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Spectrum for Broadband	)	GN Docket Nos. 09-47, 09-137
	)	
A National Broadband Plan for Our Future	)	GN Docket No. 09-51

To: The Commission

BROADCASTING AND THE BROADBAND FUTURE: A PROPOSED FRAMEWORK FOR DISCUSSION

THE ASSOCIATION FOR MAXIMUM SERVICE TELEVISION, INC. AND THE NATIONAL ASSOCIATION OF BROADCASTERS

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EXECUTIVE SUMMARY

The Association for Maximum Service Television, Inc. ("MSTV") and the National Association of Broadcasters ("NAB") here submit their initial suggestions for how the Commission should proceed in developing an optimal national broadband plan.

The debate about the spectrum-related aspects of the national broadband plan, unfortunately, has become narrowly focused on whether the Commission should seize some or all of the spectrum that supports the nation's broadcast television service, which benefits all Americans, and re-allocate it to wireless uses. In *Public Notice #26*, the Commission's Broadband Task Force prudently, but belatedly, asked certain specific questions that, for the first time in the Task Force's deliberations, relate to this issue. (MSTV and NAB are concurrently filing Comments that respond to those specific questions).

A broader perspective is necessary, however. This "Broadcasting and the Broadband Future: A Proposed Framework for Discussion" ("Framework Document") attempts, as a preliminary matter, to provide the needed broader perspective. The 19-day comment period provided by *Public Notice #26* and the scope of *Public Notice* 26 are not sufficient to provide this needed broader perspective. MSTV and NAB intend to supplement this Framework Document later with additional input, to more fully develop and support the positions set forth here.

A principal purpose of the Framework Document is to rebut the false dichotomy between broadcasting and wireless — the improper and untested presumption that the Commission must choose one or the other. In fact, both are important parts of the national

communications landscape, and it is neither desirable nor necessary to elevate one over the other for purposes of re-allocating spectrum or providing resources for broadband uses.

* * *

This Framework Document, therefore, starts by demonstrating how television broadcasting serves critical communications needs: (1) many of the benefits it delivers are public goods, *i.e.*, goods whose value is difficult to quantify and certainly cannot be derived from predicted auction revenues; (2) other services cannot and will not deliver these benefits to the public if broadcasting is marginalized or terminated due to loss of spectrum; (3) because of innovations being launched now — mobile DTV and multicast services, as well as HDTV — these public goods will be even more valuable in the future; and (4) even pay service subscribers benefit from broadcasters' highly trusted local journalism, emergency alerts, and other locally-oriented services.

Accordingly, the Commission needs to assess the damages to the public that would result from confiscating broadcast spectrum — wiping out the massive and recent investments of American consumers, the federal government and broadcasters in the digital transition — and depriving them of its benefits (HDTV, 1,400-plus digital multicast services so far, with more to come, and mobile DTV). Broadcasting's core services would also be undercut, marginalized, or destroyed.

This Framework Document also rebuts the Brattle Study,[1] which reflects the efforts of the wireless industry and others to denigrate the value of broadcasting in support of

[1] Bazelon, Coleman, Brattle Group, *The Need for Additional Spectrum for Wireless Broadband: The Economic Benefits and Costs of Reallocations*, October 23, 2009 ("Brattle Study").

expropriating its spectrum. Although the Study notably stops short of endorsing this conclusion, it suffers from these defects:

- it ignores television's social benefits to the public;
- it assumes that broadcasting services, both present and future, would be unaffected by spectrum re-allocations — a proposition that is erroneous on its face;
- it fails to consider other land-based and wireless-based sources of additional broadband capacity;
- it overlooks the costs and delays in the re-allocation process that are particularly relevant since mobile DTV can more efficiently and immediately address the demand for mobile video services (which represents two-thirds of the wireless industry's alleged need for additional wireless capacity); and
- it makes other serious, incorrect assumptions and methodological errors.

The Framework Document next shows that broadcasting plays a necessary and irreplaceable role in our country's communications ecosystem. As a consequence, it is an essential complement to land-based and wireless broadband services. They are not either/or alternatives. The attached Technical Review describes this point in greater detail.[2]

Then, this Framework Document lays out the following suggestions for how the Commission should proceed:

1. Treat broadcasting and broadband as complementary services;
2. Assess the availability of non-spectrum-based resources to meet broadband needs;
3. Critically evaluate the wireless industry's bloated and unsupported claims that it needs additional spectrum;
4. Catalogue the spectrum resources already allocated for wireless use but underutilized;

[2] *See* Technical Review: The Ongoing Need for Over-the-Air Broadcasting (Attachment A) at Executive Summary (1) and Section V.

5. Examine how the wireless industry can use its existing spectrum resources more efficiently and exploit new spectrum and new technologies to the same end;

6. Inventory all spectrum (no re-allocations should be ordered until this step has been completed), whether overseen by NTIA or the FCC; and

7. Work with broadcasters to devise non-coercive, non-destructive ways in which broadcasters can help address the legitimate capacity needs of the wireless industry without sacrificing service to the American public.

In implementing these suggestions or taking other action, the Commission should act in accordance with legal and Constitutional constraints and the basic precepts of national communications policy, including the priority goal of providing service to local communities.

BROADCASTING AND THE BROADBAND FUTURE: A PROPOSED FRAMEWORK FOR DISCUSSION

Television broadcasting is a vital part of the nation's communications ecosystem, and innovations that are now being introduced will only enhance its role and increase its value to consumers. Broadcasters are ready to work with the Commission and other industries to facilitate greater access and availability of wireless broadband for the American public. The Association for Maximum Service Television, Inc. ("MSTV")[3] and the National Association of Broadcasters ("NAB")[4] here offer suggestions for placing the discussion of these important issues in a practical and constructive framework—one that is balanced, proceeds without reliance upon untested assumptions, aims for effective solutions, and avoids destructive outcomes harmful to American consumers. Within this framework, broadcasting and wireless broadband are complementary, not mutually exclusive, services.

The current debate must be considered in the context of the recent DTV transition, which was completed on June 12, 2009. For years leading up to the transition, the Administration, Congress, the FCC, and the industry told American consumers that if they purchased a new DTV receiver, they would receive free, over-the-air HDTV and new multicast services.[5] Consumers participating in the government-sponsored digital-to-analog converter box

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[3] MSTV is a nonprofit trade association of local broadcast television stations committed to achieving and maintaining the highest technical quality for the local broadcast system.

[4] NAB is a nonprofit trade association that advocates on behalf of local radio and television stations and also broadcast networks before Congress, the Federal Communications Commission and other federal agencies, and the courts.

[5] Michael J. Copps, *Remarks at Digital Television Switch-Over in Wilmington, NC*, Sept. 8, 2008, *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-285228A1.pdf ("You know, in addition to a better picture and better sound, DTV brings another huge potential reward. I'm talking about the ability of broadcasters, using the new digital technologies, to send out four, five or even six different program streams on the same amount of spectrum where they can broadcast only one stream in analog."). *See also* Press Release,

(continued…)

program were told they would receive more programming channels. In response, consumers spent more than $109 billion on DTV receivers. Less then six months later, wireless advocates are proposing and the Broadband Task Force is considering policies that would undermine this promise.

From nearly the beginning of the Task Force's work on the national broadband plan, some have initially accepted the claim that wireless broadband will need more spectrum and have presumptively targeted television broadcast spectrum as a leading source for this additional spectrum. It is a mistake, and without justification, to narrow the focus of this proceeding so dramatically. The Commission should start by testing the first premise, which is suspect and exaggerated.

Indeed, the wireless industry and some other commenters have gone so far as to urge the FCC to expropriate all television broadcast spectrum.[6] Other proposals, explicitly or implicitly, would force broadcasters to surrender large chunks of broadcast spectrum. Advocacy of these measures has chilled meaningful dialogue about voluntary and collaborative measures and has cast a shadow on the new services that broadcasters are rolling out, potentially deterring investments that will support the delivery of these services to the public. Broadcasting and

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FCC, 1 Day Until DTV Transition: Focus at End of Technological Transition is on People (June 11, 2009) (noting that the digital transition will provide "consumers with a better picture and sound and more channels"); Press Release, Michael Copps, Acting Chairman, FCC, 2 Days and Counting to DTV Transition (June 10, 2009), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-291346A1.pdf ("One of the great benefits of digital technology is that stations can now provide many more free over-the-air channels than the single channel they provide today").

[6] *See* Reply Comments of the CTIA—The Wireless Association on NBP Public Notice #6, Spectrum for Broadband, GN Docket Nos. 09-47 *et al.*, Nov. 13, 2009, at 16 ("CTIA again urges the Commission to take a hard look at the spectrum use of the U.S. broadcast industry."); *id.* at 17 (urging "reallocation of broadcast television spectrum for commercial mobile wireless broadband uses."); *id* at 18 (advocating "Commission consideration of broadcast television spectrum reallocation for licensed commercial mobile wireless broadband services.").

broadband are not "either/or" propositions; that is a false choice that the Commission should reject.

It is clear that a comprehensive inventory of present and future spectrum availability and usage is a necessary precursor to any consideration of spectrum re-allocation proposals, as Congress itself has signaled in the form of pending legislation.[7] The inventory of spectrum usage must survey government spectrum under the NTIA's jurisdiction, as well as satellite, BRS/EBS, broadcast, and other spectrum under the FCC's jurisdiction. Only 5.18 percent of the spectrum in the 225 MHz to 3.7 GHz range is allocated exclusively for television service.[8] In the meantime, the Commission should pursue measures that facilitate broadband deployment without draconian and disruptive spectrum re-allocation.

At least in parallel with, if not precedent to, this comprehensive and unbiased spectrum inventory process, the Commission should rigorously assess wireless broadband's future spectrum needs. In discharging this responsibility, the Commission should (i) assess how much of broadband's capacity needs can be met by non-spectrum distribution means like coaxial and fiber-optic cable; (ii) take into account how new and emerging technologies and access to new spectrum will increase the spectral efficiency of wireless broadband utilization over the next six to ten years; (iii) ask how much of the claimed new spectrum needs are for video distribution (for which broadcasting is inherently a more effective and efficient mode of distribution); and

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[7] *See* Spectrum Relocation and Improvement Act of 2009, H.R. 3019, 111th Cong. (2009); Radio Spectrum Inventory Act, H.R. 3125, 111th Cong. (2009); Radio Spectrum Inventory Act, S. 649, 111th Cong. (2009); *Hearing on H.R. 3125, The Radio Spectrum Inventory Act, and H.R. 3019, The Spectrum Relocation Improvement Act Of 2009*, 111th Cong. (Dec. 15, 2009).

[8] *See* Technical Review: The Ongoing Need for Over-the-Air Broadcasting (Attachment A) at III(A).

(iv) honor the principle that throwing new spectrum at a supposed spectrum problem will deter, rather than spur, spectrum efficiency initiatives and technical innovation.

Before turning to MSTV and NAB's specific comments, it is necessary to address a crucial fact of technology that has been assiduously ignored, as well as a pernicious myth that has been advanced in this proceeding. The technological fact is that the case for more broadband spectrum is based primarily on demand for mobile video services. Yet broadcasting's point-to-multipoint architecture is a far more efficient means of delivering many of these services, especially real-time, live video content, than wireless' point-to-point distribution architecture. Broadcasters' mobile DTV services are being implemented now, do not have to await a protracted re-allocation process, and will not disrupt and destroy existing consumer services.

The myth pervading this proceeding is that only those Americans who receive television service exclusively over-the-air, via antennas, have a stake in this service and that viewers who receive this service as part of their pay-TV packages would be unaffected by re-allocation of spectrum away from it. The fact is that all television viewers, not just viewers who rely in whole or in part on over-the-air television, benefit from local broadcast services. It is inconceivable that, with the demise or marginalization of over-the-air television service that would result from the spectrum re-allocation proposals broached to date, pay-TV subscribers would receive anywhere near the same amount, quality, and diversity of local services—local journalism, local emergency information and alerts, and a variety of local voices—as they do now. Neither cable, satellite, nor the Internet would serve these functions if broadcasting were crippled or eliminated.

I. BROADCASTING IS THE NATION'S PREEMINENT SYSTEM FOR DELIVERING VIDEO CONTENT TO MASS AUDIENCES. IT PROVIDES NUMEROUS IRREPLACEABLE BENEFITS TO THE PUBLIC.

A. Consumers Benefit From Local Broadcast Services.

1. Overview.

Local broadcasting provides many economic and non-economic benefits to American consumers. Over-the-air television service is free; it is universal; and it is local. Broadcasters offer innovative new services: over 1,400 multicast services are available today, just six months after the transition to digital television,[9] contributing to diversity and localism, and mobile DTV is already being rolled out. The benefits of television broadcasting accrue not just to the tens of millions of households that rely exclusively on over-the-air television, but also to households that subscribe to pay-TV services. Additionally, aside from conventional economic benefits, local television broadcasting produces a wide array of public goods—public goods that subscription services cannot replace.

The public's broadcasting service, unlike cable and satellite services, does not mail a bill to viewers every month. As Chairman Genachowski has advised Congress, "[b]roadcast television remains an essential medium, uniquely accessible to all Americans."[10] A viewer with a television and antenna can receive free, wireless, high-definition programming, including network programs, sports, local news and weather, syndicated programs, films, and special events. Cable, satellite, and telephone companies that distribute multichannel video

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[9] According to Media Access Pro(tm), BIA/Kelsey.

[10] *Rethinking the Children's Television Act for a Digital Media Age: Hearing Before the United States S. Comm. on Commerce, Sci. and Transp*, 111th Cong. (July 22, 2009) (statement of Julius Genachowski, Chairman, FCC) ("Statement of Julius Genachowski"). *See also* Press Release, FCC, Ten Days and Counting to DTV Transition (June 2, 2009) (citing Acting Chairman Copps' statement that, "[f]or many people, free, over-the-air television is their primary source of news, information and emergency alerts—not to mention entertainment").

programming ("MVPDs") charge consumers ever-increasing rates for video content, including premiums for HD channels.[11]

Local stations provide local news and coverage of breaking stories. Indeed, in times of emergency, local broadcast stations often are the only available source of information (whether the consumer accesses that information by tuning in to the station's over-the-air signal, receiving it through a subscription service, or even obtaining it from the station's website).[12] Television broadcasting is reliable, even in times of emergency or, more commonly, bad weather (rain and snow often knock out the signal from satellite providers).

Chairman Genachowski has observed that broadcasting is "the exclusive source of video programming relied upon by millions of households in this country."[13] There is important value in preserving a free TV alternative for all Americans, so that those who cannot afford or choose not to subscribe to pay-TV services are not forced to take them. All Americans should have a free service available to them as an option and competitive choice.

Broadcasters will continue to roll out new, innovative services. These new services include high-definition programming, multicast services, and mobile DTV. Mobile

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[11] *See, e.g.*, Matt Richtel, *Cable Prices Keep Rising, and Customers Keep Paying*, N.Y. Times, May 24, 2008, *available at* http://www.nytimes.com/2008/05/24/technology/24cable.html ("Cable prices have risen 77 percent since 1996, roughly double the rate of inflation"); Ben Patterson, *Average Cable TV Bill Rose 7.5% in Second Half of 2008*, The Gadget Hound, Apr. 20, 2009, http://tech.yahoo.com/blogs/patterson/44841 (citing "pricier HD channel tiers" as a factor in the increases).

[12] *See* Advisory, FCC, 5 Days and Counting to DTV Transition (June 7, 2009) (warning consumers to be prepared for the digital transition, in order to avoid losing access to vital emergency information).

[13] *See* Statement of Julius Genachowski, supra note 9. The Commission has recognized repeatedly the importance of access to broadcast services, particularly news and emergency information. *See, e.g., FCC Requires Public Interest Conditions for Certain Analog TV Terminations on February 17, 2009*, Public Notice, FCC 09-7 (Feb. 11, 2009) (establishing "enhanced nightlight" service to ensure that "viewers relying on over-the-air television do not lose access to local news, public affairs and emergency information before they are ready for the full power television transition to all-digital television service" and identifying 123 stations "whose early termination [of analog service] poses a significant risk of substantial public harm").

DTV will be deployed over the next year, with 70 stations in 28 markets (covering 39 percent of the country) committed to launch soon, and with 30 stations already on the air with mobile DTV.[14] A national roll-out is expected to follow quickly.[15] Research shows that consumers have a high interest in receiving local news and information via live mobile DTV, with breaking news, emergency reports, and weather topping the list.[16] Mobile DTV should be included in the calculus of the value of television broadcasting.[17] But the Commission should not assume that Wall Street or economists can correctly value new mobile services at this stage (or have correctly valued them).[18] Neither the public good benefits of mobile DTV (the public goods concept is

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[14] Further, more than 25 companies have consumer devices with mobile DTV reception capability in the pipeline, with several devices expected to be demonstrated at the Consumer Electronics Show ("CES") in January.

[15] Broadcasters have invested heavily over a three year period to develop the mobile DTV standard and the variety of equipment necessary to implement it. Although the FCC should be technology-neutral, and not in the position of picking technology winners and losers, it now is "considering taking an active role" in promoting for-pay mobile TV services (*i.e.*, mobile video from MVPD platforms and broadband-based video platforms). *See* NBP Public Notice #27, DA 09-2519 (Dec. 3, 2009), at 2.

[16] *See* Frank N. Magid Associates, Inc., *The OMVC Mobile TV Study: Live, Local Programming Will Drive Demand for Mobile DTV* (Dec. 2009), *available at* http://www.openmobilevideo.com/_assets/docs/press-releases/2009/OMVC-Mobile-TV-Study-December-2009.pdf. Among the results of the study: 88 percent of respondents expressed an interest in watching local news and information on a mobile device, exceeding other categories of content such as entertainment (65 percent) or sports (44 percent). Mobile DTV may provide a market of perhaps $2 billion per year in advertising revenue in the United States by 2012. See Richard V. Ducey *et al.*, *Study of the Impact of Multiple Systems for Mobile/Handheld Digital Television* 102 (2008), *available at* http://www.nabfastroad.org/jan14rptfinaldouble.pdf.

[17] Gary Shapiro, President and CEO of CEA, has recognized that "[w]ith the successful digital transition now behind us, the ATSC Mobile DTV standard gives broadcasters an opportunity to provide consumers with the next generation of compelling over-the-air content." *The Standard: News from the ATSC*, vol. 10, issue 3 (Nov. 2009).

[18] The example of cellular telephone service is illuminating: when cellular telephone service was first introduced in 1982, it was significantly undervalued. There were just three applicants for the cellular license in Chicago. *See Advanced Mobile Phone Service, Inc.*, 91 FCC 2d 512 (1982). It would be a mistake to assume that the value of mobile DTV already has been incorporated into the market's assessed value of broadcasting assets.

discussed below) nor the purely "economic" values of mobile DTV are ripe for a specific evaluation at this point.

Importantly, the benefits of television broadcasting accrue not just to the tens of millions of households that rely exclusively on over-the-air television, but also to households that subscribe to pay-TV service.[19]

- Tens of millions of households that pay to subscribe to an MVPD service have additional television sets that are not hooked up to cable or satellite boxes, and these households rely on free, over-the-air broadcast services. There are millions of cable and satellite households that collectively own more than 23 million television sets that are not connected to a pay-TV service.[20] In fact, 35 percent of U.S. households, including over-the-air only homes and MVPD homes with additional sets, have television sets that rely on over-the-air television to get a signal.[21]

- Pay-TV subscribers rely primarily on broadcaster-provided local news, local emergency information and alerts, and other local services because MVPDs provide little or no local services of this kind.[22] Only a handful of markets

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[19] The most recent video programming report published by the FCC cited a 2007 Nielsen estimate that "15.5 million households, or about 14 percent of the 111.4 million total U.S. television households, rely on over-the-air television broadcasts for video programming." *Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming*, Thirteenth Annual Report, 24 FCC Rcd 542, at para. 108 (2009) ("Thirteenth Annual Report").

[20] *See* Thirteenth Annual Report at para.108 (citing NAB's estimates that "there are as many as 19.6 million households containing 45.5 million television sets that do not subscribe to an MVPD and that there are an additional 14.7 million MVPD households with 23.5 million television sets that are not connected to MVPD service"). NAB's estimates result in a total of 34.3 million households that rely on over-the-air television in whole or in part, representing about one third of the United States. *See also* National Telecommunications and Information Administration ("NTIA"), *TV Converter Box Coupon Program Weekly Status Updates*, Dec. 2, 2009, https://www.ntia.doc.gov/dtvcoupon/reports/NTIA_DTVWeekly_120209.pdf (noting that 34,761,460 households were approved to receive DTV converter box coupons).

[21] *See* Statement of Mark L. Goldstein, Director, Physical Infrastructure Issues, GAO, *Broadcasters' Transition Status, Low-Power Station Issues, and Information on Consumer Awareness of the DTV Transition*, GAO-08-881T (Sept. 23, 2008), at 11 (noting that about 65 percent of homes have all televisions connected to a pay-TV service, while the remaining 35 percent rely on over-the-air television for at least one television set).

[22] In 2008, local television remained the most popular source of news in the United States. Stations produce an average 4.1 hours of local news per day. *See* PEW Charitable Trust, Project for Excellence in Journalism, *The State of the News Media: An Annual Report on American Journalism, 2009, available at* http://www.stateofthemedia.org/2009/narrative_localtv_audience.php?media=8&cat=1 Proe. *See also* Communications Infrastructure Security, Access, and Restoration Working Group, Media Security and (continued…)

have local cable news channels.[23] The Commission should not assume that local broadcast content, relied on by both over-the-air viewers and pay-television subscribers, would continue to be available in a system where there is no over-the-air service or it is a marginalized service.

- Broadcasting reduces capacity demands on other wireless or wired services.[24] Relatedly, mobile DTV provides a way to spread emergency information and alerts on a spectrally efficient, point-to-multipoint basis and to reduce demand on other emergency communications systems.[25]

- Free over-the-air television service gives consumers a choice to stop paying for expensive cable or DBS subscriptions. This is a valuable option for every consumer, and its importance cannot be overstated in light of the ever-increasing prices for such pay-TV services and the state of the economy.[26]

As support for the view that the value of local broadcast television is diminishing, data presented by the Broadband Task Force purportedly show a 56 percent decline in the

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Reliability Council, *Final Report* (Feb. 25, 2004), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-244430A1.pdf ("It is therefore vital that one or more television broadcasters be capable of continuing operations under the extremely adverse conditions that could occur in the event of a disaster."); Public Safety and Homeland Security Bureau, FCC, *FCC Preparedness for Major Public Emergencies* (Sept. 2009) at 32 (noting that "[c]ertain provisions of the Stafford Act limit the FCC's ability—through FEMA—to help for-profit critical infrastructure entities in a disaster situation. This has resulted in the inability of Federal emergency personnel to assist, for example, *broadcasters that provide essential emergency information to at-risk population segments such as non-English speakers*" (emphasis added); Remarks of FCC Commissioner Michael J. Copps, Joint Center for Political and Economic Studies, U.S. Capitol Visitors Center (Sept. 22, 2009) ("We rely so heavily on our broadcast media for so much of the news we must have; for emergency and public safety information . . . ."); *Syntax-Brillian Corp*., 23 FCC Rcd 6323, 6340 (2008) (noting that televisions that are unable to receive television broadcast signals "could impede the dissemination of emergency information in case of disaster"); *Broadcast Localism*, 23 FCC Rcd 1324, 1358 (2008) ("[P]roviding emergency information is a fundamental area in which broadcasters use their stations to serve their communities of license.").

[23] *See* Adam Lynn *et al., National Owners Dominate Local Cable News: Local Cable News Channels Do Not Significantly Contribute to Source or Viewpoint Diversity, available at* http://www.freepress.net/files/study_4_cable_local_news.pdf.

[24] *See* Attachment A at I (noting that "[o]ver-the-air television broadcasting in general, and mobile DTV in particular, are complements rather than impediments to wireless broadband solutions").

[25] *See* Attachment A at V(C).

[26] *See Turner Broadcasting Sys., Inc. v. FCC*, 512 U.S. 622, 627 (1994) ("[T]oday's cable systems are in direct competition with over-the-air broadcasters as an independent source of television programming."); *Implementation of Cable Television Consumer Protection And Competition Act of 1992*, 22 FCC Rcd 17791, at para.25 (2007) (noting the competition MVPDs face from broadcast television and other sources).

number of exclusively over-the-air television viewers between 1998 and 2009.[27] These data present a flawed picture of consumer demand for broadcast television. First, local stations provide the most popular programming carried by MVPD operators.[28] Second, the Task Force's analysis assumes that no over-the-air viewing occurs in homes that subscribe to an MVPD. To the contrary, over-the-air viewing in MVPD homes is significant and is an important service to these subscribers.[29] Third, the period covered in the Task Force's "snap shot" does not reflect the future. It represents the waning days of a single channel, fixed analog TV service. Contrary to the Task Force's dated snap shot, recent estimates indicate that over-the-air viewing in the United States will increase substantially over the next few years. A recent study showed that the number of over-the-air only homes is expected to increase by 36 percent, from 10.7 million in 2010 to 14.7 million in 2014.[30] Also, the overall number of homes that will have at least one over-the-air television receiver will increase from 32.3 to 51.4 million during the same period, an increase of 59 percent.[31] These data show that, with the completion of the digital transition, consumer interest in over-the-air reception is growing.

