom phases. Only three of the line trips were on 110kV circuits early in the event, and one of these was a mal-operation of protection coincident with the loss of a 275kV line, the remaining 136 being on the 275kV network from approx. 19:30hrs onwards. Whilst most of the 275kV faults cleared and auto-reclosed from the DAR (Delayed Auto Reclose) protection systems, or were switched in from SCADA (Supervisory Control and Data Acquisition), three of the faults became permanent and required the circuits to be patrolled, prior to being returned to service.

Visual evidence from this patrolling confirmed a heavy cylindrical accumulation of wet snow (up to 100mm diameter) accreted around the conductors and on some spans weighing the middle conductors down to within 300mm of the bottom conductors.

Cause of the Line Faults

Weather

Weather conditions during the period of the transmission overhead line failures consisted of wet snow being blown by a relatively consistent north to

north-west wind, travelling at a speed of up to 35 knots with temperatures at or just above freezing point.

These conditions are those consistent with wet snow accretions on transmission overhead line networks experienced elsewhere in the world.

Snow Accretion

There have been several previous occurrences of 'Ice Accretion' on the NIE transmission overhead line network, which led to some measures being introduced to minimise the effects of this condition. This involved the de-spacering and dog-legging of certain affected spans to prevent 'galloping', caused by ice or wet snow forming on the windward side of the conductor, in the shape of an aerofoil, causing the conductors to lift with the wind.

The evidence from this event suggests that the failures were not caused by galloping but rather by accreted wet snow, weighing the conductors down. The visual evidence from the distribution overhead line failures supports this view of large cylindrical build-ups of accreted wet snow.

The nature of wet snow accretion, supported by evidence from other transmission networks throughout the world, is that it occurs when wet snow falls during periods with a consistent wind speed, with temperatures at or slightly above freezing (1-3 Deg C). Wet snow accretion occurs initially on the windward side of the conductors. In the vicinity of the conductor dead ends at the towers, axial growth, in the form of a spike of ice growing outward into the wind, is observed. Near the centre of the span this ice loading causes the conductor to twist, so that cylindrical-sleeve growth is observed. For smaller diameter single conductors with lower torsional stiffness, the conductor rotation can amount to many complete revolutions.

Reports from patrols on two of the three permanent 275kV line faults (Coolkeeragh - Magherafelt circuits) confirmed that conductors had a cylindrical build-up of snow up to 100mm in diameter, consistent with the wet snow accretion on a rotating conductor. It may be that the de-spacering of

these circuits in the past to address galloping could have left them more vulnerable to this infrequent condition of wet snow accretion. As these particular circuits are strung with the smaller diameter Lynx ACSR conductor (19.53mm), it is likely that its lower torsional stiffness exacerbated the rotating effect. In the two observed cases, the top and middle phase conductors had a cylindrical build up of 80-100mm of snow, and the middle conductor was weighted down to within 300mm of the bottom conductor, which had a cylindrical build up of 30-40mm of snow. It was estimated that the bottom conductors had sagged by an additional 6-7.5m. As the middle conductor had sagged to within 300mm of the bottom conductor, the middle conductor had sagged an additional 14-16m.

Evidence from protection operations and distance to fault calculations suggests that, for the non-permanent faults, conductor clashing has not only occurred on de-spacered spans but has also occurred on spans with spacered twin conductors. Also, evidence from a patrol on the Kilroot - Kells 275kV circuit, which is a type L8 construction with an extended middle phase crossarm, showed the middle phase conductors had sagged to the extent where the middle and bottom phase conductors sat side by side. Had this been a type L2 construction, with crossarms of almost equal length, the two phases would have been touching and the fault would most likely have been permanent. The visual evidence from site described a build up of wet snow on the top and middle conductor pairs only. The pattern of the snow still adhering to these conductors was observed as being on the top and windward side of the windward conductor and on the top only of the inner conductor of the pair. The build up of snow in this instance would seem to have started on the windward side of the windward conductor of the pair, the inner conductor being initially protected. As the weight of this snow built up, the outer conductor of the spacered twin pair has dropped, twisting the twin pair of conductors and exposing the top of the conductors to the blown snow. The build up in this situation has also permitted the middle phase conductors to sag to the level of the bottom conductors.

Evidence would show that the build-up of wet snow predominately affects the top and middle phase conductors only, with the bottom conductor remaining unaffected or having a lesser build up. The most probable explanation is that the lower phases are less exposed to the driven snow and are afforded more shelter from trees, hedgerows and buildings. The fact that the bottom conductor does not sag as far as the other two phases gives more opportunity for the middle and bottom conductors to clash.

Span Length and Location

It is notable that, for the faults that were observed on site, all occurred on long spans greater than 330m in length and in exposed geographic areas at elevations above 170m. Indeed some of the highest and most exposed spans are up to 480m in length. Due to their vulnerability to ice/snow accretion and galloping, many of these also tend to be the spans that have been de-spacered in the past.

There seems to be little correlation between the orientation of the spans and their vulnerability to this wet snow accretion, as experienced on the distribution network.

Tower Design

As faults occurred on both type L2 towers, with crossarms of uniform length, and on type L8 towers, with an extended middle crossarm, it is felt that the advantage of the L8 tower design in these circumstances was marginal. However, the evidence from observations on the Kilroot - Kells circuit would suggest that a transient/intermittent fault, caused by the middle and bottom conductors hanging side by side, would otherwise have been a permanent fault on a type L2 construction.

Permanent Damage

The only permanent damage evident from patrolling on the transmission line network was on the earthwire associated with the Coolkeeragh - Magherafelt

circuits. Both layers of aluminium strands were broken, leaving only the stranded steel core holding the earthwire. This damage is now repaired.

The only other concern about possible permanent damage would be the extremes to which the Lynx conductors on the Coolkeeragh - Magherafelt circuits were stretched. It is planned to carry out measurements on these spans to determine that the conductors have returned to the correct sag and have not been overstretched.

The fact that worn conductor clamps and selected suspension string fittings were replaced on the 275kV overhead network during RP4 will have ensured that the effects of this extreme event were minimised and that no conductors dropped from their supports.

The recently completed programme to replace the population of ageing 275kV air-blast circuit breakers with modern spring operated SF_6 breakers across the network also ensured the optimum performance of the 275kV system when faced with as many transient faults as were experienced during this event. In particular, it is our belief that the old air systems previously in place at Kilroot and Kells Grid substations would have struggled to cope with the number of fault duty operations during this event and may otherwise have led to more widespread outages on the transmission network.

APPENDIX 4

WEATHER WARNINGS

Summary of Met Office weather forecasts preceding Tuesday 30 March.

Date	Information Received	Details	Action Taken
Fri 26/3/10	Met Office Planning Forecast - Trend forecast for Mon 29/3/10 and Tue 30/3/10	Remaining unsettled, winds becoming strong to gale force. Risk of showers becoming wintry over hills	Noted on DIT weekly risk assessment
Mon 29/3/10 @ 04:29 hrs	Met Office Planning Forecast	Mon 29/3/10 – Periods of rain throughout the period, turning to sleet at low levels overnight and snow over hills. Strong N-NE winds	Emergency and Standby Teams were asked to confirm they had access to 4WD vehicles.
Mon 29/3/10 @ 12:00 hrs	Conference Call re Extreme Weather Warning – John Wylie (Met Office) + All Agencies.	John Wylie outlined his concerns regarding the weather forecast for 30th and 31st March. Whilst snow over high ground was predicted accompanied by strong winds the key concern was rainfall levels accompanied by high tides bring a high flood risk. Most of the discussion was centred on this.	NIE Confirmed: 4WD vehicles mobilised, DIT in place, Emergency Teams alerted. Additional Call Handling planned
Mon 29/3/10 @ 12:45 hrs	Severe Weather Warning issued by PWSA -Met Office (Follow up from conference call)	Weather for late Monday / Tuesday is giving considerable cause for concern with 40 - 60 mm of rain possible. This will turn to snow in places overnight and through Tuesday, espeically in western Counties but increasingly in the east later on Tuesday afternoon and evening, giving the potential for 20 - 40 cm on some high level routes and 5-15 cm at lower levels, mainly inland away from coastal influence. Snow will drift in increasingly strong winds during Tuesday and early Wednesday. **Please note the 20 % probability of up**	As Above

