BROADCASTAUSTRALIA

Level 10, 799 Pacific Highway
Chatswood NSW 2067
AUSTRALIA

PO Box 1212
Crows Nest NSW 1585
AUSTRALIA

T: +61 (2) 8113 4666
F: +61 (2) 8113 4646

www.broadcastaustralia.com.au

28 April 2008

Communications and Technology Branch

Commerce, Industry and Technology Bureau

2/F, Murray Building

Garden Road

Hong Kong

Email: mobiletv@cedb.gov.hk

Dear Sirs

Thank you for the opportunity to respond to the Second Consultation on Digital Broadcasting: Mobile Television and Related Issues released by the Commerce, Industry and Technology Bureau and dated January 2008. Please find enclosed submission from Broadcast Australia.

Should you have any further enquires please contact me on +61 418 384 622 or email, Chris.Jaeger@broadcastustralia.com.au or alternately, Linda Andersen, Policy and Regulatory Affairs Executive on +61 2 8113 4654 or, email Linda.Andersen@broadcastaustralia.com.au.

Yours faithfully

Chris Jaeger
MANAGING DIRECTOR
INTERNATIONAL BUSINESS GROUP

Response to the

Second Consultation on Development of Mobile Television Services

By BROADCAST AUSTRALIA

28 April 2008

COMMERCIAL-IN-CONFIDENCE

Contact details

For further information regarding any part of this Proposal, please contact:

	Details
Name	Chris Jaeger Managing Director, International Business Broadcast Australia Chairman Radio Frequency Engineering Pty Ltd Hong Kong
Address	Level 10, Tower A, 799 Pacific Highway, Chatswood, NSW 2067, Australia
Phone	+61 418 384 622
Fax	+61 2 8113 4730
Email	Chris.Jaeger@broadcastaustralia.com.au

Submission from Broadcast Australia on Digital Broadcasting: Mobile Television and Related Issues

Broadcast Australia (BA) is a broadcasting transmission provider and plays a critical role in the Australian free to air sector. BA's core business is the provision of services for the transmission of analogue and digital television and radio broadcasts to audiences across Australia. BA is a wholly-owned business of Macquarie Communications Infrastructure Group (MCIG), an entity listed on the Australian Stock Exchange (ASX) code: MCG. MCIG's major shareholders include a broad range of institutional and retail investors. More details on BA are provided in Appendix 1.

BA is pleased to provide the following comments in response to issues raised in the second consultation paper on "Development of Mobile Television Services". This submission should be read in conjunction with our earlier submission which provides more detail on BA's experience and history.

On 2 October 2007, Broadcast Australia acquired a majority share in Radio Frequency Engineering Limited (RFE), a Hong Kong-based business specialising in indoor and confined space coverage for mobile telecommunications, radiocommunications and broadcasting. The acquisition allows the two companies to work together closely, in particular, on broadcast mobile TV networks. Coverage inside buildings and tunnels will be essential for the success of any mobile TV business

Spectrum Availability

BA supports the intention to release a UHF channel for the development of mobile TV services. It should also be noted that the interoperability upper limit for DVB-H (in the UHF band) is 746 MHz, or ch55 in an 8 MHz channel raster, if the GSM900 band is deployed in any given market1.

BA does not support the release of the two VHF channels for mobile TV as the amount of VHF spectrum available is unlikely provide sufficient capacity to support a viable commercial product. The failure of the BT Movio mobile TV product in the UK, which was launched in VHF Band III can in part be attributed to the lack of bandwidth to offer a compelling number of channels to consumers. We do not believe that six channels is viable. A package of a minimum of 15 channels and wide handset choice is required for viability.

In order to ensure that a new mobile TV licensee has every opportunity to develop a viable market and service, it is BA's view that a moratorium on the release of spectrum for new services should be imposed for a period of 5 years from the commencement of the new UHF service. This would apply to both VHF spectrum and UHF currently "reserved", or released through the switch off of analogue television services or through DTT being deployed in SFN configuration.

This moratorium is strongly recommended to create a framework that starts to address the "considerable market uncertainty" referred to in Section 4.11.1 of the 2008 Digital 21 Strategy document issued by the Commerce and Economic Development Department. It is essential that the details of that moratorium or the

[1] Refer draft ITU Technical Report 102 377 V 1.2.2.

factors that would give rise to the release of additional competing spectrum are clearly articulated in the "sale" document for the initial tranche of UHF spectrum for mobile TV services.

As signalled in its previous submission, BA is sceptical of the case for S-Band based services which are being proposed in some markets. Satellite distribution in itself, is unlikely to provide a satisfactory customer experience and would need to be supplemented with multiple terrestrial re-transmission for infill and in-building solutions, reducing the potential viability of such a service. We strongly question the suitability of this technology in the Hong Kong environment.

We are also sceptical that an L-band solution for mobile TV in Hong Kong can be viable. We estimate that a multiple of many times the number of transmission facilities will be required and the availability and price of L-band handsets is likely to raise very significant risks for the business case.

Spectrum Allocation

BA supports the recommendation that spectrum should be licensed in a technology neutral manner and that the spectrum should be allocated for mobile TV services only. In other words, we would go further than the pro-mobile TV requirement if of 50% of bandwidth and recommend this be increased to 80%. This will ensure that mobile TV is delivered to the public and avoid spectrum being purchased for other services or for anti-competitive reasons.

We believe the following broad allocation principles should be applied:

- Spectrum should be made available consistent with the technology neutral allocation approach in other major markets to avoid Hong Kong being "forced" down proprietary technology routes;
- Any restrictions on the use of spectrum should be predominantly driven by the need to minimise any interference with adjacent users of that spectrum; and
- Regulation of what services could be offered should be "light touch" and aimed only to ensure the delivery of new mobile TV services without being prescriptive as to content etc.