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[27] Public Notice, FCC, FCC Identifies Critical Gaps in Path to Future Broadband Plans (Nov. 18, 2009) at 2.

[28] According to TVB, "Broadcast television dominates subscription TV in delivery of the top 200 programs on a national level — it's the same story with local broadcast. In the top 10 people-metered markets, broadcast takes the lion's share of the top-rated programs-whether Adults 18-49 or Adults 25-54-when compared with subscription TV." Television Bureau of Advertising, *Local Market Top 200 Report*, http://www.tvb.org/rcentral/viewertrack/trends/Top_200.asp (last visited Dec. 18, 2009).

[29] *See* n.20, *supra*. Also, the so-called 56 percent decline must be taken in context. For example, a decline in over-the-air homes by 5 percentage points, from 15 percent of households to 10 percent, could be represented statistically as a 50 percent decline. The Broadband Taskforce provides no context for its data.

[30] Informa Telecoms and Media, UK LTD, *Global Digital TV: 9th Edition*, Oct. 2009, at 378. We recognize these figures may reflect lower over-the-air viewership today than is reported by Nielsen. Nonetheless, the data are significant, for they show an increasing trend in the overall use of over-the-air service.

[31] *Id.*

In addition to growth in traditional over-the-air viewing, over-the-air local television broadcasting is expanding its reach outside the home. HP, Dell and others are incorporating ATSC digital reception chips in a number of their computers and laptops.[32] A number of companies are selling "dongles" which transform laptops and netbooks into portable TV sets. The deployment of mobile DTV, through these and other devices, will expand the reach of over-the-air television to millions of mobile devices, including PDAs, netbooks, and cellular telephones. In short, over-the-air broadcast television is becoming more, not less, valuable.

2. The Public's Television Broadcast Service Produces Substantial Public Goods That Benefit All Americans.

Local television broadcasting produces a wide array of public goods—public goods that subscription services cannot replace. Any proposal to re-allocate spectrum on the theory that an alternative use would make the spectrum more "valuable" must take into account the full value of the existing and future uses of the spectrum as currently allocated, and that value must not be confined to only economic considerations. Because broadcasters serve the public interest, the value of the country's broadcast service cannot be calculated simply by comparing the auction prices that purchasers would pay for spectrum allocated to broadcasting use as opposed to wireless use.

In authorizing auctions as a mechanism for picking among applicants for *already allocated* spectrum, Congress was fully aware of this distinction and of the importance of basing allocation (as opposed to licensing) decisions on the public interest, including public good

[32] See, for example, the HP TouchSmart 600xt series, *available at* http://www.shopping.hp.com/series/category/desktops/600xt_series/3/computer_store, and the Dell Mini 10 Laptop with integrated DTV tuner, *available at* http://www.dell.com/us/en/home/notebooks/laptop-inspiron-10/pd.aspx?refid=laptop-inspiron-10&s=dhs&cs=19.

considerations. As a consequence, it explicitly required the FCC to ground its spectrum allocation decisions in the public interest.[33] And it barred the FCC from considering potential auction revenues in making allocation decisions. *See* 47 U.S.C. § 309(j)(7)(A) ("In making a decision… to assign a band of frequencies to a use for which licenses or permits will be issued… the Commission may not base a finding of public interest, convenience, or necessity on the expectation of Federal revenues from the use of a system of competitive bidding under this subsection.").

Congress's clear directive reflects sound and well-established economic theory. In their seminal work, Noll, Peck, and McGowan observed the "public good" nature of local over-the-air broadcasting: "The precise magnitude of the benefits to consumers from the present system is difficult to measure since television normally is not sold, and hence consumers are rarely required to express the intensity of their desire by forgoing some income for the privilege of viewing."[34]

A public good has several different attributes. Classically, a public good is a benefit or service that is *non-rivalrous* and *non-excludable*. One person's consumption of a public good does not affect another's consumption of that same good ("non-rivalrous"), and it is not practical to prevent consumers from consuming the public good ("non-excludable"). Broadcast television meets both of these criteria. Over-the-air broadcasts are available to all

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[33] *See* 47 U.S.C. § 303(c) (requiring the Commission to "[a]ssign bands of frequencies to the various classes of stations" as the "public convenience, interest, or necessity requires"). *See also* 47 U.S.C. § 309(a) (requiring the Commission to "determine whether the public interest, convenience, and necessity will be served by the granting of" any particular application); 47 U.S.C. § 309(a) (requiring local licensing of frequencies, so "as to provide a fair, efficient, and equitable distribution of radio service to each" state and community"); *Improving Public Safety Communications in the 800 MHz Band*, 19 FCC Rcd 14969, n.238 (2004) (noting that "auctions may not always serve the public interest").

[34] Roger G. Noll *et al.*, *Economic Aspects of Television Regulation* 21-22 (Brookings Institute, 1973).

consumers, free of charge, and the costs of producing and providing over-the-air television are *not dependent on the number of people watching:* it costs the local, over-the-air television station the same whether eight thousand or eight million viewers are watching.[35]

Local broadcasting advances consumer welfare and public safety, provides a forum for civic participation, distributes educational and informational programming, promotes local businesses, and otherwise helps to achieve the very public policy goals articulated by Congress in the American Recovery and Reinvestment Act (which in turn must guide the Commission in this proceeding).[36] Among the many intangible benefits of our country's system of television broadcasting are that it is free, universal, local, innovative, public service-oriented, diverse, and supportive of local commerce.

Free. As noted above, the public's broadcast service is free. It is advertiser-supported and available to all Americans, including those who cannot afford expensive pay-TV services. And many consumers, including low-income viewers, the elderly, Hispanics, and African Americans, rely more heavily than the rest of the population on over-the-air television service.[37] Indeed, more than 23 percent of households with incomes under $30,000 per year, more than 20 percent of African American television households, and more than 25 percent of

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[35] See Bruce M. Owen and Steven S. Wildman, *Video Economics* 23 (Harvard University Press, 1992).

[36] *See* American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, § 6001(k)(D), 123 Stat. 115 (Feb. 17, 2009). The Act identifies 11 specific objectives, such as consumer welfare, civic participation, public safety and homeland security, community development, education, private sector investment, entrepreneurial activity, and job creation and economic growth, to which broadcasting makes major contributions (and to which it will continue to make such contributions in the future). Congress did not intend, and could not have intended, to require seizure of broadcast spectrum that would undercut broadcasting's ability to make such contributions.

[37] *See* Reply Comments of Univision Communications Inc., NBP Public Notice #6, GN Docket Nos. 09-47 *et al.*, Nov. 13, 2009, at 3 (noting heavy reliance on Univision's over-the-air signal in markets such as Los Angeles and San Francisco).

Hispanic television households rely solely on over-the-air broadcasting.[38] The public's free, over-the-air television service has enabled the country to avoid pouring resources into funding an ongoing television "universal service" fund.

Universal. Broadcast television service is universal. It is available to 99.7 percent of all Americans. Many American households are beyond cable's reach because of the expense of laying cable in sparsely-populated, rural areas of the country. Terrain and foliage prevents satellites from serving all Americans. Cable and satellites are also far more vulnerable to service interruptions than over-the-air broadcast services (in the case of satellite services, mere rain storms can shut down service). The value of broadcasting's reliable "universal service" role, especially in times of emergencies, is not reflected in market valuations.

Local. Broadcasters employ local reporters and operate local newsrooms that provide important coverage of their communities, unlike satellite and cable (with limited exceptions). These communities depend on their local broadcasting service to cover city hall, conduct investigative journalism, report on developments in local schools, inform them about local political issues (including debates and elections), and cover community businesses and organizations. Broadcasters have "boots on the ground" in their communities, and the important role they play locally is worth preserving. Local broadcast stations provide a trusted, reliable, and accountable source of information and journalism.[39]

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[38] *See* Comments of NAB, *In the Matter of Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming*, MB Docket No. 07-269 (filed July 29, 2009).

[39] For more on the key role that television journalism plays for consumers, *see* NAB's Comments in the Federal Trade Commission's New Media Workshop, Project No. P091200 (Nov. 6, 2009) (attached hereto for ease of reference as Attachment B).

Innovative. Key service innovations recently initiated by broadcasters, in addition to free, over-the-air, high-definition television, include mobile DTV and multicast services and zoning techniques that offer the opportunity for hyper-local news, information and advertising. Consumers seek out HD programming for its superior picture quality, which enhances everything from sports to movies to network programs to local news.[40] Consumers have invested over $109.8 billion in HD television sets since 2003, and the best-quality HD programming is available for free over-the-air.[41] And consumers increasingly are demanding access to video programming while on-the-go. The broadcasting industry is poised to meet this demand with real-time mobile streaming video, along with the capability of related interactive services such as audience measurement and viewer voting.[42]

Public Service. Broadcast television stations serve their communities and the public interest. For example, each station across the country provides at least three hours per week of educational and informational programming for children. Broadcasters' additional multicast programming streams include a similar level of educational/informational children's programming. Local broadcasters air public service announcements without compensation, ensuring that viewers receive information on health, safety, and other important matters. The television broadcast industry spent more than $1 billion in consumer education just concerning the digital television transition. They enhance political discourse by providing coverage of

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[40] Many stations have made significant investments in the infrastructure necessary to provide local news programming in HD. For example, WBOC-DT, Salisbury, Maryland, spent $13 million to create the NewsPlex, a state-of-the art high-definition newsroom/studio. *See The WBOC NewsPlex*, WBOC (TV), http://www.wboc.com/Global/story.asp?S=8803958.

[41] *See* Consumer Electronics Association ("CEA"), *FastFacts Historical Data* (2009). The CEA's figure represents 118.5 million receivers. CEA also projects the investment of another $21.6 billion, for 31.2 million receivers, in 2010.

[42] *See* Attachment A at Section V(C).

elections, campaigns, and political debates, and by giving access to political candidates. Stations allow public officials to directly reach voters in their communities. Broadcasters provide emergency information and alerts, in addition to their regular news and public affairs programming. In times of emergency, such as in the case of the bridge collapse in Minneapolis and Hurricane Katrina, broadcasters provide non-stop news, information on missing persons, and other important safety information for days, without running any advertising. The journalistic standards that local broadcasters follow seek to ensure that reliable information is available when the public needs it. And there are nearly 400 stations that provide exclusively non-commercial, educational programming.[43]

Diverse. The public's broadcasting service serves many markets and different consumer needs. It provides programming for children, teenagers, and adults; for central cities and outlying rural populations; for those who do not speak English; for minorities; and for viewers from many different cultural backgrounds. Broadcasters meet these needs in a variety of ways. For example, the Univision station group, which serves more than 50 markets, provides programs (and closed captioning) in Spanish and has noted that within the Hispanic community there is "disproportionate reliance on over-the-air broadcasts."[44] WPEC, in West Palm Beach Florida, uses a digital multicast channel to provide Mi Pueblo TV, a Spanish-language programming service produced in cooperation with members of the local Hispanic community.

[43] *Television & Cable Factbook*, 2009.

[44] *See* Reply Comments of Univision Communications Inc., NBP Public Notice #6, GN Docket Nos. 09-47 *et al.*, Nov. 13, 2009, at 3.

Many other stations use the ability to provide a second language audio to serve non-English speakers. Broadcasting also provides a voice for religious broadcasters and small businesses.[45]

Supportive of Local Commerce. Local businesses (and local political candidates) can reach viewers effectively and efficiently over local television stations. The audiences for subscription services and the Internet are fractured, and reaching a wide audience within the local market through those means is difficult, expensive, and uneven. Local television stations provide an effective platform to reach these wide audiences. Television broadcasting supports and promotes the health of local and regional commerce, in turn facilitating the development of local job opportunities. With television broadcasting accounting for nearly $50 billion of all advertising revenue in the United States, generating hundreds of billions of dollars in sales, it is clear that millions of jobs are attributable to local broadcasting.[46]

B. The Brattle Study Is Flawed.

The debate over the appropriateness of taking all or large chunks of spectrum away from the public's local, free, and universal television service has been distorted by economic analyses that purport to estimate the value of competing spectrum uses by limiting that evaluation to a single construct: the revenues that can be achieved from auctioning that

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[45] Providing broadcasting service for these communities is valuable not only in its own right, but in order to enhance other values, such as civic participation: research shows that "relative to non-Hispanic electoral participation, Hispanic turnout is five to ten percentage points higher in markets with Spanish-language local television news." *See* Felix Oberholzer-Gee and Joel Waldfogel, *Media Markets and Localism: Does Local News en Español Boost Hispanic Voter Turnout?* at 2 (National Bureau of Econ. Research, Working Paper No. 12317, 2006).

[46] According to the Television Bureau of Advertising, in 2008, network advertising was $25.5 billion and syndication advertising was $4.4 billion. *See Broadcast TV Revenues Were Down 0.4% in 2008*, Apr. 1, 2009, http://www.tvb.org/rcentral/AdRevenueTrack/revenue/2008/ad_figures_1.asp. As for the advertising revenues generated by local television stations, BIA/Kelsey estimates that total value for 2008 was $20.1 billion. *See Investing in Television: 2009*, 1st edition. Therefore, the total amount spent by advertisers to reach audiences watching broadcast programming in 2008 was $50.0 billion. (This total does not include expenditures on underwriting of non-commercial television stations.)

spectrum.[47] The fundamental flaw in this approach, which also pervades much of the debate about re-allocating broadcast spectrum to wireless uses, is that it ignores the public good benefits of broadcasting.

Specifically, the Brattle Study, submitted by the CEA, has been widely cited for the proposition that the benefits of re-allocating the broadcast spectrum would exceed the costs.[48] But neither the Brattle Study nor any other evidence in the record supports this conclusion. To the contrary, the 22-page Brattle Study cannot provide the foundation for a Commission recommendation to Congress that would fundamentally reshape the American communications market and disrupt core communications policies. The Study's weaknesses are recognized even by its sponsor, which "does not necessarily endorse" its results, but instead offers it as "the type of analysis that should be considered by the FCC."[49] This Commission has appropriately placed a high value on complete, careful, and unbiased analyses. The Brattle Study does not meet this test.

While a complete rebuttal of the Brattle Study would take additional time, the Study suffers from at least five fatal flaws described below: (1) it fails to recognize, let alone quantify, the social benefits associated with over-the-air broadcasting; (2) it fails (by its own admission) to analyze alternative distribution means or other sources of additional spectrum; (3) it relies on a static (or "partial equilibrium") analysis which fails to account for either the full benefits of the current spectrum allocation or the full costs of spectrum re-allocation in a

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[47] Brattle Study.

[48] *See, e.g.*, Reply Comments of the CTIA—The Wireless Association on NBP Public Notice #6, Spectrum for Broadband, GN Docket Nos. 09-47 *et al.*, Nov. 13, 2009 at 15, n.54.

[49] Comments of the Consumer Electronics Assoc., GN Docket Nos. 09-47 *et al.*, Oct. 23, 2009, at 4 ("CEA Comments").

dynamic marketplace; (4) it explicitly fails to take into account the costs and delays associated with administrative re-allocation of spectrum; and (5) it is based on serious false assumptions and methodological errors. The net effect of each of these flaws is to bias the Study's results in favor of a pre-determined and incorrect conclusion.

1. Failure To Recognize Or Account For The Social Benefits Of Over-The-Air Broadcasting.

Over-the-air broadcasting generates substantial social benefits, in the nature of public goods, in addition to its market benefits. The need to take these public goods into account in valuing alternative spectrum uses has long been understood by experts and by the Commission. As a 1992 study by the Commission's Office of Plans and Policy explained, "Examining market values is not sufficient to make policy judgments … because of the possible divergence between the social and market value of broadcasting services. To determine whether it is socially desirable to shift spectrum to a different use it is necessary to estimate social values."[50]

The Brattle Study implicitly recognizes the importance of measuring social benefits, as it bases its conclusions in part on the assertion that "Broadband deployments produce benefits well beyond the direct economic impacts."[51] Yet it fails to acknowledge, evaluate, or quantify the social benefits of local broadcasting.

2. Failure To Consider Other Sources Of Spectrum And Alternative Means For Delivery Of Broadband Services.

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[50] *See* Evan Kwerel and John Williams, *Changing Channels: Voluntary Reallocation of UHF Television Spectrum* 1 (FCC Office of Plans and Policy, Working Paper No. 27 1992).

[51] Brattle Study at 3.

While the Brattle Study is cited for the proposition that spectrum should be re-allocated *from broadcasting* to mobile broadband, its analysis cannot and does not support this conclusion, for the simple reason, among others, that it does not take into account the availability of non-broadcast spectrum and other distribution resources available for broadband uses. Indeed, the Brattle Study explicitly states that broadcast frequencies "may or may not be the least expensive to free up," acknowledges that "there are likely frequencies controlled by the federal government that would be economical to reallocate," and concludes that "[t]o the extent other frequencies are less expensive to free up—say from the current federal government allocations—the net benefits reported below would be even larger."[52] By its own admission, the *most* the Brattle Study might demonstrate (and it does not) is that *some* additional spectrum should be allocated to mobile broadband, not that *broadcast* spectrum should be re-allocated.

3. Failure To Account For The Dynamic Effects Of Spectrum Re-Allocation.

The Brattle Study relies on a static or "partial equilibrium" analysis of the effects of spectrum re-allocation, and thus fails to measure its full impact over time. This failing affects multiple aspects of the Study's analysis; here we point out only two.

First—and crucially—the Brattle Study assumes, without any basis and contrary to common sense, that the quantity and quality of local broadcast content would be unaffected by the re-allocation of broadcast spectrum. That is, it assumes that local broadcasters could be deprived of most or all of their spectrum, and with it the ability to generate revenues from existing services and future services—multicasting, mobile DTV, supplementary and ancillary services—without any impact whatsoever on broadcasters' ability to support the largely fixed

[52] Brattle Study at 11.

and substantial costs of producing local news and other content. Yet, it is precisely these marginal revenues that broadcasters are likely to rely on to sustain local content production, particularly in an era when advertising revenues are declining in the face of competition from the Internet and other new media. Assuming that local broadcasting content would continue unaffected in the absence of the revenues made possible by new and innovative uses of broadcasting spectrum is wishful thinking, not an economic analysis.

A second example of static analysis is the Brattle Study's failure to take into account the consumer benefits of the new and innovative services now being rolled out by broadcasters in the wake of the DTV transition, which would be foregone in the event of spectrum re-allocation. Even the study's sponsor recognized this omission, noting that "[the Brattle Study] analysis does not take into account the advent of digital television broadcasts to mobile and handheld devices using the newly adopted A/153 ATSC Mobile DTV Standard, which has the potential of serving millions of American consumers with live, local DTV content on a new generation of devices."[53]

4. Failure To Consider The Administrative Costs And Delays Of Spectrum Re-allocation.

The Commission's experience with spectrum re-allocation—the 800 MHz band is one example—demonstrates that re-allocation is neither easy, instantaneous, nor error-free.[54] Thus, any serious analysis of re-allocating broadcast spectrum to mobile broadband use must take into account the costs and delays associated with re-allocation. These costs include the

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[53] CEA Comments at 4, n.6.

[54] *See, e.g., Improving Public Safety Communications in the 800 MHz Band*, DA 09-1395, at para. 3 (June 24, 2009) (postponing the 800 MHz rebanding financial reconciliation "true-up" date to December 31, 2009 and recognizing that the "rebanding projects had been subject to unforeseen complexity and delay").

costs of re-allocating broadcast spectrum shared with others (such as unlicensed devices).[55] Yet, the Brattle Study wishes away these complications. It acknowledges as much, noting that its "key point" is "not to describe the specifics of any reallocation program, but rather to establish that there are significant gains from reallocating the broadcast spectrum and all interested parties could be made better off."[56] Whatever benefits and costs might result from spectrum re-allocation depend on the "specifics" of the re-allocation program. Before the Commission can conclude that there would be *any* net benefits of moving from the current allocation to a different one, it must have a clear plan for getting from here to there—and take fully into account the "specifics" and the costs of the transition. The Brattle Study simply ignores these issues. Thus, for example, the Brattle Study compares its (vastly understated) estimate of the value of broadcasting to its (vastly overstated) value for mobile broadband without discounting the latter for what would likely be a decade-long re-allocation process with administrative and other delays. In simple terms, the Brattle Study would have the Commission re-allocate spectrum, at great cost to the public, so that the mobile telephone industry can offer in the future what broadcasters are offering today—namely, high-quality, desirable, and often localized video programming.

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[55] The Brattle Study fails to consider two important aspects of the FCC's recent decision in the proceeding concerning unlicensed devices in the TV band ("white space" devices). First, the FCC justified allowing these devices in the TV band on the grounds that they would provide broadband services. Thus, they would compete with the proposed services contemplated by the auction bidders, thereby driving down the price. Second, from an interference perspective, auction value of spectrum will decrease significantly if bidders must share spectrum with these unlicensed devices. Finally, once allowed in the band, it is impossible to reclaim such devices from consumers and there is no licensee to hold accountable.

[56] Brattle Study at 11.

5. Incorrect Assumptions And Methodological Errors.

Even a cursory review of the Brattle Study reveals multiple additional incorrect assumptions and methodological errors. To take the most obvious example, the Study presents two alternative values of the "opportunity costs" of eliminating over-the-air broadcasting: the costs to broadcasters (calculated based on market valuation) and the costs to consumers (calculated based on the costs of subscribing to cable). Its largest, but not only, error is the suggestion that the two calculations should be thought of as *alternatives*.[57] The simple fact is that if broadcast spectrum is re-allocated, broadcasters will lose *at least* some portion of the future stream of income represented in their market valuations, *and* over-the-air consumers will face the additional costs of subscribing to cable or DBS (or going without). With respect to consumers, it would not just be over-the-air only households that would need reimbursement, as suggested in the Brattle Study, but also the many pay-TV subscribers that have additional receivers unconnected to an MVPD service or who receive broadcast content through their MVPD carriers. Nor was the cost calculation correct; providing consumers with the ability to again receive HDTV would include the cost of a set-top box (and even basic DTV service is generally on a different tier than basic analog service).

For the Commission to put in jeopardy the very existence of local broadcasting in this country on the basis of such flimsy analysis would be arbitrary and capricious.

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[57] *Id.* at 16 ("An *alternative* measure of the opportunity cost associated with the broadcast band is the cost of transitioning the number of over-the-air only households from 10 million to 0." (emphasis added)).

II. LOCAL TELEVISION BROADCASTING IS A CRITICAL COMPONENT OF THE NATIONAL COMMUNICATIONS ECOSYSTEM AND IS A NECESSARY PART OF THE BROADBAND SOLUTION.

The public's broadcasting service efficiently provides consumers with wireless, digital video programming, including high-definition programming. A single broadcast station can deliver high-definition digital video programming to millions of consumers simultaneously, with no reduction in quality or speed or increase in costs. Whether the programming is a popular network series, sports, or coverage of a hurricane or terrorist attack, the country's television broadcast service can easily deliver this content to the entire population.

Free over-the-air broadcasting is highly efficient for this purpose. The nationwide transition to digital television, which all full-power broadcasters completed by June 2009, has increased the efficient use of a 6 MHz channel by 400-500 percent, and broadcasting today achieves a digital data rate of almost 20 Mbp/s within a 6 MHz channel.[58] This sophisticated, highly-capable, point-to-multipoint digital communications system is far more efficient and effective for many uses — notably, serving fixed viewers with multicast and HD content while at the same time providing mobile video to vehicles and portable and hand-held devices — than the point-to-point broadband networks operated by the telephone companies. "The efficiency tradeoff is clear — it is more efficient to broadcast a DTV program on a single channel to 1,000 viewers than to transmit the same information a thousand times."[59] Broadcasters' high-power,

[58] The ATSC standard provides for a data rate of 19.39 Mbp/s per 6 MHz channel. *See* Attachment A at Section II, n.13. In connection with the digital transition, broadcasters also returned 108 MHz of broadcast spectrum to the FCC for the Commission to auction for other purposes and improve public safety communications.

[59] *See* Attachment A at Section II.

high-coverage operations mean that they have relatively low costs in providing service efficiently and economically to a mass audience.

