Before the
National Telecommunications and Information Administration
Washington, DC 20230

In the Matter of	**)**	**Docket No.**
	)	
Advancement of	**)**	**NTIA-2024-0001**
6G Telecommunications Technology	**)**	

COMMENTS OF

PUBLIC KNOWLEDGE
AND
OPEN TECHNOLOGY INSTITUTE AT NEW AMERICA

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<u>TABLE OF CONTENTS</u>

SUMMARY

6G technology stands poised to evolve our digital ecosystem and enhance our use of AI

technologies and communications networks.[1] As detailed by the Next Generation Mobile

Networks's (NGMN) "6G Use Cases and Analysis," a team of mobile operators, technology

suppliers, and academic advisors predicted that 50 6G use cases will emerge in the next decade.[2]

These use cases were categorized into four classes: enhanced human communication, enhanced

machine communication, enabling services, and network evolution.[3] This includes emerging

technologies from "immersive experience, telepresence & multi-modal interaction" among

humans and "high accuracy location, mapping, environmental, or body sensing data," along with

widespread AI services and the potential for ubiquitous network coverage.[4]

It is critical that as these emerging technologies become fully integrated into daily life –

from artificial intelligence and virtual/augmented reality, to telehealth and virtual education

applications – they are properly supported by a 6G network ecosystem that provides affordable

access for everyone. Done properly, the roll out of 6G can become a road to digital inclusion. But

without proper preparation for the rollout of 6G technology, the nation's digital divide will only

widen. Public Knowledge ("PK") and the Open Technology Institute at New America ("OTI")

submit these comments in response to the National Telecommunications and Information

Administration's ("NTIA") Request for Comment seeking input to inform the "Advancement of

6G Telecommunications Technology." PK and OTI urge the NTIA to implement policies that

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[1] As discussed below, our wireless future will depend not only on 6G, but on unlicensed/shared spectrum such as WiFi 7.
[2] Next Generation Mobile Networks' (NGMN), "6G Use Cases and Analysis," (Feb. 2022) https://www.ngmn.org/highlight/ngmn-identifies-6g-use-case.html.
[3] *Id.*
[4] *Id.*

ensure the equitable deployment, distribution, and adoption of 6G technology through all

segments of society which will help sustain long-term U.S. leadership in communications

innovation and investments. PK and OTI therefore urge the NTIA to consider the following as it

evaluates the steps necessary to advance 6G technology:

- Use a whole-of-government approach to ensure that 6G reaches all segments and members of society through properly balancing licensed and unlicensed spectrum allocations, extending the CBRS model to 6G networks, and using spectrum auction funds to support development in the public interest.

- Prioritize workforce development by investing in local job training and upskilling opportunities that both retrain and expand the industry's workforce.

- Partner with, instead of preempting against, local and state governments to ensure that 6G is developed in a fair and equitable manner through local expertise.

I. A WHOLE-OF-GOVERNMENT APPROACH MUST BE IMPLEMENTED TO ENSURE 6G IS EQUITABLY DEPLOYED TO ALL AMERICANS.

What new challenges will arise from 6G regarding privacy, equity, and civil liberties? How can the U.S. Government ensure that the benefits of 6G technology extend to all segments of society?

Historically, the federal government has often overlooked the impact of spectrum

distribution on diverse constituencies, including communities of color and low-income

communities, of consumers, workers, and business owners. Policymakers and technologists

mistakenly believed that because cell towers can provide service to large enough areas to cover

traditionally white *and* non-white neighborhoods, there was no need to specifically invest in

deploying wireless services to marginalized communities.[5] They assumed that targeting

investments in wealthier and whiter communities would naturally lead to benefits in

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[5] *See* Kathleen Burke, *Back to the Spectrum Future: The 20th Anniversary of the Spectrum Policy Task Force*, 28, 59 (Jan. 2023), https://publicknowledge.org/policy/back-to-the-spectrum-future-the-20th-anniversary-of-the-spectrum-policy-task-force/.

lower-income, non-white communities solely as a natural consequence of the technology deployment.

As mentioned by the Public Interest Spectrum Coalition, "[t]his sort of thinking created a blind-spot in spectrum policy."[6] Providers were required to build out less than a licensed area's total population.[7] Consequently, licensed areas that incorporated marginalized communities, including low-income and Tribal communities, were often neglected by providers in terms of service.[8] It is clear that even facially race-neutral policies driven by commercial motives can perpetuate the marginalization of historically underserved communities.

