Submission by Free TV Australia Limited

Australian Communications and Media Authority

Clearing the Digital Dividend – Planning objectives and principles for restacking digital television channels

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1 Executive Summary

- Free TV welcomes the ACMA's findings that the 'Block' model offers tangible long-term benefits to viewers and broadcasters and that it should be adopted as the model for restacking digital television in Australia.
- Free TV broadcasters are committed to working closely with Government to ensure a smooth transition to digital services for all viewers and restacking within the agreed timetable, whilst maintaining a viable and robust free-to-air television platform.
- Free TV believes the 'Block' model offers the best implementation timeframe and maximises the restack cost-effectiveness, bringing long-term benefits to viewers, broadcasters and spectrum planners.
- We note the ACMA's findings that the implementation method will be the key factor affecting cost-to-implement and agree that a strategy based on the use of Temporary Retune Units or similar methods (determined on a case by case basis) should be pursued to optimize the restack implementation timeframe.
- Free TV supports the ACMA's proposed restack Planning Principles which, subject to some minor amendments, provide the appropriate framework for the detailed planning work that is required to implement a 'Block' restack approach.
- Free TV is preparing a detailed assessment of the ACMA's costing of the restack in Queensland and will submit this study separately. A significant amount of further work from all parties will be required to extrapolate costings for the restack Australia-wide and we look forward to working with the ACMA to this end.
- This submission also comments on the detailed planning and implementation issues raised in the ACMA Discussion Paper, including antenna issues, simulcasting, off-air feeds, single frequency networks and gap-fillers.
- As the Government is planning to auction the spectrum in the second half of 2012 for use in 2015, work must begin very soon and we therefore support prompt finalisation of the planning approach by the ACMA.

2 Introduction

Free TV Australia represents all of Australia's commercial free-to-air television broadcasters. Upcoming decisions regarding the radio frequency spectrum used by free-to-air broadcasters will determine the future of the industry and Free TV welcomes the opportunity to comment on the ACMA's Discussion Paper *Clearing the Digital Dividend – Planning Objectives and Principles for Restacking Digital Television Channels.*

The importance of free-to-air television broadcasting services to the Australian public remains high. Consumers continue to expect high levels of quality Australian and local content, free access to news and current affairs and free coverage of major sporting events. Content on the free-to-air platform continues to be more strictly regulated than other platforms.

On any given day, an average of more than 13.4 million Australians watch free-to-air terrestrial television. Free-to-air television reaches 99.7% of Australian households and 70% rely exclusively on free-to-air television. Virtually all Australian households rely on free to-air-television for some of their television services. The majority of households (68%) have two or more TVs.

Free-to-air television is highly valued by viewers and continues to deliver a range of public interest outcomes.

The overwhelming majority of Australians rely exclusively on free-to-air services for their television and it is they who will be disadvantaged if the analogue switch-off and restack processes do not deliver a strong digital free-to-air platform that is of at least as good a quality as the current analogue system.

As noted in the ACMA Discussion Paper, restacking "will be a major undertaking, requiring coordinated changes to hundreds of sites and thousands of services across in the country in a relatively short period of time."[1]

Given the potential disruption the restack represents for viewers and broadcasters, the restack and planning of the redefined Broadcasting Services Bands (BSBs) must maximise viewers' ability to receive digital free-to-air television services.

To this end, Free TV broadcasters have developed and advocated a detailed methodology for a 'Block' planning approach.

The 'Block' plan proposes allocating five blocks of contiguous channels for all six multiplexes (commercial broadcasters, national broadcasters and Channel A spectrum) - which we believe will remove many legacy planning problems.

In the restack, we have a rare opportunity to fundamentally change the spectrum plan for the good. Free TV believes that at the conclusion of this restack, if the correct model is chosen, Australians can have the very best chance possible to receive high quality Digital services into the future.

Under 'Block' restack proposal, viewers across Australia would receive all of the Freeview digital TV channels in their region across a spread of 6 contiguous channels or 42 MHz. – bringing a more reliable TV service that is also easier for spectrum planners to manage.

[1] Discussion Paper p 20

Within this approach, it is possible to take into account existing transmission and receiver infrastructure in each licence area, so as to minimise the need to replace equipment.

Free TV therefore welcomes the ACMA's detailed analysis of the 'Block' planning approach as compared to the 'minimum moves' planning model. The importance and scale of the restack project means it must be undertaken against the background of thorough, informed analysis about the best planning and implementation methods.

Free TV strongly supports the ACMA's preliminary view that the 'Block' planning approach has real long-term benefits and should be adopted in planning post-restack spectrum allocations.

Free TV expects there will be opportunities for further optimisation and refinement of the planning approach during the detailed planning phase that will follow ACMA's final decision-making.

As the Government is planning to auction the spectrum in the second half of 2012 for use in 2014, with so many sites to be modified work must begin very soon. We therefore support prompt finalisation of the planning approach by the ACMA.

This submission addresses the following issues as raised in the Discussion Paper:

- ACMA's proposed restack objectives;
- Model comparison
- Costs
- ACMA's proposed planning principles
- Specific planning issues
- Implementation

3 ACMA's Proposed Restack Objectives

Free TV welcomes the proposed restack objectives listed in part 3 of the Discussion Paper and believe they offer a comprehensive framework in which all relevant issues can be considered.

In particular, we welcome the objectives which provide for maintenance and improvement of digital coverage, simplified viewer reception and planning arrangements which support future needs.

Consistent with the 'Block' model approach, we propose an additional objective that planning provides for six channels in a single contiguous frequency range.