High definition television and other digital television services were properly viewed as such a dramatic improvement over analog television that the country endured the upheaval of the digital transition in order to provide these benefits to the American people. Congress was right to require that the digital transition be implemented.[60] This improvement is a paradigm shift in technology, and is more significant than the transition from black and white to color television. Broadcasters in the field attest to the fact that their switchboards light up when their programming switches from HDTV to a standard definition format. As a result of this bold transition to digital broadcasting, the United States has led the world and still leads it.

In addition to providing HD video to consumers at home, broadcasters are bringing mobile DTV to the public on the go.[61] As with traditional broadcasting, mobile DTV permits a single station to serve hundreds of thousands or millions of viewers at once (depending on the population of the market in question) with no deterioration in speed or quality.[62] A recent

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[60] Over-the-air television broadcasting is so important that the federal government just spent billions of dollars to ensure that American consumers could continue to receive it, from the $1.5 billion initially allocated for the NTIA's digital converter box coupon program to the additional $650 million allocated by Congress, including $90 million for consumer education. And the Commission adopted numerous policies and regulations to promote the maximization of digital television and to minimize losses of over-the-air coverage. These policies and regulations include those concerning "use it or lose it" build-out obligations, channel elections, coverage standards for modifications, and limitations/prohibitions on early transitions.

[61] The mobile DTV standard adopted by the Advanced Television Systems Committee ("ATSC") in October of this year makes possible real-time mobile streaming video, the capability of innovative, interactive services such as audience measurement and viewer voting, and compatibility with digital video recording ("DVR") technology on the consumer's device to permit time-shifted viewing at the consumer's convenience.

[62] A point-to-multipoint service like broadcasting will be significantly more efficient than a point-to-point system in providing popular content. Consider that over the week of November 9, 2009, over 176 million people watched the top ten shows on broadcast television. This sort of volume would swamp wireless broadband capacity because broadband is essentially a point-to-point delivery service. *See* Nielsen, *Nielsen TV Ratings*, http://en-us.nielsen.com/rankings/insights/rankings/television (accessed as of December 3, 2009) (continued…)

study shows high consumer demand for mobile video, particularly for the video content offered by the public's broadcasting service: 88 percent of respondents are interested in watching live, local news and weather programming on mobile devices.[63] The public's broadcasting service already has the infrastructure and ability to meet this consumer demand for mobile video. Broadcasters have begun providing mobile DTV services to the public, and within several months these services are expected to reach 39 percent of the country.[64]

Broadcasters also use their 6 MHz channels to provide multicast video services. A multicast program stream is a standard-definition digital programming stream that a broadcaster provides in addition to its primary program channel. Many stations provide more than one multicast programming stream. In small markets where there are allocation constraints or where it is difficult to sustain multiple transmission facilities, some stations are using multicast streams to provide a major network service (such as ABC, CBS, NBC, or FOX) to viewers. Prior to the transition these stations often provided "part time affiliation" with the major networks. Local broadcasters across the country are using multicast channels to provide other desirable programming services, such as qubo (children's programming), thisTV (films and other entertainment), LATV (bilingual music and entertainment), WCSN (sports), and a suite of

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(providing ratings data for Broadcast TV in the United States for the week of November 9, 2009). While many viewers watched these shows through pay-TV services, it is clear that viewership is concentrated on a handful of popular programs.

[63] *See Magid Morning Facts: OMVC-Magid Study Reveals High Interest in Mobile DTV Services*, Frank N. Magid Assocs., Dec. 9, 2009, *available at* http://www.magid.com/publications/magid_morning_facts/news_article.asp?articleID=3329.

[64] In October, seven Washington-area television stations transmitted live local news, weather, sports and other programs to mobile DTV compatible devices, including mobile phones, laptop computers, and netbook PCs. *See* Press Release, OMVC, With Standard Adopted, Broadcasters Poised to Bring Mobile DTV to American Consumers, (Oct.16, 2009) *available at* http://www.openmobilevideo.com/_assets/docs/press-releases/2009/OMVCOctober162009FINAL.pdf.

educational, non-commercial program services from PBS (including PBS World, Create, PBS Learner, and the Spanish-language V-me network).[65] With the digital transition completed only six months ago, the diversity and robustness of multicast services can be expected to continue to develop strongly in the future.

Digital broadcasting has the potential to be used for other new, innovative services. Various broadcasters use their digital spectrum to provide ancillary/supplementary services. These services can include data and software transmissions and interactive services.[66] And broadcasters are developing various technologies for the roll-out of the next-generation digital broadcasting standard. As one example, Sezmi is introducing a service that seamlessly blends programming content delivered by over-the-air broadcast and broadband distribution channels. Sezmi's high-capacity DVR set-top boxes are already on sale in certain markets, and a major roll-out is planned over the coming months. Sezmi also has negotiated arrangements with some local broadcasters to lease and aggregate spectrum in local markets, using that spectrum to deliver high-demand video content other than broadcast programs to customers, in addition to the broadcasters' local signals.

Digital broadcasting has other inherent efficiencies. The infrastructure for state-of-the-art digital broadcasting is already built, after many billions of dollars invested by broadcasters, the public, and the federal government in the Congressionally-mandated digital transition. These services are being provided today: it would be wasteful and destructive to

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[65] Additional examples of multicast programming, including news and other local programming, are described in the attached comments submitted by NAB to the FTC for its journalism workshop. *See* Attachment B at 9.

[66] For example, PBS has a mechanism whereby participating stations lease access for datacasting purposes. Broadcasters return five percent of gross revenues from ancillary/supplementary services to the U.S. Treasury.

expend additional effort, resources, and time to construct duplicative wireless infrastructure to replace the more efficient broadcast infrastructure that is already in place.

III. RE-ALLOCATION OF TELEVISION SPECTRUM FOR BROADBAND PURPOSES WOULD HARM CONSUMERS.

With the public interest paramount in any spectrum allocation decision, the Commission should give full weight to consumer expectations and investments. Some have proposed, explicitly or implicitly, to take all television spectrum away from television broadcasters.[67] Some proposals are less draconian but still extremely destructive. All are deeply flawed. First, the effect on local news and other local programming, including emergency information, would be devastating. (No DBS system and few cable systems provide independent local news, much less multiple independent, competing local news services.) Second, particularly in this economy, it would not be feasible to give consumers, for an indefinite amount of time, "TV stamps," so as to avoid forcing citizens to forego service altogether or subscribe to expensive and not always available MVPD services.

Another scenario that has been suggested would entail a partial but forced re-allocation of spectrum from local broadcasting to broadband. Called "stacking," it would place multiple stations on a single channel. As described in more detail below, this proposal would also harm the public's broadcast services.

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[67] *See, e.g.*, the Brattle Study; Comments of CTIA —The Wireless Association, GN Docket Nos. 09-47 *et al.*, Nov. 13, 2009, at 15 (describing broadcast spectrum as "ripe" for reallocation); *see also Aides Hear Case for Ending Over-The-Air TV*, CongressDaily, Dec. 8, 2009, *available at* http://www.nationaljournal.com/congressdaily/hbp_20091208_1961.php (describing the CEA's lobbying efforts before both the House and Senate wherein the CEA advocated repurposing broadcast television spectrum).

These and other re-allocation scenarios that have been at the center of the broadband debate, expressly or implicitly, entail forced loss of capacity that would undercut existing broadcast services.[68]

A. Service Losses That Would Result From Various Re-Allocation Proposals Would Harm Consumers.

"Stacking" would entail using a 6 MHz channel to multicast the signals of two or more different television stations. In effect, the plan would decrease the bit stream of local stations making it impossible to provide the full array of services they now provide. It necessarily would entail the loss of high-definition television, because HD signals consume the majority of a 6 MHz television channel's capacity. Consumers would lose this desirable capability, which was the major purpose of the digital transition,[69] despite having heavily invested in televisions with DTV tuners and HD capability. In 2009 alone, it is estimated that consumers will have spent over $25 billion for HDTV receivers.[70] The digital transition was "sold" to the public as a means to achieve the advances of digital television, chief of which was

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[68] At this point it is not clear how much spectrum the Broadband Task Force will recommend re-allocating from the public's over-the-air television service. There has been some discussion of re-allocating and clearing a nationwide block of spectrum of up to 200 MHz. To obtain a nationwide spectrum block of this magnitude, the government would have to dislocate all stations operating on these channels in multiple markets. If nationwide consent could not be achieved, some form of coercion would be necessary to clear this spectrum.

[69] Some have argued that stations could provide more HDTV channels on a 6 MHz channel if they improved their compression technology and adopted MPEG4. Today broadcasters use MPEG2 compression and all TV receivers and digital to analog converter boxes are built to decode this compression standard. Switching to MPEG4 compression would require replacing every DTV set and digital-to-analog converter box. Such a policy would strand billions of dollars in receiving equipment.

[70] David Goetzl, *Big Picture: HDTV Sales on Upswin*g, MediaPost News, Sept. 29, 2009, http://www.mediapost.com/publications/?fa=Articles.showArticle&art_aid=114483 (citing estimates of SNL Kagan); Comments of MSTV and NAB, NBP Public Notice #6, GN Docket Nos. 09-47 *et al.*, Oct. 23, 2009, at 9. In 2008 alone, consumers purchased 4.4 million antennas. Press Release, Harris Corporation, Consumers Positive on U.S. Digital Television Transition; Many May Switch to Free Over-The-Air Reception, According to Survey (June 11, 2009), *available at* http://www.prnewswire.com. Over the past two years, consumers have invested tens of million in antennas for the reception of over-the-air television.

HD television.[71] Further, social and policy harms would result from making HDTV available exclusively as a pay/subscription service.

Stacking would also force broadcasters to turn off (or never turn on) multicast signals, and it would preclude mobile DTV services. They would simply lack sufficient spectrum capacity to maintain or launch these new services.

Additionally, stacking would have adverse consequences for pay-television subscribers. As described above, many homes that subscribe to cable or satellite have additional television sets that rely on an antenna, and these consumers would be harmed by the loss of free, over-the-air HD television. In addition, up to 50 percent of all cable headends rely on the HD signals of over-the-air television stations to obtain local television stations' programming. DBS likewise places heavy reliance on over-the-air HD signals in order to provide broadcast television programs to their subscribers.[72] This effect would be particularly prevalent and particularly destructive in rural areas where it is uneconomical to construct and maintain an expensive fiber or microwave link to the cable or satellite system's headend. Thus, pay-television subscribers would lose a valuable and free alternative for HD television service, as well as possibly losing access via their MVPDs to local stations' HD signals.[73]

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[71] *See* Press Release, FCC, 1 Day Until DTV Transition: Focus at End of Technological Transition is on People (June 11, 2009) (noting that the digital transition "is an unprecedented engineering feat," "providing consumers with a better picture and sound and more channels"); Press Release, FCC, 3 Days And Counting to DTV Transition (June 9, 2009) (underscoring the better picture and sound quality of digital television.).

[72] Satellite receive sites in 182 of the 210 broadcast markets installed new off-air receiving equipment in connection with the digital transition. According to DirecTV, 73 percent of all of the television station signals carried by DirecTV were received at satellite receive sites via over-the-air transmission.

[73] Stacking also could cause other problems, from technical difficulties to confusion with respect to channel identification.

A second alternative that has been discussed is a "repacking" of the television band. Under this approach each station would retain its current 6 MHz channel and 19.39 Mbp/s bit stream. Spectrum efficiencies would be achieved by collocating stations on a common tower or antenna farm.[74] Repacking the television band would entail heavy costs to consumers and broadcasters. The Commission and Congress are well aware of the service disruptions that occurred in the digital transition when some stations undertook necessary facility relocations. In many areas, such repacking not be achieved without significant reductions in stations' coverage areas. Service disruptions that would result from the all-market, tower-relocation proposals could well be orders of magnitude worse than experienced during the DTV transition. The result is that millions of viewers likely would lose substantial amounts of, or all, local television services.

Collocation may not be possible, especially in highly urbanized areas. Many existing towers are not engineered to hold multiple broadcast antennas.[75] In many urbanized areas there is simply not enough land to accommodate this policy. For example, delays in building the Freedom Tower have complicated broadcast transmission in New York City.[76] In many areas the federal government would have to preempt local zoning regulations.[77] The

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[74] Because of interference concerns, stations cannot operate on adjacent channels in the same market. Such operation may be possible, however, if both stations are broadcasting from exactly the same location, such as a common tower or antenna farm.

[75] TV broadcast transmitting antennas are much larger than those used in other wireless systems. For example, the antenna used by WUSA-TV in Washington weighs approximately 19 tons.

[76] The Empire State building cannot accommodate all of the New York stations, and efforts to use Governors Island have not been successful.

[77] Local zoning fights may be long and costly. For example, it took years of effort and a federal statute to preempt local land use regulations to allow a DTV tower to be used in Denver.

nature and extent of the problems and harms, including service loses, cannot be determined in the absence of detailed proposals.

B. Consideration Of Destructive Re-Allocation Scenarios Should Take Into Account The Fragile State Of Broadcast Services In Markets Of All Sizes.

It is widely recognized that print journalism is in grave peril, that the new media will not serve many of the functions that print journalism has served, and that our political and social structures may suffer as a result.[78] Increasingly, the country is realizing that broadcast journalism is similarly threatened. Chairman Genachowski has been in the vanguard of those who have been alert to this danger and its adverse consequences for the American public.[79] As borne out by various research statistics, he is aware that the American public trusts and turns to its local broadcast news more than any other news source.[80]

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[78] *See* John Eggerton, *Genachowski's Media Mission*, Broadcasting & Cable, Aug. 3, 2009 (quoting Chairman Genachowski as stating "I have real concerns, as many Americans do, about what is going on in America with respect to newspapers, local news and information. It has been an area of ongoing interest at the FCC from the beginning. Local news and information has been a core pillar of the Communications Act and remains that."); Michael J. Copps, Acting Chairman, FCC, Remarks at the Free Press Summit: Changing Media (May 14, 2009) ("[W]e are skating perilously close to depriving our fellow citizens of the depth and breadth of information they need to make intelligent choices about their future. Newsrooms decimated. Beat reporters laid off. Newspapers literally shrinking before our eyes. . . . We're not only losing journalists, we may be losing journalism."); FTC, Public Workshops and Roundtables: From Town Crier to Bloggers: How Will Journalism Survive the Internet Age?, 74 Fed. Reg. 51605, 51606 (Oct. 7, 2009) (noting concerns regarding whether the economic hardships facing newspapers have reduced the coverage of "certain types of news" including "public affairs reporting" and "local journalism").

[79] *See* John Eggerton, *Genachowski on Net Neutrality, Broadband*, Broadcasting & Cable, Oct. 19, 2009 (quoting Chairman Genachowski discussing broadcast journalism and stating: "It remains essential for the country to have a healthy and vibrant broadcasting industry that meets the informational needs of our communities. I understand that many stations are facing challenges in this difficult economic climate. At the FCC, our door is open for ideas on the best ways to make sure that we have a broadcasting industry that's healthy, vibrant and serves the public interest."); *Chopra, Genachowski to Use Media and Government Report to Guide Policy*, Comm. Daily, Oct. 5, 2009 (quoting Chairman Genachowski as acknowledging that new media is "putting real stress on journalism").

[80] According to a recent study by the Pew Research Center for the People & the Press, television remains the dominant source of news for most people, and the public generally turns to local television stations to identify and report on local issues (as compared to newspapers, radio, and the Internet). *See* Press Release, Pew
(continued…)

The causes of this weakening of local broadcasting's viability are well known: the absence of revenue sources other than advertising, the dilutive onslaught of Internet and cable advertising, and the country's general economic malaise. The new opportunities made available by digital technologies—multicasting and mobile DTV, in particular—offer prospects for strengthening the economic base that makes possible local television's irreplaceable and indispensable role of service provider to the American public. Clearly, broadcasters have invested heavily and with foresight in making themselves prepared for these opportunities, and as with most new technologies, they have ventured and experimented with a variety of innovative services.[81] But only in the last six months have they been able to launch their entrepreneurial ideas in a fully digital marketplace, and it may take several years before the market and the public anoint successes and failures. It is in this precarious environment that proposals for re-allocating broadcast spectrum are being advocated that would deter investment in these promising new services and undercut the financial foundations for broadcasters' important existing services.

Many local broadcasters, especially smaller-market stations and stations serving minority audiences in large markets, may well not be able to survive if they cannot compete with offerings of enhanced picture quality (HDTV) and new services (multicast and mobile DTV). But the problem affects all stations in all markets. And forced channel changes, relocation of transmitters and towers, and major alterations to stations' service areas could threaten stations'

Research Center for the People & the Press, Public Evaluations of the News Media: 1985-2009, Press Accuracy Rating Hits Two Decade Low (Sept. 12, 2009), at 4, *available at* http://people-press.org/reports/pdf/543.pdf; s*ee also id.* at 14 (noting that the vast majority of Americans "say that if all local television news programs went off the air—and shut down their web sites—it would be an important loss").

[81] *See* Attachment B.

ability to serve their markets and disrupt longstanding television DMAs, which facilitate the buying and selling of advertising time on television stations in all markets.

IV. IN DEVELOPING A BROADBAND PLAN, THE COMMISSION SHOULD PROCEED SYSTEMATICALLY AND SHOULD NOT TAKE AT FACE VALUE PRESUMPTIONS THAT OTHERS INSIST ON.

Because of the stake all Americans have in the country's broadcast television service, because of the harms to the public that would be caused by the re-allocation of broadcast spectrum, and for reasons of good government, MSTV and NAB recommend that the Commission proceed as follows.

First, the Commission should approach the development of a broadband plan with the recognition that the point-to-multipoint wireless digital architecture operated by broadcasters and the point-to-point wireless digital broadband architecture operated by wireless companies are complements. It should not assume, as many have urged, that it must choose between the two. This is a false and unnecessary dichotomy.

Second, the Commission should scrutinize claims that more spectrum must be allocated for point-to-point wireless broadband services. The principal support for this claim is an International Telecommunication Union ("ITU") model. CTIA uses this ITU model to support its argument that 800 MHz is needed for wireless broadband by 2015.[82] The ITU model is examined in detail in Attachment A at Section III(D). As demonstrated in Attachment A, the ITU model is very sensitive to input assumptions, and modifying certain assumptions made by

[82] CTIA, Wireless Crisis Foretold: The Gathering Spectrum Storm and Looming Spectrum Drought (attached to CTIA, Written Ex Parte Communication, GN Docket No. 09-51, Sept. 29, 2009).

CTIA about video and other issues changes the results of the ITU model to suggest that no additional spectrum is required, even by 2020.[83]

As described in Attachment A, CTIA cites the ITU model in its effort to build its case for the wireless industry's future spectrum needs. But, the ITU model results that CTIA used to show a shortfall of 800 MHz in 2015 also show that there is a similar shortfall of hundreds of megahertz in 2010. There is clearly not a shortfall today, let alone of this magnitude.[84]

In its assessment of the wireless industry's spectrum needs,, the Commission should take into account that some two-thirds of these claims are for the delivery of video services to mobile devices.[85] But because broadcasting uses a point-to-multipoint delivery architecture (not a point-to-point wireless architecture) and because it already is in the process of launching these new services, broadcasting can meet large portions of mobile video demand more quickly, more economically, in a more spectral-efficient fashion, and with less disruption. If broadcasting's ability to deliver mobile video to consumers is properly considered, wireless

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[83] As recently as 18 months ago, a leading wireless carrier catalogued for the Commission the large quantities of spectrum available for wireless, suggesting that there was no scarcity at the time (nor did it indicate that any scarcity was projected for the future). *See* Joint Opposition to Petitions to Deny and Comments, Cellco Partnership d/b/a Verizon Wireless and Atlantis Holdings LLC, *Applications of Atlantis Holdings LLC*, WT Docket No. 08-95, Aug. 19, 2008 (attaching "The Supply of Spectrum for CMRS" report by Charles Jackson).

[84] *See* Attachment A at Section III(D).

[85] *See* Attachment A at Executive Summary (1) ("[e]xperts project that mobile video will dominate traffic over mobile broadband networks in the coming years, with up to two-thirds of broadband usage growth forecast to be from video."). Even the CTIA predicts that nearly 64 percent of global mobile traffic will be video by 2013. *See* Comments of CTIA—The Wireless Association, NBP Public Notice #6, GN Docket Nos. 09-47 *et al.*, Oct. 23, 2009, at 30; *see also QuickPlay Media Sees More Than 60 Percent Growth In Demand for Mobile TV, Video Content in Q1 2009*, Broadcast Engineering, May 18, 2009, *available at* http://broadcastengineering.com/products/quickplay-media-demand-mobile-video-content-0518/.

claims for more spectrum would be reduced by 500 MHz. When other factors are taken into account, these claimed needs shrink to very small amounts of spectrum, if any at all.

Third, the Commission should catalogue the significant spectrum resources that already are allocated and being used for wireless broadband purposes. As part of this spectrum catalogue process, the Commission should take into account additional spectrum already in the pipeline for wireless uses, but that is currently unused or underutilized. 749 MHz of spectrum already is available for use on a licensed basis for mobile broadband between 225 MHz and 3.7 GHz.[86] In addition, hundreds of megahertz of additional spectrum are available on an unlicensed basis.

Some have alleged that the United States is behind other countries in the amount of spectrum they have in the pipeline for future broadband use. But these allegations overlook the fact that the countries used in these comparisons still have yet to reap their "digital dividends," because they have lagged behind the United States in completing the digital television transition and allocating the newly vacated spectrum to wireless.[87]

Fourth, the FCC should thoroughly investigate how wireless providers can use existing spectrum resources more efficiently. The Commission's inquiry into this subject should not stop at current technologies. New technologies are being developed now and will be developed in the future that will unquestionably enhance the wireless carriers' efficient use of existing wireless (and wireline) capacity. As documented in the Technical Review, "a large number of emerging technologies are poised to improve the system spectral efficiency of

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[86] *See* Attachment A at Section III(B), Table 1.

[87] *See* Attachment A at Section III(B) for a more detailed discussion of this point.

wireless broadband systems."[88] Research shows particular promise in new technologies such as multiple-input multiple-output ("MIMO") wireless systems, femtocells, and user cooperation.[89] According to Cooper's Law, coined by the lead inventor of the cell phone, spectrum efficiency doubles every two and a half years; over the last 90 years, spectrum utilization has increased over a trillion times.[90] In addition, the "trend has been that technology advances make possible the effective use of higher and higher spectrum bands. A number of different bands above 3.7 GHz may be viable future options."[91]

Fifth, the Commission should assess the extent to which broadband needs can be met by non-spectrum-based, distribution technologies—wire, and coaxial and fiber-optic cable, in particular dark fiber (*i.e.*, fiber optic cables that are presently unused due to overcapacity in fiber optic networks). As noted in the Technical Review: "[o]f particular importance are fiber wireline networks which offer very high data rates (and the potential for future rate increases)."[92] Serious efforts to maximize non-spectrum resources would help to achieve the two goals of improving broadband access and preserving the role of incumbent spectrum uses.

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[88] *See* Attachment A at Section IV(A).

[89] Unwired Insight, *3G Networks Will Evolve, But Will They Cope?* (Executive Summary, Sept. 2009), *available at* http://www.unwiredinsight.com/PDF/Unwired%20Insight%20white%20paper.pdf (underscoring the importance of complementary service delivery mechanisms, including femtocells and mobile broadcasting).

[90] *See* ArrayComm, *Cooper's Law*, http://www.arraycomm.com/serve.php?page=Cooper (last visited Dec. 18, 2009) (describing the application of Cooper's Law).

[91] *See* Attachment A at Section IV(B) (describing the ability to use for wireless broadband purposes the 3650-3700 MHz, 4940-4990 MHz, 5 GHz, 27.5-31.3 GHz, 38.6-40 GHz, and 60 GHz bands).

[92] *See* Attachment A at Section IV(C) (continuing, "[i]f the penetration of fiber-to-the-home increases, a number of problems related to spectrum could also be solved. Deploying in-home femtocell and Wi-Fi networks that communicate through these fiber links could give high rate wireless broadband with small cell sizes and extensive frequency reuse").

Sixth, the Commission should conduct a comprehensive inventory of present and future spectrum availability and usage. Congress has already begun to take action in this regard.[93] A complete inventory of spectrum usage must survey satellite, BRS/EBS, broadcast, and other spectrum under the FCC's jurisdiction, as well as government spectrum under the NTIA's jurisdiction.

