Chapter 4

Communications infrastructure

4.1 During the course of the inquiry, public broadcasters and Telstra discussed their ability to broadcast and maintain telecommunication networks, respectively, during an emergency.

4.2 The Australian Broadcasting Corporation (ABC) and Special Broadcasting Service (SBS) raised difficulties associated with damage to infrastructure caused by natural disasters which have the potential to disrupt broadcasting. Telstra also described damage to infrastructure as a result of natural disasters and the steps the company takes to maintain communication across networks during these times. Both the public broadcasters and Telstra identified power outages as a specific challenge.

4.3 The concerns raised in relation to maintaining telecommunications during emergencies can be divided into four key areas related to infrastructure:

- maintaining radio broadcasting and phone coverage when power is unavailable and / or there has been damage to fixed infrastructure;
- the importance of built-in redundancies in infrastructure systems to help networks cope during and after an emergency;
- transportable technology used to maintain telecommunications when fixed infrastructure has been damaged; and
- the advantages and disadvantages associated with overhead versus subterranean telecommunication cabling.

4.4 These matters are discussed below.

Resilience of broadcasting systems

4.5 The ABC identified the resilience of transmission and distribution infrastructure as essential to its ability to provide emergency communications.[1]

4.6 The ABC focused on the role of local radio in providing information to regional Australian communities during times of emergency given the wide geographic area over which ABC local radio services are broadcast.[2] The ABC voiced particular concern about the vulnerability of radio transmission infrastructure during natural disasters:

> Local Radio is broadcast on some 240 transmitters around the country, as well as some 130 self-help installations. While all of the metropolitan

1 Australian Broadcasting Corporation (ABC), *Submission 35*, p. 5.

2 ABC, *Submission 35*, p. 1.

> services and most major regional services have a stand-by program source (such as a satellite feed) and standby power (emergency generators) available, this is not the case with many of the transmitters covering smaller communities in regional Australia. Indeed, some Local Radio transmitters covering major regional populations centres—including the Gold Coast, Toowoomba, Emerald, Albury/Wodonga, Bega, Orange, Grafton, Tamworth, Glen Innes, Kempsey, Broken Hill, Horsham and Karratha—have no stand-by program source available. Similarly, many transmitters covering populations of around 10,000 or fewer people do not have standby power available. A major capital injection would be required to address these shortcomings in the network and secure the services in times of emergencies.[3]

4.7 Mr Hugh James, Manager, Transmission Services, SBS stated that maintaining continuous service at major transmission sites supported the SBS's ability to provide timely information to communities. In particular, Mr James highlighted that continuous service required access to fuel, specifically diesel fuel, when generators were being used:

> **Mr James**: ...Both the ABC and ourselves run gensets [electrical generators] at our major transmission sites so that when the power fails we can stay on air. The limitation is how much fuel we can store on site and how long they can run.
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> **Senator BACK**: Are these gensets, particularly in the fly-away transmitters [portable transmitters], which I imagine are the ones you are talking about, run on diesel or petrol?
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> **Mr James**: Diesel generally, and most of them are on the existing transmitter sites, not just on the fly-aways.
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> **Senator BACK**: What is the problem with underground fuel storage?
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> **Mr James:** The problem we have is limited capacity—24 hours typically, some of them up to a week—and the need to replenish that and refresh that diesel. The more critical question is a short supply in the event of a long power failure. Once we get past the point of capacity, we need supply. In any emergency where there is a widespread power failure there is high demand for diesel fuel. At the moment, broadcasters have no higher call on that than the local trucking operator or the local hospital, although I have no objection to the hospital getting their fair share.
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> **Senator BACK**: So you would not object to this committee making a recommendation that, in circumstances like that, you would join the highest priority for supply of diesel fuel.
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> **Mr James**: I would like to see that as a requirement, yes.
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> **Senator BACK**: It would specify diesel fuel, because I would not want petrol tankers going into areas.

