Broadcasting the Future

The Role of Broadcasters in the Future of Communications Infrastructure

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On my honor as a University student, on this assignment I have neither given nor received unauthorized aid as defined by the Honor Guidelines for the Undergraduate Thesis Project.

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For more than 60 years, television has been available to the public via over the air broadcast service, but in recent years it has come under increasing pressure. With the demand for broadband Internet growing rapidly, many are pointing to broadcast's perceived 10% usage and saying that it is time to either reduce or end broadcast television and auction some or all of its spectrum off to companies in order to provide additional wireless broadband services. This paper aims to show how the broadcast service remains an important piece of our national emergency infrastructure and an important technical innovator on its own, as well as to demonstrate that the present plan proposed by the FCC for auctioning off some of the current broadcast spectrum is flawed and infeasible. This paper will show how statistics, such as the aforementioned 10% usage statistic, are misleading. In addition, it will attempt to rebut other claims used to argue against the continued licensing of spectrum to broadcasters in its current state.

The explosive growth in demand for faster Internet access that has arisen in the past 20 years is quickly outpacing supply and ability to provide (FCC, 2010). As a result, Congress passed the American Recovery and Reinvestment Act of 2009, directing the Federal Communications Commission (FCC) to develop a National Broadband Plan (NBP) devising a solution to this issue. Among the key points of the plan is one to remove 120 Megahertz (MHz) of electromagnetic spectrum from broadcast television in the ultra high frequency (UHF) band, and then auction it to providers of wireless Internet services in order to expand those services (FCC, 2010). The key assumption made in this plan is that the use of spectrum which would provide the greatest public interest benefits would also bring the largest amount of auction revenue to the federal government, an assumption that has become increasingly widespread in the last 25 years. Due to this change in philosophy, questions have been raised about whether television broadcasting is the optimal use of this particular band. Though commercial television broadcasting has been around for more than 60 years, it continues to serve many important purposes to society and should not be discounted with regard to spectrum usage and allocation.

Benefits of Broadcasting

The history of the broadcasting industry shows its commitment to the public interest from the very beginning. As far back as the Radio Act of 1927, Congress declared that licensing should be conducted in the "public interest, convenience, or necessity." This act only lasted seven years before being replaced by the Communications Act of 1934, but serves as a basis for public interest aspects of broadcasting even today. The act directed the then-Federal Radio Commission (FRC) to revoke the licenses of stations that failed to serve the public interest, and also required license renewal on a regular basis to determine that the public interest had been served during the previous license term. This language exists in FCC documentation today, and a few examples will show stations' commitments to acting in the public interest.

Broadcasting in Emergency Situations

Both radio and television broadcasting have shown their value repeatedly in the form of its continued operation in the case of natural disasters and other emergencies. Due to the extensive amount of equipment needed by land line telephones, cable television, and cellular telephones, these services are often found to be victims of outages due to widespread damage. Broadcasters often have only a single transmitter, and thus have invested significant amounts into redundancy such as generators, alternate paths for providing programming from the studio to the transmitter, backup transmitters, or even entirely redundant secondary facilities. Even in the event of a total failure, the presence of multiple stations, often using different transmission towers, makes the chance of all broadcasters being removed from the airwaves highly unlikely.

An excellent example of the utility of broadcasting in emergency situations comes from New Orleans during Hurricane Katrina. The city of New Orleans “lies below sea level, in a bowl bordered by levees,” (Fischetti, 2001, p.78) so when Hurricane Katrina ruptured the levees, the city found itself under 20 feet of water. As a result, land line infrastructure, including that of telephones and cable television, was deluged with water and thus largely non-functional in Katrina's wake. This left broadcast radio and television as the only forms of communication still operating (Chow, 2005). While several of the other broadcasters in New Orleans had their broadcast facilities completely destroyed (Herpich, “Big washout,” 2005), local CBS affiliate WWL had designed a transmission facility capable of withstanding 140 mile per hour winds and had a plan in place for news coverage during a situation like the one encountered during Hurricane Katrina (May, 2006). As a result, that station was able to remain on the air from the studio of Louisiana Public Television in Baton Rouge, providing valuable emergency information to the public throughout the disaster and during the days and weeks that followed (Herpich, “Grim outlook,” 2005; May, 2006).

