



**Australian
Broadcasting
Authority**

***Report to the ABA on the Outcomes of the Studies by the
Single Frequency Network Consultative Group***

1. Introduction

In May 1999, the ABA sought advice from the Digital Television Channel Planning Consultative Group on the advantages of using and options for implementing single frequency networks within the Australian digital television broadcasting environment.

The Single Frequency Network Consultative Group was established to consider the ABA's request, and to report to the ABA before the end of December 1999 (its membership was essentially the same as the DCPCG). The work took longer than anticipated because some members of the group needed time to coordinate the work of their consultants and to provide their reports to the Consultative Group. The preparation of the report on options for SFNs was completed in May 2000.

The SFN Consultative Group's Terms of Reference (refer to Attachment A) were, among other things, through consultation, to provide advice to the ABA on:

1. The extent of the advantage to the community of SFNs in planning for digital terrestrial television.
2. The practicalities of single frequency networks to extend digital television coverage.
3. The technical planning options and constraints in planning SFNs.
4. The limitations of using off-air feed for SFNs.
5. The implications of operating in the 2k or the 8 k mode.
6. The relative costs of implementing SFNs versus a multiple frequency network.
7. The implications in terms of local (break-out) programming.

On-going technical issues are still under consideration within the digital channel planning activities of the Planning and Licensing Branch in consultation with the members of the Digital Channel Planning Consultative Group (the Group's membership is shown at Attachment B).

Following presentation of a preliminary report to the ABA, on 20 January 2000, it was decided to seek wider public consultation on the issues addressed by the SFN Consultative Group.

On 22 February 2000, the ABA released a Discussion Paper, "Options for Implementing Single Frequency Networks for the Australian Digital Terrestrial Television Broadcasting Service". In publishing the discussion paper, prepared in consultation with the ABA's Single Frequency Network Consultative Group, the ABA sought comments from the public by 31 March 2000, on the single frequency network (SFN) channel planning options outlined in that paper.

Eight submissions were received, from:

- The Australian Broadcasting Corporation.
- The Australian Communications Authority.
- Fairfax.
- The Federation of Australian Commercial Television Stations (FACTS).
- News Limited.
- Nine Network Australia.
- NTL Australia.
- The W.A. Department of Commerce and Industry.

Supplementary submissions were received from Digital Convergence Australia (18 May 2000), NTL-Australia (18 May 2000) and FACTS (25 May 2000).

2. Conclusions drawn from the consultations

Following extensive consultations within the SFN Consultative Group, in consultation with Planning & Licensing Branch staff, I have concluded that there is a general, not necessarily unanimous, acceptance on the following issues.

1. It is recognised that single frequency networks are viable and a practical proposition, both at VHF and UHF, provided suitable receivers are available (this latter aspect of SFNs is being considered world-wide and in the Australian standard being developed within the Standards Australia consultative processes).
2. Use of SFNs will make some additional capacity available for new services in most markets. In particular, capacity for at least two unallocated high power channels in Sydney and the Central Coast can be expected to result from the implementation of SFNs in these areas.
3. Australia should adopt the 8-k carrier mode of operating the DVB digital television standard to enable use of SFNs in the digital terrestrial television network.
4. Despite the apparent higher spectrum efficiency that could result from use of the VHF "pure" SFN option, the resulting high costs to the viewing public of both analog and digital services suggests that it may be preferable in some circumstances to consider allocation of low power UHF SFN channels to supplement the allocation of VHF high power main digital channels, the "1 + 1" option. Significant spectrum efficiencies are still gained from this dual frequency network option.
5. In deciding against the most spectrum-productive option (the "pure SFN") in some circumstances, the ABA should take particular account of additional costs and inconvenience that would accrue to the public.

On this point, while it has been argued that these costs may be small relative to the economic and other benefits of increasing datacasting capacity, the current legislative scheme limits what either the ABA or ACA can do to apply the supposed value of these channels to compensate the losers from the most spectrum-productive options. It also limits the power of the ABA to compensate the losers from other productivity-enhancing

measures, such as clearance or retuning of analog services to maximise datacasting capacity.

With careful thought and appropriate consultation there may be solutions to some of these problems, but it is not within the ABA's power to solve them unilaterally. There may be scope to review the current legal framework to permit compensation of the community or the affected broadcasters for the costs incurred in clearing additional frequencies to be used by datacasters. Properly designed, this would have the potential to release more spectrum for auction, following additional planning work and consultation with affected parties.

6. Some broadcasters have expressed concern that adoption of "Pure SFN" or a "1 + 1" channel allocation proposal may not give them the flexibility they seek to introduce break-out programming in all areas where they wish to do this. To retain this flexibility some broadcasters have sought additional channels (in what is called a multi-frequency network) to permit them to introduce new break-out programming within their licence areas from the commencement of digital television broadcasting.
7. There will be some limitations on the use of off-air feeds to retransmission facilities due to the distance between transmitters.
8. The ABA should retain the existing digital channel planning parameters for planning purposes.
9. Implementation of a multi-frequency network would not achieve the required spectrum efficiency in a digital television channel plan as it would be unlikely to provide sufficient channels for the conversion of existing analog services to the digital format, let alone provide capacity for additional digital broadcasting or datacasting services.

3. ABA Staff Analysis of Submissions to the Discussion Paper

The ABA's analysis and comments on the submissions received are at Annex A. The analysis reflects a lack of consensus within the SFN Consultative Group. This is not surprising in light of the different and sometimes competing interests of the Consultative Group members. However, it must be remembered that the Group was never intended to be one in which consensus was expected.

It must be noted that within the legislative framework, in preparing digital television channel plans, the ABA must have regard to:

- whether the parts of the broadcasting services bands that are allocated for the use of broadcasting services (or other uses) are efficiently structured;
- the policy objectives of the Broadcasting Services Act 1992;
- the likely cost, to holders, tower owners, tower operators and site operators, of allotting particular channels and digital transmission using the channels;
- the likely cost, and disruption, to consumers caused by having to receive television services in the digital mode using the allotted channels;
- any interference that digital transmission using a particular channel is likely to cause to analog transmission;
- where a regional equalisation plan is in force in a particular area, the ABA must have regard to the plan; and

- such other matters as it considers relevant.