		to 100 mm of rain in some places from the whole event - ie an extreme event. There is clearly the potential for significant disruption of either / or a combination of heavy rain / snow bringing the risk of flooding or tranport disruption. Snowfall is likely to have a high water content - bringing some risk to power lines. High tides with onshore winds & Low pressure during Tuesday / Wednesday are also a matter of considerable concern - bringing the risk of some coastal flooding to Antrim and Down at times of high tides. The weather will eventually improve on Wednesday morning from the west but snowmelt is likely to bring further potentially significant pressure on watercourses - maintaining the risk of flooding from surface water and out of river sources. Hazard Manager is currently being worked on (maintenance) - but I've attached the latest graphic below. This will be updated and available to those registered for Hazard Manager later this afternoon.	
Mon 29/3/10 @ 14:28 hrs	Ice Accretion Warning from Met Office	Rain at lower levels will gradually turn to snow above 150m during tonight, and continue through	Warning was circulated by email to Emergency

		Tuesday and into Wednesday. Accumulations around 30cm with drifting in the strong to gale force winds. High risk of ice accretion above 100m from about 0001 onwards	Circulation list with additional note that DIM would be monitoring the weather throughout Tuesday and that LIC Managers should remain alert to the risks and watch for updates.

The following weather warnings were received by NIE's Duty Incident Manager from Tuesday 30 March.

Warning Issued on Tuesday, 30 March 2010 at 01:01

High Gusts Warning

Tel: 0870 900 0100 www.metoffice.gov.uk

NIE (Ref: MO43)

For Duty Engineer (Castlereagh) Fax: 028 9040 1614 & via email distribution list

Carn (Central Dispatch) Fax: 028 3836 8562

Warning Issued on Tuesday, 30 March 2010 at 01:01

Northern Ireland

Wind Speed - Probability of Gusts & Duration Event: J / 2010

Prob of Gusts (KT) Duration / Period

Station □ 45 □ 55 □ 65

Ballykelly 100 80 40 0600-0600

Ballypatrick 100 80 40 0900-0900

Aldergrove 80 60 20 1200-0900

Orlock 100 80 40 1200-0900

Glenanne 80 60 20 1200-0900

St. Angelo 80 60 20 0900-0600

Castlederg 80 60 20 0900-0600

Mean Wind Speeds (KT): Increasing N-NE winds during this morning. Gusts above 45kt expected from 30/0600 at Ballykelly then affecting Ballypatrick and Orlock Head through the afternoon evening and overnight.

Additional Comments: Nil

Warning valid FROM : 0600 on Tuesday 30 March 2010
Warning valid TO : 0900 on Wednesday 31 March 2010
Met Office Warning Number : 34

Warning Issued on Tuesday, 30 March 2010 at 11:47

All,
Rainfall totals since this time yesterday now stand at 25 - 55 mm and these totals will easily double in places between now and Wednesday morning. In addition snow is falling to increasingly low levels in the west and already some places at just 750 FT are reporting snow depths of 16 cm and accumulating.

The situation is expected to deteriorate steadily with snow descending to ever lower levels across western counties today - and then in eastern counties this evening. Northeast and later Northerly winds winds will become increasingly strong reaching gale or severe gale in all areas by tea-time and through much of the evening / night. This will result in blizzard conditions and severe drifting of lying snow on high ground but atrocious conditions may well descend to lower ground at times as well. Wet snow and very high winds historically bring a significant risk to power supplies.

The risk of surface water flooding continues due to persistent accumulating rainfall totals before the transiition to snow. Some coastal localities may continue with sleet / rain throughout the event.

For the reasons I've outlined above we are currently preparing to issue an Emergency Flash for Exceptionally Severe Weather. This would appear as a RED 'TAKE ACTION' warning on the web.

Conditions will ease only slowly during the first half of Wednesday with persistent snow moving away to leave occasional rain / sleet / snow showers. Staying windy - though gradually less so than soon expected. The slow thaw of lying snow will continue to be a problem, releasing water into catchments for some days to come.

John Wylie.
Public Weather Service (PWS) Advisor to Northern Ireland.
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E-mail: mailto: John.Wylie@metoffice.gov.uk Http://www.metoffice.gov.uk

Issued by the Met Office on Tuesday, 30th March 2010 at 12:32

NATIONAL SEVERE WEATHER WARNING SERVICE

EMERGENCY Flash Warning of
- Severe Blizzards
- Severe Drifting Snow
- Very Heavy Snowfall

For the following areas
- Co Derry (Severe)
- Co Fermanagh (Severe)
- Co Tyrone (Severe)

A prolonged period of snow which will turn very heavy at times is expected to develop through this afternoon and evening. The snow will quickly drift in the strong to gale force North wind with blizzard conditions developing inland away from the north coast. Over upland areas in particular, such as the Glenshane Pass, extreme conditions will develop with severely reduced visibility at times in severe blizzards. The extreme conditions will last well into the night. Snow accumulations will vary largely across the region, with typically 15cm, but less across some low lying coastal areas, whilst upland areas could catch 30 or 40cm with deep drifts. Many roads are liable to become impassable and some interruptions to power supplies are possible. The public are advised to take extra care and refer to TrafficWatchNI.com (operational hours 07.00 to 21.00 Mon to Fri and 09:00 to17:00 on Saturdays) for further advice on road conditions.

Valid from 15:00 on Tuesday, 30th March 2010
until 06:00 on Wednesday, 31st March 2010

For enquiries regarding this warning -
please contact the Met Office customer centre
- Phone: 0870 900 0100
- Fax : 0870 900 5050
- Email: enquiries@metoffice.gov.uk

Issued by the Met Office on Tuesday, 30th March 2010 at 14:41

NATIONAL SEVERE WEATHER WARNING SERVICE

EMERGENCY Flash Warning of
- Severe Blizzards
- Severe Drifting Snow
- Very Heavy Snowfall

For the following areas
- Co Antrim (Severe)
- Co Armagh (Severe)
- Co Down (Severe)

Rain and sleet will quickly turn to snow this evening and become prolonged and very heavy at times and persist into the overnight period. The snow will quickly drift in the strong to gale force North wind with blizzard conditions developing in many areas. Over upland areas severe blizzards will develop with severely reduced visibility at times. Snow accumulations will vary largely across the region: highest snowfalls across county Antrim and upland parts of Armagh and Down with typically 15cm, but upland parts of county Antrim in particular could catch 25 to 40cm with deep drifts. However the Antrim coast, Belfast City and Ards Peninsula will catch notably less snow. Many roads are liable to become impassable and some interruptions to power supplies are possible. The public are advised to take extra care and refer to TrafficWatchNI.com (operational hours 07.00 to 21.00 Mon to Fri and 09:00 to17:00 on Saturdays) for further advice on road conditions.

Valid from 17:00 on Tuesday, 30th March 2010
until 06:00 on Wednesday, 31st March 2010

For enquiries regarding this warning -
please contact the Met Office customer centre
- Phone: 0870 900 0100
- Fax : 0870 900 5050
- Email: enquiries@metoffice.gov.uk

Warning Issued on Tuesday, 30 March 2010 at 23:05

Power Cable Hazard/Snow Warning

Tel: 0870 900 0100 www.metoffice.gov.uk

NIE (Ref: MO43)

For Duty Engineer (Castlereagh) Fax: 028 9040 1614

Carn (Central Dispatch) Fax: 028 3836 8562 & via email distribution list

Northern Ireland

Snow will continue to fall to low levels during the night, with accumulations of around 15cm in places, but up to 40cm with extensive drifting over high ground. Strong to gale force winds mean a high risk of ice accretion will continue through the night until 0600 Wednesday morning. The Northerly winds will back NW during the morning as the snow clears eastwards to leave isolated showers.