We also suggest removal of the words 'aim to' in the objectives relating to coverage, reception and future planning. These are key issues and the objectives should be clear and unequivocal. This applies particularly to digital coverage where the 'same coverage' requirements make words such as '*aim* to maintain' inappropriate.

4 Model Comparison

We welcome the ACMA's comparative analysis of the 'minimum moves' model and the Free TV developed 'Block' approach. Given the size and scale of the restack project, it is appropriate that a thorough analysis of potential planning approaches is undertaken.

Consistent with our advocacy of a 'Block' planning approach, we strongly support ACMA's finding that "overall, adoption of a block planning approach would appear to have modest but real long-term benefits compared with minimum moves."[2]

In particular, we welcome the findings that:

- At most, there would only be minor differences in implementation costs under either planning approach;[3]
- The Block model is expected to be quicker to implement than the minimum moves planning approach and has the advantage of less complex project and risk management;[4]
- The Block model will assist in equalising coverage;[5]
- The Block model could allow smaller and simpler antennas to be used by viewers;[6]
- The Block model offers benefits in terms of the ability of broadcasters to make use of off-air inputs.

Free TV believes that if a 'Block' model is confirmed as the planning approach for the restack, Australians will have the very best chance possible to receive high quality digital services into the future.

5 Costs

Free TV has considered the costing model developed by the ACMA in cooperation with consultants Kordia. A separate report will be provided outlining the Free TV assessment of the ACMA's cost study (TPS2011/01) as soon as possible. For the purposes of comparison with the Kordia study, costings on alternative methodologies will be undertaken on the same set of transmitter sites, even though some of these sites may not be implemented.

As a general comment, a significant amount of further work, between the ACMA and broadcasters and service providers, will be required before any Australia-wide cost estimates can be considered as accurate.

It is not until the final channel and frequency assignments are allocated Australia-wide that we will be able to conduct a site-by-site analysis and calculate precise costs.

[2] Discussion Paper p 19
[3] Discussion Paper p 15
[4] Discussion Paper p 16
[5] Discussion Paper p 18
[6] Discussion Paper p 19

For example, the cost model includes the costs associated with band changes at the Wide Bay transmitter – a work item that attracts a substantial cost. Until the detailed, area by area frequency plan is developed, we can't know for sure how many similar situations will arise Australia-wide. In addition, the model includes proposed gap fillers, the details of which have not been finalised at this stage.

Free TV looks forward to working closely with the ACMA, service providers and national broadcasters to refine and further quantify the cost impact of restacking.

6 Proposed Planning Principles

On the whole, Free TV welcomes the ACMA's proposed planning principles. Subject to some amendments, they will provide the appropriate framework for the detailed planning work that is required to implement a 'Block' restack approach. We offer the following comments on the individual principles.

6.1 Principle 1

Replan digital television services to use VHF channels 6 -12 and UHF channels 28-51

Free TV notes this is consistent with the Ministerial Direction and offers no further comment. However, as previously stated by Free TV, a successful switchover and restacking process will mean little if broadcasting services are subject to unacceptable interference from new services in the Digital Dividend spectrum.

6.2 Principle 2

Create a digital radio sub-band, comprising of VHF television channels 9 and 9A, that is clear of digital television in metropolitan and regional licence areas. Where practicable also avoid planning new services on these channels in remote licence areas

Free TV notes that this principle is consistent with the Ministerial Direction.

We note the ACMA's findings that this sub-band option will create the least disruption. However, it should be noted that the creation of a digital radio sub-band in the proposed channels will nevertheless have implications for existing planned television services and hence, viewers.

Services in Bathurst (CTC), Western Victoria (BCV), Manning River (NEN), Broken Hill (BKNSCN), Wide Bay (TNQ) and sites in Regional/Remote WA (Broome, Carnarvon, Howick, Cue, Derby, Halls Creek, Kalbarri, Kalgoorlie, Kununurra, Meekatharra, Mount Magnet, Mullewa, Newman, Norseman, Pannawonica, Parraburdoo, Port Headland, Ravensthorpe, Roebourne, Southern Agricultural, Southern Cross, Tom Price, Wyndham, Yalgoo), will need to be relocated so as to avoid T-DAB into DVB-T interference.

6.3 Principle 3

	Plan for six digital channels at each transmission site, except for:
i)	Licence area overlaps where two sets of three commercial services will require channels (a total of nine channels)
ii)	Where broadcasters operate from different sites but cover the same area

Free TV notes this is consistent with the Ministerial Direction and submits that the principle should refer to planning for 'six contiguous channels' at each transmission site, consistent with the block planning model. Where nine channels are required, the adjacent upper or lower three channels from an adjacent block should be allocated, thereby creating a contiguous block of nine channels.

6.4 Principle 4 and Principle 5

Plan channels so that viewers in metropolitan and regional licence areas can receive all services in a single band (ie, either all VHF or all UHF channels). Consider the benefit of single band operation in other areas on a case by case basis

Plan all six services on channels within defined blocks of channels

Free TV strongly supports Principles 4 and 5 as they set the groundwork for a 'Block' model restack.

As previously noted, the benefit of single-band planning is to equalise coverage between broadcasters arising from the different propagation characteristics across the BSBs. It will ensure that if a viewer receives one service, they are likely to receive all services in the area.

Free TV welcomes ACMA's finding that the use of six contiguous channels results in the most consistent coverage possible between broadcast services due to the minimisation of propagation difference between channels which occur as a result of a wide spread of channels.[7]

This approach will simplify viewer reception as viewers will no longer need multiple antennas, instead requiring only one single-band antenna. As noted in the Discussion Paper, a reduced span of channels could make it simpler for antenna installers optimise antenna installations.[8]

Free TV is willing to work with the ACMA to address any further work that is required to implement this planning Principle, such as the need to increase the power of some services, or upgrade facilities to accommodate increased power levels.

