Department for
Business, Energy
& Industrial Strategy

Energy Emergencies Executive Committee Storm Arwen Review

Final Report

June 2022

Any enquiries regarding this publication should be sent to us at:
enquiries@beis.gov.uk

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Executive Summary

The Energy Emergencies Executive Committee Storm Arwen Review was commissioned in December 2021 by the Secretary of State for Business, Energy & Industrial Strategy. The review has been a joint endeavour between government, industry and the regulator (Ofgem) with the aim of identifying lessons to be learned and actions to take forward. These actions will drive improvements to Great Britain's electricity network resilience to severe weather events.

Storms on a par with Arwen and Eunice are relatively exceptional events. They may not be repeated for several years, even as the United Kingdom becomes subject to more extreme weather as a result of climate change. Nevertheless, both storms challenged and tested the existing planning assumptions, and made clear that growing electricity dependency for essential services will make storms, even those that are less severe, increasingly impactful.

The actions recommended by this review address concerns under the three pillars of system resilience, consumer protection and additional support.

To support system resilience, actions will be taken forward to assess physical resilience standards, planning for future storms and enhancing the tools available to support repairs to the network and restoration of supplies to customers. This will include consideration of an outcomes-focused physical resilience standard to help set industry targets and meet public expectations. The success of the mutual aid forum, NEWSAC, is also recognised, with recommendations to consider expanding its scope and building on its success.

The poor service customers received during the storm when attempting to contact their Distribution Network Operator (DNO) will be addressed through actions to enhance customer call centre resourcing strategies and ensure web and telephony systems are adequate to meet demand. How customers are compensated for the loss of power has been reviewed, and recommendations made on the regulation of compensation, in addition to actions on the DNOs to address shortcomings in their systems.

Under Additional Support, actions have been identified to improve the quality of communication and information sharing between DNOs and local resilience partners, where coordination and cooperation are vital to ensuring public safety and welfare during major incidents.

The Energy Emergencies Executive Committee will be responsible for the implementation of these actions, in collaboration with other partners as appropriate. The majority address improvements to be made across all Distribution Network Operators; where individual examples of especially good or poor practice are relevant these are noted in the report. While improvements will be made, no electricity system can be totally immune from disruption.

Introduction

This is the Final Report of the Energy Emergencies Committee (E3C) Storm Arwen Review, as commissioned by the Secretary of State for Business, Energy & Industrial Strategy (BEIS) in December 2021. It follows the publication, in February 2022, of an Interim Report detailing the early findings of the review and builds upon those findings to present a set of recommended actions to improve electricity resilience to severe weather events.

The scope of this review is focused on the response of the Distribution and Transmission Electricity Network and System Operators to Storm Arwen in November and December 2021. The majority of the recommendations are for the Distribution Network Operators (DNOs). These businesses hold licences from Ofgem, the energy regulator, to operate the GB electricity network at the distribution level. These networks connect approximately 30 million customers including domestic households, businesses and Independent Distribution Network Operators (who manage a cluster of customers, such as a housing estate) to electricity supply. DNOs receive their income via customer electricity bills, receiving around £93 per customer per year. Some recommendations are for all operators, including Transmission Operators and where relevant, Independent Distribution Network Operators, and a number will be taken forward jointly by industry, government and Ofgem.

In the course of the review, the interactions of DNOs with local resilience partners and other sectors have been assessed. Some recommendations touch on the work of these other partners and organisations and should be considered by them. The actions recommended here for electricity operators may also be pertinent for consideration by other energy or utility operators.

Since this review was commissioned, further storms have impacted GB. The most impactful was Storm Eunice in February 2022, during which over 1.7 million households experienced an electricity disruption of more than 3 minutes. Storm Eunice was not directly comparable with Storm Arwen due to the differences in wind direction, duration, and geographic location. However, where useful comparisons and lessons can be drawn out, these have been.

The report covers the three key pillars of system resilience, consumer protection and additional response support, and identifies actions to drive improvements in all three areas.

System Resilience

The Interim Report into Storm Arwen found that the existing network standards did not provide adequate resilience from severe conditions that combined a northerly wind direction with sustained high wind speeds, snow and ice. This contributed to prolonged electricity disruption that, in some cases, extended well beyond what most households can tolerate. Lessons have been identified and recommendations made for existing and future resilience standards, storm preparations, fault identification and restoration options.

Electricity Network Resilience

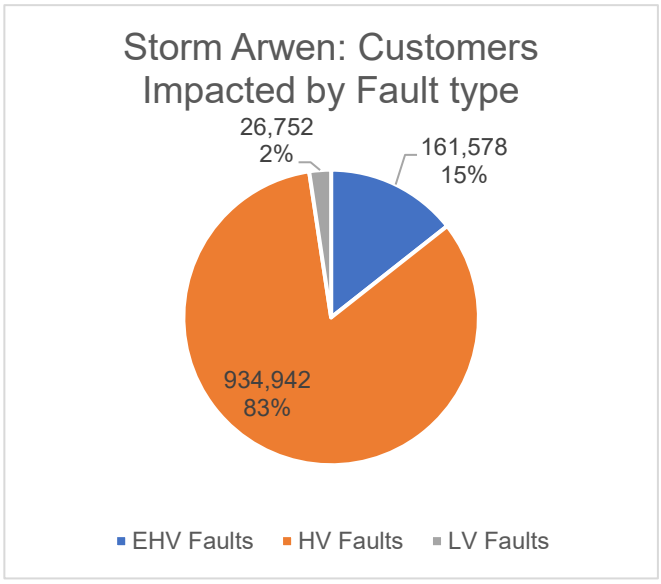
Electricity network resilience is maintained by the licensed network operators, guided by a series of standards, codes and guidelines that inform build standards and good practice. DNOs are incentivised to provide a highly reliable service in an economical way and penalised through compensation payments to customers who experience specific levels of disruption (as pre-defined by Ofgem). In practice, this means the DNOs invest in ways to both prevent disruption and to minimise the length of disruption when it does occur.

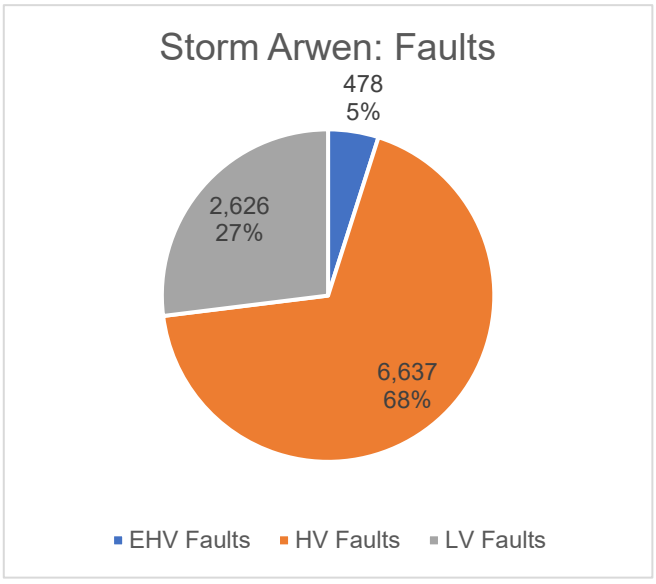
Damage to the Network

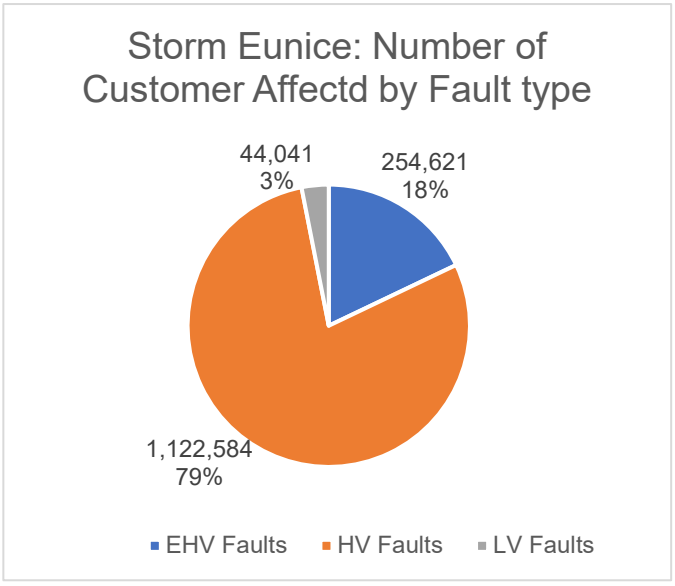
Distribution Network

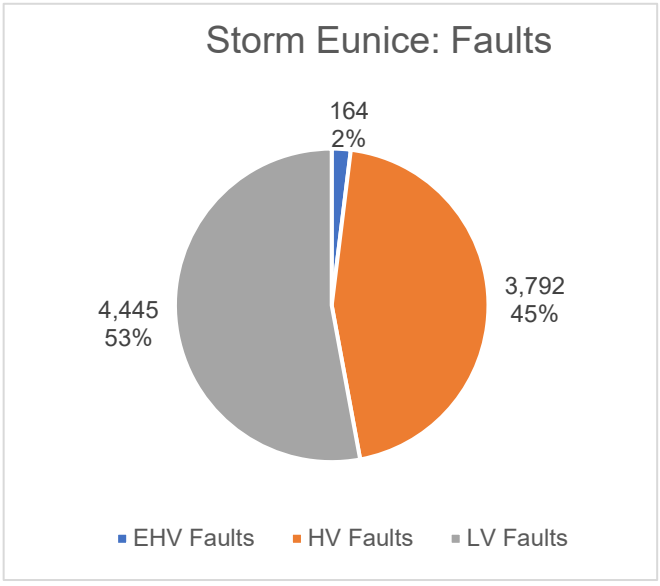
Storm Arwen and Storm Eunice caused substantial damage to the distribution network with evidence suggesting the existing industry standards and licence requirements that are intended to deliver a resilient electricity network for the GB consumer could be improved. Whether the existing licence conditions were fully adhered to by all operators is a matter for Ofgem to review.

