Before the
National Telecommunications and Information Administration
Washington, D.C. 20554

In the Matter of:	)	
	)	
Development of a National Spectrum Strategy	)	Docket 230308-0068
	)	
	)	

COMMENTS OF
THE NATIONAL ASSOCIATION OF BROADCASTERS

I. INTRODUCTION

The National Association of Broadcasters (NAB)[1] hereby submits comments in response to NTIA's Request for Comments (RFC) in the above captioned matter.[2] While NAB appreciates NTIA's efforts to collect stakeholder opinions on the scope and content of a National Spectrum Strategy, the RFC's failure to include broadcasting as a primary focus for a forward-looking spectrum strategy is shortsighted and worrisome. For over a century, broadcasting has furthered a vast array of national policy goals including competition, diversity, localism, and public safety. Tens of millions of Americans, including elderly, rural, and minority and underserved populations heavily rely upon broadcasting, both radio and television, for news, entertainment, and a critical connection to their local communities. Broadcasting remains crucial for its efficient delivery of *free* services with near-universal

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[1] The National Association of Broadcasters (NAB) is the nonprofit trade association that advocates on behalf of free local radio and television stations and broadcast networks before Congress, the Federal Communications Commission and other federal agencies, and the courts.

[2] *Development of a National Spectrum Strategy*, Request for Comments, Docket Number 230308-0068, 88 Fed. Reg. 16244 (March 16, 2023) (RFC).

reach and with high levels of resilience in times of crisis. A U.S. National Spectrum Strategy that does not recognize and reflect the importance and value of the broadcast industry to the economy and to our common culture is frankly no "strategy" at all.

II. NTIA SHOULD NOT PICK WINNERS AND LOSERS

NAB is troubled by the omission of broadcasting from the list of "spectrum reliant services and missions" in the RFC.[3] Despite the "including, but not limited to" qualification in the RFC, the appearance is that certain applications are being singled out for favorable consideration while others are tacitly disfavored. Broadcast radio and television informs, educates, and entertains, while providing vital public information, particularly in emergency situations. Because it is the only platform that offers *free* communications directly with citizens, it promotes social cohesion, inclusion, and national identity. Broadcasting delivers national and local news at a time when hundreds of local newspapers have shuttered their doors or drastically reduced their staff, and tens of millions of Americans live in counties with either no local newspaper or only a weekly paper with a limited staff.[4] These functions are critically important for the health and stability of our democracy. Accordingly, any worthwhile National Spectrum Strategy must consider the spectrum allocated for broadcasting – both for linear delivery and for contribution, distribution, and other auxiliary services – as a vital component of a healthy spectrum and communications ecosystem, rather than as an afterthought to wireless broadband, space-based systems, advanced transportation technologies, and the litany of other services mentioned in the RFC.

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[3] RFC at 4.

[4] Penny Abernathy, "The State of Local News," Northwestern University's Medill School of Journalism (June 29, 2022) available at: https://localnewsinitiative.northwestern.edu/research/state-of-local-news/report/.

Over-the-air television is a significant and important user of spectrum below 1 GHz. The National Broadband Plan recognized that:

> "Over-the-air television continues to serve important functions in our society. It delivers free access to news, entertainment and local programming, and provides consumers an alternative video service to cable or satellite television. It is the only such service to a segment of the population that either cannot afford paid television or broadband services or cannot receive those services at their homes currently. Over-the-air television also serves numerous public interests, including children's educational programming, coverage of community news and events, reasonable access for federal political candidates, closed captioning, and emergency information. Through broadcasting generally and broadcast television specifically, the FCC has pursued longstanding policy goals in support of the Communications Act, such as localism and diversity of views."[5]

Those policy goals remain as important as ever and a National Spectrum Policy must not pick spectrum winners and losers. In particular, a National Spectrum Policy should not assume *sub silentio* that other wireless delivery systems will supersede broadcast. There is no plan nor any assurance that such a transition will ever occur, and a loss of broadcast spectrum or a further degradation of broadcast service will come directly at the expense of those who are least able to afford other options. Just as importantly, there is no evidence that *any* service will step into the local news vacuum that would be created if broadcasting were to fail.

