Supplementary Submission
Senate inquiry into the capacity of communication networks and emergency warning systems to deal with emergencies and natural disasters

(A) HEARING GENERAL COMMENTS & OBSERVATIONS

The following are general comments and observations based on our reading of the transcripts from the Hearings on the 8th and 9th August 2011. We have also provided more specific detailed comments against actual extracts under a separate section.

Motorola Solutions Credentials:
Motorola Solutions is a leading provider of business and mission-critical communication solutions for enterprise and government customers. With 80 years of experience in wireless communications, Motorola Solutions has earned a solid reputation as trusted partner to many public safety agencies and local, state and federal governments. We are a worldwide leader in nearly all the markets we serve, with a highly diversified customer base, operations in over 65 countries and an unmatched portfolio of innovative technology offerings.

With a heritage of over 40 years in Australia, Motorola Solutions has been at the forefront of local innovation, and is driving next-generation communications technology to help connect and mobilise enterprise and government customers in the moments that matter most to them.

Motorola Solutions has built more than 500 standards-based, public safety networks in 90 countries around the globe, and our solutions form the basis of emergency communication networks, applications, devices and services currently relied on by public safety agencies across Australia.

In recent years, Motorola has developed and deployed the first of the next generation public safety mobile broadband networks and highly customised devices to meet the rapidly growing demand for our emergency services mission critical applications.[1]

Motorola serves a diverse customer base throughout all regions in the world and provides a valuable contribution and support to the international spectrum harmonisation and standards process. In particular, we are active participants to the International Telecommunications Union (ITU), Asia Pacific Telecommunity (APT) and 3rd Generation Partnership Project (3GPP) for developing global 3G & now 4G standards.

Based on the extensive experience as a technology provider and operator, Motorola is well qualified to provide expert advice to the Senate Inquiry Committee on the points raised during the Hearings.

Need for Dedicated Public Safety Spectrum
The statements provided by the public safety witnesses are consistent with the view of public safety organisations globally that there is a definite requirement for dedicated broadband spectrum to support public safety mobile applications. In Australia, public safety agencies currently only have access to spectrum suitable for building their mission critical narrow band voice and very low speed data networks, and therefore require a new allocation of spectrum for public safety broadband (PSBB). Based on extensive testing and evaluation by US Agencies, a block of paired 10+10 MHz (20 MHz total) of spectrum will be required as a minimum to meet the demands of public safety organisations responding during an emergency.

Costs to Establish Public Safety Broadband (PSBB) Networks
We note references from AMTA and Telstra to the "billions of dollars" that mobile phone operators have invested in their networks, and concerns that any spectrum allocated to public safety may not to be used effectively.

Public safety organisations in Australia currently install and operate their own sophisticated radio voice and data communications networks, designed specifically to meet their mission critical requirements. Similarly, public safety grade broadband networks can be overlaid on these sites. Most State Governments currently operate public safety digital Government Radio Networks, with mission critical cores capable of being upgraded to operate LTE public safety broadband networks, with roaming capability onto 3G/4G commercial networks.

In this way, the next generation public safety networks are scalable, allowing these systems to be deployed in stages, whilst maintaining the choice to operate in partnership with the commercial networks as required attaining the specific agency requirements and budget constraints.

[1] First State Wide Public Safety Broadband Network: http://www.governorbarbour.com/news/2011/aug/8_24barbourmotorolamswin.html

700 MHZ OR 800 MHZ SPECTRUM

We note that there were several references from witnesses as to whether the allocation of spectrum for public safety should be from the 700 MHz digital dividend, or the 800 MHz bands.

We note from the transcripts that:

- The Police Federation of Australia (PFA) has indicated that this band would not be viable, and that an allocation would need to come from the 700 MHz digital dividend band.
- Conversely, the representatives from ACMA, DBCDE, Telstra and AMTA favour an allocation of spectrum for public safety broadband from the 800 MHz band – specifically 806-820MHz paired with 851-865MHz, or possibly 805-820MHz paired with 850-865MHz

- The main points of contention we have identified from the transcripts are:

  i. Whether 700 or 800 MHz will provide the optimum opportunity for spectrum harmonisation for public safety within the Asia Pacific Region and globally - which in turn will impact:

     - Market size, hence cost and availability and variety of public safety products, and
     - Interoperability with neighboring countries

  ii. Uncertainty, impact and cost required to clear the existing narrow band users of the 800 MHz band, compared to clearing the 700 MHz digital dividend

Motorola would like to submit the following to assist in evaluating these main contentious points that were made by the various witnesses on this subject.

700 OR 800 MHZ OPTIMUM FOR SPECTRUM HARMONISATION

- **Australian Public Safety Suppliers Prefer 700 MHz:** Whilst the mobile phone operators support the notion of allocating spectrum from the 800 MHz band for public safety, preeminent suppliers of the public safety solutions in Australasia have formally expressed their support for 700 MHz band for public safety broadband and have raised concerns[2] regarding the 800 MHz band. Motorola has also previously provided a briefing paper[3] explaining the issues associated with 800 MHz compared to 700 MHz. Copies of the Joint Supplier correspondence and Briefing Paper have been included as evidence to this submission.

- **ITU & APT Harmonised Spectrum for PPDR**: The 700 MHz digital dividend spectrum plan (698-806MHz) has been accepted by the APT for broadband in the Asia Pacific Region. To date, the APT has agreed for each country to decide the amount, if any, of spectrum from this 700 MHz digital dividend to be allocated to PPDR[4].

  Contrary to the claims made, there has been no consideration or consensus to convert the existing 800 MHz (806-824/851-869) PPDR narrow band spectrum to public safety broadband. In fact, at their last meeting, the International Telecommunications Union (ITU) working group approved a draft report[5] Recommendation with full support from all APT countries for ongoing harmonised use of the 806-824/851-869 MHz band for narrow band PPDR, not broadband as is being claimed by ACMA. A copy of this report is attached as evidence to this submission.

  Therefore, based on the current planning, it is unlikely that the APT countries will agree to reallocating the 800 MHz PPDR narrow band spectrum for PPDR broadband. A decision to allocate this spectrum to public safety for broadband would isolate Australia from the region and the rest of the world.

- **Technical Issues with 800 MHz Broadband:** Even if Australia decides to proceed with a unique allocation of spectrum between 806-824/851-869 MHz for public safety broadband, spectrum engineers, particularly experts from technology providers, APT and 3GPP are advising that there are a numerous technical issues that need to be addressed before the 800 MHz band could be considered for PSBB.

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[2] Refer joint supplier letter to Senator Conroy 30th May 2011
[3] Motorola Briefing Paper - Considerations for 800 MHz Spectrum for Public Safety Broadband, 30th May 2011
[4] PPDR - "Public Protection and Disaster Relief" as defined by ITU Resolution 646
[5] ITU-R WP5A LMS.PPDR.UHF

The most significant will be to mitigate unacceptable interference between the 700 MHz digital dividend spectrum and the 800 MHz public safety band, and the upper portion of the existing 850 MHz mobile phone services to the public safety 800 MHz band. Therefore, experts are recommending that a 10 MHz guard band would be required to protect the user devices of public mobile phone services in 700 MHz from likely interference from public safety transmissions in 800 MHz band.