The number of customers impacted by a fault generally scales according to the voltage of the line the fault occurs on, with High Voltage (HV) and Extra High Voltage (EHV) faults impacting the most customers. As set out in the charts below, most customers were impacted by a fault on an HV line, but a large number of faults occurred on Low Voltage (LV) lines; each fault impacting a proportionally smaller number of customers. For both Storms Arwen and Eunice, only 2-3% of customers impacted were off supply as a result of faults on LV lines.





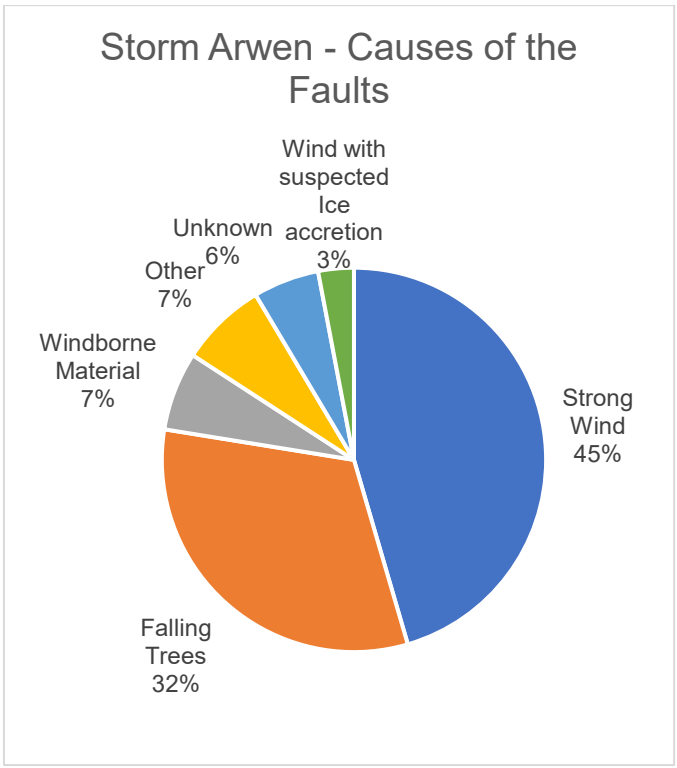


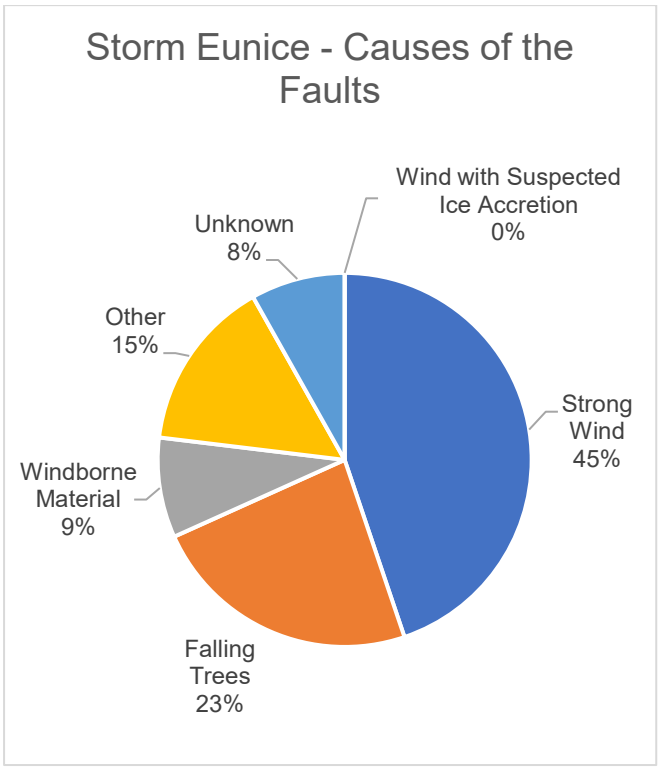


The storm damage was predominantly caused directly by strong winds or falling trees in both storms. A small proportion was caused by ice accretion during Storm Arwen. There was also more tree damage during Storm Arwen, suggestive of the different environments in the areas hit by the two storms.

Scottish Power Energy Networks, for example, reported that their enhanced approach to investment in vegetation management resulted in fewer faults on their EHV lines. Evidence of best practice in this area should be used to inform a review of the existing standards and guidance for vegetation maintenance.

The evidence suggests the priorities for enhancing physical resilience should remain on the following: EHV and HV lines, protection from sustained high wind speeds, and tree cutting policy.





Construction standards for electricity networks intended to ensure resilience to strong winds should be reviewed in light of the damage inflicted by both Storms Arwen and Eunice.

Overhead lines cannot be fully protected from windborne debris except by burying cables underground. This is routinely done in urban areas, and almost two thirds of the distribution network is already underground, but undergrounding would not be a cost-effective means of providing resilience on long spur routes that serve smaller numbers of customers. There are also different risks associated with increasing the quantities of undergrounded network, including longer repair times, voltage management and power quality issues that would require additional investment to be mitigated.

Additional investment in undergrounding to protect against the rarest and least likely of risks would not provide value for money for energy consumers. Resilience to events like Storms Arwen and Eunice can be improved through other means, combining some improvements to physical standards of infrastructure with enhanced response and restoration practices. Upgrades to standards in the past have made a significant difference. Electricity North West estimated that the electricity supplies to over 100,000 households in their area were protected during Storm Arwen by the tree cutting programme driven by changes to the Electricity Safety, Quality and Continuity Regulations.

While important to consider, changes to build standards and codes are not a short-term solution. They take time to embed across a network made up of 274,800km of overhead line, requirements differ across geographical regions, and it is costly to replace healthy physical infrastructure before the end of asset life. Any changes would be subject to a cost-benefit analysis process to ensure value for money and would need to be accounted for in future price controls set by Ofgem.

Current resilience standards focus more on inputs in the form of build standards than on consumer outcomes. An outcomes-focused resilience standard based on a set of principles could allow operators to plan and invest accordingly while setting Government and public expectations of the service they fund.

Transmission Network

The electricity transmission network is intended to carry large amounts of power across the country, therefore faults on this network will impact significantly more customers than the equivalent on the distribution network. The infrastructure, metal pylons rather than wooden poles, withstands much higher wind speeds than the distribution network, despite a greater proportion being overhead lines rather than underground cables.

The flying debris and high winds of Storms Arwen and Eunice did cause several temporary faults on the GB transmission network. The lines were successfully returned to service automatically by Delay Auto Reclose mechanisms, reinforcing the value of these.

There was only one transmission fault during Storm Arwen caused by fallen trees on lines connecting a 132kV substation that resulted in customers off supply. At the same time, many of the local distribution 33kV overhead lines that would have allowed a continuation of supply from alternative substations were also affected. The loss of the substation resulted in 7,400 customers off supply, who were restored within three days.

Trees fallen onto lines near a 132kV transmission substation during Storm Arwen

Generation and System Stability

The Electricity System Operator (ESO) maintains system stability across the GB electricity system, ensuring that supply meets demand on a second-by-second basis. The ESO takes

measures ahead of any impending severe weather event to ensure the electricity system stays stable. In preparation for both Storms Arwen and Eunice, the ESO increased reserve levels for the periods of greatest risk.

There was limited generation loss during both Storms Arwen and Eunice. A common loss of generation during severe storms comes from windfarm “cut outs” which protect the wind turbines from being damaged by excessive wind speeds. During both storms, wind farm cut-outs were experienced, however these had been planned for and did not result in system issues.

It was also observed that some offshore windfarms were unexpectedly disconnected from the system following the activation of the offshore networks’ protection and control systems. These disconnections were in response to faults on the onshore network, rather than a risk to the wind turbines themselves. The unexpected operation of these protection and control systems has the potential to result in large-scale generation loss that could impact system stability.

While there were no impacts to system stability in GB during either Storms Arwen or Eunice, the disconnection of the offshore windfarms was coincident with, and therefore likely caused by, onshore transmission faults. This is being investigated by the ESO and the relevant Offshore Transmission Operators. The conclusions of their investigations will inform whether further action may be required, or changes made. With the significant offshore wind developments to support the Government’s Net Zero targets, it is important that the design and operation standards ensure the fault response capability of windfarms meets the overall system needs.

Planning for Future Storms

Current modelling suggests that in the future, GB will likely be subject to more extreme weather events, although it is not certain this will include more frequent severe winter storms similar to Storms Arwen and Eunice. While the precise details of future forecasting are uncertain, what is guaranteed is the increased reliance of the population on electricity for daily life and access to essential services. As we move towards Net Zero and electricity dependency rises, customers will likely have less tolerance to power cuts.

The Energy Networks Association (ENA)-led Climate Change Resilience Group has worked with the Met Office to assess future weather risks to electricity resilience. Continued work is necessary to understand the future strength and longevity of high winds, frequency of severe weather events and changes in prevailing wind direction. These assumptions are critical to inform the necessary cost-benefit analysis required to justify expenditure on electricity network resilience. The cost of resilience will ultimately impact the cost of electricity, so improvements need to represent value for money for the consumer.

Following the 2013 storms, planning scenarios were prepared to enable an improved storm response from the networks. However, Storms Arwen and Eunice exceeded those planning assumptions, indicating a need to review the scenarios.

