

Proposed guidance consultation

Question	Your response
Question 1: Do you consider the measures in the proposed guidance relating to the resilience of the physical infrastructure domains to be appropriate and proportionate?	No comment.
Question 2: Do you consider the measures in the proposed guidance relating to the resilience at the Control Plane to be appropriate and proportionate?	No comment.
Question 3: Do you consider the measures in the proposed guidance relating to the resilience of the Management Plane to be appropriate and proportionate?	No comment.
Question 4: Do you consider the measures in the proposed guidance relating to communications providers' own managed services to be appropriate and proportionate?	No comment.
Question 5: Do you consider the measures in the proposed guidance relating to communications providers' arrangements for preparing for adequate process, skills and training to be appropriate and proportionate?	No comment.

Call for Input

Question

Your response

CFI question 1: Does this framework accurately capture the factors relevant to assessing what is an appropriate and proportionate measure for MNOs to take with regards to power resilience for RAN cell sites?

Highlands and Islands Enterprise (HIE) welcome Ofcom's Call for Input regarding power resilience within the radio access mobile network. The Highlands and Islands of Scotland are home to some of the most remote and sparsely populated areas of the UK and Europe. As such mobile connectivity, in particular 4G coverage, has become increasingly essential to communities within our region especially as coverage has continued to reach further into these areas through public intervention programmes including the Scottish Government's 4G Infill (S4GI) and the UK Government's Shared Rural Network (SRN). As well as increasing the ability for rural communities to communicate, the use of mobile applications has made everyday tasks more efficient and convenient for our residents while data transfer via 4G coverage has also had a significant impact in the region regarding business growth and economic expansion. In addition, communities within the Highlands and Islands typically have an older age profile, and many are also vulnerable and dependent on telecare services which are now being delivered over mobile networks using dual or roaming SIM cards to ensure mobile connectivity.

Consequently, mobile networks within the Highlands and Islands not only enable communities to function on a day-to-day basis, but they also underpin critical voice and telecare services within the region in times of emergencies. Therefore, when mobile networks fail, the implications for rural communities in the Highlands and Islands are significant. Previous mobile network power outages caused not only disruption and loss of mobile communication, but also resulted in residents reliant on VoIP technology as a result of the PSTN migration, being unable to make calls as a result of their home broadband routers failing. This results in entire rural communities being unable to make emergency calls.

HIE is acutely aware that mobile communications are now seen by many residents as a primary means of communication and the reliance on mobile networks is only likely to increase as 4G coverage improves and as the migration of landline customers from PSTN to VoIP technology continues. This leaves residents more dependent on their broadband services to make outgoing calls including to the emergency services. This means the importance of RAN cell site resilience is

increasingly critical to the region as any prolonged mobile network outages can have grave consequences for those completely reliant on them.

HIE is supportive of the framework Ofcom has outlined for assessing which measures would be appropriate and proportionate. However, we believe opportunities around embedding measures relating to mobile network resilience have been missed through Government intervention programmes such as the SRN. This programme would have been an ideal opportunity for UK Government to improve the resilience of the UK's mobile infrastructure similar to the programme undertaken by the Australian Government (Mobile Network Hardening Program) and ensure rural cell sites, like those in the Highlands and Islands which support whole communities, were all equipped with extended battery capacity. Instead, the SRN just as with the rollout of the commercial mobile networks across the UK, is 'best effort' and has not been designed with any guaranteed service levels regarding service impact, fault limitation or recovery speed. While we understand some mobile networks do offer a degree of robustness at RAN cell sites with limited battery power backup for short-term incidents, in general, mobile operators have not considered the critical nature some cell sites represent to communities dependent on them. Therefore, the vulnerability of these cell sites, how best to optimise them within the context of operators' overall network design, and how to maximise their uptime in the event of a power outage, has in general been ignored. HIE is also concerned that given the high capital investment needed by mobile operators in order to build and connect sites, network resilience is often overlooked as it is not directly seen as revenue generating. HIE acknowledge the costs outlined by Ofcom in the Call for Input (£0.9 - £1.8bn) and agrees it is not feasible to dictate mobile operators must upgrade all RAN cell sites within their networks and provide battery backup. However, we believe there are a number of key considerations that do need to be addressed in order for mobile operators to identify those 'critical' RAN cell sites, which support whole rural communities and ensure measures to ensure their continued operation in the event of power outages are embedded:

- HIE agree with the outline framework and the factors mobile operators need to consider in understanding the role RAN cell sites play in providing connectivity to end users. We strongly believe a more strategic approach is needed by mobile operators to improve the robustness of their access networks by first understanding which cell sites within their network architecture are 'critical'. This would be based on factors including the function, configuration and location of the cell site, such as whether the cell site serves multiple base station sites and provides backhaul connectivity to the core network, whether the cell site is part of a shared infrastructure site, whether the operator has any overlapping cell site coverage or it is an isolated remote site, the 'typical' number of customers served by each cell site and whether this changes significantly during peak times such as the summer months due to tourism, the type of network equipment deployed and the total power consumed at each cell site.