In addition, special filters will be needed both for public safety and public mobile phone transmitters, increasing the cost of both PSBB users as well as mobile phone operators. This guard band would result in an allocation of spectrum for public safety of 813-823 MHz paired with 858-868MHz, which occupies virtually all the spectrum currently utilised by the existing non carrier users in this 800 MHz band. This leads to the next point of contention.

UNCERTAINTY, IMPACT AND COST TO CLEAR EXISTING 800 MHZ USERS

- **Existing users of the 800 MHz band**: The existing 800/900 MHz band is currently the subject of a review by the ACMA initiated in May 2011.[6] We note from the transcripts that the DBCDE confirmed that they are still in the process of reviewing the responses from industry and affected parties.

  We also note that the decision to allocate spectrum for public safety mobile broadband from this 800 MHz band was announced[7] before the closing date for responses to the discussion paper. This highlights serious concerns raised by the public safety and other users that ACMA's decision has preempted the outcome of the "review", and had been made without any reasonable consideration to the consequences to the existing users.

  As indicated in the ACMA discussion paper, the 800 MHz spectrum is dominated by mobile phone operators, who currently have 88% of the assignments in this band. Whilst Australia is in the unique situation for the 806-820 MHz portion of this band to become available as part of our digital dividend, the corresponding paired spectrum 851-865 MHz is currently home to some 4,200 narrow band assignments supporting networks with many tens of thousands of commercial essential services, government and public safety end user devices.

  The 820-825 paired with 865-870 MHz band is predominantly utilised by narrow band trunked radio services and emergency services mission critical narrow band data services. This segment alone supports many tens of thousands of end user devices.

  Re-planning the existing 806-824/851-869 MHz narrow band for broadband services would necessitate the clearing of all these services. It is important to note that most of these users will have already determined that no alternative communications technologies were fit for purpose.

  Examples of current commercial, government, essential and emergency services users of this portion of the 800 MHz band include:

  - NSW Police Force
  - Australian Federal Police
  - Victoria Police
  - Western Australia Police Service
  - Tasmania Police
  - Department of Justice
  - Department of the Attorney General (WA)
  - Motorola Smartnet Pty Ltd
  - Mobile Communications Systems Pty Limited
  - Comsource International Pty Ltd
  - Memo Communications
  - Country Energy
  - Energex Limited
  - Ergon Energy Corporation
  - Electricity Networks Corporation
  - Powercor Australia
  - Department of Defence
  - NSW Rural Fire Service
  - NSW Fire Brigades
  - Queensland Urban Utilities
  - Brisbane City Council
  - Queensland Ambulance Service
  - Ambulance Service of NSW
  - Ambulance Victoria
  - Australian Customs and Border Protection Service
  - Telstra Corporation Limited
  - Soul Pattinson Telecommunications Pty Limited
  - State Water Corporation
  - Water Corporation

[6] ACMA 900 MHz band – Exploring new opportunities – Initial consultation on future arrangements for the 900 MHz band, May 2011
[7] Minister Press Release 10th May 2011:
http://www.ema.gov.au/www/ministers/mcclelland.nsf/Page/MediaReleases_2011_SecondQuarter_10May2011-DiscussionsonNationalBroadbandforPoliceandEmergencyServices

- **Cost and time to clear 800 MHz compared to 700 MHz**: Clearly the decision to close down all the existing narrow band services will be a serious matter, and will require significant planning to identify alternative spectrum and technologies for the existing user networks.

  From the transcripts, it appears that ACMA and DBCDE have not even acknowledged the impact on the community that conversion of the existing narrow band spectrum to broadband would have, let alone commenced any planning or costing analysis.

  As indicated in our response to the ACMA discussion paper, "the cost and timing to migrate some or all of these services will depend on a number of factors, including the type of service and availability of cleared spectrum. Migration could necessitate the construction of parallel networks to ensure continued operation, with the requirement to expand or build new radio sites and towers where space is limited. In this case, the costs to the industry, state and federal government would be prohibitively expensive, and could cost the community many hundred million dollars, with increased risks to life and infrastructure during migration over many years."

  In contrast, the planning process and time period for clearing the 700 MHz digital dividend is well defined and understood by all parties.

  Therefore, the overall costs to the community, and risks associated with clearing the 800 MHz spectrum need to be factored into any decision process on whether the allocation of spectrum for public safety should be from the 800 or 700 MHz digital dividend.

SUMMARY

(a) Motorola and other industry suppliers of next generation public safety solutions support the Police Federation views that an allocation of spectrum from the 800 MHz band is not as viable as an allocation from the 700 MHz digital dividend band.

(b) There is significant competition between public safety and the commercial operators, which is clouding the facts and dividing opinions on the viability of 800 MHz spectrum being allocated for public safety broadband, compared to an allocation from the 700 MHz digital dividend.

(c) We have not been able to find any evidence to support the notion that appears to be shared by ACMA, DBCDE, AMTA and Telstra that promoting an allocation of spectrum from the 800 MHz PPDR narrow band would gain support from countries within the Asia Pacific Region, or anywhere else in the world. In fact, all the evidence appears to support the contrary view - that 800 MHz should remain planned for narrow band PPDR applications, not broadband.

(d) There can be no disputing the fact that the existing 851-869 MHz spectrum that pairs with the 806-824 is currently occupied by many tens of thousands of commercial, government, public safety and essential services end users. There would be significant costs and disruption to the community to relocate these services to clear a 10+10 MHz (20MHz) block of broadband spectrum for public safety. It appears there is currently no plan on how this would be achieved. Conversely, the 700 MHz digital dividend planning process is well advanced and with defined timelines.

(e) There are a number of technical issues that would need to be resolved before 800 MHz narrow band spectrum could be adapted to broadband – in particular interference issues with the 700 MHz digital dividend and the 850 MHz mobile phone band. In contrast, the spectrum plan for the APT 700 MHz digital dividend has been defined and agreed by all APT countries. This includes the engineering analysis required to determine guard bands, mid band gap, filter requirements of network infrastructure and user equipment.

Based on the above, we would strongly recommend that the public safety mobile broadband steering committee terms of reference be expanded to include a review of spectrum from the 700 MHz digital dividend, and not just confined to the 800 MHz band as is the situation currently. This will allow the committee to better analyse all the options, to enable a fully informed decision for the future of public safety spectrum.

To put this into perspective, the 20 MHz of spectrum that public safety are requesting represents less than 2% of the total broadband spectrum that will be available to mobile phone operators.

While Motorola is committed to best supporting our public safety community and will continue to do so regardless of the decision taken on band, we do not believe allocation of the 800MHz band will provide our community with the same operational or investment value as the 700MHz band.

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(B) SPECIFIC COMMENTS BASED ON ACTUAL EXTRACTS FROM HEARING TRANSCRIPTS 8TH & 9TH AUGUST 2011

Telstra....in the absence of a Government business plan and commitment to fund the roll out of a standalone network, there is a high risk that the spectrum would remain largely unused.