Spectrum assignment

BA broadly agrees with the principle of using a proven and well defined allocation process, such as auction or via a beauty contest, for the allocation of new digital services. Price based allocation allows the market to decide the value of the spectrum and can provide a "quick and easy" equitable process. However, it can result in unrealistic prices being paid for spectrum for "strategic" reasons.

Experience from our DVB-H trial in Sydney suggests that mobile TV will face a challenge to be viable given the significant cost of building the required infrastructure and the nascent nature of the market. This can be expected to be exacerbated by the current lack of certainty around the business model, the potential of competitive technologies (such as WIMAX, 3G streaming or LTE) and the scarcity of capital due to the world credit squeeze. These more uncertain market conditions have emerged since our last submission. The burden of an unrealistic cost of spectrum has the potential to impact on that viability and therefore on the services available in the Hong Kong market

For this reason, BA does not support allocation via an auction process as the mobile TV business case is as yet unproven and competitive forces may result in an unrealistically high auction price, threatening the capacity of the licensee to deliver

the services required or to compromise network quality leading to a poor customer experience and reputation of services. On the assumption that the desired government outcome is the delivery of mobile TV services, rather than additional revenue, BA favours a beauty contest based on the financial, technical, rollout, content and revenue risk sharing proposed by the bidder.

Any beauty contest should be supported by government policies which ensure that the allocation process does not distort the market. Safeguards would include:

- A pre-qualification process for bidders to ensure that that they have the financial capacity and technical capability to rollout the proposed services;
- The adoption by the government of the principle of service delivery first. In the case of a beauty contest this could be supported by an exemption from fees for the first five years or until subscriptions achieve an agreed level, as one possible revenue risk approach.
- Minimum coverage obligations to ensure quality of service from “day 1” to avoid spectrum squatting and the delivery of “minimalist” services. In other words, a “use it or lose it” obligation attaching to the spectrum.

Should the government prefer a price based allocation then it is important that the reserve price set is realistic. Alternatively a fixed price mechanism relating to revenues earned would provide more certainty for bidders if identified in the “sale” document (eg a fixed percentage of revenues after a grace period of 3-5 years)

Irrespective of which approach is taken to allocation, there are a number of licence conditions which need to be determined in order to provide certainty for potential licence holders:

- Licence commencement date

  It is BA’s view that the licence should commence once rollout has been completed and the commercial service is ”on air” or 12 months from licence allocation, whichever earlier. This means that up to 12 months of the licence term is not wasted while the service is being rolled out.

- Interference management

  Interference management should be based on the “polluter pays” principle. This means that the interfering entity is responsible to “fixing” the problem. This would also apply to any future services which might interfere with the rolled out mobile TV service.

- Licence Term

  The tem of the licence is a minimum of 15 years with known arrangements for the renewal of the licence at expiry. We strongly support a presumption of renewal of the licence on a 5 year rolling basis if there has been material compliance with all of the licence terms in the period. This provides long term certainty to the market to underpin the substantial capital investment required.

Licensing Arrangements

Mobile TV services offered via broadcast solutions such as those discussed in this document will co-exist and to some degree compete with mobile video based services offered by mobile network operators via existing 2.5G and 3G networks and future LTE/WIMAX networks. This alternate platform risk is considered significant in the context of a nascent market for mobile TV services and the capital investment required; another reason to carefully reconsider a price based allocation approach. As such licensing should be structured so as to ensure that there is a reasonably

"level playing field" between mobile network operators and operators of any broadcast mobile TV networks.

BA recognises and strongly supports the need to regulate television content provided on mobile devices to protect the public, children etc. We also believe that it is important to ensure that the content which can be provided on mobile devices is not unduly restricted so that existing content i.e. from television and pay TV providers as well as new innovative content can be delivered. This will assist the success of the new product.

Of the two options proposed in the consultation paper, BA supports the Self Regulatory approach. This would require content providers to be subject to general laws including the Control of Obscene and Indecent Articles Ordinance and the Prevention of Child Pornography Ordinance and mobile TV operators would be required to draw up an industry code of practice for voluntary compliance which included an access control mechanism for adult content and general principle of good practice in conducting business and providing content. No changes to the Broadcasting Ordinance would be required.

Access to Hilltop Transmission Sites and Geographical Coverage for Broadcast Type Mobile Television

BA welcomes the statement in the discussion paper that indicates that the TA would use its power to intervene and adjudicate in circumstances where mutual agreement through commercial negotiation failed to achieve access to hill-top sites

BA notes the intention to impose rollout requirements more akin to those of broadcasting than conventional telecommunications services. BA has no difficulties with this proposal but as stated in the above paragraph this can only achieved if access is available to suitable sites.

Work Plan

BA believes that it is important that the release of a mobile TV licence is "fast tracked" so that the services can come to market as quickly as possible. BA would support the allocation of the channel and license by the end of 2008 allowing the rollout of consumer services in 2009.

It has come to our attention that there are some industry concerns relating to the use of Single Frequency Networks (SFN's) and a view that allocation should be further delayed until these difficulties are overcome. SFN's have been in operation in Australia since 1999 and are now a mature technology in this market. BA has considerable experience with SFN's having installed and operated over 25 SFN networks since then. Their value has been cemented in Australia and they continue to be utilised as part of the rollout of digital television in a highly spectrum efficient manner. BA is prepared to provide assistance to the Bureau on this matter should it be required. Information prepared by BA relating to the use of SFN's in the delivery of mobile TV has been provided in Appendix 1. It is BA's view that as long as the technical design parameters are chosen to optimise SFN usage, then excellent SFN performance can be guaranteed.

