Telecommunications Emergency Forum

Cyclone Gabrielle Post Incident Report

May 2023

For External Distribution

Contents

1) Purpose

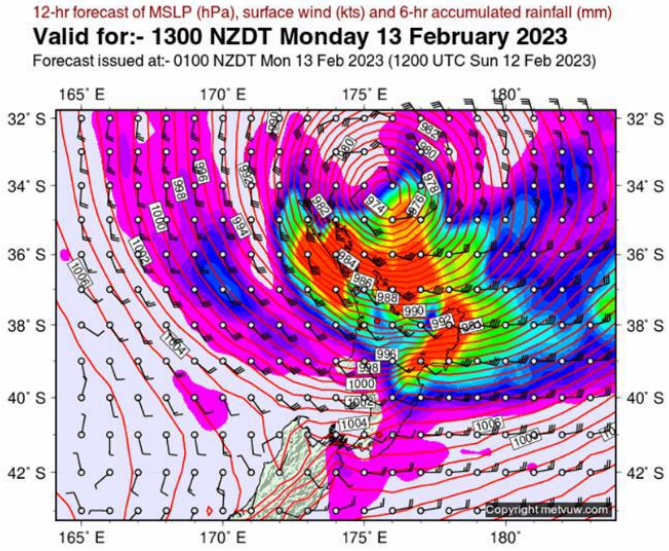
The purpose of this report is to provide a summary of the event, set out any learnings and make key recommendations for the Telecommunications Emergency Forum (TEF). This report has been published by the New Zealand Telecommunications Forum and is not for external distribution.

2) Event Summary

Cyclone Gabrielle was a severe tropical cyclone that devastated the North Island of New Zealand between 12 – 16th February 2023, causing significant damage to homes, infrastructure, and livelihoods across northern and eastern regions of the North Island.

The cyclone is New Zealand's costliest non-earthquake natural disaster, with economic losses expected to exceed the $2bn-$4bn of losses of the 2016 Kaikōura earthquake[1], of which the provisional cost of insured damage is at least NZ$1.15 billion (US$730 million)[2].

Gabrielle nearing the North Island on 13 February



3) Event impacts

Prior to the Cyclone hitting New Zealand the Metrological Service issued red alerts for Northland, Coromandel and East Cape Regions and widespread Orange Warnings for extreme rainfall and wind across much of the rest of the North Island.

The existing states of emergency that were in place in Auckland and the Coromandel due to recent Auckland Anniversary floods were extended, and new states of emergency declared in other areas. A national state of emergency was declared on 14 February 2023.

[1] https://www.mfat.govt.nz/en/trade/mfat-market-reports/cyclone-gabrielles-impact-on-the-new-zealand-economy-and-exports-march-2023.

[2] Wikipedia. *"$395.3 million of $2.47 bn of 2023 climate claims settled". ICNZ | Insurance Council of New Zealand. Retrieved 4 April 2023.*

The impacts of Cyclone Gabrielle resulted in widespread power outages with over 225,000 homes losing power[3], severe flooding across some regions and significant number of buildings damaged by high winds and landslides[4]. Numerous roads across the North Island were closed due to flooding, slips and high winds. Hundreds of people across the North Island were mandatorily evacuated, while hundreds more self-evacuated. The cyclone claimed the lives of 11 people.

Images of damage caused by Cyclone Gabrielle across the four regions.

Damage in Esk Valley. (Source: rnz.co.nz)

a) Impact on telecommunications

Major impacts to telecommunications occurred over the 13-14th February period as the cyclone moved from the Northland Region to Auckland then across the Bay of plenty then rapidly into the Hawkes Bay and East Cape regions.