Motorola: Innovative solutions are currently being developed by several suppliers to meet the demand for public safety organisations who have an immediate requirement to take advantage of the benefits of mobile broadband. Agencies in Australia have already expressed an interest in establishing pilot systems as the first stage to commence rolling out the technology as soon as spectrum is available. Motorola is currently seeking approval from the ACMA to install a demonstration public safety LTE network using existing broadcast spectrum as an overlay on one of the existing agency digital P25 voice networks.

Mr Goonan: In planning set down by the International Telecommunications Union and also by the Australian Communications and Media Authority, for some years the 700-megahertz so-called digital dividend spectrum has been set aside for public mobile telephone services. Also, what has been set aside at the bottom end of the 800-megahertz spectrum—I think from 806 to 824 megahertz—is a piece of spectrum that is known as PPDR or public protection and disaster relief, and that piece of spectrum has been harmonised across the South-East Asia region. By harmonised I mean the countries that are in that region of South-East Asia, New Zealand et cetera, all have that piece of spectrum earmarked, if you like, for a common emergency service capability so that devices, handsets et cetera would work equally in Australia as they would in New Zealand and South-East Asia. So one of Telstra's submissions has been that that spectrum is better suited for the utility that the emergency service organisations are looking for, as opposed to utilising the valuable and scarce spectrum at 700 megahertz.

Motorola: The 800 MHz band specified by the ITU under Resolution 646 for PPDR (Public Protection and Disaster Relief) in our Region 3 is 806-824/851-869 MHz. This band is currently planned for **narrow band** which is suitable only for voice and low speed data applications - **not broadband**. This is evidenced by an Asia Pacific Telecommunity (APT) Report that has approved the channeling plan for use of this 800 MHz band for narrow band PPDR. This Report also specifically identifies New Zealand as an example of a country where the 800 MHz band is already occupied, and so not suitable for conversion to broadband. This is typical of most of the countries in the region, which uses the spectrum extensively for narrow band trunking in the 806-824/851-869 MHz range. Further, the ITU-R WP5A has approved a draft new Recommendation (LMS.PPDR.UHF) on the harmonised use of the 800 MHz band for narrow band PPDR with full support from all APT countries. Any standardization discussions for public safety broadband within the APT have been focused on the 698-806 MHz (700 MHz) digital dividend band, where it was agreed at this stage that any allocation of public safety broadband in this band would be left to each country to decide, rather than specify a particular block of spectrum. Motorola is not aware of any discussion or interest by the APT countries for conversion of this 800 MHz narrow band spectrum for public safety broadband. We would challenge Mr Goonan to produce any evidence to support his comments.

Mr Goonan: In fact, I think it is quite the opposite. The 700-megahertz spectrum plan is for Australia. There are lots of different 700-megahertz bands across the world. The 700-megahertz band plan in North America is different to the 700-megahertz band plan here in Australia. So there are in fact not synergies between those. Where there are synergies is at that lower end of the 800-megahertz spectrum that I mentioned before.

Motorola: The broadband 700 MHz Digital Dividend is harmonised with our Asia Pacific spectrum plan and will coexist with the 800 MHz PPDR and other narrow band networks deployed extensively in Australia and the rest of our region. Industry suppliers are already developing public safety broadband products in the 700 MHz band which they have advised can more easily be adapted to the Asia Pacific Digital Dividend spectrum plan. The larger market and wider availability of chipsets will provide a rich ecosystem of competitively priced devices and solutions developed for public safety applications. The performance and features of these devices will keep pace with the rapid evolution of technology. Because the 700 MHz chipsets will be developed for our local regions digital dividend spectrum plan, these will be compatible with other commercial networks deployed in the region allowing roaming onto the other networks. 700 MHz digital dividend spectrum will be released in a defined time frame, allowing public safety to commence planning and schedule deployment.

Mr Goonan: We will certainly take that on notice. With respect to the comment about narrowband versus wideband I do not understand that comment from the Police Federation. Essentially there is 18 megahertz of

spectrum which is set aside at 806 to 824 megahertz. That 18 megahertz of spectrum is more than enough to support the broadband services that we operate today and intend to operate into the future. By way of example 10 megahertz bandwidth today supports the fourth-generation technology that Telstra is introducing. So the PPDR spectrum at 800 megahertz can more than adequately support 4G technology.

Motorola: We understand that 800 MHz spectrum that is being proposed by Telstra for PPDR broadband is based on what has been referred to as "Band 27" (806-824/851-869). Technical investigations have yet to be undertaken, however preliminary studies by spectrum engineering specialists have advised that using Band 27 would result in unacceptable interference with the 700 MHz digital dividend band, as well as posing interference with the existing 850 MHz mobile phone network. Additionally, the latest ITU WP5-A report recommends that band 806-824/851-869 MHz for PPDR is for narrow band, not broad band and hence not suitable for LTE deployment.

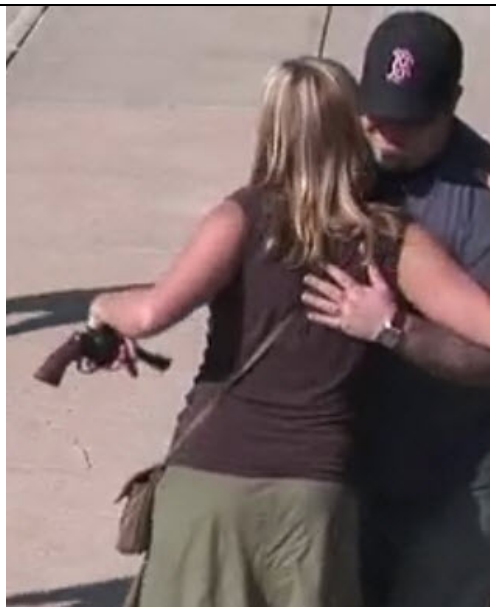
Spectrum engineers have advised that a 20 MHz (10+10) allocation of spectrum for public safety broadband would require a 10 MHz guard band, and/or additional filtering in both the base station infrastructure and the user equipment to mitigate the interference.

This means that the allocation would need to be 813-823 MHz paired with 858-868 MHz – which would displace many tens of thousands of existing 800 MHz narrow band users.

With the expected growing bandwidth demands of public-safety applications in conjunction with the finite capacities of LTE, it is recommended that 20 MHz (10+10) of spectrum for LTE is the absolute minimum to satisfy the current and future needs of law enforcement. As the available throughput per user goes down due the number of users increases compounded by the many broadband applications needing 1 Mbps or higher throughput, the 10 MHz considered sector capacity can be quickly exhausted.

Commercial operators can design and build their best effort networks for typical density of mobile users. However such approach will be insufficient for emergency situations due to the immediate requirement to support extremely high density of public-safety responders. For this reason alone, the public-safety network has to have as high a capacity as possible requiring at least 20 MHz (10+10) of spectrum. Anything less could lead to catastrophic consequences due to applications performing unreliably or in the worse case failing completely when needed most.