In developing a digital channel plan with these objectives in mind, the ABA may need to weigh up conflicting considerations.

The analysis and comments on submissions received, in Annex A, are given in the context of the Terms of Reference and the National and Commercial Digital Television Conversion Schemes governing the preparation of digital channel plans, and are the views of the ABA's Director Technology and the ABA's planning staff.

4. Summary of Views

There is support for the use of some form of single frequency networks in planning for digital television and datacasting services. Some submissions support a "pure SFN" approach on the basis that it is the most spectrum efficient allocation mechanism; others support a "1 + 1" channel allocation proposal in circumstances where the implementation of a "pure SFN" would be contrary to the public interests or would result in untenable impact on the viewer.

FACTS and Nine have indicated that in the longer term broadcasters may need additional channels in order to provide break-out programming and to extend coverage of the digital signals.

Nine has asked for additional channels from the outset, to allow the introduction of break-out programming on the Central Coast and in Geelong.

The SFN Consultative Group has not quantified the relative costs of implementing SFNs versus a multi-frequency network (MFN). However, it is clear that adoption of an MFN will not leave sufficient channel capacity for new digital broadcasting and datacasting services in some major metropolitan areas, at least until analog services start to switch off.

Provision of new break-out programming for digital services in some areas using additional channels may depend on channels used by analog services becoming available. The alternative could be to use other techniques to provide different data streams to specific areas for retransmission.

There will be some limitations on the use of off-air feeds to retransmission facilities due to the distance between transmitters. On-going SFN tests and early experience with digital broadcasting will help to resolve this issue. Broadcasters may need to use alternative program feed technologies in some cases, such as satellite feed, microwave links, etc.

Please note that this report is based on the best information available at this time. Some changes to aspects of the digital television planning parameters for SFNs may be necessary as a result of on-going tests and early experience gained with broadcasting digital television services. However, such changes are not expected to impact on the digital channel plans determined to date.

5. Summary of Analysis of Submissions

In a "green fields" situation it would be possible to plan digital television on a "pure SFN" basis (1 + 0). However, in the practical situation digital services must be planned to operate within spectrum already occupied by five analog television services in most areas.

In planning for these digital services, while maintaining the simulcast of analog services, the ABA will have conflicting objectives, the maintenance of existing analog services free from interference with minimum disruption to the public, the achievement of “same coverage” by the digital services so that viewers are not disadvantaged through the change to digital television services, and the need to achieve spectrum efficiency through the change over to the digital mode of television broadcasting.

Proposals for the “pure SFN” model have the potential in certain circumstances to cause extensive disruption to viewers through changes to their viewing habits which will have potentially costs for consumers and broadcasters, to restore the affected services.

Two issues arise, first interference caused to existing analog services where an adjacent channel SFN retransmission is required but viewers are watching distant analog services – costs have not been estimated but the disruption to an as yet unknown number of viewers is expected to be considerable. Secondly, disruption and costs for new receiving equipment for those viewers who receive their services via UHF analog retransmission facilities, but who would be required to receive their VHF digital services via a VHF “pure SFN” in metropolitan areas.

Taking Sydney and the Central Coast as an example, estimated costs for new receiving equipment are approximately \$34 million to replace receiving antennas at a cost of \$200 per house, for 170,000 homes.

To this must be added the costs to broadcasters to establish VHF digital retransmission facilities at existing UHF analog retransmission sites where this is practical. These costs are estimated to be approximately \$5 million, which would need to be met by the broadcasters.

In extreme cases, adoption of a “pure SFN” proposal might achieve a greater number of datacasting channels but at great cost to the public. Proposals to make additional capacity available for datacasting do not appear to have taken account of these costs and the potential disruption to the viewers and to the broadcasters.

The ABA has the power to make affected broadcasters responsible for their own additional costs for implementing digital television planning. It does not have the power to charge these or other costs against the proceeds of the sale of any additional spectrum, or the beneficiaries of the additional channels auctioned as a result of increased spectrum productivity. While this is not a decisive argument against the adoption of the “pure single frequency network” approach in any given case, it is recommended that the ABA give considerable weight to any substantial additional costs and disruption to viewers, as well as the potential for interference to existing analog services.

The outcome, on balance, is that the adoption of the “pure SFN” digital channel planning allocation mechanism is recommended as the default, but use of a “1 + 1” digital channel plan, where this is in the best interest of the public, is expected to be the most practical outcome that can achieve the objectives of the digital conversion legislation. It provides adequate capacity for existing broadcasters to convert from analog to digital television and still meet the simulcast requirements of the Act, it provides for “same coverage” and it makes available capacity for at least two datacasting services in each licence area. This recommended approach is also aimed at minimising disruption to the public’s access to analog television services and to digital television and datacasting services in meeting the objectives of the BSA.

In summary, it is recommended that the channel allocation mechanism for a particular licence area be decided on a case-by-case basis, based on the use of single frequency networks. Depending on local or regional circumstance, in some cases, the costs of adopting a "pure SFN" will outweigh the benefits of using that planning model.

6. Recommendations

Australia should use SFNs in planning digital television services to ensure efficient use of the broadcasting services bands, to assist in meeting the Government's same coverage requirements and to make available some additional capacity for new digital broadcasting and datacasting services.

Australia should adopt the 8-k carrier mode for operating digital television, to enable the maximisation of the use of SFNs.

The "pure SFN" allocation should be the default for digital channel plans for metropolitan digital television services, but that a "1 + 1" channel plan should be implemented where use of a "pure SFN" approach would on balance be contrary to the public interest. Each case should be judged on its merits having regard to its particular circumstances. Similar considerations may be applicable in regional television areas.

