

ACMA Draft

Five-year spectrum outlook

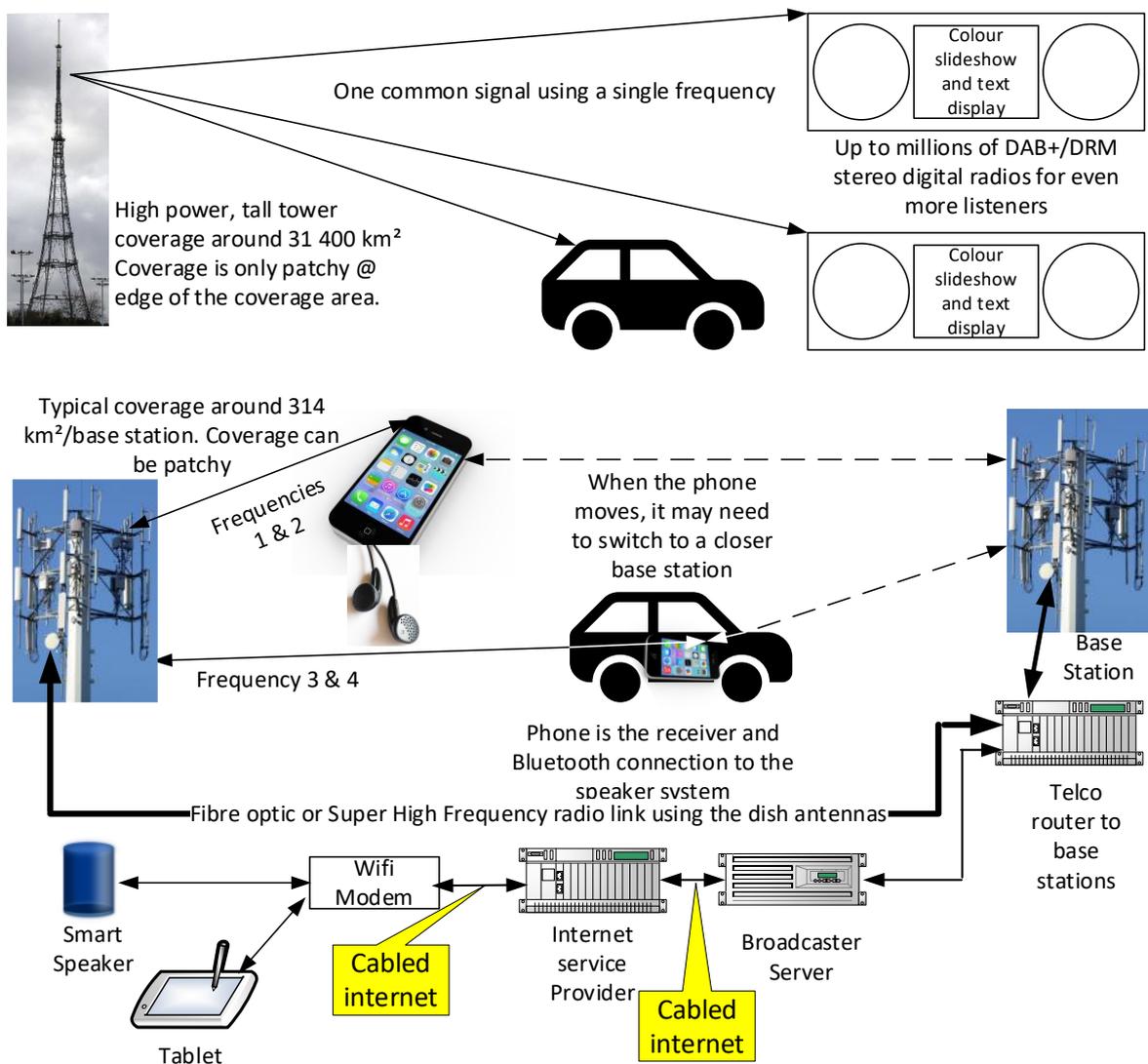
2023–28

Submission by Alan Hughes

Page 10: Net zero emissions

The Commonwealth Government passed the [Climate Change Bill 2022](#)
 What is the ACMA, communications and broadcast industry doing to reduce their generation of carbon dioxide as a result of their activities?

The ACMA who in concert with the 'The Department of Climate Change, Energy, the Environment and Water' need to collect data on the consumption of electricity and its consequential generation of greenhouse gases for different methods of distributing programs.



- **Communications**

Communications are a bidirectional individual connection between a pair of users. Where a viewer or a listener is supplied by a streaming service, a separate bidirectional link is required for each simultaneous paying user. This requires a base station transmitter/receiver for mobile phone/broadband for each link. This also requires spectrum 'real estate'.

Since mobile phones and cars move it requires spare capacity in the number of transmitter/receivers on base stations which will also be powered continuously.

Telstra is amongst the largest electricity consumers in Australia. This does not include the other telcos of Optus and TPG which is mostly mobile phone/mobile broadband. Telcos also push cloud storage. Where are the storage computers located? It's Iceland's growth industry because the ambient air temperature is around 8 ° removing the need for cooling. Are they exporting the electrical load to another country so it is not counted here?

The NBN is also a major communications provider, all of whom use internet service providers as well as the provision of electricity for the Australian end of undersea fibre optic international cables all use electricity as a product. How does the NBN's electricity consumption between Fibre to the Premises, Fibre to the Node, Fibre to the Curb, HFC, Fixed Wireless and the land segment of Skymuster® compare?

The electricity used by consumer equipment such as modems, NBN connection box, smart speaker, smart TV and the charging of phones/tablets. Whilst each consumer may not be much when there are up to 26 million consumers it does add up.