As shown in the illustrations below, a system that makes use of 20 MHz of spectrum (10 MHz for the downlink and 10 MHz for the uplink, or 10+10 MHz) will have more bandwidth available on a per-sector basis than a system that deploys a total of 10 MHz of bandwidth (a 5+5-MHz system). The difference is roughly 50%; that is, in a 20-MHz system, the network operator will have twice the available bandwidth than a network operator that builds out a system in only 10 MHz of spectrum.

10 MHZ OF SPECTRUM	**20 MHZ OF SPECTRUM**
	
SITUATIONAL AWARENESS	**STRATEGIC DECISION ENABLING**

The consequence of insufficient spectrum is restricted capacity, which combined with high demand, causes network congestion. For applications, this means sluggish behaviour or outright failures.

Beyond sluggish performance in congestion situations, there is also the high likelihood that networks simply have to drop packets of data. Packets arrive at a base station over a high-speed connection such as fiber but then the base station forwards the packets using the slower radio connection. If there are too many incoming packets the inevitable result is that the base station, or infrastructure nodes prior to the base station, will drop or significantly delay packets.

Consequences of such congestion are not just slower performance but also application failures. Most communications protocols implement timeouts on their operations, including Transmission Control Protocol (TCP) itself, the packet-transport protocol used in the Internet to provide reliable end-to-end delivery. With large delays or dropped packets, communications protocols attempt to deliver data reliably, but at some level of congestion, they can no longer cope properly, and applications will either indicate a failure, or worse yet, require an application or full-system restart.

Beyond needing 20 MHz just to satisfy bandwidth requirements, there are compelling reasons for providing Public Safety 20 MHz of contiguous spectrum.

- LTE is spectrally more efficient operating in 20 MHz channels than 10 MHz channels. In other words, the network can deliver more bits per second using a 10 MHz radio channel (10 MHz down, 10 MHz up) than in two 5 MHz radio channels;
- Using non-contiguous radio channels will significantly increase the cost of the radio access network due to the need for additional radios and antennas; and
- Adding spectrum later in a non-contiguous manner will result in devices in the field likely not being able to take advantage of the new spectrum

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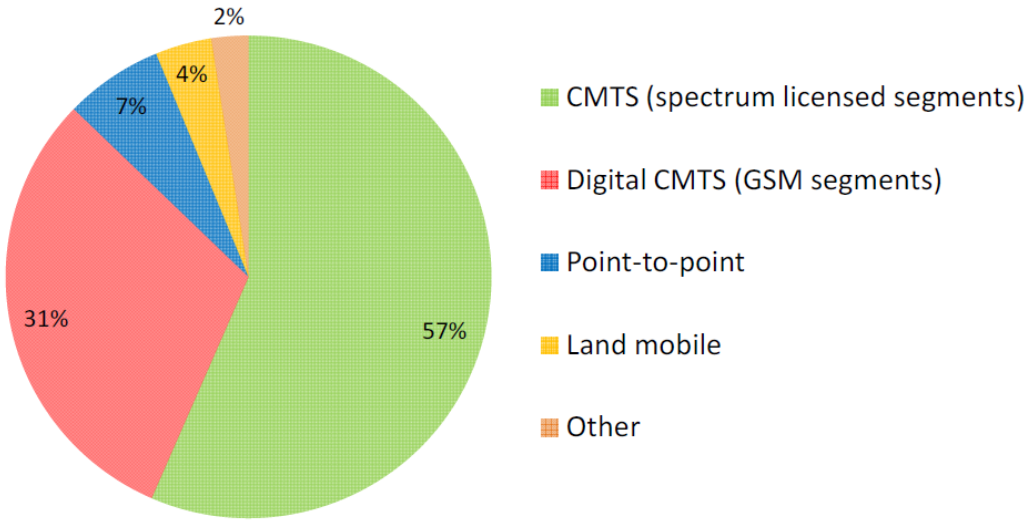
Senator BILYK: Is it correct that 88 per cent of the 800, 900 bands are already occupied by Telstra, Optus and Vodafone?

Motorola: This information is correct, and comes directly from the ACMA 900 MHz Spectrum Review. The following chart is an extract from the ACMA report that shows that both the CMTS (57%) plus GSM segments (31%) account for 88% of the total assignments in this spectrum. The remaining 12% is split between point to point links and land mobile narrow band (mostly trunking) services.

Figure 2.2 Assignments in the 900 MHz band (September 2010)



Mr Althaus: ...700 versus 800. Today, you will hear later from the Australian regulator of the spectrum, ACMA, who are expert not only in the technical side but expert in positioning and management of spectrum both nationally and internationally, and they will, I am sure, give some key information. From industry's understanding there is no difference between 700 and 800 technically.

Motorola: Technically speaking the performance of 700 and 800 are similar however, it must be stressed that to use the 800MHz band for public safety would put Australia out of sync in the Asia-Pacific region as well as globally since only 700MHz has been identified for public safety broadband. Therefore an allocation of spectrum from 800 MHz PPDR is not preferred for the following key reasons:

a) **Harmonisation:** The International Telecommunications Union (ITU) Public Protection Disaster Recovery (PPDR) 800 MHz spectrum is intended for narrow band (25 kHz or less) operation in our region (Region 3), and in Region 2 (Americas). Asia-Pacific Telecommunity (APT) has already approved the channelling plan for use of this band for narrow band PPDR under an APT Report. Further, the ITU-R WP5A has approved a draft new Recommendation (LMS.PPDR.UHF) on the harmonised use of the 800 MHz band for narrow band PPDR with full support from all APT countries. Therefore, allocation of 800 MHz spectrum for public safety broadband will be unique, will not be in accordance with ITU Recommendations for PPDR, and the resulting lack of harmonisation will isolate Australia from the rest of the Asia Pacific region and the world.

b) **Limited Product Availability:** Currently all public safety broadband product development is in the 700MHz band. The relatively small public safety 800 MHz LTE market size globally and departure from the Region 3 band plan will limit availability of chipsets and devices for public safety organisations. This will lead to reduced competition and consequential higher prices for products, and lack of advanced features as the technology evolves over future decades.

c) **Public and Private Network Roaming**: In particular, incompatibility with the rest of the Australian and Region 3 band plans will lead to restricted roaming between public safety Broadband and the public carrier networks, which will significantly limit the effectiveness of public safety Broadband capability and coverage.

d) **Time-To-Market:** The allocation of sufficient (20 MHz) bandwidth would necessitate clearing and relocation of existing services from the 800 MHz spectrum. As the 800/900 MHz band is currently under review by the ACMA there will be a delay in the time period to implement any re-organisation of the band. Moreover, chipsets and purpose built public safety devices will take longer to develop and get to market.