This holistic understanding of each RAN cell site will help identify the service impact each cell site will have in the event of a power outage and which cell sites need to be prioritised with battery backup. HIE also believe that once 'critical' RAN cell sites have been identified by mobile operators, specific SLAs should be agreed jointly with Ofcom regarding the minimum power backup to be provided. HIE see no reason why at 'critical' cell sites, this cannot mirror the best practice adopted in other countries such as Finland and Norway where rural power backup is 4 or 6 hours to ensure the continuity of mobile services in the case of power outages.

- We also believe that mobile operators should include other metrics or factors within the framework to help identify 'critical' RAN cell sites. For example, using Ofcom's Area 3 categorisation which represents areas that are more likely to be served by only one mobile operator and more reliant on mobile communications.
- HIE also considers it important for mobile operators to implement power monitoring in real-time at 'critical' RAN cell sites in case of power fluctuations or outages. This would allow communities or

vulnerable telecare users dependent on these cell sites to be given advanced warnings. Alternative power backup options could also be considered if battery capacity is depleted (such as tow-to-site generators or the deployment of targeted temporary cell sites) and local government / councils could then also be involved and assist communities in emergency planning under their obligations as part of the Civil Contingencies Act. However, at present most councils are unsighted on which cell sites deployed across the region are considered 'critical', what (if any) power backup options exist at these sites, and if any of the cell sites deployed across the Highlands and Islands were to experience issues whether basic voice coverage could still be provided (for example from a neighbouring cell site). Therefore, we have no visibility on which of our communities would be most at risk and are unable to make emergency calls in the event of severe weather. Equally, these communities may be further exposed as they will be unable to receive emergency alerts or guidance from the UK Government's Emergency Alert System since this is also reliant on 4G mobile cell sites.

- Finally, HIE believes that the operator's approach to resilience needs to also include operational processes for better cooperation and coordination between each of the mobile operators, electricity providers and the UK Government regarding contingency planning. This should include the possible option of infrastructure sharing of the Emergency Services Network (ESN) and utilising the EE network during times of emergency when communities are left without any other means of voice communication.

Currently, EE is upgrading and building thousands of mast sites across the UK often in rural areas and this is being supplemented further with the Extended Area Services (EAS) programme. While the ESN network is primarily for first responders, it has been designed from the start with security, availability and resilience at its heart including exacting performance requirements for enhanced availability and providing continuous operation in the event of power outages. We understand that for some key ESN sites, provision must be made for

Question

Your response

them to operate for up to 7 days in the event of power outages while less critical sites must provide coverage in contiguous areas for a minimum of 30 hours as well as have implementation plans in place to extend this capability in the event of power outages that are longer.

Given the ESN / EAS network has been designed with power backup in mind, we believe that the potential to re-use elements of this network should be considered within the framework for assessing power resilience options at RAN cell sites. In addition, HIE would also encourage mobile operators to engage more with electricity providers and corresponding DNOs to ensure those RAN cell sites identified as 'critical' through the framework can have power restored as a priority during any prolonged power outages. It may also be feasible for some limited cell sites to be classified and included on the UK 'protected site list' and have increased redundant power feeds under the Electricity Supply Emergency Code (ESEC) framework.

- When assessing what appropriate and proportionate measures mobile operators should take about power resilience for RAN cell sites, we believe the industry should also look at what other sectors reliant on communication networks have adopted to maintain voice communications. This would include the water and railways industry as well as National Grid's Optel network. This includes the resilience maturity model used to assess their action plans and preparedness against events such as power outages and what baseline battery backup they provide to critical sites.

Question

Your response

CFI question 2: Do you agree that at a minimum MNO's networks should be able to operationally withstand short term power-related incidents?