- ***Broadcasting***

Broadcasting is one to many distribution systems, where the broadcaster pays for all but the receiver and its antenna.

Transmitter electrical efficiency decreases as transmission frequency increases. The worst case is high speed 5G mobile broadband being the highest frequency ever used by the public. In addition, the coverage area also decreases, to the point that high speed 5G requires a micro base stations 900 m apart. High Frequency (Short Wave) transmissions go furthest because they are reflected by the radio mirror in the sky. (ionosphere)

The main providers of transmitter infrastructure are [BAI Communications TX Australia](#).

- ***Television***

Television is using digital transmitters most of which were new and installed from 2010 onwards. It uses the most electrically efficient technology, but now has been made able to carry more data, but

broadcasters have only briefly tested it. (DVB-T2/HEVC). The transmission power quoted by the ACMA is the equivalent power from a single (dipole) antenna. Nearly all TV & FM broadcasters use a more efficient antenna, which requires a lower power transmitter for the same coverage. Some of the transmitter power is lost in the cable up the tower. The transmitter also generates heat which must be removed. Thus, for electricity consumption for every site will be different.

- *AM radio.*

The first Australian broadcast was in 1919. This is the most inefficient method of broadcasting. This is because it contains a ‘carrier’ which is all of the broadcast power during silence and is published by the ACMA. For the loudest sound the transmitter power increases by another 50 %. The carrier does not contain any sound signal.

National Electricity Consumption and CO₂ Production

Broadcaster	Energy kWh/year	CO ₂ t/year
AM commercial	4,044,367	3,123
AM ABC/SBS	14,005,666	10,348
AM Community	613,252	473

These values do not include transmitter cooling which is considerable in high powered transmitters

- *FM radio 87.5 – 108 MHz*

The first Australian broadcast 1947, commercial 1980. This transmission does not contain a ‘carrier’.

For reasons in the television paragraph, the ACMA publish the effective radiated power just like for TV. There are many more FM transmitters making the pollution greater. A survey is required.

- *Digital Radio*

None of the systems below contain a ‘carrier’ with the exception of HDRadio[®]. The [BBC Sustainability](#) report found that DAB uses the least electricity of all systems including internet delivery. They did not test any other digital radio system.

- *DAB+*

The first broadcast worldwide was in Australia in 2009. Its efficiency is its ability to carry at least 18 sound programs. It is the highest terrestrial frequency used by broadcasters.

All capital cities including Darwin and Canberra as well as commercial radio the Gold Coast and Mandurah have DAB+ transmissions which are simulcast on AM or FM with the exception of the ABC/SBS in the Gold Coast Qld and Mandurah WA. This means 71 ABC/SBS, 106 commercial and 41 community transmitters can be decommissioned. This includes standby transmitters. This will prevent the emission of lots of carbon dioxide and the spending on redundant dollars in simulcasting. The quantity is not specified because of the reasons quoted for TV.

Considering now that many electric vehicle manufacturers are no longer including AM reception, new AM radios are hard to obtain and that 75 % of new vehicle registrations can receive DAB+ it is time to switch off AM/FM transmitters in the above areas. Norway did this in 2017 and ratings returned to their FM levels within 12 months. No new cars are sold without DAB+ reception.

If broadcasters believe the streaming via the telcos using phones that they can provide an acceptable alternative to analog radio particularly in cars, then they can switch off AM and FM now!

- **VHF DRM**

The ABC 2 year DRM trial has been completed. Was the electricity consumption compared to analog particularly in Band 1? Untested was a single FM transmitter carrying 18 sound programs using 6 consecutive transmission channels. A single transmission channel of DRM requires only 10 % of the transmitted power than FM to carry 3 programs. For the same coverage area a single FM transmitter can carry one program.

- **HF DRM**

HF DRM can easily cover the whole of Australia, with a sound quality which is better than local AM radio. Whilst ABC NT, and Radio Australia had the ability to transmit DRM, they didn't even trial it. Radio New Zealand Pacific has been broadcasting in DRM and AM since 2005. I have now ordered a \$4 million transmitter which is currently being constructed. A single high powered DRM high frequency transmitter can replace many lower powered transmitters giving continuous coverage instead of the patchy coverage of other technologies.

- *HDRadio*[®]

Rejected in Australia. The USA's all digital HDRadio[®] in the 'AM' band still contains the wasteful carrier with 10 % of the transmitted power being the data of the sound signal.

Objectives

- *The Government's objective is to meet climate change targets. The telecom/NBN/internet industries are not recognised as big polluters because you cannot see it at the point of use and is instead being blamed on the electricity generator.*

The telco's and NBN/Internet businesses waste is at the point of use where it is the production of heat from the electricity, and the number of large air conditioners is the only external sign. The NBN also uses electricity at telephone exchanges and in those green metal cabinets along the streets in fibre to the node areas. Their use lots of electricity continuously which makes the continuous supply of renewable electricity expensive. Added to this is the users continuous use of electricity for modems, smart speakers and chargers for tablets and phones. None of the above electronic equipment can be relied upon during an emergency usually because of blackouts.

If broadcasting was switched off, the telcos/NBN/Internet would have to supply the additional capacity to electronically distribute video and sound programs to a large number of users requires more equipment which will have to run continuously, thus increasing pollution. As a result a comparison of broadcasting and streaming video and sound programs needs to be quantified in the Australian context as the BBC-UK situation is different.