Mr Althaus: ...If we look at what emergency services will to do with that spectrum, should they gain access to it and effectively build their own network, it is very much a matter of looking at the cost and the benefit and what advantage would be gained from that course of action. In fact, the Attorney-General's Department commissioned a study on the subject by Access Economics and the resounding conclusion of that study was that the very best way forward was for the emergency service organisations to partner with the industry in the use of spectrum to manage emergency situations and that the 700 megahertz spectrum should be allocated to the telecommunications industry as is currently planned by the Communications and Media Authority. That is an important point. Access modelled several scenarios. They looked at building a stand-alone network, they looked at partnering, they looked at a hybrid and they looked at using other spectrum, but the overwhelming conclusion was that the best option for cost benefit and service delivery was for the ESOs to partner with the industry.

Motorola: We have not had the opportunity to review the Access Economics Report fully, having only just received an edited copy following a FOI request. However, from our perspective the comments regarding Access Economics Report have been taken out of context, and conclusions greatly exaggerated. It is recommended that the entire report be taken into account.

For example, the Access Economics Report did not take into account a weighting for the increased resilience and grade of service demanded by a public safety network that is not available on the commercial networks.

There is no argument that effective communications is an essential tool for public safety. Also, it is clear that Australia's residents, businesses and visitors reap social benefits. Safer cities breed a higher quality of life, peace of mind and are a better environment in which to attract business. Improved public safety communications capabilities provide additional tools to help prevent criminal activity at the outset and to gather evidence and solve crime more expeditiously when it does occur.

In determining spectrum allocation policy, much attention is now given to the revenue from spectrum auctions.[8] However, there appears to be less focus on the economic benefits that improved communications capabilities can support. Placing a monetary value on a human life is a difficult and emotionally unappealing exercise. However, every homicide that occurs has a monetary as well as the obvious negative societal impact to their families. At a U.S. Congressional hearing by The Subcommittee on Communications, Technology, and the Internet titled, "A National Interoperable Broadband Network for Public Safety: Recent Developments" held on Thursday, September 24, 2009, Los Angeles Police Chief William Bratton testified on the cost of a single murder. Chief Bratton's testimony stated:

Although some have questioned how to offset the potential loss of revenue resulting from the D Block [spectrum] being taken off the auction block, we see this scenario in fundamentally different terms. We view the reallocation of the D Block as a critically needed investment in Public Safety rather than as a loss of revenue. This investment of spectrum into Public Safety will reap large dividends far into the future.

Let me offer an example. In Los Angeles, a recent Rand Corporation study showed that the negative economic impact of a single homicide in our city is four million dollars. Now, mind you, this four million dollar figure is actually a conservative number. Utilizing technology, we have been able to reduce the number of homicides in Los Angeles by over 300. This has resulted in a net positive economic impact of $1.2 billion.[9]

Recently, the University of Iowa in the United States also conducted an independent study that assesses the full economic cost of certain crimes, including murder, rape and armed robbery. For example, the study states the following regarding the victim costs for murders:

…the assorted costs of murder are staggeringly high. The average victim costs exceed $6.5 million with more than $426,000 in justice system costs, and nearly $200,000 in lost productivity. The WTP estimate is $16.8 million for a total cost of $23.96 million per murder. The offenders in this sample averaged nearly 1.4 murder victims and the range was 1–9 victims. The total costs imposed by the offender with nine murder victims were greater than $155 million. [10]

Based on that study, every murder prevented by the improved communications tools an effective broadband system helps prevent will have an economic benefit on average of US $23.96 million dollars, or the equivalent of A$23.2 million, in addition to the social benefits to Australian's families and society as a whole.

The benefits of a dedicated public safety broadband communications system of course would not be limited to potential prevention of murders. Motorola would recommend that the social and economic factors surrounding crime also be factored into decisions regarding spectrum allocations. While reduction in the potential auction revenue could result by dedicating a part of the digital dividend spectrum to public safety, counteracting economic and social benefits of improved public safety also will result from the decision.

Equipment Economies of Scale

Traditionally, public safety terminal equipment has carried a higher initial cost than consumer equipment supported by commercial networks. This is due to several factors including the harsher public safety environments in which the equipment must be designed to operate and most importantly the much lower economies of scale experienced in the public safety market as compared to that in the consumer cellular phone market.

In planning for a public safety broadband network in the U.S., both public safety leaders and policy-makers recognized the benefits of selecting spectrum and technology for public safety that would help leverage the economies of scale in commercial bands. The 700 MHz digital dividend band in the U.S. includes dedicated public safety broadband spectrum and commercial carrier spectrum. In the U.S., 10 MHz of spectrum in the 700 MHz band, also referred to as the digital dividend, has already been dedicated to public safety broadband.

[8] The Australian Government has estimated that the auction of the spectrum will yield approximately A$1 Billion.
[9] Testimony of Chief William J. Bratton, Los Angeles Police Department representing Major Cities Chiefs Association, House Committee on Energy and Commerce, Subcommittee on Communications and the Internet, September 24, 2009.
[10] RESEARCH ARTICLE, "Murder by numbers: monetary costs imposed by a sample of homicide offenders," The Journal of Forensic Psychiatry & Psychology, Vol. 21, No. 4, August 2010, 501–513, which cites a study by the University of Iowa.

The public safety community is seeking an additional adjacent 10 MHz to provide sufficient dedicated capacity for video and data operations that meet public safety operational requirements. The U.S. President has endorsed public safety's request for this additional spectrum and the issue is currently being debated in Congress.[11].

Also, public safety leaders in the U.S. endorsed, and the Federal Communications Commission now requires, use of the Long Term Evolution (LTE) standard for the public safety broadband network. Public Safety endorsed the LTE standard largely because it is the broadband technology chosen by commercial carriers deploying in their respective portions of the 700 MHz band. This clearly will result in significantly higher economies of scale, which lowers equipment costs. For example, the build out already is well underway by one of the carriers in the U.S. 700 MHz commercial spectrum already covers 117 cities and encompassing 160 million pops.[12]

While public safety will still need devices which can stand the rigors of the harsh environment in which first responders work, economies of scale can still be leveraged in chipsets and other components across both public safety and consumer terminal devices.

If ACMA allocated a 20 MHz portion of the 700 MHz band for public safety use and endorsed the LTE standard, Australian agencies would have the proper spectrum and standards foundation to take advantage of equipment economies of scale being developed in volume markets such as in North America.

Mr Althaus: ...Should the emergency service organisations be granted spectrum to do their own thing, there is spectrum internationally harmonised in the 800 band, which is available in roughly the same time frame as the 700 megahertz, that will not impact upon the digital dividend use for Australia's benefit.

Motorola: This is not correct. The 800 MHz band specified by the ITU under Resolution 646 for PPDR (Public Protection and Disaster Relief) in our Region 3 is 806-824/851-869 MHz. This band is currently planned for **narrow band** which is suitable only for voice and low speed data applications - **not broadband**. This is evidenced by an Asia Pacific Telecommunity (APT) Report that has approved the channelling plan for use of this 800 MHz band for narrow band PPDR. This Report also specifically identifies New Zealand as an example of a country where the 800 MHz band is already occupied, and so not suitable for conversion to broadband.

