The technological requirements, and associated incremental costs, for an existing free-to-air (FTA) commercial broadcaster to provide multi-channel digital services

A Report by Convergent Consulting for the Australian Competition and Consumer Commission

TABLE OF CONTENTS

Important Note:

Throughout this report, there are numerous references to certain important digital television terms. For the sake of clarity, we define these terms as follows:

SDTV = the digital standard for Standard Definition Television

HDTV = the digital standard for High Definition Television

Simulcast channels = the two digital channels (in SDTV and HDTV modes) that replicate a broadcaster's main analog channel

Multi-channel = one, or a number of, digital SDTV channels that can be broadcast in addition to the simulcast channels

1. Executive Summary

The purpose of this report is to detail the technological requirements, and incremental costs, for an existing free-to-air (FTA) commercial broadcaster to provide multi-channel digital services.

In order to do this, we first reviewed the digital deployment choices already made by broadcasters, in terms of how they affect a broadcasters current and future capacity to multi-channel. We found that, with modest incremental investment[1], there is the potential now, and even greater future potential, to multi-channel.

	Multi-Channel capacity	**Incremental Cost /Channel/ Area Served**
During HDTV transmission times	0-2	$100,000 to $125,000
During times HDTV is not in transmission	2-6	$100,000 to $125,000

As described in the above Table, during times that simulcast HDTV is being transmitted by a broadcaster there is the potential to transmit between zero and two multi-channels (in addition to the HDTV and SDTV simulcast channels). Further, during times that simulcast HDTV is not being transmitted there is the potential to transmit between two and six multi-channels (in addition to the SDTV simulcast channel). Importantly, exactly how many multi-channels any particular broadcaster can transmit, under either scenario, depends on certain discretionary commercial and technical choices each has the ability to make.

The additional incremental cost, in the above table, relates to the additional encoding and multiplexing equipment needed in a broadcaster's studio to prepare each additional multi-channel for each market (area) served. It should be noted most broadcasters serve more than one area. For example, each metropolitan broadcaster will need this addition incremental investment, for each of the major capital cities it serves, while a regional broadcaster, typically serving up to 25-35 regional markets, will need this investment for each of these areas.

Outside these incremental studio costs, we do not expect that there would be any further requirements, or cost, in order to enable multi-channelling. That is the equipment and services associated with distribution, transmission and consumer reception will remain unaffected.

The above analysis provides a 'base-case' for multi-channelling. In particular, it ignores any of the equipment and services required to support a particular

[1] Excluding production costs

commercial model for the additional channels (e.g. through advertising or subscriptions). As a result, we have also identified and scoped two other further options that enable broadcasters to exploit these commercial models:

1. Advertising based FTA Television for a particular market

The previous analysis assumed that the additional multi-channels were fully 'produced', and that they only needed to be 'prepared' for digital transmission. In other words, the analysis did not include any activity that allowed a broadcaster to customise the channel programming for a particular geographical market. Most commonly, in the FTA environment, this customisation consists of inserting local advertising and local news/current affairs into a national program stream.

If one were to consider these costs, then the incremental capital cost, per channel, per area served, would increase around A$200,000-$500,000, above those costs already identified. Note, this capital cost will only cover the equipment required to enable the insertion of local advertising and news/current affairs into a typical national program stream. It does not include the operational cost of program acquisition, or any of the station management required to support the channel. These annual incremental operational costs could vary anywhere from $2m p.a. to $50m p.a. for each broadcaster's additional channel.

2. Subscription (Pay) Television

To provide the ability to charge viewers a subscription fee would require significant investments in new equipment and services, as well as changes to a viewer's existing digital FTA receiving devices.

Firstly, the broadcaster will need to invest in a subscriber management, billing and conditional access (CA) system. Deploying these relatively sophisticated technology platforms will result in a capital cost in the order of $5-$10m, depending on the competitive business model being pursued.

Secondly, because the digital FTA reception devices deployed to date, do not possess CA capabilities, then they would all need to be completely changed over (i.e. swapped out), with set-top-boxes that possessed this capability. This would result in a capital cost in the order of $300 per subscription TV viewer.

2. ACCC Brief

The ACCC is seeking a short report detailing the technological requirements for an existing free-to-air commercial broadcaster to be able to provide 'multi-channel' digital services.

The ACCC understands that the technological requirements may differ depending on whether the services are provided on a free-to-air or subscription basis. The report should address both possibilities.