Congress' instructions to the Federal Communications Commission ("FCC") to prevent these inequitable outcomes by developing inclusive spectrum and auction policies not only proved ineffective, but clearly demonstrate the need for an effective whole-of-government approach rather than simply trying to nudge the private sector in the right direction. Congress anticipated that amending the Communications Act to use auctions to distribute spectrum licenses would jumpstart the development of the mobile economy, and therefore sought to use auction policy to create an inclusive mobile world. Congress therefore required the FCC to design auctions that avoid "excessive concentration of licenses" and to "disseminat[e] licenses among a wide variety of applicants, including . . . businesses owned by members of minority groups, and women."[9] Congress required the FCC to prescribe "area designations and bandwidth assignments" that promote equitable license distribution amongst areas and applicants, including "small businesses, rural telephone companies, and businesses owned by members of minority

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[6] Public Knowledge et. al., Comments of the Public Interest Spectrum Coalition (PISC) to the NTIA, 54, (Apr. 17, 2023), https://publicknowledge.org/wp-content/uploads/2023/04/Group-NTIA-Comments-on-National-Spectrum-Strategy-2023.pdf.
[7] *Id.*
[8] *Id.*
[9] Omnibus Reconciliation Act of 1993, Pub. .L. No. 103-66, §Section 6002, 107 Stat. 312, 387 (1993). .

groups and women."[10] Finally, Congress required the FCC to use auction design to ensure that such businesses, owned by minority groups and women, "are given the opportunity to participate in the provision of spectrum-based services," including through the consideration of bidding preferences.[11]

Unfortunately, reliance on the FCC's licensing efforts alone to "nudge" the private sector cannot overcome the broad structural problems and the legacy of "redlining" that created and perpetuates the digital divide. Congress itself recognized that over-reliance on market forces creates a "persistent digital divide" that "disproportionately affects communities of color, lower-income areas, and rural areas" in the Infrastructure Investment and Jobs Act of 2021 (codified at 47 U.S.C. § 1701(b)-(c)). Despite this, many still cling to the view that "[r]adio waves don't see race" or argue that e communities of color frequently over-indexing on mobile phone usage indicates that inequity does not exist in the mobile world, leading policymakers to ignore ongoing inequities under current mobile policy.[12] This blind spot must be corrected. PK and OTI advocate for the adoption of 6G policies that ensure all communities, including low-income communities and communities of color, can thrive. While this begins with spectrum access policies designed to promote equitable access, it cannot end there.

What Does "Whole of Government" Mean?

Successful deployment of 6G in a manner that brings all Americans the full social and economic benefits – especially the potential for community economic development – stands on two legs. First, deployment depends on *coordinated federal spectrum policy* as envisioned in the National Spectrum Strategy ("NSS"), but which places digital inclusion as a central goal and not as a mere afterthought. This applies not simply to FCC determinations on spectrum access rules,

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[10] 47 U.S.C. § 309(j)(4)(C).
[11] 47 U.S.C. § 309(j)(4)(D).
[12] Burke at 61.

but on federal spectrum planning and use as well. This, in turn, requires a functioning system of resolving interagency concerns and consideration by agencies as to how their policies may either enhance or exacerbate digital inclusion.[13] Second, and of equal importance, deployment depends on *conscious and mindful efforts to overcome structural and systemic barriers* such as access to technical training and workforce development, access to capital, and other factors that have contributed to the "persistent digital divide" identified by Congress in the IIJA. For example, the federal government has used its contracting and purchasing power to support women-owned and minority-owned businesses.[14]

As the Executive Branch agency charged by Congress with advising the President on telecommunications and technology policy,[15] the NTIA should serve as the central coordinating agency for this whole-of-government approach. While the NTIA does not exercise authority over its sister agencies, a whole-of-government approach depends less on compulsion and more on mindful coordination.

Spectrum Policies and Coordination to Ensure 6G Digital Equity.

Mobile begins with spectrum, and therefore an inclusive policy begins with a proper balancing of licensed and unlicensed spectrum. Determining this balance is a data-driven process that must include specific research and review regarding how policies impact rural communities, communities of color, Tribal communities, low-income communities and the moments in which

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[13] For example, federal agencies such as the FAA should consider how interference mitigation mechanisms such as exclusion zones may disproportionately impact low-income communities and communities of color, who disproportionately live in areas surrounding airports. More positively, federal agencies should consider ways to share access to spectrum on Tribal lands pursuant to the Memorandum of Understanding between the Department of the Interior, the NTIA, and the FCC and in recognition of the federal trust relationship.

[14] *See* General Services Administration, "Set Asides and Special Interest Groups," available at: https://www.gsa.gov/small-business/register-your-business/explore-business-models/setasides-and-special-interest-groups

[15] *See* 47 U.S.C. § 901(b)(6).

those identities intersect. Further, the NTIA must integrate policies that explore the relationship between Tribes and government to ensure 6G deployment respects the right of spectrum access on Tribal lands.