Conclusions

Network readiness and resilience need to be predicated on a comprehensive understanding of the risks – including the likelihood of severe storms.

The current design standards/guidance, including vegetation management guidance and overhead line designs, and industry practices across distribution and transmission networks, such as tree cutting procedures, should be reviewed to reflect the damage inflicted on the network by Storms Arwen and Eunice and determine how best to improve future network resilience to similar scale events. The review should take into consideration that resilience standards should be fit for a future of higher electricity dependency.

Storm Arwen resulted in electricity disruption which went well beyond the expectations of both Government and society. Current resilience standards are solely defined as measures to be implemented rather than specific consumer outcomes. A principles-based outcomes-focused resilience standard would allow operators to plan and invest accordingly while setting Government and public expectations of the service they fund.

Actions

Code	Action	Owner	Delivery Date
E1	Put forward proposals for an outcomes-focused physical network resilience standard to set public and government expectations and industry targets to guide planning and funding decisions by industry and the regulator.	E3C - Electricity Task Group	30 September 2022
E2	Review and update as required the current distribution and transmission network infrastructure and standards (including ERT132, OHL designs and vegetation management) to ensure they are fit for purpose, especially for spur lines in rural areas.	E3C - Electricity Task Group	30 September 2022
E3	Review international approaches to resilience infrastructure to identify best practice – particularly as we transition to Net Zero.	E3C – Electricity Task Group	30 September 2022
E4	E3C, working with the Met Office, to identify opportunities to expand and enhance research into future severe weather risks and planning assumptions for the electricity sector, building on existing research and putting in place a regular review process.	E3C / Met Office	30 September 2022

E5	Electricity Task Group to update the reasonable worst-case scenarios for testing response plans against and provide updated planning assumptions for other sectors to plan against.	E3C - Electricity Task Group	01 July 2022
E6	Electricity Task Group to review the outcome of the ESO / OFTO investigation into voltage dips in the OFTO transmission network as a result of Storm Arwen and recommend if changes are necessary to current connections and any requirements for new connections.	E3C - Electricity Task Group	30 September 2022

Restoration & Response

Irrespective of the level of investment, no physical system can ever be made 100% failsafe, therefore restoration efforts remain an integral part of electricity network resilience. The review indicates the potential for improvements to weather forecasting, fault identification methods, resourcing for repair work and generator deployment.

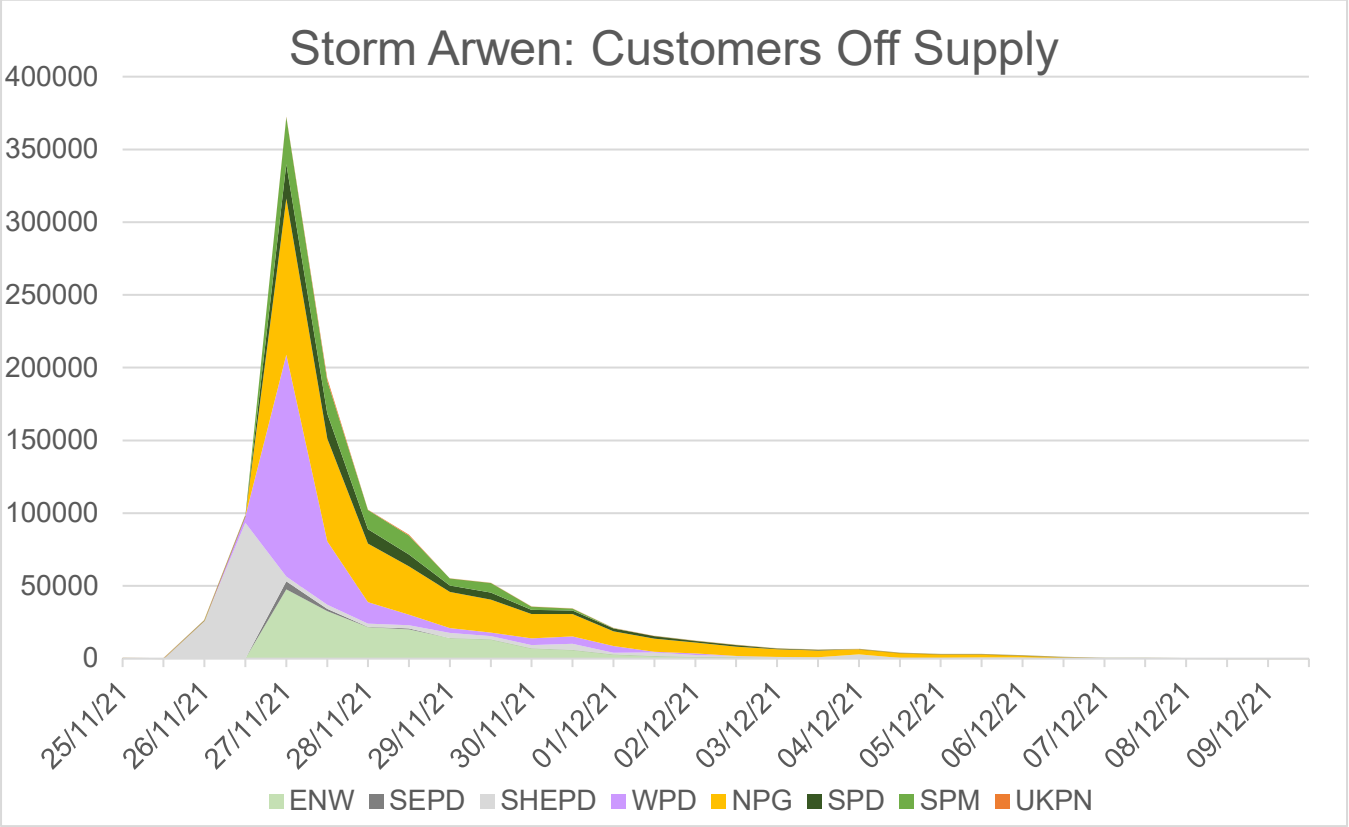
Forecasting

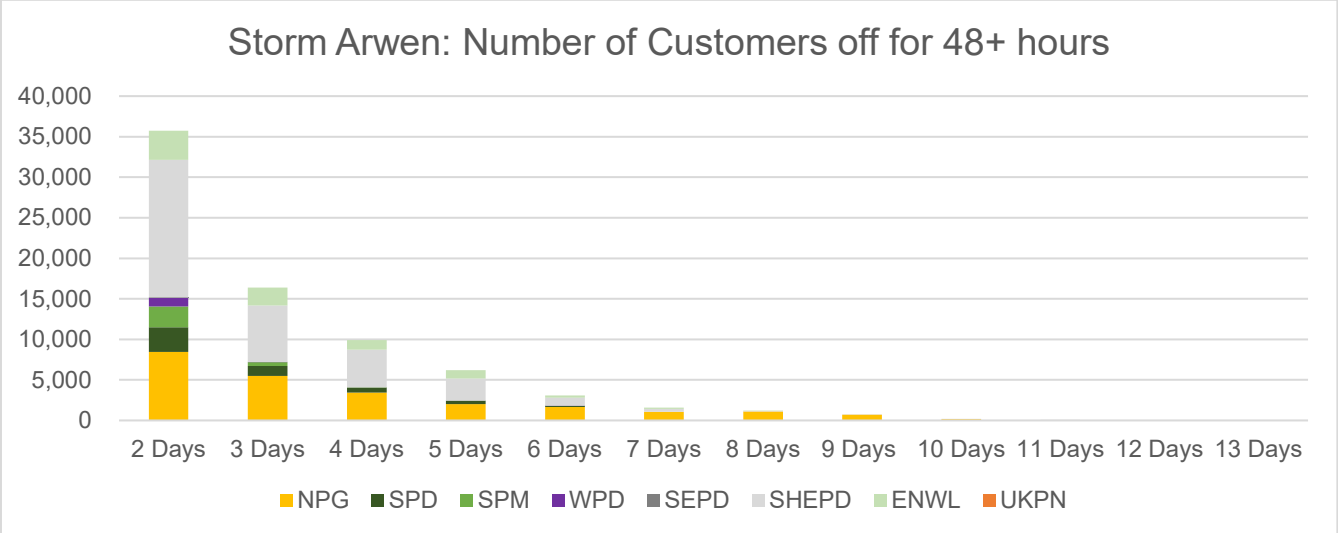
A key capability highlighted by Storm Arwen was the critical importance of accurate, timely and relevant weather forecasts in combination with strong understanding of the specific implications of weather patterns for electricity infrastructure. This access to relevant forecasting allows DNOs to prepare and stand up their response procedures at the optimum moment and level.

The Met Office will work with the electricity sector on how public forecasting tools can be best used to support early warning of disruptive weather for the electricity sector. This could include work on predicting not just the top speed of wind gusts, but the risk of sustained high wind speeds which were a significant feature of Storm Arwen. All DNOs should review their severe weather escalation plans to ensure that all relevant factors, including wind direction, are taken into consideration.

