

EXHIBIT I

**The 700 MHz Auction:
Economic Analysis of the
Public Safety & Homeland Security
Benefits of a Public-Private
Partnership**

Alan Pearce, Ph.D.
Information Age Economics

April 2006

Table of Contents

Preamble	3
Executive Summary	4
Introduction.....	6
FCC’s Leadership on the Introduction and Deployment of New Technologies and Services	7
Landmark Policies of the FCC.....	8
Public Safety Communications Crisis and the 700 MHz Opportunity	11
Auction Revenue Model for Reduced Spectrum	13
Conclusion and Recommendations.....	15
Toward A New Public-Private Spectrum Partnership	16
Bibliography & Reference Materials	19

Figures and Tables

Figure 1 - Total US Catastrophe Losses 1985-2004.....	12
Figure 2 - Projected Future US Catastrophe Losses (Source: Insurance Information Institute) ..	13
Table 1: Scarcity Impacts On Projected Additional Auction Revenues (Millions).....	14

Preamble

“Communications during emergencies and crises must be available for public safety, health, defense, and emergency personnel, as well as all consumers in need. The Nation’s critical communications infrastructure must be reliable, interoperable, redundant, and rapidly restorable.” So stated the Federal Communications Commission in its Strategic Plan 2006-2011.

The FCC currently confronts a unique opportunity to resolve the nation’s communications problems in times of crises with the allocation of a portion of the spectrum at 700 MHz. Its mandate comes directly from the US Congress, which, in 1937, added the following sentence to the Communications Act of 1934:

“For the purpose of obtaining maximum effectiveness from the use of radio and wire communications in connection with safety of life and property, the Commission shall investigate and study all phases of the problem and the best methods of obtaining the cooperation and coordination of these systems.”

Public Safety Communications have suffered from decades of benign neglect and today’s FCC can play a major role in developing a policy to establish a secure, reliable, and interoperable communication system that can be used by the nation’s public safety, federal law enforcement, and homeland defense organizations. Historically the Commission has repeatedly demonstrated its courage by politely resisting the efforts of entrenched forces that have attempted to protect the status quo. Time after time the Commission, in the name of pursuing its mandate from the US Congress, has prevailed in ways that have resulted in enormous economic, business, social, cultural, and educational benefits accruing to the nation as a whole. History suggests that it will tackle today’s challenge and take the steps necessary to resolve the Public Safety and Homeland Security Communications Crisis.

Executive Summary

This report represents the first study to outline how the US Government and the people benefit in almost every way from the removal of 30 MHz of spectrum in the upper 700 MHz band from the currently scheduled early 2008 700 MHz auction, and instead awarding that spectrum for use in a public-private partnership structure that will finance, build, operate, and manage a ubiquitous, interoperable, reliable, broadband wireless network designed specifically to meet the nation's needs in times of crises. Other studies of the economics of disasters demonstrate the huge and dramatically increasing cost to society, and predict annual losses from major catastrophes of \$25 Billion to \$85 Billion in the future. The report presents a strong economic, business, and political case for assigning this key spectrum resource to public safety, with authority to establish spectrum leasing arrangements with applicants from the private sector in order to pay for construction of the nationwide broadband network. Even the largest current commercial wireless companies, dominated by Cingular, Verizon, and Sprint-Nextel, are not able to satisfy the needs of the public safety community in times of crises. They understandably act as one would expect of strictly commercial operators, concerned with adding new revenue generating services in an attempt to increase profits. They are also preoccupied with managing existing and future mergers, further consolidating the industry into fewer competitors, and minimizing viable competitive choices for the consumers.

Although it is difficult to accurately quantify all of the benefits to be derived from an improved, integrated, and interoperable public safety communications network, it is self-evident that the savings in public life and the protection of property will be enormous and that government response costs can be significantly reduced through massive improvements in interagency coordination and more efficient and effective deployment of government response resources. Further, these benefits do not expire once used, but rather continue and grow ad infinitum once the network is built, fully operational, and singly committed to first responder support during periods of public emergency. If the FCC were to proceed with the scheduled auction with only half the 60 MHz of available spectrum at 700 MHz, current and potential wireless companies will "bid up" the price for the remaining spectrum, thereby offsetting a portion of the anticipated, but foregone, auction revenue. The US Treasury will recover some or all of the "lost" auction revenue from public safety and homeland security savings. Add to those first responder savings the incremental economic value in terms of new services and technologies, new employment opportunities, growth in Gross Domestic Product, and greater tax revenues, increased employment and business activity, all generated by the enterprise created through a public-private partnership that will deploy and operate the Nation's first 4G network. As for current wireless companies, it is likely that they will refocus their efforts and capital resources on existing networks, thereby enhancing utilization of their spectrum assets and create further economic value for the nation. Obviously, all of these benefits and revenues will continue to accrue as the public-private spectrum is used in perpetuity resulting in the creation of a significant annuity that adds economic value while simultaneously protecting lives and property..

This analysis cannot quantify the additional benefits derived by citizens, business, or the government from accelerated availability of a sophisticated, state of the art, broadband wireless network, designed in such a way that it will be immediately responsive to the needs of public safety, homeland security, and the federal law enforcement agencies. Such benefits, over time,

are likely to result in billions of additional government revenue extending in perpetuity. In the final analysis, it is these benefits that will be of greatest value to the American people.

Although the temptation in times of national deficits is to pay down debts and focus on meeting immediate needs, traditional spectrum auctions clearly are not an efficient mechanism to solve the nation's more vital needs in public safety and homeland security. The financial and societal benefits to the US Government and its citizens are far better served by mandating creative new arrangements that are designed to produce the rapid deployment of a state-of-the-art nationwide broadband wireless network that will meet current and future public safety specifications and also will bring the economic and other benefits of technologically advanced communications services to historically overlooked and underserved commercial user groups.