3 ABC, *Submission 35*, p. 5.

Mr James: No, it is diesel fuel that is the critical one.[4]

4.8 The ABC agreed, while highlighting the extent to which AM radio broadcasting is a key component of its own emergency communications strategy:

> I would endorse Mr James's statements and also say that that would be an important issue from our perspective as well. We have found the resilience of AM radio broadcasting during an emergency to be one of the key aspects of our role. The two greatest problems that can occur are that, first, the site is hit by the disaster itself, such as a fire or flood, and therefore you lose the transmitter; but the far more likely one, the longer an emergency goes on, is that a power supply problem will occur and once you lose electricity you go to the generator backup and you have a fuel problem. I know during the Brisbane floods one of our real issues for a few days was just this point, of wrangling to make sure that we had a fuel supply in the situation that power is turned off in central Brisbane and we were not able to transmit. So the issue of having access like that is of critical importance, I agree.[5]

4.9 The resilience of the broadcasting system was also raised in terms of limited bandwith and mobile phone coverage. The ABC noted that limited bandwith in regional areas had impacted on access to information:

> Limited network bandwidth can and has delayed content delivery during emergencies. Most ABC regional stations are currently limited to 1Mb/second network links, which are too narrow to handle high volumes of network traffic. Reporters using domestic internet connections in the field have also encountered local congestion during emergencies, making it more difficult to access the internet and in turn affecting information gathering and dissemination.[6]

Resilience and redundancy of telecommunications infrastructure

4.10 The design of telecommunications infrastructure, and the extent to which it can withstand damage during natural disasters, was explained by Telstra:

> Telecommunications network architecture is normally designed to deliver traffic from individual premises to be collected and transported back up into higher levels of the network. The design rules used in developing such network architecture will determine the degree of resilience and survivability against fibre cuts, damaging weather events, and optical equipment failures. In all network implementations, final design decisions

4 Mr Hugh James, Manager, Transmission Services, SBS, *Proof Committee Hansard*, 8 August 2011, pp 43–44.

5 Mr Michael Ward, Head, Operations Planning, ABC, *Proof Committee Hansard*, 8 August 2011, pp. 44.

6 ABC, *Submission 35*, p. 5.

> that determine the level of resilience need to be balanced against how the application of these rules will affect network performance and costs.[7]

4.11 Telstra noted the inevitability of natural disasters and the subsequent 'unavoidable' impact on communications infrastructure.[8] Telstra stated that '...such impacts can be reduced if networks are planned and operated with this inevitability in mind'[9] and described the company's experience during the summer of 2010–11 by way of example:

> While Telstra's networks and communications operations did suffer damage as a result of the various disasters during the summer of 2010/11, its fixed, mobile and managed radio service networks and associated disaster recovery operations and processes operated very effectively. Telstra staff worked quickly and effectively and in many cases around the clock to restore services efficiently, once it was safe for our people to access impacted areas. In many cases the existence of multiple networks in affected areas meant that alternative forms of communication were still able to be maintained.[10]

4.12 In addition to the power supply issues raised by the ABC and SBS, the importance of maintaining power supply for telecommunications networks was flagged by Telstra. Telstra stated:

> Power loss is a very significant issue confronted by Telstra in maintaining the operation of its networks during extreme weather events, including fires, flooding and cyclones.
>
> Key elements of Telstra's networks rely on a continuous supply of power. These include exchanges and mobile base stations. If the power supply is disrupted, functionality may be lost to that equipment, and to the services supported by that equipment.[11]

4.13 In response to power supply difficulties, Telstra recommended that '[s]ome consideration may need to be given to additional strategies to better preserve the supply of electricity in the event of disasters'.[12]

4.14 The effect National Broadband Network (NBN) technology may have on network resilience was also raised during the course of the inquiry:

> Future communication technologies, such as the National Broadband Network (NBN), have the potential to influence how emergencies and natural disasters are managed. Much will depend on the network design

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7 Telstra, *Submission 31*, p. 17.