Specific questions to be answered:

What equipment is required to prepare programming content (once it is produced) to be transmitted on a multi-channel basis? How, if at all, is this different from what is required for current (digital) FTA broadcasting? What would the (approximate) incremental cost of this be (ie over and above the costs incurred by broadcasters in preparing current digital FTA broadcasts)?

What transmission equipment is required to carry the signals from the broadcaster's location to the viewer? How, if at all, is this different from what is required for current (digital) FTA broadcasting? What would the (approximate) incremental cost of this be (ie over and above the costs incurred by broadcasters in transmitting current digital FTA broadcasts)?

What receiving device is required by the consumer to be able to receive a multi-channel service? How, if at all, is this different from what is required to receive current digital FTA broadcasting services? What would the (approximate) incremental cost of this be (ie over and above the costs incurred in receiving current digital FTA broadcasting services)?

Are these receiving devices capable of providing information back to the broadcaster in such a way as to enable the broadcaster to charge for the service? If not, what additional equipment is required for this, for both broadcaster and consumers? What would the (approximate) incremental cost of this be (ie over and above the costs incurred by broadcasters/consumers in providing/receiving free-to-air digital multi-channelled services)?

There may be more than one model for providing/receiving multi-channelled services. To the extent that there is a predominant model, responses to the above questions should concentrate on that model. If there are several feasible models the responses may need to address each of them.

23rd February 2005

3. Methodology and Information Sources

Methodology

In addressing questions posed in the ACCC brief, we followed a three phase process:

- We first reviewed the deployment choices already made by broadcasters, in terms of how they affect a broadcaster's current and future capacity to multi-channel. This analysis provides a framework in which to assess the individual differences between broadcasters and the options now available for them to multi-channel;
- Secondly, we reviewed the technological requirements and costs involved in enabling this current and future multi-channelling capacity; and
- Thirdly, we analysed a number of additional commercial options, including the delivering services through an advertising and subscription basis.

Note: This report does not scope the multi-channelling potential that might be made available through exploiting spare spectrum (not currently allocated to broadcasters), nor the additional capacity that may be made available by using different encoding standards (e.g. MPEG-4) to that so far adopted by the Australian Broadcast industry (i.e. MPEG-2).

Information Sources

- We found that much valuable information was contained with the Commercial Broadcaster's (Seven and Ten in particular), the National Broadcaster's (SBS in particular) and Broadcast Australia's recent submissions to the DCITA inquiry into "The provision of services other than simulcasting by FTA broadcasters on digital spectrum", held over 2004;
- We have used much of the non-confidential information we have gathered from our previous investigations into the strategies and costs involved in deploying digital television services throughout Australia. These consultancies were conducted on behalf of DCITA, the ABA and ANAO; and
- We held direct discussions with broadcasters (the ABC and Southern Cross Broadcasting in particular) to help verify our analysis.

4. Deployment Choices already made by Commercial Broadcasters

In Australia, all metropolitan areas, and most of the major regional cities and towns, already receive the digital television services, as prescribed in the Broadcast Service Act (BSA). Fundamentally, there is an obligation for broadcasters to simulcast in SDTV and, at varying times, in HDTV, the exact same programming material that is provided on the broadcasters analog channel.

In this Section, we review the deployment choices already made by broadcasters, in terms of how they affect a broadcaster's current and future capacity to multi-channel (should they be permitted to do so in the future). Broadly, we look at three questions:

1. What is the total payload capacity available to broadcasters?
2. How much of this capacity is taken up by a broadcasters obligation to simulcast in digital mode?
3. How much capacity is left for multi-channelling purposes?

4.1 What is the total payload capacity available to broadcasters ?

Under the BSA, each licenced Commercial Broadcaster (i.e. 7,9,10 and their associated regional area affiliates: Prime, WIN and SCB etc.), and the National Broadcasters (i.e. the ABC and SBS) have each been granted the right to 7MHz of VHF/UHF spectrum, for the purpose of transmitting their broadcast services in digital mode throughout metropolitan and regional Australia.

It should be understood that, as each broadcaster has been allocated a finite amount of spectrum, each in turn is limited in the total payload capacity[2] available for transmitting its simulcasting channels, and any other services, such as multi-channels.