Warning valid FROM : 2359 on Tuesday 30 March 2010
Warning valid TO : 0800 on Wednesday 31 March 2010
Met Office Warning Number: 40

Issued by the Met Office on Wednesday, 31st March 2010 at 16:09

NATIONAL SEVERE WEATHER WARNING SERVICE

Flash Warning of

- Widespread Icy Roads

For the following areas
- All of Northern Ireland (Severe)

Widespread ice is likely to form on untreated roads and pavements tonight, especially where showers have recently fallen. The public are advised to take extra care and refer to TrafficWatchNI.com (operational hours 07.00 to 21.00 Mon to Fri and 09:00 to17:00 on Saturdays) for further advice on road conditions.

Valid from 20:00 on Wednesday, 31st March 2010
until 08:00 on Thursday, 01st April 2010

For enquiries regarding this warning -
please contact the Met Office customer centre
- Phone: 0870 900 0100
- Fax : 0870 900 5050
- Email: enquiries@metoffice.gov.uk

Warning Issued on Wednesday, 31 March 2010 at 22:24

Power Cable Hazard/Snow Warning

Tel: 0870 900 0100 www.metoffice.gov.uk

NIE (Ref: MO43)

For Duty Engineer (Castlereagh) Fax: 028 9040 1614

Carn (Central Dispatch) Fax: 028 3836 8562 & via email distribution list

Northern Ireland

Showers will continue through the night, these being mainly rain and sleet at low levels, but turning wintry over high ground, and expected to fall as snow above 300m. There may be accumulations of up to 5cm in any heavier showers. The showers will gradually become more isolated during the morning. There will be a moderate risk of ice accretion over high ground as the Northwesterly winds will remain strong and gusty, especially in the showers, but as these are moving quickly it is not expected to be a widespread problem.

Warning valid FROM : 2230 on Wednesday 31 April 2010
Warning valid TO : 0900 on Thursday 01 April 2010
Met Office Warning Number: 41

Warning Issued on Thursday, 1 April 2010 at 11:38

All,
The weather will remain very disturbed over the Easter Holiday with periods of wet and on occasion windy weather. Some consideration is currently being given for an advisory for the late Sunday / Monday period - so please keep a check on the website.

My main concern remains the huge amount of snow which will be melting steadily throughout the period and this combined with periods of wet weather - is bound to have an impact on river and lake catchments. The speed of snowmelt and hence the impact is difficult to assess but broadly speaking the process will speed up with time. It is not out of the question that significant swathes of land could again become inundated as water locked up as snow

on high ground melts - the risk probably highest in Fermanagh, Tyrone, Londonderry and parts of north Antrim.

Unfortunately this means we will have to remain vigilant over the Easter holiday period.

John Wylie.
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Forecast Issued on Friday, 02 April 2010 at 04:49

Planning Forecast

Tel: 0870 900 0100 www.metoffice.gov.uk

Met Office

NIE (Ref: MO1)

For: Duty Incident Manager

Forecast Issued on Friday, 02 April 2010 at 04:49 UTC

Northern Ireland Forecast

General weather forecast (periods 0600 - 0600)	
Friday	Starting mainly dry, with some bright periods in the west. Patchy rain towards afternoon will then increase and spread north with some heavier bursts in the east. Some sleet or snow may be possible over highest hills.
Saturday	Hill fog, outbreaks of rain, heavy at times, turning to showers and clearing in the west towards evening. Most places becoming dry during the night with clear periods in the east and a risk of a local ground frost.
Sunday	Dry and bright start in the east with patchy light rain in the far west. Rain spreading across from the west later in the day.

	N			W		
NIE LIC	BCL	BMA	COL	CAM	OMA	ENN
MET OFFICE WEATHER STATIONS	Ballypatrick Aldergrove			Ballykelly Castlederg St Angelo		
	Wind			Wind		
	Mean/Gust (kt)	Risk Gust >45kt	Direction	Mean/Gust (kt)	Risk Gust >45kt	Direction
Friday	22/32	Neg	-	20/32	Neg	-
Saturday	25/38	Neg	-	19/32	Neg	-
Sunday	22/33	Neg	-	22/35	Neg	-

	S			E		
NIE LIC	DUN	CRA	NRY	DPK	BNA	BFS
MET OFFICE WEATHER STATIONS	Glenane			Orlock		
	Wind			Wind		
	Mean/Gust (kt)	Risk Gust >45kt	Direction	Mean/Gust (kt)	Risk Gust >45kt	Direction
Friday	24/36	Neg	-	24/36	Neg	-
Saturday	25/40	Neg	-	30/45	Low	NW
Sunday	22/33	Neg	-	25/40	Neg	-

ALL NORTHERN IRELAND							
	Temp	Lightning	Snow (cm)		Cable Icing		Rain (mm)
	Max/Min (C)	Risk	% Risk	Amount	% Risk	Mod/Sev	
Friday	8/3	LOW	Neg	N/A	Neg	N/A	5-16
Saturday	8/1	MEDIUM	Neg	N/A	Neg	N/A	3-15
Sunday	10/5	NEG	Neg	N/A	Neg	N/A	1-5

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Trend forecast (Mon and Tue)	Windy with outbreaks of rain, heavy at times. Clearing late Tuesday with easing winds.
Outlook (Wed and Thu)	Showers becoming fewer with sunshine increasing especially in the east. Breezy at times Wednesday and at first Thursday.

Supplementary comments	**North**	Strong, gusty winds possible, some heavy rain at times mainly in the east tonight where quite persistent tomorrow morning.
	West	Only highest mountains likely to see any sleet or snow.
	South	Some heavy bursts of rain possible for a time this evening and again tomorrow morning.
	East	Some heavy bursts of rain possible for a time this evening and again tomorrow morning. Slight risk of gusts exceeding 45KT in NW'ly for a time tomorrow evening.

Notes

Snow % risk is probability of any snowfall with 'Amount' giving the most probable accumulation.

Wind - Mean speed is the highest hourly mean speed during the period of the forecast, with the associated highest gust. Direction need only be mentioned if the gust is above 45kts.

Supplementary Comments

These should be used to clarify the details in the ALL NORTHERN IRELAND area, such as forecast amounts of snow that could settle or cause Cable Icing problems and which particular areas are more likely to be affected (North, South, East or West, high ground, etc).

For Lightning risk, clarification is needed as to whether it is from isolated/scattered showers, widespread/frequent showers, embedded within an active front, or from a Spanish Plume-type event.

Lightning and Gust risk options are **Neg (0-25%), Low(25 to 50%), Medium(50 to 75%) and High(75% or more)**

For Rainfall there should be some clarification of the areas likely to catch the heaviest rain, and whether there is a risk of the rain falling in a very short period of time.

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APPENDIX 5

DISTRIBUTION SERVICE CENTRE AND KEY SYSTEMS

Overview Of The Distribution Service Centre And Key Systems

The Distribution Service Centre (DSC), which is located at Craigavon, is responsible for; answering customer calls on the fault reporting number (08457 643643), dispatching faults, and the real time control of the Distribution Network. The Incident Centre is based at the same location and the Incident Teams works closely with the DSC in coordinating NIE's response to major emergencies, such as the widespread storms experienced in January 2009.

Key Systems

Trouble Management

Details of faults reported by customers are recorded by call handlers on the GT-X system. This call handling system automatically updates the Trouble Management system which in turn links customer calls to an electronic model of the electricity network. The Trouble Management system automatically groups customer calls together to create an 'event line' which contains a prediction of which device on the network has opened. A device can be a circuit breaker, pole mounted recloser or fuses that will open to isolate a fault on the circuit it is protecting.