The benefits of multiple broadcasters was revealed during the September 11 attacks in New York City. The north tower of 1 World Trade Center was the primary home to all of New York's network English-language television station transmitters (Fybush, 2002). As a result, when the attack occurred, a great number of primary TV stations found themselves off the air, as redundancy had been provided for with the idea that the buildings themselves would not cease to exist. Of the network stations, WCBS in New York had a backup transmission facility in the Empire State Building, and was thus able to remain on the air while the other English-language network stations were offline (Wiggins, 2001). In addition, other broadcasters such as Spanish-language station WXTV, public broadcaster WNYE, and home shopping station WHSE all had their primary transmitters located on the Empire State Building and were able to provide coverage of the disaster without interruption (Fybush, 2002). In addition, cellular telephone networks quickly became overloaded in the area as people attempted to contact friends and family members (Rogers, 2003), making information distribution via Internet nearly impossible. In this instance, even though the primary transmitter site for New York City was completely demolished, having multiple transmitters at different locations ensured that vital information continued to be available to the public during a time of national tragedy and disaster.

Though these are only a few examples, broadcasters regularly provide emergency information during times when the infrastructure associated with modern broadband Internet networks has failed. Removing this vital public service in favor of services with many additional points of failure would be a significant loss for public safety in the United States.

Technical Innovation of Broadcast Television

Television broadcasters have often been technical innovators in providing new and upgraded services to viewers. Broadcast began as a monaural, black and white service with few channels available in limited areas. Through both incremental improvements in technology as well as the digital television transition that was completed in 2009, today broadcasters transmit a high quality digital signal which is unmatched by many of its competitors, including many Internet-based video services, in its quality and features.

Analog television underwent many upgrades during the course of its more than six decades of existence. The first major upgrade was the upgrade from black and white to color transmission, which was largely completed by the major broadcast networks by 1967. A backwards-compatible system was developed to ensure existing black and white television sets would receive the new color signals, albeit in black and white, while allowing new sets to receive the full color signal (Newcomb, 2004, p.554-555). Other successive upgrades to the analog television service occurred in the 1980s, which included the addition of closed captioning for the hearing impaired (Robson, 2004, p.11-13) and Multichannel Television Sound (MTS) standard, which provided for stereo audio as well as the Secondary Audio Program (SAP) for those with visual impairments or those who prefer audio in another language (Eilers, 1984). These upgrades not only ensured broadcasters were up to date with modern technology, but also served the public interest by providing more content to disabled or foreign-language audiences.

The transition from analog to digital broadcasting brought its own technical benefits which are being continually improved upon. The most obvious of these is the upgrade from standard definition to high definition video, providing a sharper picture and higher quality. Additionally, the audio was upgraded to support not only stereo audio, but also 5.1 surround sound as well as multiple SAP services instead of just one as in analog (Hopkins, 1994). But since the new signal is digital, it also can be used for datacasting services such as providing software updates to devices and other services that are completely unrelated to television (Thomas, 2000). So far, only a few of these services are in operation, such as the Kentucky Educational Television (KET) datacasting service to schools (KET, n.d.) and the Update TV service which provides aforementioned software updates to television receivers (UpdateLogic, 2008). In the future, however, it could be possible to provide internet access directly through the spectrum used for television. An advocacy group called Spectrum Evolution is only the latest to propose allowing broadcasters to provide Internet services using the spectrum for which they hold licenses (Spectrum Evolution, 2010). In addition to data services, broadcasters are currently implementing Mobile DTV, which will be used to provide both free and subscription video to cellular telephones and other mobile devices via broadcast (Lim & Lee, 2010). With all of these potential usages of spectrum in the future, broadcasters are clearly continuing to innovate and make efficient use of their spectrum.

Problems with Spectrum Reclamation

Though it is plain to see that broadcast serves an important purpose and its loss would be detrimental, there exist numerous problems with the very idea of shrinking and/or repacking the broadcast spectrum. This is especially true if the goal is to prevent any loss of service, since such a shrinking of the band would almost certainly require stations to share channels and/or decrease their coverage areas. In addition, questions remain about the costs that would go into implementing such a plan as well as what the impacts would be on low-power broadcasters. Finally, such a repacking would likely have a negative impact on the recently-approved "white space devices," which would operate under the premise of filling gaps in the current broadcast service with Internet services.