As previously stated, in order to accomplish successful 6G deployment and adoption, a robust, whole-of-government, interagency approach must be prioritized. One of the NTIA's central priorities is working with federal agencies to determine when the commercial use of particular federal spectrum bands is appropriate and to subsequently coordinate with the FCC to bring spectrum to market.[16] To facilitate the emergence of 6G, federal agencies must "leverage the traditional interagency process by submitting all federal spectrum concerns to the NTIA as opposed to forging individual complaints."[17] Federal agencies must also respect the established role of the FCC in securing expeditious 6G deployment. As it relates specifically to 6G adoption and workforce development, other agencies have a role to play in ensuring that all communities have access to the devices and skills needed to benefit from this technology alongside the economic opportunities made available through these innovations. This includes the Department of Labor, which NTIA can further partner with to develop broadband workforce pipeline programs. NTIA should also work collaboratively with the Department of Housing and Urban Development, the Rural Utilities Service, and the Department of Agriculture, and other federal agencies that play critical and unique roles in getting households access to affordable, reliable broadband.

Importantly, PK and OTI endorse the whole-of-government approach NTIA is using in the implementation of the NSS. This should serve as a model for future policy development

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[16] Joel Thayer and Greg Guice, *The Interagency Process and Its Importance in Securing the Future of 5G*, 6, (March, 2022),
https://publicknowledge.org/policy/the-interagency-process-and-its-importance-in-securing-the-future-of-5g/.
[17] *Id.* at 24.

processes as the the NSS is poised to successfully facilitate spectrum research and create a "stakeholder-driven process to forge a long-term spectrum pipeline," expand our spectrum workforce, and forge a path forward for 6G and Wi-Fi 7 that avoids disruptive interagency feuds, such as the 2022 feud that obstructed air travel.[18]

A. 6G Inclusion Requires Proper Balancing of Licensed and Unlicensed Spectrum.

The FCC has recognized the importance of licensed and unlicensed spectrum. Since the 1980s, when the "FCC opened numerous licensed bands to unlicensed underlays," the potential for coexistence between licensed and unlicensed spectrum has been successfully demonstrated.[19] Furthermore, technological evolution since the 1980s has increasingly improved the ease of this coexistence.[20] As previously stated by PK and OTI, "[t]he most robust and competitive wireless ecosystem will need additional contiguous blocks of unlicensed, shared/licensed-by-rule, and exclusively-licensed spectrum."[21] As with the 4G and 5G "spectrum crisis," the "race to 6G" framing exaggerates the threat of losing U.S. wireless leadership at the expense of DEI concerns. Certainly, ensuring timely deployment of 6G to all Americans should be a priority, but it should be carefully balanced with long-established, successful policies. In other words, such fear-mongering should be ignored and not distract us from securing access for marginalized communities in rural and urban America.

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[18] Shiva Stella, *Public Knowledge Applauds NTIA for Developing Pathway To Boost Nation's National Spectrum Strategy*, (March 12, 2024), https://publicknowledge.org/public-knowledge-applauds-ntia-for-developing-pathway-to-boost-nations-national-spectrum-strategy/.

[19] Harold Feld, Testimony Before the Senate Committee on Commerce, Science and Transportation, *The 5G Workforce and Obstacles To Broadband Deployment*, 8 (Jan. 2020) https://publicknowledge.org/wp-content/uploads/2021/11/Harold-Feld-Testimony-Senate-Commerce-5G_PK_1.22.20.pdf.

[20] *Id.*

[21] Reply Comments of Public Knowledge & Open Technology Institute at New America, at 22 (July 2024), https://publicknowledge.org/policy/2024-communications-marketplace-report-reply-comments/

America should increase the availability of licensed, unlicensed, and shared/lightly-licensed mid-band spectrum because the 6G wireless ecosystem cannot sustain on mobile carriers or licensed spectrum alone.[22] An increasing amount of "mobile device data traffic is consumed indoors, on a nomadic and not mobile basis," through small cell network technologies that enhance home interactive video, virtual reality, and IoT– and Wi-Fi already carries "at least 80 percent of all mobile data traffic."[23] Therefore, distinctions must be established between coverage spectrum (the traditional licensing model) and localized area spectrum (the unlicensed and lightly-licensed, or shared, spectrum model) in order for successful 6G deployment.[24] The future 6G wireless ecosystem "will rely on a combination of big national or regional carrier networks for truly mobile connections (for use 'on the go') and a far larger number of complementary, high-capacity and customized networks deployed by individual enterprises, households, and community anchor institutions to meet their particular needs at a lower cost."[25]

An additional reason to increase the availability of licensed, unlicensed, and shared/lightly-licensed spectrum is that the Communications Act mandates "deployment on a reasonable and timely basis of advanced telecommunications capability to all Americans."[26] While opinions differ on the nation's progress towards this goal, the need to effectively and equitably close the digital divide that exists across our most marginalized communities including rural, low-income, and households of color, is undisputed. The expansion of unlicensed and lightly-licensed shared spectrum use can provide these communities with higher-capacity, affordable broadband which will help counter the systemic barriers to universal service.