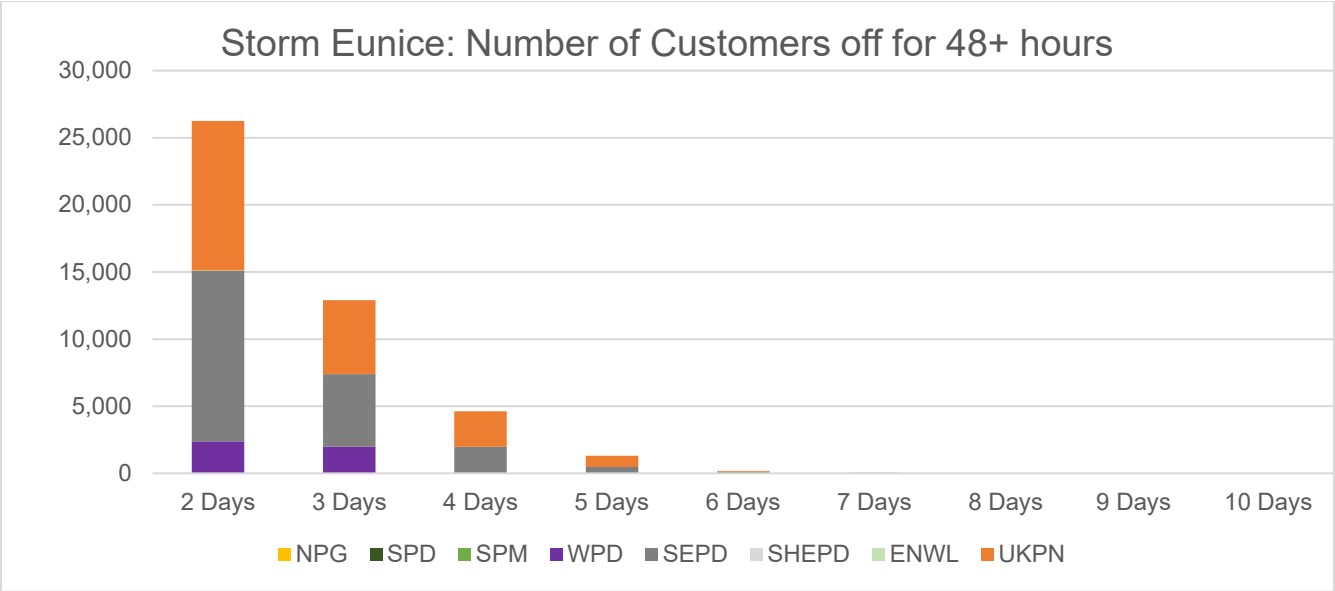
Storms Arwen & Eunice

For Storm Arwen over 74,000,[1] and for Storm Eunice over 45,000 customers were off supply for over 48 hours.





[1] This figure has increased since the Interim Report due to more accurate data being available primarily from SSEN North (Scotland).



Although more people were affected by Storm Eunice the overall restoration was faster compared to Storm Arwen, with the final households restored after 9 days compared to 13. For each HV and EHV fault repaired by engineering teams during Storm Eunice, over twice the number of customers had their supplies restored compared to similar repair work during Storm Arwen.

Fault Identification and Damage Assessment

As identified in the Interim Report, there were challenges to DNOs quickly identifying all the faults on the network and accurately assessing the level of damage and time to repair. The key challenges were impacts to LV lines with less or no remote monitoring, 'nested' faults on LV lines hidden by faults higher up the network on HV lines and reliant on visual identification, and poor customer communications. The review has identified three areas for future improvements to enhance fault identification and damage assessment.

LV lines have far less remote monitoring than HV or EHV lines and are therefore especially reliant on customer reporting and visual assessment by teams of scouts, helicopters, or drones. The latter can both identify faults and begin to assess the level of damage. All DNOs had scouting/damage assessment teams, although processes and plans were different across each organisation, including how they surged additional resource to this work during major events. Best practice and innovation should be shared, to ensure the full network damage assessment is completed in the shortest time possible.

During Storm Arwen, which arrived on Friday 26 November 2021, high winds prevented helicopters and aerial surveillance from assessing damage until Sunday 28 November 2021. Once wind speeds reduced to a safe level, helicopters were an effective tool for surveillance over wide areas.

There are a number of helicopters across the gas and electricity networks beyond those used by the DNOs, and mutual aid processes could be enhanced to ensure use of these additional resources is considered when appropriate.

Finally, DNOs also rely on customers to report loss of electricity as a way of identifying faults. This was especially challenging during Storm Arwen for those operators whose call centres were overwhelmed, preventing customers from reporting their power cut. Examples of good mitigations include Electricity North West, which had an automated process once customers called in that allowed them to log a fault and send text message confirmation without waiting to speak to a call hander; and Scottish and Southern Electricity Networks which highlighted that fault reporting via their app was a notable success. For the small number of customers who also lost their telecommunications however, they had no way of reporting a fault to their DNO.

An alternative to pro-active customer reporting is to use smart meters to automatically provide an indication that a property is without power. Western Power Distribution noted that during Storm Arwen smart meters gave inaccurate data, and only 25% of their customers have them. Improvements in smart meter take-up, technology and data access may present opportunities to speed up fault reporting.

Restoring Electricity Supplies

There are two ways to restore power – repair the fault or provide an alternative source of electricity. The latter can be achieved by automatically switching from one line or cable to another, bypassing the fault altogether. When damage is widespread however, or impacts are on the more remote, less interconnected parts of the network, repairing the fault or replacing the supply, with mobile generation, are the only options.

Repair

The preferred option is to permanently repair the fault – this usually makes best use of engineering resources and restores power permanently to customers in the shortest timeframe. In the first 24-48 hours of a storm, most resources will be committed to making repairs that can restore the largest number of customers.

Two key challenges to the repair effort were noted during Storm Arwen where improvements may be possible: the availability of resources and the use of power resilient field communications.

Availability of Resources: DNOs should review their resourcing requirements in line with the updated planning assumptions, continuing to give appropriate consideration to value for money. During a large-scale, widespread event like Storm Arwen however, the repair needs will quickly outstrip the resources of any one DNO.

Under those circumstances, DNOs agree to share resources through the NEWSAC electricity industry mutual aid forum, so that when a large-scale event hits some DNOs, those unaffected will offer staff to support those responding, as happened in both Storms Arwen and Eunice.

NEWSAC has proven to be a highly effective tool enabling operational teams to move from less impacted areas to places with more customers off supply, resulting in quicker restoration. Nevertheless, some areas for improvement have been identified, including removing unnecessary barriers to cross-sector/operator working and streamlining the onboarding process of bringing in new teams. Work should be done to identify how other parts of the

energy industry, including electricity transmission and gas distribution, could be most effectively utilised to support electricity distribution operators in major incidents, and vice versa.

One area for improvement should include increasing the visibility of available non-personnel resources across mutual aid participants via a regularly updated catalogue of specialist equipment such as helicopters or pole trucks. A catalogue approach might be more cost-efficient than a physical 'spares club' where equipment held in kind is stored in readiness, as there are significant material and efficiency costs associated with the latter.

Resilient Field Communications: The review considered the impact of public mobile network outages on the repair effort. The DNOs found that any impact was minimal, due to their back-up communications. During the response, however, Northern Powergrid indicated to BEIS that the lack of public telecoms in some areas was impacting their ability to efficiently communicate with field staff.

Scottish and Southern Electricity Networks indicated that the impact was one of speed, as some back-up communications can take longer to operate and initially field teams, unaware of the widespread telecoms issues, spent time attempting to locate a mobile signal. In an example of effective cross-utilities coordination, their repair efforts in one area were assisted by a telecoms provider who deployed remote on-site communications where public networks were unavailable due to electricity disruption.

Different organisations have deployed different back-up solutions, including the use of Airwave and private radios. Best practice should be shared in this area, to ensure every DNO has a set of power resilient and secure operational communications systems now and in the future. This should consider the foreseeable developments in the telecommunications sector including the switch-off of PSTN, 2G and 3G mobile networks and Airwave.

Replace

If repairing a fault would take a significant amount of time, customer supplies were in some cases temporarily restored via the use of mobile generators. These can be large and installed directly onto the network to supply multiple properties, or small and supply only a single site. There are however several challenges and limitations in their use.

Generators, in particular the larger sizes, are heavy and require specialist authorised resource to transport and install. This can take trained staff away from repairing network damage. Once installed, generators require regular refuelling and may require servicing.

Generators can only be installed in certain specific parts of the network, and in suitable locations. Electricity North West noted that some rural parts of their licence area are unsuitable for large generator installation, for example.

DNOs should review the requirement for generator capacity, considering the growing dependency on electricity and the increased uptake of electric vehicles in houses and communities. This review should consider the availability of suitably qualified personnel who can deploy generators, as these could come from a wider personnel pool via mutual aid. It

should also consider a survey of key substations or sites where permanent mobile generating unit connection points should be installed to allow the fast deployment of generators. This could include designated welfare hubs and take into consideration the heightened resilience needs of at-risk communities.

Industry Reporting

Part of the electricity industry's response to severe weather events is to report into the Lead Government Department for energy, the Department for Business, Energy & Industrial Strategy (BEIS). This reporting is critical to ensure that Government has a clear understanding of the situation and that central government decision making during an electricity disruption, is supported by timely and accurate evidence.

During Storm Arwen, returns from the DNOs during the storm reporting process put in place, were not always accurate or submitted to BEIS in a timely fashion. This highlighted a need to review the storm reporting process to ensure that industry is aware and understand their reporting requirements and the right level of information is collected in an efficient manner to inform prioritisation of government decision making.

An initial audit took place to enhance this process and lessons were applied during Storms Eunice and Franklin which improved the level of information and efficiency of its collection. This process should be further refined to ensure consistent and comprehensive situational awareness during future events. For those networks where it applies, BEIS will also look to ensure Scottish and Welsh Government processes are aligned.

Conclusions

All DNOs should continue to ensure they have access to high quality weather forecasting and a corresponding understanding of the implications (i.e., of wind direction on tree damage) and escalation thresholds to inform the appropriate response to weather warnings.

Fault identification mechanisms should be improved as shortening customer restoration times is heavily dependent on accurately and comprehensively identifying faults on the network. Opportunities to effectively share resources should continue to be identified and enhanced.