Mobile service was severely impacted due to the loss of power to cell sites and multiple cuts across the fibre transport routes. Across the four regions (Northland, Auckland, Hawke's Bay and Gisborne) there are a total of 1645 cell sites and only two cell sites were affected by actual storm damage. The major impacts to mobile cell sites were loss of power and fibre backhaul cuts. The total number of cell sites across the four regions impacted was relatively low with the most affected day being the 14th February when 20% of cell sites were offline. The worst hit region was Gisborne where for two days (14 / 15th February) around 90% of cell sites were offline.

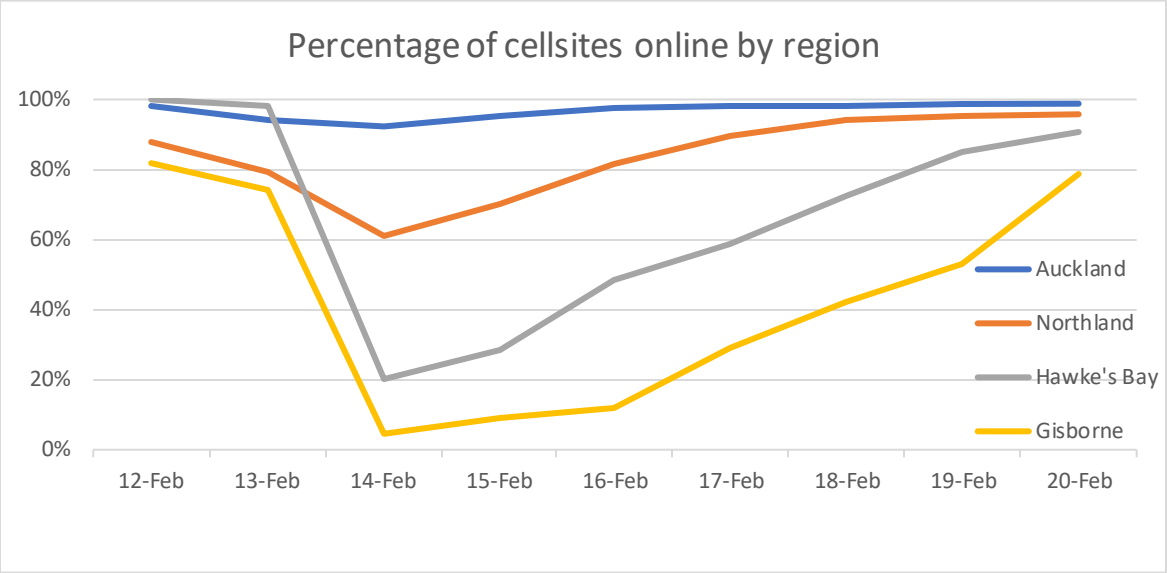
All cell sites have battery back-up, the below graph shows the trend as mobile cell sites went offline at the end of their battery life and/or failure of fibre backhaul. Restoration was either through the

[3] https://www.stuff.co.nz/national/131225113/power-outage-by-cyclone-gabrielle-the-largest-since-cyclone-bola

[4] https://www.1news.co.nz/2023/03/07/over-2100-properties-red-yellow-stickered-post-cyclone

installation of a generator or power restoration plus backhaul services restored to bring the cell site back online.

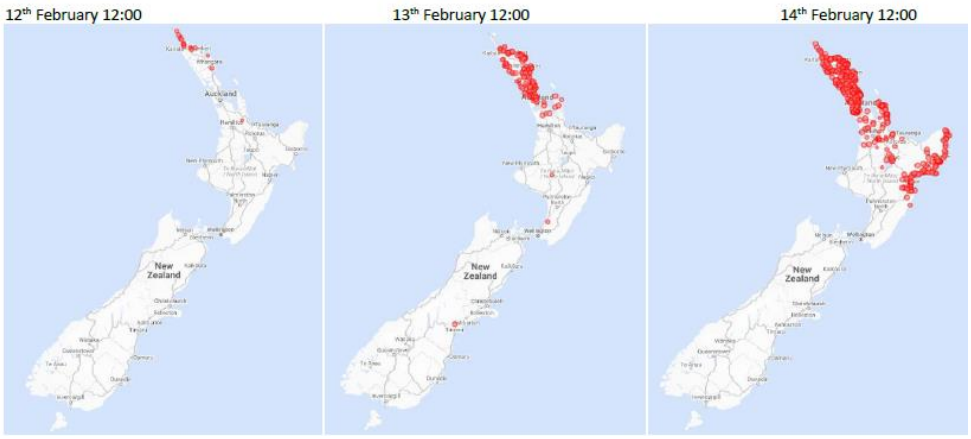
Collated mobile cell site outages over the period 12 – 20 February 2023