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[22] PISC Comments to the NTIA at 31.
[23] *Id.*
[24] *Id.*
[25] PISC Comments to the NTIA at 31.
[26] 47 U.S.C. § 1302(a).

1. Periodic Review of Spectrum Bands is Necessary to Ensure 6G Inclusion.

In order to determine which bands should be repurposed or adapted to meet service needs, a "regular, periodic process" of review must be adopted.[27] The NTIA and FCC must be transparent about what exactly is under consideration when reviewing band repurposing. The following questions can assist in providing a transparent and thorough review and will allow spectrum users to shift their business operations to comply with regulatory requirements and meet the needs of the country:

- Which federal users and commercial services are no longer meeting the needs of the public or serving our nation's goals?

- Which federal users and commercial services can continue to serve the public interest while occupying less spectrum and/or sharing their spectrum with new uses and services?

- In bands that are not utilized intensively, is actual spectrum usage limited in time, location (e.g., outdoors but not indoors, space but not terrestrial), and/or frequency? What spectrum coordination mechanism is best suited to unlock that fallow capacity to facilitate new uses and to address unmet needs?

- What additional spectrum bands or shared capacity do federal users and service providers need that will help us achieve our nation's telecommunications goals?

- Which access models can best fill connectivity gaps and expand access to critical telecommunications systems to underserved Americans, including Tribes?[28]

2. Authorizing Access of Underutilized Bands on a Use-or-Share Basis is Necessary to Ensure 6G Inclusion.

The authorization of "opportunistic access on a use-it-or-share-it basis in underutilized bands should be embraced as a default approach aimed at expanding local spectrum access for small and non-traditional ISPs in rural, tribal and other underserved areas, as well as for

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[27] PISC Comments to the NTIA at 35.
[28] *Id. at 35-36.*

enterprises, venues, schools, libraries and other community anchor institutions."[29] A framework

for opportunistic spectrum sharing under a use-it-or-share-it approach of automated frequency

coordination mechanisms has already been implemented with proven success and efficacy

("including CBRS, TV White Spaces, and an unlicensed underlay across 1,200 megahertz

between 5925-7125 MHz"), and these powerful precedents can cement a model for future

implementation.[30] An automated coordination mechanism will allow smaller and non-traditional

ISPs to provide underutilized spectrum to local areas which will enable America to maximize the

abundance of bandwidth and circumvent significant opportunity costs while honoring exclusive

use and primary licensee agreements and avoiding harmful interference.[31] This use-or-share

model also incentivizes licensees to facilitate secondary markets by partitioning or leasing more

unused spectrum or building out services at a quicker rate, thereby reducing spectrum

warehousing and increasing access to local areas ready for deployment but lacking access.[32]

     A use-it-or-share-it framework results in a cascade of effects that serves a series of public

interest goals. By promoting use of underutilized spectrum, barriers to entry for a wide set of

users and use cases will decrease and innovation and healthy competition will increase. This, in

turn, narrows the digital divide by improving consumer choices and lowering costs, which will

facilitate broadband access and adoption in underserved areas.[33] Beyond protecting and

accommodating incumbent users, "the use of a dynamic spectrum management system can also

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[29] *Id.* at 24; *See* Michael Calabrese, "Use It or Share It: A New Default Policy for Spectrum Management," Open Technology Institute at New America (Mar. 8, 2021), https://tinyurl.com/m7v2rkre.
[30] PISC Comments to the NTIA at 25; *See* Harold Feld, "Addendum To My Auctioning Unlicensed Post," Public Knowledge (July 15, 2011), https://publicknowledge.org/sauce-for-the-goose-an-addendum-to-my-auctioning-unlicensed-post/.
[31] *See* Comments of OTI and Public Knowledge, Partitioning, Disaggregation and Leasing of Spectrum, WT Docket 19-38 (June 3, 2019).
[32] PISC Comments to the NTIA at 26.
[33] European Commission, Radio Spectrum Policy Group, "RSPG Opinion on Spectrum Sharing—Pioneer Initiatives and Bands," RSPG21-022, 20-27 (June 21, 2021), https://radio-spectrum-policy-group.ec.europa.eu/document/download/0e3df317-dbc6-49ee-9d15-ef47ccd9db0d_en?filename=RSPG21-022final_RSPG_Opinion_Spectrum_Sharing.pdf.

provide a glide path for transitioning the use of a band over time, while avoiding stranded devices or users."[34]