This is typical of most of the countries in the region, which uses the spectrum extensively for narrow band trunking in the 806-824/851-869 MHz range. Further, the ITU-R WP5A has approved a draft new Recommendation (LMS.PPDR.UHF) on the harmonised use of the 800 MHz band for narrow band PPDR with full support from all APT countries. Any standardization discussions for public safety broadband within the APT have been focused on the 698-806 MHz (700 MHz) digital dividend band, where it was agreed at this stage that any allocation of public safety broadband in this band would be left to each country to decide, rather than specify a particular block of spectrum.

Motorola is not aware of any discussion or interest by the APT countries for conversion of this 800 MHz narrow band spectrum for public safety broadband. Furthermore, the conversion of the existing 800 MHz narrow band spectrum in Australia for public safety broadband would displace many tens of thousands of existing users of this spectrum, that would take many years to transfer to other spectrum – assuming alternative spectrum could be made available. We would challenge Mr Althaus to produce any evidence to support his comments.

Mr Althaus: The Access Economics report certainly does challenge that view from a cost-benefit perspective—it makes that quite clear. But, also, we go back to the experience that industry has in what it costs to build, operate and maintain a network. These are very significant costs, let alone the opportunity cost in terms of spectrum impact to the industry if 700 was not available. It cannot be overstated that you would be seeing billions of dollars worth of investment in something that would effectively duplicate what is already in place.

Motorola: There is no intention for public safety organisations to duplicate existing mobile phone networks. Public safety organisations in Australia currently install and operate their own sophisticated radio voice and data communications networks, designed specifically to meet their mission critical requirements. Similarly,

[11] http://www.whitehouse.gov/the-press-office/2011/02/10/president-obama-details-plan-win-future-through-expandedwireless-access

[12] Verizon 4G LTE now reaches more than half the U.S., August 18, 2011. http://news.cnet.com/8301-1023_3-20094115-93/verizon-4g-lte-now-reaches-more-than-half-the-u.s/#ixzz1VaZbTC6s

public safety grade broadband networks can be overlaid on these sites. Most State Governments currently operate public safety digital Government Radio Networks, with mission critical cores capable of being upgraded to operate LTE public safety broadband networks, with roaming capability onto 3G/4G commercial networks.
In this way, the next generation public safety networks are scalable, allowing these public safety grade networks to be deployed in stages, whilst maintaining the choice to operate in partnership with the commercial networks as required attaining the specific agency requirements and budget constraints.

For many organisations where communications are necessary for their business operations, cell phones are a good cost-effective alternative for basic non-critical, one-to-one communications, but not effective enough when they need critical communications for urgent situations and emergency response.

Emergency services networks today have been built to withstand any emergencies be it nature or manmade. Because of emergency services sector's need to support mission critical communications, designing a broadband 4G network for emergency services is a lot different than creating one for use by the public. Emergency services networks are built for "worst case scenarios," while commercial networks are designed for "best effort." Emergency services networks, by necessity, are generally hardened to withstand nature's ferocities. They have back-up power at every tower site. They are built to guarantee a certain level of coverage so that emergency services officials never find themselves without the ability to communicate.

While the usage patterns on commercial mobile networks are typically based on normal traffic patterns, the same is not true of emergency services networks. Emergency services officials never know when or where an emergency might occur, so emergency services networks must be built to support sudden, unexpected spikes in usage in any portion of the network. In contrast, commercial mobile networks will be designed around normal daily traffic cycles, but quickly become overloaded even during an event such as the surge that occurs during New Year's eve or following a football grand final.

For public safety the combination of both public safety and commercial broadband network provides the greatest options, flexibility and savings. Public safety agencies can have a public safety LTE broadband network that is optimised to deliver priority, control and availability demanded for mission-critical applications, and at the same time have all of the benefits in coverage and service from a carrier's 3G or LTE 4G commercial network.

The combination of these services allows public safety agencies to balance their capital investments and still deliver ubiquitous service as they expand their network. Over time, as their investment in a public safety LTE network expands, the dependency and operational expenses of using a carrier network are offset. It's a truly unique way to solve some economic issues: Public safety can launch their own public safety LTE within budget, and ensure a system that will be "Second Nature" to their daily procedural operations from day one.

The fact that both commercial and public safety systems will be built using the same basic technology architecture offers several benefits to public safety and government agencies. LTE will benefit from a rich ecosystem of devices spurred by the standards-based designs, open intellectual property environments, commitments from chipset manufacturers, large communities of developers and interest from consumer electronics manufacturers. Of course, 4G devices supporting critical public safety services will need to support many of the public safety features and design considerations used today.

Mr Althaus: Our advice is that clearance of and replanning that band could be undertaken in roughly the same time frame as 700 megahertz. Bear in mind that 700 is going to be available in the shortest option of time to industry following an auction process in late 2013 or early to mid-2014. That is the time frame we are looking at. I stress that the rearrangement of 800 will be harmonised within the Asia-Pacific region. Leave the United States to one side; they have a different band plan for 700 meg. We need to focus on region 3, which is where we are. Those arrangements could take place in the same time frame as 700.

Motorola: This is not correct. Mr Althaus is not taking into account that the existing 800 MHz band has many tens of thousands of end users that will need to be cleared and relocated into other spectrum.

Clearly the decision to close down all these existing narrow band services will be a serious matter, and will require significant planning to identify alternative spectrum and technologies for the existing user networks.

As indicated in our response to the ACMA discussion paper, "the cost and timing to migrate some or all of these services will depend on a number of factors, including the type of service and availability of cleared spectrum. Migration could necessitate the construction of parallel networks to ensure continued operation, with the requirement to expand or build new radio sites and towers where space is limited. In this case, the costs to the industry, state and federal government would be prohibitively expensive, and could cost the

community many hundred million dollars, with increased risks to life and infrastructure during migration over many years."

In contrast, the planning process and time period for clearing the 700 MHz digital dividend is well defined.

Ms Cahill: In 700. But it has a very different band plan to what is being considered in 700 in the Asia-Pacific Telecommunity. So I just need to put that on record. On the issue about public protection and disaster recovery spectrum allocation in 700, there was some discussion. It did not gain traction in the region. The traction that has been gained in the region has been about looking at spectrum allocations in the 800 spectrum and looking at enhancing those allocations to make them broadband rather than a narrowband service. There are still ongoing discussions. There is the next meeting of the Asia-Pacific Telecommunity Wireless Group in September—there are submissions coming from Vietnam and India which go to mobile broadband capability in 800 for public safety agencies—and that will be when there is further discussion on it. So, in relation to the PPDR issue and public safety agency spectrum, there is still a discussion about how that will play out in 800. We expect to finalise the 700 band plan, which basically says there will be two by 45 megahertz of spectrum available in the digital dividend across the region.

Motorola: Whilst the US 700 MHz public safety broadband plan is different to the APT 700 MHz digital dividend plan, manufacturers of the public safety broadband user devices have advised it is more cost effective to adapt existing US 700 MHz products for the APT 700 MHz band, than the 800 MHz band.

Also, it is appropriate to clarify the point about previous APT discussions regarding specifying a portion of spectrum for PPDR from the APT 700 MHz digital dividend. The APT agreed to leave the decision on the amount of spectrum, if any, to each respective country. Therefore, Australia could take a leadership role within the region by allocating spectrum for public safety from the 700 MHz digital dividend band.

