

## Should TV Move?

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**Abstract:** This article considers five options for the future of television transmission in Australia. We begin by describing the unprecedented threats to broadcast television's business model and power. We then set out the global picture for terrestrial TV broadcasting and options for modernising the Australian system. We do this within a framework that asks what now constitutes "television", because the services that viewers and users now treat as TV are broader than the subset that have carried most of the public policy freight for decades. The five options we consider are: first, do nothing much apart from adopting further improvements in compression technology; second, replace the current transmission system with a new, specialised terrestrial broadcast platform; third, migrate terrestrial TV to a direct-to-home satellite platform; fourth, move over-the-air TV online; fifth, design some sort of hybrid of Options 1 to 4. Finally, we arrive at some tentative conclusions.

**Keywords:** television, digital switchover, NBN, wireless broadband, spectrum auctions

### Introduction

TV should move. So argued MIT Media Lab co-founder Nicholas Negroponte in the 1980s as part of a bigger idea he called "trading places". Most TV sets and telephones, at the time, were immobile. Switching television from over-the-air transmission to wired networks would enable it to offer viewers more channels and better quality pictures by deploying additional bandwidth. Telephone services were delivered over copper landlines to fixed locations in homes and businesses. Switching to wireless networks would enable callers to be mobile. Someone coined it the "Negroponte Switch" ([Negroponte, 1995](#), p. 24).

The idea was never a comprehensive, global prescription. Much television was already delivered by cable in countries like the United States, Germany, Canada, The Netherlands, Belgium and Switzerland.<sup>i</sup> Most of the world's people had no telephones, landline or

otherwise, so there was nothing to switch. When telephony finally came to them, it was born wireless ([Ritchie & Roser, 2017](#)). In Australia, the idea was real. Telephones meant landlines and almost all TV households received their service over the air. A very few received services retransmitted by cable in areas of poor broadcast reception. Many began subscribing to multichannel pay TV services from the mid-1990s: Optus and Telstra built hybrid-fibre coaxial cable (HFC) networks for that purpose in parts of the mainland state capitals and the Gold Coast ([BIS, 2001](#), p. 14). Take-up of these pay TV services never exceeded about a third of households and a lot of customers—75% by one estimate—were served by satellite ([Long, 2018](#)).

So Australian TV was still predominantly delivered by wireless in 2009 when the National Broadband Network (NBN) was announced. Some were quick to see the new network as a potential delivery system for broadcast TV ([Lohman, 2010](#); [Morsillo & Barr, 2013](#)), which was in the process of upgrading from one form of wireless signal (analogue) to another (digital). But the stated rationale for building an all-fibre – and later “multi-technology mix” – broadband network to more than 90% of households and businesses lay elsewhere. The option of building a so-called RF-layer into the NBN’s architecture, which would have enabled free-to-air signals to be delivered over the fibre network, was rejected ([Budde, 2012](#)). Broadcast TV was well on the way to its own independent transmission future, all digital, and still all wireless, a destination it reached at the end of 2013 ([Bunch, 2015](#)).

The NBN is now mostly built. By June 2020, 11.7 million premises could order an NBN service, 99.7% of the total ([NBN, 2020d](#)). There is still a lot of work ahead to connect customers: 7.3 million had done so by June 2020. Even by June 2023, NBN estimates more than a quarter of premises that are “ready to connect” will not have activated a service ([NBN, 2019](#), p. 49). Network usage was already heavy before the COVID-19 pandemic and has surged since, supported by additional Connectivity Virtual Circuit (CVC) capacity provided by NBN Co to service providers at no extra cost in March (later extended until November 2020) ([NBN, 2020c](#)) and a doubling of the Sky Muster satellite data allowance. From the pre-COVID baseline (week starting 24 February 2020) to 19 June 2020, peak downstream network throughput on NBN’s main wholesale broadband service increased by 21% to 13.4 Tbps during the Evening Busy Hours (8pm to midnight). Peak Business Hours (Monday–Friday 8am–5pm) throughput increased 26% to 9.8 Tbps ([NBN, 2020b](#)).

One of the main reasons evening usage peaks higher than daytime, and post-COVID usage is up on pre-COVID, is video: video streaming, video conferencing and remote accessing of cloud-based office applications ([NBN, 2020a](#)). By early 2017, NBN was touting its role in “enabling the online video streaming revolution in Australia” ([NBN, 2017](#)). By late 2019, more than two-thirds of Australians aged 14+ used some kind of subscription video service.

This was less than five years after the launches of the most popular streaming video-on-demand (SVOD) services, the international giant Netflix and Australian-based Stan. A quarter used the incumbent pay TV operator Foxtel ([Roy Morgan, 2019](#)). None of those video services use TV's digital broadcasting transmission platform. Nor do video sharing sites like YouTube, TikTok and Vimeo, online video games, or Disney+, the streaming video service launched in November 2019. If this is television, it has moved already.

Broadcast television, though, is still heavily used. Overall viewing has fallen in recent years, precipitously among younger viewers, though, like video streaming, it was boosted by COVID isolation. The switch to all-digital transmission made broadcast TV more technically efficient and enabled popular multichannels from the commercial and national broadcasters, but the upgrade in picture quality that came from the highest resolution HDTV formats did not provide a durable competitive advantage: it may have matched DVD, but not BluRay or the "4K"/ultra-high definition (UHD) streaming options that came later. The struggling financial performance of commercial TV broadcasters in the 2010s has been accentuated by the advertising decline that has inevitably accompanied the COVID-driven downturn in economic activity. Even with the abolition of broadcast licence fees in September 2017, which until 2010 required the big Sydney and Melbourne stations to pay 9% of their gross earnings before tax,<sup>ii</sup> and COVID-era holiday from the spectrum tax that replaced them, serious doubts about the economic viability of regional affiliates have been raised. Although other countries have upgraded their terrestrial TV distribution platforms, or are in the process of upgrading them, someone has to pay and the viewers have to be there when the job is done.

Is it time to revive the old idea that "TV" should move? This article considers five options. First, that we do nothing much, apart from adopting further improvements in compression technology. Second, that we replace the current transmission system with a new, specialised terrestrial broadcast platform. Third, that we migrate terrestrial TV to a direct-to-home satellite platform. Fourth, we implement the Negroponte Switch and move most over-the-air TV online. Fifth, we design some sort of hybrid of Options 1 to 4.

These options are considered as part of a wider analysis of the future of television transmission in Australia. We begin by describing the unprecedented threats to broadcast television's business model and power. We then set out the global picture for terrestrial TV broadcasting and options for modernising the system in Australia. We do this within a framework that asks what now constitutes "television", because the services that viewers and users now treat as TV are broader than the subset that have carried most of the public policy freight for decades. Finally, we arrive at some tentative conclusions.

## The State and Fate of Australian Broadcast Television

IBISWorld's July 2020 report on Free-to-Air Television Broadcasting in Australia portrays an industry "in the decline stage of its economic life cycle". Although barriers to entry into the narrowly-defined TV broadcasting industry are significant, competition from across the more widely-defined television and video market is high and increasing. IBISWorld estimates free-to-air broadcasting's revenue declined at an annual rate of 0.8% over the five years 2015–2020 and profits at an annual rate of 7.7%. Employment also declined, at an annual rate of 3.6% ([Chapman, 2020a](#)).

Broadcast television remains an extremely popular medium. Three-quarters of all Australians used it every week ("Weekly Reach") in the second half of 2019, and nearly 90%, 21.5 million people, used it every month ("Monthly Reach"). On average, they watched for just over two hours a day, around 65 hours per month ([ThinkTV, 2020](#)). But these figures have declined sharply in the 2010s and the averages mask big differences across age groups. A little over a decade ago, weekly reach was 95% ([Screen Australia, 2013](#)). Even six years ago, the average viewer watched for three hours a day, nearly 96 hours per month ([OzTAM, 2013](#)). Weekly reach remains at more than 90% for people aged 65 and over, but just 50% for 18–24 year-olds and 56% for teens (13–17 years). Those teens and 18–24 year-olds watch only half an hour per day. It is people aged 65 and over who bring up the average, watching more than 4.5 hours of broadcast TV per day, including live and playback up to 28 days later ([ThinkTV, 2020](#)).

The biggest programs still draw huge audiences but they are not what they were. In 2001, the finale of the hot reality show that year, *Big Brother*, drew 2.8 million viewers in the five main metro markets, and the AFL Grand Final 2.6 million (a Melbourne team, Essendon, against an interstate team, the Brisbane Lions). In 2019, the finale of *Married at First Sight* drew 2.1 million and the AFL Grand Final 2.2 million (again, a Melbourne team, Richmond, against the out-of-town Greater Western Sydney) ([Screen Australia, 2020](#)). Over the same period, the population grew by nearly a third ([ABS, 2020](#)).