Seventh, concurrently with the above steps, the Commission should work with broadcasters on various non-coercive ways in which spectrum currently allocated for broadcasting might be used to meet wireless spectrum needs that cannot otherwise be met. MSTV and NAB have proposed fixed, licensed wireless services in rural areas where sufficient broadcast spectrum may be available (without harming the public's broadcast service).[94] This proposal is consistent with Senator Rockefeller's insistence that "we need real broadband solutions for real people — and we need them now."[95] In addition, some broadcasters may be willing to lease spectrum capacity to broadband providers for backhaul and other uses supportive of broadband services. Another constructive approach would be for the Commission, in cooperation with local broadcasters, to focus on developing localized broadband solutions. The Task Force's preoccupation with re-allocations to create nationwide spectrum blocks entails broadcaster coercion, would lead to large-scale service dislocations, and stands in the way of

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[93] *See* Spectrum Relocation and Improvement Act of 2009, H.R. 3019, 111th Cong. (2009); Radio Spectrum Inventory Act, H.R. 3125, 111th Cong. (2009); Radio Spectrum Inventory Act, S. 649, 111th Cong. (2009); *Hearing on H.R. 3125, The Radio Spectrum Inventory Act, and H.R. 3019, The Spectrum Relocation Improvement Act Of 2009*, 111th Cong. (Dec. 15, 2009).

[94] *See* MSTV and NAB Comments—NBP Public Notice #6, GN Docket Nos. 09-47 *et al.*, Oct. 23, 2009, at 13-14.

[95] David Hatch, *Rockefeller Warns FCC Over Direction Of Broadband Plan*, Congress Daily, Nov. 6, 2009.

more tailored, effective, practical, and quicker solutions in which broadcasters can play a constructive cooperative role.

Finally, in crafting its broadband recommendation to Congress, the Commission should be mindful of statutory and constitutional requirements. They include the requirement to ensure that all spectrum allocation decisions be governed by the public interest standard — a determination that, by law, cannot be based on narrow, incomplete and unreliable economic analysis based on auction revenues.[96] The Commission must also take into account the prohibition against arbitrary and capricious agency action under the Administrative Procedure Act.[97] The Supreme Court has noted that when an agency changes course, it would be arbitrary and capricious for the agency to ignore "serious reliance interests" that "its prior policy has engendered."[98] The Commission also should ensure that any spectrum re-allocation proposals do not run afoul of the Fifth Amendment prohibition on regulatory takings and do not infringe the First Amendment. In the end, the Commission's broadband recommendations must be guided by its ultimate legal and policy touchstone — the public interest.

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[96] *See* 42 U.S.C. § 309(a) (requiring all spectrum license decisions to be made consistent with the "public interest, convenience, and necessity"); *see also* Section 1 of the Communications Act, 47 U.S.C. § 151 (requiring the Commission to regulate in the interests of providing universal communications for all communities and for various interests including promoting the safety of life and property); *see also* 47 U.S.C. § 307(b) (requiring the Commission to "make such distribution of licenses, frequencies, hours of operation, and of power among the several States and communities as to provide a fair, efficient, and equitable distribution of radio service to each of the same").

[97] *See* 5 U.S.C. § 706(2)(C).

[98] *See FCC v. Fox Television Stations, Inc.*, 129 S. Ct. 1800, 1811 (2009).

For the reasons described above, MSTV and NAB urge the Commission to implement the action plan summarized in Section IV of this Framework Document.

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ATTACHMENT A:

TECHNICAL REVIEW:
THE ONGOING NEED FOR OVER-THE-AIR BROADCASTING

Current and Future Roles in the U.S. Economy and Society

Technical Review:
The Ongoing Need for Over-the-Air Broadcasting

Current and Future Roles
in the U.S. Economy and Society

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December 22, 2009

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Executive Summary

The Federal Communications Commission's (FCC's) Notice of Inquiry on a National Broadband Plan has elicited comments from some in the wireless industry expressing concerns that the United States has insufficient spectrum available for the projected demand for future wireless broadband services. This technical paper has been prepared on the behalf of the Association for Maximum Service Television, Inc. and the National Association of Broadcasters as part of an initial response to a request from the FCC for information on the spectrum use of the television broadcast industry.

The purposes of this paper are to:

a) Determine and briefly describe the role that broadcast television should play in the 21st Century digital economy.

b) Provide a data-based perspective for the public policy discussion about the wireless broadband "spectrum crisis" by reviewing the spectrum currently available for broadcasting and broadband, examining broadband wireless claims for future spectrum demand, which are based on an International Telecommunication Union (ITU) spectrum estimation model, and examining whether spectrum and technology are available to address future broadband needs.

Some of the key observations of this paper are outlined in bold below.

1. **The over-the-air (OTA) television broadcasting industry serves the public interest and with the conversion to digital television can complement and contribute to wireless broadband services and applications.**

The United States has the most dynamic, diverse, and innovative market for information technologies in the world. The ability of the U.S. to remain globally competitive amid rising demand for high speed Internet access and digital content in an increasingly mobile consumer environment is presenting policy makers with critical decision points in regulating and allocating spectrum for advanced wireless services. However, policy solutions can ensure broadband deployment while at the same time advancing the critical role of – and continuous technological improvements to – digital over-the-air television.

Broadband and broadcasting services are twin pillars of the digital economy. Digital television (DTV) broadcasting should be viewed as a complement, rather than as an alternative, to wireless broadband. OTA television broadcasting serves the public interest in many ways, including in its capability to provide a portion of the public need for cost-effective and widely available broadband services. Broadcasting offers the optimal solution for delivery of bandwidth-intensive applications such as real-time

video to a large number of users in the same geographic area and is superior to unicast solutions by orders of magnitude. Innovation in broadcasting technology is responsible for increased spectral efficiency while simultaneously introducing new advanced television services. Broadcasters can offer more viewing choices at higher quality for free to the public.

Due to advanced physical layer modulation and coding coupled with advances in computing and memory technologies, the broadcast industry is poised to serve a significant fraction of market demand for both fixed and mobile wireless broadband. The Advanced Television Systems Committee (ATSC) standards provide for IP data downloads that can be used for distributions of e-books, movies, and music. With intelligence and data storage built into devices, broadcasting can offer consumers a near "on-demand" functionality. With the introduction of mobile television service, scheduled for wide-scale deployment in early 2010, broadcasting will offer this functionality in new mobile devices, laptops, and vehicles. In summary, broadcasting can be a natural and spectrally efficient complement to wireless broadband.

Following the successful conclusion of the transition to DTV earlier this year, broadcasters are now doing "more with less" spectrum and OTA broadcast services are at a critical turning point. Experts project that mobile video will dominate traffic over mobile broadband networks in the coming years, with up to two-thirds of broadband usage growth forecast to be from video. Broadcasting is the most spectrally efficient way to meet this need. Therefore, broadcasting is an essential complement to other mobile broadband technologies and will play a unique role in delivering valuable content – which is free, local, and universally available – to the U.S. viewing public.

2. A data-based perspective of the "spectrum crisis" shows:

a. Broadcast television bands are a small fraction of the spectrum between 225 and 3700 MHz.

At the present time, broadcast television services are allocated exclusively only 5.18% of the spectrum in the range of 225 MHz to 3700 MHz. Further, the amount of spectrum used by broadcast television has been reduced by more than 140 MHz as a result of the DTV and Broadcast Auxiliary Services (BAS) transitions, while broadcasters have implemented (and continue to implement) a number of new innovations related to HDTV, multicasting, and mobile DTV for consumers.

b. Over the last 5 – 7 years, the FCC has provided substantial licensed spectrum suitable for wireless broadband use.

There is almost 750 MHz in the 225 MHz to 3700 MHz range currently available for licensed broadband use. While proponents of more spectrum for wireless broadband claim that the United States has far less spectrum in the pipeline than other countries, this is not a meaningful comparison because many of these countries have not yet

assigned recovered spectrum from their transitions to digital television or identified other frequency bands for wireless broadband that have already been allocated in the United States. In addition, a substantial amount of spectrum that has been identified for wireless broadband use in the United States is either currently unused or only beginning to be used by wireless operators. Finally, simply allocating more spectrum for wireless broadband will not necessarily solve any claimed spectrum crisis. Spectrum is a resource. Merely allocating more of a certain resource does not mean that the resource will be used or used efficiently.

c. Future forecasts of wireless mobile broadband spectrum requirements derived from the ITU spectrum model are flawed or, at best, highly suspect.

The licensed wireless industry contends that additional spectrum must be identified and allocated over the next six years in order to provide a total of about 1300 MHz to meet its demand projections. However, these requirements were directly based on a "one size fits all" figure from a 2006 ITU spectrum requirements study and model estimating the needs for future IMT-Advanced systems. Unsurprisingly, the ITU study's solution requiring 1300 MHz for IMT-2000 and IMT-Advanced is highly sensitive to parameter values in the model.

The ITU study did not fully consider future broadcast television, wired solutions, or emerging femtocell possibilities in apportioning demand for high-speed multimedia and video and, in addition, assumed a diminishing market share for wireless local area networking. These assumptions have the consequence of increasing the apparent need for significantly increased licensed spectrum. To test this premise, the ITU spectrum estimation software tool was used to vary the video and high-speed multimedia market share assumptions and it was found that the projected spectrum needs were reduced by approximately 800 MHz and no additional spectrum would be required by even 2020.

Further evidence of the questionable accuracy of the ITU model is an examination of today's spectrum requirements for wireless broadband. The ITU model was used to examine a "baseline" of near-term wireless spectrum demand using the ITU 2010 spectrum needs projections. The same ITU model results that CTIA-The Wireless Association® (CTIA) uses to show a shortfall of 800 MHz in 2015 also suggests that there is a similar shortfall of hundreds of megahertz in 2010. There is clearly not a shortfall today of hundreds of megahertz or even close to this magnitude. One, therefore, must question whether a model that fails to accurately assess spectrum requirements in the near-term should be relied on for speculative future requirements. While the wireless industry may need a larger total spectrum allocation than 500 MHz over the next decade, it has not made this case, and the 1300 MHz number is highly speculative. Any spectrum requirements should be based on models reflecting the U.S. market.

d. Broadband spectrum requirements should be based on demand models that more accurately reflect the U.S. market, including the fact that there are other competitive providers of video services.

As policymakers address the spectrum "gap" it is imperative that better estimates be obtained and based on U.S. industry projections and demand studies. Indeed, a comprehensive examination is needed of the full range of spectrum that can be used for advanced wireless applications including both licensed and unlicensed bands. Fostering competition in wireless broadband requires an economically viable, innovative and dynamic wireless digital broadcast industry in competition with emerging broadband 3G/4G cellular, advanced wired Internet access (FiOS, for example) and continued improvements in wireless Local Area Network (LAN) technologies.

3. Improving spectral efficiency with emerging technology is a critical factor to meet increasing bandwidth requirements, and technology advances will make possible the effective use of higher spectrum bands.

Several technologies are emerging to increase spectral efficiency for wireless broadband systems, including network multiple-input multiple-output (MIMO) wireless systems, which use multiple antenna technology. Other promising areas include user collaboration and femtocells, the latter of which may have a dramatic impact on frequency reuse. These developments would reduce the claim for additional spectrum that has been advanced by the wireless industry.

The FCC's Broadband Task Force also appears to be focusing only on bands of frequencies less than 3.7 GHz. However, a rapid trend demonstrates that technology advances make possible the effective use of higher and higher spectrum bands. A number of different bands, both licensed and unlicensed, should be investigated and considered for wireless broadband.

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I. Introduction

In April 2009 the Federal Communications Commission (FCC) issued a Notice of Inquiry requesting comment on a National Broadband Plan[1], which has resulted in expressions of concern from some in the wireless industry that the United States does not have enough spectrum available to meet future demand for wireless broadband services. In a Public Notice[2] released on December 2, 2009 the Commission requested information on the spectrum use of the television broadcast industry.

In light of these recent events, the following technical review has been written on behalf of the Association for Maximum Service Television, Inc. and the National Association of Broadcasters to achieve two main purposes. The first purpose is to underscore the critical and irreplaceable role of free, over-the-air television as an integral component to a vital 21st Century broadband wireless economy. The paper will show that broadcast television is a natural and spectrally efficient complement to wireless broadband. The second purpose is to provide the ongoing public policy discussion with a technology and data-based perspective about the broadband "spectrum crisis." The paper will also show that claims about the future spectrum requirements for wireless broadband need to be critically assessed and scrutinized.

A transformation is under way in free, over-the-air television with the recent rollout of digital television (DTV) service and the finalization of the Advanced Television Systems Committee (ATSC) Mobile DTV Standard (originally known as the Mobile/Handheld or M/H Standard) for mobile television. Equipment manufacturers already have produced prototype mobile devices and transmission systems, and dozens of television stations plan to broadcast mobile DTV programs in the coming year. The changeover from analog to digital communications technologies heralds a period of intense innovation in television broadcast and its applications, just as similar changeovers signaled periods of change over the years in wired telephony, cellular communications, satellite communications, photography, music and movies.

The future promise of digital television is made possible by enhanced spectral efficiencies and digital system flexibility, which allow more programming and new applications to exist within a spectral allocation that formerly served a single analog television channel. This enables digital broadcast to complement[3] other broadband communications technologies and opens exciting opportunities in the convergence of broadcasting, Internet and personal communications.

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[1] *See* the FCC 09-31 Notice of Inquiry: "A National Broadband Plan for Our Future," released April 8, 2009.

[2] *See* the FCC DA 09-2518 Public Notice: "Data Sought on Uses of Spectrum," released December 2, 2009.

[3] The term "complement" here is used from the consumers' point of view. For example, mobile DTV operations may provide consumers with local news, emergency information, weather, traffic and entertainment programming that complements and supplements other mobile video services. The use of the term does not mean to preclude the possibility that DTV also will provide competition to those other video offerings.

Television broadcasters are essentially doing "more with less" spectrum, following the release of 108 MHz for wireless broadband applications and public safety requirements as part of the transition to digital television.[4] Yet some policymakers see a looming "gap" between the spectrum currently available for broadband wireless and certain estimates of future spectrum requirements. They have cited the long lead times to clear new bands for advanced wireless uses – an average of 6 to 13 years – as a driver for near-term decisions to close the spectrum "gap."[5]

As policymakers, industry stakeholders and the public consider the development of the FCC's National Broadband Plan[6] and its implications for spectrum policy, it is essential to ensure that the over-the-air digital marketplace for high-definition television (HDTV) and multicast services has the regulatory flexibility and certainty needed to meet future consumer demands and technology requirements. Over-the-air television broadcasting in general, and mobile DTV in particular, are complements rather than impediments to wireless broadband solutions.

This paper is organized as follows. In Section II we review the role of broadcast television in the digital economy with a focus on its important role in enhancing federal public policy objectives in the broadband domain. In Section III we carefully examine the so-called "spectrum crisis" with an analysis of the spectrum estimation methodology adopted by the International Telecommunication Union (ITU), which forms much of the basis for projected spectrum needs in wireless broadband. Section IV examines the impact of technological evolution on spectrum requirements. Section V highlights the unique capabilities that broadcasting technologies offer to enhance efforts in deploying ubiquitous broadband. Section VI offers conclusions.

II. Role of Broadcast Television in the Digital Economy

Broadcast television technology, including mobile DTV applications, provides a range of spectrum-based services that address many of the public interest and economic growth requirements associated with the FCC's goals of ubiquitous deployment of accessible broadband, including civic participation, consumer welfare,

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[4] As a result of the transition from analog to digital television, completed in June 2009, spectrum that corresponded with channels 52-69 was freed for advanced wireless uses (84 MHz) and public safety requirements (24 MHz). Of the 84 MHz designated for wireless broadband, the FCC placed 60 MHz up for auction in 2008.

[5] *See* B. Levin, "You Can't Coach Height: A Winning Spectrum Strategy," Oct. 29, 2009, http://blog.broadband.gov/?entryId=10624 ("Levin Blog"). Elsewhere, the FCC has cited the 13 years it has taken from the first step of reallocating 700 MHz (1996) to its availability for use (2009). *See* FCC Presentation, Broadband Gaps, November 18, 2009, Open Meeting.

[6] *See* the FCC 09-31 Notice of Inquiry ("Broadband NOI"): "A National Broadband Plan for Our Future," released April 8, 2009.

investment and innovation.[7] Efficient and innovative uses of existing broadcast television spectrum are also key components to advancing the FCC goal of smarter spectrum management policy.[8] In this regard, broadcast DTV technology meets the goals of innovation, competition and spectrum efficiency.

- **Innovation**: The ATSC recently approved its A/153 Mobile DTV Standard for mobile DTV, which offers a highly spectrally efficient and low-cost implementation technology to satisfy the demand for real-time video and audio on a mobile platform.[9]

- **Competition**: As wireless carriers continue with planned deployments of mobile broadcast offerings[10], mobile DTV services provide an important competitive balance to the competitiveness of the overall wireless marketplace.[11]

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[7] *See Broadband NOI*, paras. 63-105. The Inquiry lists the series of public policy goals that the Recovery Act requires the FCC to advance in the national broadband plan, including advancing consumer welfare, civic participation, public safety and homeland security, education and private sector investment.

[8] *See* Prepared Remarks of Chairman Julius Genachowski, "America's Mobile Broadband Future," *International CTIA Wireless I.T. and Entertainment*, Oct. 7, 2009. "Smart spectrum policy will be part of the solution."

[9] *See* R. V. Ducey, M. R. Fratrik, and J. S. Kraemer, "Broadcasters' Competitive Advantages in the Mobile Video Marketplace," July 29, 2008, http://www.openmobilevideo.com/_assets/docs/broadcasters/BroadcasterCompetitiveAdvantages.pdf. ("The incremental capital cost (i.e., variable cost after the sunk cost of the analog-to-digital conversion) at the transmitter to send a M/H signal could be as low as $100,000.")

[10] *See* GSM Association ("GSMA") press release, "GSMA Endorses Integrated Mobile Broadcast (IMB)," September 9, 2009. (The GSM Association has endorsed a new 3GPP standard – Integrated Mobile Broadcast (IMB) – which it said will "allow its members to accelerate the adoption of mobile data and broadcast services worldwide." A white paper released along with the GSMA press release acknowledged the extent to which Mobile DTV availability could alter the role of IMB deployments: "… if an operator decided to make an investment in IMB in a market where low-cost mobile Digital TV reception is already available, it could be that IMB would be used to provide an alternative primary service, such as non-linear multimedia content distribution services. Income generated from the linear TV Broadcasting service in such a market may be insufficient to justify a business case, and so IMB would need to offer other services to generate sufficient Return on Investment."

[11] The FCC has cited competition as a tenet of its promotion of broadband deployment, including mobile wireless broadband. Chairman Genachowski said in remarks, "America's Mobile Broadband Future" to the International CTIA WIRELESS I.T. & Entertainment on Oct. 7, 2009: "The PCS auctions of the 1990s showed the power of a competitive marketplace. They allowed new carriers to enter the market and resulted in a huge uptick in dollars spent, cell sites built, and jobs created, even as prices declined to make cell phones accessible to the mass market. The FCC will be vigilant in promoting competition."

- **Spectrum Efficiency**:[12] The sheer complexity of the broadband deployment challenge in the U.S. means that a one-size-fits-all approach for platforms will not facilitate deployment of all advanced applications, for all users in all geographic areas. As a point-to-multipoint system, broadcasting offers the optimal solution for efficiently transmitting high-quality HDTV and digital video content in small bandwidth segments to large audiences in the same geographic region. The DTV data rate of nearly 20 Mbps in one 6 MHz channel is competitive with the delivery speeds of other wireless technologies.[13] The efficiency tradeoff is clear – it is more efficient to broadcast a DTV program on a single channel to 1,000 viewers than to transmit the same information a thousand times.

The innovative public benefits provided by television broadcast service are a pillar of the U.S. digital economy. Over-the-air broadcasters have made significant technological contributions that have both facilitated and complemented the wireless broadband revolution. As part of the transition to digital television, broadcasters freed 108 MHz of spectrum in the 700 MHz band, which was auctioned by the FCC in 2008 to facilitate additional wireless offerings and provide billions of dollars in auction receipts to the U.S. Treasury. In what the FCC called "an unprecedented engineering feat,"[14] the transition led to major new investments, including billions of dollars spent by consumers on digital receiving equipment to continue access to free local programming, news, weather, sports and other services. Mobile DTV is the next innovation that broadcasters are launching. The technology is available today[15], 30 stations are already operational[16] and many more will be rolling out services in the next few months.[17]

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[12] We use the terminologies spectral efficiency and spectrum efficiency to refer to both the data rate per unit bandwidth sent over a point-to-point link and the data rate per unit bandwidth sent over a network. From a communication theory perspective, these are two separate analytical measures. The context of the discussion should make clear which notion of spectral efficiency is intended.

[13] 19.39 Mbps is the data rate that the ATSC standard provides within a 6 MHz channel. A broadcaster can offer a mix of video/data streams within that 19.39 Mbps payload, including fixed terrestrial SD, HD, and mobile DTV.

[14] *See* FCC Press Release, "1 Day Until DTV Transition: Focus at End of Technological Transition is on People," June 11, 2009.

[15] *See* Open Mobile Video Coalition Press Release, "With Standard Adopted, Broadcasters Poised to Bring Mobile DTV to American Consumers," Oct. 16, 2009: "Technology manufacturers such as LG Electronics, Samsung Electronics, Harris Corporation, Rohde & Schwarz and Dell have produced prototypes devices and working transmission systems."

[16] *See* G. Dickson, "Mobile DTV Standard Approved: ATSC formalizes broadcast standard, clears way for retail sales next year," *Broadcasting and Cable*, Oct. 16, 2009, http://www.broadcastingcable.com/article/358341-Mobile_DTV_Standard_Approved.php.

[17] *See* Open Mobile Video Coalition Press Release, "Broadcasters Target Washington, D.C. for Mobile Television Consumer Showcase," April 20, 2009. Broadcasters are launching an ATSC Mobile DTV consumer showcase in the Washington DC metro market with at least seven participants, including Fox Television Stations' WDCA-DT, Gannett Broadcasting's WUSA-DT, ION Media Networks' WPXW-DT, NBC Universal's WRC-DT, PBS' WHUT-DT and MHz Networks, Sinclair Broadcast Group's operated WNUV-DT,

Mobile DTV provides a complementary service to mobile broadband and can off-load capacity to a dedicated network to increase a mobile broadband provider's use of spectrum.

Broadcast innovations are also fostering new technologies such as Sezmi Corporation's upcoming product, which combines OTA television with content from cable television and Internet video programming.[18] Sezmi is just one company pioneering new uses that broadcast advancements have enabled.

III. Spectrum "Crisis": Facts and Fallacies

The claim that the United States will suffer a spectrum crisis needs to be critically assessed. To undertake this assessment, it is important to examine the availability of spectrum in the United States, how demands (e.g., CTIA's claimed spectrum needs) were estimated, and how spectrum is used today. This report studies the bands currently viable for wireless broadband between 225 MHz and 3700 MHz and also looks at other spectrum that could be viable for wireless broadband use. Note that the scope of this report does not include all spectrum that could be used for wireless broadband and is not intended to conduct a comprehensive spectrum inventory. The goal, however, is to highlight the fact that the current broadcast spectrum allocations represent only a small percentage of the spectrum suitable for wireless broadband use and point out a number of observations about the current spectrum allocated for broadband and the availability and suitability of other spectrum for wireless broadband.

A. Broadcast television bands are a small percentage of the 225 to 3700 MHz spectrum

Today, broadcast television services are allocated a total of 307 MHz in the 225 MHz to 3.7 GHz range.[19] The percentage of spectrum available (exclusively and shared) to television services is summarized in Fig. 1. Only 5.18% of the spectrum in that range is allocated exclusively for television service. Broadcasters recently cleared a total of 143 MHz of spectrum after the lengthy and costly digital television and Broadcast Auxiliary Services (BAS) transitions.[20] Despite this reduction in spectrum, broadcasters have

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and National Datacast. An additional 21 broadcasters have plans to launch Mobile DTV over the next year, for a total of 70 stations in 28 markets covering nearly 39% of U.S. TV households.

[18] *See* Reply Comments Of Sezmi Corporation, NBP Public Notice # 6, GN Dockets No. 09-47, 09-51, 09-137, Nov. 13, 2009, http://fjallfoss.fcc.gov/ecfs2/document/view?id=7020348536.

[19] *See* the count in Appendix B, which includes spectrum allocated for broadcast to homes as well as the spectrum used by broadcasters for Electronic News Gathering in the Broadcast Auxiliary Services band.

[20] This includes 108 MHz in the 700 MHz band and 35 MHz in the Broadcast Auxiliary Service band. *See* R. M. Rast, "The Dawn of Digital TV," *IEEE Spectrum*, October 2005, ITU BDT Seminar, "How much digital dividend? How countries tackle the question?" June 2009, http://www.itu.int/ITU-D/tech/digital-broadcasting/SaranskJune2009/Presentations/Day3/Saransk_June2009_Day3_3.pdf, and J. Krauss, "The

implemented (and continue to implement) a number of new innovations related to HDTV, multicasting, and mobile DTV.