In this regard, each 7MHz of spectrum allocation typically provides a broadcaster between 19 MB and 23 MB of payload capacity, depending on the transmission parameters chosen[3]. It should be noted, that under the BSA, there are no obligations on broadcasters to provide any specific minimum or maximum payload capacity. Nevertheless, it is apparent that Australian commercial broadcasters, in their deployment of digital services, have universally elected to deploy transmitters of sufficient power and quality so that they are capable of

[2] Digital payload capacity refers to maximum amount useable capacity available for carrying the digital television channels

[3] In essence, this range exists as a broadcaster can elect to trade-off 'forward correction rates' and 'transmitter power', in order to vary the available payload capacity. For example, a broadcaster can elect to use a low forward correction rate, and therefore leave more capacity for the program payload (e.g. 23MB), however, the broadcaster is likely to have to install a higher-power transmitter (which will be a more expensive investment) in order to ensure the integrity of the received signal by the viewer. Alternatively, the broadcaster may elect to use a lower-power transmitter, and a higher forward correction rate, leaving less payload capacity (e.g. 19 MB), but less capital investment being required for the transmitter.

providing between 19-23MB of payload capacity. It is noted that such payload capacity covers their minimum capacity needs for simulcasting their SDTV and HDTV signals and so seems a practical choice on their part.

It should be noted, we have not scope the multi-channelling potential that might be made available through exploiting spare spectrum (not currently allocated to broadcasters), nor the additional capacity that may be made available by using different encoding standards to that so far adopted by the Australian Broadcast industry (e.g. MPEG-4). While such developments would lead to significant increases in the capacity available to multi-channel, each of these two developments is outside the control on any one broadcaster.

4.2 How much of this capacity is taken up by a broadcaster's obligation to simulcast in digital mode?

The BSA requires that each broadcaster transmits in digital mode:

- a standard definition (SDTV) signal that provides a replica (simulcast) of the broadcaster's analog service; and
- for at least 1020 hours per year, a high definition (HDTV) signal that also provides a replica (simulcast) of the broadcasters analog service, although, in a format suitable for display on large wide-screen televisions.

In addition to the above, a broadcaster, from a technical implementation point of view, must also transmit an electronic program guide (EPG), and service information (SI) that allows the viewer to navigate and access the broadcasters program channels.

Based on the digital television encoding standards chosen for Australia (i.e. MPEG-2), a good quality SDTV signal will consume between 4-7 MB of payload capacity, while a HDTV will signal consume between 8-14MB. There are a number of reasons as to why these wide ranges for SDTV and HDTV payload capacity exist:

- **Choice of SDTV signal quality.** A broadcaster has a degree of discretion on the amount of bandwidth capacity it allocates to its SDTV signal. Programming that is relatively static in nature (e.g. news-reading) requires less payload capacity, while programs that are more dynamic in nature (e.g. sports) will require greater capacity in order to produce a similarly acceptable quality picture for the viewer. Hence, the decision is based somewhat on the genre of programming a broadcaster predominantly programs, as well as the quality of signal it wishes its viewers to experience. As examples of this range, Channels 10, 7 and SBS each claim to currently use 7MB, 6.5MB and

4MB respectively for their SDTV simulcast channels[4].

- **Choice of HDTV signal quality.** Again a broadcaster has a degree of discretion on the amount of payload capacity it allocates to its HDTV signal. There are three standards used in Australia:

    1. **1080i.** This standard is the highest (in terms of picture quality) and requires around 13-14MB of payload capacity. We understand this standard is currently being used by the Ten and Nine Networks.
    2. **720p.** This 'mid' standard requires around 10-12MB of payload capacity.
    3. **576 50 p** This standard is the lowest and requires around 8-10MB of payload capacity. We understand it is currently being used by the ABC, SBS and the Seven Network.

    It is noteworthy that even though two broadcasters currently choose to transmit in 1080i, there are very few receivers currently capable of fully processing this standard. Those few devices on the market that can process this standard retail upwards of A$12,000.

- **Capability of encoding equipment.** Encoding equipment is constantly improving and therefore reducing the amount of bandwidth capacity consumed. If a broadcaster uses the latest MPEG-2 encoding technology, then it is more likely the broadcaster will require less capacity. For instance, SBS claim that they have reduced their SDTV requirement for simulcasting, without any noticeable degradation in picture quality, from 5.5MB (in 1999) down to 4 MB in 2004, based on improvements in encoding technology[5].

Typically, in addition to the capacity absorbed by the simulcast channels themselves, the EPG and SI will consume up to another 2MB of the available transmission capacity.