- From <https://www.acma.gov.au/list-transmitters-licence-broadcast> determine the current transmitter power output, comparative energy consumption including cooling, pollution generation of all radio broadcasting transmitters in Australia.
- Calculate from the above results the cost and pollution reduction when all AM & FM simulcasting transmitters in all capital cities, Gold Coast and Mandurah are switched off. This will decommission 263 analog main & standby transmitters. These cost & pollution reductions will not occur until analog simulcasting ceases.

- For all regional licence areas and remote areas, predict the reduction of electricity production, pollution generation and transmitter output powers. For commercial stations use 10 % of their current FM transmitter power. The licensee can transmit both their programs on a single DRM transmitter. The ABC can decommission all AM transmitters and only use 60 % of the JJJ power. The ABC will be able to transmit all of the 18 programs of ABC & SBS.
- For remote areas & blackspots, which as a population of around 1 million people but also has many tourists and itinerant workers from semi-trailer drivers, fishers, jackaroos/jillaroos, geologists etc who cannot use fixed dishes to listen to the VAST satellite. A national HF omnidirectional DRM coverage for ABC News & ABC Sport, along with medium power HF DRM broadcasting from studios in remote areas. Remote commercial broadcaster licencees should be able to obtain a pair of HF DRM channels for an area surrounding their studio to make the content relevant. It is to be geofenced to their licence area. Near Vertical Incidence transmitting antennas should be used to give a coverage or around 200 km radius or 126,000 km².

Conclusions

- The use of digital radio drastically reduces the electricity requirements making the supply of locally generated and stored electricity so that transmitters will operate for a long time compared to mobile phone base stations which will only run for a couple of hours during a blackout.
- For a TV program compare the average cost and pollution of delivering a program through broadcast vs streaming the same program via the NBN including the broadcaster's server to the population of the licence area.
- For a radio program compare the average cost and pollution with streaming that same program via the mobile broadband network including the broadcaster's server to the population of the licence area.
- Viewers and listeners used to record the programs they wanted to store at the receiving location. Now the broadcaster stores it and sends the program via the internet on demand. I accept that broadcasters need to keep archive copies of programs. What is the electricity consumption and pollution generated by services like ABC Iview, SBS on demand, 7plus, 9Now and 10Play.

- In summary stop the AM or FM simulcasting with DAB+, which has been going for 14 years and to initiate a rollout of DRM broadcasting over the rest of the whole country including an AM/FM switch off. This provides localised programs and emergency warnings and will reduce the generation of greenhouse gasses and costs to help fight off streaming companies.
- Quantify the use greenhouse gas production as to why broadcast should be favoured over streaming.

P21: Market and technology drivers of change in spectrum demand, Broadcasting Services

- ***Communications***

Virtually all communications infrastructure operates continuously, however much of it is not used continuously. The capacity of the system is designed on average numbers of bidirectional, simultaneous links are being used. The users pay the telcos or NBN as well as internet service providers. With increasing demand and profits the telcos are demanding greater amounts of spectrum. When many viewers/listeners want access to a common content simultaneously this demand is not economically provided. For example, Optus tried to netcast a Soccer World Cup. Their overloaded system crashed and they had to give the coverage to SBS TV. If all broadcasting was switched off and the all viewers/listeners had to access content simultaneously, will the supply the necessary infrastructure for these peaks in demand. For example the peak radio listening time is during breakfast show on most stations, and midnight to dawn, is minimal. TV is typically the evening news on all stations. In capital cities this can be millions of extra connections on top of the existing demand. Providing the extra infrastructure for a few hours a weekday is hardly economic.

Do the broadcasters really think that listeners will listen for long periods using uncomfortable head/earphones? Nearly all phones except Apple products contain an FM radio which uses the headphone cable for an antenna. Some phones use Bluetooth only to the headphones so there is no antenna for the FM radio. Therefore, emergency warnings are often not heard or seen because of mobile phone base stations failing. There is an app and dongle for DRM reception from a transmitter available. This could be integrated into the phone if the demand is high enough.

Broadcasting

- ***Television***

The telcos pushed for the digitisation of TV, because of DTV's ability to transmit different programs on adjacent TV channels without interference. After a restack of transmission channels in 2014, 100 MHz of spectrum was auctioned by the ACMA for \$2,119 million to the telco industry for mobile broadband/phones with a duration of 15 years.

The TV restack contained for each transmitter site to have transmission channels for 3 existing commercial TV networks, ABC, SBS and a spare. Now the telco's voracious appetite for spectrum want to restack all sites back to 5 unchangeable channels. It could also mean that some broadcasters and viewers have to pay for new antenna installations. The conversion of the 6th channel to mobile use removes the possibility of TV expansion of 8K, UHD television or where the viewers can watch where a new broadcaster pays for the delivery rather than the viewer paying one of 3 telcos! The advantage for broadcasters is live locally relevant programming which is easy to find.

To sell large screen 4K and 8K Ultra High Definition TVs, the manufacturers burn a demo to highlight their image quality into their large TV. Many retailers cannot switch those TVs to on air TV where there are no UHD programs being transmitted. The best they can achieve is one to three high definition programs per broadcaster. The rest of the programs are in blurry Standard Definition. A simulcast of the primary program in Standard Definition still continues because there was for any TVs manufactured before 2015. Sony started importing MPEG-4 compatible TVs in 2010. This could have been avoided by specifying a switch over date back before 2010. After all, New Zealand started digital TV using MPEG-4 in 2007. Do the broadcasters know how many viewers still watch the SD simulcast or are unaware of the HD version of each network's primary program?