There is a better way and this is presented in the study. The US has a long history of addressing challenges through innovative public-private entities. The problem confronting public safety in the US is that its communication requirements are minimal except in times of crisis, when demand is so great that it causes strains and breakdowns on the commercial networks. Yet building a stand alone, dedicated, broadband network will be extraordinarily expensive, and for most of the time in most parts of the country it is unnecessary. In order to meet the needs of the public safety community throughout the country, the report proposes the creation of a cost effective public-private partnership with the following characteristics:

- Open IP Broadband Communications Network
- Commercial Usage and Public Safety Standards
- Fully Preempt-able during National Regional, and Local Crises
- Public Safety Specific Quality of Service & Priority Assignments.

Introduction

It is generally accepted in business, in economics, and in government, that the market cannot meet all of the needs of society. Among the generally accepted needs where the market cannot, or should not, provide are national defense and security, and public safety. Today, because of new threats to society, along with an apparent increase in the number of so-called natural disasters, there is need for new thinking and new solutions in order to deal with these emergencies. The Federal Communications Commission currently confronts a unique opportunity to resolve some of the nation's communications problems in times of crises with the allocation of a portion of the spectrum at 700 MHz. This report provides an analysis to support reconsideration of the spectrum auction strategy, currently proposed, and instead consider the allocation of half of the 700 MHz spectrum, namely 30 MHz, for use in a new Public-Private partnership that will both remedy the widely acknowledged shortfalls of Public Safety communications, along with those of Homeland Security and law enforcement, and also provide the benefits of modern broadband wireless communications to commercial customers.

The FCC has an impressive history of using its regulatory and policymaking role to turn the nation's scarce and valuable spectrum resources into assets that have benefited the US population from a public safety, national security, and commercial perspective. Most of the innovations have enabled new commercial networks: launching radio and television; transforming traditional landline service that reliably provided dial-tone into an advanced suite of network services available to individual consumers and businesses alike; and creating the modern cable, satellite, and wireless telecommunications industries. This report describes an approach that extends these innovations to address a public policy problem – how to provide modern, effective, reliable and affordable wireless communications products and services to Public Safety and Homeland Defense personnel.

Public Safety mobile communications networks in the US are in dire straits. More than four years after the 9/11 terrorist attacks on New York City and Washington, D.C., the public safety community still lacks the resources to build truly robust and interoperable networks and information services. First responders lack the basic voice and data communications services that they need to confront terrorism, natural disasters, chemical spills, and other emergencies that threaten life and property and cost the nation multiple billions of dollars annually.

Communications during emergencies and crises must be available for public safety, health, defense, and emergency personnel, as well as all consumers in need. The Nation's critical communications infrastructure must be reliable, interoperable, redundant, and rapidly restorable¹.

The FCC is in the midst of preparing for currently scheduled auctions of portions of the available spectrum at 700 MHz that currently are occupied by incumbent UHF-TV licensees, for purely commercial use. That available spectrum totals 60 MHz, and includes 30 MHz in the upper 700 MHz band (known as the C and D blocks) that are located adjacent to 24 MHz of spectrum previously assigned for public safety usage, and currently channelized to support narrowband and wide-band applications. While collecting an additional estimated \$12.5 Billion, and perhaps

¹ Federal Communications Commission Strategic Plan 2006-2011, pg. 3.

even more, for the US Treasury is tempting, the actual financial benefits of following a traditional auction approach to allocate the full 60 MHz of this spectrum among competing applicants are much less. As the analysis below demonstrates, facilitating the deployment of a new broadband network using half (or 30 MHz) of the total available 700 MHz spectrum, and forgoing the quick revenues of an auction, is a much wiser medium and long-term investment for the citizens and government of the US.

By assigning that 30 MHz portion of this spectrum to public safety, the FCC can avail itself of a unique opportunity to establish a new model for dealing with today's critical and urgent public safety and homeland security threats. Rather than "auction-and-forget" as has been done for the past decade, the FCC can license this 30 MHz of spectrum in a creative new arrangement that will effectively and finally address through a new public-private partnership structure the critical mobile communications issues confronted by the public safety community in the US. In addition, that same spectrum will be efficiently utilized (to the extent it is not required to meet the needs of public safety) to deliver commercial broadband wireless services through a wide range of commercial entities that could make economically sound arrangements in a secondary spectrum market.

FCC's Leadership on the Introduction and Deployment of New Technologies and Services

The position of the FCC in the communications landscape in the United States has consistently been one of positive stewardship. At the core of this positive role is the Communications Act of 1934², which has served as the foundation for this country's national telecommunications-information-entertainment policy that has enriched the country both culturally and economically.

The key policy directives of the 1934 Act include:

- The FCC must encourage the larger and more effective use of radio.
- The FCC must ensure that the benefits of new inventions and developments are made available to all of the people of the US.
- The FCC shall encourage the provision of new technologies and services to the public.
- The FCC has the sole responsibility for the allocation and assignment of spectrum upon which many of the technologies are based.

Most importantly for the purposes of this study, the 1934 Act was amended in 1937, to add the following language:

"For the purpose of obtaining maximum effectiveness from the use of radio and wire communications in connection with safety of life and property, the Commission shall investigate and study all phases of the problem and the best methods of obtaining the cooperation and coordination of these systems."³

² 47 U.S.C. 151-614, 333 pp.

³ 47 U.S.C. 154(o), pg.14.

In sum, the FCC is charged by the US Congress to serve the public interest, convenience, and necessity, by using spectrum policy in an efficient manner in order to serve those laudable public policy goals.

The 1934 Act represented a giant step forward in bestowing the benefits of communications technologies and services to all Americans on an equal, non-discriminatory and non-preferential basis. Not only did the 1934 Act specify that the benefits of new technologies should flow to all, but it added that discrimination and preferences were illegal.