4.3 How much capacity is left for multi-channelling purposes?

It should be apparent that the available capacity to multi-channel is a function of both the BSA's rights and obligations on broadcasters (e.g. payload capacity & simulcast obligations), as well as the individual deployment choices of broadcasters themselves. Given that the BSA equally applies to all broadcasters, then the main cause of any variability in the current and future capacity to multi-

[4] Seven, Ten and SBS's submissions to the DCITA inquiry into 'The provision of services other than simulcasting by FTA broadcasters on digital spectrum'

[5] It should be noted that, it is often argued that improvements in MPEG-2 encoding techniques are reaching maturity and that future improvements will be less dramatic, however, SBS, for instance, still expect a further 20-30% improvement in the next 5-10 years

channel boils down to the technical and commercial choices of individual broadcasters.

To this end, we have elected to provide a high and low capacity case scenarios based on the experiences of SBS and the Ten network.

A. High Capacity Case Study

We believe SBS provides a good working demonstration of a high capacity scenario for the potential to multi-channel. SBS has elected to extract the maximum use of its available payload capacity by:

- Adopting the use of high quality MPEG encoders;
- Using the minimum standards for HDTV;
- Adopting the use of statistical multiplexing; and
- Flexibly allocating bandwidth for SDTV channels based on genre.

SBS currently uses 8 MB and 4 MB of payload capacity for its main simulcast HDTV and SDTV channels respectively. Given it has a total payload capacity of 20MB[6], this leaves SBS 8MB of spare capacity during periods of HDTV transmission and 16MB during periods on non-HDTV transmission.

SBS believes it has room for 3 multi-channels during HDTV transmission times. These channels absorb 3MB, 3MB and 2MB of capacity respectively. (Note the 2MBservice is the relatively 'static' SBS Essential service). During times that HDTV transmission does not occur another 8MB of payload becomes available. Feasibly, SBS could then fill this capacity up with a further 3 multi-channels, making 6 multi-channels in total.

B. Low Capacity Case Study

Ten has as elected to use its available payload capacity by:

- Using the highest standards for HDTV (1080i)
- Allocating a high fixed bandwidth for its SDTV channel

Consequently, Ten use 14 MB and 7 MB of payload capacity for its main simulcast HDTV and SDTV channels respectively. Given it has a total payload capacity of 23MB, this leaves Ten 2MB spare capacity during periods of HDTV transmission and 16MB during periods on non-HDTV transmission.

Ten therefore has no room for multi-channels during HDTV transmission times. During times that HDTV transmission does not occur another 14MB of payload becomes available. Feasibly, Ten could then fill this capacity up with a further 2

[6] SBS's submission to the DCITA inquiry into 'The provision of services other than simulcasting by FTA broadcasters on digital spectrum'

multi-channels, assuming it sticks to its policy of allocating 7MB to SDTV channels.

Summary on capacity left for multi-channelling

In summary, we do not view that High Definition television (HDTV) and multi-channeling are necessarily mutually exclusive choices. In fact, the current multi-channeling services of SBS and the ABC amply demonstrate that, with certain technical choices being made, the two can co-exist now. With improvements in technology over time we expect that the capacity to simultaneously multi-channel and broadcast in HDTV will rise even further.

It is also worth stressing again that the main cause of any variability in the capacity to multi-channel boils down to the technical and commercial choices made by individual broadcasters. This applies to their choices for delivering their simulcast obligations (e.g. standard of HDTV and SDTV chosen), as well as how they might deploy any further multi-channels (e.g. standard of SDTV, use of statistical multiplexing etc.)

Table 4.3: Potential number of multi-channels that can be made available

	Low Capacity Case (based on Ten's choices)	**High Capacity Case** (based on SBS's choices)
During HDTV transmission times	0	3
During times HDTV is not in transmission	2	6

5. Technological Requirements and Costs

There are four major components of technology

1. Studio (preparing the digital signal in the Broadcaster's studio)
2. Distribution (delivering the signal from the studio to the transmission sites)
3. Transmission (delivering the signal from the transmission site to the viewer)
4. Viewer Reception Equipment (decoding and displaying the signal)

We review each in turn as follows:

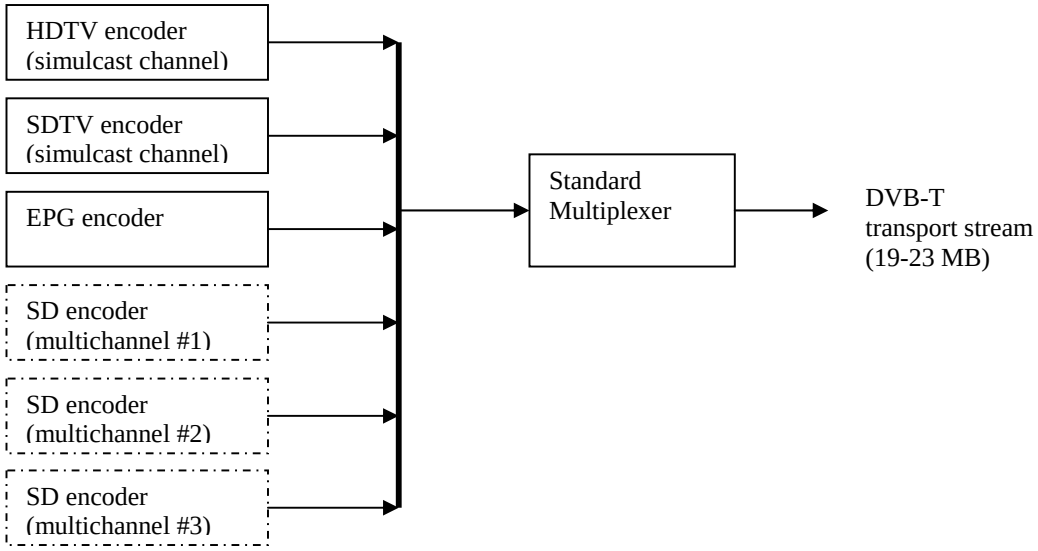
5.1 Studio Equipment and Costs

Note, the following analysis assumes that any additional multi-channels are fully 'produced', and that they only need to be 'prepared' for digital transmission. In other words, the analysis does not include any activity that allows a broadcaster to customise, in the studio, the programming for a particular geographical market. (Most commonly, in the FTA environment, this customisation consists of inserting local advertising and local news/current affairs into a national program stream.) Instead, we review the requirements for implementing this additional functionality (as well as subscription TV) in Section 6.

Required Studio Facilities for preparing Digital Transmissions

In order to prepare a combined program stream (e.g. all SDTV channels, HDTV channel, EPG etc) for distribution, the channels must be encoded and then multiplexed into a single DVB-T compliant transport stream. This is achieved through encoding and multiplexing equipment, shown in Figure 5.1. As shown in this Figure, each program stream is separately encoded and then the program streams are combined through multiplexer into a single DVB-T transport stream.

Figure 5.1



It is important to note, the sum of the inputs to standard multiplexing process is equal to the total output. That is, if one HDTV signal (say 13MB), one SDTV signal (say 5MB), and an EGP (say 1.5MB) are multiplexed together, then the output will be a 19.5 MB payload (i.e. 13+5+1.5=19.5). Of course, the output cannot ever be greater than the total payload allowed by a 7MHz channel – which, as described previously, is between 19 and 23MB.

One way of increasing the number of channels transmitted, is to use a statistical multiplexer, rather than the standard multiplexer. This device enables the sum of the inputs to be increased to around 10%-30% greater than the total output. The statistical multiplexer achieves this feat by simultaneously monitoring all the input signals and dynamically allocating the bandwidth made available to each input. For example, if at a particular point in time, in one program stream there is not much movement (e.g. a head and shoulders shot of a newsreader), while in another program stream there is much movement and contrast (e.g. a Kylie Minogue dance sequence) then the statistical multiplexer will dynamically allocate greater capacity to the Kylie program, at the expense of the newsreader. It should be noted, statistical multiplexers are not effective unless there are at least 4-5 channels, as there would not be enough variability amongst the programs. Hence, in the current circumstance where commercial broadcasters only transmit their simulcast HDTV and SDTV channels, then it is unlikely they would have invested in a statistical multiplexer.

How many DVB-T transport streams are required?

Each commercial broadcaster operates at least one major studio facility and in most cases, also possesses a number of secondary studios. For example a metropolitan broadcaster, such as the Ten Network, produces and originates most of its content from its Sydney studio. However, a good deal of programming (such as local news, sports, local advertising etc.) is also produced, or originated, by studios in the other major metropolitan areas. Further, each Australian State will have its own time-zone requirements effected by each State's timing and approach to day-light savings. The net effect is that for metropolitan broadcasters, 7, 9 and 10, a separate digital transport stream must be generated for each of the metropolitan areas served (e.g. Melbourne, Sydney, Brisbane, Adelaide and Perth).