There are normally more event lines than faults. This is because some calls are from customers who are not off supply but are reporting damage to the network. Such calls are held as separate event lines.

Information from the field regarding the status of faults is recorded on the Trouble Management system and made available on the GT-X Call Handling system to enable call handlers to update customers on progress in restoring their electricity supply. In the early stages of a major event the information on estimated restoration times is always limited as the extent of damage is being assessed by field staff.

The Trouble Management system maintains a record of all customers whose details have been entered by call handlers. This information is used to assist in making return calls to customers in order to check that supplies have been restored following physical repair.

High Volume Call Answering

The High Volume Call Answering system (HVCA) is designed to answer the high volumes of calls which customers make particularly in the initial stages of a major storm. It enables customers to record an interruption to electricity supply directly into our Trouble Management system. Customers also receive a message giving specific information about local faults. The HVCA system is automatically updated by the Trouble Management system with details on the progression of each fault. It is the best system currently available and is widely used in the USA. NIE was the first utility in the UK to implement this technology.

The High Volume Call Answering system recognises customers on NIE's Critical Care Register automatically routing their calls to a call handler as a priority call. Customers who have a hazardous situation to report are also given the option of speaking to a call handler. If there are no call handlers available and the caller's call line identifier (CLI) is unavailable, the caller is asked to input their telephone number in order that they can be phoned back once a call handler is available. These details are logged on a "web call-back report" and customers are contacted by call handlers dedicated to this task as they become free. A severe weather broadcast message can be applied at the initial stages of a weather related event when the extent of network is being assessed for damage and restoration times are not available.

Intelligent Call Management (ICM)

All 08457 6436463 calls are routed through the ICM platform. A new CISCO IPT telephony solution was implemented with the DSC Business in April 2009. Together with a call agent management system known as CAD (Cisco Agent Desktop), delivery of calls is now automatically matched to the number or

agents available and removed the need for manual intervention and adjustment of telephone lines. During an escalation the number of calls delivered will match the number of call handlers. This ensures that customers do not queue for excessive periods and that when all call handlers are busy, calls overflow into the HVCA system.

CAD (Cisco Agent Desktop)

This system enables Call Handlers to receive calls according to their skill group. During an escalation, priority calls (e.g. from public representatives, emergency services, etc.) will be routed, where possible, to experienced call handlers before being routed to volunteer call handlers.

APPENDIX 6

HVCA MESSAGES

Sample customer messages from Tuesday, 30 March to Sunday, 4 April 2010

Welcome message – "Thank you for calling our fault reporting service. If you are calling to report a hazardous or life threatening situation please press 1 now, otherwise, please stay on the line." (Pressing 1 at this stage forwards the caller to the call handlers. If a call handler is unavailable to take the call, the caller's details are recorded and the caller will be contacted by a call handler once available. These details are listed on the Web Call Back report).

In the early stages of an event, a "Broadcast Message" will be applied so that, with the exception of those customers selecting option 1 to report a hazardous or life threatening call, all customers will hear a summary message providing information about what has caused the fault and the general areas affected.

When the HVCA system has identified the customer address, one of two types of message will be played:

1. Default Message

This is played when there is no existing fault line in the Trouble Management system. "Unfortunately faults have occurred on our electricity network and we are working to restore supplies as quickly as possible. If your supply has not been restored within the next 3 hours you may wish to call us back. We have logged a fault report for your address. Please remember to treat all lines and cables as live and dangerous."

2. Area/Device Specific

This is played when an existing fault event exists on the Trouble Management system and the customer's address is associated with this event. This message has two main elements.

1. Area specific, with or without a known estimated time of restoration. "Customers are currently without electricity in the Portadown and Richhill areas. We estimate supply to be restored by 3pm".

2. Device specific, as above but with a known cause of the fault given. “Due to equipment failure customers are currently without electricity in the Portadown and Richhill areas. We estimate supply to be restored by 3pm”.

HVCA Custom Broadcast Messages Applied on 30 March 2010

Message 1

Date 30 March 2010

Time 20:15 hrs

This message was updated at 8:15 pm on Tuesday 30th March

Gale, snow and heavy rain have caused widespread damage to the electricity network in Northern Ireland. At present, around 15,000 customers are without electricity

Gale force winds have brought down lines and poles and caused 250 individual faults. The network in the Omagh, Enniskillen and Dungannon areas are experiencing the most damage.

If your supply has not been restored within the next 3 hours, you may call us back on 08457 643643 or if you wish to leave information about your supply failure, please continue to hold.

Message 2

Date 30 March 2010

Time 22:30 hrs

This message was updated at 10:30 pm on Tuesday 30th March

Snow and traffic accidents are hampering efforts to restore power to customers in Northern Ireland

It is estimated that around 20,000 customers are currently without electricity supplies due to damage to the network caused by gale force winds and severe weather. Omagh, Dungannon, Enniskillen, Coleraine, Londonderry and Ballymena are the worst affected areas.

Around 280 additional engineers, linesmen, call agents and admin staff are reinforcing our normal capability to restore supplies. Additional resources are being brought in from the South of Ireland to bolster efforts.

Updated information will be provided regularly to the media and the company asks customers to listen to their radios for updates.

If you wish to leave information about your supply failure, please continue to hold.

Message 3

Date 31 March 2010
Time 00:15 hrs

This message was updated at 12:15 am on Wednesday 31 March 2010

Extreme weather conditions have caused extensive damage to the electricity network in Northern Ireland throughout this afternoon and evening.

Approximately 30,000 customers are currently without electricity. This number is constantly changing – as faults are repaired in one area customers are losing power in another. Emergency crews have already restored power to thousands of customers over the last 12 hours.

Poor visibility, high winds and worsening weather have meant that crews were stood down at midnight. In many areas visibility and strong winds are

preventing linesmen from climbing poles. Customers should be aware that if they are still off supply at midnight, their power will be off overnight.

A full mobilisation of staff will take place from 06:00 am in the morning involving 450 NIE employees and additional outside contractors.

If you wish to leave information about your supply failure, please continue to hold.

Message recorded 31 March @ 07:20 am

Extreme weather conditions have caused extensive damage to the electricity network in Northern Ireland overnight. Approximately 30,000 customers are currently without electricity.

Additional resources have been mobilised to deal with a large number of faults.

Prevailing weather conditions are hampering restoration of supplies in many areas.

If you wish to leave information about your supply failure please continue to hold.

The above message was re-recorded every 2 – 3 hours to amend date and time up to 20:00 hrs.

Message recorded 31st March @ 20:00 hrs

This message was last updated at 20:00 hrs on Wednesday 31st March.

Extreme weather conditions have caused extensive damage to the electricity network. Damage is widespread but is most severe in the Omagh, Londonderry, Coleraine and Ballymoney areas. We would advise customers that due to the extent of the damage in these areas restoration of supplies is

likely to take a number of days. If you wish to leave information about your supply failure please continue to hold.

Messages 1st April

The following message was recorded at 07:30 am on Thursday 1st April 2010 The message was re-recorded to amend date and time aproximatly every 2/3 hours

Thursday 1st April

This message was last updated at 07:30 am on Thursday 1st April 2010

Ice storm conditions experienced on Tuesday have caused extensive damage to the electricity network

All our resources have been deployed to repair faults. The main areas affected are Coleraine, Omagh, Dungannon and Ballymoney.

We will continue with our efforts to restore all our customers as soon as possible

If you wish to leave information about your supply failure please continue to hold.

The following message was the basic template used from 12:30 pm on Thursday 1st April through to 14:45 on Friday 2nd April. The message was re-recorded to amend the date and time approximately every two/three hours. At 14:45 on 2nd April, the custom broadcast message was remove.

This message was last updated at 12:30 on Thursday 1st April 2010

Ice storm conditions experienced on Tuesday have caused extensive damage to the electricity network

All our resources have been deployed to repair faults.