Storm Arwen brought unacceptably long power cuts to some households, especially those in rural areas. Mobile generators are a critical part of the solution to reducing the length of power cuts and getting customers back on supply before full repairs can be completed. There are limitations to the value and practicality of their use. The number accessible to DNOs and the strategies for resourcing and deploying enough generators should be reviewed by the industry.

The reporting framework between industry and government needs to allow for the full suite of information to be provided in a timely and accurate fashion when required and should be prepared and pre-agreed as far as possible in advance of being needed.

Actions

Code	Action	Owner	Delivery Date
R1	E3C to review and update industry best practice to ensure DNOs can quickly identify faults and safely assess the extent of network damage earlier in a severe weather event. This review should include the role of smart meter data and technology for this task.	E3C + (I)DNOs	01 April 2023
R2	E3C to identify options to enhance the use of mobile generators in reducing the length of power disruption, covering the population of mobile generators held by the DNOs and resourcing options to transport, install, refuel and remove.	E3C – Electricity Task Group	01 August 2022
R3	Energy Network Operators should share best practices to ensure they each have a suite of resilient communications systems, considering developments in the telecommunications sector.	STTG	30 September 2022
R4	Energy Network Operators should continue to engage with DCMS and Ofcom to secure the utility spectrum so that the energy sector can develop its own resilient data/voice networks in the future.	STTG	31 December 2023
R5	E3C to identify other appropriate areas where mutual aid could be appropriately and effectively deployed, specifically considering the areas of welfare, customer communications and resourcing support, and whether mutual aid agreements could be expanded to include, for example, gas distribution operators.	E3C	30 September 2022
R5a	NEWSAC membership to review and update and expand as required the list of specialist resources and equipment that could be called upon during an emergency response and put in place a process to keep the list updated.	NEWSAC	30 September 2022
R5b	NEWSAC membership to explore ways to streamline guest engineer onboarding and share best practice.	NEWSAC	30 September 2022
R6	Electricity Task Group to review and update as required existing good practice guidance on weather	E3C - Electricity Task Group /	30 September 2022

	forecasting and escalation triggers, and work with the Met Office to consider what additional forecasting information may be useful to enhance storm preparations by both DNOs and resilience partners, government, and the public.	Contracted Weather Forecaster Services	
R7	Each DNO to review their severe weather escalation plans, trigger points and resulting preparatory actions, to ensure all relevant factors that can influence scale of impacts are considered, e.g., wind direction.	DNOs	30 September 2022
R8	BEIS to audit storm reporting rhythm and template in consultation with industry and Devolved Administrations to ensure data requested is most useful and can be provided in a timely, accurate and consistent fashion to support Government decision making and prioritisation.	BEIS	30 June 2022

Secondary Impacts

Sectors providing essential services were impacted by Storm Arwen both directly by the high winds and resulting damage from fallen trees and debris, and by the widespread loss of power. The scale and longevity of the disruption during Storm Arwen, and to a lesser extent during Storm Eunice, exceeded the level of resilience some essential services have to electricity disruption. Electricity resilience remains the responsibility of each essential service to secure, but where restoration times are particularly inaccurate or change frequently, the ability of other operators to mitigate impacts is impaired.

Telecommunications

The Electronic Communications Resilience & Response Group (EC-RRG) brings together the telecoms sector resilience leads and has conducted its own review of the protracted recovery of fixed and mobile communications during Storm Arwen. The volume and scale of power outages highlighted the extent of the interdependencies between the energy and communications sectors and the need to improve resilience.

The EC-RRG Storm Arwen Post Incident Review is identifying the impacts of the event and setting out a framework for action. This includes a review of the sector's incident management processes for storm related events, working with the energy sector to improve cross-sector working to accelerate restoration of services and explore costs and challenges of making the mobile phone network more resilient.

Emergency Services

The electricity disruption caused by Storm Arwen impacted both the Airwave Network (which currently provides telecommunications coverage for emergency services) as well as the Emergency Services Network (ESN), the future Airwave replacement.

For Airwave, there were 1,053 incidents recorded during Storm Arwen, of which 636 were primarily caused by power outages. As key sites which provide vehicle coverage have on-site generator power back-up, not all these incidents impacted services. Within the area affected by the storm, a total of 376 key sites suffered a loss of mains power of which 359 remained powered by their back-up generator.

For remote critical sites, the practicalities of delivering mobile generators over long distances when roads may be inaccessible suggest that fixed back-up electricity sources are required.

ESN was also impacted by power outages. During the restoration effort, the operator, EE, worked effectively with DNOs but also noted that DNOs were not able to prioritise restoration to ESN sites over restoring domestic customers.

The Home Office is conducting a post-incident review into Airwave performance and may look to review upgrades to Emergency Service Network resilience.

Water

The water sector experienced impacts due to electricity disruption during Storm Arwen where sites lacked back-up electricity supplies, predominantly in the north of the UK. Whilst 50,000 customers could have been impacted by loss of power to pumping stations, only 2,000 were impacted due to the mutual aid protocol, whereby water tankers and emergency generators were deployed. However, DNOs were not always able to prioritise restoration work at water sites.

In a case of good practice, Scottish Water was able to communicate effectively with its DNOs about how electricity faults were impacting its sites. The accuracy and detail of this information enabled DNOs to make efficient prioritisation decisions, balancing the need to restore domestic customer electricity supplies with the need to assist the restoration of critical water supplies.

During Storm Eunice, there were cases where water companies had difficulty contacting the right DNO who serviced their area regarding restoration times, hindering response efforts. This review suggests that all Category 2 responders regularly share and update emergency contact details with their critical partners and stakeholders. Enhancing relationships between water companies and DNOs will be key to minimise future event disruption. Water resilience to power loss is also critical for Fire and Rescue Services who depend on water pressure.

The Department for Environment, Food and Rural Affairs is reviewing power resilience at strategic water sites, and as the water sector was heavily reliant on mobile generators, the availability of these within the sector will be a key consideration.

High Risk Communities

Some communities, particularly rural communities, suffered disproportionately from the loss of essential services during Storm Arwen. Electricity infrastructure in more remote communities is inherently less resilient, as they are often reliant on a single LV connection, and this can be compounded by less resilience to loss of other essential services.

In rural and coastal areas, there is less overlap of mobile phone provision from multiple cell sites, increasing the risk of outages in those areas. Further inland and in urban environments, the greater overlap provides resilience, as was seen during Storm Eunice, where a greater level of damage resulted in fewer impacts to mobile phone coverage for customers. Where there is greater dependency on local or individual transport links and water sources, these services are also more vulnerable to disruption. DNOs have suggested dependency on power for a localised water source could be identified by water companies as a specific vulnerability to local resilience partners to aid in the prioritisation of vulnerable customers.

It may not be economically viable to enhance physical resilience via additional infrastructure to some communities due to geography or population size, however in those cases it is necessary to ensure that enhanced contingency plans are in place instead. For circuits that suffer frequent electricity disruption, there is a ‘worst served customer’ process managed by Ofgem to fund enhancements to their resilience. A similar process could be implemented for communities judged to be at significantly high risk of electricity disruption, and this option is worth exploring between Ofgem, industry and government.

Conclusions

Where sites are of a particular criticality, they should have robust contingency plans for the loss of electricity supplies judged against an informed and proportionate risk assessment. DNOs can help better inform these risk assessments through the provision of clear planning assumptions.

DNOs should continue to work with other essential services through Local Resilience Forums and Partnerships (LRF/P) to understand the priority of needs across the local area and to ensure shared situational awareness is maintained about the electricity restoration process.

Strategic planning is necessary to ensure the best and most efficient support is available to the most at-risk communities, and all resilience partners can inform on both area risk assessments and appropriate contingency planning.

Actions

Code	Action	Owner	Delivery Date
S1	E3C to review approach to storm restoration, including if and how critical sites could be prioritised under existing regulations, and develop an explanatory outline of electricity restoration to share with resilience partners.	Electricity Task Group – E3C	30 September 2022

S2	Updated planning assumptions [developed under action E4 above] for electricity disruption in severe weather events should be shared with Ofgem and relevant government departments to update their own planning assumptions.	BEIS	01 September 2022
S3	Cabinet Office to consider messaging clarifying expectations of Category 2 responders within the CCA with reference to National Resilience Standards and share with all LGDs of essential services impacted in severe weather events.	Cabinet Office	30 September 2022
S4	DNOs (including IDNOs) should directly share contact lists for emergency planners with resilience partners and build stakeholder updates into regular incident response plan reviews.	DNOs	01 July 2022
S5	The Department for Levelling Up, Housing and Communities (DLUHC) with DAs to consider local/regional Utilities Advisory Cells within and to advise the Strategic Coordination Group during an emergency response which disrupts multiple LRF/P areas.	DLUHC	30 September 2022
S6	E3C to conduct a review with Ofgem into the 'worst served customers' process to determine whether it can be enhanced, including whether it can be expanded to include a framework to conduct community risk and contingency assessments, prioritising those communities judged to be at high risk of disruption.	E3C	31 December 2022

Consumer Protection

The Interim Report found that customers struggled unacceptably to communicate with their DNOs and get the information they needed. Optimistic restoration times impacted on customer welfare decisions and caused frustration. The welfare support available differed widely between regions. Compensation entitlement was not always clearly communicated, and the payment mechanism did not allow for timely and accurate payments. Actions have been identified to improve customer communications strategies, address the significant variance in welfare provision, publicise compensation and improve how it is paid to customers.

Customer Communication

Communication with customers was poor for a significant number of customers during Storm Arwen. Four key areas for improvement have been identified: the physical systems that supported customer communications, the resourcing of those systems, the range of communication methods used, and the content of communication.