The same logic applies to regional commercial broadcasters, such as WIN (9 affiliate), Prime (7 affiliate), and Southern Cross (10 affiliate). However, in this case, the number of transport streams is higher because there are a number of discrete 'break-out' areas, with unique advertising and local news serving the specific needs of regional cities and towns. Southern Cross, for example, claims to possess 33 'break-out' areas across Australia. One would reasonably expect WIN and Prime to possess a similar number. The net effect is a separate digital transport stream must be generated for each of unique break-out areas served.

Incremental Cost Summary

Each additional multi-channel will require an incremental investment in an SDTV encoder. Depending on the quality and support equipment required, the incremental cost of adding this encoder is estimated to be in the vicinity of $75k-$100k.

Installing a statistical multiplexer will improve the capacity of a broadcaster to provide more multi-channels. The capital cost of a statistical multiplexer is in the order of $75k. Assuming a broadcaster possessed three multi-channels then the incremental cost per channel would equate to $25k.

Hence, the cost per multi-channel, per area served, is estimated approximately $100-$125k.

It is worth noting that Australia's metropolitan-based population could be covered with 6-8 'break-out' areas. That is, the populous markets of Sydney, Melbourne, Brisbane, Perth, Adelaide, Canberra etc. would each only require this incremental capital investment per each broadcaster's additional multi-channel.

5.2 Distribution Equipment and Costs

Once the Transport Stream has passed through the multiplexer it is ready for distribution from the studio to the transmission sites. This can be achieved through a number of distribution methods including:

1. renting terrestrial transmission capacity from a telecommunications provider, such as Telstra or Optus;
2. renting satellite transmission capacity from a provider, such as Optus or PanAmSat; or
3. a broadcaster building its own terrestrial network (most likely to be digital microwave)

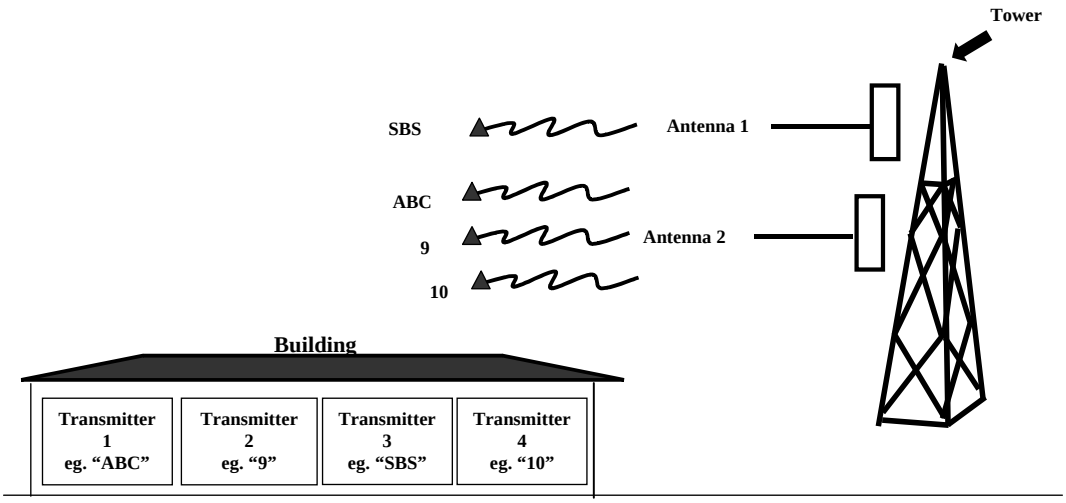
Regardless of the method chosen, it should be reasonably expected that a broadcaster would normally have provisioned for its full 19-23MB of capacity, in order to meet its HDTV and SDTV simulcasting obligations. Hence, any additional multi-channels will not incur any incremental distribution costs.

5.3 Transmission Equipment and Costs

Transmission is the task of broadcasting a program stream from a particular 'transmission site' to the television receiving aerials of the viewers. There are around 600 VHF/UHF transmission sites in Australia, from which FTA television signals (and many FM radio signals) are broadcast. Each site tends to be positioned on high ground and visibly consists of a transmitter (usually in a hut), a steel tower, antennas (on the tower) and ancillary equipment such as power generators, and air-conditioners.