The following are areas that have been badly affected by the Ice Storm. These are:

Cloughmills, Ballycastle, Martinstown, Cargan, Glenwherry, Buckna,
The Colin in North Ballyclare
Dungiven, Claudy, Windy Hill in Limavady
Dunamanagh, Plumbridge, Castlederg
Pomeroy, Aughnacloy and rural areas around Cookstown.

Be assured that we are doing all in our power to restore all supplies as soon as is humanly possible

If you wish to leave information about your supply failure please continue to hold.

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APPENDIX 7

SAMPLE PRESS RELEASES

Communications: Media Coverage 30 March – 4 April 2010

Regular updates were provided to the media from Tuesday, 30 March. There was intense media interest from media in the UK, Ireland and Northern Ireland. The NIE media team dealt with 330 separate media enquiries.

Twenty-six press releases were issued as well as regular verbal updates and responses to specific media enquiries. Spokespeople were made available for radio and television interviews. Regular sound bites were given to Radio Ulster, U105, Citybeat, Cool and Downtown. Crews from BBC, UTV, Sky, RTE and GMTV were provided with regular opportunities to film with engineers and linesmen working in some of the worst affected areas around Northern Ireland. Film crews and photographers were also invited to the Distribution Control Centre in Craigavon.

Press releases were uploaded to the 'Latest News' section of the Northern Ireland Electricity website and distributed to key stakeholders, MLAs and to all call agents.

Summary of media coverage:

Media	Articles/ Broadcasts	Notes
Press Releases issued by NIE	26	Issued to: - Local and national broadcast and print media - CCNI/ UR/ DETI - Public representatives - All call agents
Radio Eg. Radio Ulster, U105, Five Live, Radio Foyle, Citybeat, Cool FM and Downtown	260 (approx)	Recorded interviews / updates / soundbites used in hourly radio news bulletins from Tuesday 31st evening through to Easter Monday 5th April.
TV Eg. BBC, UTV, GMTV, ITN, SKY, RTE	26	Camera crews sent to Cloughmills, Slaughtmanus area of Derry, Loughguille, Ballymoney, Plumbridge Dunamanagh. There were also TV broadcasts from the NIE Duty Incident Centre in Craigavon.
National Eg. RTE, Irish Times, Guardian, Sun, Daily Mirror, The Mail, The Express etc	29	Mostly covered in broader stories on the severe weather
Regional Eg. Belfast Telegraph, Irish News, Newsletter, including local editions of national papers eg. Irish Sun	58	Headline news and stories covered throughout the event.
Local Eg Ballymena Chronicle, Ballymena Guardian, Ballymena Times, Ballymoney and Moyle Times, Fermanagh Herald, Derry Journal etc	101	Verbal localised updates provided for 20 local papers
Web Eg. BBC Online, Ireland.com	25	These are unique articles. Many web sites also used published articles on their sites

Sample of Press releases issued:

30 March 2010 at 19.30

NIE Corporate Communications

Gales, snow and heavy rain have caused widespread damage to the electricity network in Northern Ireland. At present, around 15,000 customers are without electricity.

All of Northern Ireland Electricity's Local Incident Teams were opened this afternoon and around 200 additional engineers, linesmen, call agents and admin staff are reinforcing our normal capability to restore supplies.

Gale force winds have brought down lines and poles and caused 250 individual faults. The network in the Omagh, Enniskillen and Dungannon areas experiencing the most damage.

Updated information will be provided regularly to the media and the company asks customers to listen to their radios for updates.

A spokesperson from Northern Ireland Electricity said, "We continue to - reinforce our teams on the ground and are working on new faults as quickly as it is safe to do so.

"We have invested heavily in our service and our systems have been thoroughly tested. However, a rural network, like Northern Ireland's is still vulnerable to severe weather like we are experiencing this evening."

We will be issuing regular updates to the media. The same information will be available from call handlers and our automated call handling system

Northern Ireland Electricity is reminding customers of the precautionary measures to take in the event of a power cut:

-never approach broken lines or damaged poles, and keep children and animals away - report damage to Northern Ireland Electricity on 08457 643 643 and listen to recorded messages carefully
-turn off electric cookers, ovens, irons, etc. if electricity supply is lost
-leave a light switched on so you know when power has been restored
-take extra care if using candles, oil lamps or other naked flames
-test smoke alarms with fresh batteries
-ensure adequate ventilation if using gas heaters.

…ENDS…

Issued by:
Sara McClintock
Northern Ireland Electricity
Media line: 0845 300 3556

30 March 2010 at 23.45

NIE Corporate Communications

Extreme weather conditions have caused extensive damage to the electricity network in Northern Ireland throughout this afternoon and evening.

At present, around 30,000 customers are without electricity. This number is constantly changing – as faults are repaired in one area, customers are losing power in another. Emergency crews have repaired already restored power to thousands of customers over the last 12 hours.

Poor visibility, high winds and worsening weather have meant that crews will stand down from midnight. In many areas visibility and strong winds are preventing linesmen from climbing poles. Customers should be aware that if they are still off supply at midnight, their power will be off overnight.

A full mobilisation of engineers, linesmen, call agents and admin staff will take place from 6am tomorrow morning involving 450 NIE employees and additional outside contractors.

A spokesperson from NIE said, “We are aware that there are a number of lines and poles that have been blown down across Northern Ireland and particularly over roads. For safety reasons, we would urge the general public not to approach any broken lines or damaged poles and to keep children and animals away.”

…ENDS…

Issued by:
Sara McClintock
Northern Ireland Electricity
Media line: 0845 300 3556

31 March 2010 at 09.30

Severe weather update – NIE

Since first light Northern Ireland Electricity teams have been working to gauge a true picture of the network damage caused by last night's severe weather. A helicopter is being deployed imminently to provide a birds eye view of faults in difficult to reach areas.

Access conditions remain extremely difficult due to deep snow and crews are trekking across fields to reach faults. In some areas linesmen are still unable to climb poles due to strong winds.

Seventy additional engineers and linesmen are making their way to Northern Ireland this morning from the South of Ireland and the mainland in order to bolster the existing 450 NIE employees already mobilised.

There are over 600 individual faults on the electricity network and in many areas poles and lines have been brought down by snow and gale force winds. Omagh, Dungannon, Coleraine and Ballymena areas remain some of the worst hit areas.

We will be issuing regular updates to the media. The same information will be available from call handlers and our automated call handling system

Northern Ireland Electricity is reminding customers of the precautionary measures to take in the event of a power cut:

- never approach broken lines or damaged poles, and keep children and animals away - report damage to Northern Ireland Electricity on 08457 643 643 and listen to recorded messages carefully
- turn off electric cookers, ovens, irons, etc. if electricity supply is lost
- leave a light switched on so you know when power has been restored
- take extra care if using candles, oil lamps or other naked flames

- test smoke alarms with fresh batteries
- ensure adequate ventilation if using gas heaters.

…ENDS…

Issued by:
Sara McClintock
Northern Ireland Electricity
Media line: 0845 300 3556

31 March 2010 at 20.00

Severe weather update

NIE has now restored electricity supplies to over 70,000 customers who lost electricity supplies following the severe ice storm last night caused by a combination of wet snow and cold northerly winds.

The ice build caused severe damage to the electricity network across Northern Ireland. Approximately 30,000 customers remain off supply while NIE responds to hundreds of incidents of damage to the electricity network.

The damage is widespread throughout Northern Ireland but is most severe in the Omagh, Londonderry, Coleraine and Ballymoney areas. NIE warns that due to the extent of the damage in these areas restoration of supplies is likely to take a number of days.

NIE will be doing everything it can to restore supplies to these customers as soon as possible. Customers may wish to contact NIE on 0845 7 643 643 this evening for further updates."

Damage has been caused by flying debris and high winds, including broken electricity lines and damage to poles and other equipment. There may be also further faults which have not yet been reported to Northern Ireland Electricity.