We would challenge Ms Cahill to provide any evidence that would support her claim that India supports the 800 MHz band for public safety broadband, or that Vietnam as a country in region 3 has put up any formal suggestions/recommendations on the use of 800 MHz. As far as Motorola are aware, the only reference on the use of 800 MHz for public safety broadband comes from Ericsson Vietnam; a commercial company operating in Vietnam, who submitted a discussion paper on the subject as information to the APT working group. We can find no evidence to support the claim that there has been any further discussion within the APT on this subject.

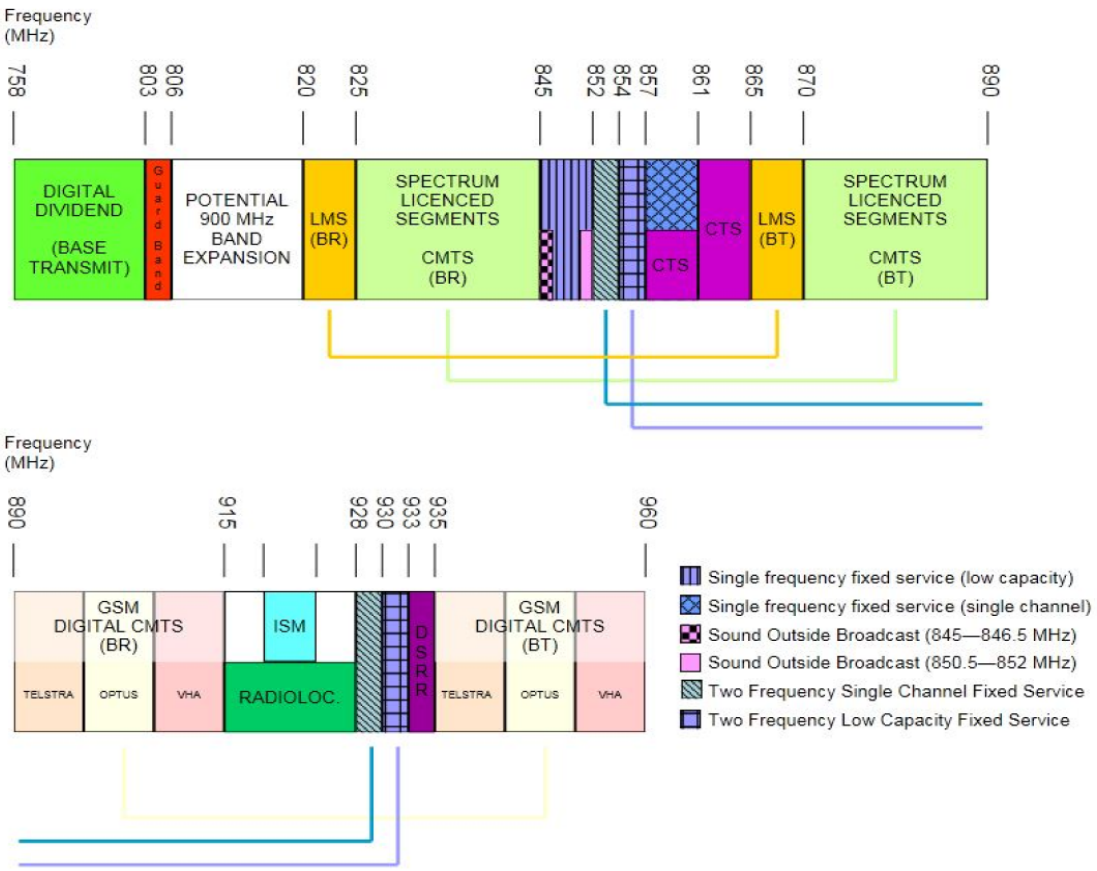
Given all the technical issues and limitations associated with 800 MHz band for public safety broadband, Motorola has the view that it is unlikely that many countries, if any, will adopt ACMA and Telstra's proposal to use band 27 for public safety broadband.

Mr Maurer: I think we were up to the multiple licensees, the thousands of licensees, in the 800 band and their many users, and the contention that it would be difficult to clear spectrum in that band and would take decades. The supplementary submission comments on the issues associated with the clearance of spectrum and the frequency ranges 820 to 825 megahertz and 865 to 870 megahertz for public safety use. These portions of spectrum are currently allocated for trunked land mobile services. The ACMA's review discussion paper sought comment on the migration of land mobile services out of these bands. The comment period closed on 1 July. The ACMA is currently reviewing those submissions. The spectrum in the 820 to 825 megahertz range is not in the Asia-Pacific region's accepted designated frequency ranges for public safety use and would therefore not be part of the portion that has been identified for potential allocation to public safety agencies. So I think the current incumbency should not be a problem in those areas.

Motorola: The existing 800/900 MHz band is currently the subject of a review by the ACMA initiated in May 2011.[13] We note that Mr Maurer confirmed that they are still in the process of reviewing the responses from industry and affected parties. We also note that the decision to allocate spectrum for public safety mobile broadband from this 800 MHz band was announced[14] before the closing date for responses to the discussion paper. This highlights serious concerns raised by the public safety and other users that ACMA's decision has preempted the outcome of the "review", and had been made without any reasonable consideration to the consequences to the existing users.

[13] ACMA 900 MHz band – Exploring new opportunities – Initial consultation on future arrangements for the 900 MHz band, May 2011
[14] Minister Press Release 10th May 2011:
http://www.ema.gov.au/www/ministers/mcclelland.nsf/Page/MediaReleases_2011_SecondQuarter_10May2011-DiscussionsonNationalBroadbandforPoliceandEmergencyServices

Figure 2.1 Assignments in the 900 MHz band (September 2010)



Whilst Australia is in the unique situation for the 806-820 MHz portion of this band to become available as part of our digital dividend, as depicted in the above spectrum chart, the corresponding paired spectrum 851-865 MHz is currently home to some 4,200 narrow band assignments supporting networks with many tens of thousands of commercial essential services, government and public safety end user devices.

The 820-825 paired with 865-870 MHz “LMS” band is predominantly utilised by narrow band trunked radio services, and emergency services mission critical narrow band data services. This segment alone supports many tens of thousands of end user devices.

As we have indicated above, the use of the 800 MHz Band 27 for public safety broadband would require a 10 MHz guard band to mitigate interference with the 700 MHz digital dividend, and the 850 MHz mobile phone band. Therefore, it will be necessary to allocate spectrum for public safety broadband in the range 813-823 paired with 858-868 MHz to provide a 10+10 MHz allocation.

This scenario will necessitate re-planning and clearing the entire existing 806-824/851-869 MHz narrow band services. It is important to note that most of these users will have already determined that no alternative communications technologies were fit for purpose.