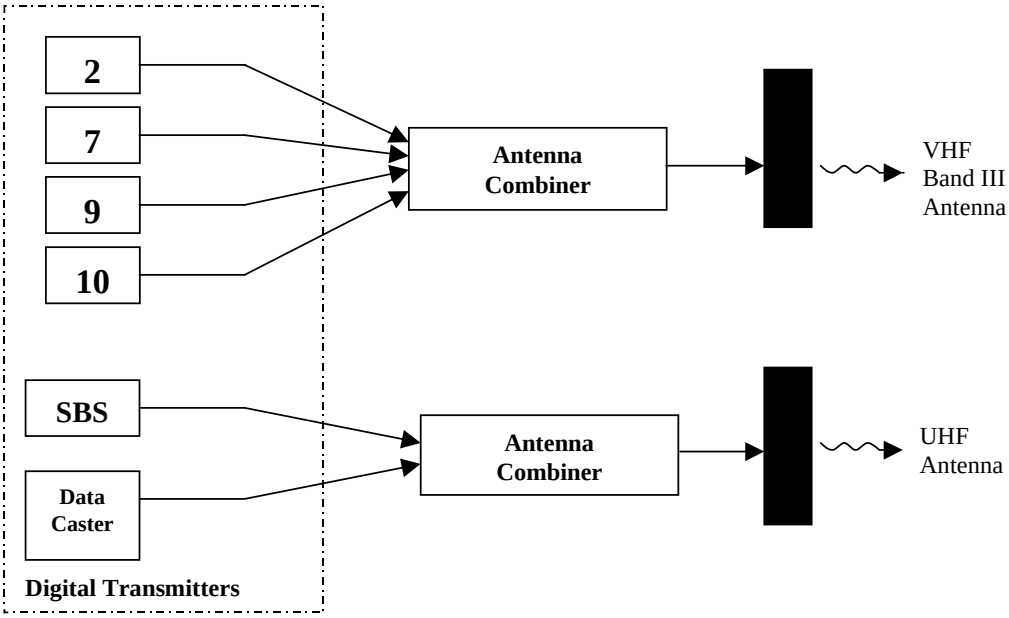
Well known sites, include the towers on the Dandenong Ranges covering the Melbourne population, and the Gore Hill/Artarmon towers covering the Sydney population.

Figure 5.3.1 Typical Components of a Transmitter Site



The transmission of digital signals from a transmission site is similar to the process involved in transmitting analog signals. Each broadcaster has a dedicated transmitter that 'powers up' the broadcasting signal before the wireless broadcast is made from the antenna to the viewer's television sets. Between the transmitter and the antenna there is usually a 'combiner' that combines the all the transmission signals (e.g 2, 7,9 and 10) as shown in Figure 5.3.2.

Figure 5.3.2 A typical digital transmission configuration



A feature of digital transmission is that transmitters are much lower in power, hence up to five broadcasters can combine their signals into one antenna. By contrast, in analog transmission generally only one or two broadcasters can share the same antenna.

While digital transmission makes more efficient use of antennas than analog transmission, during the simulcast period, analog antennas will still need to remain in place. Digital conversion will therefore require the installation of additional antennas on broadcasting towers.

With the required roll-out of digital television, as specified under the BSA, the vast majority of Australia's transmission sites will, or already have, undergone 'digital conversion'. As just described, at a minimum, this has, or will, entail the installation of a new digital transmitter, per broadcaster and a new antenna for each site. Depending on the physical infrastructure and RF capacity of the site, it is possible that the digital conversion process may, or will, also consist of installing more than one antenna, physically strengthening the existing tower (to support the new antenna), and upgrading the ancillary equipment such as the power generators and air-conditioning systems to cope with the additional transmitters.

At large, high-power, transmission sites, such as those in the metropolitan areas, and large regional towns, the digital conversion process may have cost several million dollars for each broadcaster. At smaller sites (which form the vast majority of the 600 sites), the process may have cost as little as $100,000.

Regardless, these digital conversion costs are irrelevant, given that the FTA broadcasters have, or will, as part of their BSA obligations, need to convert each of their sites to transmit over the full 7Mhz of spectrum (or 19-23MB of payload). Hence, regardless of whether a broadcaster intends to multi-channel or not, there would be no incremental cost involved for any additional multi-channels broadcast within the payload.

Note, the only exception to this conclusion would be if any spare UHF/VHF spectrum (i.e. spectrum not currently used by FTA broadcasters in analog or digital mode) was to be made separately available to a broadcaster. In this case, a full digital network would need to be deployed.