Physical Systems

All impacted DNOs had excessive abandoned calls and maximum wait times. This was most obvious in the case of Northern Powergrid, whose website infrastructure proved unequal to the volume of traffic and frequently crashed. Northern Powergrid took steps immediately following Storm Arwen to upgrade their web platform to increase its capacity. Northern Powergrid also had extremely high call waiting times (maximum time of 5 hours 55 minutes and 19 seconds) and its system force-disconnected calls. Following the 2013/2014 disruption, DNOs developed a series of planning scenarios ranging from business as usual to RED alerts. These are used to stress test the capacity of their systems as well as helping plan public communication strategies and resourcing requirements. As part of updating these planning scenarios, the planning assumptions for communication requirements should also be updated.

Staff Resourcing

The availability of sufficient call handling staff also contributed to the excessive abandoned calls and maximum wait times. One possible resourcing option, initially used during Storm Arwen at short notice, and formally adopted and trialled during Storm Eunice, would be to extend the mutual aid framework to cover call handling staff. During Storm Arwen, Northern Powergrid's call centre received a large volume of enquiries and UK Power Networks provided call centre staff and facilities, establishing a new process whereby UK Power Networks call handlers were able to handle some overflow calls on behalf of Northern Powergrid. During Storm Eunice, Northern Powergrid provided a team of 50 call handlers to UK Power Networks, who were able to make outbound calls offering information to customers. There are limitations to how call handlers could be shared between organisations, especially while ensuring a high quality of service, but opportunities to identify appropriate surge resourcing strategies should be explored, including how and when mutual aid could be used.

Communication Methods

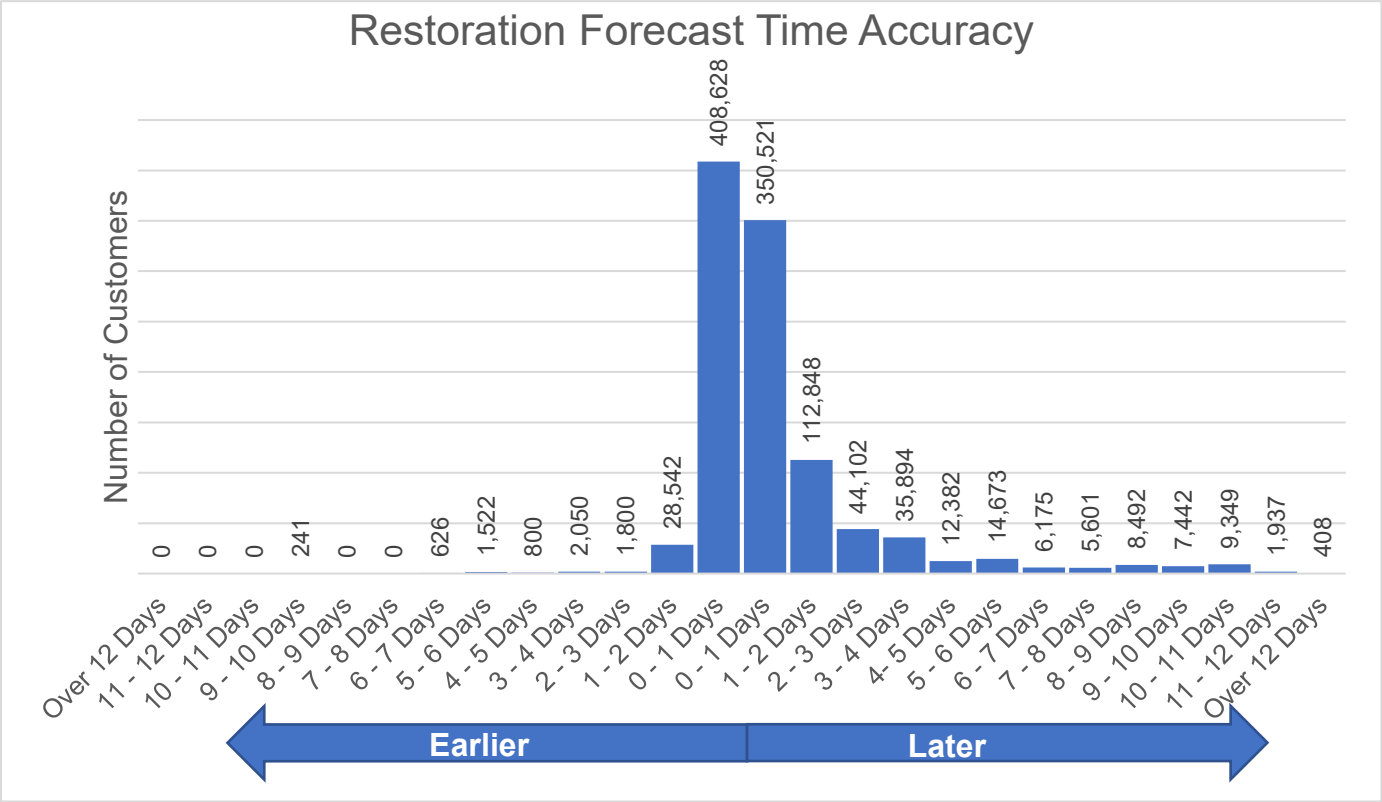
Having robust telephony and web systems adequately resourced is critical, but this is only effective for those customers with access to phone and internet services. Storm Arwen demonstrated that during major incidents, it is likely that a minority of areas will suffer from a loss of both electricity and telecoms and be unable to access the internet or make calls, making it harder or impossible to learn about available welfare. DNOs did use a variety of communication methods to contact their customers following Storm Arwen, for example inbound and outbound calls through their call centres including the 105 number; mass SMS and voice messages; social media and website updates including videos and audio recordings; options to listen to automatic voice recordings when dialling into the call centre; and radio and TV interviews. However, there should be additional consideration for those without internet or telecoms access, for example by utilising local radio, leafletting and coordinating with other local resilience partners. This approach would also ensure that customers stand the greatest chance of receiving the information they need.

SSEN noted that during Storm Eunice, local radio was often a better method to push out audio updates to the public instead of national radio. Local stations were more likely to play full clips containing more detailed information. Learning and good practice in this and other areas, including best use of social media, should be shared and built on across the industry.

Content of Communications

DNOs should reassess the content of the communications they issue to their customers. DNOs need to consider the most appropriate way to communicate to customers both before and during electricity disruption. Of particular importance is improved methods to communicate uncertain or changing estimated restoration times, as these had a detrimental impact on customers decisions about their welfare.

The graph below illustrates that while the majority of people were restored within 24 hours either before or after their initial estimated restoration time, a significant minority were restored multiple days after their initial estimate.



Based on available data, during Storm Arwen, over 100,000 people had their estimated restoration time change five times or more before their power was restored, and some more than ten times. Northern Powergrid was notable for accounting for over half of those cases. Since Storm Arwen, Northern Powergrid has implemented a new approach to communicating estimated restoration times to customers, including more information on the stage of the storm response, what the estimated restoration time means and the support it offers to customers.

The Restoration Forecast Time Accuracy figure (above) is based on data from 12 out of 14 licence areas. The remaining 2 licence areas did not have systems that recorded this data automatically.[2]

Providing accurate restoration times to customers early during a disruptive event is difficult, due to the challenges of fault identification and damage assessment, discussed in the Restoration section. While some improvement to early assessments may be possible, uncertainty about final restoration times will likely always remain, especially during large and dangerous incidents.

DNOs need to be able to communicate uncertainty in a sensitive and effective way to their customers and ensure that information about the welfare support available in their local area should be readily available and easy to access, for both customers and local resilience partners who are coordinating the wider welfare support. An example of improvement in this

[2] The missing data would likely add more customers who had their estimated restoration time changed five or more times, especially in cases where people experienced over 8 days of disruption. Overall, however, the 2 missing data entries together accounted for about 11% of all customers impacted by Storm Arwen, while Northern Powergrid (2 licence areas) accounted for about 27%.

area was during Storm Eunice, when the ENA coordinated a national picture on its website of the disruption, noting the most up-to-date information of welfare hub locations.

Conclusions

DNOs need to have physical telephony systems and website architecture that are capable of handling significantly increased traffic under a range of severe disruption scenarios.

It is critical for customer confidence and to support accurate fault data collection that call centres are not overwhelmed and remain accessible to customers. DNOs should consider any additional resourcing or processes to avoid call centres being overwhelmed whilst ensuring customer service.

Communication strategies need to ensure that information reaches the people who need it and utilises the full range of communication methods. Storm Arwen resulted in numerous individual accounts of vulnerable customers unaware of the available welfare support.

Actions

Code	Action	Owner	Delivery Date
CM1	Reasonable worst-case scenario planning assumptions for customer call volumes should be updated to reflect the new scenarios developed under action E4.	E3C - Electricity Task Group	01 August 2022
CM2	All DNOs to stress test customer communication architecture, including website capability and call centre processes, against updated planning assumptions, and to update contingency plans for additional capacity and features, such as queuing in severe weather events accordingly.	DNOs	30 September 2022
CM3	DNOs to ensure their physical telephony systems do not force-disconnect customers.	DNOs	31 July 2022
CM4	DNOs to improve their assumptions for estimating restoration times and improve the quality of their communication to customers, so that customers can make informed choices about their needs. E3C to coordinate sharing of lessons learned and developing and/or updating good practice guidance.	E3C - Electricity Task Group	30 September 2022
CM5	Northern Powergrid to ensure their customer communication strategies take into consideration the impact of inaccurate, uncertain and changing messaging.	Northern Powergrid	1 October 2022

CM6	ENA to scope value of including customer contact staff as part of NEWSAC.	ENA	31 December 2022
CM7	Ofgem to review the incentive framework for customer service, in relation to call-backs, and ensure that it drives overall benefits for consumers.	Ofgem	31 December 2022
CM8	DNOs to hold a workshop on their current comms software to share pros and cons of in-house vs off-the-shelf options including logging facilities, customisation, and queuing to better inform other organisation's decisions for cost/value.	DNOs	October 2022
CM9	DNOs to hold a workshop on their approach to social media and non-electricity dependent comms routes (for example leafletting) to share best practice and refine strategies in order to better inform customer and resilience partners decisions during electricity disruption.	E3C(CTG)	December 2022
CM10	E3C to hold a workshop on options to improve supplier communications with their customers during widespread electricity disruption.	E3C	October 2022

Customer Welfare

DNOs work with Strategic Coordinating Groups to coordinate and provide welfare support to customers, although DNOs are not legally obliged to provide this. Nevertheless, DNOs do offer enhanced support via the voluntary priority services register to customers who request it.