The ABA should retain the existing digital channel planning parameters for planning purposes.

Requests for additional channels for new break-out programming requirements should be reconsidered by the ABA closer to the time of switching off analog services.

7. Acknowledgments

I would like to thank the staff of Planning & Licensing Branch, in particular Fred Gengaroli, Alastair Gellatly, Richard Longman and Ray Treloar for their support and hard work during the consultative meetings and afterwards in assessing the comments received and in preparing the SFN Report to go to the ABA. I would also like to thank Giles Tanner for his assistance with the preparation of the Report.

Bob Greeney
Director Technology
Australian Broadcasting Authority
(Convenor, SFN Consultative Group)

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Annex A

Summary and Analysis of submissions received.

Submitter	Pure SFN	"1 + 1"	MFN	Main Points	ABA Staff Analysis
ABC		✓		<p>Supports "1 + 1" as a practical compromise between spectrum efficiency, the difficulties of practical implementation and will lessen the impact on the audience.</p> <p>Concerned about channel allocations on the Central Coast. Cannot operate channel 12 there as no other broadcaster is operating in the VHF band on the Central Coast, ABC must have a UHF channel there.</p>	<p>The question of channel availability for break-out programming will be considered within the Digital Channel Planning (DCP) process. Noting that the ABC is to operate its digital television service on VHF channel 12, there is no apparent requirement to provide an additional channel in Sydney, on the basis of preventing interference to analog services on adjacent channels.</p> <p>Because approximately 165,000 viewers in the Sydney licence area receive their analog services via UHF retransmission facilities at Kings Cross and North Head, there may be a case to provide their digital television services via UHF channels from those retransmission sites. The alternative, using a "pure SFN" to provide those services via VHF channel 12, would require every affected household to install a new VHF Band III receiving antenna at a cost of approximately \$200 per house, for a total cost for 70,000 households, of around \$14 million.</p> <p>Similarly, it is valid to comment that the ABC cannot use VHF channel 12 on the Central Coast without significant costs to themselves as broadcasters and to all viewers who currently watch UHF analog television services provided from local transmitters. According to the Gosford commercial radio Licence Area Plans the population in the Gosford/Central Coast area is 260,000</p>

Submitter	Pure SFN	"1 + 1"	MFN	Main Points	ABA Staff Analysis
				<p>Channel 37 (from Newcastle) does not allow for ABC to provide break-out programming on the Central Coast - ABC requires another channel.</p>	<p>people. For television, the Gosford/Central Coast area is in licence area overlap and is served by both the Sydney and Newcastle commercial television services.</p> <p>The Gosford/Central Coast area suffers from poor coverage from the Sydney and Newcastle VHF and UHF analog television transmission sites. Therefore, three local UHF retransmission sites are used to provide the ABC and SBS national services, the three Sydney metropolitan and the three Newcastle regional commercial television services to the area.</p> <p>Assuming 100,000 television homes would be affected in this area, if the retail cost of a VHF receiving antenna, including installation, is \$200, the total cost of provision and installation of new VHF antennas for each home would be about \$20 million. Because viewers throughout the overlap area rely on the provision of their television services via UHF receiving antennas, it is preferable to allocate all UHF channels for the Central Coast digital television services.</p> <p>In its submission, the NTL suggested that one option to provide a UHF channel for the ABC on the Central Coast is for the ABC to use its Newcastle UHF channel for retransmission of its digital services on the Central Coast. While this may be a practical channel planning solution, Clause 44(2) of the National Television Conversion Scheme might be interpreted to mean that if the ABC's Newcastle digital program material being retransmitted on the Central Coast, is different from that rebroadcast from Sydney by the ABC's Central Coast analog service, the question could arise as to whether or not the ABC is simulcasting the appropriate program on the Central Coast.</p> <p>All broadcasters should be given equitable treatment</p>

Submitter	Pure SFN	"1 + 1"	MFN	Main Points	ABA Staff Analysis
				<p>ABC expects equitable treatment for channel allocations, using "1 + 1" for Sydney.</p>	<p>within the proposals to have an additional channel where this is necessary to avoid causing interference to other services or to maintain the status quo for large communities of viewers who receive their services in a particular part of the spectrum, ie. VHF Band III, UHF Band IV or UHF Band V.</p> <p>Provision of an additional channel for the ABC to provide break-out programming at this stage would impact on the availability of additional spectrum in Sydney and in Newcastle for new datacasting services. The availability of additional spectrum to provide break-out programming can be re-visited closer to the time when analog services are to be switched off and the channels used for analog services could be re-allocated for digital services.</p>
ACA		<p>✓ (conditional)</p>		<p>The ACA believes that any Government decision to accept the "1 + 1" proposal needs to be taken in the full knowledge that the decision will reduce the number of channels available for datacasting.</p> <p>Channels 68 and 69 should not be used for digital television, as that spectrum is needed for mobile radiocommunications services.</p> <p>The ACA proposes an alternative channel arrangement for Sydney and the Central Coast.</p>	<p>The ABA's planning staff recognise the ACA's proposal to use channels 68 and 69 for other services once they are no longer needed for broadcasting. Planning staff have given a commitment to avoid using channel 69 everywhere if possible and also to avoid using channel 68 unless that means capacity for digital services cannot be met during the simulcast period (see "The ABA's General Approach to Digital Terrestrial Television Planning, clause. 3.3.3). Planning staff will re-assess the ACA's alternative proposals for the DCP in Sydney and the Gosford/Central Coast overlap area.</p> <p>However, based on earlier digital channel planning work it appears that the channels proposed by the ACA (channels 35 and 61) cannot be used for high power datacasting in Sydney without causing interference to or disruption of other services incurring significant costs for both broadcasters and viewers for new analog transmitting equipment and adjustment of existing receiving equipment.</p>