This conceptual approach differentiated the U.S. from almost every other country of the world where telephone service, for example, was exclusive, as opposed to inclusive, focusing primarily on service to government, business and the well-to-do. As a result, the 1934 Act contributed enormously to the growth of the U.S. economy from the 1930s onward by promoting policies that resulted in the construction of nationwide, ubiquitous, telephone, wireless, radio, TV, and satellite networks, that are available to almost everyone at affordable prices.

Landmark Policies of the FCC

As market conditions have evolved over the past 70 years, the FCC has exhibited extraordinary foresight, leadership and resolve in adapting its regulatory policy framework so as to continually foster the successful deployment of new technologies and services. Although the FCC always has had – and always will have – its critics, its overall success cannot be challenged.

Generally, the FCC's major public policy role is one of encouraging the development of new technologies. From its beginnings, it has successfully promoted the deployment of new technologies and services by framing rules and regulations that have guaranteed that the public interest is better served.

Over the past 70+ years, the FCC has not only improved the level of competition but, in so doing, has encouraged the deployment of new technologies and services in radio, TV, cable TV, satellites, fixed and wireless telecommunications, information services (including the Internet and the World Wide Web), and equipment.

Among the most successful landmark decisions and policies are:

- Spectrum policies developed in the 1920s (when it was still the Federal Radio Commission), the 1930s, 1940s, and 1950s that launched a commercially based nationwide radio and TV system that has become an essential part of the economic fabric of the United States⁴.
- The Above 890 MHz policy of 1959 drove microwave technology into the market, and ultimately led to the emergence of competition in the provision of long distance telecommunications services⁵.

⁴ The early years of radio broadcasting in the U.S. is described in *National Broadcasting Co. v. United States*, 319 U.S. 190, 210-13, 1943. Congress passed the Radio Act of 1927 and created the Federal Radio Commission whose role it was to develop the potential of radio. As the Supreme Court stated: "regulation of radio was...as vital to its development as traffic control was to the development of the automobile." See also *Television Assignments, Notice of Proposed Rulemaking*, FCC 48-1569, May 6, 1948, Report and Order, FCC 48-2182, Sept. 30, 1948; *Sixth Report and Order*, 41, FCC 148, 1952.

⁵ *Allocation of Frequencies in the Bands Above 890 Mc.*, Report and Order, 27 FCC 359 (1959), recon. 29 FCC 825 (1960).

- The MCI decision in the late 1960s and the Specialized Common Carrier decision of 1971 that opened the market to long distance and private line competition⁶.
- The Cable TV rules of the early 1970s that led to a growth of an increasingly sophisticated cable telecommunications system in the U.S. By mandating multi-channel capacity and the provision of public access channels and institutional networks, the FCC paved the way for cable TV to become more than an entertainment distribution. Today, because of FCC policies, Cable TV Multiple Systems Operators (MSOs) provide a wide array of broadband telecommunications, information, and entertainment services⁷.
- The domestic satellite decision of 1972, embracing an “open skies” philosophy, which contributed to the development and expansion of Pay-TV services for cable TV operators, as well as increasingly sophisticated satellite communications links⁸. Further develops in satellite policy have led to the creation of direct broadcast satellites as well as low-earth orbit (LEO) satellites and mid-earth-orbit (MEO) satellites.
- The value-added network decision of 1973, which resulted in the creation of an increasing array of “packet” services⁹. This decision, like those concerning the convergence of communications and computers, contributed to the development of the Internet and the World Wide Web, based primarily on packet switched technology as opposed to circuit switched.
- In 1971, the FCC was the world’s first government agency to enunciate a policy regulating the convergence of computers and communications with its Computer I decision¹⁰. This was followed by the Computer II and III decisions promulgated in the 1980s, further promoting the convergence of computers and communications by enabling the growth of the Internet and the World Wide Web. This effort paved the way for Internet Service Providers (ISPs) that the FCC insisted should be interconnected with the public switched telecommunications network via open network architecture (ONA)¹¹.

⁶ Microwave Communications Inc., 18 FCC 2d 953 (1969) and MCI Telecommunications Corp., 60 FCC 2d 25 (1976), and Specialized Common Carrier Services, First Report and Order, 29 FCC 2d 870 (1971), recon. Denied, 31 FCC 2d 1106 (1971).

⁷ Cable Television Report and Order, 36 FCC 2d 141 262, 1972, and Staff of Subcommittee on Communications of the House Committee on Interstate and Foreign Commerce, 94th Congress, 2d sess., Committee Print 1976, Cable Television: Promise Versus Regulatory Performance.

⁸ Domestic Communications Satellite Facilities, Second Report and Order, 38 FCC 2d 844 (1972), modified, 35 FCC 2d 665 (1972).

⁹ Packet Communications Inc., 43 FCC 2d 922 (1973); Graphnet Systems Inc., 44 FCC 2d 800 (1974); Telenet Communications Corp., 46 FCC 2d 680 (1974).

¹⁰ First Computer Inquiry, Tentative Decision, 28 FCC 2d 291 (1970), Final Decision, 28 FCC 2d 267 (1971), aff’d in part sub nom. GTE Service Corp. v. FCC, 474 F. 2d 724 (2nd Cir. 1973), and Second Computer Inquiry, Final Decision, 77 FCC 2d 384, 461 (1980), recon. 84 FCC 2d 50, 74-75 (1980) further recon. 88 FCC 2d 512 (1981), aff’d sub nom. CCIA v. FCC, 693 F.2d 198 (D.C. Cir. 1982), cert. Denied, Nos. 82-1331, 82-1332 (U.S., May 16, 1983).