To provide even more spectrum the telcos are also pushing for a technical upgrade of TV coding from DVB-T to DVB-T2 which fits more data into an existing channel. **This will cause most existing TVs to become redundant just like they were for the analog to digital switchover.** The danger for TV is that streaming services are already using the NBN to have Ultra High Definition content available at a higher price. If non-backward compatible DVB-T2 and HEVC compression is used for UHD, then the other programs broadcast by each network could then be broadcast in high definition. This requires each TV broadcaster to maintain their existing channel allocation. Getting locally owned broadcasters to share channels will disadvantage broadcasters compared to the streaming companies most of which are overseas owned and contain overseas content. Regardless of what happens, DVB-T2 is already in common use outside of North America, and HEVC compression is in all smart TVs. Dumping non DVB-T2/HEVC on the

Australian market, must be prevented through an upgraded Australian standards AS4933/AS4599 by the ACMA must require all new TVs sold in Australia as soon as possible. The current standards are 8 years old.

- *Digital Radio*

DAB+ and DRM below are both capable of transmitting pictures and indexed text along with an Emergency Warning Function. This would be invaluable during our bushfire and cyclone seasons. During the 2019 – 2020 1,400 of the 19,726¹ mobile phones base stations failed mainly due to blackouts in critical areas. It is not economically possible to provide backup electricity for at least a day at all sites. Disaster response controllers will not allow refuelling during the emergency.

- *DAB+*

DAB+ is unsuitable for regional and remote areas because in most of populated Australia there is only 8 transmission channels available. High powered transmissions need to have a separation between transmitters carrying any different content is 336 km to prevent interference. Interference causes unreliable reception. Also being the highest broadcast frequency means the smallest coverage area per transmitter. The current regional plans only have spot coverage around the interested broadcasters' transmitters.

Whilst very low power black spot retransmitters are being used in DAB+ it is not suitable for large area coverage.

- *Which Band for DRM?*

Capital city and remote Australians have the option of listening to 18 programs from ABC/SBS. The ABC has a local radio option which is related to the area in which the listener is located. This leaves those in country areas with a choice of between 0 and 5 ABC programs. A single SBS program can only be heard from locally financed retransmitted which covers only a town.

The ABC's Classics and JJJ are transmitted usually from tall TV towers on a frequency between 87.5 – 108 MHz. (Band 2)

At the end of 2013 the last analog TV transmitters was switched off. This included those operating between 47 – 68 MHz. (Band 1). Thus

¹ Statistic 2017

these frequencies are vacant and can provide 206 DRM transmission channels.

The advantages of

- Using the same radiated transmission power and antenna location on a tall tower. The transmission frequency is in the centre of each band. The maximum theoretical coverage areas are with the same received signal strength are;
 - Band 1 31,000 km² @ 57.5 MHz
 - Band 2 11,000 km² @ 97.7 MHz
 - By comparison with DAB+
 - Band 3 2,000 km² @ 202 MHz
- *Band 1*
 - is vacant so it means it is easy to plan coverage using a geographic grid of locations to minimise interference, the most even coverage and also to allocate 6 consecutive channels for ABC/SBS coverage per transmission site.
 - Less total electricity consumption because there are less blackspot areas requiring repeater transmitter sites.
 - There is no need to reduce the power of DRM channels adjacent to FM transmissions to prevent interference.
 - With all digital broadcasting in this band an additional 198 channels will become available after the FM switch off.
- *Band 2*
 - The existing FM transmitters can be upgraded to DRM by swapping the modulator to a DRM version thus reducing the price for broadcasters.
 - Current FM allocations 2677 transmitters into the existing 100 FM channels. Like TV after conversion to digital a restack of transmission channels can be used to move to an orderly to a grid as above.
 - Optimum vertical car antenna is 765 mm tall vs 1.3 m for band 1.
- *Band 1 47 – 68 MHz*

42 – 50 MHz was the original FM band used by the USA inventor. It only changed to the current band which made the original sets redundant. NBC/RCA got the FCC to change the frequencies to band 2 because did not want to pay patent rights to the inventor! Low cost receiver modules are available for all broadcast frequencies including this frequency range. There are more than enough channels to carry all existing broadcasts. It enables the 18 programs available to capital city audiences from ABC/SBS including a local version of ABC regional radio to be transmitted from a single transmitter. Commercial stations can transmit their 2 programs using a single transmitter and a single transmission channel using their existing tower for FM. In areas with more than one commercial/community broadcaster they can share a transmitter but still have their own channels. With demise on country newspapers, Jounaline® will allow radio stations to transmit an electronic newspaper including coloured pictures, live.

- **Band 2 DRM 87.5 – 108 MHz**

In remote areas there are around 250 sites of self-funded satellite fed very low power retransmitters of ABC programs mainly JJJ in mine sites and less with ABC state based radio. These sites should be able to apply to the ACMA to be allocated 600 kHz block of the FM band. Then they can buy a new 6 channel DRM modulator to transmit all 18 ABC/SBS programs through their existing FM transmitter.

- **High frequency DRM**

A high powered HF DRM transmitter in the centre of Australia can cover the whole country with stereo programming live everywhere, particularly for the 1 million remote Australians without any broadcast radio or mobile broadband whilst mobile. The only suitable programs without time zone delays are ABC NewsRadio and ABC Sport, which can be both transmitted from a single DRM transmitter. ABC NewsRadio is transmitted on 10 AM and 84 FM transmitters for areas of >10,000 people which would become redundant. ABC sport is only available in DAB+ areas and wireless internet which often is not available. Satellite phones are not data capable for streaming. The geographic centre of Australia is easily accessed from by existing rail and for a fibre optic link or satellite to Sydney for program. The area is low scrub away from storms and cyclones, and foreign forces and can be easily solar/battery powered, like many mine sites in WA.² Radio

² <https://arena.gov.au/assets/2017/11/renewable-energy-in-the-australian-mining-sector.pdf>

Australia could also co-site on this location as well to minimise the cost of soft Australian diplomacy.