6.5 Principle 6

Assign channels within a block as follows.

VHF: Existing VHF services to retain current channels unless they have to move to clear channels 9 and 9A under Principle 2.

UHF: Channel assignments should be made after considering and balancing a number of objectives including:

[7] Discussion Paper p 39
[8] Discussion Paper p 39

i) Avoids off-air input issues, ie, n+5
ii) Avoid changes to existing services already in the assigned block
iii) Uses Channel A as a buffer to manage block/band edge issues
If none of the above, then follow the order: SBS, ABC, Seven, Nine, Ten, Channel A

Free TV provides qualified support for Principle 6.

As noted in the ACMA's Discussion Paper, there is a need to avoid adjacent channel off-air inputs, which are the primary source of program feeds in many service areas for commercial broadcasters. National broadcasters have less of a reliance on off-air input feeds than commercial broadcasters and would therefore be affected to a lesser degree by a channel assignment order which places their services at or near the block edge

At present, the national broadcasters rely to a greater degree on satellite distribution to their rural and remote sites. Whilst this may not always be the case, their national satellite capabilities provide a ready solution to off-air feed issues and this solution is not available to commercial broadcasters.

Free TV therefore wishes to propose an alternative channel assignment order of ABC, Seven (or affiliate), Nine (or affiliate), Ten (or affiliate), SBS, Channel A.

Free TV also supports the allocation of the unassigned channel at either the top or bottom of a frequency block as a buffer or guard channel as a good planning principle. However, consideration must be given to the fact that at some stage, this channel may be used for additional services in some areas (or used as a transition channel for the introduction of new technology by existing broadcasters). This would immediately make it unsuitable for use as a guard channel.

However, the need for a guard channel to enable off-air feeds only occurs in instances where the input is from an adjacent block. For example, block B feeding block C. But would not be required if block B fed blocks D or E. As noted in section 4.8 of Engineering Report TPS2011/01, there are only limited instances where a guard channel is required due to adjacent channel off-air feeds – 25 instances in the minimal moves plan and only 7 instances in the block model. In these cases, alternative input arrangements would be required.

The placement of the unassigned channel at the top edge of Block E may also be required to address potential interference issues. As noted in Free TV's response to the ACMA Discussion Paper *Spectrum Allocation in the 700 MHz Digital Dividend* we have serious concerns regarding the potential for new services allocated adjacent to the band-edge to interfere into digital television services operating below 694 MHz.

Extensive studies in Europe have demonstrated conclusively that without significant mitigation strategies, conventional duplex services will interfere into digital television.

Studies undertaken by the European Broadcasting Union and Free TV Australia regarding the potential interference impact from UMTS into DVB-T near the edge of the coverage area indicate that interference could impact as low as channel 49.[9]

[9] http://www.itu.int/md/R07-JTG5.6-C-0084/en

Free TV has called on the ACMA to ensure that best practice interference management strategies are employed to protect broadcasting services from potential interference from new services operating in the Digital Dividend. This must include protection of channel 51 services to the same extent of any other DTTB channel.

Until it is made clear what interference management measures will be put in place, Free TV will remain cautious regarding channel allocations at the upper end of proposed Block E.

A valid case exists to deliberately place a service in Channel 51 to confirm it was established as, and continues to be, a protected channel once new services commence in the adjacent Digital Dividend Spectrum (to ensure there is no degradation of the adjacent services over time).

Accordingly, Free TV proposes that Principle 6 should be reworded as follows:

Principle 6: Assign channels within a block as follows.

VHF: Existing VHF services to retain current channels unless they have to move to clear channels 9 and 9A under Principle 2. New or changed channel assignments do not need to follow any particular order, except in all Metropolitan areas where SBS should move to channel 7. Where it is possible without moving existing services, channel 10 should be the unassigned channel to align with the metropolitan area unassigned channel.

UHF: Channel assignments should be made after considering and balancing a number of objectives including:

- *avoiding off-air input issues (adjacent channel and N+5)*
- *avoiding changes to existing services within the block*
- *using the unassigned channel an interim buffer to manage block/band edge issues at either the top or bottom of the block (to assist with off air inputs adjacent to transmitted block).*

If none of the above issues apply, UHF channels should be assigned in the following order: ABC, Seven (or affiliate), Nine (or affiliate), Ten (or affiliate), SBS, Unassigned.

6.6 Principle 7

Avoid use of Block B where there is no current or past use of UHF Band IV channels. Where this cannot be avoided, minimise the total population affected

Free TV supports this Principle but notes that the proposed restriction on using Block B should be analysed on a case by case, area by area basis. There may be some difficulty in finding alternate spectrum in some spectrum congested areas and it may be necessary to consider Block B in these areas notwithstanding the potential viewer impact. This includes current DTTB services allocated in upper Band V, such as Coffs Harbour, Rockhampton and Rosebud.

6.7 Principle 8

In selecting the channel block for a transmission site, consider the channels used by existing digital services and information available on the operating frequency range of broadcaster transmission equipment

Free TV supports this principle as it is consistent with the methodology applied in the development of the 'Block' restack model.

This principle needs to be implemented through a thorough area-by-area analysis of the transmit and receive antenna populations, so as to minimise viewer disruption and maximise reception quality.

Free TV has concerns with the Band changes proposed by ACMA at Mt Hopeful, Mt Blackwood and Mt Goonaneman.

At Mt Blackwood, the ACMA propose a conversion from VHF to UHF. If this were to occur, there would be knock-on effects for child sites. This would create the need for expenditure to improve the reliability of the input signal, particularly for Bowen Town and Collinsville and possibly at other child sites in that market. Existing VHF receive antennas and channelised filtering at some child sites would all need to be replaced as a consequence.