These are seismic changes in a business that dominated the Australian media landscape in the last decades of the twentieth century. They were not, however, unanticipated. In the 1990s, TV broadcasters lobbied hard for spectrum arrangements and government funding to enable them to switch from analogue to digital transmission. This would provide them with flexible capacity to improve their picture quality, to add more standard definition channels, and to introduce forms of interactivity ([ABA, 1997](#); [Tanner, 2013](#)). The first of these was under-utilised at first, though all networks now transmit their main channel in HDTV. The second, though delayed by complicated political deals, was eventually implemented

successfully through services like Seven's 7TWO, 7flix and 7mate and the ABC's Kids/Comedy, ABC ME and News. The third also occurred, but less through the TV remote "red button" interactivity that broadcasters envisaged, and more through "multi-screening" with mobile phones, laptops and tablets, as part of a wider transformation of the media and communications landscape.

Television and "the TV" diverged. TV sets became displays for content from multiple inputs, not just from "TV stations", and they were no longer the only screens people watched. The industry's switchover pioneers had hoped to find themselves in the centre of the digital revolution: instead, they were "to some extent overrun" by it ([Given, 2016](#)). From 2001–2013, as the digital transmitters were switched on, a plethora of online and mobile digital platforms was launched that took audience attention and advertising dollars from existing media, especially television and print: Google News (2002, a few years after Google Search), LinkedIn (2003), Facebook (2004), YouTube (2005), Twitter (2006), Instagram (2010) and SnapChat (2011) ([ACCC, 2019](#)). They came "Over The Top", reaching users mainly over infrastructure that was built, maintained, upgraded and replaced by others. Older competitors also had an impact. Multichannel subscription TV did not become the dominant television force it was in Britain, but Foxtel got to all-digital transmission on its cable and satellite platforms well before broadcasters and deployed HDTV more aggressively. Since the mid-2010s, Foxtel has earned roughly the same amount in revenue as the three commercial networks combined ([Chapman, 2020a](#); [2020b](#)). For a time, DVD was another strong competitor: the market surged from an annual turnover of less than 20 million discs in 2000 to more than 80 million in 2009 but has declined since to around 30 million in 2018 ([AHEDA, 2019](#), p. 7).

Better quality fixed and later mobile broadband, cheaper and eventually "unlimited" data plans, together with the rapid evolution of big screen TVs and mobile devices, then enabled video sharing and streaming to surge in the 2010s. Apple's iPhone was released in 2007, its iPad in early 2010. Internet-capable TV sets entered the Australian market early in 2011 ([OzTAM et al., 2017](#)). Between March 2014 and March 2015, SVOD services were launched by Foxtel and SevenWest (Presto), Nine and Fairfax (Stan) and Netflix. Their impact was immediate. Paying for television, a minority practice through two decades of "pay TV", became a majority practice in 2016 ([Roy Morgan, 2019](#)). Three years later, the ACMA estimated 71% of adult Australians had access to some form of "pay TV" ([ACMA, 2020](#), p. 92). According to Roy Morgan, in the three months to May 2020, 15.7 million Australians aged 14+ viewed some kind of subscription TV service. Netflix was by far the most popular, with 13.3 million viewers, followed by Foxtel (5.5 million including Kayo Sports) and Stan (4.4 million). New entrant Disney+ had nearly 2.5 million viewers within six months of its

November 2019 launch, having reached 2 million even faster than Netflix. Households with multiple subscriptions are now common, especially Netflix/Stan and Netflix/Foxtel ([Roy Morgan, 2020a, 2020b](#)).

Television broadcasters adapted their activities and restructured their inter-firm relationships to deal with all this change. Initially, Seven and Nine took stakes in pay TV operators and created partnerships for their online activities with US tech giants, Yahoo! and Microsoft. Yahoo!7 and NineMSN were eventually unwound. Most, though not all, free-to-air broadcasters invested in the Freeview online platform. This was a hesitant move away from exclusively intra-network competition, towards a recognition that free-to-air TV in its entirety is in competition with other platforms. Freeview Plus now offers simplified access to catch-up TV and is supported by popular TV receiver, set-top box and personal video recorder (PVR) brands. All five national networks, however, have their own live streaming, catch-up and on-demand brands: ABC iView, SBS On Demand, 7plus, 9Now and 10play.

Mergers and acquisitions in the late 2010s were defensive: Seven and Nine merged with primarily print media companies, West Australian Newspapers and Fairfax Media in 2011 and 2018, respectively; Ten was placed into voluntary administration and sold to one of the original Big Three of US broadcast television, now ViacomCBS, in 2017 ([Chapman, 2020a](#)). In the national and community sectors, the National Indigenous Television Network (NITV) was merged into SBS in 2012 and, from 2014, the Federal Government encouraged the few community TV broadcasters to move online: the Sydney service (TVS) ceased all operations in 2015, the former Brisbane service rebranded itself as Hitchhike TV and moved online in 2017, while Melbourne station C31 continues to transmit on UHF at least until 30 June 2021 ([Turnbull, 2014](#); [Kalika, 2020](#)).

In 2020, the COVID-19 pandemic initially boosted free-to-air viewing ([Mason, 2020](#); [Samios, 2020c](#)) but hammered advertising expenditure. According to SMI AU/NZ data, ad spend across all media fell nearly 15% in 2019/20 (see Table 1). Managing director Jane Ractliffe said the level of confirmed future ad bookings was looking more positive in early August, but: “Never before have we seen a situation where all major media have reported significant declines in ad spend in the last month, quarter, half year and financial year as such large product categories significantly reduced their media investment” ([Mediaweek, 2020](#)). Seven West Media reported a statutory loss from continuing operations before tax of \$294 million in 2019/20 (more than accounted for by significant items “including impairment of intangibles, other assets including fixed assets, restructuring costs and onerous contracts”), after reporting an equivalent loss of \$444 million the previous year ([Seven, 2020](#), p. 10). News Corporation announced a 14% fall in its “subscription video revenue” (which is mainly Foxtel) in the year to 30 June 2020, and a 12% fall in subscribers

to Foxtel, Kayo and Binge ([Kelly, 2020](#)). In the UK, “changing behaviour during the pandemic appears to be accelerating the growth in viewing of online video”, reported Ofcom, prompting “a surge in TV viewing that amplified the shift from broadcast to on-demand”, while “reinforc[ing] the importance of public service broadcasters as trusted providers of news and information” ([Ofcom, 2020a](#), p. 4).

**Table 1. Ad Spend Trends, Australia, 2019/20**

Media Type	Variance – FY2019/20 change on 2018/19, %
Television	-15.3
Digital	-8.0
Radio	-19.9
Outdoor	-19.0
Newspapers	-23.3
Magazines	-29.3
Other	-13.9
Cinema	-16.5
<i>Grand Total</i>	<i>-14.7</i>

Source: SMI AU (Standard Media Index, Australia), cited in *Mediaweek*, 4 August 2020. ([Mediaweek, 2020](#)).

Those who sensed immediately the scale of the social and economic crises ahead saw the possibility that this might be a time to ask the big, old question: Should TV Move?

## The Global Picture for Terrestrial TV Broadcasters and Broadcasting

Terrestrial TV looks likely to remain an irreplaceable part of the communications infrastructure in most, though not all, comparable countries over the medium term. Longer term, beyond ten years, the outlook is less clear. Sources of uncertainty include, at the level of individual nations, the risk that other platforms will reduce the need for terrestrial broadcasting to the point where it is financially unsustainable. At a global level, the main uncertainty is potential competition from wireless broadband for broadcasters’ UHF spectrum.

International generalisations about terrestrial TV viewing conceal big differences at the country level. Revenue models differ, including various combinations of public and/or advertiser-funded commercial broadcasting as well as free-to-air, receiver-licensed and subscription models. The historical level of competition from pay TV also varies widely. In countries with a strong tradition of public service broadcasters, the future of free-to-air TV is wrapped up with questions about the future of those institutions. In some other countries,

however, public TV never existed, has disappeared, or now plays only a minor or specialised role. (See, for example, UK regulator Ofcom's work on the future of public service broadcasting and media ([Ofcom, 2020b](#).)