3. The NTIA Must Consider Policies That Improve Tribal Access.

Since rural Tribal lands are often sparsely populated and have lower household incomes, there is little economic incentive for licensees to build networks out in these regions and consequently, they often lack access to quality service. With carriers only required to provide coverage to a certain percentage of people within the geographic boundaries of their licenses, they can easily avoid buildout in less profitable areas like Tribal lands.[35] Tribes have attempted to build their own ISPs, but due to a limited supply of unlicensed spectrum, the resultant access is lower in quality or completely blocked due to the U.S. border commercial protocols.[36] In addition, they face unfavorable odds of winning a spectrum auction due to the degree of competition with private entities. Also, even if such an auction were won, the license area would likely extend far beyond the Tribal boundaries which creates more burden due to additional needs for network deployment and operation.[37]

6G deployment policies must prioritize tribal sovereignty and spectrum access. First, a tribal priority window should be held prior to every spectrum auction. The FCC has already adopted a Tribal priority window prior to the 2.5 GHz spectrum auction.[38] During the successful 2020 window, the FCC received 418 applications from 266 separate Tribal lands, despite the obstacles to filing during the COVID-19 pandemic.[39] However, these windows are not limited to

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[34] PISC Comments to the NTIA at 26.
[35] *Id.* at 61.
[36] *Id.* Due to the negotiation procedures with Mexico and Canada prior to FCC spectrum repurposing, much of the spectrum along the borders is unavailable to Tribes. *Id.*
[37] *Id.* at 62.
[38] FCC, Tribal Priority Window, https://www.fcc.gov/25-ghz-rural-tribal-window.
[39] Mark Colwell, "Success of Rural Tribal Window Demonstrates Need for Rural Education Window," Voqal (Sept. 9, 2020),
https://voqal.org/success-of-rural-tribal-window-demonstrates-need-for-rural-education-window/.

the 2.5 GHz band and should be extended to every auction.[40] Second, Tribes should be permitted

to access federal spectrum on Tribal lands. Section 927(b) of the Communications Act permits

the Secretary of Commerce, with the FCC, to allow non-federal entities to use shared federal

spectrum.[41] Allowing such access to Tribal governments would serve public interest, strengthen

the federal trust relationship, and bolster the sovereignty of Native American Tribes.[42]

    Additional, and more immediate, remedies can also be implemented to further close the

digital divide, better preparing the nation for the wave of 6G. For example, "nothing stands in the

Commission's way to unleashing 500 MHz of spectrum in the 12.2-12.7 GHz band…

provid[ing] focused connectivity improvements on Tribal lands."[43]

    B. The CBRS Model Should Be Extended into the Deployment of 6G Networks.

    The CBRS framework stands as one of the FCC's most successful innovations. It has

exceeded expectations domestically and been replicated by numerous nations, all while retaining

full protection for incumbent military operations.[44] In September 2022, the OnGo Alliance (an

association of more than 200 companies making commercial use of CBRS) reported that

deployments included nearly 500 certified client devices (EUDs) and more than 240,000 base

stations (CBSDs).[45] Just six months later, that number of stations exceeded 300,000.[46] That

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[40] PISC Comments to the NTIA at 62.

[41] 47 U.S.C. § 927(b).

[42] PISC Comments to the NTIA at 62.

[43] Harold Feld, Michael Calabrese, Jeff Blum, and Hadass Kogan, "Ex Parte Joint Letter to the FCC," 4 (Aug. 19, 2024), https://www.fcc.gov/ecfs/document/108201841108055/1.

[44] *Id.* at 19; *See, e.g.,* Ofcom, "Shared Access Licenses," https://www.ofcom.org.uk/consultations-and-statements/category-1/enabling-opportunities-for-innovation ; "CBRS Leading a Global Trend of Private LTE/5G: HP," Communications Daily (Apr. 13, 2023).

[45] "OnGo Alliance Marks Important Milestones for CBRS Networks, Illustrating Substantial Momentum for Private, Fixed and Neutral Networks," OnGo Alliance Press Release (Sept. 28, 2022), https://ongoalliance.org/news/ongo-alliance-marks-important-milestones-for-cbrs-networks-illustrating-substantial-momentum-for-private-fixed-and-neutral-networks/.

[46] PISC Comments to the NTIA at 19.

number now exceeds 370,000, with more than 1,000 distinct providers registered.[47] These

effective CBRS deployments have allowed for the existence of innovative wireless network

deployment that would otherwise be impossible or too expensive in an ecosystem of exclusive

licensing. For many Tribes, schools, libraries, and other communities lacking connectivity,

CBRS is a critical tool for combating the "homework gap" for students who cannot afford a

broadband connection.[48] For example, "Las Vegas built a massive CBRS network to bring

broadband access to students during the height of the pandemic and has now committed to using

CBRS to build the largest open private network in the U.S. for its small businesses and

schools."[49] In Fresno, California, CARES Act funds were used to quickly deploy a CBRS

network which connected 18,000 low-income student households directly to the school's

network by relying on GAA spectrum and "schools as towers."[50] Similarly, Texas schools in Fort

Worth, McAllen, Dallas, Castleberry and Harris County rely on CBRS spectrum to close the

homework gap.[51] The CBRS framework model works and should be extended into 6G

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[47] FCC, Notice of Proposed Rulemaking and Declaratory Ruling, *In the Matter of Promoting Investment in the 3550-3700 MHz band*, GN Docket No. 17-258, at ¶14 (Aug. 16, 2024).