¹¹ For a complete history of the FCC’s policy role in the convergence of computers and communications see the Chapter on Computers & Communications Convergence by Alan Pearce, Ph.D., in The Encyclopedia of Telecommunications, Marcel Dekker, Inc., New York, 1992.

- The competitive equipment decisions dated back to the late-1950s and extending throughout the 1960s and 1970s, culminated with the investigation of Western Electric Company, which, back then, was vertically integrated with AT&T and the Bell System¹². These decisions created not only a competitive equipment industry in the United States, stimulating the deployment of new communications, computers and information technologies and services, but also, with the assistance of the Department of Justice Antitrust Division and a Federal District Court presided over by Judge Harold Greene, resulted in the break up of AT&T, the Bell Operating Companies, Bell Laboratories, and Western Electric.
- The policies of the early 1980s, stemming from a rulemaking known as FCC Docket 18262, launched nationwide, universal cellular service with the allocation of spectrum in 1981 and the start of service in October, 1983. Concurrently Specialized Mobile Radio (SMR), which was first licensed by the FCC in 1977 and was restricted to public safety, special emergency services, industrial users and land transportation, was allowed to interconnect with the public switched telecommunications network thanks to a favorable decision by the FCC in Docket 20846 in March, 1982. This decision also governed the interconnection of all private radio systems with the emerging cellular wireless systems.
- More recently, the Commission has encouraged the rapid deployment of digital high definition television, assisted in the deployment of broadband technologies, and is promoting a new age of IP-based video and data services based on packet switching as opposed to circuit switching.
- In December 2005, FCC Chairman Kevin J. Martin submitted a Report to Congress on the Study to Assess Short-Term and Long-Term Needs for the Allocations of Additional Portions of the Electromagnetic Spectrum for the Federal, State and Local Emergency Response Providers¹³. This report was followed in March 2006, with the creation of a Public Safety Homeland Security Bureau described as a major step toward the Commission's goal of a secure national telecommunications system that can meet critical needs in the event of a disaster¹⁴.

The public policymaking scene now presents the FCC with an opportunity to make the next great leap forward in the development of a mechanism combining the strengths of the government and the private sectors so that they can deal with today's emergencies in an effective, efficient and timely way that will result in huge benefits to society as a whole. National and international tragedies and natural disasters are not only costly in terms of lives lost and disrupted, enormous property damage accompanied by economic, business, educational, social, and political disruption, they also demand new, more effective and immediate coping and response mechanisms for dealing with them.

Today's FCC has a major role in developing a policy to establish a secure, reliable, and interoperable communications system that can be used by the nation's public safety, federal law

¹² *Hush-a-Phone v. U.S.*, 238 F.2d (1956); *Hush-a-Phone Corp. v. AT&T*, 22 FCC 112, 113 (1957); *Carter Electronic Corporation*, 13 FCC 2d 420 (1968), recon. Denied, 14 FCC 2d 571 (1968); and *United States v. American Tel. and Tel. Co.*, 552 F. Supp. 131, aff'd, 103 S. Ct. 1240 (1982).

¹³ FCC Report to Congress Submitted Pursuant to Public Law No. 108-458, December 19, 2005.

¹⁴ FCC Adopts Plan to Establish a Public Safety and Security Bureau, FCC Press Release, March 17, 2006.

enforcement, and homeland defense organizations. Historically, the FCC has repeatedly demonstrated its courage in politely resisting the efforts of entrenched forces that have attempted to protect the status quo. Time after time the Commission, in the name of pursuing its mandate from the US Congress, has prevailed in ways that have resulted in enormous economic, business, social, cultural, and educational benefits accruing to the nation as a whole. History suggests that it will rise again to this challenge to, after carefully listening to, and then disregarding, the voices of outrage, protectionism and retrenchment, take the steps necessary to resolve the Public Safety and Homeland Security Communications Crisis.

Public Safety Communications Crisis and the 700 MHz Opportunity

Public Safety communications have suffered from decades of benign neglect. While 9/11 should have served as a wake-up call to modernize and revamp public safety communications, four years later, Hurricane Katrina exposed glaring weaknesses in public safety systems. Traditional wired and wireless networks, upon which we rely in national, regional, and local emergencies, are optimized to meet the day-to-day needs of their customers and are eager to offer more value-added, i.e., revenue producing, services, as opposed to reliable, recoverable, and re-routable systems that can survive and recover from natural and other disasters.

Of course, improving public safety communications cannot, and will not, prevent disasters. But, unlike many other measures that can be taken to address catastrophes, ranging from hurricanes and earthquakes to terrorist incidents and attacks, improved communications can support improved preparation and speed response to these crises, resulting in the saving of lives, the restoration of public health and welfare, and added protection to property. The benefits to society as a whole are self-evident and are not challenged by any responsible person or institution.

As with many infrastructure systems, it is difficult to accurately quantify the benefits of improved public safety communications. But, even a modest improvement will result in substantial financial benefit, and there will be immeasurable – and continuing -- benefits stemming from human lives saved due to, for instance the faster response and more effective evacuation procedures that an assured and effective network for providing enhanced public safety communications services would make possible.

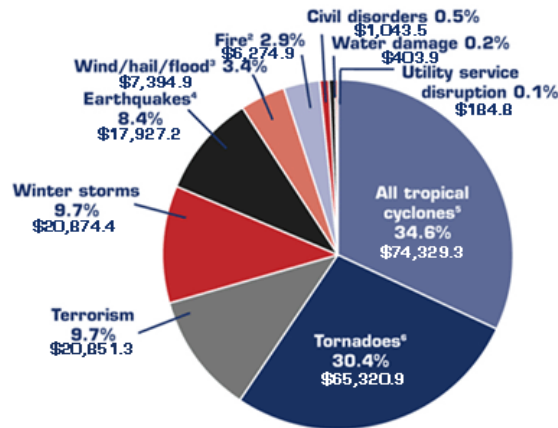


Figure 1 - Total US Catastrophe Losses 1985-2004¹⁵

As seen in Figure 1, above, the total costs of catastrophic incidents in the US has exceeded \$10 Billion per year¹⁶. Projections for future catastrophes are predicted to continue to escalate at a rapid rate. The continued expansion of development in coastal areas, combined with the expansion of urban areas, is dramatically increasing costs associated with disasters. Major catastrophe loss projections range from a “low” of \$25 Billion to nearly \$85 Billion a year (see Figure 2).