Welfare Provision

Local Resilience Forums (LRFs) are responsible for local support to customers following incidents such as Storm Arwen. Under the Civil Contingencies Act (2004), DNOs are required to liaise with Local Authorities, Strategic Coordinating Groups, and third parties (such as the British Red Cross), to share information about vulnerable customers.

Following Storm Arwen, in some areas, the coordination of welfare support was challenging between local responders due to a lack of situational awareness and understanding of roles and responsibilities. Welfare provision was also hindered by obstacles in information sharing between DNOs and Strategic Coordinating Groups, which is discussed under the 'Information Sharing' section of Additional Support. In addition, there are no principles or agreements setting out whether the DNOs or LRFs are responsible for the cost of certain types of support for customers. The agreement and implementation of best practice documentation would provide clarity on who is responsible for the provision and payment of welfare.

As well as issues of coordination, welfare provided by DNOs varied widely geographically and in terms of when support was made accessible to different categories of customers at different stages of the response. For example, Northern Powergrid prioritised, but did not otherwise differentiate, between vulnerable customers and all customers when offering hotel accommodation from 27 November 2021, while Scottish and Southern Electricity Networks focussed on reimbursing hotels for vulnerable customers from 26 November and expanded this offer to all customers from 29 November.

Expense Reimbursements

DNOs all offered expense reimbursements, whereby customers paid upfront for costs such as food and accommodation and were reimbursed later. For example, Electricity North West provided reimbursements for customers who used additional fuel sources, food deliveries or booked themselves into accommodation if they could not access the support provided by Electricity North West. Scottish and Southern Electricity Networks North (Scotland) accepted expenses claims from customers covering items, such as £15 per day food allowances, hotel accommodation and other reasonable expenses. These reimbursements are discretionary, and so there was variation in the offer and extent of expense reimbursements provided by each DNO. The offer of expense reimbursements and the method to claim them was also not always effectively communicated to customers; this is discussed in the compensation mechanism section below.

Expense reimbursements put customers who cannot afford to pay for food or accommodation upfront at a particular disadvantage. Expense reimbursements should be more consistent while acknowledging that DNOs have made clear they want to keep the freedom to make additional, discretionary payments to those with specific needs.

Conclusions

The successful coordination of welfare support depends on the ability to quickly acquire and share information between resilience partners, based on a shared vocabulary and understanding of roles and responsibilities.

There should be principle-based guidance or agreed best practice to make expense reimbursements more aligned across all DNOs, without being so specific that it limits DNOs' ability to make discretionary payments to those with specific needs. That some customers cannot afford to pay for food or accommodation upfront also needs to be taken into consideration.

Actions

Code	Action	Owner	Delivery Date
W1	DNOs, in consultation with resilience partners, to develop principles-based industry guidance on best practice in the provision of welfare support.	DNOs	30 September 2022
W2	DNOs to work with Local Resilience partners to agree clear roles and responsibilities during severe weather events, and incorporate them into DNOs' Emergency Plans.	DNOs	30 September 2022
W3	Where DNOs are providing discretionary support (e.g., accommodation, hot meals), DNOs should make clear to customers what support is available and how they can access it. DNOs should provide assurance this process is in place in their winter preparedness reporting to BEIS and Ofgem.	DNOs	30 September 2022
W4	DNOs to develop industry principles-based best practice, to guide how and when expense reimbursements are offered and made (especially when outages exceed 5 days), taking into consideration customers who cannot afford to pay for food and accommodation upfront.	DNOs	31 December 2022

Compensation

How DNOs communicated and paid compensation to customers, the compensation levels and £700 cap on payments were identified as areas for improvement following Storm Arwen.

Compensation Mechanism

The compensation mechanism used by DNOs to pay customers resulted in considerable delays to some payments being issued during Storm Arwen. For example, by 25 December 2021, more than four weeks after customers were affected by Storm Arwen, 27.5% of customers had not been issued compensation payments.

DNOs referenced two key factors that prevented them from swiftly and accurately paying customers; customer details that were missing or not up-to-date, and the requirement to write a cheque to issue payment.[3] DNOs also require accurate network fault data, to confirm how long customers have been off supply and, in some instances, inaccurate data resulted in further delays or inaccurate payments. In addition, although DNOs moved to a position of automatically issuing compensation to customers, this process, and their entitlement, was not

[3] The requirement to issue compensation by cheque is outlined in Ofgem Regulation 19(8)(c).

clearly communicated, which created further delays and stress for customers. The feasibility of a move towards automatic issuing of compensation should be explored.

Customer data: The major delays were for customers for whom the DNOs did not hold accurate or up-to-date records. Where DNOs already held accurate customer data, the issuing of payments was much swifter. Unlike Electricity Suppliers, DNOs do not have a direct relationship with customers nor are they obliged to, which can create difficulties in accessing up to date customer details.

The customers of Northern Powergrid and Scottish and Southern Electricity Networks had the biggest delays in receiving compensation. These DNOs had by far the most customers affected who were due compensation, and they had the largest number of customers without accurate records. Northern Powergrid took the longest to identify and pay out compensation to customers for whom they did not hold records, completing all payments the week commencing 07 March 2022, followed by Scottish and Southern Electricity Networks, completing all payments the week commencing 28 February 2022. Northern Powergrid needed to develop wholly new processes to handle the volume of compensation payments following Storm Arwen which they are continuing to develop and refine.

In contrast, SP Energy Networks had the largest proportion of customers with incomplete records, but its compensation payments were completed the quickest. SP Energy Networks was quick to contact customers with missing records and sent letters to all customers with inaccurate or missing records the week commencing 06 December 2021, accompanied by information on their website and social media, likely contributing to their swift completion of payments.

Compensation Payments Table*

DNO	Customers due compensation	No. of customers without DNO held records	% of customers without records held by DNO	Date when all customers without records paid
Northern Powergrid	26,955	3,635	13.49%	W/C 07 Mar 2022
Scottish and Southern Electricity Networks	36,168	2,899	8.02%	W/C 28 Feb 2022
SP Energy Networks	8,848	2,186	24.71%	W/C 31 Jan 2022
Electricity North West	9,118	852	9.34%	W/C 14 Feb 2022
Western Power Distribution	1,629	0	0.00%	N/A

**Based on data provided by the DNOs to Ofgem. Accurate as of 10th March 2022*

Inaccuracies in network fault data caused customers to be paid the wrong amount in some instances; the process of customers notifying the DNOs of this, and being reissued another cheque, caused further delays. This was a particular issue for customers of Northern Powergrid, although they have since put in place new and heightened controls to mitigate against similar errors in the future. The level of expediency showed by DNOs may be related to the quality of their data systems, which overall may require further development, in particular how they can exchange data effectively with energy suppliers.

The implementation of customer accounts would improve the compensation mechanism to allow for prompt and accurate payment. Customer accounts would allow customers to directly update their contact details to their DNOs to facilitate the writing of cheques, and to report power cuts at their residence. DNOs are all in the process of developing their systems to enable customer accounts. Customer bank details could also be added to the account, if the Ofgem regulation is amended to permit payment of compensation via bank transfer, though a process would need to be developed and implemented to ensure these details are maintained as up to date.

Communication: DNOs did not effectively or consistently communicate compensation entitlements and arrangements to customers following Storm Arwen. This was also the case for expense reimbursements. Although DNOs communicated information to customers via their websites, social media, letters or helpline or email contacts, there was variation in how quickly or effectively the entitlements and arrangements were communicated to customers. This caused additional uncertainty and confusion for some customers. Lessons were learned and implemented by DNOs in their response to Storm Eunice, with proactive communications around compensation provided by operators on their websites and social media, in which they provided detail about compensation entitlement and how it is paid. This included the publication of an updated page on the ENA website to outline and signpost the compensation policy.

Compensation Levels and Cap

Ofgem checks and verifies storm categories, which informs the level, and a cap, for compensation to be paid to impacted customers. The cap protects DNOs from being exposed to potentially unlimited liability for uncontrollable risks like severe weather, which would in turn increase the risk they have to assume and jeopardise their ability to finance their activities.

The £700 compensation cap for a Category 3 storm does not recognise the impact of extended power cuts as it caps compensation at five days therefore some customers may not be compensated for the entire period they are off supply. For extreme Category 3 Storms, customers may get no compensation at all. In addition, the compensation cap is not regularly revised or increased in line with inflation. All DNOs voluntarily lifted the cap following Storm Arwen and Storm Eunice, recognising that customers should be compensated in line with the level of disruption they faced, for the full length of time they were without power.

In some areas, Storm Eunice reached the threshold to be considered a Category 3 storm, and therefore DNOs in those areas had an additional amount of time, scaled depending on the area and the total number of customers off supply, to reconnect people before paying compensation. Despite this, operators have all committed to paying compensation under Category 2 storm regulations, which entitles impacted customers to £70 if they are off for over 48 hours, and a further £70 for every 12 hours they are off after that. Ofgem should therefore consider the relevance of this policy and establish revised thresholds for compensation.