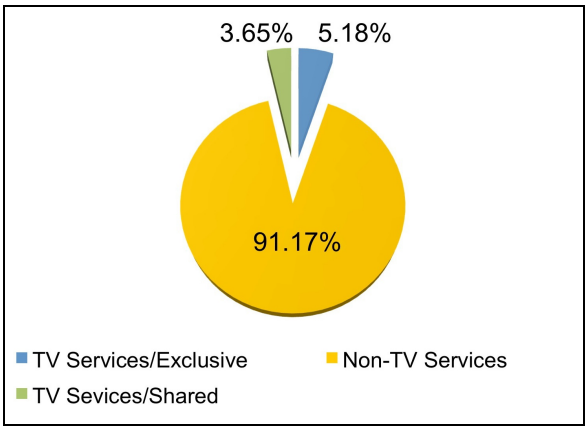

Figure 1: Allotment of spectrum to television services showing shared and exclusive spectrum percentages in the 225 MHz to 3.7 GHz range of frequencies.

B. Snapshot of today's spectrum allocations

The FCC's Broadband Task Force has suggested that 584 MHz (including 50 MHz in the pipeline) of spectrum is available for wireless broadband use.[21] The FCC spectrum assessment is reprinted in Fig. 2.

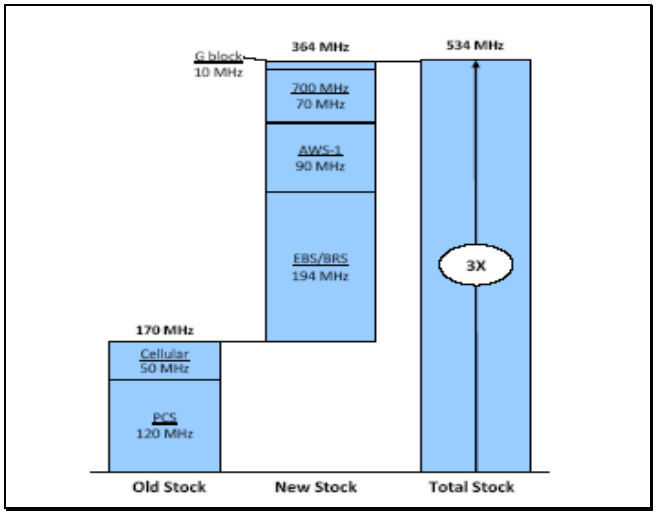

Figure 2: Spectrum available for mobile broadband has tripled
Source: FCC Presentation, September 29, 2009 Open Meeting

FCC's White Spaces Decision," *CEDMagazine*, Jan. 1, 2009 http://www.cedmagazine.com/Article-Capital-Currents-010109.aspx.

[21] *See* FCC, "September Commission Meeting September 29, 2009: 141 days until Plan is due," Sept. 29, 2009, slide 69, http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-293742A1.pdf, (534 MHz of total spectrum, 364 MHz newly available (700, AWS-1, BRS/EBS, G-Block), 170 MHz existing (PCS, Cellular)).

Several groups have produced other estimates of the usable spectrum for wireless broadband. As part of an economic study, the Consumer Electronics Association (CEA) and The Brattle Group counted 664 MHz of the spectrum below 3 GHz as "licensed and available for mobile broadband uses."[22] In contrast, CTIA has counted 459.5 MHz (409.5 MHz currently available plus 50 MHz in the pipeline) for wireless broadband. These estimates are presented in Table 1 below:

Table 1: Comparison of spectrum available for mobile broadband between 225 and 3700 MHz

Band Name	Band Location	Brattle Group Count (MHz)	FCC Count (MHz)	CTIA Count (MHz)[23]	Modified Count (MHz)[24]
PCS	1.9 GHz	120	120	120	120
Cellular	800 MHz	50	50	50	50
SMR	800 MHz / 900 MHz	20	-	19	20
BRS/EBS	2.5 GHz	174	194	55.5	194
AWS	1.7 GHz / 2.1 GHz	90	90	90	90
700 MHz	700 MHz	80	80	80	80
G Block	1.9 GHz	10	10	5	10
ATC Spectrum	1.5 GHz / 2 GHz	55	-	-	55
H Block	1.9 GHz	10			10
AWS-II	1.9 GHz / 2 GHz	-	20	20	20
AWS III	2.1 GHz	25	20	20	20
WCS	2.3 GHz	30	-	-	30
WBS	3.65-3.7GHz	-	-	-	50
TOTAL SPECTRUM SUITABLE FOR MOBILE BROADBAND		664	584	459.5	749

Sources: Brattle Group Study, FCC Broadband Presentation (Sept. 2009), CTIA FCC Ex Parte filing, GN Docket No. 09-51 (September 29, 2009).

Table 1 also includes a revised spectrum tally that includes all spectrum up to 3.7 GHz. Note that the band from 3650-3700 MHz is licensed for Wireless Broadband Services and is available for fixed and mobile wireless broadband operations.[25] This band appears well-suited for deployment of WiMAX or WiMAX-like systems. The Wireless Communications Association International (WCAI) recently formed a working

[22] The Brattle Group, "The Need for Additional Spectrum for Wireless Broadband: The Economic Benefits and Costs of Reallocations," Oct. 23, 2009.

[23] This is a best-effort reconstructed breakdown of the CTIA count that includes allocated spectrum and pipeline spectrum.

[24] The modified count tabulates the usable spectrum up to 3.7 GHz.

[25] *See* "FCC: Wireless Services: 3650-3700 MHz Radio Service: Services," http://wireless.fcc.gov/services/index.htm?job=service_home&id=3650_3700. Part 90 Subpart Z - Wireless Broadband Services in the 3650-3700 MHz Band.

group to enable wireless broadband in the 3.65GHz band.[26] There are over 1,100 licensees and over 5,400 base stations registered nationally.[27] This band has several interesting regulatory issues including exclusion zones and licensee cooperation requirements.[28]

The proponents of more spectrum for wireless broadband claim that the United States has far less spectrum in the pipeline than other countries. Thus, CTIA has cited several international examples to show that the 50 MHz in the pipeline of the United States lags behind other industrialized nations.[29] But this is not a meaningful comparison because many of these countries have not yet assigned recovered spectrum from their respective transitions to digital television or identified other frequency bands for wireless broadband than have been allocated in the United States. For example, France and the United Kingdom are still finalizing plans on how to handle their digital dividend spectrum holdings.[30] Similarly, Germany's digital dividend auctions will take place early in 2010.[31] In contrast, the CTIA assigned spectrum figure of 409.5 MHz includes the "700 MHz [digital dividend] spectrum not yet in use".[32] The CTIA figure, however, does not include almost 300 MHz of other spectrum that has been made available by the FCC for broadband use.[33]

Spectrum assigned but not fully utilized: Over the last four years, the Commission has reallocated and/or fashioned a favorable regulatory framework for 354 MHz of spectrum in its 700 MHz and AWS (Advanced Wireless Services) I auctions, and its

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[26] *See* WCAI Press Release, "WCAI Launches Industry Effort to Unlock 3.65 GHz Band Potential," http://www.wcai.com/images/pdf/2009_wcai11-18.pdf.

[27] *See* P. J. Sinderbrand, "The 3.65 GHz Band: Unlocking Its Potential," http://www.wcai.com/images/pdf/2009_wcaiWebinar11-18.pdf.

[28] *See* Solectek White Paper, "The U.S. WiMAX 3.65 GHz Opportunity: The History of the Band and How WISPs Can Register for FCC Approval," *WiMAX Forum*, http://www.solectek.com/files/pdf/techtalk/wp-365GHz.pdf.

[29] *See* Written Ex Parte Communication, CTIA, GN Docket No. 09-51, Sept. 29, 2009.

[30] *See* UMTS Forum Press Release, "Europe's Golden Opportunity to Capitalise on Digital Dividend," Feb. 16, 2009, http://www.umts-forum.org/content/view/2700/174/. ("In France, 72 MHz of digital dividend spectrum in the 790-862 MHz UHF band has been earmarked for mobile services as part of the Government's "France numérique 2012" plan, unveiled last Autumn and confirmed late December by the recent official Digital Dividend allocation scheme." and "It is anticipated that Ofcom will hold its auction for the UK's digital dividend spectrum during 2010." and "Other EU and CEPT member states (Sweden, Finland, Switzerland) have aligned on the same band to support expansion of affordable access to broadband communication services."

[31] *See* A. Mitchell, "German Spectrum Auction Set to Proceed in 2010," *4G Trends*, Oct. 14, 2009, http://4gtrends.com/?p=1821. German regulator Bundesnetzagentur will move forward with a planned auction of 340 MHz next year, including allocations in the 790 to 862 MHz band being released by broadcasters as part of the digital dividend. [The CTIA figures denote 340 MHz of spectrum in Germany's pipeline.]

[32] *See* Written Ex Parte Communication, CTIA, GN Docket No. 09-51, Sept. 29, 2009.

[33] *See* Table 1.

Broadband Radio Service (BRS)/Educational Broadband Service (EBS) order. While several carriers have deployed third generation wireless systems in AWS-I spectrum,[34] including T-Mobile USA, Leap and MetroPCS, the use of BRS/EBS and 700 MHz is still in its infancy.

Clearwire has access to 100 MHz of BRS/EBS spectrum in nearly all major markets and is aggressively deploying Mobile WiMAX.[35] The company plans to serve 30 million consumers by the end of 2009 and expects to have coverage to offer service to 120 million consumers by the end of 2010. [36] Meanwhile, AT&T, Verizon, and MetroPCS have announced plans to deploy Long Term Evolution (LTE) in the 700 MHz band, with deployments beginning in 2010 and some full build-outs scheduled to be completed in the 2012-2013 timeframe.[37]

Moreover, public statements and studies suggest that Clearwire and T-Mobile USA's new networks use less than half of their respective network deployment capacities. A Signals Research article on Sprint's Xohm WiMAX network (now part of Clearwire) in Baltimore reported that the initial launch required 30 MHz of spectrum to provide services.[38] This leaves approximately 70 MHz of spectrum for future growth. In the case of T-Mobile USA, the highest bidder in the AWS-1 auction, its 3G network was deployed using 10 MHz of the 30 MHz of AWS spectrum purchased in the 2006 AWS-1 auction. They have 20 MHz in reserve for future use.[39]

A review of the spectrum from 225 to 3700 MHz suggests that a substantial amount of spectrum has been identified for wireless broadband use and a significant portion of this spectrum is unused or only beginning to be implemented by wireless operators.

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[34] *See* S. Fox and J. Walkenhorst, "Mobile Broadband in the Americas: Momentum Building in the AWS Band," http://www.gsmworld.com/documents/Momentum_Building_in_the_AWS_Band_Report.pdf.

[35] *See* Press Release, "Clearwire Completes Transaction With Sprint Nextel and $3.2 Billion Investment to Launch 4G Mobile Internet Company," http://newsroom.clearwire.com/phoenix.zhtml?c=214419&p=irol-newsArticle&ID=1231029&highlight.

[36] *See* Press Release, "Clearwire Reports Second Quarter 2009 Results," August 11,2009, http://newsroom.clearwire.com/phoenix.zhtml?c=198722&p=irol-newsArticle&id=1319734.

[37] *See* Verizon LTE Innovation Center, "Verizon Wireless LTE Network," https://www.lte.vzw.com/AboutLTE/VerizonWirelessLTENetwork/tabid/6003/Default.aspx. Om Malik, "AT&T Moves Up Its LTE Rollout, Admits To Network Issues," *GigaOm*, May 27, 2009, http://gigaom.com/2009/05/27/att-moves-up-its-lte-rollout-admits-to-network-issues/. MetroPCS Press Release, "Unlimited Wireless Carrier MetroPCS Announces Vendors for 2010 4G LTE Launch," Sept. 15, 2009, http://investor.metropcs.com/phoenix.zhtml?c=177745&p=irol-newsArticle&ID=1331809&highlight.

[38] *See* M. Thelander, "Sprint launches XOHM," *Signals Flash*, Sept. 29, 2008, http://www.signalsresearch.com/Docs/flash_092908.pdf.

[39] *See* M. Dolan, "T-Mobile's Neville Ray: We will have more G series phones in 2009," *Fierce Wireless*, Jan. 29, 2009, http://www.fiercewireless.com/story/t-mobiles-neville-ray-we-will-have-more-g-series-phones-2009/2009-01-29?utm_medium=nl&utm_source=internal&cmp-id=EMC-NL-FW&dest=FW - ixzz0Viee1vEr. ("(T)he network we are launching uses 10 MHz of spectrum and we have 30 MHz so we have headroom to grow.")

C. Will adding more spectrum increase broadband penetration?

In any communications system, spectrum is a resource. Allocating more of a certain resource does not mean that the resource will be used or used efficiently. As documented in the draft report *Next Generation Connectivity: A review of broadband Internet transitions and policy from around the world*, surveys conducted by the Harvard University Berkman Center for Internet & Society found no common driver for third generation wireless penetration.[40] In fact, these studies showed varying levels of penetration across different economies, regulatory structures, and spectrum policies, but no consistent correlation between these approaches and wireless penetration.

In order to integrate new spectrum into network operations, carriers must invest in a number of areas throughout the entire network. One of the most critical areas will be improvements in backhaul links to facilitate the data demands of wireless devices.[41] For example, Verizon has already invested heavily by laying fiber to cell sites, in large part to support future LTE deployments,[42] and Clearwire has invested in microwave backhaul links to support future mobile WiMAX sites.[43] T-Mobile USA is upgrading its towers to achieve speeds of 50 –100 Mbps with fiber.[44] These examples demonstrate that the issue of future strain on the backhaul infrastructure is one of great importance and has been recognized internationally.[45]

Simply allocating more spectrum for wireless broadband will not solve the claimed spectrum crisis. Building a wireless broadband system with sufficient scale to be financially viable requires a large outlay of capital and a great deal of expertise. Clearwire, a relatively new player building out a nationwide wireless broadband network, is finding that "fostering innovation and investment in the risky, capital-intensive wireless communications market is complex and will not be solved with a

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[40] *See* DRAFT Berkman Center for Internet & Society at Harvard University, "Next Generation Connectivity: A review of broadband Internet transitions and policy from around the world," Oct. 2009. *See also* Comments Sought on Broadband Study Conducted by the Berkman Center for Internet and Society, NBP Public Notice #13, GN Docket Nos. 09-47, 09-51, 09-137, Oct. 14, 2009.

[41] *See* O. Malik, "Mobile Data Growth Boosting Backhaul Demand," *GigaOm*, May 27, 2009, http://gigaom.com/2009/05/27/mobile-data-growth-boosting-backhaul-demand/.

[42] *See* K. Fitchard, "Verizon lays fiber to 1000 cell sites," *Telephony Online*, Nov. 2, 2009, http://telephonyonline.com/3g4g/news/verizon-fiber-cell-sites-1102/. ("Verizon has committed to deploying fiber Ethernet to the 90% of the cell sites in its territory by the end of 2013, closely following VZW's LTE rollout schedule.")

[43] *See* D. Jones, "Clearwire's Backhaul Bet," *Unstrung*, http://www.unstrung.com/document.asp?doc_id=154063.

[44] *See* T. Duryee, "Mobile Broadband Consumption Is Creating Problems On All Sides Of The Equation," *MocoNews.Net*, Dec. 4, 2009, http://moconews.net/article/419-mobile-broadband-consumption-is-creating-problems-on-all-sides-of-the-e/.

[45] *See* European Commission, Radio Spectrum Policy Group, Final Position Paper, Working Group on Wireless Broadband, May 14, 2009.

single silver bullet. Additional spectrum resources, for example, while important, alone will not create a solid foundation for innovation."[46]

D. Issues with ITU spectrum estimation

From the above-mentioned Table 1, it can be seen that a significant amount of spectrum already has been identified for wireless broadband use. In addition, a number of experts, including the FCC's own source for research, Harvard University's Berkman Center for Internet & Society, find no clear nexus between allocating more spectrum and broadband penetration and performance. Nonetheless, as noted above, there is the claim by the wireless industry of a broadband spectrum crisis in the United States.

The principal support for this claim is an ITU model of spectrum needs. CTIA uses this ITU model to support its argument that 800 MHz is needed for wireless broadband by 2015.[47] The ITU model is examined in this section. As shown below, this examination finds that the ITU model is very sensitive to input assumptions. For example, modifying certain video and other assumptions used in the CTIA estimation changes the results of the ITU model to suggest that no additional spectrum is required by even 2020.

In addition, the ITU model was used to examine today's wireless spectrum demand. To do this, the ITU model's spectrum projections for 2010 were examined. For example, the ITU model results that CTIA cites to show a shortfall of 800 MHz in 2015 also suggest that there is a similar shortfall of hundreds of megahertz in 2010. There is clearly not a shortfall today of hundreds of megahertz, a fact confirmed by the growth in this industry sector. One, therefore, must question whether a model that fails to accurately assess spectrum requirements in the very near-term should be relied on for speculative future requirements.

The details of these examinations of the ITU model are shown below.

Generic ITU Model: The spectrum needs projection produced by the ITU spectrum estimation methodology is the primary basis for the CTIA request for at least 800 MHz of additional spectrum.[48] The methodology used by the ITU[49] is based upon well-

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[46] *See* Clearwire Comments, "Fostering Innovation and Investment in the Wireless Communications Market," GN Docket 09-157, Sept. 30, 2009.

[47] *See* CTIA, "Wireless Crisis Foretold: The Gathering Spectrum Storm … and Looming Spectrum Drought," Sept. 2009.

[48] Id.

[49] *See* Recommendation ITU-R M.1768, "Methodology for calculation of spectrum requirements for the future development of the terrestrial component of IMT-2000 and systems beyond IMT-2000," 2006.

known trunking theory[50] applied in a complex scenario involving many service classes, heterogeneous user requirements and multiple communications systems (IMT-2000, IMT-Advanced, radio Local Area Network [LAN] with wired backhaul, and broadcast systems).[51]

The problem lies in the application of the ITU methodology to real-world policy considerations. First, the overall model is extraordinarily complex with many parameters characterizing, 1) assumptions about wireless access technologies and the future evolution of their spectral efficiencies, 2) service categories, 3) current and future applications utilizing broadband access, and 4) current and future assumptions about the application market. As is well known in statistical estimation theory, estimates and predictions based on high-dimensional models must be examined with a skeptic's eye as the sensitivity to errors in model structure and parameters is typically high.[52]

The use of a highly variable multi-dimensional model based on inferences from a three-year-old requirements document should not be relied on as "evidence" of spectrum needs and the timing of these needs. Instead, the FCC should use a more stringent, data-driven projection of U.S. need:

- At a minimum, such projections must assess the extent to which wireline substitutes would more cost-effectively meet overarching broadband requirements in the period of time evaluated.

- In addition, such "pipeline" projections must be evaluated in the overall context of the broadband deployment scenarios for whether licensed, advanced wireless applications are the "best pipe" versus other broadband options, including wireline alternatives and other types of spectrum-based deployments (e.g., unlicensed). A recent European Commission report noted the need for balance based on not just data speeds, but a broader range of parameters. It pointed out that the wired option typically provides higher speeds than the best wireless option.[53]

- Similarly, unlicensed options such as Wi-Fi, because of their small operational area and limited number of users within each operational area, offer (and will continue to offer) consumers an effective alternative to licensed broadband. Apple's

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[50] *See* T. Irnich and B. Walke, "Spectrum Estimation Technology for Next Generation Wireless Systems: Introduction and Results of Application to IMT-2000," in *Proc. 2005 IEEE International Symposium on Personal, Indoor, and Mobile Radio Communications*, pp. 2801-2809, 2005.

[51] *See* J. Kaufman, "Blocking in a Shared Resource Environment," *IEEE Transactions on Communications*, vol. COM-29, no. 10, pp. 1474-1481, Oct. 1981.

[52] *See* R. Bellman, *Adaptive Control Processes: A Guided Tour*, Princeton University Press, Princeton, NJ 1961.

[53] *See* European Commission, Radio Spectrum Policy Group, Final Position Paper, Working Group on Wireless Broadband, May 14, 2009.

advertising for the iPhone 3G emphasizes this point when it notes that the iPhone 3G "seamlessly switches between EDGE, faster 3G, and even faster Wi-Fi".[54]

Specific Results from a Generic Model: A cursory review of the ITU estimation model demonstrates that it is not a reliable predictor of spectrum requirements for any country, let alone the United States, in the near or mid term. The ITU study sought to estimate the additional spectrum to be needed by one wireless network for each country in, respectively, 2010, 2015 and 2020, with "higher" market settings for countries whose mobile markets developed earlier and "lower" market settings for those with markets that were still developing. To derive the projection of 800 MHz of additional spectrum that, allegedly, will be needed by 2015, CTIA "conservatively" points to the ITU's projection for 2015 for a total U.S. spectrum requirement of 1300 MHz. Using 459.5 MHz as the total amount of mobile broadband spectrum, CTIA concludes that the U.S. "would still need to identify and allocate just over 800 additional MHz of spectrum for commercial wireless services within the next six years."[55]

Reviewing the ITU figures for 2010 and comparing them against the amount of spectrum currently allocated for wireless broadband reveals a fundamental flaw in the use of the model. For 2010, the ITU study estimates that a "lower" market setting country requires 760 MHz of spectrum for one network deployment.[56] This is the identical setting used for the basis of spectrum requirements in 2015. While the total amount of spectrum available for use in the U.S is contested, 760 MHz exceeds what is currently allocated in the United States by any measure (see Section III.B). CTIA ignores the ITU model's 2010 prediction, which would indicate a current spectrum shortfall of 300 MHz (calculated using CTIA's count of 459.5 MHz and subtracting from the ITU 2010 estimate of 760 MHz).[57] The ITU model therefore fails to accurately assess spectrum requirements in the near-term (e.g., 2010) and policymakers should not rely on it to predict future requirements.

Ignoring its accuracy for predicting 2010 spectrum requirements, the need for CTIA to point to the "conservative" scenario of one wireless network and a "low" market setting further underscores that this data is not designed to predict specific country spectrum requirements on a going forward basis. At a minimum, such estimates must take into account technological developments in wireless networks that have developed since 2006 and that are now projected to be operational by 2015.

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[54] *See* Apple web site, http://www.apple.com/iphone/iphone-3gs/high-technology.html.

[55] *See* Written Ex Parte Communication, CTIA, GN Docket No. 09-51, Sept. 29, 2009. "Wireless Crisis Foretold: The Gathering Storm… and Looming Spectrum Drought," at p. 19.

[56] *See* Recommendation ITU-R M.2078.

[57] The ITU model also contains adjustments for countries with multiple networks. Taking into account the fact that the United States has four major wireless carriers each with their own network would further increase spectrum requirements making this error and spectrum shortfall even greater. *See*, for example, Table 26 in Report ITU-R M.2078, "Estimated spectrum bandwidth requirements for the future development of IMT-2000 and IMT-Advanced," 2006.

Radio Access Technology Limitation: In the ITU methodology, demand is apportioned in the first few steps between four radio access technology groups (RATGs). The first two correspond to IMT-2000 and IMT-Advanced. The second two correspond to existing radio LAN systems and digital mobile broadcasting systems. The ITU model makes assumptions[58] that a growing percentage of demand will be apportioned to IMT-2000 and IMT-Advanced systems, which has the effect of increasing their spectral requirements. This approach short changes the potential for broadband traffic to be carried by LAN with wired Internet and/or via digital broadcast technologies.

The ITU approach seeks to predict a global spectral requirement for IMT-2000 and IMT-Advanced without adjustment to account for country specific differences, such as population density or application demand. From a United States point-of-view, this makes little sense for deployment decisions. The U.S. has a varied and unique environment (including geography, population density, consumer demands, access requirements) that is not properly modeled by a "one-size-fits-all" approach.

Assessing the ITU Spectrum Requirements Estimation Tool - SPECULATOR: The ITU spectrum estimates were based on a model by the Wireless World Initiative New Radio (WINNER) group.[59] WINNER is a consortium coordinated by Nokia Siemens Networks which consists of 41 partners, primarily European telecommunications equipment manufacturers or carriers[60], seeking to improve mobile broadband network technology.[61]

WINNER developed a spectrum estimation tool called SPECULATOR, which the ITU selected as its official tool for spectrum estimation.[62] This spectrum estimation tool and the methodology behind it are described in two ITU-R reports, ITU-R M.2078 Report entitled *Estimated spectrum bandwidth requirements for the future development of IMT-2000 and IMT-Advanced* (2006) and Recommendation ITU-R M.1768 *Methodology for calculation of spectrum requirements for the future development of the terrestrial component of IMT-2000 and systems beyond IMT-2000* (2006). The methodology in the tool uses various factors to derive its estimates, including "service categories (a combination of service type and traffic class), service environments (a combination of service usage pattern and teledensity), radio environments, market data analysis and

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[58] *See* Report ITU-R M.2078, "Estimated spectrum bandwidth requirements for the future development of IMT-2000 and IMT-Advanced," 2006.