Appendix 1 Background on Broadcast Australia

Broadcast Australia (BA) is Australia's leading broadcast transmission provider and plays a critical role in the Australian free to air sector. BA's core business is the provision of services for the transmission of television and radio broadcasts to audiences across Australia. BA is a wholly-owned business of Macquarie Communications Infrastructure Group (MCIG), an entity listed on the Australian Stock Exchange (ASX) code: MCG. MCIG's major shareholders include a broad range of institutional and retail investors.

BA owns and operates an extensive broadcast transmission infrastructure network in Australia. The company provides transmission services from approximately 600 strategically located transmission sites across metropolitan, regional and rural Australia and reaches over 99% of the country's population. BA's principal customers are the ABC and SBS to whom it delivers television and radio managed transmission services. The company also provides services and/or co-hosting for commercial FTA broadcasters, the community broadcasting sector, telecommunications companies and radio-communications users (such as emergency services organisations).

BA and its predecessor organisations have many decades of broadcast transmission experience with its current activities including the provision of both analogue and digital broadcasting services. Its aim is to harness the full benefits of new digital communications technology to provide its customers with world-class broadcasting solutions, both now and in the future. To this end, BA has worked with a range of partners to establish trial services for Datacasting (Sydney, launched March 2004), Mobile TV (Sydney, commenced July 2005) and Digital Radio (Melbourne, commenced November 2003). Further Information relating to these trials is provided at Appendix 2.

The Australian government has announced its intent to release of two UHF digital channels for the provision of new digital services including datacasting and mobile TV ("Channels A & B"). These channels may be allocated during 2008 subject to confirmation by the Federal Government. This provides a major opportunity to generate greater consumer interest in digital television services which were first introduced into Australia in 2001.

BA also operates in the Asia-Pacific Region providing technical & business consultancy services and as well seeking partnerships in the development and operation of digital broadcast networks (including MobileTV).

The comments provided above reflect the principles which we believe deserve consideration in Hong Kong in the context of setting the policy for the introduction of new digital services.

Appendix 1 Mobile TV Network: what's the plan?

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MOBILE TV NETWORK: what's the plan?

First introduced to allow spectrally efficient digital broadcast networks, Single Frequency Networks (SFNs) are now proving essential in the move towards mobile TV. Broadcast Australia explores the SFN planning challenges.

When it comes to deploying a new digital television broadcast network, there is a deal more to be considered than a mere upgrade of transmission site infrastructure. Not only does the impact of the new network on existing analogue TV services need to be taken into account, but, in today's increasingly mobile-focused society, the ability of the new network to support future mobile TV services must be considered as well. In an increasing number of cases, the network is expected to support both fixed and mobile digital reception.

This places unprecedented significance on the planning phase of a new network. From the increase in spectrum congestion to the high field strengths required for mobile TV reception, digital broadcast network planners face a far greater number of variables than in the days of analogue-only. Network planning is now one of the most challenging – and arguably the most important – phases in network deployment.

Assigning spectrum

There are two main stages of network planning: spectrum and service planning respectively. Allocation of spectrum is usually undertaken by the national regulator and in today's environment is increasingly scarce. Whereas multi-frequency networks (MFNs) were commonly deployed for analogue TV services, the spectral efficiency of single-frequency networks (SFNs) are proving essential in many regions when it comes to overlaying digital networks. There is simply not always enough spectrum available to deploy digital repeater sites on different channels.

Most regulators around the world are allocating spectrum for digital services in the same band as analogue TV services – in many cases using adjacent channels. This means that the impact on the existing analogue services needs to be closely examined. There are typically two deployment scenarios: to provide a simulcast period during which the impact on analogue services is minimal; or to assume a short simulcast period allowing a higher but acceptable level of interference to the existing analogue audience.

Depending on which option is selected, either the digital or analogue service will potentially be compromised in some way.

Consider the first option, where disruption to the existing analogue TV audience is minimised. Interference to analogue services is prevented by limiting the effective radiated power (ERP) of the digital signal by 6 to 13dB relative to the analogue transmission. Depending on the digital signal modulation scheme used, the number of programs per digital channel may be constrained as a result. Alternatively, the reduced ERP can yield a reduced coverage area. Either way, the full potential of DTV broadcasting is compromised until analogue services are switched off.

It follows that if the full potential of digital broadcasting is to be realised immediately, existing analogue services may be deteriorated, as per the second deployment option. This option has been adopted in countries with a high cable and satellite penetration and a low proportion of analogue terrestrial viewers.

The SFN scenario

Once the spectrum has been allocated and the level of protection of existing analogue services determined, the detailed service planning is carried out by the broadcaster or broadcast service provider. If the new digital network is to be an MFN with reception by fixed outdoor antennas, the planning approach is similar to, but more complex, than analogue planning principles.

When planning an SFN, on the other hand, the situation is even more complex – the basic principles of 'same content', 'same frequency' and 'same timing' at the receiver are all-important. Moreover, the issue of whether reception is to be fixed or mobile introduces different challenges.

Consider first a fixed-reception DTT system. In the case of an MFN overlay, it is fairly safe to assume that existing consumer receive antennas will be appropriate, assuming the same frequency band and signal polarisation as the existing analogue service are used. Household antennas are likely to be already pointing in the ideal direction, depending on which site provides the most appropriate transmission signal. This is not necessarily the case with an SFN, where the optimum transmission signal might originate from an entirely different direction.