8 Telstra, *Submission 31*, p. 4.

9 Telstra, *Submission 31*, p. 4.

10 Telstra, *Submission 31*, p. 4.

11 Telstra, *Submission 31*, pp 15–16.

12 Telstra, *Submission 31*, p. 5.

> which impacts the resilience of the network in the face of natural disasters.[13]

4.15 Specifically, the effect of NBN technology on resilience was associated with the fibre-optic cable network which the NBN will roll out and which requires power supplies to be maintained at both ends of the network.[14] Telstra explained that in this regard the NBN differed from Telstra's existing copper network 'where a standard landline phone draws the power it needs from the wires that connect the phone to the network':[15]

> As telecommunications fixed access networks evolve from copper to fibre optics it is important to understand the impact on service availability during power outages. As stated above, all telecommunications networks need power to operate. Fibre optic networks are no exception and require power to be available at both the switch and the customer ends of the network to remain operative. This is different to the existing Telstra copper network design.[16]

4.16 The Fire and Emergency Services Authority of WA (FESA) agreed that 'power supply issues' associated with the NBN need to be considered.[17]

4.17 Information provided to the committee during the inquiry about the resilience and redundancy of telecommunications infrastructure also included discussion of overhead and subterranean cabling, as well as the use of transportable infrastructure to maintain communication networks following a natural disaster.

Overhead versus subterranean cabling

4.18 There was some discussion during the inquiry about the placement of telecommunications cabling either overhead or below ground and the differing ways in which these are able to withstand natural disasters.

4.19 In support of subterranean cabling, Telstra made the following comments:

> While no network will be able to withstand the full force of intense and prolonged natural disasters, a critical consideration in network design is the location of cables. In Telstra's experience, underground cables are generally more resilient in the face of natural disasters. By way of example the severity of heat levels experienced in the Victorian Black Saturday bushfires was such that there was some (albeit limited) direct fire damage to optical fibre located within pits. While the vast majority of the network withstood the intensity of those fires, some 18 pits were impacted. Aerial

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13 Telstra, *Submission 31*, p. 17. See also Mr David Lemcke, *Submission 2*, [p. 1].

14 Telstra, *Submission 31*, p. 17 and DBCDE, *Submission 34*, pp 16–17.

15 Telstra, *Submission 31*, p. 17.

16 Telstra, *Submission 31*, p. 17.

17 Fire and Emergency Services Authority of WA, *Submission 18*, p. 3.

> cabling is also particularly vulnerable in cyclones and high winds. In flood situations, poles may be washed away, leading to aerial cabling across creeks and rivers being severed.[18]

4.20 Telstra subsequently noted that in determining which cabling options were most appropriate it was necessary to consider both practical matters, such as the ability to lay cables in certain terrain, and the benefits of using underground cabling in flood and cyclone prone areas:

> The vast majority of Telstra's cabling is laid underground, whether copper cables or fibre (typically laid inside conduits and pits). Generally, aerial cables are used when the terrain is not suitable for underground cabling. As an example, where the terrain is solid rock it is not practical to lay underground cabling. In some areas it is not possible to lay an underground cable without an unacceptable environmental impact and so aerial cables are used. Installation of underground or aerial cables will be subject to all necessary approvals being obtained for the deployment. Telstra's experience is that underground cabling is more robust than aerial cabling even in areas prone to flooding from cyclones as the combination of excessive rain and wind, especially in the cyclone season, can cause considerable damage to aerial cabling.[19]

4.21 In relation to the NBN, the placement of cables was raised by FESA. FESA emphasised the importance of considering the types of natural disasters experienced in a particular location when deciding whether cables should be laid overhead or underground:

> It is understood that in Tasmania the Broadband Network cables are above ground which creates problems in a bushfire, storms etc, highlighting the need for a reliable power source. As has been demonstrated in WA, above ground communications infrastructure is vulnerable in the event of a significant natural event. Whilst not immune from impact or failure, those assets that are purpose built for their operating environment, and having regard to the likely events that may impact upon that environment, will stand a greater chance of survivability.[20]

The role of transportable infrastructure

4.22 Transportable infrastructure can be deployed following a natural disaster to maintain communication networks even where fixed infrastructure has sustained damage. In this way, transportable infrastructure has the potential to bolster the resilience of telecommunications systems in times of emergency.

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18 Telstra, *Submission 31*, p. 17.

19 Telstra, *Answers to questions taken on notice*, 8 August 2011 (received 30 August 2011).

20 Fire and Emergency Services Authority of WA (FESA), *Submission 18*, p. 3; see also Tasmania Fire Service, *Submission 23*, [p. 3].