Observations

Unlike DAB+, ACMA and the broadcasters seems to be waiting for other countries to be the initiators of new technologies. Our CSIRO developed COFDM modulation which is used in Wifi, DVB-T(2) digital TV, DAB+ and DRM digital radio, so why don't we use it for ourselves with DRM?! In India, there is now high powered DRM coverage over all of the subcontinent. Now, Indian car manufacturers are voluntarily installing DRM capable receivers in almost all new vehicles, so there are already up to 6 million receivers and rapidly climbing.

Note: High Frequency DRM radio tames the short wave AM bands. It produces a much better sound quality than local AM broadcaster in your town and broadcasters can be selected by name. It can automatically change transmission channels when the broadcaster does, which is required at dawn and dusk along with seasonal changes.

Optimising Established Planning Frameworks

Table 1: Optimising established planning frameworks

Planning area	Project priorities	Proposed timelines
Broadcasting	<p>Variations in several solus licence areas in NSW and Vic³ to enable AM to FM conversions</p> <p>Why? Canberra which has enough DAB+ capacity to accommodate all Canberra broadcasters. There is a case for repeaters in the Brindabella valley and Bondo which is in the licence area. However, there are other locations such as Captains Flat who are not in any the licence area and cannot receive DAB+ from Canberra. Braidwood is in the Goulburn LAP and is almost equidistant from Goulburn and from Canberra. The Canberra DAB+ signals are non-existent. Even the Goulburn commercial broadcaster is very weak. It needs band 1 DRM transmitters of Goulburn programs. Band 1 DRM conversion is needed for all other licence areas.</p>	Ongoing: consult

³ This may include a subset of the following commercial licence areas: Inverell, Moree, Gunnedah, Lismore, Young, Parkes and Wangaratta. We are consulting with the licensees to determine indicative timelines and relative priorities. Proceeding with these variations may depend on the relevant licensees making timely strategic business decisions on available implementation options.

Planning area	Project priorities	Proposed timelines
	<p>Variations in several competitive licence areas in NSW, Vic and ACT⁴ to enable AM to FM conversions</p> <p>Canberra as above. Tweed Heads NSW is a conurbation with Gold Coast Qld. Gold Coast already has commercial DAB+. SuperRadio's 2MW, has an AM transmitter at Clothier's Creek and FM translator in the Gold Coast licence area at Elanora along with another in Mullumbimby. In Lismore NSW SuperRadio also has 2ZZZ FM on Mt Nardi and 2LM AM. On Mount Nardi a band 1 DRM transmitter could carry 2ZZZ and 2LM feeding a directional antenna pointed at the Lismore licence area. Another directional antenna and Band 1 DRM transmitter feeding 2MW and an absent supplementary licence program for the Murwillumbah licence area and this eliminate the need for the Clothier's Creek, and perhaps Elanora and Mullumbimby transmitters. This is because of the Band 1 DRM and the altitude of Mt Nardi may be strong enough in the 'shadows'. All other sites can use a single Band 1 DRM transmitter per LAP to carry all commercial programs as well as sharing the costs, just like the capital city broadcasters. This can be extended to all LAPs except remote areas.</p>	Ongoing: consult
	<p>Make a determination of population figures under section 30 of the Broadcasting Services Act. As an example Mandurah WA's LAP population is using 32 year old data. It has grown from 27,000 in 1991 to 107,641 in 2021. The area of the Mandurah region has grown considerably and no longer matches the map. Eg. Peel is below the thick horizontal line in Metropolitan region plan Conversely there could be areas which have lost population too.</p>	Q3 2023

⁴ This may include a subset of the following commercial licence areas: Albury, Canberra, Dubbo, Maryborough, Murwillumbah, Muswellbrook, Newcastle, Sale and Warragul. We are consulting with the licensees to determine indicative timelines and relative priorities. Proceeding with these variations may depend on the relevant licensees making timely strategic business decisions on available implementation options.

Planning area	Project priorities	Proposed timelines
	<p>Vary the Remote Western Australia Radio LAP. Outside of Perth all commercial radio is owned by Southern Cross/Austereo, with the exception of Coastal Broadcasters, Mandurah and SEN in Bunbury. In remote areas the current system uses satellite distribution low powered village FM transmitters. Since the ABC shut the high frequency broadcasts in 1994 this zone has no live radio except in some towns and villages. This means no warnings to those in the cyclone zone from the Tropic of Capricorn Northwards. It is also useful when people are being searched for. High Frequency DRM could transmit a map of the search area for victims and controlled access commands to crews. With the advent of VAST in 2013 has allowed some radio programs broadcast to fixed satellite dishes. Instead of the above system, each studio should feed its own high frequency DRM transmitters to provide continuous coverage over the whole region rather than spots in villages. Transmissions should be capable of stereo music.</p>	Q4 2023: finalise
	<p>Variations to the Perth LAP to give effect to ABC AM to FM conversions and other requests After 17 months the new LAP was published which is only 7 months ago. All but small community broadcasters have been on DAB+ for 14 years. It is the ideal location to switch off AM and FM. This will prove like Norway did that audience recovers within 12 months and the broadcasters' transmission savings will continue from then onwards.</p>	Q1 2024
	<p>Vary the Remote Central and Eastern Australia Radio LAP. The situations are similar to the Western Remote licence area but with different commercial broadcasters. The ABC switched off high frequency broadcasting in Queensland in 1994 and in the NT in 2017. VAST satellite transmissions are encrypted to limit reception to licence areas. HF DRM radio can geofence reception provided the receivers contain a GPS receiver. The infotainment systems in vehicles all contain them for navigation. This allows licence areas to be maintained without the use of a card reader in the receiver like for VAST and pay TV.</p>	Q2 2024: consult