Submitter	Pure SFN	"1 + 1"	MFN	Main Points	ABA Staff Analysis
				<p>The ACA proposes that channels 35 and 61 should be allocated for high power datacasting services.</p> <p>The ACA proposes that NBN should use the same channel on the Central Coast as is used for Newcastle.</p>	<p>There is some possibility that one or both of these channels (35 and 61) may be available for datacasting under specified constraints, such as those already applicable to channel 29 in the Sydney DCP. In these cases, the constraints may be a restriction to comply with directional radiating patterns and/or power restrictions on the use of those channels to avoid causing interference to existing services. Channel 29, which is currently available for new digital services including datacasting, is restricted to an effective radiated power of 10 kilowatts to protect analog SBS television services operating at Nowra North and Lithgow.</p> <p>If either channel 35 or 61 were allocated for datacasting, in order to remove restrictions on their operation, there would be a requirement to facilitate the change to an alternative channel, if one is available, of an ABC analog service currently occupying the same channel at Wollongong. There is also an allocation (currently unused) of channel 35 to NRN for its analog service at Bouddi (Central Coast). Similarly, channel 61 is allocated to NRN (currently unused) for its analog service at Gosford.</p> <p>At present, the ABA would appear to have no power to require a datacasting transmitter licence holder to facilitate clearance. The ABA could require the existing analog service to move at its own expense, but has no mechanism to compensate either the broadcaster or its viewers if they incur expense. It is also unclear what powers are available to the ABA to recall the unused allocation of channels 35 and 61 to NRN for their analog services on the Central Coast to re-allocate those channels for digital services in Sydney and/or the Central Coast.</p>

Submitter	Pure SFN	"1 + 1"	MFN	Main Points	ABA Staff Analysis
NINE			✓	<p>Supports FACTS' submission, but wants additional frequencies.</p> <p>Requires ability to provide break-out programming; particularly at the Gold Coast, Central Coast (NSW) and Geelong. Already providing analog break-out programs on Gold Coast to 600,000 viewers. Wants to provide digital break-out services at Central Coast and Geelong from 1 January 2001.</p> <p>Concerned that the recommendation in the ABA's discussion paper will limit the flexibility of the ABA to allocate additional digital channels to enable simulcast of analog transmissions.</p>	<p>The NNA proposals are based on providing new break-out services immediately, in areas so far not receiving break-out services through their analog television services.</p> <p>In its submissions, NNA indicates that it has been providing local program (break-out) on the Gold Coast for a number of years and that they would wish to do the same with their digital service there. NNA has also indicated that they propose to start local programming in Geelong (in the Melbourne commercial television licence area) and the Central Coast (in the Sydney commercial television licence area) from 1 January 2001. To do this would require an additional channel in each case, which would impact on the capacity that can be made available for datacasting in those areas.</p> <p>Assuming that the Seven and Ten networks, the ABC and the SBS would seek the same treatment as that sought by NNA, these proposals have the potential to use all of the available digital television channels to provide these new break-out services. At present, by not considering provision of additional channels to each broadcaster for new break-out services, Planning staff are having some difficulty finding the two digital channels required for datacasting in each of these commercial licence areas.</p> <p>It may still prove possible that break-out programming can be provided within the "1 + 1" SFN model. SFN tests and early experience with digital broadcasting may show that in some circumstances break-out programming can be achieved in within a "1 + 1" channel allocation. In such cases, broadcasters would still have the option to use either their main digital channel or their supplementary digital channel to provide the proposed break-out programming. In the</p>

Submitter	Pure SFN	"1 + 1"	MFN	Main Points	ABA Staff Analysis
				<p>The digital channel plan should allocate channels to enable provision of services in the Central Coast and Geelong, with additional channels over and above the allocation intended for these two areas.</p>	<p>longer term, once analog services begin to switch off, the ABA may be able to consider reusing the newly vacated channels for break-out services or for other services, if that proves necessary.</p> <p>I have concluded, with advice from the Planning staff, that it would not be practical, at least during the simulcast period, to allocate additional channels to Geelong (population 290,000 according to the Geelong radio licence area plan) or the Gosford/Central Coast overlap areas (see comments for ABC, above) and still be able to provide sufficient capacity for digital conversion of all existing free-to-air broadcasters in the surrounding areas. To provide for these break-out proposals would remove any capacity for datacasting services in the metropolitan and adjacent overlap licence areas. I recommend that these proposals be reconsidered once analog transmissions start to switch off.</p> <p>With respect to Geelong, none of the television broadcasters currently provide local retransmission of their Melbourne programs. Due to relatively low signal levels in parts of the Geelong area, local retransmissions may ultimately be required for all Melbourne digital television services. Digital channel availability for local retransmissions, in addition to the channels proposed under a "1 + 1" allocation, at least initially, is expected to be problematic because of the density of television services in the region (Melbourne, Ballarat and Bendigo, as well as the proximity of the Gippsland services to Geelong).</p>
WA DCT		✓		<p>Supports "1 + 1" option.</p> <p>Viewers rate program content higher than picture quality. HD too expensive for majority of viewers.</p> <p>Using off-air feeds has the potential to save other</p>	<p>Interesting to note that according to the DCT, viewers rate program content a higher priority than improved picture quality. We do not have sufficient data to confirm this claim.</p>