[48] *See* Raul Katz, "The 'To and Through' Opportunity: An Economic Analysis of Options to Extend Affordable Broadband to Students and Households via Anchor Institutions," New America and Schools Health & Libraries Broadband (SHLB) Coalition (Aug. 2022), https://assets.noviams.com/novi-file-uploads/shlbc/PDFs_and_Documents/SHLB_Research_and_Publications/Raul_Katz_Economic_Study1.pdf.

[49] *See* Linda Hardesty, "NTT Builds Municipal Private Wireless Network for City of Las Vegas," Fierce Wireless (Sep. 28, 2022), https://www.fierce-network.com/private-wireless/ntt-builds-municipal-private-wireless-network-city-las-vegas; Harold Feld, "Don't Let Special Interests Tie the FCC's Hands," Washington Examiner (Dec. 9, 2022), https://www.washingtonexaminer.com/opinion/dont-let-special-interests-tie-the-fccs-hands. *See also* JMA Wireless, "JMA Brings Semper Fi 5G to Georgia Marine Corps Facility" (Mar. 24, 2021), https://jmawireless.com/jma-brings-semper-fi-5g-to-georgia-marine-corps-facility/; Wireless Infrastructure Association, *Baicells Helps Las Vegas Improve Connectivity for Students with Private CBRS Network*, WIA.org (Sept. 8, 2021), https://wia.org/baicells-helps-las-vegas-improve-connectivity-for-students-with-private-cbrs-network/.

[50] Michael Calabrese and Matthew Marcus, "Case Studies of School and Community Networks Able to Close the Homework Gap for Good," New America and Schools Health & Libraries Broadband (SHLB) Coalition report, 25-29 (Aug. 2022), https://newamericadotorg.s3.amazonaws.com/documents/Anchor-Nets-Case-Studies-revisedFINAL_091422.pdf.

[51] *Id.* at 52-59.

deployment to achieve even more success by use in new technologies with enhanced policies—

"such as implementing a federal Incumbent Informing Capability (IIC) to improve spectrum

sharing and making PALS more accessible."[52]

C. The NTIA Should Recommend Public Interest Uses for Auction Funds.

NTIA should consider ways that auction funds could be spent to achieve equity and to

make public reports and recommendations that could be translated into legislation. Auction funds

can be incredibly impactful in advancing public interest goals, especially digital equity.

"[H]istoric funding opportunities have become or will become available to address all parts of

the digital divide" through the Infrastructure Investment and Jobs Act (IIJA), but a more

sustainable, consistent source of funding is necessary to ensure resilient networks and affordable

access.[53] FCC Chairwoman Rosenworcel has also proposed applying auction revenues towards

next-generation 911 with the goal of ensuring all Americans, regardless of race, gender,

disability, income, or fluency in English, have the ability to call for and receive help during

emergencies.[54] In addition, auction funds could be used to support and upgrade networks,

enhance reliability, address supply chain security issues, and support digital equity initiatives

such as programs to enhance digital skills and low-income subsidies for broadband subscriptions

and devices.

In one application of his eponymous Coase theorem, economist Ronald Coase argued that

the assignment of property rights should follow a market-based approach as opposed to a

command-and-control approach.[55] In other words, he advocated for an approach based on the

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[52] PISC Comments to the NTIA at 21.
[53] Alisa Valentin et. al., "Communications Marketplace Report" 37 (July 2024), Public Knowledge & Open Technology Institute at New America, https://publicknowledge.org/policy/2024-communications-marketplace-report-reply-comments/.
[54] Remarks of Chairwoman Jessica Rosenworcel: FirstNet 10-year Anniversary Celebration, National Press Club, (Feb. 22, 2022), https://docs.fcc.gov/public/attachments/DOC-380562A1.pdf.
[55] Ronald Coase, The Federal Communications Commission, 2 J. of L. and Econ. 1 (Oct. 1959).

theory that those who pay the most for rights to a frequency will subsequently attain the most value from that frequency (thereby achieving a Pareto efficiency in ideal conditions), regardless of whether that entity warehouses or re-sells their rights to another entity.[56] However, applying this to spectrum, auctions are often utilized to maximize the government's revenue. While the FCC is statutorily prohibiting from considering potential revenue,[57] with billions of dollars on the line, auction decisions have been increasingly influenced by estimates of revenue effects and the CBO budget score.[58]

This revenue-maximizing approach can directly conflict with a healthy, competitive market. An incumbent's value for a license might rise above the new entrant's value, "simply because of the greater market power the incumbent would enjoy without the new entrant."[59] Also, when technological standards are competing, supporters of a particular standard may value a license more "if it creates a hole in the footprint of a competing standard."[60] This system might generate the most revenue, but in the end, the consumer pays for increased spectrum costs and barriers to entry.[61] Therefore, the FCC, NTIA and Congress must obey the Communications Act's prohibition on considering auction revenue during spectrum distribution decisions. Furthermore, any auction revenues generated from exclusively licensed spectrum, an already "inherently inequitable" practice, should be invested back into telecommunications, specifically into digital equity and affordable broadband efforts.