Widespread telecommunications fibre and copper network infrastructure was damaged. Multiple fibre cuts were caused by bridge washouts, land subsidence and flooding, fallen trees, and lightening, with the majority of damage to the copper network caused by flooding and water damage. Chorus reported at the peak of the event, up to 651 Digital-Subscriber-Line-Access-Multiplexers (DSLAM) and 64 Passive Optical Line Terminals (POLT) became isolated across the North Island and reported that the major impact to their Fibre UFB customers was within the Gisborne, Wairoa, and East Cape Regions, caused by the fibre cuts north and south of Gisborne.

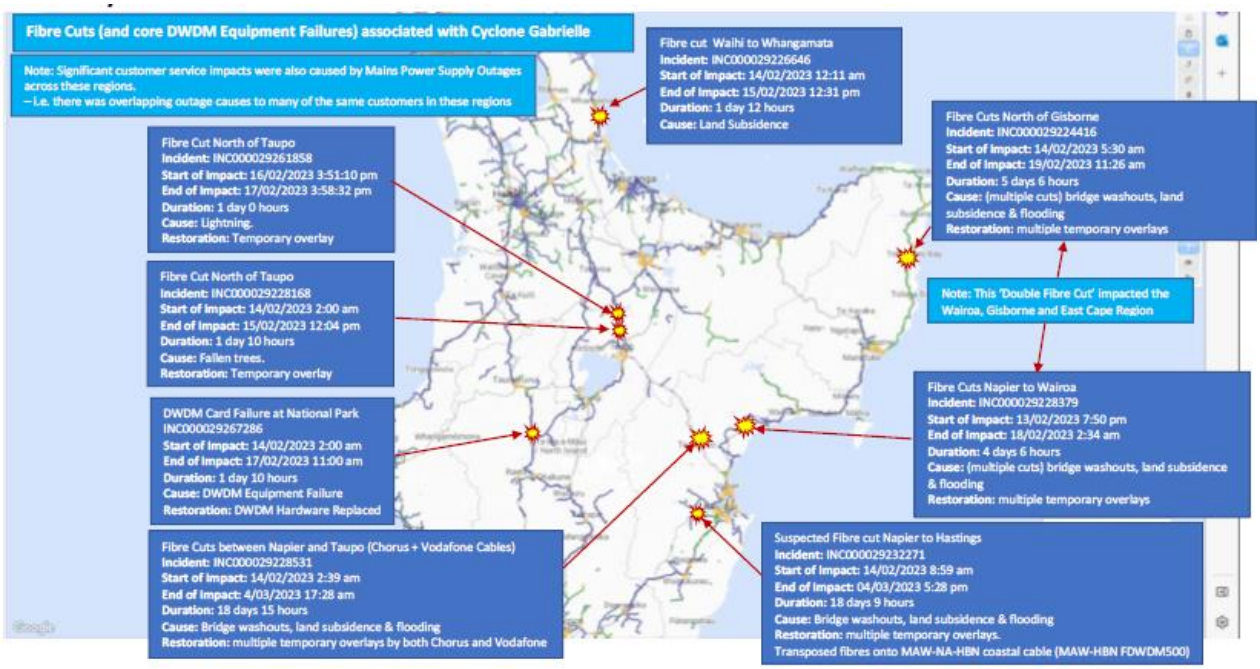
Northpower Fibre had around 11% of their customer base without service due to the wide spread power outages in the area affecting customer's ONTs within their homes and businesses. Northpower deployed portable generators to some of their remote Central Offices to maintain service for those customers that had alternative power. The main damage to their Network was to their aerial Network from falling trees.