4.23 The committee heard about different types of transportable infrastructure and the ways in which these can increase the speed at which services are restored to areas affected by natural disasters:

> Telstra's experience with disasters has led to the development of innovative technology solutions, such as Cells on Wheels (COWs), Satellite Cells on Wheels (SatCOWs) and Mobile Exchanges on Wheels (MEOW). These solutions help restore services quickly to disaster impacted communities, and assist in the overall recovery effort.
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> A COW is a temporary mobile base station that provides temporary coverage if a mobile site is lost; alternatively it can provide a temporary expansion of mobile coverage.
>
> A SatCOW is ideal for locations where there is no terrestrial backhaul network or power is available – it provides Telstra Next GM network coverage. It is highly portable, being able to be transported in a standard 4WD or light aircraft or helicopter, and can be set up within 1.5 hours. In the aftermath of Cyclone Yasi a SatCOW was deployed to Palm Island, restoring communications in 24 hours.
>
> A COW and a MEOW can operate using generators, batteries or mains power to enable the quick installation of temporary communication solutions, especially for those communities hardest hit by the disaster. A SatCOW has the benefit of being able to operate even if there is no transmission or power.[21]

4.24 Telstra informed the committee that it had deployed transportable infrastructure during the summer of 2010-11:

> It is certainly the case that our networks and operations suffered damage as a result of the various disasters during the summer, but our fixed, mobile and managed radio service networks and associated disaster recovery operations and processes operated very effectively...Our standard disaster response processes included a range of measures to help customers stay in touch with family and friends when normal services had been affected...We used our COWs, SatCOWs and the other technology—mobile exchange on wheels, to give its full title.[22]

4.25 The deployment of this technology, together with other elements of Telstra's emergency procedures meant that, in Telstra's view, 'its fixed, mobile and managed radio service networks and associated disaster recovery operations and processes operated very effectively'.[23]

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21 Telstra, *Submission 31*, pp 12–13.

22 Mr Jamie Snashall, Senior Adviser, Telstra, *Proof Committee Hansard*, 8 August 2011, p. 67.

23 Telstra, *Submission 31*, p. 4.

4.26 The fallibility of infrastructure, including the NBN, was acknowledged by the Department of Broadband, Communications and the Digital Economy (DBCDE).[24] With respect to the resilience and protection of critical communications infrastructure, DBCDE stated:

> Infrastructure providers have primary responsibility for managing, and responding to, emergencies and disasters which impact on their services. The department supports the work of critical infrastructure providers through its secretariat services for the Communications Sector Group, as well as through monitoring the work of the communications industry.[25]

4.27 The Communications Sector Group (CSG) comprises representatives from relevant Commonwealth, state and territory government agencies as well as the owners and operators of critical infrastructure in the telecommunications, broadcasting, international submarine communications cables and postal sectors'.[26] The committee was informed that:

> The CSG has conducted numerous discussion exercises since 2006 which were developed to raise awareness of the impact of communications during emergencies and build resilience for future prevention, preparedness, response and recovery activities. A key outcome has been the increased awareness of the interdependencies within the communications sector (for instance, broadcasting reliance on telecommunications) and across the broader critical infrastructure sectors (for instance, the communications sector‘s reliance on the supply of mains electrical power).
>
> Members of the CSG have individual business continuity and disaster recovery plans to respond to, and mitigate, the impacts of an emergency or disaster.[27]

4.28 In addition to the work of the CSG, the Commonwealth Government's Critical Infrastructure Resilience Strategy (CIRS) recognises that much 'of Australia’s critical infrastructure is privately owned or operated on a commercial basis'.[28] For this reason, the federal government has sought to partner with infrastructure owners and operators 'to enhance the resilience of critical infrastructure' by:

- sharing information;
- raising awareness of dependencies and vulnerabilities; and

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24 Department of Broadband, Communications and the Digital Economy (DBCDE), *Submission 34*, p. 4.

25 DBCDE, *Submission 34*, p. 2.

26 DBCDE, *Submission 34*, p. 2.

27 DBCDE, *Submission 34*, p. 2.

28 Attorney-General's Department, *Critical Infrastructure Resilience Strategy*, 2010, available: www.ag.gov.au/www/agd/rwpattach.nsf/VAP/(9A5D88DBA63D32A661E6369859739356)~Australian+Government+s+Critical+Infrastructure+Resilience+Strategy.PDF/$file/Australian+Government+s+Critical+Infrastructure+Resilience+Strategy.PDF (accessed 28 October 2011), p. 4.