Submitter	Pure SFN	"1 + 1"	MFN	Main Points	ABA Staff Analysis
				<p>valuable spectrum (for fixed links, etc.).</p> <p>Supports break-out programs in country and regional areas, not in metropolitan areas.</p> <p>Use of data capacity (multi channelling) to deliver different material in each area.</p> <p>Concerned about interference to analog services – supports co-siting of analog and digital transmitters.</p> <p>Supports '1 + 1' in regional areas because of poorer coverage of UHF vs VHF.</p> <p>Concerned about provision of all existing services in overlap areas, Mandurah and Pinjarra.</p> <p>Viewer's interests must be paramount.</p>	<p>It is also interesting to note the DCT comments that break-out programming to regional areas could use multi-channel delivery of programs to regional transmitters in many cases. Although it is still too early to comment on regional DCPs, it is expected that regional areas will have their own digital channels and related SFNs and so will be able to preserve the regional nature and localism of their programming.</p> <p>This is a planning issues covered by the “same coverage” requirements of the legislation</p>
<p>Fairfax</p> <p>(see also, NEWS LTD comments below)</p>	<p>✓</p>			<p>Option of a Pure SFN has not been fully tested.</p> <p>The "1 + 1" conclusion in the discussion paper is an ABA view and does not necessarily represent the consensus view of the Consultative Group.</p> <p>Evidence supports a pure SFN (1 + 0) plan.</p>	<p>Adoption of a "pure SFN" in which each broadcaster or datacaster is allocated a single channel for all of its transmitters in a particular region is the best option from the point of view of spectrum productivity.</p> <p>However, in considering the potential costs for broadcasters and the impact on the public (the viewers), a pure SFN may not always be the most practical or the most cost-effective spectrum allocation mechanism.</p> <p>This will often be the case where the service converting from the analog mode to the digital mode uses a digital channel adjacent to the channel used by the analog service. Under these circumstances, if the analog services are received from the distant main analog transmission site, any local digital infill transmitter on the main digital channel used to achieve “same coverage” would cause adjacent channel interference to</p>

Submitter	Pure SFN	"1 + 1"	MFN	Main Points	ABA Staff Analysis
					<p>reception of the analog service in the vicinity of the retransmission facility.</p> <p>This would result in reduction of interference-free coverage by the analog service and could be expected to happen at the extremities of the Sydney licence area. Possible examples of this situation are in the Penrith or Windsor regions where analog viewers watch their analog services directly from Gore Hill/Artarmon using high gain receiving antennas to receive relatively weak signals and where the adjacent channel digital services may need a local retransmission facility. To overcome this, the ABA would have the option of not permitting the introduction of local digital retransmission facilities in such cases to protect the analog service, which could prevent the digital service(s) from achieving the same coverage as required by law.</p> <p>Geelong, where viewers watch their analog services at quite low signal strengths from Mount Dandenong over 130 kilometres away, is another case where digital services are likely to require local infill retransmission facilities - this could require a "1 + 1" channel allocation in the long term for the Melbourne's digital television services.</p> <p>The issue of increased costs to television households will arise where large numbers of viewers currently watch their analog services through UHF translators and the retransmission of digital services using the VHF digital channels would disrupt their television services or deny viewers access to the digital services because they do not have appropriate receiving antennas. Examples of such cases exist for viewers watching the Kings Cross (110,000 people), the Manly/North Head (55,000) and the Gosford/Central Coast (260,000) UHF retransmission facilities. The data</p>

Submitter	Pure SFN	"1 + 1"	MFN	Main Points	ABA Staff Analysis
					<p>for Kings Cross and North Head is taken from an NDC report based on 1996 census, data for Gosford/Central Coast is taken from the ABA licence area plan for the Central Coast.</p> <p>In some cases, the retransmission of the digital service on a VHF channel may be impractical for environmental reasons where local government approvals will not be granted, facilities are physically unable to accommodate new VHF transmitting antennas because of their size, or broadcaster's inability to develop suitable VHF retransmission facilities is problematic.</p> <p>Experience with digital television coverage is expected to confirm the need for the additional channel. Accordingly, provision should be made through the adoption of the "1 + 1" proposal for the additional low power retransmissions on a case-by-case basis where this is deemed, on balance, to be in the public interest and to ensure same coverage is achieved as quickly as possible.</p> <p>In accepting the Fairfax and News Limited comments on the necessity of using a "pure SFN", questions that need to be addressed include, who will pay for the costs of providing alternative facilities for broadcasters and viewers? What extra capacity could be made available for datacasting if "pure SFNs" were proposed rather than adopting a "1 + 1" allocation mechanism?</p> <p>Fairfax and News suggested that a number of options exist to cover these costs. The affected broadcasters and viewers could pay their own respective costs, or the government might subsidise the associated costs from revenue earned from the auction of any additional channel capacity made available through the adoption</p>

Submitter	Pure SFN	"1 + 1"	MFN	Main Points	ABA Staff Analysis
				<p>The paper does not properly quantify and weigh the costs and benefits of each option.</p>	<p>of a "pure SFN". In their supplementary submission, the NTL proposes that the "polluter pays" principle would be appropriate.</p> <p>These costs have not been quantified but anecdotal evidence suggests costs would be in the order of millions of dollars for each affected service. Using Sydney as an example, the number of people in the Sydney licence area who currently receive their television services through a UHF retransmission facility (Kings Cross, North Head and the Central Coast) is about 425,000 - conservatively, about 170,000 households. If a new VHF receiving antenna is to be provided and installed for each household at a cost of \$200 per household, the cost to provide viewers with suitable VHF receiving antennas would be about \$34 million.</p> <p>To this, one must add the costs to broadcasters to establish VHF facilities at their UHF retransmission facilities. The latter is estimated to be \$200,000 per broadcaster; there are five sites so the cost of providing VHF transmitting facilities for the five broadcasters at all five existing UHF retransmission (assuming each site can be upgraded to accommodate VHF facilities) sites could be as high as \$5 million.</p> <p>There remains the question of whether each UHF retransmission site is capable of being upgraded to take new VHF transmitting facilities and continue to provide the UHF analog services uninterrupted. This relates to the physical size of the existing facilities and whether or not they are mechanically strong enough to accommodate the much larger VHF transmitting antennas and feeder cables. Many existing UHF retransmission facilities are relatively small and require a small tower on the roof of a building (eg. Kings</p>