Planning area	Project priorities	Proposed timelines
	<p>Consult on digital radio channel plans for the licence areas where the incumbent broadcasters have committed to rollout digital radio. This is a very difficult task to cover regions due to only 8 available channels and the small coverage areas. DRM has 168 channels Band 1 available nationally.</p> <p>The urgency is increasing because electric vehicles are not fitted with AM reception and are equipped with DAB+/FM receivers. Adding DRM is an inexpensive addition to a DAB+. The EU made terrestrial digital reception in new cars needed here. Many European AM transmitters have closed.</p>	<p>Timing is driven by demand from broadcasters. The only way to reduce cost and pollution the ACMA should mimic TV switch over. This will drive receiver prices to acceptable values.</p>



Broadcasting

We are conducting a technical research program consisting of preparatory activities to ready the ACMA to undertake channel replanning activities, if required, to support possible future government policy decisions that may require replanning of TV channels. Under this program we are:

- > investigating television receiver performance capabilities, including operating under Single Frequency Networks (SFN) scenarios, and the ability of receivers to cope with shared multiplexing. This work will help inform consideration of potential consumer impacts under different planning scenarios, and coverage and interference modelling in possible subsequent channel planning
 Prior to the digital channel restack there were single frequency networks on the Sunshine Coast, Brisbane (SBS only) and Gold Coast and another in the Central Coast in NSW. All SFN transmitters were low powered UHF. After the 2014 restack the SE Queensland SFN has been broken up by changing the channels of the Gold Coast and Brisbane SBS main transmitters. Over large distances the time the signal become weaker and the delays in the air increases making the area of unreliability increases. I am yet to see an SFN for TV on channels 6 – 12.
- > investigating new processes and tools for channel planning to assist with any possible restack channel planning under multiplex sharing arrangements. **This has been covered above.**
- > exploring possible parameters and solutions for channel planning relevant to possible new shared multiplex arrangements. This work will provide evidence to inform any possible future restack channel planning framework and planning principles **This will prevent the transmission of ultra high definition TV which is in competition with streaming services.**

undertaking preliminary work on the licensing options under potential arrangements with shared multiplexing and assessment of requirements for amendments to television licence area plans (TLAPs). **Not required if the telcos are not given any more spectrum. They have spare spectrum already. If all broadcasting went on line there would be insufficient spectrum available for the individual onto and from the customer the whole time they are either viewing or listening.**

We continue to provide spectrum planning and licensing assistance for ad-hoc requests for optimisation of existing television transmission infrastructure, as well as facilitating trials of new television transmission technologies.

We provide information about television reception and interference on our website and manage the mySwitch website, a public television coverage data portal with address-specific information about television coverage and access to Viewer Access Satellite Television (VAST). We also provide interference diagnostic services where external interference is the cause.

The [myswitch](#) website needs to be updated to match post restack. Brisbane Sydney and Perth because the community TV stations were supposed to go to the internet which caused then to go broke. The recommended antenna is a band 3 VHF only Yagi-Uda or a Log Periodic. Since the site recommends a VHF/UHF antenna, for those viewers, half of their antennas receive nothing. What a waste of aluminium and money. Only Melbourne and Adelaide are still on air with the licences expiring next year.

In the transmitter listings on the myswitch site, remove the appropriate community TV transmitter allocations and remove the TXA Willoughby Site Tower 15 Richmond Avenue WILLOUGHBY allocation as the tower has been replaced by apartments. It is also still in the transmitter spreadsheet. The myswitch website should be linked to the current transmitter spreadsheet which is usually updated monthly.

For vertically polarised strong signals a phased array antenna should be recommended not a Yagi-Uda or a log periodic shown as an option because there is no protection from reflected signals from beside the antenna. Reflected signals causes unreliable reception. For strong vertically polarised signals a 2 bay antenna should be enough. In horizontally polarised signals the Yagi-Uda & LPA provide protection against delayed signals from beside the antenna. For weak signals 4 bay phased arrays should only be recommended for weak horizontally polarised signals and high gain Yagi-Uda antennas for vertically polarised signals

To the ACMA's credit, all high-powered sites have allocated A, B, C, D, E which are 6 channel blocks each. Unfortunately the antennas sold in Australia are of European designs which cover 470 – 526 MHz and 694 – 862 MHz which are not used for TV here. This makes antennas less sensitive less directional and perhaps cost more, because they have added a filter to remove the 700 MHz band phone frequencies.

Myswitch for remote areas and blackspots does not tell you the transmission frequency, dish size, elevation and azimuth required to set up a VAST satellite receiver for the requested location.

The myswitch website software should also show [DAB+ coverage areas](#) including repeaters, and it could also be used to plan Band 1 and perhaps Band 2 DRM.

For radio spectrum planning, we are progressing with the priorities outlined in the [future delivery of radio](#) report.

Our current radio broadcasting planning priorities are:

- > converting commercial, national and community services from AM to FM where FM spectrum is available. It would be much more fruitful planning for regional Band 1 DRM channel allocations. Particularly that the ABC/SBS will need 6 consecutive 100 kHz DRM channels all vertically polarised radiated from all high powered TV transmitter sites except in DAB+ areas. Low powered community broadcasters in DAB+ areas will also need to be allocated a DRM transmission channel, although it can be shared at the same site. Similarly to the smooth conversion to digital TV, the ACMA will need to use their propagation prediction map on the MySwitch website but set to band 1 frequencies and an antenna being only a metre above the ground, along with the typical sensitivity of receivers for reliable reception. Once transmissions start field checking will prove its accuracy.
- > enhancing coverage of national, commercial and community broadcasting services where spectrum is readily available.