At Mt Hopeful any change from UHF to VHF would involve considerable expense for broadcasters particularly as transmit base power is relatively high there and our preference is to stay on UHF.

Further comments regarding Mt Goonaneman can be found in Section 7.11.

6.8 Principle 9

Break up wide-area SFNs known to have associated reception problems and minimise use of new SFNs where possible

Free TV supports Principle 9 as it acknowledges the need to break up wide-area SFNs to resolve long-standing reception issues. This 'wide area SFN' approach (nominally beyond the guard interval distance) has been used for DTTB planning in defined coverage areas. Free TV has consistently advocated for wide-area SFNs to be addressed. SFN performance is limited to distances corresponding to the guard interval of the particular transmission mode being used.

This principle need to take into consideration SFN planning to within 1/16 guard interval distances. Where wide area coverage is provided by a single site (ie, Bald Knob or Mt Tamborine), these sites need to be assigned to an alternate block than the SFN channels.

6.9 Principle 10

Plan on the basis of broadcasters using the DVB-T standard with transmission parameters of 8k, 64QAM, ¾ forward error correction (FEC) and 1/16 guard interval. As a consequence of this Principle, the minimum median field strength values are revised to:

VHF Band III	UHF Band IV/V (continuous)
Rural 44 dBuV/m	Rural 50 dBuV/m
Suburban 58 dBuV/m	Suburban 64 dBuV/m
Urban 67 dBuV/m	Urban 72 dBuV/m

Free TV welcomes the proposed transmission parameters as they would maintain the current industry practice, which has been necessary to support the data rates required for multiple program streams within a 7 MHz channel. As noted in the Discussion Paper, channel planning for the introduction of digital television was based on a bit rate of 19.3 Mbits/s. However, most broadcasters have adopted the higher bit-rate transmission parameters of 8k, 64-QAM, ¾ FEC and 1/16 GI (a bit rate of 23.0 Mbits/s) to achieve this higher data rate.

It is noted that taking the UHF Bands IV/V boundary down to Channel 51 reduces the combined band span to a similar ratio to Band III. The frequency ratio of the combined band is 694/520 = 1.335 and the digital allocations in Band III span 230/174 = 1.322; supporting a view that as one set of planning values have sufficed for Band III, one set of planning values will suffice for the combined Band IV/V. Conveniently the new band limits approximate a multiple of 3 of each other: 174 x 3 = 522, 230 x 3 = 690 and there are 8 VHF channels and 24 UHF channels.

However, elements in the link path to a digital television receiver increase with frequency, including the path loss, which also depends on distance from the transmitter, the antenna gain and the feeder cable loss.

Information provided to Free TV by Australian antenna manufacturers indicates that the currently deployed band IV/V yagi antennas in Australia exhibit a gentle increase in gain of 4dB from low Band IV to the maximum value in the current upper Band V and then a fairly sharp roll-off above this frequency. Between channels 28 and 51, these antennas have an increase in gain of approximately 2.7dB. Whilst these gains and losses compensate to some extent for each other, overall the difference across the band is approximately 1 dB.

Frequency effects would be evident on shaded or long link paths where the receiver is operating near threshold with the upper channels being impacted first.

Viewer's antennas do require this higher gain at higher frequencies to compensate for the increased path loss.

There are also consequential changes to minimum medium field strengths proposed (refer to Table 2 on p 26 of the Discussion Paper). For VHF and Band IV channels, the outcome is either 'no change' for rural areas, or a 1 dB increase for the suburban and urban cases. This change essentially reflects the impact of rounding of the accumulated numbers that are slightly different in aggregate from the original parameter values.

For Band V channels, the outcome is a reduction in E_{min} of 4 dB (rural), 3 dB (suburban) or 2 dB (urban). These changes reflect the impact of reduced bandwidth across the narrowed Band V span and the small improvements in

assumed notional receiving system performance that appear to have occurred since the original planning studies were undertaken.

The ACMA notes that one unexpected outcome of the proposed Band V E_{min} changes is that locations previously receiving signals below the original E_{min} level, but above the proposed Band V E_{min} level (and thus not considered to have acceptable reception) would not be considered to have adequate reception.

This situation raises a question as to the existence, or otherwise of evidence (complaints) of inability to receive upper Band V digital services at locations where Band IV or lower Band V services are providing acceptable reception.

Many of the Australian planning parameters for DTTB were developed in Europe and applied in Australia. The ACMA has declined to consider, at this time, the inclusion of factors such as time availability, additional man-made noise allowance, allowance for ambient temperature in Australia being higher than in Europe and additional allowance for multi-path propagation. The ACMA correctly notes that any substantial increase in E_{min} (such as might flow from these adjustments) implies a need for additional ERP (or more transmitter sites) to cover the implied loss of coverage.

Free TV has previously indicated a preference to retain separate E_{min} values for Bands IV and V. The technical data regarding receiver performance does not appear to support the ongoing need for such a difference in E_{min}.

Or if the outcome of the current process is to adopt the 'block' model, then an extension of the Free TV position would be the adoption of different E_{min} values for each UHF channel block or pairs of blocks (ie, for channels 28-39 and 40-51).

Given the discussion above, Free TV would request the following format for the parameters, to illustrate the frequency band ranges:

VHF Band III (174-230MHz)	UHF (Bands IV and V) (520-694MHz)

Also, Free TV welcomes the ACMA acknowledgement that this issue requires further discussion.