To illustrate, overall viewing figures from the European Broadcasting Union (EBU) show a stable 29% of TV viewers in the EU-28 mainly reliant on digital terrestrial TV over the years 2014–17, almost level with satellite reception and well ahead of cable and IPTV ([Broadband TV News, 2018](#)). In two markets, Italy and Spain, twice that proportion, around 60% of households, mainly relied on a terrestrial signal to receive their television channels ([Quijada, 2020](#)). At the other extreme, Switzerland and Belgium had high penetration of cable and/or satellite TV and those mainly reliant on digital terrestrial TV had never exceeded 5%. Switzerland ended digital terrestrial transmissions by its public broadcaster, SRG, in June 2019. (An Austrian cable company got approval to reinstate them from a site in the Alps that reaches viewers in Austria. This preserved the cable company's regulated ability to carry the channels on its cable service, where they are popular with viewers especially in border regions. Similar arrangements are being contemplated along the French and German borders ([Krieger, 2019](#).) Significantly, other options for the less than 2% of Swiss households seen as relying on DTT included free-to-air satellite DTH. Belgium too had high cable penetration and free-to-air DTH satellite options. Flemish public broadcaster VRT announced in 2017 it was turning off its digital terrestrial service ([Broadband TV News, 2018](#)).

Germany and the United States provide counterexamples illustrating the durability of terrestrial TV even when only a small minority relies on it. In these two countries, although most TV viewing is also via cable or satellite, significant investment is occurring in new digital terrestrial TV technology. Between 2016 and 2019, Germany progressively upgraded its digital TV network to DVB-T2/HEVC TV transmission and compression standards (discussed in the next section). The all-HD service offers unencrypted access to Germany's public broadcasters and access to commercial broadcasters for a monthly fee ([Weidner, 2016](#)). In the United States, reliance on terrestrial TV has bounced back in recent years ([Perez, 2019](#)). Following a two-sided "incentive auction" conducted by the Federal Communications Commission (FCC) in 2016/17, US broadcasters are currently migrating out of the 600 MHz band. This process is being funded by mobile network operators wishing to use the band for 5G telecommunications. In a series of recent decisions, the FCC has allowed existing TV operators to upgrade to the more advanced ATSC 3.0 TV transmission standard as they move from the 600 MHz band ([Edgerton, 2018](#)). ATSC 3.0 is able to support 4K/UHD picture quality. Nielsen found in May 2018 that the number of US television households receiving TV via an over-the-air antenna had nearly doubled over the



previous eight years, to 14%: “As consumers look for more on-demand and cost-effective options, there has been a resurgence in this type of television household” (Butts, 2019). The US example also shows how the rise of Internet-delivered TV services may, by reducing the appeal of “traditional” cable or satellite pay TV, actually reverse the long-term trend away from the terrestrial TV service.

Despite its soaring uptake, Internet-delivered TV is not yet seen as a viable substitute for terrestrial broadcasting in any country. As early as 2014, the UK regulator Ofcom recognised an “emerging debate” about the right future delivery mechanism(s) for free-to-air television, driven by increasing viewer reliance on Internet delivery and “possible future demands” on the spectrum used by terrestrial TV, a reference to the re-farming of the UHF broadcasting bands for wireless broadband. Ofcom identified the Internet and satellite TV as the rival candidate platforms. It proposed some criteria for a migration of television to the Internet, including the availability and take-up of superfast broadband, the take-up of IP-capable receivers and the quality and reliability of the IP viewing experience. Ofcom’s own, tentative conclusion was that the free-to-air terrestrial platform would be needed at least until “post-2030” (Ofcom, 2014).

Decisions to re-farm entire bands from broadcasting to telecommunications use are commonly taken supranationally, by a “critical mass” of countries. The development and subsequent global influence of the Asia-Pacific Telecommunity (APT) 700 MHz “digital dividend” from analogue TV closure shows how, by increasing the value of the relevant spectrum world-wide, these decisions tend to create their own momentum. Major changes in broadcasting delivery have historically been led by the most developed countries, suggesting North America, Europe and East Asia should be looked to for leads. The ACMA’s 2019-23 *Five Year Spectrum Outlook [FYSO]* suggested “current thinking in Europe is that the remaining UHF TV spectrum will be needed at least until 2030” (ACMA, 2019b, p. 29), suggesting terrestrial TV is unlikely to face pressure to migrate out of UHF in the medium term.<sup>iii</sup> The picture is somewhat different in North America; the relevance of US moves to re-farm part of the UHF TV spectrum (600 MHz) is discussed further below.

## Options for Modernising Terrestrial TV in Australia

One of the legacies of analogue to digital conversion in Australia was a ubiquitous, free-to-air TV service that was initially able to match its chief rival – cable or satellite subscription TV – on picture quality. By the 2013 completion of analogue switch-off, five digital TV networks offered seventeen streams of free-to-view audio-visual content, in a mixture of High Definition (HD) and Standard Definition (SD) formats (Tanner, 2013). The service was available everywhere for the price of a single, relatively cheap external antenna or – in

remote areas and reception “black spots” – a satellite dish, after the government supported the creation of the Viewer Access Satellite Television (VAST) service. This provides satellite delivery of free-to-air television (FTA TV) to approximately 200,000 households, mainly in remote and regional areas, and 30,000 travellers, that are unable to receive reliable local terrestrial transmissions ([DOCA, 2018b](#)).

Digital TV in Australia launched using the European DVB-T *transmission standard* coupled with the MPEG-2 video and audio *compression standard* or codec. Each network obtained an entire, 7 MHz TV channel at every site, able to carry up to six standard definition (SD) video streams, or up to two high definition (HD) video streams, or a combination. Broadcasters have subsequently begun to deploy the more efficient MPEG-4 *compression standard* for some services in some markets. Consumers have needed newer, MPEG-4-compatible receivers to watch the services, so the upgraded compression standard has been used mainly to supplement the existing (MPEG-2) ensemble with new channels, like Racing.com on Seven, and to carry the HD versions of each broadcaster’s primary channel. The number of MPEG-4 streams varies between networks and between metropolitan and regional services. The use of MPEG-4 for HD services may reflect the larger percentage of MPEG-4-compatible HD sets. There is as yet no stated industry plan or timetable for full migration, which would leave an unknown number of older MPEG-2 sets unable to receive services. Moving fully to MPEG-4 should permit a roughly two-thirds increase in the number of SD or HD streams broadcast ([SBS, 2015](#), p. 11). It is debateable whether it can support 4K/UHD content: even if it is technically possible to carry a 4K/UHD picture, broadcasters could only do so by sacrificing multi-channel capacity, so it is very hard to see it happening.

Most public discussion to date has focussed on the option of updating the entire platform, both the transmission standard and the compression standard. But, as the deployment of MPEG-4 demonstrates, newer compression standards can be introduced with the existing DVB-T transmission standard to enable broadcasters to expand and improve services as viewer uptake of compatible receivers allows. MPEG-4’s effective successor, HEVC, is already widely used, and the first version of its successor, VVC (Versatile Video Codec), was finalised by the Joint Video Experts Team in July 2020 ([JVET, 2020](#); [Ozer, 2019](#)). Both would, in theory, considerably increase the carrying capacity of each DVB-T TV channel used for transmissions from existing multiplexes. By contrast, conversion to a more advanced transmission standard – which would incorporate a newer compression standard as well – cannot be achieved using current multiplexes. New transmitters would be required, with full conversion requiring sufficient viewer uptake of compatible receivers and the eventual switch-off of existing transmitters.

In theory, there is a choice of several terrestrial TV standard families in use globally: the others are ATSC (North America), DTMB (China) and ISDB (Japan), which has a Brazilian variant, SBTVD-T ([Digital TV Status, 2017](#)). The obvious choice for Australia is DVB-T2, the newer version of the DVB-T standard chosen initially. This was first deployed by Freeview in the UK in 2009 with MPEG-4 compression. (New Zealand, where digital services started later than Australia, uses DVB-T/MPEG-4.) The ATSC 3.0 standard, used in North America, is newer than the comparable European standard and is based on Internet Protocol (IP), which may confer an advantage in interactive use cases ([Siebert, 2019](#)). An updated version of SBTVD is still “evolving” ([Forum SBTVD, 2018](#)).

Australia’s continuing use of DVB-T means DVB-T2 starts with several advantages. It would be easy to source affordable DVB-T2 receivers that are backwards-compatible to DVB-T, which is something consumers will require in any plausible migration scenario. The local TV industry has conducted trials of DVB-T2 and has consistently identified it as the likely future standard ([Broadcast Australia et al., 2019](#); [Free TV Australia, 2020](#)). While the early history of TV digitisation is littered with false starts, and numbers of countries have upgraded or augmented DVB-T networks with DVB-T2, we are not aware of any examples to date of countries where digital television services were established using one family of standards and subsequently changed to another.

A DVB-T2/HEVC TV channel would allow 4K/UHD pictures and carry about five times as much TV content as a DVB-T/MPEG-2 channel, as shown at Figure 1, or a little over three times as much as a DVB-T/MPEG-4 channel.