Band 1 is currently vacant, worldwide, so the new DRM transmissions can start without having to reduce power to prevent interfering with existing FM broadcasts. It also means that existing broadcasting is unaffected until a predicted switch off date which will be well known to importers and broadcasters.

- > making digital radio channel plans for regional DAB+ if a commercial licensee or national broadcaster has committed to a rollout. As previously mentioned this is very difficult to provide an equivalent coverage to AM or even FM. DRM can produce equivalent coverage to FM but using 10th of the power of FM.

supporting trials of new broadcasting technology. The ACMA did licence the ABC testing of MF and VHF DRM for 2 years, but they have not published the result despite the ABC allowing it. The Emergency Warnings on DAB+ trial that Grant Broadcasters performed in Darwin has disappeared from public view.

These broad categories of activity inform how individual requests for planning and allocation activity are prioritised.

Recent developments

We have:

- > decided on the best way to replan analog radio services in Perth to address the AM reception problems due to Perth's unique geographic circumstances and to maximise spectrum efficiency. We continue to engage in targeted consultation with the ABC and commercial radio broadcasters in Perth to progress replanning the Perth FM radio band. The Licence plan released last year acknowledged the poor coverage of AM due to the sandy soil. All broadcasters other than council only community coverage have been transmitted since 2009. Stop wasting your time and switch off all AM and FM. The ABC now knows that there are main and standby AM transmitters at Dalwallinu, Northam, Wagin and Busselton so there is no need to expect the ABC Perth transmitter to cover surrounding areas. If all AM and FM transmitters in DAB+ areas will allow the switch off of 71 ABC/SBS, 106 commercial and 86 community/HPON transmitters. For Perth it is respectively ABC/SBS 8, Commercial/Community 15. This leaves SEN and Racing Radio still on the AM band. Band 1 DRM would be useful for them because they can transmit race results including the photo finishes to radios live.
- > adopted planning principles for AM to FM conversions in regional licence areas, which will guide how we plan conversions of commercial radio broadcasting services in regional radio licence areas as we expand the current AM to FM conversion program. If the car industry can convert from petrol to electric/digital, it's about time that cars become all digital and use DAB+ and DRM instead of analog AM and FM. Plan for the digital conversion instead.
- > engaged with commercial radio AM licensees in competitive regional radio markets that had expressed interest in the AM to FM conversion of their AM services and advised them how to progress their applications. Organise a convention on digital radio and invite the DRM non-profit consortium to give information sessions and demonstrate the latest equipment. Communications with stakeholders including listeners on the progress of the DRM rollout is also important.
- > extended the spectrum availability for Low Powered Open Narrowcasting (LPON) services. There is plenty of spectrum in band 1.
- > finalised variations to the Murrayville, Charleville and Mount Gambier LAPs. Murrayville Vic and Charleville Qld are both in the Eastern Remote area; See the comments in the table.
- > released a proposal for public consultation on the conversion of Tamworth commercial AM service to FM. Discussed already in other sites.
- > concluded the work relating to the viewer antenna survey initiative, funded from the Television Research and Policy Development Program. The survey work was conducted by external consultancies and included areas in Victoria, New South Wales, Queensland, Western Australia, and South Australia. The current qualifications for an antenna installer

<https://training.gov.au/Training/Details/ICTRFN202> does not contain any reference to determining from [myswitch](#) the most appropriate transmitter site which may even contain a recommendation to use the VAST satellite dish and receiver instead. As evidence it must be noted in Perth that even many new receiving installations use band 3 and UHF combined antennas when there have been no UHF transmissions from the main transmitter site for 10 years. There seems to be a lack of awareness of the existence of the UHF translators by antenna installers. This is particularly a problem in Mandurah (Population 108,000 people) also hills suburbs, and the coastal suburbs North of the Swan River. Some of whom are using VHF/UHF antennas pointed at UHF translators. The Toodyay is not in the Perth licence area. The translators should be fed from the same source as the Central Agricultural/Northam program feed.

- > licensed various incumbent broadcasting services and finalised the variation of the Remote Central and Eastern Australian Radio LAP to include Norfolk Island in Q2 2023, following the extension of Part 3 of the Broadcasting Services Act to Norfolk Island. [See comments in the table.](#)

The following activities have been funded from the Television Research and Policy Development Program:

- > engaging an external consultancy to test the performance of TV receivers under the different conditions that may occur in a potential future replanning of TV channels. This includes single frequency network (SFN) reception environments, including potential 'wider area' SFN operations using DVB-T2 and shared multiplex configurations. [the SFN of Currumbin, Gold Coast and Gold Coast Southern Hinterland used the same transmission channels existed until the channel restack. The transmission channels of the Gold Coast transmitters were changed. Already the remaining Currumbin and Gold Coast Southern Hinterland retained their directional antennas and different polarisation. Thus the Single Frequency Network was destroyed. Now the Central Coast NSW is the only one left. Do not share multiplexes to prevent the transmission of UHD by broadcasters..](#)
- > developing new methodologies for TV channel planning and tools to assist with any possible future restack planning under potential new shared multiplex arrangements. This work will deliver new planning methods and processes required for planning optimisation, including developing automated software planning tools and optimisation criteria. [The telcos force their customers to buy a new handset every 16 years because they bring out the next generation of telecom technology and switchoff the oldest one. Telcos do sell phones! As a result they have no problem requiring viewers to buy new TVs or new set top box. Why is the ACMA kowtowing to the telcos and punishing broadcasters who provide Australian content when streamers do not?](#)
- > undertaking preliminary work on licensing options under proposed new arrangements with shared multiplexing and assessing requirements for TLAPs. This work will consider the policy and regulatory implications of various licensing options. It will also consider whether any updates are required to the information in current TLAPs, as well as the operational procedures for potential variations to them. [As above](#)

assessing possible parameters and solutions for channel planning for potential new, shared multiplex arrangements for television services. This work will provide evidence to inform any possible restack channel planning framework and future planning principles, once the restack objectives have been set by government. [As above](#)