Spectrum Shortage in Populated Areas

The areas which the FCC would most like to recover spectrum are those where there are the most broadcasters to accommodate. The Trinity Broadcasting Network made note of this in a recent filing with the FCC in which they noted that if no channels elected to share spectrum in the Los Angeles market, the FCC would be seeking to fit 26 stations into a spectrum consisting of "a total of only 23 available channels" (TBN, 2011, p.7). This estimate by TBN includes the use of the undesirable channels 2-6, which have shown through extensive real-world testing to perform poorly with regard to digital television (Lung, 2004). Similar shortages of spectrum would occur in the congested northeast and Great Lakes region, where stations are located very close together and are typically already experiencing interference above the FCC's typical 0.5% limit (FCC, 2007). It becomes evident that the only way for the FCC to conduct spectrum shrinking on the scale in which they wish to do so is to make their proposed voluntary channel sharing policy (FCC, 2010) into something that is not voluntary.

Cost of Equipment

Many broadcasters installed significant amounts of new equipment at very high cost in order to satisfy the requirements of the digital television transition. Many stations which had previously operated on channels 2-6 were assigned to operate digital channels on the UHF band, requiring entirely new antennas, transmitters, and other equipment to facilitate this transmission. Some of these stations were required to operate in spectrum that was ultimately recovered for auction, but these stations were made aware of this in 1997 by the Balanced Budget Act, giving them many years to prepare for the eventual building of yet another facility during the transition which finally took place in 2009. This FCC repacking plan would now require stations to relocate to new channels yet again at significant cost.

An example of this is made clear by recent comments on the request for comments from the FCC made by Trathen and Hartzell on behalf of UNC-TV. UNC-TV is a public television station network in the state of North Carolina which owns 12 television stations plus a group of low-power translator stations to fill in the coverage gaps in mountainous western North Carolina (UNC-TV, 2011). In these comments, UNC-TV claimed to have spent a total of nearly $70 million converting this entire network to digital operation, including having to build two facilities in the spectrum ultimately recovered by the FCC in 2009. These included a careful juggling act in Raleigh, one of the largest markets in which UNC-TV operates, where WUNC-TV abandoned its analog channel 4 and could not retain the channel 59 which was within the 700 MHz band to be recovered by the FCC. This required the station to install even more temporary equipment to keep the station on the air as both the channels 4 and 59 equipment was removed (UNC-TV, 2011). Adding the costs of yet another relocation would create additional burdens on broadcasters only a few years after building out new facilities to facilitate the return of channels 52-69 to the FCC for alternate uses.

Low Power Broadcasters

Throughout the spectrum reclamation proceedings, little has been said of what fate might arise for low-power and Class A television broadcasters. The low power television (LPTV) service was created in 1980 both to serve underserved geographic areas as well as underserved audiences in more populated areas (Kersey, 1995). The Class A broadcast service was created by the Community Broadcasters Protection Act of 1999 and would allow LPTV stations which met certain requirements to obtain a protected status (FCC, 2000). These broadcasters not only serve an important local public interest in terms of providing local content, but a disproportionate number of LPTV stations are owned by minorities (Bush, 1996). The question of what would happen to LPTV broadcasters in particular, due to their secondary status with regard to other services in the band (Kersey, 1995), should be addressed before any action is taken on repacking the spectrum.

White Space Devices

A final concern is what such a spectrum reclamation would mean for the new white space devices approved by the FCC in 2008. These devices are designed to utilize the guard bands that protect television stations from interference as transmission channels for Internet access in an unlicensed fashion (Bahl, et al., 2009). However, if the broadcasters are repacked so as to be closer together, then there will be fewer white spaces available for these devices to utilize. This would put a significant damper on opportunities to make use of this unlicensed spectrum to potentially create new competition in existing markets, as well as hindering the creation of potential new markets through completely new devices. As the rules for this service are written, there is already concern that significant areas of high demand will have few or no white spaces available (Mishra & Sahai, 2009) and packing stations closer together will surely eliminate what few white spaces there are in these areas.