Submitter	Pure SFN	"1 + 1"	MFN	Main Points	ABA Staff Analysis
					<p>Cross) or a small tower on a hilltop (eg. Central Coast and North Head). As well, there may be an environmental issue if an existing transmission facility is perceived by local or town planning authorities, to be being made larger and less environmentally acceptable to the community (compare with mobile phone towers which are typically much smaller than a VHF television transmission facility).</p> <p>As noted earlier, while the ABA may have the power to make the affected broadcasters responsible for their own additional costs for implementing a "Pure SFN" or for any additional costs for implementing a "1 + 1" allocation, the ABA does not appear to have the power to charge these or other costs against the proceeds of the sale of additional spectrum, or against the beneficiaries of any additional channels auctioned as a result of increased spectrum productivity.</p> <p>While this is not a decisive argument against the adoption of the "Pure SFN" approach in any given case, the ABA should give considerable weight to any substantial additional costs and inconvenience to viewers, also interference to existing analog services.</p> <p>The additional productivity of "Pure SFNs" in all cases may bring offsetting benefits, eg. in terms of increased competition in the short term. However, there is a danger that broadcasters will not be able to achieve "same coverage" and that by hindering the rapid uptake of digital television and the consequent timely clearance of the analog system, excessive reliance on "pure SFNs" may tend to prolong the simulcast period and postpone the far larger public benefits that would flow from the complete clearance of the analog television services.</p>

Submitter	Pure SFN	"1 + 1"	MFN	Main Points	ABA Staff Analysis
				<p>Spectrum is too valuable and important a public resource to be allocated on the basis of flawed or incomplete analysis. It is critical that the ABA be allocated and deploy appropriate resources without delay.</p> <p>Break-out programming should not be considered.</p>	<p>"Pure SFN" proposals for VHF broadcasters in Sydney are not favoured because of the obvious effect on broadcasters who would be unable to meet the "same coverage" requirements of the Act, and viewers who would either lose or suffer unacceptable interference to the reception of their television services.</p> <p>Both Fairfax and News Limited have strong objections to any proposals by broadcasters for break-out programming that has the potential to consume additional digital channels. The ABA planning staff share these concerns and have noted the unacceptable outcome of providing for new break-out services, namely that fewer channels than those now proposed in DCPs would be available for conversion of analog broadcasting services, or for new broadcasting or datacasting services.</p> <p>In its supplementary submission to the ABA, dated 15 May 2000, Digital Convergence Australia, expresses dissatisfaction with the proposals to implement a "1 + 1" channel plan for metropolitan digital television services where necessary. DCA points out that this conclusion denies additional capacity for datacasting and has been reached despite three detailed modelling studies prepared by BCL and NTL that quantified many of the issues.</p> <p>The BCL reports (July and November 1999) provide an indication of the number of people who might be adversely affected in a "pure SFN" scenario. Depending on the planning parameters used, up to 176,500 people could be affected or as few as 7,150 could be affected.</p> <p>The BCL report concludes that only 7,150 people will be affected. However, these are theoretical calculations that remain to be confirmed through test transmissions</p>

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				<p><i>Note: See supporting submission to the ABA from Digital Conversion Australia, dated 15 May 2000 (attached).</i></p>	<p>and through experience gained as digital television broadcasting expands. No cost estimates are given with respect to fixing reception problems for viewers suffering interference or loss of services as a result of implementing a "pure SFN", nor is any estimate given of the impact on services that might be affected in adjacent areas. BCL proposes channels 35, 61 and 68 as possibilities for additional high power digital services in Sydney.</p> <p>Note that the BCL estimate that as few as 7,150 people would be affected by interference if a "Pure SFN" allocation were adopted for Sydney does not take account of the fact that more than 165,000 viewers (70,000 households) in Sydney and 260,000 people (100,000 households) on the Central Coast currently receive their television services through UHF retransmission facilities and would require new VHF receiving antennas to receive VHF digital services delivered in a "pure SFN" configuration. As estimated earlier, the cost of providing and installing new VHF receiving antennas for 170,000 households is estimated to be around \$34 million.</p> <p>ABA planning studies show that use of channel 35 in Sydney has an impact on the ABC and its viewers in parts of Wollongong, affecting approximately 10,000 households. ABA Planning staff are reviewing the availability of any of these channels and the likely costs in terms of viewers affected by any consequential disruptions or by interference to their existing services.</p> <p>The NTL report also proposes three new channels, in addition to those proposed by the ABA planning, channels 35, 61 and 68 (the same channels proposed by BCL). The NTL also indicates that in their view, no power restrictions are required on channel 29, although</p>

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					<p>it is currently used in Lithgow and in Nowra. The NTL report does not include any detail of their analysis of these additional channels.</p> <p>Planning staff are looking at these proposals and any consequential changes, eg. ABC Wollongong would have to change to an alternative analog channel before channel 35 could be used unencumbered in Sydney for digital services.</p> <p>As indicated earlier, channels 35 and 61 are currently allocated to commercial services on the Central Coast and their availability for digital services in Sydney is not clear. Channel 68 may be able to be used in Sydney but if that becomes the case, there would be insufficient channels available for conversion of analog services in Sydney and the Central Coast. The NTL report does not identify any relevant costs associated with making additional channels available in Sydney</p> <p>The NTL proposals require further assessment of relevant interference and protection ratio calculations and consideration of the impacts of each proposal before they could be considered sufficient to proceed to make any of those channels available for high power datacasting services in Sydney.</p> <p>Significant additional work is being done in assessing the BCL and NTL proposals, to confirm their suitability, to quantify the costs of those options and to determine the operating parameters and conditions applicable to each channel that might be able to be made available for datacasting or other uses in the Sydney area.</p> <p>In its supplementary submission to the ABA, DCA indicates also that its members do not accept that a case</p>