Following Storm Arwen, all affected DNOs gave additional, goodwill payments to all affected customers, on top of those required by Ofgem’s Quality of Service Guaranteed Standards, in recognition of the exceptional impact of the storm. That these additional payments were made

suggests that the current system does not appropriately compensate customers for the disruption caused.

Overall, the system does not grant compensation proportionate to the level of impact experienced in all cases. However, to remove it entirely could expose DNOs to potentially unlimited liability. These considerations should be acknowledged in Ofgem's review of the compensation levels and the cap.

Conclusions

The compensation mechanism used by DNOs needs to be further developed to allow for swift and accurate payment of compensation to those entitled to it, without undue onus on customer applications.

DNOs should continue to develop their systems to support the operation of customer accounts and update E3C on progress.

Customers need to be informed of their entitlement to compensation and the method by which they will receive it to remove a source of anxiety and fear during extended electricity disruption.

Customers off supply for an extended period of time should receive compensation at a level that recognises the impact on customers of extended power cuts.

Actions

Code	Action	Owner	Delivery Date
CP1	DNOs to develop more robust payment mechanisms capable of delivering payments at scale, and to continue their development of systems to support customer accounts. ENA to consider how data-led approach using smart meter data could improve the accuracy of compensation payments.	DNOs/ENA	30 September 2022
CP2	DNOs to adopt lessons learned from 2021/2022 storms in their compensation payment processes, including a review and an update to the process of obtaining customer data. DNOs should also explore the options for customers to automatically receive direct compensation.	DNOs	30 September 2022
CP3	ENA to lead on developing more publicity for compensation entitlement in the event of a power cut; to form part of winter preparedness.	ENA	30 September 2022

CP4	Ofgem to commission a review the Guaranteed Standard of Performance for Severe Weather. This should include: • Assessing if a compensation cap is still appropriate and, if so, what the right level is. • Consideration of the current payment structure and develop alternative options, e.g., inclining payments. • Assess whether the thresholds for different storm categories are fit for purpose in light of climate change. • Developing options to improve the accuracy of customer data and make the process for compensation payments more efficient.	Ofgem	31 July 2022
CP5	Northern Powergrid to provide assurance to E3C that steps have been taken to improve accuracy of compensation payments to customers following a severe weather event, including for customers for whom they do not hold records.	Northern Powergrid	30 September 2022

Additional Support

The Interim Report found that the key area for improvement in the wider response support to the electricity disruption during Storm Arwen was in information sharing between DNOs and local resilience partners. This included a better mutual understanding of roles and responsibilities.

Situational Awareness

Local resilience partners and DNOs have long experience of working together and in many areas have well established practices in place. However, due to the longevity of the disruption during Storm Arwen, there were some processes that had not been tested, particularly with regards to information sharing, and these did not work optimally through the event.

There was a disconnect between the information required by local resilience partners and the information provided by the DNOs. This led to challenges for decision making within the local response, impacting on targeting additional welfare support to those most in need and on timely response escalation. While there was broad agreement on the need and responsibility to share information, the challenges and requirements need to be better understood on all sides.

Information Sharing

DNOs generally provided the level of detail needed for vulnerable customers in accordance with standard practice to resilience partners. In an emergency response, local resilience partners bring together the different vulnerable people lists of various agencies, for example local authority social services and water companies, to coordinate an effective response.

During Storm Arwen, however, increasing numbers of people were considered vulnerable due to the impact of being without power for an extended period of time, and in some cases also without water and telecommunications.

The Priority Services Register (PSR) used in the energy sector to identify households that may need extra assistance (ranging from large print bills to extra help during power cuts) did not capture those customers who only became vulnerable due to the length of time they were without power. The need for additional information for all customers, beyond those on the PSR, taxed DNO systems not set up to provide this data.

Agreeing an information sharing protocol that details how the existing commitment to share information can be effectively fulfilled would improve shared situational awareness during major incidents. Such an agreement should cover type, format, granularity and timeliness of data sharing at different stages of a response.

A challenge all DNOs faced was being requested to provide information in slightly different formats to the Strategic Coordinating Groups of multiple different LRFs. This delayed the process and caused inefficiencies in the data collection. There is a need to have a commonly

understood set of data requirements for electricity disruption events that is consistent across GB. This should consider a universal public system which shows this level of information as this would be beneficial, not just to local resilience partners and DNOs regarding welfare provision, but also for general customer situational awareness.

An additional situational awareness tool is the use of liaison officers from DNOs to the relevant resilience coordination response groups, e.g., Strategic Coordinating Groups (SCGs). Such provision is a requirement under the Civil Contingencies Act, but the effectiveness of this liaison role varied, depending heavily on the resource allocated to this role. DNOs should ensure the role is sustainably resourced by those with the necessary level of situational awareness.

Supporting Local Resilience Partners

Two wider learning points also emerged during the review for DNOs and their local resilience partners. Due in part to the difficulties in receiving the necessary level of information and accurate risk assessment from Northern Powergrid, Major Incidents were not declared in the North East when similar impacts in Scotland and the North West had already resulted in escalation.

Local Resilience Forums and Partnerships are in broad agreement that for the future, in the face of uncertain information they should consider standing up Major Incidents early and risk having to stand down again than risk standing up too late. Nevertheless, understanding the nature of uncertainty of restoration and having clearer communication of the risks from DNOs, who frequently face unknown levels of damage, is critical to help support timely decision making by these groups. Northern Powergrid has assigned executive oversight of engagement with their Local Resilience Forums to help ensure that messaging about alert levels and risk assessments ahead of anticipated disruption are communicated clearly in future events.

Another learning point was the variable nature of coordination between utilities providers, i.e., energy, water, transport and telecommunications. During Storms Arwen and Eunice, there were both good and poor examples of sector-to-sector engagement. For example, during Storm Arwen water companies in Scotland were able to share granular information with their DNO on critical water sites, allowing the DNO to take this into consideration in its restoration efforts. In contrast, during Storm Eunice, one water company caused delays by spending time attempting to contact the incorrect DNO for its area.

Strategic Coordinating Groups can, based on the information available to them, require the establishment of supporting sub-groups as necessary, which could include a Utilities Advisory Cell to focus specifically on the restoration of essential services. Additionally, the Civil Contingencies Act 2004 provides for the Department for Levelling Up, Housing and Communities to host a Response Coordination Group (ResCG) – which brings together multiple SCGs to share information and can be requested by any local resilience partner, including DNOs.

Risk Preparedness

Local resilience partners generally conduct winter preparation activities each year, and these can be effectively coordinated by Local Resilience Forums/Partnerships. DNOs conduct a range of activities from public messaging around winter risks to resource and equipment checks, and report on these activities to BEIS. Storm Arwen demonstrated that there are opportunities to improve the coordination of these activities across resilience partners and expand their scope in areas such as welfare.

The need for a clear articulation of roles and responsibilities in welfare provision during major incidents is covered in Customer Welfare above. The principles developed under those recommendations should inform response plans and pre-winter checks of both DNOs and their local resilience partners.

Local resilience partners conduct regular exercising, risk assessments and scenario planning, and DNOs are already heavily involved in this work. DNOs should ensure they continue to be fully engaged, and resilience partners should incorporate relevant elements of DNO roles and responsibilities into their own incident plans.

Staff turnover and the move to remote exercising because of COVID-19 played a role in eroding readiness in some areas, especially around the less likely but higher impact risk of extended and widespread electricity disruption. Enhancing the existing cooperation, leading to coordinated pre-winter checks would serve as a critical opportunity to bring new staff up to speed and refresh knowledge and mutual understanding of roles and responsibilities, enhancing overall preparedness for severe storms.

Conclusions

Information sharing is critical to effective local response coordination, in particular to supporting welfare: DNOs and their local resilience partners should work together to pre-agree type and format of information to be shared in severe events and where improvements to this can be made.

For events with the potential to result in extensive electricity disruption, it is preferable for SCGs to stand up early while scale and impacts are uncertain to provide the most effective local coordination and situational awareness. DNOs should ensure their response plans provide the right basis to support local resilience decision making.

Joint winter preparedness checks are recommended between DNOs and their local resilience partners to provide a good basis for cooperation during severe events; workshops, exercises and scenario planning should reflect a variety of scenarios including welfare needs during extended power disruption and information sharing at different stages of a response.

Actions

Code	Action	Owner	Delivery Date
L1	DNOs to work with local resilience partners to agree an information sharing protocol for severe electricity disruption and work towards compatible systems (such as mapping formats) that can provide that information.	DNOs	30 September 2022
L2	ENA to conduct scoping work into the development of a shared GB Power Cut mapping platform and provide outline of scale and cost of further development work.	ENA	31 July 2022
L3	DNOs to review resourcing of SCG liaison to ensure consistency, quality of information flow and personnel resilience.	DNOs	30 September 2022
L4	DNOs to work with local resilience partners to develop an agreed Joint Winter Preparedness strategy that can include an appropriate mix of exercising, workshops, scenario planning and information sharing. LRF/P chairs to provide assurance specific learning objectives have been embedded before winter 2022.	E3C – Electricity Task Group	30 September 2022
L5	DNOs to review the information they share with resilience partners and ensure that a strategy exists for communicating uncertainty in a way that supports decision making about escalation of local response coordination.	DNOs	30 September 2022
L6	Northern Power Grid to reach mutual agreement with their local resilience partners on information expectations and communication strategies to ensure timely and sufficiently detailed information is shared regularly to support local decision making.	Northern Powergrid	30 September 2022

This publication is available from: www.gov.uk/government/publications/storm-arwen-electricity-distribution-disruption-review

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