The below shows the geographical spread of Chorus (DSLAM and POLT) outages[5]:

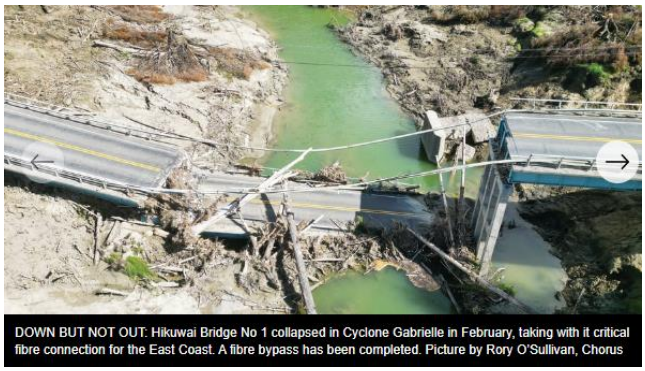


[5] Chorus Customer Incident Report – Feb 2023

Summary below from Chorus of the fibre cuts (and core equipment failures) that occurred between 12-17th February:



Images below of key infrastructure damage



DOWN BUT NOT OUT: Hikuwai Bridge No 1 collapsed in Cyclone Gabrielle in February, taking with it critical fibre connection for the East Coast. A fibre bypass has been completed. Picture by Rory O'Sullivan, Chorus

4) Coordination during the event

On the 10th of February 2023, the TEF was activated by the New Zealand Telecommunications Forum (TCF) at the request of NEMA National Lifeline Utility Coordinator.

The role of the TEF is to enable effective coordination of emergency response across the sector when an event may impact national and regional telecommunications. The TEF acts as a conduit between NEMA, government and TEF members to be kept informed of a developing situation. The TEF remained activated until 1 March 2023 after which we reverted to "business as usual" activity.

The TEF is managed by the TCF and there are currently 20 companies who are active members, including Transpower.

During the activated period the TEF coordinated the following activities:

a) Produced daily situational reports to NCC on behalf of the sector during the period 10th Feb – 1 March 2023.

b) Collated company reports and data for reporting to the following stakeholders:
   - NEMA
   - CDEM Lifelines, Councils and other Sector Coordinating Entities (SCEs)
   - The Minister for the Digital Economy and Communications
   - Department of the Prime Minister and Cabinet (DPMC) and the Ministry of Business, Innovation and Employment (MBIE).
   - Commerce Commission
   - Other affected parties with an interest in telecommunications.

c) Appointed the bunker liaison person and communicated directly into the NEMA bunker

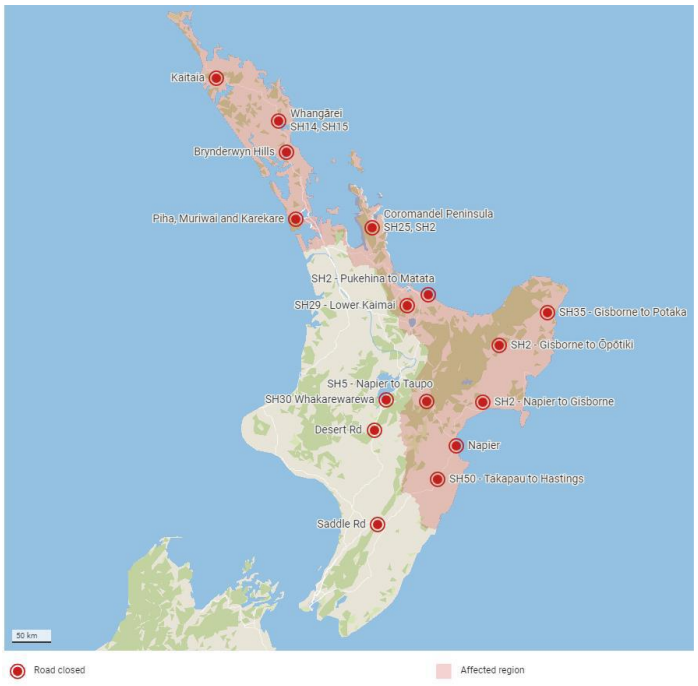
d) Escalated immediate needs of TEF members during the effort to restore service including but not limited to:
   - access and transport requests,
   - direct contacts to Lifelines on the ground,
   - direct communication with other TEF members on the ground supporting the restoration efforts
   - movement of equipment into the affected regions.