Complete migration of all five broadcast networks to DVB-T2 would be costly and complex, like the transition from analogue to digital. That experience, however, does not provide a precise template for digital-to-digital conversion. The net implications for government from additional expenditure and revenue raised from vacated spectrum are difficult to estimate, just as they were for digital switchover.

Between 2000 and 2014, digital switchover cost the Australian government \$A2.4bn in 2018 dollars, a sum fortuitously exceeded by the amounts paid for wireless broadband licences in the vacated 700 MHz band ([Given, 2018](#)). The largest expenditure item (66% of the total), direct assistance to broadcasters, included the entire costs of digitising the transmission networks for the two taxpayer-funded networks and more than half the capital costs of digitising commercial TV transmission outside metropolitan areas. Assisting viewers with the cost of conversion, including establishing the VAST service, was the next largest item (27%). Government also funded the “restack” of digital TV services in preparation for the 700 MHz auction. This involved a large number of frequency shifts for transmitters at

particular sites to create larger and more valuable contiguous blocks of spectrum for auction. It also ensured all TV services from each transmission site were delivered on either VHF or UHF frequencies, simplifying viewer reception.

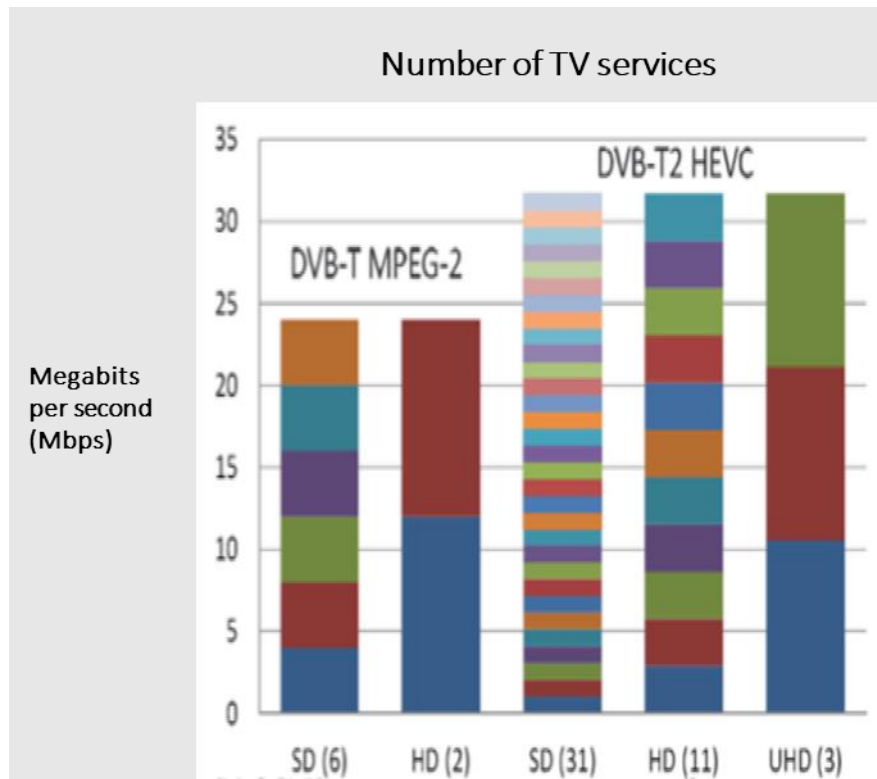


Figure 1. Comparison of DVB-T/MPEG-2 with DVB-T2/HEVC. The two columns on the left show alternative uses of the capacity of a 7 MHz channel using DVB-T/MPEG-2; the three on the right represent alternative uses of a channel using DVB-T2/HEVC. The DVB-T columns are lower than the DVB-T2 columns, because DVB-T can carry only up to about 24 Mbps compared to around 32 Mbps for DVB-T2. Source: Helge Stephansen's presentation at *VidTrans13—Content in Motion*, Annual Technical Conference and Exposition, February 26–February 28, 2013. Los Angeles, California, cited in Giles Tanner's Radcomms speech in 2018 (Tanner, 2018).

The most important extra complexity involved in a complete migration to DVB-T2 derives from the limited supply of TV channels. For digital switchover, each of the five analogue broadcasters in each area gained access to an entire, additional 7 MHz TV channel. This was possible because digital transmission allowed previously vacant frequencies to be used. For example, in metro areas, VHF Channel 8 could be used, previously a “taboo” frequency when used for analogue transmissions from the same sites as Channels 7 and 9. This meant each broadcaster was able to simulcast analogue and digital versions of their main services throughout the transition. Introducing further new digital transmissions using a different standard, DVB-T2, would not now create the same opportunity.

The current TV channel plan provides only a single spare channel at each site, the “sixth channel”, which has been used in major cities and some regional areas by community TV stations. It could be used for DVB-T2 services but, if more than one broadcaster wished to use it, participants would need to consolidate their signals, as radio broadcasters are already

doing for digital radio services transmitted on DAB+. (As DAB+ radio multiplexes can carry eighteen or more near-FM quality radio streams, two models were adopted in major city markets. ABC and SBS share one multiplex. One or two other multiplexes, as required, are shared by up to seven analogue commercial radio services, each qualifying for one-ninth of the capacity. The remaining two-ninths must be offered to community radio services.) Even with the increased efficiency of DVB-T2/HEVC, a single multiplex could not handle the existing free-to-air multi-channels in all the formats in which they are currently delivered. Some sort of progressive roll-out of services would be required, with extra frequencies becoming available only when existing services were turned off. This contrasts with the single switch-on date set in each transmission area for the launch of DVB-T services, which was easier to plan and especially to communicate to viewers.

On the other hand, several elements of the transition might be easier than analogue–digital migration. Because fewer people now rely on broadcast television, more may simply shrug at the prospect of losing over-the-air reception. They will not miss out on what they have come to think of as TV and their political representatives will not be as fearful. Those that do care may be more attuned to the relentless redundancy of media and communications devices, and less likely to blame governments for the expense of the new one(s) needed to receive familiar services. The legacy of rationalised TV transmission arrangements left by digitisation – including the current “block” channel plan and the neat sorting of households into terrestrial and satellite (VAST) audiences – would simplify planning for DVB-T2 services. Most people will already have the correct (VHF or UHF) rooftop antenna and a substantial but unknown percentage of viewers will be “DVB-T2-ready”, having fortuitously acquired one of the many DVB-T2-compatible TVs already on the market. If the five national broadcasters consolidated transmissions onto less than five DVB-T2 multiplexes at each site, the total capital and operating cost of new transmission infrastructure would fall proportionately.

Auctioning any vacated spectrum might not attract the bonanza anticipated, and eventually delivered, by the first “digital dividend”. While demand for spectrum for fixed and mobile wireless broadband from mobile network operators (MNOs) is the most plausible source of revenue to finance the migration, there is no current shortage of similar (sub-1 GHz UHF) spectrum in Australia ([ACMA, 2020](#), pp. 29–30). Longer term, the value of TV spectrum will depend on international developments in spectrum harmonisation and telecommunications equipment availability. As discussed above, there is little sign of any global move to re-farm the remaining broadcasting bands. An important exception is that the US has identified a paired allocation for wireless broadband of 75 MHz of spectrum that corresponds to the top of Australia’s UHF TV allocation (617–698 MHz). While Europe seems unlikely to follow any

time soon, Australia's isolation frees it somewhat to pick and choose with whom it harmonises. Submissions to the draft *FYSO 2020–24* indicate there is growing medium-term mobile network operator interest in the allocation ([AMTA, 2020](#); [Telstra, 2020](#)). If, in future, MNO demand grows strong enough, a TV upgrade might even be funded via a two-sided auction, as has happened in the US. In 2018, ACMA staff estimated that alignment with the US 600 MHz plan could be achieved if TV squeezed down to either four or “preferably” three channels at each site ([Tanner, 2018](#)).

## Considering the Options

So, should Australian TV move? And, if so, where? We now consider five options:

1. Minimalist model: upgrade the current compression standard(s);
2. Replace the current transmission standard with a new, specialised terrestrial broadcast platform like DVB-T2;
3. Migrate terrestrial TV to a direct-to-home satellite platform;
4. Move over-the-air TV online;
5. A hybrid of Options 1 to 4.