Furthermore, the losses are not restricted to major disasters. Even minor hurricanes can cause substantial damage. Average total losses for all hurricanes average over \$122 Million a year and these events (Categories 0 to 2) are thirty seven times more likely than a large (Category 3, 4, or 5) hurricane¹⁷ making the aggregate losses virtually equivalent to a one major hurricane. Losses from fire and other minor, non-catastrophic incidents totaled over \$27 Billion in 2004. Many of these losses could also be reduced by improved public safety communications (loss from fire and bodily injury represent about one quarter of this total or \$6.75 Billion,¹⁸ yielding between \$67 Million and over \$337 Million in potential additional savings per year, if one were to assign a 1% to 5% loss reduction effect to improvements in public safety communications).

¹⁵ Source: Insurance Information Institute Web Site – Media - Facts & Statistics – Catastrophes - <http://www.iii.org/media/facts/statsbyissue/catastrophes/>.

¹⁶ This estimate is consistent with the Congressional Budget Office Cost Estimate - H.R. 230 - Natural Disaster Protection and Insurance Act of 1997, October 8, 1997, <http://www.cbo.gov/showdoc.cfm?index=157&sequence=0>.

¹⁷ Impact of Low-Intensity Hurricanes on Regional Economic Activity, Robert T. Burrus Jr.; Christopher F. Dumas; Claude H. Farrell; and William W. Hall Jr., Natural Hazards Review, August 2002, pgs 118, 122, and 124.

¹⁸ Insurance Information Institute, <http://www.iii.org/media/facts/statsbyissue/homeowners/>

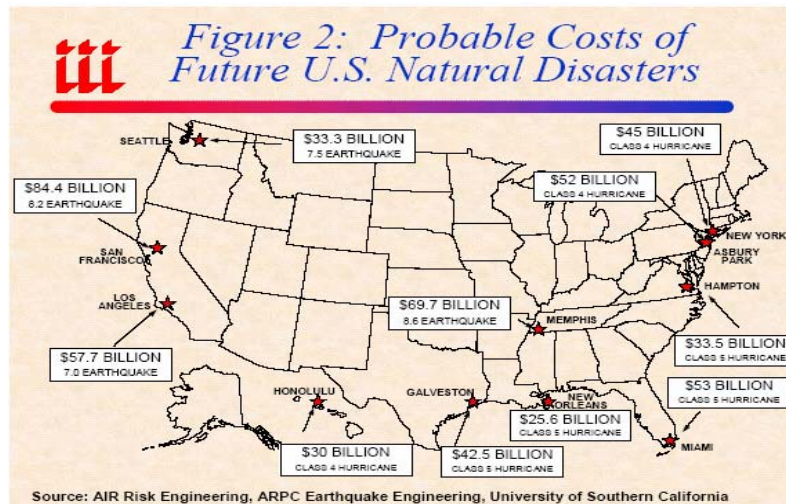


Figure 2 - Projected Future US Catastrophe Losses (Source: Insurance Information Institute)

Improved public safety communications cannot prevent these incidents, but they can both reduce loss of life with effective early warnings prior to the catastrophes, restore public health and welfare more quickly by enabling the rapid and reliable transfer of information to service those ends, and reduce secondary damage (for example from fire, flooding, or looting) and speed the evacuation and recovery process. If the cost savings assumed to be associated with significant improvements in the coverage, functionality, reliability, redundancy and capacity of public safety mobile communications could be expected to result in even a modest reduction in the dollar cost of damages and losses caused by all catastrophic events – for instance 1% - 5% of these total costs – the annual savings would be astronomical, ranging from \$250 million to \$4.25 billion per year. A combined public-private interoperable communication system, such as the one planned for the broadband network at 700 MHz, will provide more than sufficient capacity in cases of emergency, while also substantially expanding the US national wireless network.

Auction Revenue Model for Reduced Spectrum

Reallocating to public safety communications 30 MHz of the available spectrum at 700 MHz could save hundreds of millions, and perhaps even billions, of dollars per year and many lives. Given the scope of potential natural and manmade disasters that the US faces (see Figure 2, above), this should be enough justification for reallocating this spectrum. By taking this spectrum out of the auction, the remaining 30 MHz of 700 MHz spectrum (and potentially, spectrum in other bands currently available for commercial mobile radio services and scheduled for auction, e.g. the AWS) will immediately become more valuable and thus will help defray the so-called potential losses from the estimated \$12.5 Billion that might have been bid for the 60 MHz.

There are 60 MHz of spectrum in the 700 MHz band designated for auction, with projected total revenues of between \$10 Billion and \$15 Billion, according to the Congressional Budget Office (CBO)¹⁹. Under the Public Safety Broadband Trust proposal, half of this spectrum or 30 MHz

¹⁹ “Digital TV Date Pushed to 2009”, Grant Gross, PC World, 21 October 2005.

should be allocated to public safety, homeland defense, and law enforcement, with the advanced nationwide broadband wireless network in which that spectrum would be deployed to be funded by a process involving the award of spectrum lease rights to commercial users²⁰. This proposal leaves 30 MHz available for commercial auction. As a result, the effective “investment” in public safety communications accounts for one half of the total auction value, namely \$6.25 Billion (assuming bids total the CBO’s estimate of an expected value of \$12.5 Billion in auction revenues).