5) Restoration Efforts

a) Access

Major access roads were closed across the north and east of the North Island due to flooding, slips and bridge washouts. This restricted the ability of the field resources to assess network damage, locate fibre cuts, install generators and refuel generators. Helicopters were used extensively to provide access and speed up restoration work particularly across the Hawke's Bay / Gisborne regions.

Below map shows main state highway road closures throughout the North Island



b) Mains Power Supply Outages

There were extensive localised and regional mains power outages which were caused by high winds as well as flooding that impacted the mains power supply infrastructures. The Hawke's Bay region experienced a power cut to over 40,000 properties, almost 32,000 of them in and around Napier,

when the main Redcliffe substation was damaged after the Tutaekuri River burst its banks. Subsequently, phone and internet services were also lost. On the 14th February Transpower declared a grid emergency[6].

The power outages severely impacted telecommunications infrastructure (cell sites, network sites/cabinets) and service to both residential and business premises across the regions.

Restoration required a huge effort from the power supply authorities and this took several weeks before the majority of sites had power supplies restored.

From a Chorus network perspective, existing battery reserves progressively expired as the mains power outages continued beyond the first 12 hours. This impact was mostly evident in the smaller sites, huts and cabinets where the battery reserves are less than 24 hours. Northpower Fibre reported their central offices running on batteries which had a 6-8 hour run time before generators were required to be started.

For mobile cell sites, which have battery back-up but rely on electrical power to operate over time, a massive mobilisation of generators was required with ongoing refuelling requirements while the power grid and fibre backhaul was being restored. TEF members collaborated to share refuelling needs and generator resources where possible. An example of this was the Pauanui site.

c) Restoration of Telecommunications Fibre / Copper Service

There were four main actions to restore the network and service impacts:

1. Mains power supplies restored by power authorities
    a. Note: temporary generators were also used on some sites
2. Fibre cables repaired
3. Network equipment replaced (e.g., DSLAM LT Cards, NANT cards)
4. Site infrastructure repaired (e.g., cabinets replaced)

The restoration of these fibres took six days, so the impact was evident for that duration. The majority of affected customers on copper network were in the Northland area which was affected by mains power supply outages and water inundation in the copper network.

d) Restoration of Telecommunications Mobile Service

Restoration of mobile services across the regions was prioritised by the telco sector, coordinating a response by sharing resources, equipment and field teams to focus on cell site restoration, as well as optimising existing services.

The following are the major impacts/issues the telco sector experienced trying to restore the mobile network and main action take to restore service:

1. Power grid failure – temporary generators located to cell sites and mains power restored by local power authorities.
2. Core fibre network cuts – alternative backhaul established via satellite and microwave technology until fibre cables repaired.

[6] https://www.stuff.co.nz/national/weather-news/131220400/first-progress-made-restoring-power-to-gisborne-and-hawkes-bay

3. Access and transport – ability for field teams to get to affected sites was compromised to carry out site checks, installation of equipment and generators and subsequent refuelling of generators.
4. Prioritisation – the lack of prioritisation for telecommunications by NEMA and Lifelines caused major issues for telcos trying to coordinate transport of equipment into affected areas, access into areas and access to fuel.