Computer modelling tools are invaluable in SFN planning and design. Parameters such as receive antenna orientation, ground cover or 'clutter', topology and the details of all transmission sites (such as ERP and synchronisation timing) can be used to map coverage signal strength for a given area. Furthermore, the relative signal strengths from each site – and the corresponding time interval between them – can be calculated to determine which of the transmission sites is expected to provide the greatest level of service, or cause interference.

Interference in SFN networks can be caused by co-channel transmission signals arriving at the receiver outside a nominated time guard interval. Same-frequency signals that arrive within this time guard interval will be non-destructive. If they arrive outside the guard interval, on the other hand, they reduce the carrier-to-noise margin available as if they are co-channel interferers. From experience, so long as they are more than 20dB down on the main signal, they do not cause the digital signal to fail (Figure 1).

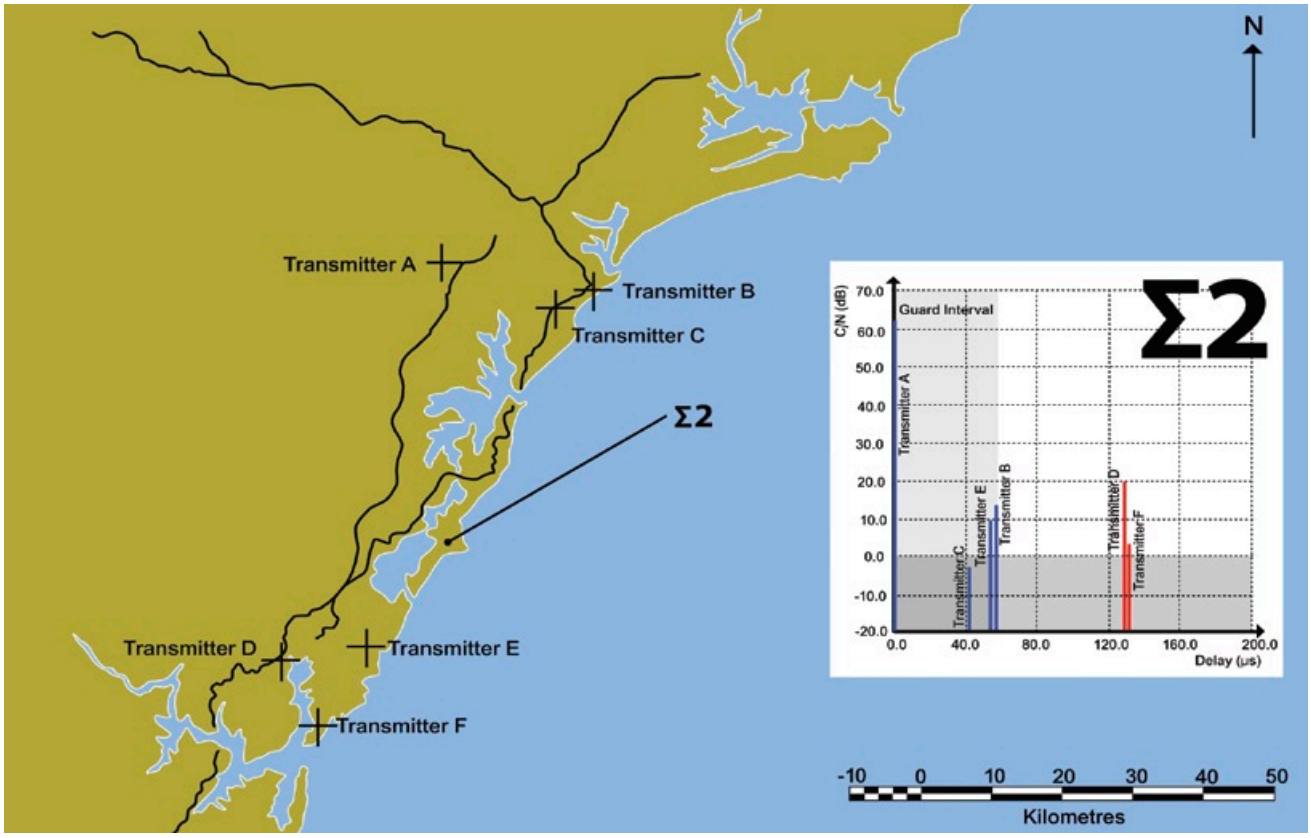

Figure 1. A Single Frequency Network performance analysis determines whether co-channel transmission signals will cause interference.

The philosophy of mobile

Broadcasting to mobile devices injects additional complexity to network planning. This is primarily because mobile television users expect quality reception virtually anywhere, on devices with small receive antennas at variable orientation. In order to address challenges such as reduced antenna height, building penetration, reduced receive antenna gain, and higher required location availability, trials have shown that for effective mobile reception the field strength needs to be 30 to 50dB higher than fixed services, depending upon the data-throughput requirement of the network operator.

It is impractical, however, to simply add power to a centralised transmission site in order to achieve the required field strength. Consider a site broadcasting at 50kW ERP: for that site to deliver a field strength that is increased by 30dB, the required ERP would be a massive 50MW (Figure 2).

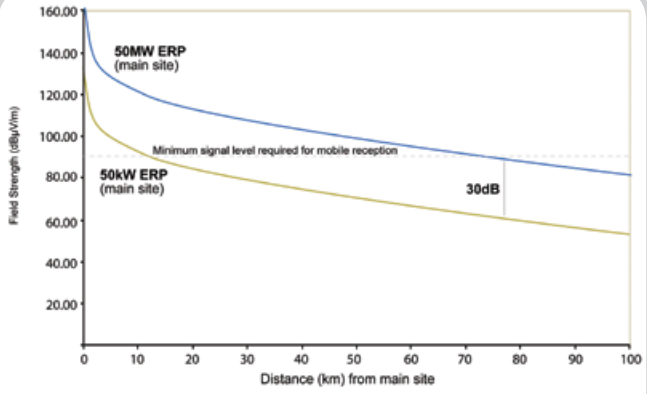

Figure 2: A centralised transmission site would need to broadcast at 50MW ERP to achieve the minimum field strength of 90dBµV/m required for mobile TV networks.