6.10 Principle 11

Equalise transmissions across all broadcasters as far as practicable through planning on the basis of equal ERP levels, identical antenna patterns, closely sited transmitters and all broadcasters having the same SFN arrangement

Free TV supports the concept of Principle 11, noting:

i) The ERP variations as discussed in Principle 10; and

ii) it is consistent with work initiated by stakeholders in regards to the development of DTTB Transmission Standard AS4599.

Free TV also notes this principle will equalise the SFN arrangements between broadcasters and remove anomalies such as the current limitation on Network Ten

in Melbourne. Under the current arrangements, Network Ten have one less channel allocated compared to other broadcasters and accordingly have had to operate a wider SFN than other broadcasters.

6.11 Principle 12

Determine the timing constraints on channel availability and specify a minimum window of six months, where practicable, when both the current digital and the final digital channels are available. When all sites and timing windows are considered together, they should result in the digital dividend channels (52-69) being cleared as soon as practicable, and by the end of 2014 at the latest.

Free TV supports an efficient and timely restack process and provides in-principle support for Principle 12.

Further discussion and analysis is required to ensure the proposed timing window of 6-months (minimum) between when the current and final digital channels are available provides a sufficiently flexible period for broadcasters to implement the restack. The order and size of timing windows should be coordinated with the ASO timetable and Free TV looks forward to further detailed discussions regarding planning and implementation of the restack.

6.12 Principle 13

Wherever sites utilise UHF channel blocks, attempt to place higher power services on lower UHF channel blocks

While Free TV supports this approach in principle, we note that the ACMA has acknowledged it may not be possible to implement it in all areas.

There will be some spectrum congested areas, particularly south-east QLD and the central coast of NSW – both service overlap areas, where Block E would need to be used for some high-powered services.

In addition, other metropolitan areas such as Melbourne and Adelaide will require use of all blocks once self-help sites are converted to digital and gap fillers are installed to supplement digital deficient areas (limiting the choice of blocks to be sued for higher powered services). If over time more DTTB service overlap areas develop adjacent to major population centres, this principle may need to be reconsidered so that the full range of the redefined BSBs is protected and available for full use by DTTB.

7 Specific Planning Issues

The ACMA Discussion Paper includes discussion of specific planning issues arising from its consideration of the 'Block' and 'Minimum Moves' planning approaches.

Free TV offers the following comments.

7.1 Retention of spectrum for digital radio

Free TV notes that the discussion of a digital radio sub-band in section 5.2.1 of the ACMA Discussion Paper is consistent with the Ministerial Direction to the ACMA.

Free TV supports the allocation of Channels 9 and 9A to T-DAB as this will cause the minimum disruption to other services, particularly in the metropolitan areas.

Free TV is aware of proposals for an extensive roll-out of T-DAB in regional Australia. A key consideration in any consideration of such a proposal must be the geographical separation distance between regional T-DAB and metropolitan DTTB.

Free TV is also aware of plans by Commercial Radio Australia to implement on channel repeaters for T-DAB. Widespread use of on-channel repeaters may create reception problems in areas where the wanted DTTB signals are low and near a T-DAB repeater. Accordingly the allocation of ensembles within Channels 9 and 9A should where possible avoid use of Channel 9 Ensemble A and Channel 9A Ensemble D to allow some small guard band between the services. As broadcasters will have translator sites to supplement VHF digital deficient areas, where practical any T-DAB on channel repeater should be located at the DTTB repeater site.

Use of Channel 9 and 9A by T-DAB may also benefit the re-transmission of DTTB on MATV systems allowing Channels 6 - 8 and 10 -12 to be filtered, equalised and amplified as two sub-bands and hence optimise performance of the MATV system. This would not be possible with the other band options presented in the ACMA Discussion Paper.

7.2 Channel assignment issues

Free TV's views regarding the channel assignment issues raised in section 5.2.2 of the ACMA Discussion Paper are discussed in section 6.5 of this submission (in relation to Principle 6). Free TV's view is that if none of the other issues raised in Principle 6 apply, UHF channels should be assigned in the following order: ABC, Seven (or affiliate), Nine (or affiliate), Ten (or affiliate), SBS, Unassigned.

7.3 Restack planning technical parameters

The Technical parameters to be used in restack planning are discussed in section 5.2.3 of the Discussion Paper. Several issues related to the technical parameters are discussed under Principle 10.

Free TV welcomes and fully supports the ACMA proposal to adopt the transmission parameters used by most broadcasters as the new basis of planning. As a consequence of this change, we welcome the ACMA's acknowledgement that the co-channel Protection Ratio will need to be changed. As noted in the Discussion Paper, Free TV proposes a value of 22dB and the ACMA are proposing a value of 21dB. We suggest further consultation on this matter to finalise the value. These discussions should also include finalising the minimum median field strength values for planning.

7.4 Use of SFNs

As discussed in Principle 9, Free TV supports the break-up of SFNs where possible, to equalise the use of SFNs and standardise the timing for SFNs between broadcasters.

7.5 Antenna issues

"The ACMA would welcome data on the types and percentages of antennas typically installed in each region to assist in estimating the number of viewers that may be affected if this issue (redundant Band V antennas) cannot be avoided"

In section 5.2.5 of its Discussion Paper, the ACMA notes potential performance issues with Band V antennas where services have been restacked into Band IV. In addition, Planning Principle 7 states that restacking services into the lower UHF Band (Block B) should be avoided unless Band IV channels are currently in use or have recently been in use.

This should be assessed on a case-by-case basis to ensure that the assumptions applied for the existing/deployed household antenna population in an area are correct.

Free TV encourages the ACMA to consider either surveys of existing populations or close consultation with antenna manufacturers re deployed antenna statistics and characteristics.