The main issues raised in different ways and to different degrees by the five options are mostly familiar from the debates about analogue–digital switchover and the first digital dividend. First, transforming TV: the extent to which each option enables better picture quality and more channels, and delivers video services in the ways users want them. Second, freeing spectrum: how much might be vacated, how soon and what value might other spectrum users place on it. Third, economics: any migration will bring its own costs to operators, consumers and also governments, which fund two networks and subsidised the transmission infrastructure of the others outside of major cities. To some extent, these costs can be traded off between the stakeholders, but this risks leaving vulnerable consumers behind altogether or making them pay for a previously free service they regard as essential. Fourth, international trends: the extent to which Australia keeps pace with developments in major overseas countries, to ensure the supply of transmission equipment and domestic receivers that Australia does not produce itself. Fifth, competition: if broadcasters have to collaborate more closely with each other, and/or are compelled to migrate to a single fixed-line or satellite platform, might that result in unacceptable concentrations of power in the hands of the broadcasters or another entity, such as the NBN?

What is different from the debates about analogue–digital switchover is the smaller – though still large – place broadcast TV occupies in the social, political and economic landscape. The audience that actually still relies absolutely on “the TV” is increasingly mainly old, though, at particular times, it is much larger and more diverse. For that absolutely reliant audience,

moving TV transmission is about the retention of a critical service, as telegrams once were, and petrol stations stocking gasoline might become.

The five options and the issues they raise are summarised in Table 2.

**Table 2. Should TV Move? Comparison of Options**

Option/Issue	Transforming TV	Freeing spectrum	Economics: costs for industry, consumers, government	International trends	Competition
1. Minimalist model – upgrade current transmission system	modest	modest or very long term	modest	common	preserves existing level; could involve consolidation among broadcasters
2. New specialised terrestrial platform like DVB-T2	potentially significant	potentially significant	complex, expensive	follows Britain and Germany on DVB-T2, US on 600 MHz band clearance	could involve consolidation among broadcasters
3: Migrate terrestrial TV to a DTH satellite platform	potentially significant – dependent on satellite/capacity chosen	potentially clears all terrestrial TV spectrum	complex, expensive, contentious	some use of satellite common but not complete migration	potentially significant
4: Move over-the-air TV online	most significant	potentially clears all terrestrial TV spectrum	<i>Industry:</i> depends on access pricing <i>Consumers:</i> may require viewers to acquire new services or upgrade existing ones to higher speed/price tiers <i>Government:</i> depends on scale of any direct or indirect subsidies, including via NBN	unprecedented at this stage	potentially significant
5: Hybrid of Options 1 to 4	depends on precise mix of elements	depends on precise mix of elements	depends on precise mix of elements	depends on precise mix of elements	depends on precise mix of elements

## Option 1: Minimalist model: upgrade the current transmission system

Policymakers could choose to do nothing much. Those who think broadcast TV is dying anyway might just want to hang back and monitor the decline. Any action will cost money

and risk alienating viewers. Why invest in a new, specialised broadcasting platform when other platforms exist – satellite everywhere, the fixed-line NBN in most places, and even mobile networks in and near major population centres, especially once 5G is widely deployed?

Upgrading the current transmission system, at this point, means each broadcaster fully converts all or most of its transmitters to MPEG-4. Longer term, it could mean upgrading to a still newer and more efficient compression standard like VVC while retaining the DVB-T transmission standard and transmitters. Full conversion to MPEG-4 would give broadcasters and their audiences the full benefit of the roughly two-thirds increase in capacity. The resulting greater efficiency would also create some possibilities – though not as large as those offered by DVB-T2/HEVC – for television broadcasters to consolidate their services onto shared multiplexes so as to reduce their transmission costs and spectrum use. Full migration to MPEG-4 by each broadcaster would not, of itself, free any spectrum, but opportunities would be created for further steps that would achieve this result. In 2016, the ABC's outgoing managing director, Mark Scott, highlighted the scope for savings through consolidation of transmission by the ABC and SBS, as part of a broader plan for the national broadcasters to co-ordinate activities while retaining distinctive brands ([Knott, 2016](#)). The SBS had previously identified practical problems with this approach ([DOC, 2015](#), pp. 25–26; [SBS, 2015](#), pp. 20–21).

Since then, the pressure on transmission costs for both national and commercial broadcasters has only intensified. In response to the COVID-19 pandemic, governments have shown themselves prepared to spend on an extraordinary scale, but the resulting deficits may sharpen the search for savings measures elsewhere. As TV advertising revenue has crashed, genuine doubts have been raised about the economic viability of regional commercial TV affiliates that earn much less revenue than their metropolitan counterparts but incur larger transmission costs to distribute their signals to more dispersed audiences ([Samios, 2020a](#); [2020b](#)). To illustrate, the Adelaide and Southern NSW/ACT aggregated TV markets each contain a little over 1 million viewers. Adelaide is served from a single transmitter at Mt Lofty plus a couple of small in-fill translators. Southern NSW requires separate high-power sites to serve Canberra, the Illawarra, Central Tablelands, Cooma/Monaro, Central Western Slopes, and South-Western Slopes/Riverina, plus literally dozens of medium- and low-powered sites.

Facing these and other pressures about the future of their medium, we should not assume that all five networks will share the same strategic vision or even that they will stick with their own individual vision over time as circumstances and perhaps owners change. They had quite different ideas about how to deploy the flexible extra capacity offered by DVB-T in



the late 1990s and early 2000s. The national broadcasters and Seven were interested in multi-channels, while Kerry Packer's Nine and Ten wanted HDTV ([Given, 2003](#), pp. 164–165). Those divisions declined after Packer's death in 2005 and Seven's rise to ratings leadership. It would not be surprising, for example, if the Ten Network, now owned by a US media giant, had different priorities from Nine and Seven, or the publicly-funded ABC and SBS. Nor would it be surprising if the larger ABC were more interested in consolidating transmission than the smaller SBS, which jealously guards its separate identity.

Even a minimalist model is likely to involve government. Leaving the future of terrestrial TV wholly in the hands of a potentially divided industry seems unlikely to be attractive to governments that pay the transmission costs of two of the five networks, receive revenue from reallocating any vacated spectrum and generally want to ensure Australia is at least a relatively fast follower of technical developments in comparable markets. It may be acceptable for the next few years, but less so for the longer term, especially if it leaves Australia significantly lagging the US and any other countries that follow it in clearing TV out of the 600 MHz band. The VAST service also sets decision points. It was initially funded for ten years to 30 June 2020. Reviewing the service in December 2018, the Department of Communications and the Arts recommended the current satellite delivery model should continue for five years, as it currently provides the only available cost-effective way of delivering free-to-air television in areas not served terrestrially. It also recommended a further review before the next funding service period ([DOCA, 2018b](#)). Releasing the Department's report in January 2019, the Minister for Regional Services, Bridget McKenzie, announced \$10 million in additional funding to secure the VAST service “until 2021” ([McKenzie, 2019](#)).

## Option 2: Replace the current transmission system with a new, specialised terrestrial broadcast platform like DVB-T2

Replacing the current transmission system entirely provides more advantages but some big disadvantages. It offers greater capacity to improve television, potentially a five-fold increase in the number of SD or HD channels, or three 4K/UHD channels, or some combination, per multiplex, compared to DVB-T/MPEG-2. (The percentage increase will be smaller, a little over three-fold, if TV has fully upgraded to MPEG-4 compression.) The scope for reducing transmission costs and enabling a second digital dividend is large, depending on how much of the increased transmission efficiency is harvested by reducing spectrum allocated for TV rather than allowing broadcasters to expand services. Replicating the steps taken in some major overseas markets – DVB-T2 in Britain and Germany, clearing TV from the 600 MHz

band in the US – would help to minimise any unique technical features of industry and consumer equipment needed for the Australian market.

The disadvantages are that it would be complex and expensive, much more so than just upgrading compression standards on existing transmitters (Option 1). It would risk disruption and perhaps temporary or permanent loss of service to vulnerable, politically-sensitive viewers, but deliver capacity increases well short of the potentials offered by Options 3 and 4. As discussed in the previous section, the transition from DVB-T would be more complicated than that from analogue to digital. Like that process, however, viewers would need to buy set-top converters or new TV sets to receive the DVB-T2 transmissions (some sets on the market are already DVB-T2 compliant) and dispose of old ones at a time when concern about the environmental consequences of electronic waste has grown.

While presented as a single option, full conversion to DVB-T2 encompasses myriad sub-options with different levels of consolidation among broadcasters and different timeframes for switching transmitters on and off across the country. These set the actual levels of improvement in services that can be delivered, and when, as opposed to the theoretical improvements implied by each standard's maximum data rates. A crucial issue is the preparedness of the five broadcasters to consolidate transmissions onto four or perhaps three multiplexes, thereby vacating one or two sets of frequencies, then “restacking” to optimise the useability and value for incoming spectrum users. Any restack, too, would bring a range of options, costs and complications. The US incentive auction provided a government-structured bargaining framework through which incumbent broadcasters and aspiring mobile broadband operators negotiated the price of multiple strategic options. Something similar could be done in Australia, although the regulatory cost and complexity would need to be amortised against a much smaller pool of auction revenue ([Tanner, 2018](#)). As a “standards taker”, Australia might instead choose to adopt a simpler format for a two-sided auction, where a single option is put to the market, such as whether to align with the US 600 MHz allocation.