Generating a 50MW ERP would be a huge price to pay for good mobile coverage, assuming that the channel would even be permitted to operate at that level. Clearly, an alternative transmission network philosophy is required.

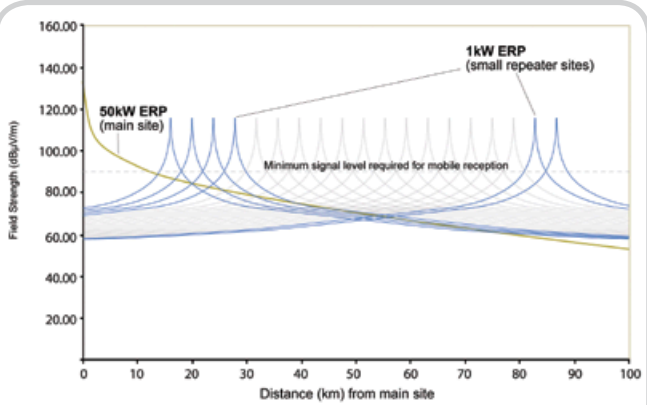

Figure 3: A mobile TV network comprising multiple sites broadcasting at 1kW ERP provides a more viable solution to achieving a minimum field strength of 90dBµV/m.

Figure 3 demonstrates the principles of a mobile network that instead consists of multiple low-power (1kW ERP) sites, based on theoretical field strengths. The main site broadcasts at 50kW ERP, but as the field strength falls with distance below the minimum requirement for a mobile network (indicated by the grey dashed horizontal line), the coverage is supplemented by the smaller, low-power sites.

Not only does this approach provide a consistent signal level across the entire area of interest, but it also delivers signals from multiple directions, thereby improving location availability and reducing the impact of building clutter.

Adjacent channel challenges

Despite the myriad advantages, such multi-site broadcast networks can offer their share of challenges. One possible scenario occurs in regions with low level analogue signals, where residents are using fringe area receive systems with mast-head amplifiers. If a mobile TV repeater is deployed in this area, it could lead to receiver overload; to address this, suitable filtering would need to be implemented in the receive system.

Adjacent channel interference can also become an issue. If the mobile TV channel is adjacent to an analogue service, the establishment of a mobile TV transmission site where no analogue transposer exists will cause adjacent channel interference to the analogue signal in the region surrounding the mobile TV site (Figure 4).

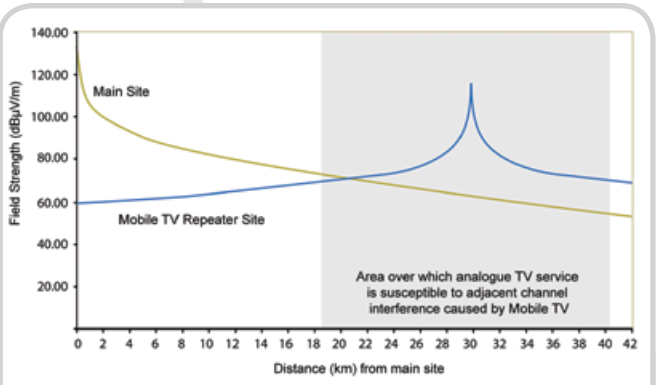

Figure 4: Interference caused by mobile TV services on adjacent channel analogue TV.

This is not easily addressed in a viable manner, since it would require establishing a new analogue transposer – assuming spectrum could even be found – and re-pointing antennas away from the main site.

If there is an adjacent channel DTV service, on the other hand, there is still the potential for adjacent channel interference caused by a mobile TV repeater, but the area affected is much reduced owing to the robustness of

the digital signal (Figure 5). Moreover, in digital systems the interference is more easily addressed.

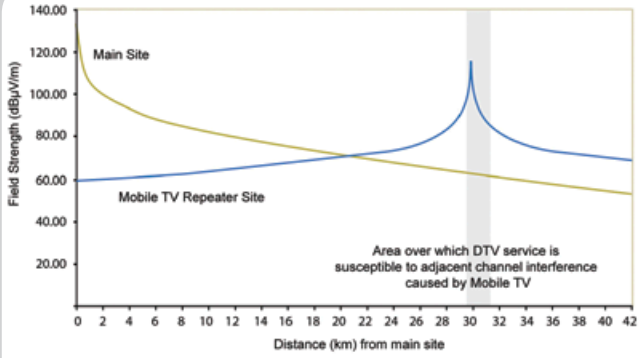

Figure 5: Interference caused by mobile TV services on adjacent channel fixed-reception DTV.

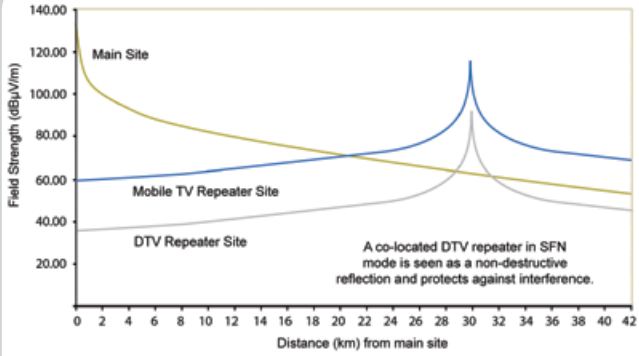

Figure 6: The interference to fixed-reception DTV caused by adjacent channel mobile TV can be addressed by a co-located DTV repeater facility.