- facilitating collaboration to address impediments.[29]

4.29 The CIRS continues:

> The Australian Government has established the Trusted Information Sharing Network (TISN) for Critical Infrastructure Resilience (CIR) as its primary mechanism to build a partnership approach between business and government for CIR. The Australian Government has the unique ability to bring critical infrastructure sectors together in a non-competitive environment to discuss and address vulnerabilities within sectors on a national or cross-jurisdictional basis as well as enabling the identification of cross-sector dependencies. While the business-government partnership is the cornerstone of the CIR approach, there are a number of other important imperatives that contribute to the collective effort.
>
> This Strategy has six complementary strategic imperatives to build CIR and achieve the Australian Government's aim and objectives:
>
> - operate an effective business-government partnership with critical infrastructure owners and operators
> - develop and promote an organisational resilience body of knowledge and a common understanding of organisational resilience
> - assist owners and operators of critical infrastructure to identify, analyse and manage cross-sectoral dependencies
> - provide timely and high quality policy advice on issues relating to critical infrastructure resilience
> - implement the Australian Government's Cyber Security Strategy to maintain a secure, resilient and trusted
> - electronic operating environment, including for critical infrastructure owners and operators, and
> - support the critical infrastructure resilience programs delivered by Australian States and Territories, as agreed and as appropriate.[30]

4.30 Regarding the NBN and its power supply needs, DBCDE explained that the federal government had instructed NBN Co 'to deploy battery backup capabilities within all network termination devices (NTDs) connected within the fibre footprint'.[31] The department continued:

> During a mains power failure, the battery backup is expected to allow the end-user to receive telephony services for up to five hours. As an additional safeguard, when battery runs down to approximately half its capacity,

29 Attorney-General's Department, *Critical Infrastructure Resilience Strategy*, 2010, p. 4.

30 Attorney-General's Department, *Critical Infrastructure Resilience Strategy*, 2010, p. 4.

31 DBCDE, *Submission 34*, p. 4.

power is automatically cut-off. This reserve would then be manually activated by the end-user to enable an emergency call to be made.[32]

Committee comment

4.31 The committee recognises the importance of maintaining telecommunications systems during and after emergencies, and the challenges that both broadcasters and telecommunications organisations face in doing so.

4.32 Access to power is essential. Given the important role of ABC local radio (in particular) in broadcasting emergency warnings and information, and the difficulties the public broadcaster can face when sourcing diesel fuel to power radio transmission sites, the committee is sympathetic to the ABC's request that consideration be given to granting priority access to fuel by public broadcasters. The committee therefore recommends that the government consider—without causing detriment to ESOs—granting priority fuel access to public broadcasters during emergencies for the purpose of broadcasting emergency warning and information.

Recommendation 6

4.33 The committee recommends the government consider granting public broadcasters priority access to fuel during times of emergency for the purpose of broadcasting emergency warnings and information, and in a way that does not impede the ability of emergency service organisations to access fuel.

4.34 The resilience of telecommunications infrastructure to withstand natural disasters and the availability of back-up systems, such as COWs, SatCOWs and MEOWs, when fixed infrastructure fails determine how well communications networks can be maintained at these times. The frequency with which natural disasters occur in Australia means that resilience and redundancy will continue to be key features of Australia's telecommunications infrastructure systems.

4.35 The committee notes the work being conducted by the federal government and the telecommunications industry through the Communications Sector Group and the Critical Infrastructure Resilience Strategy. The committee encourages the government to work with industry to examine the impact of recent natural disasters on telecommunications infrastructure to identify weaknesses and areas for improvement so that disruptions to telecommunications networks during and after future emergencies can be kept to a minimum.

4.36 The committee commends Telstra's use of transportable infrastructure during recent natural disasters to maintain telephone networks. The committee encourages telecommunications companies to continue to develop technology such as this for use into the future.

32 DBCDE, *Submission 34*, p. 5.

4.37 With respect to the NBN, the committee notes that NBN infrastructure will face similar challenges to existing networks when it comes to withstanding natural disasters. The NBN will, therefore, be susceptible to damage and failure during an emergency in much the same way as existing telecommunications infrastructure.

Senator Mary Jo Fisher
Chair