7.6 Equalising coverage between broadcasters

In section 5.2.6 of the Discussion Paper, the ACMA notes that one of the benefits of the block planning proposal is to equalise coverage of services between broadcasters. The Discussion Paper notes the example of Newcastle with a current spread of channels from 36 to 53 but does not agree that a reduced span of channels in this instance would be a valid means of resolving all reception complaints.

Over many years commercial broadcasters have investigated complaints in the Brooklyn area served from the Bouddhi translator with services over a digital metro channel spread from 34 to 65. The national digital services are on the lower channels, interspersed with the commercial analog channels and vice versa at the top of the band. The overwhelming feedback from viewers at Brooklyn indicate they watch national digital services and commercial analog services. Recently the site owner confirmed the antenna array has a pattern change with frequency of 4.3dB from channel 37 to 65 and a further 5dB of differential diffraction and other propagation losses. The Brooklyn residents offer a case in point, having 'equalised' their coverage by selecting a mix of analog and digital services spread from channel 34 to 50, rather than suffer a difference of 10 dB in received field strength (placing some services below threshold).

Equalisation of services in this manner is therefore desirable. However, it should be noted that in licence overlap areas, there may be two antenna patterns used to ensure the one transmitter site provides services as licensed, providing as near a practical equal coverage within the specific overlap region. For example, Mt Tamborine has two transmit antenna arrays, providing metro and regional patterns. National broadcaster services are on one pattern only with is appropriate. However, there could be viewers who do not have 9 'equalised'

services due to the differences in antenna patterns. For the small number of viewers potentially affected, Free TV contends that the intention of Principle 3 is satisfied in that a viewer should have at least two national services and the current three commercial services, and the national broadcasters do not need to transmit on both antenna systems in overlap areas where different patterns are employed.

7.7 Simulcasting

"What period of simulcasting would be required to change most MATV systems in the Brisbane, Sunshine Coast and Gold Coast region and other major population centres? What changes to MATV systems will need to occur as a result of the restack? Will less complex systems also reqire changes or other interventions by technicians?"

Simulcasting has a discrete but important role to play in minimising the viewer impact of the restack. Whilst simulcasting may add cost and time to the restack process in chosen areas, those costs will not outweigh the scale of viewer disruption that would arise if no simulcast was implemented. The impact of the restack on MATV systems is likely to be significant and this topic requires considerable further research.

Free TV is not advocating widespread simulcasting during the restack period. In proposing simulcasts as part of the overall restack strategy, the driving principle is to ensure viewers do not suffer significant disruption to digital television services. To this end, single night switch-over is the preferred method of implementation as it involves the least disruption to viewers.

Simulcasting is likely to be beneficial in areas where there are large numbers of multi-dwelling units, hotel systems and other systems such as community distribution systems in the coverage area. After analysis of the data presented in Annex 5 of Engineering Report TPS2011/02, (noting that any move from UHF to VHF will have an implicit simulcast period) Free TV considers that UHF/UHF simulcasting is likely in areas serviced by the following sites:

- QLD – Gold Coast (including Mt Tamborine, Currumbin and Springbrook)
- NSW – Manly, Kings Cross and Gosford
- VIC – South Yarra
- SA – Grenfell Centre,

Consideration will also have to be given to some of the proposed metropolitan gap-filler sites, which may have to operate in an SFN with some of the above sites.

Free TV agrees that the simulcast period should be as short as is necessary to allow technicians to carry out the necessary work on MATV systems in the area.

When simulcasting digital-digital services in an area, it is essential that all broadcasters are treated equally. That is, if one affected broadcast service is providing a simulcast, all other services requiring restack at that transmission site should also provide a simulcast.

Free TV is yet to consider in detail the extent of simulcasting that will be required and in which areas but looks forward to working with ACMA and other stakeholders to determine detailed requirements.

We encourage the ACMA to consider close consultation with the antenna installation industry regarding the advice that managers of MDUs will need to address required changes in MATV systems.

7.8 Gap fillers

Section 5.2.9 of the Discussion Paper recognises the need for spectrum planning which supports future spectrum uses – one such future use is the possible deployment of additional transmission sites or 'gap fillers' after the initial restack planning process is complete.

The Block planning approach clearly has the potential to successfully introduce gap-fillers in spectrum congested areas. It achieves this through the potential channel allocation for gap fillers in adjacent channel blocks.

However, Free TV agrees there does not appear to be any fundamental difference in the ability of either planning approach to accommodate additional gap filler services, as demonstrated by the inclusion of Brisbane region gap fillers in both of the indicative restack digital channel plans that have been provided in Engineering Report TPS 2011/01.

7.9 Adjacent channel off-air feeds

Commercial television services in regional areas rely on off-air feeds to supply program inputs to broadcaster transmitters at many sites, as indicated in section 5.2.11 of the Discussion Paper.

Whilst alternative means of providing program inputs are available, they are considerably more expensive and are therefore not preferred, particularly at small sites covering small populations where the commercial viability of more expensive options would be questionable.

The Block model, together with the Free TV proposed channel assignment order (which locates commercial broadcasters away from the edges/top edge of the channel blocks) will maximise the feasibility of off-air channel inputs (refer to the discussion of Principle 6, above).

7.10 Non-broadcasting services in the redefined BSBs

The ACMA Discussion Paper notes the comparative merits of the 'Block' and 'minimum moves' planning approaches in terms of their capacity to support future spectrum uses. This is taken to include non-broadcasting services (eg, wireless microphones) and potential new applications.

Free TV considers the following needs to be confirmed in relation to the planning of the digital television services in the restacked BSB:

- DTTB services should continue to be planned as sole and primary services in the bands 174-230 and 520-694 MHz
- Any secondary applications in 520-694 MHz operate under the regulations for Low Interference Potential Devices

- DTTB services in UHF channel 51 (687-694 MHz) be applied with the same protection as any other DTTB channel.