The key issues for the mobile network related to power outages and fibre backhaul being cut. While the power and fibre backhaul was being worked on, the focus to restore service to cell sites across all regions was reliant on generator power and satellite backhaul.

A large mobilisation of generators, some of which had to be helicoptered into areas where no land transport was available, were installed followed by refuelling plans implemented. The Mobile Network Operators coordinated resources and fuel across the regions in a combined coordinated effort as power was being restored days, and in some cases weeks, later.

Refuelling for all telecommunication sites where generators were installed required access to both diesel and petrol supplies, and road access to transport the fuel. In addition, the lack of electricity supply at various refuelling stations meant electronic payment mechanisms were unavailable which further delayed operations. Despite this, the immediate restoration effort enabled vast tracts of the mobile network to deliver a level of communications to affected communities.

Mobile Network Operators made individual decisions to limit the service levels on across the effected mobile networks to voice and SMS only initially to reduce the demand across the network. Backhaul (connection in and out of the region) was limited to satellite and microwave links which lack the capacity of fibre. Once fibre links were repaired, 4G and 5G data services were restored.

Appendix 1 shows the trend to restore mobile cell sites across the four regions between 12 – 20 February 2023.

6) Existing risk factors

TEF members have identified the following risks that remain as part of their individual restoration efforts. The Cyclone Recovery Unit Taskforce has been established by the Government to coordinate restoration efforts across all sectors and affected regions.

a) Fibre cut re-occurrence:

Chorus reports that the immediate aftermath there remained an increased likelihood of further fibre cuts in the areas that were impacted by Cyclone Gabrielle due to:

1. civil contractors and private landowners using heavy equipment during flood debris clean up; repair of bridges and reinstating bridge approaches; roadside washouts, and other road repair activities in the impacted regions.
2. a number of temporary fibre repairs still in place, where fibre cables are exposed above ground, so there was an increased likelihood of these fibres being damaged or vandalised.
3. ongoing slips and ground movement that may affect temporary fibre repairs.

Immediately after the temporary repairs, Chorus started a program to revisit all of them and make the repairs more robust. This process took about 6 weeks, after which the risk was mitigated, and the only impact remaining is a higher level of planned outages when links get cut over to permanent installations.

b) Site Battery Reserves:

Battery expiration at sites – the condition of batteries across all sites are being audited to ensure they performed as expected.

c) Current state of resilience

Restoration of the networks across the affected regions to the usual levels of redundancy is underway and is largely dependent on other network rebuild efforts (in particular roading and electricity supply) and as such a restoration timeframe cannot be confirmed. This does pose a risk should another weather event (or other natural disaster) strike before the network is fully restored.

7) Observations

a) Coordination across the telecommunications sector

The widespread impact of the cyclone across multiple regions was unprecedented. The TEF members came together quickly and mobilised efforts amongst themselves within the first five days, without a lot of coordination via NEMA. In the areas which had the greatest impact and loss of telecommunications resulted in the reliance of 'friends' on the ground, whilst the national providers mobilised collectively to share transport to get equipment and fields teams located into areas where there was limited access.

Recognising very early on in the event that other Lifelines, Civil Defence and NEMA would be focussed on providing critical support and services to communities, the telecommunications sector was focussed on repairing and restoring the telecommunications network. Coordination of these efforts was more efficiently managed across the TEF members and their partners than relying on or waiting for NEMA.

When an incident affects multiple telecommunications then the TEF is required to coordinate the response. The widespread impacts on the power grid and fibre transport routes required TEF members to think outside the box and focus on the restoration of the mobile network, during this time assessment of the fibre core network and repairs were being carried out, at least to be able to provide a level of service to as many affected communities as possible.

We have three types of incidents, illustrated in the table below7. Each provider will have its own process, but for the purposes of this report they are identified below. The TEF assessment of Cyclone Gabrielle would conclude that this event has been categorised as a crisis.