While the TV networks are ferociously competitive, they are no strangers to collaboration where commercial imperatives justify it. Most are partners in Freeview Plus and several use the playout, live streaming, archiving, audio description, closed captioning and other facilities provided by Media Hub ([Kelly, 2018](#)). The three commercial networks pooled their transmission facilities into the jointly-owned TXA years ago. Seven and Nine bought Ten out of its share in 2019 when Ten shifted its transmission to BAI Communications (formerly Broadcast Australia and, long before that, the state-owned National Transmission Agency), which handles transmission for the ABC, SBS and Southern Cross Austereo. (Seven and Nine are currently looking to sell TXA ([Samios, 2020d](#).) Radio broadcasters share DAB+

multiplexes for digital radio transmission and newspaper publishers now share printing facilities ([Ryan, 2018](#)).

A cost/benefit analysis could also be undertaken. This was done for digital switchover in some countries including New Zealand and the UK, though not Australia ([Given, 2007](#)). Any analysis would be contentious and incomplete, not least because of the difficulty of estimating the costs of technical equipment years in advance and the value to consumers of free, over-the-air reception in areas where a new transmission standard might result in poorer or no coverage. Cost/benefit analysis cannot be relied on to precisely evaluate options but it does force disciplined thinking about what each option involves, the nature and magnitude of costs and benefits, and where and when they occur. The analyses undertaken for digital switchover in New Zealand and the UK, for example, helped to identify the relative merits of partial and complete switchover, the optimal mix of terrestrial and satellite delivery for all-digital free-to-air TV, and who was best placed to bear the costs. Like digital switchover, most of the costs of a full migration to a new standard are likely to come early, the revenue much later. That experience shows that big, complicated shifts can occur over a long period and deliver net benefits, despite changing governments, industry disagreement and uncertainty about technology, costs, processes and timing.<sup>iv</sup>

### Option 3: Migrate terrestrial TV to a direct-to-home satellite platform

Wholesale migration to a satellite platform has considerable technical and economic attractions and may seem conceptually straightforward – turn off terrestrial transmitters and allow viewers in all markets to acquire satellite receivers giving access to an enhanced version of the VAST service. Alternately, the potential for some future synergy with another government-supported satellite service, the NBN's satellite broadband service, has already been flagged for long-term future exploration in the 2018 review of the VAST service ([DOCA, 2018b](#), pp. 32–34). In practice, any wholesale shift to satellite delivery would be costly for many households and require the current satellite DTH service to be fundamentally re-engineered and expanded to incorporate all TV networks and the separate programming and advertising break-outs they currently deliver terrestrially to discrete local service areas. It would therefore be extremely contentious with viewers and hence politicians.

On the question of cost, if the same satellite also carries pay TV and the householder is a subscriber, the conversion would not be complex. For other viewers, the \$850+ indicative cost of a dish to receive VAST would compare poorly with the \$350+ their standard VHF or UHF antenna probably cost them. Broadcasters could cut these costs by leasing capacity on more powerful satellites, but that would reduce the savings. Very few retail customers prefer

satellite-to-terrestrial transmission for any kind of service. It is better than no service at all and was welcomed in remote areas when it brought broadcast TV, telephony, multichannel TV, the Internet and broadband for the first time. But it is never better than a service a customer is already receiving via terrestrial delivery with cheap, easily available equipment. Aspiring telephone users who had waited decades for landlines did not welcome a National Broadband Network that forced them to shift to fixed wireless or satellite.

On the question of distinctive programming and advertising break-outs, the VAST service is a workaround, not a complete solution. Though conceptually simple, it is operationally complex and a long way from replicating the full suite of separate TV services now delivered across all metropolitan and regional markets. It was designed in 2010 to preserve as much as possible of the distinctive local news, other programming and advertising break-outs offered by relevant non-metro TV broadcasters, but it has always been a compromise. The ABC and SBS carry distinct TV and radio services to five separate areas corresponding to the country's five summer time zones. These services include Indigenous services like ICTV supported by the Department of Prime Minister and Cabinet under its Cultural and Capability Program. Two different commercial joint ventures involving WIN, Prime, Imparja and Southern Cross Austereo provide three different service packages to three satellite coverage zones – broadly, Western Australia, Northern Territory and Queensland, and the states and territories of South Eastern Australia. Dedicated news channels are carried in the Northern and South-Eastern satellite areas. These rebroadcast nightly bulletins and updates from regional commercial broadcasters about half an hour after the original terrestrial broadcast, and include the same advertising.

Even the viewers VAST is designed for raised a range of concerns when the government reviewed the service in 2018: the cost and functionality of the VAST set-top boxes; the reliability of reception especially during heavy rainfall; the half-hour delay in broadcasting the commercial news bulletins; and the fact that “sport, advertising, metropolitan news and emergency information on commercial VAST channels [is] not as comprehensive as terrestrial channels or as relevant to viewers” ([DOCA, 2018a](#), p. 13). These concerns, from the existing base of 200,000 households and 30,000 travellers, would be amplified many times over if millions of households were offered a similar substitute for their existing free-to-air services, although newer transmission and compression technology may increase the range of signals that can be economically carried, and broadcast/broadband integration may create new ways of delivering programming break-outs. This issue lies at the heart of the idea of television and the role it has come to play in the lives of dispersed audiences. It can be difficult for big-city viewers to appreciate fully the personal, social and economic impact of media messages aggregated in faraway places even within the same state – news from

distant towns, ads for irrelevant businesses, results from meaningless sporting fixtures, forecasts of other people's weather.

Satellite would offer more potential capacity than an upgraded or new terrestrial platform, but the precise capabilities would depend on the satellite(s) chosen and decisions taken about how much capacity to buy or build. An optimistic view about the future of free-to-air TV might encourage ambitious capacity commitments, offering scope to expand the numbers and picture quality of services. But, if a central reason for the migration is to reduce overall transmission costs, an agenda more like the one chosen when VAST was created in 2010 seems more likely: "freeze-frame" the currently best-available free-to-air offering in metropolitan areas and equalise its delivery across satellite and terrestrial platforms. That makes satellite's theoretically unlimited capacity less of a practical advantage.

All the spectrum used by terrestrial broadcasters could be vacated if the migration to satellite was comprehensive, maximising the opportunities and value of reallocated frequencies. More likely, any migration would be staged, beginning in regional areas, optimising the trade-off between spectrum freed and viewers inconvenienced. The proportions of households served terrestrially and by satellite would shift again, as they did when VAST was established, and, before that, when commercial pay TV operators made their decisions about platforms. The boundaries of terrestrial service would be redrawn still closer to metro centres. Those with an eye for history might see this as a further step along the path proposed by Kerry Packer when proposing a domestic satellite system in the 1970s. Packer wanted the three metropolitan networks to beam their single channels direct to homes in the major regional centres, replicating the three-channel competition that Sydney, Melbourne, Brisbane and Adelaide had had since the 1960s. (His father, Sir Frank, had wanted the same thing when commercial TV services were first proposed for country areas, though with signals distributed by Telecom's cables.) Packer – unusually! – did not get his way. Regional TV resisted and country politicians and the whole Parliament chose to preserve a degree of independence for regional broadcasters. The large, aggregated regional markets created in the early 1990s are the result, with their attendant high transmission costs relative to revenues. That independence was always tendentious and has been progressively mugged by financial reality as the economics of the TV business have deteriorated.

Looking overseas for precedents and potential future moves, both New Zealand and the UK provide examples where the availability of satellite delivery options for free-to-air TV was an important factor that allowed many terrestrial analogue transmission sites to be shut down as part of the shift to an all-digital terrestrial platform. Satellite was already the platform of choice for the main subscription TV operators in those countries, so neither provides a neat precedent for the extreme version of this Option 3, a mandated shift from over-the-air to

satellite for the large number of city viewers who depend primarily on broadcast reception for the many hours of TV they watch each week.

Any comprehensive consolidation of TV broadcast transmission onto a single platform may raise competition concerns, firstly about the level of collaboration required among ostensibly competing broadcasters, and secondly about the market power it would give to the satellite provider. These may be mitigated by the degree of competition already being provided to broadcasters by SVOD and other video services and apps, and by competition for distribution in geographic markets served by the fixed-line NBN. Given the long-running, rumbling government unease about BAI's power and pricing in terrestrial transmission, these competitive concerns may not be easily allayed.