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[56] Comments of the Public Interest Spectrum Coalition, at 50-51; Ronald Coase, The Federal Communications Commission, 2 J. of L. and Econ. 27 (Oct. 1959).
[57] 47 U.S.C. § 309(j)(7)(A).
[58] PISC Comments to the NTIA at 51.
[59] Peter Cramton, Handbook of Spectrum Auction Design, 57 (Oct. 2017)
[60] *Id.*
[61] PISC Comments to the NTIA at 52.

PK and OTI recommend reframing a definition of efficiency based on public interest metrics, including, economic impact, consumer impact, and technical usage.[62]

- ***Economic Impact*** extends beyond mere money generation for the government and providers, but includes maximizing societal-wide value for a particular spectrum (including personal wages, job opportunities, and overall economic impacts).

- ***Consumer Impact*** concerns the degree of end users served by a particular spectrum use and the cost of that service.

- ***Technical Usage*** involves maximized data transmissions over a particular spectrum. This metric values services that utilize their spectrum allocations and devalues services that underutilize/neglect their spectrum allocations by prioritizing profit maximization over the costs of building out to less affluent and populated communities, and, in turn, prevents competitors or new entrants from accessing and utilizing the spectrum.

These metrics should be balanced by policymakers to maximize the public benefits of a spectrum allocation decision.

II. SUCCESSFUL 6G DEPLOYMENT REQUIRES MEANINGFUL WORKFORCE DEVELOPMENT OPPORTUNITIES.

What is required to develop a domestic workforce capable of designing, manufacturing, deploying, and operating 6G networks and equipment? Will retraining or expansion of the current wireless industry workforce be necessary for U.S. success in 6G?

With 6G deployment, as with any shift into a new network standard, comes a heightened demand for a robust workforce. Even with increased governmental interest and funding, estimates show a shortage of 58,000 workers for the deployment of broadband infrastructure and technologies over the next several years.[63] Without these workers, "critical broadband expansions could be delayed."[64] Such estimates do not even account for the attrition of the existing workforce, with the average age of the broadband workforce being 39.[65] The NTIA should, in

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[62] *Id.* at 53.
[63] Linda Hardesty, *The U.S. Needs 58k More Workers to Deploy Broadband*, Fierce Network (Aug. 6, 2024), https://www.fierce-network.com/broadband/us-short-about-58000-tradespeople-deploy-broadband.
[64] *Id.*
[65] *Id.*

conjunction with the broader Commerce Department, prioritize funding for workforce development efforts to ensure the success of 6G deployment objectives in the years to come.

Workforce development should focus on both retraining the workforce and expanding the workforce to meet heightened needs. With regard to retraining, the focus should be shifted to upskilling of the current workforce to meet the demands of building and sustaining 6G technology and infrastructure. A major issue facing the wireless industry today is the lack of trained tower climbers and the severe skills gap therein.[66] Increased funding for work-based learning programs can counter the relatively higher unemployment and low-income rates in marginalized and rural communities.[67] By integrating on-the-job training, work-based programs forge a career path for unemployed or under-employed individuals who lack the resources to simultaneously support their families through their current jobs and separately train for a new career.[68] These programs also benefit employers who are able to train their own employees to meet their exact needs.[69] In addition to retraining the current workforce, such programs may be utilized to expand the current workforce by creating new career paths through educational opportunities.

NTIA should also facilitate the creation of a "national database of critical broadband industry jobs and standardized training programs, certifications, and licenses."[70] This includes consulting and interviewing those who have implemented successful workforce development

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[66] Feld, *5G Workforce and Obstacles* at 4; "The Surge for Tower Climbers to Build a 5G Network," 3M (July 24, 2019), https://www.3m.com/blog/en_US/safety-now/science-of-safety/quality-products/fall-protection/surge-tower-climbers-build-5g-network/.

[67] Feld, *5G Workforce and Obstacles* at 4.

[68] *Id.*

[69] *Id.*

[70] Alisa Valentin, *Biased Oversight Should Not Undermine Closing the Digital Divide*, (March 21, 2024), https://publicknowledge.org/biased-oversight-should-not-undermine-closing-the-digital-divide/.

programs, especially programs training workers from urban, rural, and Tribal communities.[71] As

advocates have previously highlighted, the NTIA has an obligation to "listen to the public,"

including "thoughts and recommendations of the public interest community."[72] By leveraging

upskilling initiatives, retraining workers, and creating pathways for the training of a new

workforce through a data-driven and informed approach, the NTIA can help to address shortfalls

and meet growing needs as 6G infrastructure is deployed and new technologies are developed.