III. FIRST, DO NO HARM

NAB emphasizes that a successful spectrum strategy must first avoid doing further harm to the broadcasting ecosystem and the public that it serves. Avoiding further degradation or interference not only to broadcasters' primary spectrum but also to auxiliary spectrum on which broadcasters rely must be at the core of any policy considerations

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[5] Federal Communications Commission, "Connecting America: The National Broadband Plan," p. 89 (2010) (citations omitted).

concerning the allocation and use of spectrum that historically has been used by broadcasters for delivery and distribution of content and services. This principle goes beyond technical compatibility in allotments and assignments and must include full compensation to incumbent users for any required changes to operations or equipment. Regulatory stability is key to innovation and investment, and policy changes that harm the broadcast industry will jeopardize its public and commercial value and its ability to retain and increase that value in the future.

This principle is particularly important as television broadcasters are engaged in a technological transition – the upgrade from the ATSC 1.0 to the ATSC 3.0 transmission standard – that will allow them to improve the primary service they offer to the viewing public while also paving the way for innovative new uses of broadcast spectrum. The last thing broadcasters can afford as they invest in their facilities to improve a free over-the-air service to the public is uncertainty regarding the stability of their spectrum footprint or interference environment.

IV. PILLAR #1 – SPECTRUM PIPELINE

Capacity *vs.* Spectrum needs. NAB agrees that a process is needed for identifying spectrum bands for study to help meet future requirements, both federal and non-federal. A precondition to actually allocating or assigning additional spectrum is ascertaining whether there is actually a need for more spectrum as opposed to greater capacity within existing spectrum resources. Because spectrum is inexhaustible but limited, a National Spectrum Policy must ensure that users do not view spectrum as the sole or primary means of meeting future capacity requirements. The Shannon-Hartley theorem states that channel capacity increases directly with bandwidth (spectrum), but also increases logarithmically with signal-to-

noise ratio.[6] This means that the capacity of many wireless systems can be increased through network densification, which reuses the same spectrum within a geographic area, by incorporating modulation and coding technologies that leverage increased signal-to-noise ratios, as well as by additional spectrum.[7]

Wireless traffic has grown faster than new spectrum allocations and that "most of this capacity uplift has been due to more intensive reuse,"[8] not by more spectrum. As Bell Labs' President pointed out a decade ago, "[t]he only way I get to do 100 times [increased capacity] is to go close, re-use that spectrum in small cells, use all the capacity and spectral efficiency for small user groups. That must be the way. ...[T]he only way to address that physical limit problem is to invest in small cells."[9] The economic tradeoffs between infrastructure, technology, and spectrum are complex, but NAB respectfully submits that the first step in determining whether additional spectrum should be cleared, allocated, or shared for new use most be a robust analysis demonstrating a *bona fide* need for additional spectrum that cannot reasonably be satisfied in other ways. Without that analysis, there is a risk that policymakers will default to the lowest cost alternative of throwing additional spectrum resources at favored technologies.

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6 Ted Myers, "Back to Basics: The Shannon-Hartley Theorem," ingenu (July 21, 2016), available at: https://www.ingenu.com/2016/07/back-to-basics-the-shannon-hartley-theorem/?doing_wp_cron=1681685119.8174901008605957031250.

7 Richard N. Clarke, "Expanding Mobile Wireless Capacity: The challenges presented by technology and economics," Telecommunications Policy (2013).

8 *Id.*

9 Steve Costello, "Bell Labs chief touts small cells as "the only answer" for network crunch," (2014) (Nov. 18, 2014) available at: https://www.mobileworldlive.com/bell-labs-chief-touts-small-cells-answer-network-crunch.