We would welcome further clarification from the ACMA in relation to the longevity of the technical parameters being established for the restack of UHF broadcasting services, as there might be some contradictions when sharing the band between secondary LIPD devices (wireless microphone and biomedical telemetry devices) and what is being proposed as cognitive 'white space' devices in the future.

7.11 Wide Bay and Rockhampton

In the ACMA engineering report TPS2011/01, the ACMA proposes all Wide Bay services may need to move to UHF.

The channel plans developed by the ACMA for the Block planning approach include rearrangement of the frequencies in Wide Bay and Rockhampton, on the basis of likely co-channel interference between Brisbane and Wide Bay.

Brisbane metro and Queensland regional commercial broadcasters seek further discussion with the ACMA on this proposal. In particular, there should be field surveys in the northern Brisbane metro coverage area to determine if regional re-arrangement is required to help protect certain parts of northern Brisbane in a co-channel DTTB/DTTB scenario which we acknowledge does not exist today.

If Wide Bay remained on VHF and Rockhampton on UHF, this would minimise band-changes in those areas.

Furthermore, the cost of these proposed band-changes will be considerably more than the cost of running a viewer education campaign aimed at getting Brisbane viewers to turn UHF antennas to Bald Knob. If there were still coverage deficiencies or co-channel interference prone areas, the option of installing a gap-filler service within the Brisbane licence area could be pursued.

We note there would also be input problems at the repeater/translator sites on Mt Goonaneman and the reduction in coverage would require further gap fill services to be installed.

Other points to be considered in regards to this issue are:

- Since Brisbane commenced digital services in 2001 we are not aware of any analogue viewers receiving interference from Brisbane, even after the Brisbane Metro Digitals went to their final ERP.

- Since services at Mt Goonaneman commenced in 2004, we are not aware of any digital viewers receiving interference from analogue services in Brisbane.

- We have not been made aware of any seasonal co-channel interference issues with Brisbane viewers in the Bribie Island/Caboolture area. Bribie/Caboolture viewers now would also have the coverage fallback option of receiving UHF Digital Metros from Bald Knob.

- Replacing the Mt Goonaneman transmitter and any child site equipment involves a large capital expense.

- The ERP to achieve equivalent coverage at UHF is reasonably large.

- There are existing DCP child sites such as Monto where it is likely the commercial broadcasters may need to install microwave links or IBL's to provide a reliable input if Mt Goonaneman were to restack to UHF. (Monto would have similarities to the Bowen Town/Collinsville scenario with Mt Blackwood going to UHF).

- Inputs at Black Spot/Gap Filler sites at Cooloolah Cove, Tin Can Bay and particularly Agnes Waters would all need to be re-assessed and re-engineered. The Black spot site at Agnes Waters may not even be able to obtain a reliable enough UHF input from Mt Goonaneman.

- It is very likely that additional gap-filler sites in Wide Bay would need to be considered, at a minimum Bagara/Moore Park and Gayndah.

- There may be the potential loss of a UHF block for the regional market and also the potential to have to maintain a large SFN which broadcasters were planning to reduce at restack.

- As all channel blocks in the Sunshine Coast need to be in UHF due to Brisbane occupying Block A, moving Wide Bay from Block A to a UHF block will severely limit available channel blocks for the 10 UHF blocks required to service the Sunshine Coast coverage area

8 Implementation

8.1 TRU implementation method

The ACMA Discussion Paper indicates that "the choice of implementation method is ultimately one for the television industry in consultation with the government."[10] Free TV supports the TRU or similar hybrid method for use at the majority of sites as it would allow the implementation of the 'Block' approach and provide real cost and time savings. It also seems to offer savings in terms of disruption to viewers due to service outages.

Free TV believes the TRU method or similar strategy, where feasible, would seem to give the best means of achieving a 'block' restack with all important elements of cost and time targets being met.

Free TV looks forward to discussing this method in further detail with the ACMA as there will need to be some refinements to address issues at smaller sites. For example, some low-power sites are small out-stations with very little room to park a vehicle for maintenance purposes, let alone a truck or transportable container. We are aware of one instance in which an energy company was deploying emergency 'mobile substations' but had not fully researched its implementation. The mobile unit could not manoeuvre through the tight spaces on site and due to its weight became bogged whilst trying to access a substation.

[10] Discussion Paper p 21

8.2 Pooling of equipment

Free TV would not support an implementation method which may result in a broadcaster being required to install equipment which was previously installed and maintained by an alternative service provider or broadcaster. It would not be reasonable or realistic for broadcasters or service providers to inherit such equipment of which they have no knowledge of the history and/or performance.

It may also not be possible for a rolling-pool of transmitters and combiners to meet the requirements of all sites, especially as regards the infrastructure site-owner's management obligations.

Despite this, it may be feasible for individual broadcasters or service providers to manage their own rolling pool of complementary equipment during a sequential restack. Alternatively it may be possible to have a pool of Government-supplied transmitters/combiners that could be moved around and temporarily used on-air while the site's original equipment is retuned (or replaced), in order to minimise off-air outages.

8.3 Pre-tuned combiners

One of the primary benefits of the Free TV Block model is that it could allow pre-designed or pre-tuned 6-channel combiners to be ordered and installed on site prior to restack, thus ensuring a relatively seamless cut-over. Free TV believes the most advantageous method of achieving this is to facilitate mass production, testing and commissioning of a range of combiners with common configurations and specifications.