#### Option 4: Move over-the-air TV online

This would be a big, bold strike, integrating broadcasters decisively into the distribution platform that is already carrying the video streaming and sharing services and apps whose rapid take-up is the story of the last decade. It is not exactly the Negroponte Switch, which was about shifting over-the-air TV to wires. Nor is it exactly just about shifting Australian TV to the NBN, which is a terrestrial wireless and satellite network for a small but significant proportion of customers, and is far from the only way users access video, now that mobile broadband in Australia is so fast and cheap. Indeed, some are already suggesting that TV broadcasters' real transmission future lies with 5G ([Pennington, 2020](#)).

The ongoing evolution of wireless broadband technology may well permit greater customisation of wireless broadband networks to substitute, rather than just complement, the existing broadcasting platform. For example, European initiatives under the rubric of Enhanced TV (EnTV) are exploring the holistic implementation of multicast/broadcast as a critical technology element in 5G systems in addition and as a complement to unicast ([Gibellino, 2020](#)). In the absence of a mature "5G EnTV option", however, we have focussed on the option of unicasting (i.e., point-to-point streaming) of TV to viewers using any existing (fixed or wireless) broadband platform ([5G-Xcast, 2020](#)).

Moving TV online would not remove capacity constraints, no transmission medium can ever do that, but it would extend to broadcasters the 4K/UHD capability that online video distributors are already enjoying. Free up spectrum? In theory, TV broadcasters would vacate the lot, all five sets of UHF and VHF frequencies across the nation. Over-the-air transmission costs would fall to zero and, while the fees broadcasters paid to stream all their services would rise with the increase in viewer numbers, a significant share of it would go to the state-owned NBN, helping to amortise the cost of its massive public investment, rather than to private transmission providers like BAI. The competition concerns might be

significant, especially if the NBN is privatised and controlled by parties not yet known, but the arguments have been well-rehearsed by the ACCC, the industry, the NBN, and its shareholder and stakeholders. If comparable overseas markets choose this approach in the decade ahead, Australia may be tempted to follow.

Given the dramatic generational shift from broadcast to broadband video viewing, some might see it as inevitable that broadcast and broadband should converge. Henry Jenkins warned about this kind of thinking, which he called the “Black Box Fallacy”:

Sooner or later, the argument goes, all media content is going to flow through a single black box into our living rooms (or, in the mobile scenario, through black boxes we carry around with us everywhere we go). ... Part of what makes the black box concept a fallacy is that it reduces media change to technological change and strips aside the cultural levels. ([Jenkins, 2016](#), pp. 14–15)

Television, and broadcasting more broadly, have never been just technologies. They are “a set of technologies, social practices, cultural forms, industries, institutions, words and ideas that constantly transform, finding new shapes that sometimes embody features of old ones” ([Given, 2016](#), p. 119). Broadband network operators, especially the state-owned NBN, would need to demonstrate not just that they have the technical capacity to carry the extra traffic but that they could meet whatever social and cultural expectations remain implicit in the idea of television. This seems likely to include the reliability of the services, the range of content, and free-to-air accessibility.

Technical capacity should be an empirical question and answering it has been assisted by the unanticipated, real-time experiment forced by COVID lockdowns. It still requires assumptions to be made about what and when people will choose to watch, especially any viewing peak periods or programs. These can be unpredictable. In the UK, Prime Minister Boris Johnson’s messages to the nation in March and May 2020 were the UK’s most-watched broadcasts since the closing ceremony of the 2012 London Olympic Games ([Ofcom, 2020a](#), p. 26). His 14-minute broadcast at 7pm on 10 May about the easing of lockdown plans drew an astounding 90% viewing share to the seven channels that carried it, 60% on BBC One alone. Such peaks can be technically challenging even when they are totally predictable. Governments will remember well Optus’s network meltdown after acquiring exclusive rights to transmit the 2018 FIFA World Cup finals to Australians via online streaming, a fiasco from which it was rescued by the SBS’s broadcast TV service ([Pearce, 2018](#)). One of broadcast TV’s great advantages – a declining asset, it seemed, as viewing preferences have atomised – is its capacity to absorb seamlessly those moments when, for whatever reason, everyone chooses to turn on the television.

The range of content that would need to migrate to the NBN and mobile broadband networks requires the same kind of decision canvassed under the previous option, to “freeze-frame” the current suite of free-to-air channels and set parameters around any future adaptation. When television began in Australia in the 1950s, it meant an ABC channel and two commercial channels delivered to audiences in Sydney, Melbourne, Brisbane and Adelaide. As TV expanded into regional centres, it meant an ABC channel and only one commercial service. From the mid-1960s, it meant a third service in the four biggest cities but not Perth. It was not until the 1980s that “equalisation” brought three commercial TV services to east coast regional markets. At the same time, a second national service, the SBS, was expanding across the country. Then pay TV rendered the service offerings in metropolitan and country areas unequal again, because there were (at least marginal) differences between the suites of channels available by cable and satellite and huge differences between the channels available to those who could pay and those who couldn’t. The switch from analogue to digital terrestrial transmission provided the next moment when policy-makers equalised the services available, this time not just between viewers in metropolitan and major regional centres, but everywhere, via the VAST service and heavy government subsidisation of regional commercial TV.

Arguably the biggest transformation embodied in a complete shift to broadband delivery would be the loss of broadcast television’s free-to-air accessibility. A service that is enduringly popular with older, potentially vulnerable consumers would change from a delivery mode that is effectively free at the point of consumption to ones that depend on a paid fixed or mobile broadband subscription. It seems unlikely that anything less than 100% network availability and take-up would be politically palatable as a replacement for terrestrial TV, especially when, as highlighted by Telstra’s annual Australian Digital Inclusion Index, the gaps between digitally included and excluded Australians are still “substantial and widening for some groups” ([Thomas et al., 2019](#)).

### Option 5: A hybrid of Options 1 to 4

The practical reality is that none of the Options 1–4 are likely or even capable of being implemented in a simple, discrete way. Any realistic plan for the future of TV transmission is likely to involve elements of them all.

What we call “broadcast TV” is already a hybrid of terrestrial and satellite transmission, together with a small amount of cable retransmission. Similarly, “the NBN” is, and was always planned as, a mix of wire, terrestrial wireless and satellite, even in its original FTTP iteration, before the reorientation to a “Multi Technology Mix”. The NBN’s satellite segment did not converge with the spacecraft used to deliver the VAST free-to-air TV service; they are



separate systems configured for different, but all-digital, demands. Viewers of “broadcast television” already watch a lot of it online, receiving signals distributed through the NBN and in-home Wi-Fi or over 3G, 4G and 5G mobile networks.

If everything is negotiable, if the unthinkable has become thinkable – as pandemic-era policy-making has shown – then perhaps even such durable features of Australia’s broadcasting policy landscape as the equalisation of services across metropolitan, regional and remote areas, and the very existence of regionally-based commercial TV operators, might be put on the table. Governments might decide to return to an older historical model, whereby regional services “cherry-picked” parts of the metropolitan area offering and regional audiences received fewer services than their metro area counterparts. Or they might conclude that the model of independently-owned regional affiliates is simply no longer viable, so Australia-wide carriage of TV defaults to a few national networks. Or they might come to the opposite conclusion: galvanised into building greater resilience and redundancy into communications and other networks due to health, environmental and global strategic crises, they might think a digital terrestrial transmission network independent of the NBN is a worthwhile investment. Meanwhile, in metropolitan markets, where the cost of terrestrial carriage remains comparatively small relative to revenue, commercial networks might decide the lack of an upgrade path to the all-HD or 4K/UHD picture quality that SVOD services are able to offer is a more pressing competitive concern than cutting transmission costs.

## Conclusion

To the big question “Should TV Move?” we might start with an unhelpful answer: It is always moving. Each of the five options requires us, to some extent, to ask what television is. The easy answer, especially for the purposes of this article, is the five national broadcast networks that use radiofrequency spectrum to deliver services over terrestrial networks. Do we move them or don’t we? But a more complicated answer is required if we are to deal with larger policy questions about what television broadcasting has come to represent, the cultural, social and economic policy ends it has served, and the ways those ends might best be pursued in the future.