Examples of current commercial, government, essential and emergency services users of this portion of the 800 MHz band include:

- NSW Police Force
- Australian Federal Police
- Victoria Police
- Western Australia Police Service
- Tasmania Police
- Department of Justice
- Department of the Attorney General (WA)
- Motorola Smartnet Pty Ltd

- Mobile Communications Systems Pty Limited
- Comsource International Pty Ltd
- Memo Communications
- Country Energy
- Energex Limited
- Ergon Energy Corporation
- Electricity Networks Corporation
- Powercor Australia
- Department of Defence
- NSW Rural Fire Service
- NSW Fire Brigades
- Queensland Urban Utilities
- Brisbane City Council
- Queensland Ambulance Service
- Ambulance Service of NSW
- Ambulance Victoria
- Australian Customs and Border Protection Service
- Telstra Corporation Limited
- Soul Pattinson Telecommunications Pty Limited
- State Water Corporation
- Water Corporation

Clearly the decision to close down all the existing narrow band services will be a serious matter, and will require significant planning to identify alternative spectrum and technologies for the existing user networks.

From the transcripts, it appears ACMA and DBCDE have not even acknowledged the impact on the community that conversion of the existing narrow band spectrum to broadband would have, let alone commenced any planning or costing analysis.

As indicated in our response to the ACMA discussion paper, “the cost and timing to migrate some or all of these services will depend on a number of factors, including the type of service and availability of cleared spectrum. Migration could necessitate the construction of parallel networks to ensure continued operation, with the requirement to expand or build new radio sites and towers where space is limited. In this case, the costs to the industry, state and federal government would be prohibitively expensive, and could cost the community many hundred million dollars, with increased risks to life and infrastructure during migration over many years.”

In contrast, the planning process and time period for clearing the 700 MHz digital dividend is well defined.

The overall costs to the community, and risks associated with clearing the 800 MHz spectrum need to be factored into any decision process on whether the allocation of spectrum for public safety should be from the 800 or 700 MHz digital dividend.

30 May 2011

Senator The Hon. Stephen Conroy
Minister for Broadband, Communications and the Digital Economy
Parliament House
CANBERRA ACT 2600

Dear Minister,

RE: DISCUSSIONS ON USE OF 800 MHZ SPECTRUM FOR NATIONAL BROADBAND PUBLIC SAFETY NETWORK

As the leading suppliers of Public Safety radio communications systems in the region, we are writing to express our concern regarding your announcement[1] on 10 May 2011 indicating the possibility of reserving spectrum in the 800 MHz band for use by public safety agencies to build their mobile broadband capability.

There are a number of significant issues that need to be considered in evaluating the viability of the 800 MHz band for development of a Public Safety Broadband network in Australia. Three critical points are:

1. The 800 MHz Public Protection and Disaster Relief (PPDR) bands identified by the ITU in the Asia Pacific Region (Region 3), and in Americas (Region 2), have been planned for narrow band (25 kHz or less) operation, both by APT and ITU. Further these bands are extensively being used by narrow band PPDR operations across regions 2 and 3. Therefore, allocation of spectrum from the 800 MHz band for Public Safety Broadband will isolate Australia.

2. Public safety broadband networks and products are currently being developed by the leading suppliers in the 700 MHz band only. Therefore, availability of public safety communications systems in the 800 MHz band will be limited and may also be late-to-market since Australia would be the only country in the world today that would use this band for public safety broadband applications. Leading suppliers will focus efforts towards serving larger markets first.

3. Due to the limited market size of the 800 MHz broadband opportunities, this will also minimize the number of suppliers, reducing competition, and increasing the price of the broadband products. Australian public safety will not realise the full benefits of economies-of-scale that a more-aligned plan would allow.

The optimum solution for developing public safety networks in Australia is for industry to adapt standard public safety products to operate in the proposed Pacific Region 700 MHz digital dividend band. Given the long term impact on the future of Australian public safety communications, it is critical for a detailed balanced, investigation of both bands be undertaken taking into account all factors to enable an informed decision.

We would like to request a meeting at your earliest convenience to discuss this further.

Yours sincerely,

Gary Starr
Managing Director
MOTOROLA SOLUTIONS

Brett Smythe
Managing Director
AH radio communications

[1] http://www.ema.gov.au/www/ministers/mcclelland.nsf/Page/MediaReleases_2011_SecondQuarter_10May2011-DiscussionsonNationalBroadbandforPoliceandEmergencyServices

HALEY BARBOUR
GOVERNOR

STATE OF MISSISSIPPI
OFFICE OF THE GOVERNOR

FOR IMMEDIATE RELEASE

CONTACT: Laura Hipp (601) 576-2020; lhipp@governor.state.ms.us

DATE: Aug. 24, 2011

GOV. BARBOUR ANNOUNCES WORK TO BEGIN ON ENHANCED PUBLIC SAFETY COMMUNICATION SYSTEM

Motorola Solutions will provide high-speed broadband network for emergency responders

JACKSON – Gov. Haley Barbour announced today work will begin on the nation's first statewide broadband Long-Term Evolution network for public safety agencies. The state has contracted with Motorola Solutions, Inc. (NYSE: MSI) for $56 million to create the network, which will provide high-speed broadband interoperability between city, county and state emergency responders.

"This network by Motorola will allow our first responders to share large amounts of data quickly in an emergency when every second counts," Gov. Barbour said. "This technology through the Mississippi Wireless Information Network can save lives."

The funds will upgrade the current Mississippi Wireless Information Network, which allows public safety agencies statewide to contact each other through radio systems clearly and quickly. The grant will enable first responders to transmit video and other data quickly. The program will serve 90 hospitals, 340 ambulances and up to 9,900 public safety workers in Mississippi.

The project is funded as part of the Broadband Technology Opportunities Program under the American Recovery and Reinvestment Act.

"This is a major contract award for Motorola Solutions and demonstrates our continued commitment to delivering leading-edge innovative solutions to the public safety market," said Greg Brown, Chairman and CEO of Motorola Solutions. "With our breadth of LTE public safety solutions and extensive experience implementing mission-critical public safety infrastructure and devices, we are pleased to build this robust and reliable mobile broadband network to meet the needs of public safety in the state of Mississippi."

Motorola will provide maintenance and operations for the first two years following system acceptance.

The MSWIN system, which provides interoperable communication for emergency responders, was created under the direction of Gov. Barbour after Hurricane Katrina exposed a critical need for agencies to communicate efficiently.

HALEY BARBOUR
GOVERNOR

STATE OF MISSISSIPPI
OFFICE OF THE GOVERNOR

The MSWIN system allows users to speak through a secure digital radio system operating under the Mississippi Wireless Communication Commission. The MSWIN system was established with $157 million in federal funds and $57 million in state bond funds. The MSWIN system is currently fully operational in the southern third of the state and is scheduled to be complete throughout the entire state of Mississippi by June 2012.

Motorola Solutions is a leading provider of mission-critical communication products and services for enterprise and government customers. Through leading-edge innovation and communications technology, it is a global leader that enables its customers to be their best in the moments that matter. Motorola Solutions trades on the New York Stock Exchange under the ticker "MSI." To learn more, visit www.motorolasolutions.com. For ongoing news, please visit our media center or subscribe to our news feed.

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