The establishment of a DTV repeater facility along with the mobile TV facility is effective in this case, since the DTV receiver would see the DTV repeater signal (operating in SFN mode) as a non-destructive reflection, provided the timing is established correctly. The repeater signal therefore supplements the main signal. It is important to maintain the required protection ratio between the mobile TV and digital terrestrial signals; this is most cost-effective if the DTV repeater broadcasts at a lower ERP than the mobile TV service (Figure 6).

Planning imperative

In the face of undeniable excitement surrounding mobile TV, it is equally undeniable that broadcast mobile TV network planning is a complex process, requiring a great deal of technical expertise. The use of SFNs is essential – not only due to lack of spectral resources, but also to allow deployment of a multi-site network that delivers the required high minimum field strength with realistic ERPs. Another consideration is transmission handover in the handset, the need for which is eliminated using an SFN.

When it comes to the early stages of planning, regulators need to consider the big picture when allocating spectrum, particularly if mobile TV networks are to be ultimately deployed. Moreover, network planners and designers now face a much broader range of issues than in the days of analogue-only. The introduction of digital broadcasting added one layer of complexity. Mobile TV has raised it a notch higher. It is no longer a matter of just operating within the regulator's limits; real technical expertise and forethought are required for an optimal service. Rigorous service planning is imperative.

Broadcast Australia

With over 70 years' experience as the owner and operator of one of the most extensive terrestrial broadcast transmission networks in the world, Broadcast Australia provides end-to-end transmission services for radio and television (analogue and digital) broadcasters. The company's core competencies include planning and network design, engineering design and project management, complex systems integration, site development and installation, operations and network management and in-house repairs and maintenance.

Broadcast Australia also develops world-class solutions and applications for new and emerging technologies – such as Infocasting, Digital Radio and Mobile TV – working with strategic partners throughout the Asia Pacific region. Subsidiary companies include Hong Kong-based confined space coverage group, Radio Frequency Engineering Limited (RFE), and systems integration and product supply specialist, The Bridge Networks. Broadcast Australia is a 100% owned subsidiary of Macquarie Communications Infrastructure Group, an entity listed on the Australian Stock Exchange (ASX code: MCG).

Enquiries Broadcast Australia
Telephone: +61 2 8113 4666
Web site http://www.broadcastaustralia.com.au

Appendix 2 Mobile TV: Technology Profile

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MOBILE TV
Technology Profile

'Mobile TV' or 'video on handhelds' is widely accepted to be a major business opportunity — probably the first major mass market opportunity since digital mobile communications arrived late in the twentieth century. Yet speculation is currently rife as to the ideal business model for Mobile TV, with huge emphasis being placed on identifying the key players in the value chain. This challenge is compounded by a number of different Mobile TV technologies and networks under consideration across the world.

Definition of Mobile TV: The concept of video on handheld devices comes in two main guises: that which is downloadable for viewing at the one's convenience (for example 'video on demand' or 'podcasts'), and that which is streaming content in real time ('mobile television'). Downloadable content, by its very nature, is generally delivered to handheld devices via one-to-one (unicast) connections, such as 3G cellular or even the Internet. Streaming content, on the other hand, can be delivered via either unicast or broadcast platforms (one-to-many). Content may range from repurposed television programs, live sporting events, radio or supplementary data in the manner of 'Infocasting'.

Broadcast versus Unicast: Broadcast Mobile TV delivery platforms offer a number of advantages over unicast. One of these is the utilisation of dedicated spectrum for broadcast services, which eliminates any impact (or dependence) on finite-capacity (contention limited) 3G services. The greater sustainability of broadcast TV platforms is well accepted. The dedicated spectrum also means that Mobile TV services can be broadcast using 'more ideal' spectrum. UHF frequencies (460 to 860MHz) and
VHF Band III (170 to 240MHz) offer the best balance of coverage penetration, handset design, infrastructure costs, and practicality. L-Band frequencies (~1450 to 1675MHz) are also being utilised in some deployments where UHF spectrum is scarce, e.g. Europe.

Network topology: The choice of network topology for broadcast Mobile TV is generally dependent on how best to leverage existing infrastructure. Two leading architecture models have emerged: the mobile network overlay, where existing mobile base station infrastructure is employed; and a broadcast network overlay, where existing broadcast transmission infrastructure is utilised. The most straightforward and economical of these is the latter, where the Mobile TV multiplex/services are deployed at a city's main television broadcast transmission site to provide blanket coverage. Supplementary in-fill repeater stations support the main transmitter. This architecture requires far fewer transmission sites than those associated with a mobile network overlay. This streamlined approach to infrastructure, coupled with superior coverage, makes a broadcast Mobile TV architecture the preferred option. However, it is prudent for potential service providers to compare both options, as local issues may have an impact in the final decision.

Broadcast Mobile TV platforms: Various Mobile TV platforms have been developed globally to combat issues of mobile device reception, battery life and screen resolution.

- Digital Video Broadcasting-Handheld (DVB-H) is an adaptation of DVB-T. There is also a satellite hybrid variant (DVB-SH).
- Digital Multimedia Broadcast (DMB) is derived from the Eureka 147 Digital Audio Broadcasting (DAB) standard. Both terrestrial (T-DMB) and satellite (S-DMB) variants are available.
- Media Forward Link Only (MediaFLO) is a proprietary technology for the delivery of multimedia content.
- Integrated Services Digital Broadcasting (ISDB) '1seg' uses the 13th segment of the digital terrestrial television signal for mobile content.
- A host of additional standards are also in development, particularly in China.