“Equalisation” of media and communications services available to all Australian consumers is a potent aspiration, persuasive to politicians of any generation. The geographic dimension of it is very much alive in the architecture and funding of VAST, but Australian “television” today is not just the multichannel suite of channels available over that satellite platform. It is a sprawling, overlapping amalgam of the national and commercial broadcast services that founded the medium, the subscription broadcast and narrowcast services that joined it 40 years later, and the many types of online video that might be thought of as forms of

television. Does this growth and diversification mean that television, and therefore the policy issues it raises, have got bigger? Or does it mean television has disappeared, absorbed into a wider technological and cultural ecosystem that means we should stop thinking and talking about it?

It is 25 years since Nicholas Negroponte wrote: “The future open-architecture television is the PC, period. [T]here is no TV industry in the future. It is nothing more or less than a computer industry” (Negroponte, 1995, p. 47). That is not what has happened. The “computer industry” has soared but parts of it have become TV-like: Amazon Prime, Apple TV, YouTube and Google Chrome, AT&T/WarnerMedia. Alongside it, the TV industry has survived but become more computer-like: Netflix and live-streamed and catch-up “broadcast” channels.

Australia’s terrestrial TV transmission technology, DVB-T, is no longer state-of-the-art. It is unclear if and when a business case will emerge for the high cost of upgrading it. Since it was introduced, there have been dramatic changes in TV and video viewing practices and the revenues and profits derived from them. A new, national fixed-line broadband network is virtually complete. It is being used extensively for video, but the overall migration to online video viewing masks stark demographic differences. Over-the-air transmission is an occasional indulgence for teens and 18–24-year-olds while remaining hugely important for older viewers. For the most part, these groups are not geographically separated in any systematic way that can be mapped onto physically discrete communications networks.

Australia is a technology-taker, not a technology-maker. The overseas countries it turns to for its leads about TV transmission and reception, especially those with a relatively heavy reliance on over-the-air transmission, are reinvesting in a specialised TV platform that they anticipate will take them until around 2030. Beyond that, TV’s transmission future is highly uncertain and COVID-19 has brought waves of new contingencies.

If Australia’s terrestrial platform is to be upgraded, there are two broad options with myriad permutations. The existing DVB-T standard is already being upgraded to a more efficient compression standard. That could be extended, perhaps to all transmission sites and viewers (our Option 1), and perhaps further extended later by deploying a still newer compression standard. Alternately, a wholly new transmission standard, most likely DVB-T2, could be adopted (our Option 2). Introducing a new transmission standard would be more complex than the switchover from analogue to digital broadcasting undertaken between 2001 and 2013, and would virtually compel a degree of consolidation among incumbent broadcasters. The degree and timing of consolidation and any subsequent restack of the frequencies they

use will be a crucial element of any options considered, because these would significantly affect the costs and the likely value of any second “digital dividend”.

Full conversion to DVB-T2 looks increasingly like a large investment for relatively little gain, especially if funded, in whole or in part, by a reduction in broadcaster spectrum, which would reduce the number of multiplexes in each market. The longer the future of DVB-T2 remains uncertain, the more attractive the option of pursuing further efficiencies with the existing DVB-T platform is becoming, especially if it enables broadcasters to reduce transmission costs. MPEG-4 conversion is a shorter-term, relatively low-gain option. The possibility of the ABC and SBS moving to share a single multiplex, potentially halving their current terrestrial transmission costs, has been extensively canvassed and some technical objections have been publicly raised. However, MPEG-4 might equally enable rationalisation of transmitter numbers in regional commercial TV markets. An area of future work may be to further investigate the costs and overall practicability of moving to a shared broadcaster multiplex model for all-MPEG-4 services using the current DVB-T technology. The feasibility of multiplex-sharing will also be critical to answer the question whether a second “digital dividend”, e.g. to free up 600 MHz TV spectrum for wireless broadband, is feasible based only on MPEG-4 conversion.

As with analogue-digital switchover, any new terrestrial standard might be supported by shifting the lines between terrestrial and satellite service areas, increasing the number of households receiving TV only by satellite. This leads to our Option 3 – a wholesale shift to a free-to-air satellite platform. Because a version of this, VAST, already exists, it presents as a conceptually neat option, with or without some sort of integration with NBN’s satellite segment. It would, however, be highly controversial because of the extra costs and complexity for so many metropolitan households and the risk of losing service altogether, including during heavy rain. The service offerings on VAST would need to be completely re-engineered, highlighting the challenges and costs involved in offering a true like-for-like alternative to location-specific terrestrial broadcasting services via satellite. Whatever its shortcomings, international experience, and the unique economics of satellite DTH transmission, suggest satellite is likely to retain a long-term role and may even end up as a “final safety net” in an otherwise all-online future.

A different wholesale migration, online – mainly to the fixed-line NBN – our Option 4, would be Australia’s 21<sup>st</sup> century version of Negroponte’s Switch. This would also be conceptually neat. Viewing preferences are shifting online and, in the places where the NBN is a fixed line platform – the overwhelming majority of households – it would offer enormous capacity for expansion. It might also do that in areas covered by 5G. But Internet-delivered TV is not yet seen as a viable substitute for terrestrial broadcasting in any country,

its record with big, simultaneously-viewed events is not perfect, and it currently faces a fundamental objection that free-to-air TV would no longer be “free”.

The likely reality is that Australian TV’s transmission future is going to be a hybrid of these options, our non-specific Option 5. Both Australian broadcasting and broadband are already hybrids. This reflects one of the deepest and most durable truths that Australian communications policy has always had to deal with: the differences in the costs of serving viewers and listeners, customers, users, even readers, in inner metropolitan, outer metropolitan, regional, rural and remote areas. The differences rise and fall with different technologies, services and patterns of use, but they rarely disappear for long. There are destinations but no end game. Everything is a hybrid, always in transition. Considering Australia as a series of different TV markets – remote, regional and metropolitan – suggests the future may involve a mixture of short- and longer-term innovations in response to different pressures, with different, including “hybrid”, solutions for each market segment.

In the late 1990s and early 2000s, TV was still king. Australia’s federal government was delivering budget surpluses but prepared to spend whatever it took to shift the medium from its analogue past to a digital future. The “digital dividend” was going to pay for it anyway. In 2020, budget deficits are back, deeper than for decades. Governments are finding unimaginable sums to keep businesses, services and individuals afloat. TV, though, is no longer king. It already occupies much less spectrum than before analogue-digital switchover, and it does not have a spectacular, spectrum-efficiency-boosting rabbit ready to pull from its hat. Some efficiency gains can be achieved relatively easily; bigger gains will involve considerable complexity and cost. The value of any vacated spectrum is probably large but uncertain. This time, digital-digital switchover is not a moon shot for the future of television. It’s fiendishly complicated and it’s mainly about dollars, minimising costs in a still big and important but now mature industry. If Australians want to keep this much TV, and they want its costs to match its likely revenues, it is going to have to move: at least some of it, in some places, and sometime soon.

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## Dedication

Remembering Liz Fell, 1940–2020 – peerless communications journalist, educator, activist.

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## Endnotes

<sup>i</sup> The United States had 50.5 million cable subscribers in 1990, Germany 8.1m, Canada 7.1m, The Netherlands 4.1m, Belgium 3.7m and Switzerland 1.7m: Top six countries ranked by total cable TV subscribers ([OECD, 1996](#), p. 19). US cable penetration increased from less than 1 in 5 homes in 1978, to more than half in 1990 and two-thirds in 2005 ([Christensen, 2009](#), p. 197).

<sup>ii</sup> The earnings-based fees were reduced progressively from 2010 and then replaced by a tax assessed for each transmitter licence, based on the frequency band, location and power emissions. Commercial TV licensees paid \$287 million in fees in 2008/09 and commercial radio licensees \$24 million, a total of \$311 million. In the first two years of the new arrangements, 2017/18 and 2018/19, they paid an average of \$52.3 million per year ([ACMA, 2010](#), p. 71; [2019a](#), p. 83).

<sup>iii</sup> In 2014, Pascal Lamy recommended a “2020-25-30” strategy under which, broadly, 700 MHz would be freed up by 2020, broadcasters below 700 MHz would have security until 2030 and, by 2025, the EU would reassess technology and market assessments ([Lamy, 2014](#)). An “inception impact assessment” published by the EU the following year outlined several options for the UHF band, including Lamy’s ([EC, 2015](#)).

<sup>iv</sup> While our focus has been whether to upgrade the current platform, we note that Australian radio has seen an alternative approach, where a digital technology (DAB+) was used to augment, rather than replace, the existing platform. DVB-T2 could be used to augment the TV platform, e.g. by allowing three commercial broadcasters in an area to offer a 4K/UHD stream each, using the “sixth channel”. A key difference with radio is the potentially high future value of UHF TV spectrum compared with the VHF used by DAB+. Even if UHF is

excluded, however, there remains a high power, VHF TV channel vacant in each of the five mainland metropolitan markets.