Occupancy Measurements. Industry and government claims of spectrum use should be subject to verification. On a number of occasions, NTIA has measured occupancy across various spectrum bands in various locations.[10] Other entities, including Microsoft and the Illinois Institute of Technology established fairly long-term programs to monitor spectrum occupancy in certain locations. NAB suggests that such programs of occupancy monitoring should be an important means of obtaining independent data on spectrum use, potentially identifying unused or underused spectrum bands that may be suitable for sharing or inclusion in a spectrum pipeline. Such monitoring could be done at reasonable cost by assembling and characterizing off-the-shelf equipment to verify its proper operation and placing it at federally owned facilities in key cities. Such a program would also help document increasing levels of environmental RF noise, a significant policy problem discussed in more detail below.

Short-term Broadcasting Spectrum Needs. Over the next three years, radio and television broadcast spectrum needs are expected to remain relatively unchanged but more intensely utilized. Television broadcasters are focused on a transition from the existing transmission format (ATSC 1.0) to NextGen TV (ATSC 3.0). During this transitional period, some additional transmitters may be activated or repurposed within the existing allocated VHF and UHF spectrum bands used to provide service over the air (OTA) directly to the public. That is, no additional spectrum needs for OTA reception are expected, but the coverage and interference footprints within those allocations may change to avoid loss of service to existing viewers. Thus, it is critical that policymakers retain the existing broadcast channel assignment structure to allow the modest flexibility necessary to facilitate and ultimately complete the

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[10] *See, e.g.*, Chriss A. Hammerschmidt; Heather E. Ottke; J. Randy Hoffman, "Broadband Spectrum Survey in the Denver Area," NTIA Technical Report TR-13-496 (Aug. 2013).

transition to a more capable transmission standard that allows broadcasters to significantly enhance their service to the public *without additional spectrum resources*.

With respect to spectrum used for the contribution and distribution of content, some spectrum bands used for electronic news gathering (ENG) are expected to become increasingly congested, limiting or reducing sharing opportunities for new and existing systems. For example, the lower and upper portions of the band 2025–2110 MHz used primarily for ENG are becoming increasingly unusable due to out-of-band emissions from advanced wireless systems (AWS) operating in adjacent bands. FCC enforcement to mitigate this interference has been nearly non-existent despite licensee complaints and FCC field investigations confirming the interference.[11] As AWS licensees complete buildouts and densify deployments, the resulting interference is likely to force broadcast uses away from the band edges toward the center of the band with greater density of use. Additionally, the 2025–2110 MHz band is presently being shared with three types of military systems in a number of locations on a coordinated basis, with the Department of Defense having already spent over $500 million to transition systems into the band.[12]

In the 6 GHz bands used for contribution and distribution of broadcast content,[13] the FCC has authorized uncoordinated unlicensed operations that are predicted to cause

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[11] *See, e.g.*, Letter and Informal Complaint against Cellco Partnership dba Verizon Wireless, from Tom W. Davidson to Bruce Jacobs, Chief Spectrum Enforcement Division, FCC, (March 4, 2015).

[12] NTIA, Commercial Spectrum Enhancement Act – Annual Progress Report for 2021, at 23 (Oct. 2022).

[13] 6425–6525 MHz and 6925–7125 MHz.

unmitigable interference to ENG systems under some conditions.[14] The likelihood of interference increases with the number of unlicensed devices in operation. At present, unlicensed Wi-Fi-6-E devices are just coming into common consumer and enterprise use but industry projections suggest that widespread use — and therefore potentially widespread interference — will accelerate over the next three years.[15] The combined pressures of sharing and interference at 2 and 6 GHz are expected to exhaust limited ENG capacity in these bands.

Medium term. Over the next several years, television broadcasters hope to complete the transition to ATSC 3.0. While broadcasters are largely attempting to complete the transition within their existing spectrum footprint, there may be situations where additional spectrum could be helpful — even on a temporary basis — to ensure a smooth transition for viewers. For example, the use of vacant television channels in a given market could help broadcasters preserve ATSC 1.0 services for viewers who have not yet upgraded their equipment to be ATSC 3.0-compatible as broadcasters densify ATSC 3.0 facilities in that market. While this would not require a new spectrum allocation, it would require allowing broadcast stations to gain access to unused vacant channels in the market. Policymakers should also consider how access to spectrum in other bands can help broadcasters unlock the full potential of ATSC 3.0 to the benefit of viewers across the nation.