Assuming that at all restack sites, the analog services have been turned off and the analog transmitters have been removed, there will be a very good chance that there will be enough room for a new 6-channel 'block' combiner. Typically, the space required would be 1 to 1.5 rack footprint spaces. Many of the older analog transmitters/translators occupy a full rack. Therefore, if it is assumed that 5 analog translators have been removed from a site, at least 2 contiguous rack spaces would be available.

This has the potential to deliver substantial time savings in those areas where the TRU method is not feasible.

8.4 Timing, sequencing and general project management

Free TV has no major concerns with the timing and sequencing analysis ACMA has put forward for Queensland. Restack implementation with 'Block' approach and TRU method would meet the proposed timeframe. However, it is vitally important that restack planning begin in earnest as soon as possible, particularly considering an Australia-wide restack is required.

As noted by ACMA, restacking will be a complex logistical operation, requiring coordinated changes at almost every site across the country – hundreds of sites and thousands of services.

We strongly support the need for high-level coordination between the channel planning, implementation and community communication and education aspects of the restack.

As acknowledged by the ACMA, the availability of sufficiently trained professionals in Australia is a real concern and this will impact on the timing and sequencing of restack changes across the country.

Free TV suggests that two (or more) teams of technicians conducting relevant work in parallel are required. However, Free TV is aware that this could be a problem at high power transmission sites due to the limited skill set and technical staff from the respective transmitters/combiners manufacturers in Australia.

Therefore, the project plan should have the capacity to allow for some slippage as circumstances may occur that prevent the teams turning up in parallel at all times.

Free TV believes that national and commercial networks should deploy separate teams of engineers/technicians when dealing with their respective channel restacking due to differing contractual obligations applicable to the national and commercial services at transmission sites.

Given the implementation of the restack will require a coordination of efforts, planning and resources across government, the regulator, commercial and national broadcasters and equipment providers, Free TV supports the appointment of a specialist project management/coordination unit.

8.4.1 A typical low-power restack scenario

Free TV has considered some of the practicalities of a typical low-power restack scenario. The following methodology could be applied at many East-Coast sites (this example assumes that restack channels have been assigned to large areas (eg SA & Victoria)).

Firstly, the combiner would be delivered to site via specialised transport (transport selection is important as there has been cases where transit damage has resulted in detuning of some combiner channels). The combiner would then be positioned in the pre-assigned space and the input and output tails would be made up on site to suit the positions of the existing digital transmitters and output feeder.

The combiner would then be tested to a test-load to confirm channel bandwidth, slope, return loss and intra channel isolation. This work should not interrupt transmissions and can therefore be done during normal working hours.

Similarly, the transmitter performance specifications for each transmitter can be checked on the original channel. These checks would include output MER, BER, frequency response, centre frequency, output power, monitor port coupling etc. (automatic “EFA TX Check” routine can cover a large amount of performance checks in a very short time). During this time, field checks of service performance can be also performed at prescribed locations (GPS co-ordinates noted) in the service area during travel to/from site to town of accommodation.

At the prescribed changeover time, all transmitters would be shut down, the new combiner output would be connected to the antenna and return loss checks would be performed on all channels via the newly connected combiner

input tails (to be used to connect the transmitters to the combiner in the final configuration).

At the same time at least 2 technicians would perform:

1) input signal quality checks from the parent site; and

2) channel changes to the **new** channels on all 5 existing digital transmitters.

The transmitters would then need to be connected to test loads and performance parameters checked. All this could happen in a relatively short time. The all important parameters of output power and MER would need to be carefully checked and (once the output power is set), the pre-corrector adjustments could then be performed. This is time-consuming and could take up to a couple of hours per transmitter.

Additionally, we consider that the forward power monitoring port will likely read differently on the new channel. This would need to be recalibrated via direct measurement of the output power using a power attenuator connected to the transmitter output.

Once this process has been completed, the transmitters would be shut down, connected to the combiner and then turned back on. Performance checks would be repeated using the transmitter monitoring ports and finally via the monitoring port connected to the output of the combiner where all services are present.

Performance checks would then be performed at the previously noted field locations so as to confirm reception.

Once these tests are complete and engineers are satisfied that the equipment is performing at least as well as prior to the restack, the site can be deemed as restacked and the crew can mobilise to the next site.

At this point, the old combiner from the restacked site is now available to be returned to the manufacturer to be retuned/reworked for use in another block. This combiner would typically be a 10 channel combiner containing 5 critical mask filters. Thus the old combiner would contain at least 85% of the hardware required for a new 6 channel block combiner.

In order to preserve transmitter performance after a significant frequency change, a set of sites and brands of transmitters could be used to perform a pilot test rehearsal.

This would require after hours outages and the performance of the majority of the steps noted above, plus the retune back to the original channel.

This work could be performed well in advance of the “live” date, provided the restack channels are confirmed. Additionally, many regional broadcasters have spare units or units yet to be deployed sitting on the test bench. These could be tested on a range of frequencies other than the supplied channel to assess performance.

It is also now common practice to deploy a spare digital transmitter (which is tuned to any channel needed) in order to stand in for a faulty unit at a particular site.

It is very clear that careful project management & co-ordination is required in order to make any restack work efficiently. Timelines need to be reasonably long to accommodate resources and reap the benefits of combiner re use.

With respect to receive channel changes when a transmitter up the chain towards the parent site restacks, emphasis will need to be placed on the re-engineering of the receive systems including antennas, input filtering and importantly, any internal filtering contained within the translator down converter. These situations will need to be flagged well in advance of the restack. A wise move would be to source a series of these down converter RF channel filters from the manufacturers well before the restack and to gain familiarity with retuning these in house.

It is important that this process begins as soon as possible to sites that can restack once channels are assigned so that combiner re use can be put into effect.