Even without further analysis, this is a small price to pay for a safe, secure, reliable, interoperable, responsive, and state of the art public safety and homeland security communications network. But the actual costs do not even come close to that and, when the enormous benefits are computed, the country as a whole gains a great deal.

Fortunately, however, even using a conservative \$12.5 Billion, the US will still gain an additional benefit from reducing the spectrum available for a pure commercial auction to 30 MHz – because the value of the remaining spectrum is increased when it becomes more scarce while the number of bidders will not decline. The result: More than a proportionate share of the total amount that would have been bid for the full 60 MHz – that proportionate amount here is assumed to be \$6.25 Billion-will be bid for the remaining 30 MHz.

While the actual results of the auction of the remaining spectrum are unknowable, one can build a simple model for the premium placed on the spectrum:

$$\text{Increased Government Revenue} = \text{Base Government Revenue} * \text{Scarcity Premium}$$

The Scarcity Premium is the increased value that the spectrum will have based on its new-found rarity. There is good justification for this increased valuation as there is substantial interest in the 700 MHz spectrum. The major cable companies (Cox, Comcast, Time Warner), entertainment firms (Disney, Sony, Time Warner), satellite companies (Echostar, DirectTV, Sirius, XM), venture backed firms (NextWave, MetroPCS, Aloha Partners, ClearWire), leading IT and technology firms (Microsoft, Qualcomm, Intel, Cisco, Google), and, of course, the existing wireless carriers (Sprint-Nextel, Verizon, and Cingular, which is owned by AT&T and BellSouth)²¹ all previously bid on, or are reported to have expressed an interest in bidding on, available 700 MHz spectrum in FCC auctions.

Table 1: Scarcity Impacts On Projected Additional Auction Revenues (Millions)

Scarcity Premium	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%
\$10 Billion Auction	250	500	750	1,000	1,250	1,500	1,750	2,000	2,250	2,500
\$12.5 Billion Auction	313	625	938	1,250	1,563	1,875	2,188	2,500	2,813	3,125
\$15 Billion Auction	375	750	1,125	1,500	1,875	2,250	2,625	3,000	3,375	3,750
\$17.5 Billion Auction	438	875	1,313	1,750	2,188	2,625	3,063	3,500	3,938	4,375

This scarcity premium is further supported by the fact that when one considers that the first megahertz of additional spectrum that a company purchases is more valuable than the last. Thus,

²⁰ FCC Filing, April 2006.

²¹ Aloha Partners; Open Letter to US House of Representatives, Committee on Energy and Commerce; 18 April 2005.

with a modest scarcity premium of twenty percent, the US Treasury *collects \$1.25 Billion more* than it would have for the 30 MHz that is available for open auction. This number goes up to \$1.75 Billion, if the auction reaches \$20 Billion and even higher if the scarcity premium turns out to be higher than twenty percent.

While potential auction participants have less available spectrum, the PSBT model does give the American Public the full benefit of the 700 MHz spectrum. By making this spectrum “dual use”, the PSBT will enable the delivery of broadband commercial service for day-to-day service. This service may have the additional benefit of reducing prices for broadband service offered by other providers while, at times of crisis, making a high-reliability, IP-based, open network available to national, state, and local public safety providers so that they can save lives and protect property.

In summary, the short, medium, and long term economic and broadly based public benefits stemming from a decision to remove this 30 MHz of 700 MHz spectrum from the traditional auction block, so that it instead may be used to enable the deployment of a high-speed, interoperable, broadband, secure and safe public safety communications network far outweigh the relatively insignificant financial shortfall stemming from the auction of all 60 MHz.

Public Safety Benefits:

- Lives saved on an annual basis as a result of earlier and more reliable warning procedures and evacuation practices.
- The potential for reduced property damage and quicker recovery from disasters.
- Improved response times for local police, fire, and ambulance services again resulting in the saving of lives and property, along with more effective and efficient crime fighting tools.
- Significant cost savings stemming from the interoperability of the public safety communications network, and uniform equipment standards.
- A reduction in public anxiety and increased faith in the ability of first responders to deal with disasters at the national, regional, and local levels.
- Lowering or the leveling off of insurance premiums for business and households who install emergency and security systems that receive instant warnings and evacuation instructions in emergencies.

Economic & Business Benefits:

- New and vibrant competition to the incumbent wireless companies.
- New services and technologies will be introduced on a local, regional, and nationwide basis.
- Employment opportunities resulting in growth in the nation’s Gross Domestic Product (GDP), employment opportunities, and increased federal, state, and local tax revenues.

Conclusion and Recommendations

The FCC has a long tradition of innovative oversight of America’s valuable spectrum resources. It has carefully balanced societal, Public Safety, and National Security needs while spurring commercial innovative use of spectrum to benefit the public and the national economy. The Commission’s historical commitment to the introduction of new technologies and services has resulted in pro-competitive policies in the provision of long distance, local and wireless

communications services, cable television and satellite entertainment and information services, and an increasing array of broadband services delivered over a variety of competing networks.

The management of government spectrum has been much more traditional. Until now, the military, law enforcement, and public safety spectrum was allocated in order to deploy specific, “stovepipe” networks. While this made sense at the time, it has resulted in a multitude of incompatible, non-interoperable communication systems that use spectrum inefficiently and fail to meet the rapidly evolving communications and information sharing requirements for the 21st century. This situation has been aggravated by the same budgetary constraints that have driven the government to auction spectrum in the first place.

Public Safety has been particularly hard hit. The scale of potential catastrophes has grown tremendously while the resources available to the responsible agencies have declined. Even in the wake of 9/11, numerous hurricanes, and several earthquakes, public safety communications remain in disarray. While improving public safety communications will not stop these disasters, even modest system enhancements can reasonably be expected to help save lives and reduce the costs to the US and its citizens by hundreds of millions, if not billions, of dollars per year.