Additionally, the heightened demand for a 6G workforce is not long-term and will only

persist as long as the 6G infrastructure build out extends. Therefore, it is important to ensure that

the workforce, including tower workers and line technicians, have a safety net once the initial

buildout demand subsides. The Joint Center for Political and Economic Studies[73] and Brookings

Institution[74] documented the significant opportunities 5G deployment afforded local communities

by creating local jobs and addressing digital inequities. Forward-looking federal policies that

value long-term positive impacts on local communities, rather than solely fulfilling short-term

needs, are paramount for the post-6G deployment society. As stated by Harold Feld from Public

Knowledge, "Congress should resist the rush to look only to the immediate short-term labor

needs and consider what systemic programs and work-based-learning programs can create good

local jobs in traditionally marginalized rural communities and communities of color."[75] The

NTIA should learn from 5G shortfalls as the workforce is strengthened for the deployment of 6G

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[71] *Id.*
[72] *Id.*
[73] Yosef Getachew, Alejandra Montoya-Boyer, and Spencer Overton, "5G, Smart Cities and Communities of Color," Joint Center for Political and Economic Studies, (2017), https://jointcenter.org/wp-content/uploads/2017/01/Joint-Center-5G-Smart-Cities-And-Communities-of-Color_Final-6.9.17.pdf.
[74] Nicol Turner Lee, "Enabling Opportunities: 5G, the Internet of Things, and Communities of Color," Brookings Institution, (2019), https://www.brookings.edu/articles/enabling-opportunities-5g-the-internet-of-things-and-communities-of-color/.
[75] Feld, *5G Workforce and Obstacles* at 5.

networks. Lastly, PK and OTI support the development of a "national data of critical broadband industry jobs and standardized training programs, certifications, and licenses."[76] This includes consulting and interviewing those who have implemented successful workforce development programs, especially programs training workers from urban, rural, and Tribal communities.[77]

III. LOCAL GOVERNMENTS ARE PARTNERS, NOT BARRIERS TO FACILITATING U.S. LEADERSHIP IN 6G DEPLOYMENT AND ADOPTION.

What public-private partnerships would help enable U.S. leadership in global 6G development?

Successful 6G deployment does not automatically lead to successful 6G adoption. Widespread adoption is also contingent on transparent, respectful coordination between providers and local communities. Preemption of local authority is not an effective measure to facilitate adoption and has historically led to disparate effects in marginalized communities.[78] Urban areas have experienced digital redlining by broadband providers who simply failed to invest in system upgrades and deployments in communities of color and low-income communities that were affordable and reliable.[79] Rural communities have also experienced significant issues regarding corroding legacy copper lines as a result of deregulation since such investments were not deemed profitable enough for carriers.[80] Therefore, claims that preemption of local authority will propel the "race to 6G" should be ignored. When wireless networks are given full control over local deployment, short-term profitability is the only metric, rejecting a more holistic and long-standing view of efficiency and economic impact. Subsequently, by

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[76] Alisa Valentin, *Biased Oversight Should Not Undermine Closing the Digital Divide*, (March 21, 2024), https://publicknowledge.org/biased-oversight-should-not-undermine-closing-the-digital-divide/.
[77] *Id.*
[78] Feld, *5G Workforce and Obstacles* at 6-7.
[79] *See* Bill Callahan, "AT&T's Digital Redlining of Cleveland," National Digital Inclusion Alliance Report (2017), https://www.digitalinclusion.org/blog/2017/03/10/atts-digital-redlining-of-cleveland/.
[80] *See, e.g., Commission Inquiry Into the Service Quality, Customer Service, and Billing Practices of Frontier Communications, Report of the Minnesota Department of Commerce*, Docket No. P-407, 405/CI18-122 (Jan. 4, 2019), https://mn.gov/commerce-stat/pdfs/frontier-service-quality-report-final.pdf.

preempting local authority we are excluding significant segments of American society from the 6G future.

CONCLUSION

In conclusion, Public Knowledge and the Open Technology Institute at New America applaud the NTIA's commitment to engaging with civil society and industry to build support for the advancement of 6G. The consideration of such comments is crucial to ensure that future 6G rollout considers equitable deployment, distribution, and adoption throughout the entire country in order to maintain strong, long-term U.S. leadership in spectrum innovation. To this extent, PK and OTI urge the NTIA to implement a robust whole-of-government approach, prioritize workforce development, and partner with local and state governments to ensure that 6G is developed in a fair and equitable manner to every segment of America.

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