Reliable mobile communications services are critically important in both our everyday lives as well as the economy. Mobile operators' duties under the Communications Act 2003 and the General Conditions of Entitlement include ensuring "*at least one solution is available that enables access to emergency organisations for a minimum of one hour in the event of a power outage at the customer's premises*". Considering this, HIE believes all mobile networks should be able to withstand short-term power outages at RAN cell sites. In addition, for those cell sites identified as 'critical' and which represent sites where whole communities are dependent on them as a means of primary communication, these RAN cell sites should be capable of remaining operational in the event of prolonged power outages greater than 1-hour. This is especially important as increasingly end users are being migrated over to fibre-based VoIP technology meaning in times of power outages broadband routers are disabled leaving end-users unable to make emergency calls or even report connectivity or power issues to their service providers. While HIE agree that providing a minimum of 1 hour backup to all RAN cell sites is not proportionate we do note that other countries have recognised the important of mobile communication networks and have introduced resiliency plans to maintain connectivity during events which may cause cell sites to go down. This includes California where the Californian Public Utilities Commission (CPUC) has a requirement for all cell sites in high-risk fire areas to have 72 hours of backup power for emergency situations as well as the Australian Government mandating rural and remote sites are to be fitted with 12 hours power backup capability. While across Europe Norway, Sweden, and Finland have also all introduced backup requirements of up to 6 hours for certain rural cell sites. Given the fact that in the UK, 74% of calls made to 999/112 in 2021 originated from mobile phones this highlights the role mobile network now play in emergency situations and why HIE believe that those cell sites determined to be 'critical' need power backup options installed that provide greater than a minimum of 1 hour backup.

Question

Your response

CFI question 3: What mobile services should consumers be able to expect during a power outage, what consumer harms should power backup up focus on mitigating and does this vary depending on the type or duration of the outage?

As a minimum, all consumers should be able to rely on the UK mobile networks to make emergency calls, especially when they cannot use their digital landline if they are already using VoIP technologies as a result of the PSTN migration. In addition, those vulnerable end users reliant on using mobile phones or hybrid handsets provided by their telecare providers as a means of delivering redundant voice communications during power outages should also be able to continue to rely on the mobile networks for their telecare health services. As our communities increasingly move to fibre based fixed links and VoIP services, the reliance on mobile networks for 999/112 services during power outages is critical. Recent examples in our region include a community served by Fibre to the Premises (FTTP) connections, where during a recent storm and power outage the mobile network provided vital communication services until it too succumbed to a loss of power after about 5 hours. The community was then left with no access to 999 services for several hours until mains power was restored.

Question

Your response

CFI question 4: What technical choices are available to MNOs to reduce power consumption, and should be considered as part of assessment of appropriate and proportionate measures?

HIE understand there are a number of technical options available to mobile operators to allow them to reduce power consumption at RAN cell sites if needed. This could be reducing active antenna transmission in higher frequency bands while still allowing lower frequency bands to transmit to provide coverage and voice capability, and ensuring sites have automatic wake-up/sleep functionality. Greater consideration should also be given to power storage facilities at critical RAN cell sites such as smart lithium batteries which also act as UPS device in order to maximise uptime in the event of a power outage. HIE is keen to understand from the mobile industry whether more localised, renewable energy generation can be used at certain RAN cell sites to not only help increase energy efficiency but to also further boost power resilience at cell sites especially those at a higher risk of power outages. HIE is aware that some providers offer off-grid commercial eco-towers specially designed for mobile operations which utilise wind turbines combined with solar and battery technologies to provide power solutions. This is currently being trialled by Vodafone ([UK first: 'self-powering' phone mast switched on by Vodafone](#)).

CFI question 5: How many sites would it be feasible to upgrade and maintain and why?

Please see HIE's response to Question 1. We believe a framework is required for assessing various key factors to determine which RAN cell sites should be considered as 'critical' within the operator's overall mobile network architecture. This will then help determine the actual number of cell sites mobile operators need to focus their resilience activities and investment into to ensure the continued availability and reliability of these critical cell sites.

CFI question 6: Do you consider that providing a minimum of 1 hr backup to all RAN cell sites would to be proportionate to meet the security duties under s.105A to D of the Communications Act 2003?

Please see HIE's response to Q1 and Q2.

CFI question 7: What cost effective solutions do you consider could meet consumers' needs during a power outage?

No comment.

Question

Your response

CFI question 8:

No comment.

a) Is it more cost efficient to increase power backup up to any space, weight, or planning limitations, i.e., increasing power backup as much as is feasible provides the lowest £ per hour?

b) do the benefits of any power backup solution have diminishing returns, i.e., the benefit per hour decreases as you increase the amount of power backup?

CFI question 9: Does the mobile market fail to capture the value or importance of power backup, and if so, why?

Considering the high capital investment needed by mobile operators in order to design and build mobile networks, HIE believes network resilience is often overlooked as it is not directly seen as revenue generating.

CFI question 10: Should improvements in power backup be focused on solutions at sites which are identified as higher risk of outages?

Yes – please see HIE’s response to Question 1.

CFI question 11: Why would any requirement lower than a minimum of 1 hour be sufficient in future? What duration do you consider would be sufficient and why?

Please see HIE’s response to Question 1.

CFI question 12: Over what time period could industry make upgrades to provide a minimum of 1 hour at every cell site or other cost-effective solutions to address potential consumer harm?

No comment.

Please complete this form in full and return to resilience.team@ofcom.org.uk.