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					<p>has been made to support the criteria being applied (for implementation of a "1 + 1" allocation) as a general rule for the implementation of DFNs (dual frequency networks). DCA's position is that in preparing a digital channel plan for each area, the Authority should make specific assessment in support of any DFN implementation.</p> <p>The proposal to adopt the use of "1 + 1" allocations, where on balance the use of a "pure SFN" is contrary to the public interest, is a proposal based on the need for an appropriate assessment being made in each case. The "pure SFN" allocation is proposed as the default situation for digital channel planning, as proposed by DCA.</p> <p>In general, ABA staff have little difficulty with the criteria proposed by DCA. The standard practice for planning broadcasting services to achieve same coverage is the same as is proposed by DCA. Estimates of costs to repair or replace facilities, or of the relative costs to broadcasters and consumers could also be done.</p> <p>While market value of additional spectrum and additional competition during the simulcast period are relevant factors in formulating DCPs, there will be situations where they are outweighed by negatives such as additional and substantial upfront costs to viewers and loss of analog reception. As noted before, maximising additional capacity during the simulcast period may, if it significantly increases conversion costs for viewers, tend to mitigate against early clearance of all analog services, so greater short-term economic or revenue benefit may be brought at some cost in terms of long term benefit.</p>

Submitter	Pure SFN	"1 + 1"	MFN	Main Points	ABA Staff Analysis
					<p>The ABA has conducted open processes partly to allow any and all factors that parties believe to be relevant to be brought before it, but has neither resources nor time itself to conduct exhaustive economic research before moving on to complete DCPs for other areas of Australia.</p>
FACTS		✓		<p>One of the central and prime requirements of the Digital Conversion Act is that broadcasters must provide digital coverage to all viewers currently receiving analog services with the licence area.</p> <p>Related objectives such as spectrum efficiency and provision of channels for other broadcasting or datacasting services must not undermine the ability of broadcasters to meet the 'same coverage' requirement.</p> <p>Assumes that the Government would not accept imposition of technical planning for digital services that would reduce the ability of broadcasters to continue providing services individualised to specific markets.</p> <p>Use of SFNs must not deny broadcasters the ability to meet same coverage requirements, or to provide break-out programming, or deny further evolution in the market with population movement.</p>	<p>The ABA's digital channel plan seeks to provide each analog broadcaster with channel capacity sufficient to achieve the Government's same coverage objective. At the same time, the ABA's channel planning activities seek to gain efficiencies from the digital technology that will provide additional capacity for new broadcasting and datacasting services.</p> <p>Planning staff are not certain they can meet these objectives and provide additional capacity for new break-out programming proposals during the simulcast period without jeopardising capacity for datacasting services. On-going SFN tests will assist in taking this issue further, but not before January 2001. In the longer term, as analog services are switched off, the spectrum vacated can be considered for use to provide new broadcasting or datacasting services, break-out services or other radiocommunications services according to demand for spectrum at that time.</p> <p>ABA staff understand the expressed desire of some broadcasters to be able to maintain the flexibility to provide new break-out services when they are ready, but may not be able to provide additional channel capacity during the simulcast period. Accordingly, broadcasters may have to wait until analog services start switching off, or consider how they can use the</p>

Submitter	Pure SFN	"1 + 1"	MFN	Main Points	ABA Staff Analysis
				<p>SFNs may not be practical in wide-area coverage situations.</p> <p>Planning must take account of viewers - ie. those viewers who receive their analog services via UHF will not be able to receive VHF digital services without costly replacement of receiving equipment.</p> <p>Comments that in the discussion paper, that, "Due to channel scarcity, it appears unlikely that there will be sufficient digital television channels available to introduce any new break-out programming, at least until some analog television transmitters are switched off.", are understood to be comments from ABA engineering staff.</p> <p>FACTS comments that, "Subject to further detailed examination, the statement may not be totally valid, even for Sydney."</p> <p>The report's comment is premature, given the plan(s) to conduct tests to establish more detail on the performance of SFNs. The report may have glossed over some potential difficulties with SFN operations.</p> <p>Supports the use of SFNs but need to recognise their limitations. "1 + 1" is appropriate in some circumstances, but may need additional channels so in others.</p> <p>Accepts a "1 + 1" plan initially with the need for any</p>	<p>capabilities of the digital television transmission system to provide individual services to specific markets.</p> <p>ABA staff note that FACTS accepts the "1 + 1" plan initially with the need for additional channels to be assessed on the basis of broadcaster's needs, together with experience gained from the SFN tests and early broadcasting experience.</p> <p>ABA planners also note the concern expressed by FACTS for viewers who currently receive their broadcasting services in one particular frequency band and the proposal to ensure that those viewers receive their digital services in the same band. Planners have adopted this premise and will attempt to meet it, or at least ensure viewers can receive their digital services with the same receiving antennas, where possible.</p> <p>These comments are acknowledged, but if planning is to proceed in line with the statutory requirements, some in-principle decisions will be required. Test transmissions and early experience with digital television broadcasting is expected to confirm these in-principle decisions and may also show that broadcasters have more flexibility in implementing their services than may have been thought possible under conservative planning.</p>

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				<p>additional channels to be assessed on the basis of broadcaster's need for translators, together with experience to be gained from the proposed SFN tests and early broadcasting experience.</p> <p><i>Note: In a letter received on 25 May 2000, FACTS seeks the removal in the final report, of the reference in the Recommendations to, "The "Pure SFN" allocation should be the default for digital channel plans for metropolitan services" maintaining the position supported by broadcasters that there is a requirement for "1 + 1" in all areas.</i></p>	<p>ABA staff acknowledge FACTS' comments received on 25 May 2000, that FACTS does not agree with the recommendation in the Report that, "The "Pure SFN" allocation should be the default for digital channel plans for metropolitan digital television services" maintaining their position that there is a requirement for "1 + 1" in all areas.</p> <p>As already indicated, in considering DCP developments, this report recommends that the ABA should give considerable weight to achieving "same coverage" and minimising interference to analog services and significant additional expense and inconvenience to viewers associated with changes to the way they receive their television services and seeking to upgrade to digital.</p>
News Ltd	✓			<p>The discussion paper is both incomplete and misleading. It contains recommendations of the ABA Engineering group that artificially limit the availability of scarce and valuable spectrum for new entrants.</p> <p>These recommendations are made without quantification of the key parameters within which they are purportedly made and without a clear statement of the criteria against which they were judged.</p> <p>There is no digital channel plan detailing the number of new services that are possible under each option.</p>	See analysis under Fairfax.