Customers who contact NIE by phone should listen fully to the recorded telephone messages which will provide the best and latest information available. If possible, customers will be answered by a call handler, otherwise there will be a separate facility to leave a message to report visible damage to the electricity network such as broken poles or lines.

Hundreds of NIE engineers, call handlers and administrative staff are reinforcing our normal capability to restore supplies following severe weather damage and to provide regularly updated information to customers. Our Incident Management Centre at Craigavon is open.

…ENDS…

Issued by:
Sara McClintock
Northern Ireland Electricity
Media line: 0845 300 3556

1 April 2010 at 12.30

Severe weather update

Northern Ireland Electricity has advised that 23,000 customers are still without electricity supplies. Power has been restored to approximately 77,000 homes and businesses over the past two days.

All of our resources – both people and equipment - have been deployed since early morning fixing faults. This includes almost 200 additional overhead line staff brought into Northern Ireland from the Republic of Ireland and Great Britain.

NIE hopes to restore power to a significant number of customers today but there will be customers still without supply tomorrow and into the weekend in a few locations in the areas worst affected by the ice storm. These areas are:

Ballymena – Martinstown/Cargan, Glenwherry, Buchna
Ballyclare – The Collin, north of Ballyclare
Londonderry – Gortanghey/Dungiven, Claudy, Windy Hill (Limavady)
Coleraine – Cloughmills (very extensive damage with many overhead lines needing to be rebuilt), Ballycastle
Omagh – Dunamanagh, Plumbridge, Gortin Glen, Castlederg
Dungannon – Pomeroy, rural areas around Cookstown, Aughnacloy

Sara McClintock from Northern Ireland Electricity said, “We will continue with all of our efforts to restore all of our customers as soon as is humanly possible. We hope that more accurate estimates of restoration times for individual faults will continue to become available throughout the day.”

We will be issuing regular updates to the media. The same information will be available from call handlers and our automated call handling system

Northern Ireland Electricity is reminding customers of the precautionary measures to take in the event of a power cut:

- never approach broken lines or damaged poles, and keep children and animals away - report damage to Northern Ireland Electricity on 08457 643 643 and listen to recorded messages carefully
- turn off electric cookers, ovens, irons, etc. if electricity supply is lost
- leave a light switched on so you know when power has been restored
- take extra care if using candles, oil lamps or other naked flames
- test smoke alarms with fresh batteries
- ensure adequate ventilation if using gas heaters.

…ENDS…

Issued by:
Sara McClintock
Northern Ireland Electricity
Media line: 0845 300 3556

1 April 2010 at 17:15

Minister Foster Pays Tribute to NIE Workers

Energy Minister Arlene Foster has visited Northern Ireland Electricity's Escalation Centre in Craigavon to view their round-the-clock efforts to restore power to thousands of homes.

Northern Ireland Electricity (NIE) has restored power to 82,000 customers within the last 48 hours and has over 600 staff working to restore power to the remaining 18,000 customers without power.

Energy Minister Arlene Foster said: "In the space of several hours on Tuesday evening we were faced with unprecedented weather conditions which caused extensive damage to the electricity network in Northern Ireland.

"I want to reassure those who are without power that my Department has been liaising with NIE to ensure that all possible action is being taken regarding the restoration of power and the safety of customers.

"Whilst I pay tribute to all NIE workers who are working night and day in dangerous circumstances, I also recognise that many of our most vulnerable citizens are sitting without heat or light. I have personally asked management at NIE to ensure every effort is made to have power restored to all domestic and business customers as soon as possible.

Emergency crews have already restored power to thousands of customers over the last 48 hours, and they are doing everything they can to repair remaining faults despite difficult conditions."

All resources – both people and equipment - have been deployed since early morning fixing faults. This includes almost 200 additional overhead line staff brought over from the Republic of Ireland and Great Britain.

NIE hopes to restore power to a significant number of customers tonight but there will be customers still without supply tomorrow in the areas worst affected by the ice storm. These areas are:

Ballymena – Martinstown/Cargan, Glenwherry, Buchna
Ballyclare – The Collin, north of Ballyclare
Londonderry – Gortanghey/Dungiven, Claudy, Windy Hill (Limavady)
Coleraine – Cloughmills (very extensive damage with many overhead lines needing to be rebuilt), Ballycastle
Omagh – Dunamanagh, Plumbridge, Gortin Glen, Castlederg
Dungannon – Pomeroy, rural areas around Cookstown, Aughnacloy

Parts of North Antrim have been particularly hard hit by the severe weather but we are hoping to restore power to the majority of affected homes by Friday. In Cloughmills, NIE engineers are rebuilding 4.5 miles of electricity lines which were brought down and damaged during the severe weather, including replacing 60 electricity poles. This work, which would normally take a number of weeks, is being done in a matter of days and hours.

"We are also in discussions with North Antrim Council to arrange connecting a generator to a centre in Loughguile which will provide assistance to people.

Sara McClintock from Northern Ireland Electricity said, “We will continue with all of our efforts to restore all of our customers as soon as is humanly possible. We hope that more accurate estimates of restoration times for individual faults will continue to become available throughout the evening.”

NIE will be issuing regular updates to the media. The same information will be available from call handlers and our automated call handling system

Northern Ireland Electricity is reminding customers of the precautionary measures to take in the event of a power cut:

- never approach broken lines or damaged poles, and keep children and animals away - report damage to Northern Ireland Electricity on 08457 643 643 and listen to recorded messages carefully
- turn off electric cookers, ovens, irons, etc. if electricity supply is lost
- leave a light switched on so you know when power has been restored
- take extra care if using candles, oil lamps or other naked flames
- test smoke alarms with fresh batteries
- ensure adequate ventilation if using gas heaters.

…ENDS…

Issued by:
Sara McClintock
Northern Ireland Electricity
Media line: 0845 300 3556

3 April 2010 at 07.45

Severe Weather Update

NIE confirms that it has been able to restore power to 95,000 customers since the extreme weather event on Tuesday evening.

An additional 5,000 homes and businesses had power restored overnight, 5,000 customers are still without electricity supplies.

Pockets of customers are still affected in the following areas:

Ballymena – Martinstown/Cargan, Glenwherry, Buckna, Glarryford & Clough

Ballyclare – The Colin, North of Carrickfergus and Ballyboley

Campsie – Gortanghey/Dungiven, Claudy, Windy Hill (Limivady)

Coleraine – Cloughmills (very extensive damage), Ballycastle, Ballymoney, Kilrea & Garvagh.

Almost 800 staff will be deployed today in the ongoing restoration effort. These include 295 imported line staff from ESB, Isle of Man Electricity, Scottish Power and a host of other contractors. Three helicopters continue to patrol lines to identify damage and assist with the delivery of materials.

Emergency Rest Centres in Loughguille and the Joey Dunlop Leisure Centre in Ballymoney have remained open overnight. Dungiven Sports Paviliion will also re-open this morning at 9am. These centres will provide heat and hot food for customers.

A major restoration effort will continue throughout today to restore power to those customers still off supply however some customers in the areas worst affected may remain off supply into Easter Sunday.

We will be issuing regular updates to the media. The same information will be available from call handlers and our automated call handling system.

Northern Ireland Electricity is reminding customers of the precautionary measures to take in the event of a power cut:

- never approach broken lines or damaged poles, and keep children and animals away - report damage to Northern Ireland Electricity on 08457 643 643 and listen to recorded messages carefully
- if you are using a generator, be careful where you site it in case of carbon monoxide poisoning
- turn off electric cookers, ovens, irons, etc. if electricity supply is lost
- leave a light switched on so you know when power has been restored
- take extra care if using candles, oil lamps or other naked flames
- test smoke alarms with fresh batteries
- ensure adequate ventilation if using gas heaters.