5.4 Viewer Reception Equipment and Costs

To receive the DVB-T transport stream and decode the digital channels and services contained therein, consumers must purchase either:

1. a DVB-T compliant set-top-box (STB) that decodes the signal and displays it on the viewer's existing television set

2. an integrated digital television (IDTV) - essentially a television and STB in the one device

A digital viewer needs to invest in one of these two options, in order to receive the simulcast HDTV and/or SDTV channel of the broadcasters. According to Digital Broadcasting Australia, there were 658,000 DVB-T receiving devices sold into the Australian marketplace by December 2004. While it is not formally reported, it is generally thought that the vast majority of these receivers are STBs, rather that IDTVs.

- **A digital STB** connects to a wide variety of TV screens and sets, including conventional cathode ray tube (CRT) TVs, plasma display panels (PDPs), front and rear projection sets, and liquid crystal display screens (LCDs). All digital STBs will be capable of decoding Standard Definition programs and some are capable of decoding High Definition programs as well. The later category tend to cost upwards of $600, while the former have been recently retailing recently around $200. Although, not reported, it is generally thought that the good majority of STBs sold are only capable of receiving SDTV.

- **An iDTV**, having a digital tuner integrated with its other components, does not needto be connected to a separate STB in order to receive and display digital TV. IDTV currently retail upwards of $2000.

Summary of Incremental Costs

Given that STBs and IDTVs are readily tunable there would be no incremental cost to the viewer to receive any additional multi-channels contained within the DVB-T transport stream – if the viewer was already receiving the simulcast channels.

Again, as was the case for the digital distribution and transmission systems, there will be no incremental cost involved for any additional multi-channels broadcast within the existing DVB-T payload.

6. Additional Commercial Options

The analysis, so far, provides a 'base-case' for multi-channelling. In particular, it ignores any of the equipment and services required to support a particular commercial model for additional channels (e.g. through advertising or subscriptions). As a result, we have also identified and scoped two other options that enable these commercial models.

6.1 Advertising based FTA for a particular market

The previous analysis assumed that the additional multi-channels were fully 'produced', and that and that they only needed to be 'prepared' for digital transmission. In other words, the analysis did not include any activity that allowed a broadcaster to customise the channel programming for a particular geographical market. Most commonly, in the FTA environment, this customisation consists of inserting local advertising and local news/current affairs into a national program stream.

It could be reasonably argued that these costs should not be considered, as the activities of inserting local advertising and news into a national program stream is part of the 'production' process, and that, in any case, such activities are a pragmatic commercial decision on behalf the broadcasters (as they presumably drive up ratings and advertising revenues). Having said that, it would be hard to imagine that any of the regional broadcasters, for instance, would have a commercial incentive to multi-channel, unless they could insert their own advertising and local news etc. into the nationally syndicated program streams emanating for the 7, 9 and 10 networks

In order to prepare a channel for broadcasting, a presentation/play-out facility is usually required. This presentation/play-out facility is used to take the programming material from its original source (e.g. video-tape, DVD, live feed) and to insert, or combine, advertising, captions, sub-titles and station watermarks into core programming material. If one were to fully consider these costs, then the incremental capital cost, per channel, per area served, would increase around A$200,000-$500,000.

Note, this capital cost will only cover the equipment required to enable the insertion of local advertising and news/current affairs into a typical national program stream. It does not include the operational cost of program acquisition, or of the station management required to support the channel (e.g. marketing, sales, studio staff etc.). At one extreme, in the case of the new 'no-frills' ABC-2 multi-channel, for example, (which is really an automated play-out of existing programming material), ABC Television have managed to contain these annual operational costs to around $2m p.a. for the new channel. Feasibly, however, a new commercial multi-channel, with original programming, marketing and

management costs could cost more like an extra $10m-$50m p.a. for an existing network broadcaster.

6.2 Subscription (Pay) Television

To provide the ability to charge viewers a subscription fee would require significant investments in new equipment and services, as well as changes to a viewer's existing digital FTA receiving devices.

Firstly, the broadcaster will need to invest in a subscriber management, billing and conditional access (CA) system. Deploying these relatively sophisticated technology platforms will result in a capital cost estimated to be in the order of $5-$10m.

Secondly, because the digital FTA reception devices deployed to date, do not possess CA capabilities, then they would all need to be completely changed over (i.e. swapped out), with a set-top-box that possessed this capability. In order to receive subscription services a STB with a CA smart-card or CA module will be required. These STBs sell at a premium to FTA devices by around 50-80% This would result in a capital cost in the order of $300 per subscription TV viewer.