Criticism of Broadcast Television

Despite all of these things, broadcast television has not been immune to criticism from several angles regarding their use of spectrum. The most frequent argument is made regarding the diminishing audience of broadcast television, but the often-quoted statistics do not tell the whole story. In addition, an argument of efficiency is made, citing the presence of the aforementioned white spaces created by large broadcasters needing to balance interference concerns among themselves. These two statements sum up the most common arguments made to justify further reduction or elimination of broadcast spectrum. Performing additional analysis will show how these arguments are flawed and should be reexamined before being used to justify these policies.

Broadcast's Diminishing Audience

A very common argument for reducing or eliminating broadcast spectrum is to note that only about 10% of households use broadcast exclusively for television reception (FCC, 2010). However, these statistics operate under an assumption that if even a single television in a household is attached to cable or satellite television service, then the household is counted as not using over the air broadcasting at all, even if other television sets in the household are utilizing an antenna (Nielsen, 2011). LPTV broadcaster Northwest Television commissioned a study of their Portland, Oregon television stations to determine how many over the air viewers there were in that market, and the resulting statistics were sorted in two different ways. Using the Nielsen method of counting any home with cable or satellite service as not utilizing an antenna at all, the over the air households were 13.5%. However, if the data was reversed, and any home with a television set using an antenna was counted as not having cable or satellite service, the number of over the air households increased to 37%, as shown in Figure 1 (Northwest Television, 2010). In

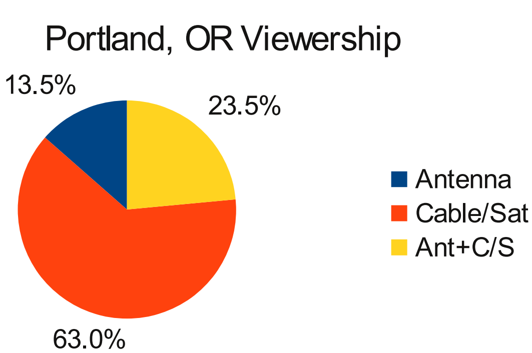

Figure 1

addition, it is important to note that this data does not separate out cable and satellite companies which use the over the air signal to receive the television signals that are then redistributed to their customers. This sharp discrepancy reveals that simply looking at the Nielsen statistics does not give the whole story, and that a significantly larger number of viewers may be impacted by a reduction or elimination of broadcast television than one may be led to believe.

The Efficiency of Broadcast

In the recent debates surrounding reclamation of spectrum from broadcasting, the argument has arisen about how efficient broadcast is. Since broadcasters typically have very large coverage areas, there are often significant gaps in between them to protect against interference; these gaps are part of the foundation of the white space device ruling by the FCC (FCC, 2008, p.7-8). Broadcast opponents have argued that these large coverage areas lead to spectrum inefficiency, in that mobile broadband services operating with a cellular structure have smaller coverage areas and utilize more transmission sites, resulting in more densely packed transmitters with fewer gaps in coverage and fewer interference protection concerns (FCC, 2010, p.90). In this way, by creating smaller coverage areas covered by more transmission facilities, spectrum is reused more and is thus more efficient.

While the argument about spectrum reuse in this manner is a fair one, it is ignoring a key benefit that the broadcasters have over wireless broadband providers. At present, many Internet-related devices do not have support for “multicasting,” which is the ability to transmit a packet once and receive it at multiple destination devices

(Ratnasamy, et al., 2006, p.1). Broadcast, however, does this “one to many” form of transmission by its very nature and has been doing so for more than 60 years. For example, if a broadband provider wished to stream a live sporting event, it would need to provide individual streams to each of its users. By contrast, a broadcaster only needs to transmit that sporting event once and whether the audience consists of one person or one million, the same amount of spectrum is utilized, which becomes more and more efficient as the number of viewers increases. In this way, it is clear to see how broadcasters could play a continuing role in providing video services to portable devices, particularly video services that are in high demand and would be most likely to bog down the network of a broadband provider.

Conclusion

It is evident that broadcasters still serve an important role through their public interest service, including that of emergency information and technical innovation. In addition, any attempt to reduce the spectrum is fraught with issues and difficulties that will almost certainly cause a decrease in coverage and service. The primary criticisms of broadcasters are often overstated or open to interpretation, and broadcasters can play a role in situations where others may be calling for them to be removed. When all of these individual items are put together, the data presented suggests that broadcast continues to serve an important role in the present, and can also serve a large role in helping with the distribution of services in the future.

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