[59] *See* WINNER, "Spectrum Requirements for System beyond IMT-2000," D 5.10.2 v 1.0, p. 2, March 2, 2007, http://www.ist-winner.org/WINNER2-Deliverables/D5.10.2.pdf.

[60] *See* WINNER Partner Page, http://www.ist-winner.org/partners.html. The number of partners is found at the WINNER Main page, http://www.ist-winner.org/.

[61] *See* WINNER About Page, http://www.ist-winner.org/about.html.

[62] *See* WINNER, "Spectrum Requirements for System beyond IMT-2000," D 5.10.2 v 1.0, p. 2, March 2, 2007, http://www.ist-winner.org/WINNER2-Deliverables/D5.10.2.pdf.

traffic estimation by using these categories and environments, traffic distribution among radio access technique groups (RATGs), required system capacity calculation and resultant spectrum requirement determination."[63]

The primary risk with using the ITU spectrum estimation methodology is that calculations appear to be highly sensitive to input modifications. Because these inputs are primarily based on forecasts and approximations, care must be used when making decisions based on this single spectrum estimation model.

The SPECULATOR tool is available on the ITU-R website,[64] which allows anyone to see how the model is sensitive to changes. The tool is a Microsoft Excel spreadsheet that incorporates multiple worksheets and macros that correspond to the calculation methodology. According to WINNER[65], the SPECULATOR tool defaults to the higher market setting. Upon downloading the SPECULATOR tool, it shows spectrum requirements as shown in Table 2. The 2015 total spectrum requirement from SPECULATOR is 1300 MHz, which is the estimate that CTIA uses to calculate its 800 MHz request. (calculated using CTIA's count of 459.5 MHz and subtracting from the ITU 2015 estimate of 1300 MHz)

Table 2: Unmodified SPECULATOR output showing CTIA spectrum request

Spectrum for RATG	**Year 2010**	**Year 2015**	**Year 2020**
RAT Group #1	840 MHz	880 MHz	880 MHz
RAT Group #2	0 MHz	420 MHz	840 MHz
Total	**840 MHz**	**1300 MHz**	**1720 MHz**

To understand the sensitivity of the SPECULATOR output to changes in assumptions, we attempted to modify the data to take into account the following considerations:

Consideration 1) **Video is already provided by broadcast television systems.** The availability of broadcast television may allow video to be off-loaded from the wireless broadband networks.

Consideration 2) **Spectrum above 3 GHz may be viable for future wireless broadband systems.** Future wireless broadband networks might effectively use

[63] *See* Recommendation ITU-R M.1768, "Methodology for calculation of spectrum requirements for the future development of the terrestrial component of IMT-2000 and systems beyond IMT-2000," p. 1, 2006.

[64] *See* ITU, "'SPECULATOR' tool for estimating the spectrum requirements for the future development of IMT-2000 and IMT-ADVANCED," http://www.itu.int/oth/R0A06000010/en.

[65] *See* IST-2003-507581 WINNER and IST-4-027756 WINNER II, "Tool for estimating the spectrum requirements for the future development of IMT-2000 and IMT-ADVANCED"

other bands, especially with technology such as femtocells. Section IV.B discusses several bands.

Consideration 3) **Wireline broadband networks offer an alternative to wireless broadband.** Wired systems (e.g., those using fiber-to-the-home technology) provide very high data rates.

To approximately model these considerations, we modified SPECULATOR as outlined in Appendix A. The changes included the following:

Change 1) Set all super-high multimedia capacity requirements to zero. As discussed in ITU-R M.1768,[66] the super-high multimedia "service type accommodates super-high data rates multi-media applications, which are currently provided with fibre-to-the-home (FTTH) services in case of wired communication systems." This change roughly models all three considerations.

Change 2) Set all high multimedia capacity requirements to zero. As discussed in ITU-R M.1768,[67] the high multimedia "service type accommodates high data rate applications, including multi-media video streaming services, which are provided with xDSL service in fixed wired communication systems." This change roughly models all three considerations.

Change 3) Set all multicasting capacity requirements to zero. The discussion in ITU-R M.1768[68] states, "Examples of services that can be provided efficiently in mobile multicast transmission modes include mobile TV type services and low data rate messaging services." This change roughly models all three considerations.

After modification, SPECULATOR shows spectrum requirements summarized in Table 3. The results are dramatic. These modifications entirely remove the 2015 requirement for 800 MHz of additional spectrum.

[66] *See* p. 10 of Recommendation ITU-R M.1768, "Methodology for calculation of spectrum requirements for the future development of the terrestrial component of IMT-2000 and systems beyond IMT-2000," 2006.

[67] *See* p. 10 of Recommendation ITU-R M.1768, "Methodology for calculation of spectrum requirements for the future development of the terrestrial component of IMT-2000 and systems beyond IMT-2000," 2006.

[68] *See* p. 17 of Recommendation ITU-R M.1768, "Methodology for calculation of spectrum requirements for the future development of the terrestrial component of IMT-2000 and systems beyond IMT-2000," 2006.

Table 3: Modified SPECULATOR output showing sensitivity to changes in assumptions about i) video usage, ii) availability of spectrum above 3GHz, and iii) broadband alternatives.

Spectrum for RATG (in MHz)	Year 2010	Year 2015	Year 2020
RAT Group #1	200 MHz	240 MHz	160 MHz
RAT Group #2	0 MHz	220 MHz	540 MHz
Total	**200 MHz**	**460 MHz**	**700 MHz**

Note that we do not claim that wireless broadband providers will not need additional spectrum by 2015. The modifications made in this simple example represent an extreme case intended to demonstrate that numbers taken from spectrum estimation models should not be accepted at face value and extrapolated for different policy scenarios. Inputs and variables used for the calculations must therefore be subject to a rigorous assessment and robust technical and policy discussion. *To fully assess the future spectrum needs of wireless broadband, a thorough study focused on the United States is needed.*

E. Importance of video to future mobile broadband traffic

Demand projections commissioned by CTIA have focused solely on the need for licensed spectrum to meet projected growth, referring to unlicensed networks as an "unproven solution" due to technical and business difficulties and poor indoor coverage.[69] This conclusion ignores various market forces that could meet projected demand growth for broadband, particularly given the sizeable amount of spectrum made available for unlicensed, as well as licensed, applications in recent years. This incomplete assessment of future market forces is particularly flawed in failing to consider the role of broadcast TV for delivering video and which will substantially reduce the role that licensed wireless networks play in carrying mobile video content.

Video applications, including mobile TV, are expected to dominate the data traffic of mobile broadband networks. For example, Cisco Networks forecasts that by 2013 video will represent almost two-thirds of mobile data traffic (see Table 4).[70] Video transcoding company Ripcode derives a similar estimate.[71] Technology and media

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[69] *See* Rysavy Research, "Mobile Broadband Spectrum Demand," Dec. 2008, as submitted by CTIA as part of Written Ex Parte Communication, GN Docket No. 09-51, Sept. 29, 2009.

[70] *See* Cisco, "The Cisco Visual Networking Index Global Mobile Data Traffic Forecast Update (2009)," http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-520862.pdf. Table 1

[71] *See* C. Schuk, "Mobile video poised to outpace other mobile traffic," *Broadcast Engineering*, July 21, 2009, http://broadcastengineering.com/RF/mobile-video-poised-outpace-0721/index.html. ("Based on current rates of growth, transcoding company RipCode estimates that by 2013, two-thirds of all mobile traffic will be video.")

specialist Coda Research Consultancy forecast that mobile video traffic will reach over 450TB per month in 2015 and will represent almost two-thirds of video traffic.[72]

Table 4: Expected rise in mobile video applications

	2009	2010	2011	2012	2013
Percent of mobile traffic for Video	45.47%	51.93%	56.99%	60.42%	63.66%
Amount of video traffic carried (TB per month)	38,681	107,714	274,820	650,310	1,390,548

Source: Table 1, The Cisco Visual Networking Index Global Mobile Data Traffic Forecast Update (2009).

IV. Technology Evolution and Its Effect on Wireless Broadband Spectrum Needs

A. Technology evolution in cellular

The wireless broadband industry's claims for more spectrum inadequately take into account the greater efficiencies in spectrum utilization that can be achieved by new and improved cellular technologies. According to wireless industry legend Martin Cooper, the theoretical "practical capacity," defined as the total number of messages that can be sent over all spectrum over all parts of the world using the best available techniques, has doubled every 30 months.[73]

In order to increase the data rates and availability of wireless broadband in the United States, investment in cellular technological innovation is necessary. There are a number of emerging standards and technologies that may increase the system spectral efficiency of wireless systems deployed in the United States. Before spectrum need projections are finalized and disruptive spectrum reallocation decisions are made, the potential of these emerging technologies needs to be properly assessed.

Emerging Standards: A large number of emerging technologies are poised to improve the system spectral efficiency of wireless broadband systems. Some of these technologies have already found their way into emerging standards, while others are still areas of active research.

The deployment of wireless broadband in the United States is still in its infancy. Both T-Mobile and AT&T cover most of the U.S. population with EDGE and

[72] *See* Coda Research Consultancy, "US Mobile Traffic Forecasts: 2009-2015," Report Extract, 2009, http://www.codarc.co.uk/usmobiletraffic/us%20mobile%20traffic%20report%20extract.pdf

[73] *See* M. Cooper, "Personal communications and spectrum policy for the 21st century," *Telecommunications Policy*, 2007.

HSDPA/UMTS.[74] Verizon and Sprint each primarily use CDMA2000 EV-DO.[75] While these technologies facilitate the delivery of increased data services, there is growing interest in technologies that go beyond 3G systems such as mobile Worldwide Interoperability for Microwave Access (WiMAX) and 3GPP LTE. Mobile WiMAX has been deployed in limited areas around the United States, primarily by Clearwire[76], and LTE deployments are currently in limited trials.[77]

Despite the promise of LTE and mobile WiMAX, there is debate as to whether either technology can be deemed a true fourth generation (4G) system. Currently, most standardization work is focused on 4G wireless networks. The ITU IMT-Advanced criteria for 4G wireless are expected to specify the most widely considered definition.[78] IMT-Advanced systems must satisfy a variety of criteria in order to be certified.[79] Various technologies are expected to be considered, including 3GPP LTE-ADVANCED and mobile WiMAX 2.0.[80] Before allocating additional spectrum for wireless broadband access, it is important to determine how these technologies evolve and their implications for spectrum need for wireless broadband.

***Emerging Research Areas*:** In addition, a variety of new research areas are emerging that could further increase system spectral efficiency and reduce or obviate the need for spectrum reallocation. Current research focuses on a number of techniques that would potentially improve the spectral efficiency of wireless broadband systems. Here follows a brief overview and references for several possible technologies that could further enhance the system spectral efficiency of wireless broadband networks.

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[74] *See* T-Mobile, "Personal coverage check- Cell phone coverage maps for your calling coverage and service coverage areas," http://www.t-mobile.com/coverage/pcc.aspx?MapType=Data&WT.mc_n=3GMapCoverage&WT.mc_t=onsite. and AT&T, "AT&T Coverage Viewer: Cities supporting AT&T 3G/Mobile Broadband," http://www.wireless.att.com/coverageviewer/popUp_3g.jsp.

[75] *See* Verizon, "Coverage locator – Verizon Wireless," http://www.verizonwireless.com/b2c/CoverageLocatorController. and Sprint, "Sprint Business - Sprint mobile broadband coverage: Enter zip code," http://www.sprint.com/business/products/products/evdoEnterZip.jsp.

[76] *See* Clearwire Press Release, "Clearwire Reports Second Quarter 2009 Results," http://investors.clearwire.com/phoenix.zhtml?c=198722&p=irol-newsArticle&ID=1319734&highlight=.

[77] *See* Verizon Press Release, "Verizon Wireless Completes Successful LTE 4G Data Calls In Boston And Seattle," August 14, 2009, http://news.vzw.com/news/2009/08/pr2009-08-14f.html.

[78] *See* Vicki Livingston, "IMT-Advanced or "4G" Technologies Under ITU Consideration," *Market Wire*, http://www.reuters.com/article/pressRelease/idUS193250+08-Oct-2009+MW20091008.

[79] *See* ITU IMT-ADVANCED website, http://www.itu.int/ITU-R/index.asp?category=study-groups&rlink=rsg5-imt-advanced&lang=en.

[80] *See* Vicki Livingston, "IMT-Advanced or "4G" Technologies Under ITU Consideration," *Market Wire*, http://www.reuters.com/article/pressRelease/idUS193250+08-Oct-2009+MW20091008.

Network MIMO: Multiple-input multiple-output (MIMO) wireless systems use multiple antenna technology (leveraged at the base station and/or mobiles) and have been shown to provide substantial spectral efficiency improvements. While MIMO systems are included in LTE and WiMAX, more recent research has focused on advanced multicell MIMO systems.

Most systems today are focused on hierarchical cellular frameworks. In this configuration, a geographic region is divided into cells. Historically, these cells have very limited interaction and interfere with each other. Multicell MIMO systems allow the downlink and/or uplink of a wireless broadband system to be jointly processed across multiple base stations simultaneously.[81] This is a major innovation because performance criteria can now be optimized throughout several cells jointly. This gives advanced spatial diversity and can provide a large network throughput.

Work on network MIMO, which currently concentrates on theoretical analysis, shows substantial benefits. One study of network MIMO, evaluated using a full WiMAX indoor simulator,[82] showed mean throughput at least twice as large as that obtained using conventional frequency reuse.

User Cooperation: The standard wireless architecture employed today allows a mobile user to communicate only with the base station. However, research has consistently shown that network throughput can substantially increase if users are allowed to collaborate.[83] Collaboration can take a number of different forms. One of the first proposed collaborative schemes was relaying. More recently, ideas taken from wireline network coding have been proposed for use in wireless networks. A wireless network coded system applies ideas from coding theory to data packets. The application of wireless network coding to cellular systems, which is still a topic of research, could possibly be applied between users, between base stations, or at higher levels of abstraction throughout the network, thereby achieving greater spectral efficiency and reducing spectrum needs.

Femtocells: Femtocells represent a fundamental change in cellular architecture. An example of a femtocell is a small base station that uses some broadband technology (e.g., Ethernet or wireless LAN) for backhaul communication.[84] This kind of base station would have a small coverage area and would likely be deployed in homes or small businesses.

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[81] *See* J.G. Andrews, W. Choi, R.W. Heath, Jr., "Overcoming interference in spatial multiplexing MIMO cellular networks," *IEEE Wirelesss Communications*, vol. 14, pp. 95-104, Dec. 2007.

[82] *See* S. Venkatesan, H. Huang, A. Lozano, R. Valenzuela, "A WiMAX-Based Implementation of Network MIMO for Indoor Wireless Systems," *EURASIP Journal on Advances in Signal Processing*, 2009.

[83] *See* L. Le and E. Hossain, "Multihop Cellular Networks: Potential gains, research challenges, and a resource allocation framework," *IEEE Communications Magazine*, vol. 45, pp. 66-73, Sept. 2007.

[84] *See* V. Chandrasekhar, J. Andrews, and A. Gatherer, "Femtocell Networks: A survey," *IEEE Communications Magazine*, vol. 46, pp. 59-67, Sept. 2008.

Femtocells have the potential to dramatically increase capacity by leveraging the dual benefits of high-quality short-range links and improved frequency reuse. Because of their limited coverage, a geographic area could potentially support a high concentration of base stations.[85] Femtocell research is an active area with investigations focused on the mitigation of interference, the provision for quality of service over IP backhaul, and scalability.[86] Care must be taken when comparing femtocell throughput to standard cellular layouts because of the base station density.[87]

B. Technology for "new" bands

The FCC's Broadband Task Force appears to be focusing on frequency bands below 3.7 GHz. However, a rapid trend demonstrates that technology advances make possible the effective use of higher and higher spectrum bands. A number of different bands above 3.7 GHz may be viable future options (see Table 5) and should be investigated and considered for wireless broadband.

Table 5: Bands located above 3.7 GHz that could play a future role in wireless broadband access.

Band Location	4.9 GHz	5 GHz	28 GHz	38-40 GHz	60 GHz
Spectrum count (MHz)	50	555	1300	1400	7000

4.9 GHz: The 4940-4990 MHz band is allocated nationally for public safety broadband. This band has been mentioned for wireless backhaul. As pointed out by the Utilities Telecom Council, "While the band is intended for use to support crisis incidents with broadband limited area communications, some vendors are marketing equipment in the band as a low cost alternative to license backhaul."[88]

5 GHz: The U-NII band of unlicensed spectrum available in the 5 GHz band could provide 555 MHz of spectrum and is poised for more intensive use. The recently ratified IEEE 802.11(n) standard can utilize the 5 GHz spectrum and promises better performance, coverage, and features over existing IEEE 802.11b,g WLAN systems in the 2.4 GHz band.[89] Because of the large amount of bandwidth available and the adoption of a new WLAN standard, this band could play an important role in femtocell architectures.

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[85] Id.

[86] Id.

[87] *See* M.-S. Alouini and A.J. Goldsmith, "Area spectral efficiency of cellular mobile radio systems," *IEEE Transactions on Vehicular Technology*, vol. 48, pp. 1047-1066, July 1999.

[88] *See* Comments of Utilities Telecom Council, GN Docket Nos. 09-47, 09-51, 09-137, Oct. 23, 2009.

[89] *See* W. Rash, "802.11n: The Wi-Fi Revolution Nobody Noticed," *eWeek*, Nov. 19, 2009, http://www.eweek.com/c/a/Mobile-and-Wireless/80211n-The-WiFi-Revolution-Nobody-Noticed-517334/.

28 GHz: The 27.5-31.3 GHz band (often referred to as the local multipoint distribution service or LMDS band) is being used for the rollout of commercially viable fixed wireless access systems.[90] There has been increasing interest in this band for use as wireless backhaul.[91]

Several of the service categories discussed by the ITU are for stationary applications.[92] In line-of-sight settings, LMDS systems could fill the role for high speed fixed wireless. Despite the fact that there is still much uncertainty about how LMDS deployments will evolve, LMDS may fulfill some demand for future wireless broadband network traffic.

38-40 GHz: The 38.6-40 GHz spectrum band in the United States is an additional viable spectrum resource for wireless broadband. Much like the 60 GHz band[93], it has unique signal attenuation features that could allow a high level of frequency reuse.[94] IDT is leasing this spectrum for fixed, point-to-point wireless service.[95]

60 GHz: The 60 GHz band(s) is another potential source for broadband wireless access. 60 GHz systems operate between 57-64 GHz.[96] This large amount of unlicensed spectrum has primarily been considered as a candidate band for new wireless LAN systems. Recently, the Wireless Gigabit Alliance (WiGig) finished its technical specification for 60 GHz WLAN technology.[97] Moreover, the spectrum range for IEEE 802.16 activities and standards has already extended to frequencies as high as 66 GHz.[98]

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[90] *See* FCC, "FCC: Wireless Services: Local Multipoint Distribution Service: LMDS," http://wireless.fcc.gov/services/index.htm?job=service_home&id=lmds.

[91] *See* C. Gabriel, "IDT and Level 3 highlight new interest in LMDS for mobile backhaul," *4G Trends*, http://4gtrends.com/?tag=lmds

[92] *See* Recommendation ITU-R M.1768, "Methodology for calculation of spectrum requirements for the future development for the terrestrial component of IMT-2000 and systems beyond IMT-2000."

[93] *See* the discussion of the 60 GHz band, available in C. Park and T. S. Rappaport, "Short-Range Wireless Communications for Next-Generation Networks: UWB, 60 GHz Millimeter-Wave WPAN, and ZigBee," *IEEE Wireless Communications*, vol. 14, pp. 70-78, August 2007.

[94] *See* V. Kukshya, T. S. Rappaport, H. Izadpanah, G. Tangonan, R. A. Guerrero, J. K. Mendoza, and B. Lee, "Free-space optics and high-speed RF for next generation networks propagation measurements," in *Proc. IEEE Vehicular Technology Conference*, vol. 1, pp. 616-620, 2002.

[95] *See* IDT Spectrum, "IDT Spectrum Leasing & Equipment: How spectrum works for you," http://www.idtspectrum.com/howitworks.html.

[96] *See* P. Smulders, "Exploiting the 60 GHz Band for Local Wireless Multimedia Access: Prospects and Future Directions," *IEEE Communications Magazine*, Jan. 2002. And C. Koh, "The Benefits of 60 GHz Unlicensed Wireless Communications," http://www.terabeam.com/solutions/whitepapers/benefits-60ghz.php.

[97] *See* WiGig press release, "WiGig Alliance Announces Completion of its Multi-Gigabit Wireless Specification," Dec. 10, 2009, http://wirelessgigabitalliance.org/news/814/.

[98] *See* IEEE 802.16, IEEE Standard for Local and metropolitan area networks, Part 16: Air Interface for Broadband Wireless Access Systems, http://standards.ieee.org/getieee802/download/802.16-2009.pdf.

Systems operating at 60 GHz are subject to a variety of system attenuation challenges primarily related to oxygen absorption and rain.[99] However, the 60 GHz band might be a viable alternative for some of the application needs documented in the ITU spectrum estimation calculations.[100] Due to its signal attenuation properties, a 60 GHz system would allow a dense frequency reuse. It could facilitate improved system spectral efficiencies when combined with techniques such as femtocell systems.

The licensing requirements vary across the above bands. A common theme among the unlicensed bands listed above is involvement in femtocell deployment. Small cell sizes are especially suitable for densely populated areas such as office buildings and apartments. These lower power cells can leverage existing network infrastructure and improve system spectral efficiency by heavy frequency reuse.[101] Technology that lowers cell sizes has been cited by the Femto Forum and New America Foundation as a key factor in meeting future demand while decreasing costs.[102]

Leveraging femtocell and WLAN technology to offload wireless broadband demands off of larger cells using licensed spectrum is logical and spectrally efficient. Carriers may, in some sense, leave the last hop of network design up to the users.

Increasingly, carriers are considering these dual network strategies at the macro and micro levels to meet increasing traffic demands. To this end, carriers are employing strategies that seek to offload traffic from their macro 3G and 4G networks to micro networks using femtocells or WLAN networks. WLAN capabilities are increasingly being built into devices and carriers are increasingly establishing relationships with Wi-Fi providers or are operating WLAN networks to offload data traffic from their macro networks to these micro networks.[103] One carrier provides

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[99] *See* Terabeam, "Performance Characteristics of 60-GHz Communication Systems," http://www.terabeam.com/downloads/whitepapers/TB_60_Ghz.pdf.

[100] *See* Recommendation ITU-R M.1768, "Methodology for calculation of spectrum requirements for the future development for the terrestrial component of IMT-2000 and systems beyond IMT-2000."

[101] *See* Femto Forum press release, "Femto Forum Outlines Case for LTE Femtocells," May 20, 2009, http://www.femtoforum.org/femto/pressreleases.php?id=107.

[102] Id. ("In fact, an analysis of Cooper's law - which holds that wireless capacity doubles every 30 months – shows that the dominant factor in improvements to date has been the use of smaller cells as opposed to other methods such as revised modulation techniques, better coding or the use of more frequencies.") and M. Calabrese and B. Lennett, "Mobile Data Demand and the Need for Increased Spectrum Access," *New America Foundation*, Oct. 2009, http://www.newamerica.net/files/CalabreseLennett_MobileDataDemand.pdf. ("An insight that can be derived from the trends noted above is that the quantity of available spectrum is not by itself the most important factor in meeting projected mobile data demand. Most important is to shrink the effective size of the cell to the level of the home, business – and even to the individual.")

[103] *See* K. Fitchard, "The Magic of the Microcell," *Telephony Online*, Nov 3, 2009, http://telephonyonline.com/connectedplanet/news/magic-microcell-1103/. (AT&T's John Stankey, president and CEO of AT&T Operations, discusses AT&T's dual network strategy utilizing both licensed and unlicensed spectrum.)

discounted unlimited voice calling when a customer uses their WLAN home network to carry the voice traffic.[104] While it may be unclear how technology and business models will evolve to increase the use of these unlicensed technologies, carriers are planning for their use.

C. Broadband Convergence: Relationship between wireless and wireline

One of the great technological benefits that the United States has over most countries is its massive wired infrastructure. Wireline broadband systems, such as digital subscriber line (DSL), cable, and fiber optic systems, provide fast and reliable broadband options to millions of American customers. According to an April 2009 survey by the Pew Internet and American Life Project, 80-81% of Americans rely on wired connections.[105] Given the reliability benefits of wireline and existing infrastructure, any spectrum policy must take into account the availability and interaction with wired systems.