- business as usual (BAU) - Green
- emergency - Yellow
- crisis - Red

	FEWER CUSTOMERS AFFECTED				MORE CUSTOMERS AFFECTED
HIGH IMPACT					
LOW IMPACT					

[7] New Zealand Telecommunications Resilience Report May 2022

b) Communication and Reporting

The purpose of the TEF is to assist TEF members communicate as the event happens or unfolds through to BAU status, so that a coordinated response can be managed effectively and quickly. TEF members have provided feedback that the daily TEF stand-up sessions (while being one of many some representatives were attending) were useful and enabled quick updates and sharing of information. Some parties like the RCG and Vital were not part of the initial response and the TCF will look at membership as an ongoing action. Attendance is voluntary during any particular event is largely dictated by those members who are directly affected by the event.

The extent of reporting was an area that will require further review. The process of members sending multiple daily reports which then required collation to provide a sector report into NEMA and the Minister was challenging due to a lack of standardised reporting and a limited TCF resource to collate the data. Standardised reporting must be a requirement going forward as will a dedicated TEF communications person. Outage reporting and network mapping tools would assist immensely particularly where multiple networks and regions are affected.

Reporting requests from multiple parties to the TEF and its members was unsustainable and a distraction for Members who were primarily focussed on responding to the event. Limiting touchpoints into organisations, while also not relying on one person, will need to be considered, by members.

Communication with NEMA was challenging. The TEF achieved more in the first five days through its own efforts rather than relying on coordination through NEMA. This is an acceptable observation considering NEMA is primarily focussed on the immediate needs of communities. However, when escalation was required, it was not always responded to in a timely manner by NEMA and justification of the request to outline the benefit to the affected community was also required; during a fast-moving event this information is not always readily available or easily described. Communication could have been better coordinated directly with other SCEs. The roles and interactions with NEMA, MBIE and other SCEs should be reviewed as part of the update to the TEF Operational Process document and Telecommunications Emergency Response Plan. This is also an issue for government to address.

c) Reliance on telecommunications

When an emergency or crisis event occurs the first reaction for people caught up in the event is to communicate either for assistance or to check on the welfare of friends and family. The cyclone highlighted the reliance on telecommunications by communities both urban and rural, civil defence, emergency services and also the infrastructure sectors:

- Community resilience was tested by being cut off physically and seeking other ways to communicate via satellite (Starlink and satellite phones) and radio service for information.
- Civil defence and emergency services equipment being affected by power outages which directly impacted civil defence communication equipment and a reliance on consumer grade services. Future investment in radio and Satellite phones to be considered.
- Ability for telecommunications and power providers to communicate to field teams and contracted partners on the ground.

The 111-emergency calling service remained operational throughout all affected regions although access to the service was affected by power outages and the ability of consumers being able to make 111 calls from a landline or mobile phone.

d) Network Diversity and Redundancy

There was a level of risk to the deployed network diversity across the North Island with significant outages across the routes particularly across the Taupo / Hawke's Bay / Gisborne region. These network outages resulted in all north to south traffic being reliant on the Western Core fibre route via New Plymouth. This was a considerable risk that could have caused a very extensive/widespread outage if the Western Core fibre (and/or DWDM equipment) had also failed during this period[8].

The impact to the mobile networks in Hawke's Bay and Gisborne region due to the core fibre routes being damaged impacted the ability for full mobile services being delivered, when power was restored to cell sites either via local power authorities or temporary generators, full service resumed immediately.

e) Power

The reliance on power to key telecommunication infrastructure sites was a significant issue due to the widespread power outages and in particular in regions where electricity networks and exchanges were severely damaged e.g., Redcliffe substation. Coordination with power companies to communicate priority telecommunication sites occurred and was required as the electricity network restored. However, at times it was difficult to understand where power restoration was being prioritised and communicating the needs of the TEF members. Ideally access to combined maps of outages would help and also overlaying this information with priority telecommunication sites.