Meanwhile, the limitations of pure market models, like the drawbacks of auctions, have become apparent. In addition to the delay in deployment of wireless networks that bring billions of benefit to the US economy every year, the nature of these market models has shortchanged public safety and national security needs. Incumbent wireless carriers continuously fight for delays and waivers in meeting public safety and law enforcement needs. Endless delays in E911 deployment²² and inability of the US Government to maintain its lawful surveillance capabilities for rapidly evolving communications under CALEA²³ have amply demonstrated the failure of markets to meet the nation’s long-term Public Safety and National Security objectives.

There must be a better way.

Toward A New Public-Private Spectrum Partnership

Pure market based systems are driven to meet the short-term needs of commercial shareholders. Conversely, Government-only solutions are driven by budgetary limitations, bureaucratic and political battles, and inability to respond to rapid technological and market changes. The US has a long history of addressing these challenges through innovative public-private entities. Independent regulatory entities such as the NYSE and NASDAQ; research organizations such as RAND, MITRE, and IDA; and even the US Post Office are hybrid government-commercial entities. All of these organizations balance commercial flexibility with long-term national policy goals.

²² “A Report on Technical and Operational Issues Impacting The Provision of Wireless Enhanced 911 Services”, Dale N. Hatfield.

²³ “On March 10, 2004, the DOJ, the FBI, and the DEA filed a "Joint Petition for Expedited Rulemaking" in which they asked the Commission to take certain steps to accelerate CALEA compliance. Based on this petition and comments received in response, the FCC has undertaken a comprehensive review of issues relating to CALEA implementation, including policies regarding section 107(c) extensions and section 109(b) petitions. See In the Matter of Communications Assistance for Law Enforcement Act and Broadband Access and Services (http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-04-187A1.doc).

The main problem facing Public Safety in the US is that its communication requirements are minimal except at times of crisis, when demand is so great that it causes strains and breakdowns on the commercial networks. When a major disaster or national catastrophe strikes, Public Safety's communication needs skyrocket. Building a standalone network that operates in this manner is extraordinarily expensive. Beyond the issue of cost, most of the time and in most parts of the country, it is unnecessary. The current commercial companies, dominated by Cingular, Verizon, and Sprint-Nextel, are not the ones to undertake this task. They are strictly commercial operators concerned with adding new revenue generating services in an attempt to increase profits. They are also preoccupied with managing existing and future mergers as the industry consolidates into fewer competitors.

In order to meet the critical Public Safety needs of the US, in the most cost-effective manner, this key 30 MHz slice of 700 MHz spectrum should be allocated to public safety to serve as the critical ingredient to fashion an effective Public-Private partnership. Such a Public-Private Partnership for this 30 MHz of 700 MHz spectrum should have the following characteristics:

Open IP Broadband Communications Network – The Internet has shown that having a common standards-based technological approach and related network infrastructure has provided a robust platform for innovative services and businesses. An IP-based technology and network architecture also provides a naturally reliable and robust survivable network well-suited to public safety requirements. Perhaps the most important benefit of this architecture is that it allows a wide range of commercial participants. The Internet gracefully includes everything from large telecommunications carriers with their own massive networks to local, independent ISPs with a small cadre of clients and everything in-between.

Commercial Usage, Public Safety Standards – Rather than build a dedicated Public Safety network, the public-private partnership approach will oversee the creation of a single network built to Public Safety specifications. The network would consist of multiple assignments of spectrum lease rights made available through a secondary market under the supervision of the public-private spectrum manager. This hybrid broadband wireless network will benefit from the enhanced reliability of building to a public safety designated standard and the large network size and commercial applications will substantially reduce the cost of meeting public safety communications needs by distributing the costs over a much larger user population²⁴. This model will protect both the public and property in times of crises; result in billions of dollars in annual savings; and will introduce new competitors and new technologies and services to the incumbent and increasingly consolidated commercial wireless companies.

Fully Preempt-able – In order to build a large, but cost-effective Public Safety network, the system must necessarily be primarily commercial. In times of national, regional, or local crisis, it must be designed to allow Public Safety users to pre-empt ordinary commercial users.

Public Safety Specific Quality of Service & Priority Assignments –Public Safety entities, commercial users, and infrastructure operators benefit from the ability to dynamically allocate available network capacity and to flexibly assign and change “Quality of Service” and priority levels for various users. The “Network Neutrality” debate misses the advantage to all parties for

²⁴ The total Public Safety community in the US comprises approximately 2.5 Million members. The US population exceeds is nearly 300 Million individuals or nearly 100 times larger. Even so, this overstates the size of the largest Public Safety networks as current systems are separate stovepipes for individual national, state, or local industries.

assigning various priorities and service levels to different users – while some services, such as real-time video, truly benefit from low-latency, high-speed services, others, like email and SMS can take advantage of long-latency, low-speed services if prices are reduced. This ability to balance a service's cost, its importance and its user's status assures the utilization of scarce spectrum most efficiently.

The availability of this 30 MHz swath of 700 MHz spectrum has presented the FCC with a rare opportunity to address a public policy problem for public safety while adding a substantial, new network for the US public. As clearly shown by this analysis, the US gains the most benefit from deploying major new wireless networks quickly. It is also clear that the public-private partnership strategy, quickly sketched herein, and discussed at length in the accompanying FCC filing, may provide the best means to open wireless spectrum to new entrants without the failures that have been previously experienced.