Mobile TV — OPPORTUNITIES and CHALLENGES

Mobile multimedia and television services offer a raft of new opportunities to mobile carriers, content providers, and broadcasters; as well as presenting some interesting challenges:

The Opportunities

New revenue stream: The clear business potential for Mobile TV has been demonstrated by user trials around the world, as well as commercial services in Korea, Japan, and Italy. The success of 3G video services globally also suggests consumer enthusiasm for Mobile TV.

Receptive Asian mobile market: The Asian market is a particularly 'ripe' candidate for Mobile TV, given its history of high mobile subscriber penetration.

Leverage existing billing relationships: By integrating Mobile TV services with 2G and 3G services, the consumer relationship is already established with mobile operators. From the consumer point of view, it may merely be a case of upgrading handsets.

The Challenges

Defining the business model: Mobile TV is an attractive business proposition for many different players (content providers, mobile operators, broadcasters, broadcast service providers, media companies, licensing bodies to name a few). Getting the balance right (investment, revenue, risk) between the key players will be the number one challenge.

Technical learning curve: Mobile TV networks will involve significant capital outlay, so getting the technology and implementation right at the outset will be imperative. Network deployment challenges include:

- understanding the strengths and weaknesses of the different platforms
- the cost / number of channels / Quality of Service (QoS) / coverage trade-off
- accommodating different network architectures (mobile or broadcast network overlay)
- understanding the impact of Mobile TV services on existing TV services
- coverage planning, including in-building coverage and Single Frequency Network (SFN) design

Mobile TV — Broadcast Australia's SOLUTION

Broadcast Australia's extensive Mobile TV experience gives the company a unique perspective on how such services and networks can be successfully realised. Its Mobile TV trial experience includes:

- DVB-H trial in Sydney, Australia
- Mobile TV showcase at the 2006 Melbourne Commonwealth Games
- Sister company Arqiva's DVB-H trial, Oxford, UK
- Arqiva's MediaFLO trial, Cambridge, UK
- Arqiva's DAB/DMB L-Band trial, London, UK

Through participation in these trials in various capacities, Broadcast Australia has gained powerful insight into Mobile TV services from both technical and commercial (user) perspectives. Technical aspects include network planning and coverage performance for different network architectures, systems integration (including adjacent channel and Mobile TV headend issues), SFN deployment, and interactive capabilities and costs.

The commercial aspects of the trials have provided insight into consumer use of Mobile TV services such as: demand cycles and locations; content preferences; handset functionality and impact of QoS. The trials also allowed various key stakeholders — mobile carriers, content providers, broadcast service providers and technology providers — to determine how potential commercial partnerships might work.

The Mobile TV 'value chain'

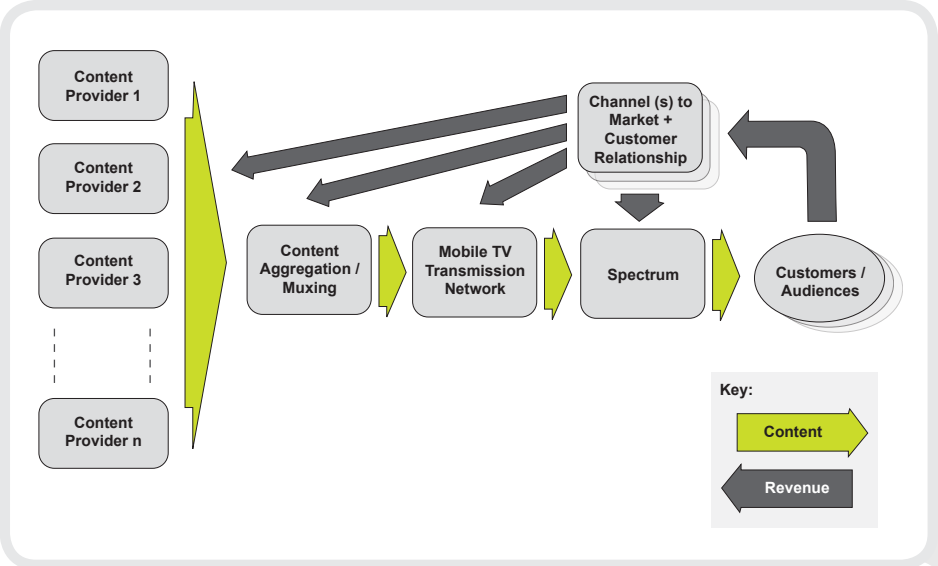
Since Mobile TV represents a convergence of industries, the resulting business model and 'value chain' is a complex mix of multiple stakeholders who ensure firstly that content is delivered to the end-users and secondly that revenue is collected and distributed among all parties.

- Content providers
- Content aggregator/multiplex owner*
- Mobile TV transmission network provider*
- Spectrum owner (usually government body) and licensee*
- Channel to market that acquires, owns and manages relationships with end-users
- Audience/end-users

*Broadcast Australia has the experience and expertise to take on the combined roles of overall mobile TV transmission network provider, content aggregator/multiplex owner and spectrum licensee or any one of these. The company is also very well positioned to take on a consulting or operational role for any individual aspect of these key value chain elements.