…ENDS…

Issued by:
Sara McClintock
Northern Ireland Electricity
Media line: 0845 300 3556

3 April 2010

Repairing the electricity network

Northern Ireland has a very dispersed population with many individual houses in rural locations. As such it has one of the most rural electricity networks in the British Isles. There are around 32,000kms of overhead line and 13,000kms of underground cables in Northern Ireland.

The overhead line network operates at a range of voltages, 275,000 volts (large pylons), 110,000 volts (pylons and wood poles), 33,000 volts (wood poles), 11,000 volts (wood poles), 400 volts and 230 volts (the voltage that comes into peoples' homes).

When a fault occurs on the 275,000 volt network a fluctuation in voltage can be seen by customers. Because of the way this level of the network is designed a single fault should not cause customers to go off supply, however, on Tuesday night customers across Ireland would have seen small dips in their electricity supply as a result of the automatic reconnection.

The electricity distribution system is remotely monitored from NIE's Control Centre in Craigavon so engineers should know when faults occur on the 33,000 volt network and on part of the 11,000 volt network. On the lower voltage parts of the network NIE's systems are designed so that they can identify where faults have occurred as a result of the pattern of calls logged by customers.

Finding faults

Often it is possible for the NIE Control Centre to restore supplies immediately following a fault by means of its remote control facilities. When a fault needs to be investigated, engineers are dispatched to try to locate the precise location of that fault. In some cases the fault will be obvious, a broken pole for instance. In other cases the fault will not be obvious, a crack in an insulator

sometimes is not visible from the ground and will require engineers to fit specialised fault locating equipment to locate it.

During major storms we use helicopters with an NIE observer to patrol damaged lines to locate and record the damage for repair. This speeds up the fault locating process. If movement is restricted by heavy snowfall, helicopters are also used to fly staff into inaccessible locations in this case up to four helicopters were deployed on a daily basis.

When there is major damage to the network, with hundreds or even thousands of faults, the fault dispatch, fault location and repair process is devolved to 12 Local Incident Centres (LIC's) spread across Northern Ireland.

This week, all LICs were opened on Tuesday afternoon in preparation for the forecast storm. Subsequently as fault levels reduced in some LICs, staff were relocated to the worst affected areas. The Local Incident Centres in Enniskillen and Bangor completed repairs in their area on Wednesday, Newry, Downpatrick, Craigavon completed repairs on Thursday night and Dungannon and Omagh on Friday night. The LICs in Ballyclare, Ballymena, Campsie and Coleraine remained opened into the weekend.

These centres have to prioritise the faults, restoring the 'backbone' of the network – the main lines that run between substations – before 'spurs' off these main lines can be repaired. In general, most customers will be directly connected to these network spurs.

Customer information

NIE's call centre is located at Craigavon and has had up to 80 call agents working from 7am to 11pm every day since Tuesday. These agents come from all over the organisation. The High Volume Call Answering service has the same information as the call handlers. It is also able to capture the information that the customer who rang is off supply and this is automatically fed into the system that manages the faults.

Understandably customers get very frustrated when NIE cannot tell them when their supply is likely to be restored or if we give them a restoration time that is not accurate. If the damage to the network is very extensive, and there are thousands of faults, it takes time to locate, visit and assess all the faults. It is not possible to provide restoration times on individual faults until this process has been completed. As such we try to provide general information through call handlers and the media as to how long customers in particular areas might expect to be off supply.

On occasions an individual customer may be affected by a number of different faults. They may be provided with a restoration time based on a particular fault being repaired but they may also be affected by another fault further down the line which may not even be known about at that time. This will be frustrating as the line will trip out again until further faults are located and fixed.

Repairing faults

To repair faults on overhead lines, overhead line staff have to climb poles. They do this using spikes strapped to their legs and secure themselves to the poles using a pole strap and harness. They could be up poles for hours at a time and from early morning to late at night. For safety reasons staff have to be very careful climbing poles when it is windy. In this mobilisation NIE has 650 lines staff working very long hours in order to restore supplies. Around a third of these have been drafted in from ESB Networks and other contractors and companies in Great Britain.

…ENDS…

Issued by:
Sara McClintock
Northern Ireland Electricity
Media line: 0845 300 3556

4 April 2010 at 07.45

Severe Weather Update

NIE confirms that it has been able to restore power to around 99,000 customers since the extreme weather event on Tuesday evening.

Approximately 1,000 customers are still without electricity supplies. Small pockets of customers are still affected in the following areas:

Ballymena – Martinstown/Cargan, Glenwherry, Buckna, Glarryford & Clough

Ballyclare – The Colin, North of Carrickfergus and Ballyboley

Coleraine – Cloughmills (very extensive damage), Armoy, Ballymoney

The Ballymoney Council's assistance centre at the Joey Dunlop Leisure Centre will remain open until 21.00 tonight to provide hot food, showers and shelter. The Millenium Centre in Loughguille will be open for lunch and into the afternoon.

NIE staff are available at both centres with up to date information. If customers have not yet reported damage or are still without electricity please call NIE on 08457 643 643.

Almost 650 staff will be deployed today in the ongoing restoration effort. These include 295 imported line staff from ESB, Isle of Man Electricity, Scottish Power and a host of other contractors. One helicopter continues to patrol lines to identify damage.

We will be issuing regular updates to the media. The same information will be available from call handlers and our automated call handling system.

Northern Ireland Electricity is reminding customers of the precautionary measures to take in the event of a power cut:

- never approach broken lines or damaged poles, and keep children and animals away - report damage to Northern Ireland Electricity on 08457 643 643 and listen to recorded messages carefully
- if you are using a generator, be careful where you site it in case of carbon monoxide poisoning
- turn off electric cookers, ovens, irons, etc. if electricity supply is lost
- leave a light switched on so you know when power has been restored
- take extra care if using candles, oil lamps or other naked flames
- test smoke alarms with fresh batteries
- ensure adequate ventilation if using gas heaters.

…ENDS…

Issued by:
Sara McClintock
Northern Ireland Electricity
Media line: 0845 300 3556

4 April 2010

NIE: keeping in touch with critical customers

Tuesday's severe ice storm left around 100,000 homes and businesses throughout Northern Ireland without power. Some of those affected included around 400 people on NIE's critical care list. These are customers who rely on electricity for their healthcare needs such as dialysis machines, ventilators or nebulisers.

These customers were contacted throughout the duration of the power cuts to find out how they were coping and to provide information on the fault. The service is designed to help customers make informed decisions on their healthcare needs.

In very extreme cases, NIE fitted small generators to homes to provide light, heat and electricity for vital health care equipment.

A team of more than 20 NIE electricians, co-ordinated from Belfast, have fitted these generators in almost 60 homes in the worst affected parts of Northern Ireland since Tuesday evening.

One of the electricians working in the Ballymena area, Stephen Greer, has been averaging around four hours sleep each night. He said, "Between this weather and my 5 week old daughter, I've only been managing a few hours sleep each day. Keeping these generators going means that I'm revisiting homes twice and sometimes three times a day to check them and top them up with fuel. Once mains power is restored, we need to safely remove the generator, switch customers back on and take the generator to the next person that needs it."

Tom Doran who has been co-ordinating efforts described some of the situations they have faced, "The weather has made getting to some

customers extremely difficult. We've relied on the good will of the general public to tow our vans out of the snow on several occasions. In one case when our 4x4 couldn't get through we had to borrow a tractor from a local farmer! We also faced a really nasty situation in Belfast where youths were stoning our van and setting up road blocks which stopped us getting to a customer. This kind of thing really makes you angry when you're trying to get to customers in need."

For more information on NIE's Critical Care Service contact 08457 643 643 or visit www.nie.co.uk/customerinformation

…ENDS…

Photo caption:

Stephen Greer from Northern Ireland Electricity installs a generator to critical care customer without power.

Issued by:
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Severe weather update

Northern Ireland Electricity confirms that all of its overhead lines affected by Tuesday's severe ice storm have been rebuilt, repaired and re-energised.