The mass deployment of generators to sites was a necessary activity and did allow quick restoration of a level of service to affected communities. However, it was quickly followed by having to coordinate refuelling activities which in some areas went on for weeks as the electricity grid was being repaired. Post cyclone many providers are now overstocked with generators and are having to find permanent storage. A stocktake should occur across the sector and preparation for the next event. This could require coordination of storing the generators across the country, rather than a centralised location, to enable quick mobilisation locally.

8) Key Recommendations for the TEF

In the TCF Telecommunications Resilience Report May 2022, we identified a number of recommendations that should be progressed as part of sector-wide emergency management plan provide assurance to central and local government about the level of preparedness and resiliency across the sector[9]. Those recommendations are aligned to what we have observed after Cyclone Gabriele.

Outlined below are seven key recommendations for the TEF to be implemented:

1.	Reporting	- Develop standardised reporting templates - Agree data sets for reporting against mobile and fixed line.
2.	Processes	- Formalise processes for: o Working together noting that responses will differ depending on the event. o Sharing resources (field teams, equipment, fuel plans) o Coordinating transport (access via road, helicopter)

[8] Chorus Cyclone Customer Incident Report.
[9] TCF Telecommunications Resiliency Report May 2022, pg. 15

		○ Optimising how we enable sharing of surviving networks
3.	Prioritisation	- Advocate for prioritisation of Telecommunications for: access, fuel supply, transportation, power
4.	Roles and Responsibilities	- Review current roles for the TEF - Define role description for bunker representative and appointment process - Formalise clear roles of NEMA, MBIE, Minister's office.
5.	Relationships	- Establish stronger relationships with: ○ Lifelines – consider how to establish shared responsibility across TEF members: ▪ Whether a telco representative for each Lifelines group is feasible; or ▪ The TCF should site across all or at least the largest Lifelines. ○ Other essential utilities – Waka Kotahi, Fuel, Electricity
6.	Communication	- Develop a communication plan to include: local and central government, other agencies, NEMA and telco stakeholders. - Escalation process (including to CEOs, NEMA, MBIE, Minister)
7.	Sector Exercise	- Carry out a sector emergency response exercise (annually)

Appendix 1: Total collated data of mobile cell site outages

Date	Auckland			Northland			Hawke's Bay			Gisborne			Total across all regions		
	impacted	total	% online	impacted	total	% online	impacted	total	% online	impacted	total	% online	impacted	total	% online
12-Feb	25	1247	98%	26	213	88%	0	119	100%	12	66	82%	63	1645	96%
13-Feb	70	1247	94%	44	213	79%	2	119	98%	17	66	74%	133	1645	92%
14-Feb	96	1247	92%	83	213	61%	95	119	20%	63	66	5%	337	1645	80%
15-Feb	56	1247	96%	63	213	70%	85	119	29%	60	66	9%	264	1645	84%
16-Feb	31	1247	98%	39	213	82%	61	119	49%	58	66	12%	189	1645	89%
17-Feb	23	1247	98%	22	213	90%	49	119	59%	47	66	29%	141	1645	91%
18-Feb	20	1247	98%	13	213	94%	33	119	72%	38	66	42%	104	1645	94%
19-Feb	17	1247	99%	10	213	95%	18	119	85%	31	66	53%	76	1645	95%
20-Feb	15	1247	99%	9	213	96%	11	119	91%	14	66	79%	49	1645	97%

Appendix 2: Summary Focus Areas and Improvement Actions

The below table sets out a list of identified areas of focus or improvements by TEF Members. Some of these are out of the remit of the TEF and will be progress by other workstreams either through the development of the Telecommunications Emergency Response Plan (ERP) or through other discussions by the TCF with government and member CTOs or by TEF members own internal Business Continuity Planning (BCP).

Editors Note: This table has been superseded by the TCF Telecommunications Resilience Plan