Achieving the 'optimal' network: There are many variables that need to be balanced in order to realise the 'optimal' Mobile TV network. The key is to identify what consumers want, then design and deliver the service efficiently to meet these requirements. Key factors include:

- **Video/audio quality —** Higher bit and frame rates will yield higher quality and it is important to ensure that the quality standard is set sufficiently high so as to differentiate Mobile TV from 3G, but not so high as to drive excessive network costs. This becomes a key factor when supporting devices with larger screens.
- **Geographic coverage —** As with the evolution of cellular networks, identifying the key markets to cover first will be critical.
- **In-building coverage —** Trials have identified the importance of in-building coverage. However, balancing this with the increasing costs of building networks with greater in-building penetration will be critical.
- **Need for regional variations —** Supporting regional variations of programming will be a requirement in many markets. However, this has implications on headend, distribution, and network design costs, which need careful planning.



Mobile TV 'value chain'

The four critical Cs of Mobile TV

When implementing a new Mobile TV service, there are four key criteria that research has shown will have major impact on its success:

- ***Content*** *— Given the plethora of entertainment options, today's modern consumers have short attention-spans. It is thus imperative that Mobile TV content is compelling. Trial results indicate that viewing sessions average around half an hour, with a wide selection of genres essential to entice users to the service.*
- ***Coverage*** *— The importance of network coverage cannot be understated. Consumers demand and expect ubiquitous mobile phone coverage and Mobile TV will be no different. Coverage at the time of launch must be designed to meet or exceed customer expectations, with well defined plans for evolution. Indoor coverage is likely to also be important; for example, in metro tunnels, shopping centres, and airports.*
- ***Convenience*** *— No consumer wants to battle with their electronic device and user trial results support the importance of convenience. This can mean handset functionality (such as user interface, form factor, battery and receive performance), integration with other services such as 3G, or quality of service. Interactivity is likely to be another driver for user take-up.*
- ***Cost*** *— There are two aspects of cost to be considered. Any Mobile TV network will be a balance between establishment and operational costs versus the price that's acceptable to consumers. Mobile TV network owners and partners will need to make smart choices to optimise their bottom line, while making the package attractive to consumers. The key will be pacing investment to develop a revenue stream, which can then be fed back into the network.*

Broadcast Australia's core deliverables for Mobile TV

- ***Trials experience*** *— Broadcast Australia has participated in various Mobile TV trials, providing insight into commercial and technical aspects of Mobile TV.*
- ***Technical expertise*** *— Broadcast Australia has unrivalled expertise in RF planning, broadcast network design, and end-to-end systems integration. The company has experience with multiple digital platforms, including DVB-H and DAB, plus extensive experience of wide area SFN design and operation.*
- ***Business Expertise*** *— Broadcast Australia has developed full-scale commercial business plans for mobile TV, including models to analyse the trade-offs involved.*
- ***Operational experience*** *— Broadcast Australia's network is one of the most extensive in the world and its Network Operations Centre (NOC) the most technically advanced. The Sydney DVB-H trial was aggregated, multiplexed and broadcast from the company's Gore Hill facility, in Sydney.*
- ***Speed to market*** *— Broadcast Australia has established relationships with technology providers and other key Mobile TV stakeholders to facilitate time to market. The company's leading project management capability will ensure complex technology rollouts, such as Mobile TV, are delivered in a timely fashion, within budget.*
- ***Potential capital funding*** *— Broadcast Australia offers the potential for capital investment.*
- ***Participant in core technology standards-setting bodies***

Mobile TV — OUTCOMES

Mobile TV is in its infancy, but the potential opportunity is enormous. Wrong decisions could result in major cost differentials and/or major customer dissatisfaction. Choosing the right technical, planning, content and distribution partners will therefore be vital.

The ideal business plan: Successfully exploiting the Mobile TV business opportunity will depend on several key success factors.

- **Understanding the competitive environment —** Weighing the strengths and weaknesses of competing Mobile TV solutions will make or break the Mobile TV proposition. Also, choosing the right partners and being clear about respective positions in the value chain will be essential.
- **Getting the consumer proposition right —** High expectations from consumers means QoS, coverage, content and pricing will be critical. As will handset form-factors, functionality, brands and prices.
- **Making technology choices —** With multiple Mobile TV platform and infrastructure options, initial choices will radically drive the level of network investment and influence long-term viability.
- **Network planning —** User trials have highlighted the importance of coverage quality and penetration (including in-building coverage); getting it right in the planning stage will be vital to meeting these expectations while still keeping costs to a minimum.
- **Phased introduction of services —** An opportunity to de-risk deployment lies in phasing the service launch across geographical areas.
- **The importance of content —** There's a need for a rich mix of relevant local, international and 'specific-to-mobile' content, provided by broadcasters, pay TV operators, rights owners and content makers.
- **Channel and speed to market —** It is likely that Mobile TV will sell through existing channels to market, so identifying the most appropriate of these early will be important. Likely contenders are mobile operators, pay TV operators or other businesses with strong consumer brands.

Broadcast Australia

As the owner and operator of one of the most extensive terrestrial broadcast transmission networks in the world, Broadcast Australia provides transmission services for radio and television (analogue and digital) broadcasters and offers site sharing and infrastructure services.

With over 70 years broadcast transmission experience, Broadcast Australia plays a strategic role in developing new and emerging technologies — including Infocasting, Digital Radio and Mobile TV. The company's aim is to provide world-class broadcasting solutions throughout the Asia Pacific region by working with strategic partners, including wholly owned subsidiary, The Bridge Networks.

Broadcast Australia is a 100% owned subsidiary of Macquarie Communications Infrastructure Group, an entity listed on the Australian Stock Exchange (ASX code: MCG). Its sister company, the UK-based Arqiva, specialises in providing broadcast transmission solutions for fixed and mobile media applications.

Enquiries Broadcast Australia
Telephone: +61 2 8113 4666
Web site http://www.broadcastaustralia.com.au