Long term. As ATSC 3.0 matures, NAB expects field contribution quality will need to rise to keep pace with viewer expectations. Presently, ENG systems operating in the 2025–2110 MHz band can routinely provide high-definition (1080i) video in an operating bandwidth of

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[14] Alion Consulting Report RESED-20-002, "Analysis of Interference to Electronic News Gathering Receivers from Proposed 6 GHz RLAN Transmitters" (Oct. 2019).

[15] Wi-Fi Alliance, "Wi-Fi momentum in 2022," (March 15, 2022), available at: https://www.wi-fi.org/beacon/the-beacon/wi-fi-momentum-in-2022 .)

about 6 MHz. Because ATSC 3.0 is expected to provide consumer service in Ultra-high definition (UHD, 4K) format, the existing spectrum allocations for ENG may be unable to continue to support the present number of simultaneous broadcast users. As discussed previously, increasing levels of interference from AWS out-of-band emissions are making the upper and lower edges of that band unusable. Technological improvements, including more efficient source-coding and channel-coding techniques, may mitigate needs for greater spectrum, but this cannot be guaranteed and long-term planning should assume additional spectrum allocations for ENG will be required to offset losses due to interference. Approximately 24 MHz of additional spectrum may be required in the long term in spectrum proximate to the present 2 GHz allocation to offset increased interference and density of use.

V. PILLAR #2 – LONG TERM SPECTRUM PLANNING

NAB believes that updated regulatory requirements and enforcement of existing requirements with regard to spurious and other unnecessary emissions are key to long-term spectrum planning. Smart regulation and enforcement can help mitigate the need for additional spectrum allocations by reducing necessary power levels and thereby make more effective use of existing spectrum allocations. NAB suggests that a National Spectrum Strategy must address noise emissions and interference aggressively and expeditiously, consistent with proper management of the RF spectrum. Failure to do so risks devaluing spectrum and drowning users in a sea of noise. Modern spectrum management traces its origins to the interference chaos that threatened to destroy nascent radio services in the early 20th century. An unsustainable interference environment prompted Congress to establish an agency (originally the Federal Radio Commission, now the FCC) responsible for maximizing the utility of the radio spectrum for the benefit of the public. The worsening RF noise problem threatens to recreate the very disorder that Congress sought to eradicate.

NAB has found that RF noise is caused largely by the proliferation of cheap and simple electronic designs with little or no regulatory oversight or enforcement. At the same time, as the shift of radio communication systems from analog to digital increases, in many cases, susceptibility increases of communications systems to such noise interference. While digital communications systems improve spectrum efficiency by packing more bits into a given bandwidth using compression, this also magnifies any interference effects when the signal is decompressed for use, thus increasing the care that must be taken in limiting interfering signals such as noise. Further, because reception of digital signals is generally "all or nothing," meaning that reception shifts from perfect to non-existent over a narrow range of signal level or interference, digital signals are often more fragile than analog signals.

Conventional wisdom is that digital radio technologies today tend to be more robust than their analog predecessors. While it is true that many digital systems can operate closer to the noise floor than their analog counterparts, a rising noise floor offsets that advantage, and underscores the need for oversight and enforcement over the long term.[16]

VI. PILLAR #3 – TECHNOLOGY DEVELOPMENT

Spectrum Sharing. Broadcasters have been willing to share their allocated spectrum under reasonable conditions and will continue to be constructive when opportunities for sharing are presented. However, sharing opportunities must not upend existing spectrum allocations and must clearly delineate primary versus secondary uses with clear levels of precedence that are rigorously enforced. Further, sharing must be balanced. When sense-and-avoid technologies are used to facilitate sharing, sensing levels must be commensurate with