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				<p>These matters must be presented and considered in a transparent process before the ABA can reach any decision as to the extent which SFNs can be implemented.</p> <p>Acceptance of the paper's recommended allocation, presumably at no cost, of a second loaned channel to the metropolitan commercial free-to-air broadcasters is an unnecessarily inefficient use of scarce and valuable spectrum.</p> <p>Break-out programming is not supported where it needs additional channel capacity.</p> <p><i>Note: See submission to the ABA from Digital Conversion Australia, dated 15 May 2000 (attached).</i></p>	
NTL Aus		✓ (conditional)		<p>Broadly supports dual frequency network (DFN) or "1 + 1" proposal, conditional* on the delivery of 8 DTTB channels in metropolitan markets.</p> <p>Endorses the view that SFNs are a viable and practical solution for digital television.</p>	<p>ABA planning staff support the view that the existing digital planning parameters must be retained. This comment from NTL is in response to informal suggestions from commercial broadcasters through the SFN Consultative Group meetings that due to the "triplecast" requirements proposed in the amendments to the BSA, they could need to change their operating parameters (Guard Interval and Forward Error Correction rate) to increase the available data rate in their digital channel.</p> <p>If these changes were applied to the digital television planning parameters in the ABA's Digital Television Planning Handbook, they could affect the number of channels that could be made available for conversion of analog television services and for datacasting. During the consultation in the SFN Consultative Group, this issue was discussed and it was agreed that the planning parameters in the Handbook should not be changed. However, it was recognised that broadcasters should have the flexibility to operate using a Guard Interval and FEC different from the nominal values used for</p>

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				<p>Maintains that it is feasible, as submitted by NTL in November 99, to allocate channels 35 and 61 for digital TV services (in the Sydney area).</p> <p>Acknowledges that "1 + 1" solution comes at a cost in spectrum efficiency but recognises the need for this arrangement.</p> <p>Believes that although there is work to be done verifying SFN implementation parameters, ABA must retain existing digital planning parameters.</p>	<p>planning but that the relevant broadcaster would have to restore its coverage without additional frequencies, even if that meant installing additional retransmission facilities using their allotted frequencies.</p> <p>The NTL proposal to include channels 35 and 61 for high power datacasting services in Sydney will be re-assessed along with the similar proposal from the ACA.</p> <p>In supplementary comments received from the NTL, on 18 May 2000, the company expressed the views that under a "polluter pays" principle, adoption of the "pure SFN" allocation mechanism would result in additional datacasting channels being made available. NTL also suggested that rather than considering the use of a "1 + 0" channel plan where use of a "pure SFN" would on balance be contrary to the public interest, consideration of a "1 + 1" plan should be used, 'where a "pure SFN" would result in untenable impact on the viewer'.</p> <p>Further planning work to find additional capacity for datacasting will review the NTL proposals for 8 or 9 digital channels in Sydney. But as indicated earlier, the NTL report does not provide sufficient data or costs to properly assess their proposals for the additional channels proposed in their report. In each case, there appear to be costs to viewers and to broadcasters which have not been quantified, as well as disruption to services due to changed viewing arrangements for affected analog services - these are being assessed as part of the on-going planning for the introduction of digital television in each city.</p> <p><u>Note:</u> Further proposals were received from NTL on 24 May 2000, concerning planning additional digital</p>

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				<p>* Comment received from NTL on 18 May 2000.</p>	<p>television channels for Sydney and Brisbane. ABA Planners are assessing this new material.</p> <p>An early assessment of the latest NTL proposals shows that additional digital channel capacity can be found for datacasting in Sydney, Newcastle and Illawarra (Wollongong). Following consultation with NTL, it is expected that two datacasting channels can be found for Sydney and Newcastle, and possibly three for Wollongong. However, to achieve this it will be necessary to allocate separate channels for SFN operation on the Central Coast from those proposed for Sydney to maximise spectrum efficiency in Sydney and adjacent areas and to avoid interference to or from services in adjacent areas. In other words, whilst operating a "1 + 1" allocation for Sydney (a main high power channel for each broadcasting service plus a second, low power, channel for each service to operate at Kings Cross and North Head (and any new digital retransmission sites in metropolitan Sydney)), it would be necessary to allocate additional channels for the Central Coast to operate in its own SFN for the three retransmission sites there.</p> <p>The NTL proposes a number of options that show the possibility of achieving up to three datacasting channels for Sydney. However, in achieving this result there are compromises that would affect the capability of broadcasters to achieve "same coverage" with their digital television services. These proposals also have the potential to disrupt the viewing habits of all Central Coast television viewers (approximately 260,000 people) because of the need to provide the Sydney services in a VHF SFN where viewers currently receive their services via UHF transmissions. The estimated cost to provide and install VHF receiving antennas throughout the Central Coast, to 100,000 households is</p>

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				<p>Is of the view that it is highly likely that future DVB receivers will have the capacity to operate satisfactorily</p>	<p>about \$20 million.</p> <p>ABA Planning staff believe the most recent NTL proposals have merit but prefer a potentially less disruptive and less costly variation that would provide seven digital channels in the Sydney and Newcastle markets (eight in Illawarra) with two datacasting channels in each market. Current DCP review work is following this course of action. ABA Planning staff are seeking to maximise the efficient use of available digital television channels while meeting the objectives of the digital conversion legislation, particularly through planning to achieve "same coverage" throughout the licence area, minimising disruption to existing services and seeking the best outcome in terms of the public interest issues.</p> <p>ABA staff support this view and note developments in European and Australian standards for DTV receivers.</p>

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				in the Australian SFN environment.	