Bibliography & Reference Materials

1. Federal Communications Commission Strategic Plan 2006-2011.
2. The Communications Act, 47 U.S.C. 151-614, 333 pp.
3. FCC, Common Carrier Cases, 1936-1978, Digest, Index, Tables of Cases and Briefs of Federal Court Opinions.
4. Report by the FCC on Domestic Telecommunications Policies, September 27, 1976.
5. The Telecommunications Policymaking Process & The Future Agenda: Implications for Service Providers, Manufacturers & Users, by Alan Pearce, Ph.D., International Data Corporation, Framingham, MA, 1981.
6. National Broadcasting Co. v. United States, 319 U.S. 190, 210-13, 1943.
7. FCC's Television Assignments, Notice of Proposed Rulemaking, FCC 48-1569, May 6, 1948, Report and Order, FCC 48-2182, Sept. 30, 1948; Sixth Report and Order, 41, FCC 148, 1952.
8. Allocation of Frequencies in the Bands Above 890 Mc., Report and Order, 27 FCC 359 (1959), recon. 29 FCC 825 (1960).
9. Microwave Communications Inc., 18 FCC 2d 953 (1969) and MCI Telecommunications Corp., 60 FCC 2d 25 (1976), and Specialized Common Carrier Services, First Report and Order, 29 FCC 2d 870 (1971), recon. Denied, 31 FCC 2d 1106 (1971).
10. Cable Television Report and Order, 36 FCC 2d 141 262, 1972.
11. Staff of Subcommittee on Communications of the House Committee on Interstate and Foreign Commerce, 94th Congress, 2d sess., Cable Television: Promise Versus Regulatory Performance, Committee Print, 1976.
12. Domestic Communications Satellite Facilities, Second Report and Order, 38 FCC 2d 844 (1972), modified, 35 FCC 2d 665 (1972).
13. Packet Communications Inc., 43 FCC 2d 922 (1973); Graphnet Systems Inc., 44 FCC 2d 800 (1974); Telenet Communications Corp., 46 FCC 2d 680 (1974).
14. The Encyclopedia of Telecommunications, Marcel Dekker, Inc., New York, 1992, Chapter on Computers & Communications Convergence by Alan Pearce, Ph.D.
15. First Computer Inquiry, Tentative Decision, 28 FCC 2d 291 (1970), Final Decision, 28 FCC 2d 267 (1971), aff'd in part sub nom. GTE Services Corp. v. FCC, 474 F. 2d 724 (2nd Cir. 1973), and Second Computer Inquiry, Final Decision, 77 FCC 2d 384, 461 (1980), recon. 84 FCC 2d 50, 74-75 (1980) further recon. 88 FCC 2d 512 (1981), aff'd sub nom. CCIA v. FCC, 693 F 2d 198 (D.C. Cir. 1982), cert. Denied, Nos. 82-1331, 82-1332 (U.S., May 16, 1983).
16. Hush-a-Phone v. U.S., 238 F.2d (1956); Hush-a-Phone Corp. v. AT&T, 22 FCC 112, 113 (1957); Carter Electronic Corporation, 13 FCC 2d 420 (1968), recon Denied, 14 FCC 2d 571 (1968).

17. United States v. American Tel. and Tel. Co., 552 F. Supp. 131, aff'd, 103 S. Ct. 1240 (1982).
18. FCC Report to Congress on the Study to Assess the Short-Term and Long-Term Needs for the Allocation of Additional Portions of the Electromagnetic Spectrum for the Federal, State and Local Emergency Response Providers, submitted pursuant to Public Law No. 108-458, December 19, 2005.
19. Cingular's Purchase of AT&T Wireless: An Economic Analysis, by Alan Pearce, Ph.D., and Richard J. Carlson, Media Law & Policy, Vol. XIV, Number 2, Spring, 2005, pp. 6-20, New York Law School.
20. Bad Connections? Foreign Ownership of U.S. Telecoms, by Alan Pearce, Ph.D., in The Georgetown Journal of International Affairs, Winter/Spring, 2001.
21. Insurance Information Institute Web Site – <http://www.iii.org/>.
22. Congressional Budget Office Cost Estimate - H.R. 230 - Natural Disaster Protection and Insurance Act of 1997, October 8, 1997.
<http://www.cbo.gov/showdoc.cfm?index=157&sequence=0>.
23. "Impact of Low-Intensity Hurricanes on Regional Economic Activity", Robert T. Burrus Jr.; Christopher F. Dumas; Claude H. Farrell; and William W. Hall Jr., Natural Hazards Review, August 2002.
24. "US Plans to take on Gabelli Suit – FCC Auction Prompted Dispute", The New York Times, Thursday, March 9, 2006.
25. "Who and What is the Wireless Industry? A Self-Portrait", CTIA, March 2005.
26. "The Impact of the US Wireless Telecom Industry on the US Economy", Roger Entner & David Lewin, Ovum, September 2005.
27. "A Report on Technical and Operational Issues Impacting The Provision of Wireless Enhanced 911 Services", Dale N. Hatfield.
28. "In the Matter of Communications Assistance for Law Enforcement Act and Broadband Access and Services" (http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-04-187A1.doc).
29. "At the intersection of regulation and bankruptcy: FCC v. Nextwave"; Perlstein, William J.; Bamberger, Kenneth A. Business Lawyer, November 2003,
<http://www.allbusiness.com/periodicals/article/741565-1.html>.
30. Evaluating Wireless Carrier Consolidation Using Semiparametric Demand Estimation - Preliminary, Patrick Bajari, Jeremy T. Fox & Stephen Ryan, University of Michigan & NBER, University of Chicago, MIT, February 15, 2006.
31. FCC Filing, April 2006.
32. Aloha Partners; Open Letter to US House of Representatives, Committee on Energy and Commerce; 18 April 2005.
33. "Digital TV Date Pushed to 2009", Grant Gross, PC World, 21 October 2005,
<http://www.pcworld.com/news/article/0,aid,123136,00.asp>.