[16] Coontz-McAllister, Megan and Littman, Laura and Cook, John, "Radio Spectrum Pollution: Facing the Challenge of a Threatened Resource," Silicon Flatirons Center, (Jan. 21, 2014).

the signal levels of the systems being protected. For example, Wi-Fi was selected for sharing in portions of the 6 GHz band with the assurance that its energy detection capability would detect and avoid interference with broadcast ENG systems. Wi-Fi has a nominal sensing (LBT) level of -60 dBm, which is several orders of magnitude above the threshold operating level of most ENG systems. Thus, on its face the sensing system designed to protect primary spectrum users is plainly inadequate. Successful sharing must be based on facts and sound engineering, not overly optimistic assumptions.

Policymakers should also consider how best to provide strong incentives for more intensive sharing or for relocation of existing users. Repacking and spectrum compression has historically been based on providing equivalent capabilities, but this policy does not provide strong incentives for existing users to embrace sharing. A spectrum policy that seeks to increase the efficiency and intensity of use is hamstrung by the present *quid pro quo* shift of an existing technology to a different frequency. As a result, existing users know that, *at best*, they will wind up with the same capabilities they have today following relocation or accommodation of new users. Policymakers should instead look for opportunities to leverage technological improvements so that incumbent users will have improved and more capable systems. This approach can provide existing users with stronger incentives than pure exchanges of existing capabilities.

Sustainable Technologies. Many believe that climate change poses the greatest existential threat to future human generations. If that is the case, policymakers cannot turn a blind eye to energy demands associated with one-to-one technologies. Increasing mobile internet subscribers will lead to higher and higher levels of energy consumption.

Policymakers should consider how spectrum policy can reduce or cabin energy consumption through “green” approaches that balance device energy use, infrastructure

needs, coding improvements and better battery technologies. While the viewing or listening device is typically responsible for the largest part of the overall carbon footprint, the energy requirements of the associated infrastructure vary dramatically with technology. In particular, energy requirements to support data centers and wireless networks to transmit a video program are much greater than for a broadcast station serving the same area.[17] Broadcasting's uniquely efficient one-to-many network architecture may offer options for serving viewers the content they demand with greater efficiency.

Roadblocks to Technological Evolution. To encourage innovation and investment, a smart spectrum strategy will seek to ease or eliminate roadblocks to adopting new technologies – particularly those that allow the potential for increased spectrum efficiency. This has been U.S. policy for over forty years,[18] but it has been applied only in a handful of cases and usually ignored. As discussed above, television broadcasters are in the process of upgrading their transmission technology. This upgrade will allow broadcasters to provide new and innovative services to consumers within the same spectrum footprint broadcasters have today. ATSC 3.0 will allow broadcasters to use their existing spectrum significantly more efficiently to improve their service.

Unfortunately, legacy regulations required broadcasters to seek permission from the FCC to begin to deploy this technology, and broadcasters will continue to need regulatory approvals and accommodations throughout the transition. Other industries in the communications space, including industries that compete with broadcasters for eyes, ears, and mindshare, face materially lower regulatory barriers to investment and innovation. A

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[17] ITU-R Working Party 6C, "Webinar on Energy Aware Broadcasting," (March 23, 2022).

[18] 47 U.S.C. § 157.

National Spectrum Strategy should consider not just how to make additional bands available and how to encourage additional sharing, but also how greater regulatory parity can create the right conditions for increased efficiency by encouraging new technology transitions.

VII. CONCLUSION

NAB appreciates the opportunity to provide comments on a potential National Spectrum Strategy. We urge NTIA to take a holistic view of the spectrum needs of different industries in the communications landscape, rather than to pick winners and losers at the outset by assuming away the spectrum needs of some industries, including broadcasting. That is particularly the case given that broadcasting in many cases competes with industries that NTIA apparently and incorrectly assumes have better claims to be considered core constituents in national spectrum policy. Broadcasting can and should play an important role in enhancing spectrum efficiency, competition, and innovation.

Respectfully submitted,

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