Activities planned for 2023–24

- > Engaging with commercial radio AM licensees in competitive regional radio markets that are yet to express interest in conversion, to advise of the updated planning principles for AM to FM conversions in regional licence areas and seek their interest in conversion. [Waste of time, go digital.](#)
- > Providing guidance notes and data for AM to FM conversions in regional competitive markets where requests are made, in accordance with the recently revised planning principles for AM to FM conversions in regional licence areas. [Waste of time, go digital.](#)
- > Commencing engineering assessments for AM to FM conversions in regional competitive markets upon receipt by the ACMA of engineering reports prepared by the broadcasters or their

consultants; these will be processed in the established order of priority, in accordance with the recently revised planning principles. [Reduce transmission costs and pollution instead by going DRM](#). One DRM transmitter can radiate the two programs from a commercial licensee. For Government funded broadcasters up to 5 transmitters can be replaced by one. For SBS outside of capital cities, Newcastle & Wollongong there is only self funded low power FM transmitters. Their programs can be transmitted on the ABC transmitters as well.

- > Progressing engineering assessments for AM to FM conversions in regional solus markets, as required. [Reduce transmission costs and pollution instead by going DRM](#). DRM transmitter can radiate the two programs from a commercial licensee for a larger coverage area for no extra cost.
- > Varying the Remote Western Australia Radio LAP. Commercial broadcasters be allocated a pair of high frequency DRM channels for each studio centre transmitted containing a geofence to limit coverage to the licence area. Programs are to be in stereo.
- > Varying the Remote Central and Eastern Australia Radio LAP. Commercial broadcasters be allocated a pair of high frequency DRM channels transmitted containing a geofence to limit coverage to the licence area. Programs are to be in stereo including content.

- > **The following tasks are already covered above.**
- > Making a determination of population figures under section 30 of the Broadcasting Services Act to account for updated Census data. [Covered previously](#)
- > Consulting on remaking or rewriting 4 broadcasting determinations due to sunset in 2024 and 2025.?
- > Finalising the variation of Tamworth and Mudgee LAPs for AM to FM conversions. [Already commented upon.](#)
- > Engaging with the broadcasting industry following requests for trials of digital radio and potentially issuing scientific licences for trials. [The ACMA should bring the DRM non-profit consortium to Australia to demonstrate the system and give information sessions to all interested parties including the ACMA, ABC, SBS, CBAA and Commercial Radio and Audio](#)
- > Update Australian standard [AS4943](#) to include a link to [ETSI Standards](#) and [ETSI Technical Standards](#) except where they are over-ridden by the unique Australian requirements such as DRM in all broadcast frequency bands from 2.3 – 108 MHz and all options including Emergency Warnings, Journaline and receivers to include GPS or Wifi to determine which side of the geofence the receiver is on. Quarter wavelength Band 1 antenna on vehicles needs to be required for maximum coverage area.

Engaging with the broadcasting industry following requests for making or varying digital radio channel plans and potentially consulting on these proposals. [Plan for DRM rollout to all non-DAB+ areas, and small community broadcaster in DAB+ areas.](#)

Conclusion

Update Australian Standard AS4943 to include DRM as well as dates for the beginning of broadcasting using this standard to start the import of compatible receivers and converters of automotive use in older vehicles.

The total conversion to main city DAB+, elsewhere DRM will;

- **reduce transmission costs**
- **pollution**
- **drastically reduce the price of providing backup electricity**

- enable the transmission of slide show for advertising and an electronic newspaper.
 - ABC/SBS will be able to provide to all Australians outside of the remote areas all 18 program types that only capital city dwellers have had for 14 years.
 - provide to remote Australians their first live talk radio for 6 or 19 years along with commercial radio whilst mobile.
 - Restore to remote areas much improved live radio when mobile outside of towns and villages, which they haven't had for up to 29 years.
 - Install standby digital transmitters on all major transmitter sites.
 - lastly but importantly, use DRM and DAB+ to provide reliable emergency warnings complete with maps and detailed instructions regardless of the number of simultaneous emergencies regardless of location because mobile phone/broadband cannot be relied upon.
-
- New EVs manufactured by BMW, Porsche, Audi, Volvo, Ford F-150 Lightning truck, Volkswagen SUV and Tesla Model S have dropped AM radio. Now Ford wants to also include petrol engine vehicles. There is pressure building in the USA to keep the polluting and expensive AM broadcasters afloat because of emergency alerts.
 - Australia could show the way by using pure digital radio (DAB+/DRM) to not only transmit alerts but also maps, detailed instructions which are indexed along with police road closures to get navigation systems to reroute drivers. For areas with poor UHF two way radio systems for emergency services transmit controlled access instructions to crews. For example, evacuate fire crews in rugged or remote country.

For Television

- Update Australian standards AS4933/AS4599 to include DVB-T2 and HEVC as well as dates for the beginning of broadcasting using this standard to start the import of compatible receivers and set top boxes.
- Correct and update the Myswitch website to match current allocations.