Of particular importance are fiber wireline networks that offer very high data rates (and the potential for future rate increases). Both fiber-to-the-home and fiber-to-the-node systems are available in the United States. According to one recent study, the number of fiber-to-the-home subscribers in North America is 5.3 million and is increasing by more than 1.5 million customers each year.[106] In addition, these fiber-to-the-home networks already pass 17.2 million homes and 15% of homes in North America.[107] Of particular note is the high rate at which AT&T U-Verse and Verizon FiOS networks continue to add customers. In the third quarter of 2009, Verizon added 198,000 net new FiOS internet customers[108] and AT&T U-Verse added 252,000 net new broadband customers.[109]

Wired broadband systems should play a critical role in future broadband deployment. Fiber links offer numerous advantages over wireless links.[110] There are a

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[104] *See* T-Mobile USA HotSpot Calling Service. More information available through http://www.t-mobile.com. and C. Ziegler, "T-Mobile goes national with HotSpot @Home WiFi Calling," *Engadget*, http://mobile.engadget.com/2007/06/27/t-mobile-goes-national-with-hotspot-home-wifi-calling/.

[105] *See* the Pew Internet and American Life Project, "Home Broadband Adoption 2009," at p. 21, http://www.pewinternet.org/~/media//Files/Reports/2009/Home-Broadband-Adoption-2009.pdf.

[106] *See* Fiber-to-the-Home Council, "North American Fiber to the Home Connections Surge Past Five Million," Sept. 29, 2009, *http://www.ftthcouncil.org/en/newsroom/2009/09/29/north-american-fiber-to-the-home-connections-surge-past-five-million*.

[107] Id.

[108] *See* Verizon press release, "Verizon Wireless and FiOS Growth Fuels Continued Strong Cash Flow," Oct. 26, 2009, http://investor.verizon.com/news/view.aspx?NewsID=1019.

[109] *See* AT&T press release, "Record Wireless Gains, Double-Digit Growth in IP-Based Revenues, Strong Cash Flow Highlight AT&T's Third-Quarter Results," http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=27290.

[110] *See* B. Mukherjee, "WDM optimal communication networks: Progress and challenges," *IEEE Journal on*

number of different ideas about how government policy can encourage more fiber deployments.[111] If the penetration of fiber-to-the-home increases, a number of problems related to spectrum could also be solved. Deploying in-home femtocell and Wi-Fi networks that communicate through these fiber links could provide high rate wireless broadband with small cell sizes and extensive frequency reuse.

High speed broadband access delivered by cable companies is also integral to the United States broadband market. According to National Cable and Telecommunications Association statistics, cable high-speed internet passes 121.4 million homes.[112] The introduction of the latest cable high speed internet standard Data-Over-Cable Service Interface Specifications (DOCSIS) 3.0 supports 160 Mbps or higher downstream and 120 Mbps or higher upstream data rates.[113] According to analysis by one firm, DOCSIS 3.0 will be available to 99% of U.S. homes passed by high-speed cable networks by 2013.[114]

V. Broadcasting: Uniquely Situated to Meet High Data Rate Video and Data Download Demands Now and in the Future

A. Broadcast: Ideally suited for wireless

In a wireless broadcasting system, a common signal is transmitted to all users. Broadcast systems typically have no uplink (though the convergence of wireless technologies may allow for multi-standard devices to be employed) and distribute the same data using all available resources (i.e., resources such as time, frequency, power, etc. are not divided among the users).

In contrast, a wireless unicasting system typically sends a different data stream to each user. Unicasting systems normally have an uplink and divide resources among users. These systems normally require control and other signaling overhead necessary to control the interaction and communication with multiple users.

Unlike a wire, a wireless transmission is not spatially localized. Depending on the antenna and propagation characteristics, a wireless transmission can cover a

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Selected Areas in Communications, vol. 18, pp. 1810-1824, Oct. 2000.

[111] *See* N. Thompson, "The Need for Speed: Why is the United States still waiting for the future to download?," *Washington Monthly*, http://www.washingtonmonthly.com/features/2009/0905.thompson.html.

[112] *See* National Cable and Telecommunications Association, "Availability," http://www.ncta.com/StatsGroup/Availability.aspx.

[113] *See* CableLabs press release, "CableLabs® Issues DOCSIS® 3.0 Specifications Enabling 160 Mbps," Aug. 7, 2006, http://www.cablelabs.com/news/pr/2006/06_pr_docsis30_080706.html.

[114] *See* T. Spangler, "Report: DOCSIS 3.0 To Blanket U.S. By 2013," *Multichannel News*, May 1, 2009, http://www.multichannel.com/article/231033-Report_DOCSIS_3_0_To_Blanket_U_S_By_2013.php.

substantial geographic area. In unicasting, the broadcast nature of wireless is often an impediment because of the interference created to users and neighboring cells. Typically, the unicasting rate available to any one user decreases as the number of users increases due to issues such as scheduling and interference. In wireless broadcasting, the system is designed to leverage the broadcast nature of wireless for highly efficient content distribution. The broadcasted signal is independent of the number of other users receiving the same signal.

B. IP over broadcast

Technological improvements to the national broadcast network go beyond traditional video distribution. The country's current broadcast network can be usefully characterized as an almost 20 Mbps fat pipe downlink that covers virtually all of the United States. Through this downlink, a variety of content could be distributed using datacasting. Datacasting has a number of applications.[115] New developments have focused on using IP data transmission over terrestrial broadcast for datacasting.[116]

One example of a datacasting service is the datacasting network of National Datacast.[117] In this system, a network of over-the-air broadcasters can send out content (not limited to video) over a wide area through the DTV signal. This data can then be stored on datacasting DTV receiving equipment for later retrieval.

C. Benefits of mobile broadcasting

Recent innovation in broadcast technology has resulted in the rapid development and adoption of the ATSC Mobile DTV Standard. This mobile standard allows large audiences to view real-time video without any of the network issues associated today with real-time video. Broadcasters can deploy ATSC Mobile DTV in their existing 6 MHz bands with relatively modest equipment costs.[118]

The deficiencies of wireless broadband delivery for real-time video have been widely experienced at sporting events and other large events. During the January 2009

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[115] *See* S. A. Valcourt, "Datacasting as a Public Network Service," in *Proc. International Conference on Broadband Networks*, Oct. 2005 and VBox Communications, "Welcome to the new world of datacasting," http://www.vboxcomm.com/datacasting.htm.

[116] *See* W. Lei, G. Gagnon, H. Liu, and A. Vincent, "IP Over Terrestrial ATSC DTV Channels: Performance Evaluations on Data Transmission Throughput," *IEEE Transactions on Broadcasting*, vol. 52, pp. 121-128, June 2006.

[117] *See* National Datacast, "How it works," http://www.nationaldatacast.com/pages/how-it-works.htm.

[118] *See* MobiTV, "ATSC-M/H: The Promise of Free to Air Mobile Simulcast," http://www.mobitv.com/technology/whitepapers/ATSC.PDF. (Estimates the cost of $70k to add a mobile simulcast) and M. Perez, "Mobile TV Gets Big Push," *Information Week*, Jan. 9, 2009, http://www.informationweek.com/news/personal_tech/TV_theater/showArticle.jhtml?articleID=212701642&subSection=All+Stories. (Cites an approximate cost of $250,000 to add mobile DTV capabilities to existing transmission stations.)

inauguration of President Obama, reports documented that cell phone users experienced a variety of difficulties despite carriers' efforts to boost capacity. The broadcast MediaFLO system did not suffer any of these issues.[119] Both MediaFLO and ATSC Mobile DTV are designed to broadcast, in real-time, widely viewed programs, breaking news, sports, and special events to large audiences.

ATSC Mobile DTV systems deliver a high quality video for viewing on a mobile screen. Like broadcast television, most programming is expected to be available for free (in addition to some subscription and for-purchase programming).[120] Unlike the ATSC A/53 signal, ATSC Mobile DTV was designed specifically to deal with the mobile effects (e.g., doppler shift).[121] The standard adds a variety of physical layer enhancements to allow mobile reception in a variety of propagation environments.[122] In fact, peak mobile speeds can be up to 300 km/hour.[123] Since battery consumption is a major challenge in streaming video, the ATSC Mobile DTV Standard also has several battery saving features including power cycling and time-slicing.[124]

The ATSC Mobile DTV Standard has a number of application layer features to improve the viewing experience. The system has features such as an electronic program guide and viewer tracking with Nielsen information.[125] The interactive nature of the application layer can support datacasting that could be used for a number of applications (e.g., traffic information, visual radio, sports scores, Homeland Security and National Weather Service alerts, etc.).[126] More improvements for second generation mobile DTV are already being developed.

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[119] *See* M. Reardon, "FLO TV gets high marks on Inauguration Day," *CNET News*, Jan. 21, 2009. http://news.cnet.com/8301-1035_3-10147468-94.html.

[120] Initial trials of mobile DTV will be available to anyone with receiving equipment. However, note that the ATSC Mobile DTV Standard allows for subscription service. *See* ATSC press release, "ATSC ADOPTS MOBILE DIGITAL TV STANDARD," Oct. 16, 2009, http://www.atsc.org/communications/press/2009-10-16-ATSC_approves_mobile_dtv.php.

[121] *See* ATSC, "Proposed Standard: ATSC-Mobile DTV Standard, Part 1 – ATSC Mobile Digital Television System (A/153 Part 1:2009)," Sept. 10, 2009, p. 12, http://www.atsc.org/standards/cs_documents/a153-2009-09-10/S4-130r16-A153-Part-1-ATSC-M-H.pdf. (Final Standard Publication Pending).

[122] Id.

[123] *See* J. Adrick, "ATSC M/H System Implementation," http://www.oab.org/cffm/custom/PDFs/Jay%20Adrick%20presentation.pdf.

[124] *See* ATSC, "Proposed Standard: ATSC Mobile DTV Standard, Part 2 – RF/Transmission System Characteristics (A/153 Part 2:2009)," Sept. 10, 2009, p. 65, http://www.atsc.org/standards/cs_documents/a153-2009-09-10/S4-131r17-A153-Part-2-RF-Transmission.pdf. (Final Standard Publication Pending).

[125] *See* J. Adrick, "ATSC M/H System Implementation," http://www.oab.org/cffm/custom/PDFs/Jay%20Adrick%20presentation.pdf.

[126] Id.

D. Broadcast is a natural and spectrally efficient complement to wireless broadband

The transmission of video over wireless broadband networks can be very taxing and consume a large portion of the system capacity. The broadcast transmission of video provides numerous benefits from a system capacity perspective. A single broadcast video stream can be efficiently designed to cover a large geographic area.

Another benefit of over-the-air broadcast television is that the data stream is there "for free." No uplink transmission is required to tell the broadcast system to transmit a particular program at a particular time. In order to allow a mobile user to watch a show at his/her leisure, digital video recording (DVR) technology can be employed. TiVO offers a device that combines broadband and OTA broadcast content.[127] Sezmi Corporation also combines OTA television with content from cable and Internet connectivity for niche programming.[128] Assuming hard drive technology continues to evolve, users will be able to record larger and larger amounts of broadcast video and watch the video in a high quality format at their leisure.

When a mobile device can support both broadcast reception and wireless broadband transmission, this opens up a number of new possible research and implementation areas of interest. User demands for a common video stream (e.g., users watching television coverage at a football game) can quickly overwhelm a wireless broadband system. Users with a device that supports both mobile broadcast video and wireless broadband could avoid this crisis by only using the broadcast feed. A smart device (or system) could dynamically recognize what is the "best" downlink distribution for any data request. This could allow a wireless broadband system to offload video data rate demands to the broadcast network and use the available network throughput for other applications.

In addition, future technology may enable hybrid video transmission.[129] One application would be a video stream being received from over-the-air broadcast and augmented with extra side information received over a wireless broadband link. When the video decoder combines both data streams together, a much higher quality video would result.

It is also critical to take into account the future uses of broadcast television spectrum. As user demand for high quality mobile video increases, future

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[127] *See* TiVO, "HDTV over the air: Free high-definition antenna signals," http://www.tivo.com/whatistivo/overtheairhd/index.html.

[128] *See* Reply Comments Of Sezmi Corporation NBP Public Notice # 6, GN Dockets No. 09-47, 09-51, 09-137, Nov. 13, 2009, http://fjallfoss.fcc.gov/ecfs2/document/view?id=7020348536.

[129] *See* C.H. Liew, S. Worrall, M.A. Mota, A. Navarro, "Hybrid WiMAX and DVB-H Emulator for Scalable Multiple Descriptions Video Coding Testing," in *Proc. IEEE International Symposium on Consumer Electronics*, June 2007. (See the DVB-H discussion)

improvements in resolution, image quality, and video technology may necessitate increased broadcast data rates.

One of the most intriguing emerging formats is three-dimensional (3D) television. Various groups, including the Society of Motion Picture and Television Engineers (SMPTE)[130] 3D@Home Consortium [131] and CEA[132] are actively pursuing 3D television efforts. Broadcasting 3D TV may require approximately 1.5 to 2 times the data rate.[133] When looking at future demand for over-the-air television, broadcasting spectrum estimation needs should consider that next generation broadcasting technology will likely incorporate 3D.

There is also much interest in 3D television for handhelds and mobile devices. Initial work has been conducted to modify the South Korean T-DMB standard to support 3D television.[134] The European Union (EU) has two projects addressing 3-D mobile television research.[135] The MOBILE3DTV project is primarily focused on the delivery of 3-D video over DVB-H.

As another example, ATSC is studying the delivery of 3-D content via over-the-air digital broadcast television.[136] While it is unclear what specifications will emerge, it is highly probable that any system would require a sizable increase in data rate to support. The work by Gotchev et al.[137] discusses either using stereo video (V+V) transmission or video and depth (V+D) transmission. For high quality video, the additional video or depth stream would have to be conveyed as overhead.

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[130] *See* SMPTE Engineering Work Statement, 3D Home Display Formats, http://www.smpte.org/standards/meeting_schedule/3dtf_mtg_details/Approved_TF_3D_2008-0703.pdf.

[131] *See* 3D@Home website, http://www.3dinthehome.org/.

[132] *See* CEA, "R4 WG16 3D Technologies," http://www.ce.org/Standards/CommitteeDetails.aspx?Id=000011074016.

[133] *See* M. Forman, A. Aggoun, and M. McCormick, "A Novel Coding Scheme for Full Parallax 3D-TV Pictures," *in Proc. IEE International Conference on Acoustics, Speech, and Signal Processing*, vol. 4, April 1997 and J. D. Sutter, "3-D Television Expected to Come to Homes in 2010," *CNN*, http://www.cnn.com/2009/TECH/09/18/3D.home.television/index.html.

[134] *See* S. Cho, N. Hur, J. Kim, K. Yun, S.-I. Lee, "Carriage of 3D Audio-Visual by T-DMB," in *Proc. IEEE International Conference on Multimedia and Expo*, July 2006.

[135] *See* MOBILE3DTV Website, http://sp.cs.tut.fi/mobile3dtv/ and 3DPhone website, http://www.3dphone.org/.

[136] *See* M. Grotticelli, "SCTE and ATSC explore 3-D program delivery," *Broadcast Engineering*, March 2, 2009, http://broadcastengineering.com/news/scte-atsc-explore-program-delivery-0302/ .

[137] *See* A. Gotchev, A. Smolic, S. Jumisko-Pyykkö, D. Strohmeier, G.B. Akar, P. Merkle, N. Daskalov, "Mobile 3D television: Development of core technological elements and user-centered evaluation methods toward an optimized system," in *Proc. IST/SPIE Conference on Electronic Imaging*, vol. 7256, 2009.

VI. Conclusions

Ubiquitous, free, and local broadcast television plays vital social, public safety, economic and technical roles in the United States. Spectrum policy decisions must not short-change or short-circuit the growing importance of broadcast digital television as part of the foundation needed for a diverse and economically robust wireless broadband industry. With regulatory stability, continued investment and innovation will make digital broadcast television and related services a potent complement to other broadband systems.

This paper has presented a data-based perspective on the current public policy discussion on the wireless broadband "spectrum crisis." Although some would argue that a large amount of additional spectrum is needed over the next few years to meet demand projections for wireless broadband, the target number of 800 MHz of additional required spectrum is highly speculative and does not stand up to serious scrutiny. As demonstrated in this paper, the 800 MHz number, based on a 2006 ITU spectrum study, is overly sensitive to assumptions about future broadband demand and how that demand will be served by the larger broadband services eco-system (which can and should include digital broadcast, wireless LAN technologies, and wired solutions). Assumptions made in the ITU study favor cellular technologies and show a need for 800 MHz of additional spectrum by 2015. If these assumptions are modified to reflect video demand being serviced by systems better suited to deliver it (e.g., digital broadcast, wire and fiber, wireless LAN, and/or femtocells with ultra-high frequency reuse), then the same ITU methodology predicts that almost no additional spectrum is needed by the cellular industry.

Additionally, the study underlying the 800 MHz number attempts to model wireless spectral efficiency over time as though it were linearly improving at a modest rate. Past experience shows that spectral efficiency improvements occur as step changes enabled by paradigm-shifting innovations, which are impossible to predict. This is evident in looking at the past history of spectral efficiencies in mobile wireless communications, which jumped in steps upon the introduction of innovations such as the cellular concept and frequency reuse, the introduction of digital modulation, cell splitting and sectorization, code-division multiple access (CDMA), orthogonal frequency division multiple access (OFDMA), and MIMO antenna systems. These "step-change" innovations have all occurred because cellular systems researchers have had to put a premium on spectral efficiency motivated by its relative scarcity. In fact, as described in Section IV, a number of technologies are emerging that could alleviate or obviate the need for more spectrum. Even more telling, significant portions of spectrum presently allocated to cellular systems may not be fully utilized. Further improvements in cellular spectral efficiency will only be delayed if cellular system spectrum is over-provisioned.

Lastly, broadcasting offers the optimal solution for delivery of bandwidth-intensive applications such as video to large numbers of users in the same geographic area. It is superior to the current unicast solutions of the cellular industry by orders of magnitude. If spectrum is truly scarce, then broadcasting is an essential complement to

other mobile broadband technologies. Thus, if future spectrum policy precludes a role for digital television broadcast in delivery of broadband video and multimedia, it will no doubt be required to "reinvent the wheel" in only a very short time.

As policymakers attempt to assess and address the alleged spectrum "crisis", it is imperative that better estimates be obtained, which are properly based on U.S. industry projections and demand studies. In fact, it is appropriate to undertake a comprehensive examination of the full range of spectrum that can be used for advanced wireless applications, including both licensed and unlicensed bands. Fostering competition in wireless broadband requires an economically viable, innovative, and dynamic wireless digital broadcast industry in competition with emerging broadband 3G/4G cellular, advanced wired Internet access such as FiOS and U-Verse, and continued improvements in wireless LAN technologies.

APPENDIX A

Instructions for modifying SPECULATOR tool used to demonstrate capacity requirements' role on spectrum requirements

All modifications to SPECULATOR will be done directly in the worksheet. No modifications will be done to the macros. The SPECULATOR tool was treated as a black box. The examination did not attempt to change any of the mathematical modeling. Our goal was only to modify the file enough to allow us to see the effect of capacity requirement changes on predicted spectrum needs.

The modifications change the capacity requirement for service categories SC1, SC2, SC6, SC7, SC11, SC12, SC16, and SC17 to zero. The modifications also change the multicast system capacity requirements to zero. Note that these modifications are only an approximate way of accounting for the effect of video on the spectrum requirement and the availability of spectrum above 3 GHz. The unicast and multicast service categories that are zeroed can carry data other than video signals. The effect of these modifications demonstrates the sensitivity of the ITU model.

Steps:

1) Download the SPECULATOR tool from http://www.itu.int/oth/R0A06000010/en
2) Open the SPECULATOR tool in Excel
3) For both the PSCapacity_calculation and CS-CapacityCalc worksheets go to Tools then Protection then Unprotect Sheet…
4) In the PSCapacity_calculation worksheet, the tables are entered as numbers and not generated as equations. To do this, we will have to reenter the equations.
    a. For columns B through AK on row 144, enter =max(COLUMN124:COLUMN143) into the cell in row 144 and column COLUMN (where COLUMN is B,C,….,AK)
    b. For columns B through AK on row 173, enter =max(COLUMN153:COLUMN172) into the cell in row 173 and column COLUMN (where COLUMN is B,C,….,AK)
    c. For columns B through AK on row 205, enter =max(COLUMN185:COLUMN204) into the cell in row 205 and column COLUMN (where COLUMN is B,C,….,AK). Note: we will zero this out, so it is not necessary to make this change.
    d. For columns B through AK on row 234, enter =max(COLUMN214:COLUMN233) into the cell in row 234 and column COLUMN (where COLUMN is B,C,….,AK). Note: we will zero this out so it is not necessary to make this change.
    e. For columns B through AK on row 265, enter =max(COLUMN245:COLUMN264) into the cell in row 265 and column COLUMN (where COLUMN is B,C,….,AK)

f. For columns B through AK on row 294, enter =max(COLUMN274:COLUMN293) into the cell in row 294 and column COLUMN (where COLUMN is B,C,….,AK)
g. In columns B through M on row 48, enter =COLUMN144 in the cell in row 48 at column COLUMN (where COLUMN is B,C,….,M)
h. In columns B through M on row 49, enter =N144 through =Y144, respectively, in the cells on row 49 in columns B through M.
i. In columns B through M on row 50, enter =Z144 through =AK144, respectively, in the cells on row 50 in columns B through M.
j. In columns B through M on row 61, enter =COLUMN173 in the cell in row 61 at column COLUMN (where COLUMN is B,C,….,M)
k. In columns B through M on row 62, enter =N173 through =Y173, respectively, in the cells on row 62 in columns B through M.
l. In columns B through M on row 63, enter =Z173 through =AK173, respectively, in the cells on row 63 in columns B through M.
m. In columns B through M on row 101, enter =COLUMN265 in the cell in row 101 at column COLUMN (where COLUMN is B,C,….,M)
n. In columns B through M on row 102, enter =N265 through =Y265, respectively, in the cells on row 102 in columns B through M.
o. In columns B through M on row 103, enter =Z265 through =AK265, respectively, in the cells on row 103 in columns B through M.
p. In columns B through M on row 114, enter =COLUMN294 in the cell in row 114 at column COLUMN (where COLUMN is B,C,….,M)
q. In columns B through M on row 115, enter =N294 through =Y294, respectively, in the cells on row 115 in columns B through M.
r. In columns B through M on row 116, enter =Z294 through =AK294, respectively, in the cells on row 116 in columns B through M.

5) In the PSCapacity_calculation worksheet, enter 0 in the cells B74-M74, B75-M75, B76-M76, B87-M87, B88-M88. B89-M89. This zeros out the multicast packet switched system capacity requirement for RATG1 and RATG2.
6) In the PSCapacity_calculation worksheet, enter 0 in the cells B134-AK134, B135-AK135, B139-AK139, and B140-AK140. This zeros out the rows corresponding to SC11, SC12, SC16, and SC17.
7) In the PSCapacity_calculation worksheet, enter 0 in the cells B163-AK163, B164-AK164, B168-AK168, and B169-AK169. This zeros out the rows corresponding to SC11, SC12, SC16, and SC17.
8) In the PSCapacity_calculation worksheet, enter 0 in the cells B255-AK255, B256-AK256, B260-AK260, and B261-AK261. This zeros out the rows corresponding to SC11, SC12, SC16, and SC17.
9) In the PSCapacity_calculation worksheet, enter 0 in the cells B284-AK284, B285-AK285, B289-AK289, and B290-AK290. This zeros out the rows corresponding to SC11, SC12, SC16, and SC17.
10) In the CS-CapacityCalc worksheet, enter 0 in the cells B98-AK98 and B127-AK127. This zeros out the circuit switched multicast capacity requirements.

11) In the CS-CapacityCalc worksheet, enter 0 in the cells B17-AK17, B18-AK18, B22-AK22, B23-AK23. This zeros out the capacity requirements for SC1, SC2, SC6, and SC7.
12) In the CS-CapacityCalc worksheet, enter 0 in the cells B46-AK46, B47-AK47, B51-AK51, B52-AK52. This zeros out the capacity requirements for SC1, SC2, SC6, and SC7.
13) In the CS-CapacityCalc worksheet, enter 0 in the cells B138-AK138, B139-AK139, B143-AK143, B144-AK144. This zeros out the capacity requirements for SC1, SC2, S6, and S7.
14) In the CS-CapacityCalc worksheet, enter 0 in the cells B167-AK167, B168-AK168, B172-AK172, B173-AK173. This zeros out the capacity requirements for SC1, SC2, S6, and S7.
15) The final spectrum requirements will be shown on worksheet Adjs&AggSpectrum in the table called Final Spectrum Requirements.