It believes that all of the 100,000 homes and businesses have had electricity supplies restored.

Roy Coulter, NIE Safety Manager, says, "As far as we can ascertain we have fixed all the outstanding faults in the Coleraine, Ballymena and Ballyclare areas however, we would ask anyone who is still without electricity to contact us on 08457 643 643. Customers should also contact this number to report any damage to the electricity network that still requires repairs."

The severe weather caused unprecedented damage to the power network – both in the number of individual faults and the geographic spread. Restoration efforts have been running round the clock since Tuesday evening.

NIE greatly appreciates the assistance of local Councils and Community Centres who have served as a vital point of respite and information for customers who were without electricity for several days.

Roy Coulter says, "The restoration of electricity supplies has been a huge team effort from all employees and NIE owes a debt of thanks to all the lines people from ESB Networks and the other companies from Great Britain, the Isle of Man and the Republic of Ireland that assisted in the five day effort to rebuild damaged lines and fix faults."

…ENDS…

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APPENDIX 8

PHOTOGRAPHS

[1]

The extreme weather manifested itself as several hours of severe snow storms lying to a depth of 50 cm with drifting in areas due to the prevailing north to north-west winds

[1] Picture from the Belfast Telegraph – Glenshane Pass

A heavy accumulation of wet snow (up to 150mm diameter) accreted around the conductors and on some spans which did not fail, the conductors were weighted down to within 300mm of the ground. The accumulation of wet snow was worst on conductors running east-west, which were perpendicular to the prevailing wind.

Supply restoration activity was severely hampered in some regions by the difficulty in getting access due to impassable snowdrifts. This difficulty not only prevented engineers and repair crews reaching the damaged sections of the network to effect repairs but also severely hampered the collection of comprehensive and accurate information on the full extent of the damage.

[2]

Permanent damage to the Distribution network was sustained when conductors were stretched until they clashed against each other, touched the ground or broke.

[2] Picture taken on Lisnaharney Road, Omagh and sent to NIE by customer

85% of all pole damages were associated with conductor damage. This was primarily due to the conductor undergoing excessive stress loading beyond its design limits resulting from effects of the storm winds and wet snow accretion causing the pole support and conductor to break.

70% of pole damage related to poles breaking with the remaining 30% failing as a result of the poles being pulled from the ground due to the increasing weight of wet snow accretion.

In line with NIE's emergency response process, 12 Local Incident Centres were mobilised on Tuesday, 30 March. The Local Incident Centres all have access to the fault management and dispatch system (Trouble Management system) enabling local dispatch of repair teams to faults in the most effective manner.

Pictures taken at the Ballymena Local Incident Centre.

On Friday, 2 April 5 helicopters were deployed. Due to the extreme numbers of overhead line mid-span joints being used on repairs, two of the helicopters had to be utilised for the collection of line joints and other materials from suppliers in GB.

Repair crews and support staff worked through hazardous and extreme conditions throughout the entire period of the storm to ensure all customer supplies were restored in as short a timescale as practicable.

NIE's material procurement, stores and logistics systems ensured that throughout the duration of the storm, materials were available for all repair teams and in many cases these were delivered directly to damage repair sites. A measure of this overall materials management and logistics success was that there were no instances, on any repair sites, of materials unavailability giving rise to delays in fault repairs.

During the event approximately 72,000 calls were answered, 44,000 by HVCA and 28,000 by call handlers. A total of 746 priority calls were answered from the Emergency Services (39), elected representatives (307) and Critical Care customers (400).

During 30 March – 4 April, NIE contacted around 400 Critical Care customers who were off supply to provide them with the best information available. Exceptionally, based on specific personal circumstances, a generator is provided to a Critical Care customer; 60 small generators were installed and maintained at the homes of Critical Care customers during the storm.

On Thursday 01 April 2010, NIE decided to open emergency centres for customers in the worst affected areas. The purpose of the centres was to provide support, assistance, hot food and respite to the local communities.

NIE liaised with local council Emergency Planners to initiate community reception centres. The emergency centres operated from 9am on Friday 02 April 2010 until the areas affected had their electricity supplies restored. NIE worked with the local Councils who provided guidelines of where best to locate the centres in order to serve all sections of the community. When the emergency centres opened, an NIE representative was present at each location.

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APPENDIX 9

STORM COMPARISONS

The following tables and comments summarise the system performance details, with respect to the number of faults and the total customer interruptions[1], for the seven major storm periods:

- February, 2001 snow storm (26/02/2001 – 27/02/2001)
- August, 2003 lightning storm (05/08/2003 – 06/08/2003)
- January, 2005 gales (08/01/2005 – 09/01/2005)
- September, 2006 gales (21/09/2006 – 22/09/2006)
- December, 2006 gales (31/12/2006 – 01/01/2007)
- January, 2009 gales (17/01/2009 – 18/01/2009)
- March 2010 snow storm (30/03/2010 – 31/03/2010)

Event	No. of Faults			No. Customer Int.		
	HV	LV	Total	HV	LV	Total
Feb '01 Snow Storm	360	841	1,201	100,000	4,201	104,201
Aug '03 Lightning Storm	572	n/a[2]	572	127,006	n/a	127,006
Jan '05 Storm	231	1,102	1,333	50,531	9,632	60,163
Sept ’06 Storm	240	1,075	1,315	95,605	8,289	103,894
Dec ’06 Storm	131	646	777	33,882	3,050	36,932
Jan ’09 Storm	119	407	526	43,846	1,525	45,371
Mar ’10 Snow Storm	629	512	1,141	135,492	2,531	138,023

The different impact of each of the storms can be summarised as follows.

- The February 2001 snow storm resulted in more than 100,000 customer interruptions due to:
  - Extensive damage to the 33kV network (i.e. large blocks of customers were affected).
  - Extensive damage to the 11kV network (many circuits sustained multiple faults – resupply often not being immediately available due to faults on other circuits).

[1] Data is for distribution system only – does not include transmission faults.
[2] There were no LV faults attributed to lightning during this storm period.

- Similarly, the lightning storm in August 2003 resulted in the loss of many 33kV circuits (and associated stepdown substations) and 11kV main lines.

- In contrast, the more recent storms in January 2005, September 2006[3], December 2006 and January 2009 have had a lesser impact on the 33kV and 11kV networks in terms of the number of faults. The increased resilience of the HV network, due to the ongoing capital investment in overhead line refurbishment, resulted in relatively minor damage to both the 33kV network and much of the 'backbone' 11kV network.

- The March 2010 storm was an extreme event, closer in nature to the February 2001 event, only on a much wider scale across the Province.

Damage Analysis

The percentage of faults resulting from damage to the network for the seven events is illustrated below:

Event	Damage Faults / Total Faults %	
	HV	LV
Feb '01 Snow Storm	57%	57%
Aug '03 Lightning Storm	12%	n/a
Jan '05 Storm	58%	71%
Sept '06 Storm	47%	36%
Dec '06 Storm	59%	62%
Jan '09 Storm	61%	64%
Mar '10 Snow Storm	71%	46%

[3] The number of customers affected by the September 2006 storm was inflated by the loss of Ballymena Main substation. This one incident, which followed a particular series of transient faults on the 33kV network resulted in the loss of supply for 23,285 customers.

The above table shows that for the March 2010 snow storm a very high percentage of HV faults resulted in damage. Unlike previous events, a significant number of these faults had multiple damage locations requiring extensive and prolonged repairs.

It can be seen that the percentage of damage faults on the high voltage network is similar for the January 2009, December 2006, January 2005 and February 2001 storms.

The higher number of transient (non-damage) faults during the September 2006 storm was due to greater interference by trees, which was caused by the heavier leaf coverage present during September compared to the winter months, January and February.

As is normally the case during lightning storms, the level of damage faults for the August 2003 storm was substantially lower than that resulting from the impact of wind and snow.