BEFORE

Final Spectrum Requirements (MHz)			
Spectrum for RATG	year 2010	year 2015	year 2020
RAT Group #1	**840**	**880**	**880**
RAT Group #2	**0**	**420**	**840**

AFTER

Final Spectrum Requirements (MHz)			
Spectrum for RATG	year 2010	year 2015	year 2020
RAT Group #1	**200**	**240**	**160**
RAT Group #2	**0**	**220**	**540**

APPENDIX B

Broadcast Television Spectrum Count

The details on how the broadcast television spectrum in the range 225 – 3700 MHz was obtained are below:

Exclusive television bands
512-608 MHz and 614-698 MHz for a total of 180 MHz (or 180/3475 = 5.18%)

Shared television bands
470-512 MHz and 2025-2110 MHz for a total of 127 MHz (or 127/3475 = 3.65%)

Total broadcast television bands = 307 MHz

ATTACHMENT B:

NAB'S COMMENTS IN THE FEDERAL TRADE COMMISSION'S NEW MEDIA WORKSHOP

BEFORE THE
FEDERAL TRADE COMMISSION
WASHINGTON, D.C.

FROM TOWN CRIER TO BLOGGERS:
HOW WILL JOURNALISM SURVIVE
THE INTERNET AGE?

NEW MEDIA WORKSHOP COMMENT
Project No. P091200

COMMENTS OF THE NATIONAL ASSOCIATION OF BROADCASTERS

JANE E. MAGO
JERIANNE TIMMERMAN
SCOTT GOODWIN

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November 6, 2009

Summary

Our local television and radio broadcasters and national broadcast networks occupy a central role in the nation's media ecosystem. The content and advertising competition produced by new media on the Internet and other new platforms have challenged news organizations in all sectors, including broadcasting. This challenge is particularly acute in light of today's sustained economic downturn.

In this new, highly competitive marketplace, it remains clear that broadcasting plays a sustaining role in local communities that is not being displaced by new media. Broadcasting continues to be the most trusted medium. It has earned that trust through decades of covering not only the high-profile events that drive the blogosphere, but the lower profile, day-to-day events that have broad impact in local communities. It has earned that trust by its leadership in emergency journalism, in which it is a lifeline for communities dealing with emergencies. And it provides a unique blend of national and local news coverage by virtue of the national-local partnership of the network-affiliate relationship.

Even as the broadcast industry economizes, it has deployed innovative new digital and Internet technologies to better reach viewers and listeners. Broadcasters are deploying new digital technologies, multiplying channel capacity in both television and radio, and making possible new mobile television services. They are providing essential platforms for community conversation on their Web sites, deploying iPhone and other mobile applications, and using social media platforms to interact more pervasively with their communities.

Policymakers should ensure that decisions assessing markets and policies take into account the overwhelming competition and diversity that exists in today's local media marketplace and should be cognizant of the dangers of imposing asymmetric regulation upon competitors. New and varied competitors to broadcast outlets have emerged, and the government should consider whether legacy regulations from a previous era now impede the ability of local broadcasters to continue to compete and to serve their viewers and listeners.

Before the
FEDERAL TRADE COMMISSION
Washington, D.C.

From Town Crier to Bloggers: How Will Journalism Survive the Internet Age?	)	Project No. P091200
New Media Workshop Comment	)	

Comments of the National Association of Broadcasters

Introduction

The National Association of Broadcasters ("NAB") represents the nation's television and radio broadcasters and broadcast networks. The more than 15,000 television and radio broadcast stations in the United States serve their communities of license through public service, local news, entertainment programming, and vital community information. Engaging in national and local journalism and acting as a lifeline during times of crisis is second-nature to television and radio broadcasters, who have thrived through repeated sea changes in technology and weathered every economic crisis since the Great Depression.

The Notice correctly points out that the content and advertising competition produced by the Internet and other new technologies has significantly challenged news organizations in all sectors, including broadcasting.[1] New technologies have produced dramatically increased competition for viewers' and

[1] *Public Workshops and Roundtables: From Town Crier to Bloggers: How Will Journalism Survive the Internet Age?,* Notice Announcing Public Workshops and Opportunity for Comment (September 30, 2009) (the "Notice").

listeners' attention and for advertisers' dollars. This challenge is particularly acute in light of today's sustained and profound economic downturn.[2] These secular and economic challenges have forced broadcasters across the United States to do more with fewer resources. Broadcasters are increasing their newsgathering efficiency with the creativity and dedication to community service that characterizes our industry.

Even as we economize, however, the technological developments fostered by the Internet have provided innovative new tools for reaching viewers, from online to mobile. The broadcasting industry is in the vanguard of deploying these technologies for the benefit of our communities. Even as technologies proliferate and our audiences seek content from a diversity of sources, broadcast journalism continues to occupy a central place in the local and national journalism ecosystems — particularly in times of emergency and crisis.

As we describe in these comments, we believe the government can best help our industry and the communities it serves by developing a new understanding of the relentless national and local competition that characterizes our markets, and the dangers of asymmetric regulation of directly competitive marketplace participants.

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[2] *See BIA Lowers TV Station Revenue Forecast,* RADIO BUSINESS REPORTS/TELEVISION BUSINESS REPORTS, http://www.rbr.com/tv-cable/15543.html (July 1, 2009); *21 Percent Ad Decline Projected for Radio,* RADIO INK (July 13, 2009); Storm, Jonathan, *Economic Tailspin Batters Local TV,* PHILADELPHIA INQUIRER (May 20, 2009).

I. Broadcasting Continues to Occupy a Central Position in the Local and National News Ecosystems Even as Internet Content and Advertising Engenders New Competition.

Notwithstanding the sea changes provoked by the Internet and related digital technologies and the intense competition for advertising revenue among all types of traditional and online media, local television and radio continues to play essential roles in the media landscape that are not being displaced by online content providers. Broadcasting is the most trusted medium in the United States and is one that undertakes challenges that no other medium, new or old, is taking on. This trust and credibility are earned by broadcasters who are consistently covering day-to-day news events that matter to local communities and who are the essential first-informers of the media world when crises threaten their communities.

Broadcasting is Uniquely Trusted. A nationwide survey released in September 2009 by the Pew Research Center for the People and the Press found that "television remains the dominant news source for the public," with 64 percent of respondents reporting that they receive most of their local news from television and 71 percent of respondents reporting that they receive most of their national and international news from television.[3] Despite the unquestioned inroads made by Internet sources for news and information, 44 percent of respondents reported that local television stations "do the most to uncover local news stories," and favorability ratings of local television news (73 percent) and national network news (64 percent)

[3] The Pew Research Center for the People & The Press, PUBLIC EVALUATIONS OF THE NEWS MEDIA: 1985-2009, PRESS ACCURACY RATING HITS TWO DECADE LOW, p. 4 (September 12, 2009).

remain at the top of all media.[4] This is consistent with other measures of media credibility, which consistently show that respondents rank radio and television above online media and other sources.[5]

Broadcast Journalists Cover the Daily Lives of their Communities. This trust has been earned over decades of news coverage, but of course it could be lost or displaced by new competitors very quickly. A bedrock source of broadcasters' credibility in local journalism is the role of television and radio in reporting on the day-to-day life of the communities broadcasters serve. Broadcast journalists provide vibrant, competitive news coverage in local markets — not only of the high-profile news that merits comment in the blogosphere, but of the essential but low-profile news that emerges from city council meetings, zoning hearings and enterprise journalism about local officials and businesses. Broadcasters certainly face increasing competition for local viewers from specialized blogs and Web sites that focus on specific issues of concern to their writers (and, of course, face dramatic new competition for advertising dollars from new Internet sources such as search advertising, a category that did not exist only a few years ago). But there are few online sources of news and information that aspire to cover the plethora of broad, day-to-day issues that communities demand from their local

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[4] *Id.* at 4, 11. Interestingly, local television news is not seen as partisan. Unlike many channels of information, local television news is seen as favorable by both Republicans (79 percent) and Democrats (77 percent). *Id.* at 12.

[5] *See, e.g., Survey: Americans Increase Use of Online and Radio News Sources; Daily Newspaper and Television Use Drops* (ARAnet, September 24, 2009).

broadcasters. Broadcasters also provide additional, unique community service, including billions of dollars annually of free air time for public service announcements and funds raised for charities, other local civil organizations and causes, disaster relief, and needy individuals.[6]

A Commitment to Emergency Journalism Distinguishes Broadcasters in the Media Ecosystem. A unique element of broadcasting's role in local markets, which undoubtedly contributes to the credibility that broadcast journalism has earned from its audience, is its leading role in emergency journalism. Broadcasters are the first-informers of the local media ecosystem, and they can be a lifeline for communities dealing with disasters, weather emergencies and other crises. As just a few examples:

- When a mine collapsed in Crandall Canyon, Utah, taking the lives of six miners and three first responders, journalists at Station KSL(AM), Salt Lake City, Utah, stayed on the job to produce wall-to-wall coverage of the emergency response, dozens of hours of special news programming, and nearly 80 additional newscasts.
- In the wake of Hurricane Katrina, 13 local radio stations banded together to continue broadcasting news, information about missing people, and other crucial content to New Orleans residents and first responders on Station WWL(AM), New Orleans. Television broadcasters WWL-TV and WDSU(TV) continued broadcasting despite the disaster by using transmitters in Baton Rouge, Houston and elsewhere.
- When the Interstate Highway 35 bridge over the Mississippi River collapsed in Minneapolis, television and radio stations remained on the air for days without advertising as the missing were identified

[6] NAB's last comprehensive survey of radio and television broadcasters' community service in 2006 demonstrated that local radio and television stations provided over $10.3 billion in community service in the previous calendar year. NAB, *National Report on Broadcasters' Community Service* (June 2006).

and the community dealt with the loss of life and critical infrastructure.

- When wildfires threatened listeners' homes in California, local radio stations in fire-ravaged areas provided up-to-the-minute, real-time information around the clock and, in many cases, made available feeds of their 24-hour coverage to other stations to relay to listeners in nearby geographic areas.

Other examples of broadcasting's unique role in emergency journalism occur daily in communities across the United States. This role is particularly acute during tornadoes, hurricanes and other weather emergencies, in which radio and television broadcasters play essential roles in warning communities of impending conditions, assisting in evacuation and emergency relief efforts, and reporting on the aftermath of weather emergencies. Online communications play an important role in supplementing broadcasting's role in emergency matters, of course.[7] But no Internet source has stepped up to provide seamless, up-to-the-second coverage of weather emergencies and crises as has broadcast emergency journalism. The blogosphere can add flavor to the life of our communities, to be sure, but our actions in reporting on fast-moving crises can *save* lives.

Broadcasters' life-saving work also is demonstrated by their pioneering of the AMBER Plan (America's Missing: Broadcast Emergency Response). Originally created in 1996 by the Association of Radio Managers with the assistance

[7] In fact, an Internet streaming agreement between broadcasters and Yahoo! after Hurricane Katrina made the signals of New Orleans stations available in other communities in and around Louisiana, Mississippi and Texas, extending the geographic reach of broadcasters reporting on recovery and evacuation efforts.

of law enforcement agencies across the Dallas/Forth Worth area, there are now 120 state, local and regional plans, credited with the recovery of 492 abducted children.[8]

Finally, we note that television and radio broadcasts can be received on widely available battery-operated devices — devices that remain available and reliable in times of dire emergency when other information sources often overload or fail. These devices often are the sole source of crucial information in times of crisis. This combination of a massive and reliable point-to-multipoint distribution system available on mature, inexpensive and readily available mobile devices distinguishes broadcasters from other news-producing media.

The National-Local Partnership Fostered by the Network-Affiliate Relationship Benefits Local Journalism. Another crucial element that distinguishes broadcast journalism is its unique ability to combine local and national coverage of events that affect the lives of viewers. American broadcasting is unique because of the national/local partnership created by the network-affiliate relationship, which combines the "efficiencies of national production, distribution and selling with a significant decentralization of control over the ultimate service to the public."[9] Because of this partnership in both television and radio broadcasting, local

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[8] Please see www.broadcastpublicservice.org for dozens of additional examples and a state-by-state breakdown of the ways in which broadcasters serve their local communities through emergency journalism and other locally oriented services.

[9] H. Rep. No. 100-887, 100th Cong., 2d Sess. 20 (1988). "[C]onsiderable credit for its existence must go to the framework in which it is broadcast – a framework formed by the national programming networks . . . [and local stations'] synergy of local and national offerings." *Report on Competition, Rate Deregulation and the Commission's Policies Relating to the*
(continued…)

events that become of interest to the nation can be instantly covered across the United States, and high-quality coverage of national events that are important to local communities is available instantaneously to communities large and small across the country. This broad-based combination of national and local journalism has no analogue, to our knowledge, in the new-media sphere.

Overall, broadcast journalism continues to occupy a valuable role in the local and national media ecosystems that is not being displaced by Internet journalism. It competes for advertising and audience with all other information providers in local and national markets, including newspapers (and their Web sites), local magazines (and their Web sites), local blogs and other local Internet content, as well as national sources for advertising (including search).[10] But the role of broadcast journalism is uniquely valuable and should be fostered in the new environment.

II. The Broadcasting Industry Is Using New Digital Technologies to Continue to Innovate in Broadcast Journalism.

The evolution of the broadcasting industry continues to heighten our ability to report effectively on the communities we serve. Digital technologies

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Provision of Cable Television Service, MM Docket No. 89-600, 5 F.C.C. Rcd. 4962, 5037 (1990).

[10] As is well known, the Internet has caused profound changes in the advertising marketplace. The shift in advertising dollars toward the Internet and away from traditional print and broadcast media has been extensively documented. *See, e.g.,* Brian Stelter, *Ad Losses Put Squeeze on TV News*, NEW YORK TIMES (May 11, 2009); Stephanie Clifford, *A Look Ahead at the Money in the Communications Industry*, NEW YORK TIMES (Aug. 4, 2009); Joe Mandese, *Online Ad Spending Rises at Double-Digit Rates, Gains Share Vs. All Other Media*, MEDIAPOST (July 6, 2009); Joe Mandese, *Revised Forecast Predicts Internet Will Be Only Medium To Grow Ad Dollars This Year*, MEDIAPOST (April 14, 2009).

transform all industries, and broadcasting is no exception. The television industry has just completed an historic transition from analog to digital broadcasting, which will provide enhanced flexibility to create new and innovative services to provide information and entertainment programming to local communities.[11] The radio industry is now implementing digital broadcasting with an innovative in-band, on-channel technology that permits dramatically higher-quality audio and additional channels of digital programming without displacing current receivers, thus permitting greatly increased program diversity.[12] In addition, and as described below, broadcasters are of course embracing Internet technologies and are using these technologies in innovative ways to serve their audiences. It is a measure of the resilience of the broadcasting industry that these significant improvements in

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[11] One opportunity created by the digital transition is the advent of "multicasting" — the ability of a television broadcast station to use its single digital channel to offer multiple programming streams. Broadcasters can use this capability to offer otherwise unavailable programming, such as sporting events, classic movies and local programming, including news. For example, in the New York City market, WNBC has launched "New York Non-Stop," an all local news and public affairs channel that is carried on its 4.2 subchannel. Similarly, in Eugene, Oregon, KEZI-TV uses one of its subchannels to air original local news and weather programming around the clock. Additionally, some stations have chosen to intersperse locally oriented programming into network multicast programming, just as they do on their primary channels. KGO-TV in San Francisco, for example, airs daily showings of "View from the Bay," a local news, lifestyle and entertainment program. And in Los Angeles, where many stations air new foreign language programming, including news, on their subchannels, KABC-TV airs the local public affairs show "Eye on LA" daily on one of its multicast channels. *See also* Greppi, Michelle, *A Sports Menu for Digital Channels: NBC's Universal Sports Aims to Fill Stations' Subchannels*, TELEVISION WEEK, Dec.1, 2008; *see also* Lieberman, David, *Old shows could find new life in digital TV: Upcoming shift in broadcasting opens door to multicast networks*, USA TODAY, Aug. 14, 2008, at 3B.

[12] There currently are 1,950 digital HD Radio stations broadcasting across the country.

public service are occurring despite increasing competition and the pressures of the current economic downturn.

An essential feature of local broadcast journalism is mobility, which is increasingly important to viewers and listeners. This is particularly essential in times of crisis, when communities rely on emergency journalism provided by broadcast journalists. Radio is the quintessential mobile medium, with hundreds of millions of portable receivers around the United States. Television, too, is mobile. On October 15, 2009, the Advanced Television Systems Committee adopted a standard for Mobile DTV broadcasting to handheld devices, and this technology now is being launched in commercial tests across the United States. This new digital technology will provide unsurpassed benefits to viewers — not only in satisfying the demand for mobility in daily life, but in increasing personal safety and security in times of crisis by making emergency journalism available when service disruptions on wired, satellite and even cellular systems make communications difficult.

Broadcasters are, of course, deploying innovative Web and mobile tools to more comprehensively serve their communities. Broadcast station Web sites that were once passive promotional opportunities for television and radio stations are now broad-based multimedia platforms that include video, user-generated content, and special features created solely for the Web.[13] Broadcasters incorporate a

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[13] *See, e.g.*, *NBC Local Site Strategy Sees Soaring Sessions,* MEDIAWEEK, Nov. 4, 2009 (NBC's launch of hyper-local Web sites with a local portal approach in each of its broadcast markets has resulted in page views increasing 296 percent); WRAL.com, http://www.wral.com (last visited Nov. 3, 2009) (accompanying breaking news coverage of (continued…)

variety of interactive devices into their Web sites to engage and expand their audiences.[14] Blogs, in particular, allow broadcasters to supplement on-air coverage,[15] reporters to add extra information and provide personal insights,[16] and on-air personalities to connect with viewers in a less formal context.[17] Live webcams offer up-to-the-minute traffic and weather information. Broadcasters also utilize mobile sites, iPhone and Blackberry applications, and RSS feeds to connect with an increasingly tech-savvy audience.[18] They employ social media, such as Facebook, Twitter, and YouTube, to pervasively interact with their local communities, and they increasingly build social media features into their own

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ex-governor campaign finance investigation with interactive timelines, live blog updates, and live web streaming of hearings).

[14] NBC adopted an interactive strategy in ten of its major markets, allowing users to react to current events by selecting from a list of six emotions. NBC aggregates and incorporates users' moods into its home page, demonstrating how "locals are" feeling about certain stories. *See*, *e.g.*, Jim Iovino, *Tech Issues Cripple Metro Services, MoCo Traffic Lights*, NBCWASHINGTON.COM, Nov. 4, 2009, http://www.nbcwashington.com/news/local-beat/Big-Problems-for-Metro-69066202.html (indicating "locals are furious about Metro glitch").

[15] Several stations use blogs to provide the "stor[ies] behind the headlines." *See, e.g.*, Wayne Havrelly, *Chatting with the Prince*, KGW REPORTERS' BLOG, Apr. 5, 2009, http://beloblog.com/KGW_Blogs/reporters.

[16] For example, blogs provide anchors a "chance to voice opinions [they] can't normally share in the newscast." *See* Mark Curtis, *We all fell for it*, MARK CURTIS BLOG, Oct. 20, 2009, http://www.azcentral.com/members/Blog/MarkCurtis/65510.

[17] One anchor has developed a blog to discuss "whatever's on his mind." *See* Mike Hart, *Balloon Boy "Grounded,"* FROM THE HART, Oct. 15, 2009, http://www.turnto23.com/from-the-hart.

[18] Gray Television, for example, has launched 27 iPhone applications in its local markets nationwide. *See also NBC Local Site Strategy, supra* n. 13 (each local portal is also available as an iPhone application).

sites.[19] Additional content from interviews and news stories that might not fit into a linear newscast is available on the Web, and Web sites often include in-depth coverage of local events, such as high school sports[20] and other community activities.[21] The incorporation of user-generated content into broadcasters' sites multiplies the impact of citizen journalists through broader and more effective platforms for their content, contributions, and views.[22] These technological advances provide new opportunities for broadcasters to connect to their communities.

New technologies are infusing newsgathering as well. Broadcasters of all sizes are deploying multimedia journalists (sometimes called "MJs" or "backpack journalists"), who cover local or even neighborhood events with video and the written word, often composing and editing their story on a laptop and transmitting it back to the station for posting via Skype or WiFi.[23] Digital video and audio

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[19] *See, e.g.*, News10.net: Sacramento California: Live Online, http://www.news10.net/news/liveonline (last visited Nov. 3, 2009) (allowing users to create screen names and personal profiles and add other members as "friends" through the Live Online portion of a broadcaster's website).

[20] *See, e.g.*, WOWT High School Sports, http://www.wowt.com/highschoolsports (last visited Nov. 5, 2009).

[21] Many broadcasters' Web sites include community calendars to inform the public of upcoming local events. *See e.g.* Community Calendar, http://cbs2chicago.com/calendar (last visited Nov. 5, 2009).

[22] *See e.g.*, *WLWT's u Local*, http://ulocal.wlwt.com (last visited Nov. 3, 2009) (providing a "u Local" section on broadcaster's website for users to share photos, video, and stories).

[23] *See, e.g.*, Paul Fahri, *WUSA Moves to One-Person News Crews*, WASHINGTON POST Dec. 12, 2008, at C01. (discussing Gannett station WUSA's transition to multimedia journalists). WUSA employs thirteen "digital correspondents" compared to eight "anchors;" WUSA9.com: Meet the Team, http://www.wusa9.com/company/bios (last visited Nov. 3, 2009).

streaming technologies that were not available just a few years ago, such as LiveStream, are permitting live video broadcasts without the need for satellite or microwave trucks; these technologies are not only cost-efficient but can permit live feeds to be transmitted from areas that could not accommodate the gear needed for a traditional remote feed.

Because of increased competition and the economic downturn, this multitude of new technologies and media is being deployed largely by an industry that has not been able to hire significantly to accomplish these new tasks. In addition, market-based combinations among broadcast stations are artificially restrained by legacy ownership regulations.[24] Accordingly, local news joint ventures are being formed in some markets under which stations "pool" photographers for certain assignments.[25] These arrangements, built on the less formal pooling arrangements that many stations have implemented to cover court hearings and other venues where only one camera is permitted, allow two or more stations to share footage of commodity news events such as press conferences. The arrangements permit broadcasters to deploy increasingly scarce resources for highly demanded enterprise journalism, rather than for redundant coverage of commodity events.

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[24] *See* 47 C.F.R. § 73.3555 (2008).

[25] *See* Paul Fahri, *The Story out of 3 Area TV Stations: They'll Create News-Sharing Service,* WASHINGTON POST, May 22, 2009, at C01 (discussing plans for three Washington news stations, WRC, WTTG, and WUSA, to follow Philadelphia and Chicago models for "pooling" news-gathering resources, including sharing helicopters and live footage).

III. Government Can Assist in Sustaining Local Journalism By Ensuring that its Policies Recognize the New Marketplace And Regulate Market Participants Symmetrically.

The Notice asks whether new policies for tax treatment, copyright, antitrust and public funding are appropriate to assist local news. The overarching contribution that government can make, however, does not require a change in statutory law. It is ensuring that decisions assessing markets and policies take into appropriate account the overwhelming competition and diversity that exists in local markets today as a result of multiple modes of communications. Television and radio broadcasters compete with a plethora of traditional media and new-media market participants, from newspapers and local bloggers to national search engines increasingly marketing advertising services in local markets. The effect of this competition should be considered in policymaking and in considering specific proposed business arrangements among media outlets.

Government also should be cognizant of the significant costs of asymmetric regulation — imposing regulatory costs and restrictions on some marketplace participants, while leaving others unencumbered by regulation. The imposition of significant structural and behavioral regulation on one type of competitor can result in increasingly scarce capital flowing to non-regulated market participants rather than regulated industries. Government policy can directly influence private investment, and it should be an aim of government to foster, rather than impede, investment in beneficial industries such as television and radio broadcasting. We suggest no subsidy or direct government benefit here, but only

suggest that direct competitors be treated more symmetrically for purposes of regulation. As the Internet floods local and national markets with entirely unregulated competitors with potentially enormous market strength, it is appropriate for government to consider whether legacy regulations from a single-platform era continue to be relevant in a multiple-platform media ecosystem.

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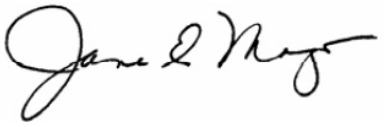
The NAB appreciates the Commission's attention to this important topic, and looks forward to the December workshops.

Respectfully submitted,

NATIONAL ASSOCIATION OF BROADCASTERS

By: 

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