TELECOMMUNICATIONS INTERAGENCY WORKING GROUP

RECOMMENDATIONS TO ADDRESS WORKFORCE NEEDS

SUBMITTED TO

THE UNITED STATES CONGRESS

Committee on Commerce, Science, and Transportation of the Senate
Committee on Health, Education, Labor, and Pensions of the Senate
Committee on Energy and Commerce of the House of Representatives
Committee on Education and Labor of the House of Representatives

Pursuant to the Infrastructure Investment and Jobs Act, Pub. L. 117-58, 135 Stat. 429,
Division F, Title VI, Section 60602 (2021)

January 13, 2023

<p align="center">TABLE OF CONTENTS</p>

Leticia Latino van Splunteren#
Chief Executive Officer, Neptuno USA, Corp.
Representative of a Telecommunications Contractor Firm, appointed by the Chairwoman of the Federal Communications Commission

Scott Ralls+
President, Wake Technical Community College
Representative of an Institution of Higher Education, appointed by the Secretary of Education

Kathy Gill, Chair, Subgroup on Telecommunications Worker Safety*
Chief Executive Officer, Tower Safety
Representative of Public Interest Advocate for Tower Climber Safety, appointed by the Secretary of Labor

Scott Ketcham, Vice Chair, Telecommunications Interagency Working Group*
Director, Occupational Safety and Health Administration Directorate of Construction
Representative of the Directorate of Construction of the Occupational Safety and Health Administration, appointed by the Secretary of Labor

Christopher Shelton#
President, Communications Workers of America
Representative of a Labor Organization Representing the Telecommunications Workforce, appointed by the Secretary of Labor

OTHER CONTRIBUTORS
Lucy Moore
Special Policy Advisor
Department of Commerce

Sharon Miller
Director
Division of Academic and Technical Education
Office of Career, Technical, and Adult Education
Department of Education

Robin Utz
Deputy Director
Division of Academic and Technical Education
Office of Career, Technical, and Adult Education
Department of Education

Manny Lamarre
Senior Advisor
Employment and Training Administration
Department of Labor

Ethan Jeans
Legal and Policy Advisor
Wireless Telecommunications Bureau
Federal Communications Commission

R. Matthew Warner
Attorney Advisor
Wireless Telecommunications Bureau
Federal Communications Commission

Nell Geiser
Director of Research
Communications Workers of America

Shane Larson
Assistant to the President
Senior Director for Government Affairs and Policy
Communications Workers of America

Zane Farr
Research Economist
Communications Workers of America

Sara E. Lang, M.S.Ed.
Project Manager, Office of Technology
Wireless Infrastructure Association

EXECUTIVE SUMMARY

The Infrastructure Investment and Jobs Act (IIJA) includes the largest investment in broadband deployment and adoption in U.S. history, with billions of dollars available across multiple programs. The IIJA invests in broadband to help ensure that every American has access to reliable high-speed internet through this historic investment in broadband infrastructure deployment. The investments through the IIJA will provide significant opportunities to create good jobs that attract workers from across the country. The need for an expanded workforce is being driven by vast new investments in the nation's telecommunications infrastructure.

Telecommunications infrastructure will be built, operated, maintained, and upgraded over time by a well-trained, highly skilled, workforce of broadband industry professionals—tower climbers and technicians, fiber optic technicians and fiber splicers, RF engineers, overhead and underground utility installers, small cell technicians, trencher and heavy equipment operators, and many others. In recognition of the importance of recruiting and retaining workers for the high-quality jobs created in the telecommunications industry, Congress directed Federal Communications Commission Chairwoman Jessica Rosenworcel, in partnership with Secretary of Labor, Martin J. Walsh, to establish the Telecommunications Interagency Working Group to develop recommendations to address the workforce needs of the telecommunications industry, including the safety of that workforce. The Working Group was tasked with providing recommendations to Congress to address seven focus areas. The Working Group's recommendations for each focus area are summarized below.

For Focus Area #1, regarding amending federal laws and practices:
- Congress should reauthorize Perkins V with a new emphasis on aligning the programs to national infrastructure needs, particularly broadband and 5G
- The Department of Labor should use existing programs to encourage training in the areas of telecommunications infrastructure, wireless technology, and broadband generally

For Focus Area #2, identifying policies and programs improving governmental coordination:
- Create an interagency "National Broadband Workforce Task Force"
- Develop key performance metrics aimed at tracking progress and outcomes across all agencies

For Focus Area #3, affecting Veterans:
- Request that the Department of Defense promote broadband careers in the SkillBridge program
- Connect Veterans to broadband careers through the Rapid Retraining Assistance Program
- Educate broadband stakeholders about specific G.I. Bill Benefits
- Expand Veteran educational programs to be telecommunications workforce ready
- Educate Regional Veterans' Employment Coordinators on broadband workforce needs
- Promote pre-apprenticeship programs to service members nearing the end of their service
- Allocate, and/or increase, funding to the Department of Labor to create sector-specific grants that will support training for transitioning service personnel, spouses of transitioning service personnel, and Veterans

For Focus Area #4, affecting recruitment:
- Promote diversity, equity, inclusion, and accessibility (DEIA) in recruitment in development programs
- NTIA should issue annual reports on the status of each state's broadband workforce development plans
- Expand science, technology, engineering, and mathematics (STEM) programs
- Expand industry specialized degree programs at higher-education institutions
- Develop effective and scalable telecommunications and broadband training programs in collaboration with a broad range of stakeholders
- Promote training opportunities through American Job Centers, state and local workforce boards, and Job Corps
- Increase funding to expand specific grants for Registered Apprenticeship programs and training in the broadband and telecommunications industry
- Target IIJA broadband workforce development funding to high-road employers

For Focus Area #5, regarding federal incentives:
- Consider allowing Pell Grants to be used for short-term Credentials Programs
- Identify model programs, promising practices, and other information on what makes for successful telecommunications pathways from current federal and non-federally sponsored research and programs.
- Align existing Registered Apprenticeship programs with available federal funding through the use of industry intermediaries
- Prioritize telecommunications when allocating federal funding to state workforce agencies and state and local boards
- Focus Perkins funding for middle school through high school
- Align funding of post-secondary education (trades, 2-year, 4-year+) programming with the needs of the workforce

For Focus Area #6, improving safety of telecommunication workers:
- Continue to engage and support state and local workforce boards on safety matters involving communications infrastructure
- Continue to require and emphasize the importance of safety and health programs at all levels
- Continue support for enforcement of applicable federal and state safety regulations and funding of grants for compliance assistance, which help to educate the industry to provide a safe workplace
- Continue training of workers in the telecommunications industry on the focus four hazards and how to mitigate them in the workplace
- Continue federal and state support for training grants involving worker safety
- Consider specific factors affecting the environmental and physical working conditions unique to this industry
- Create a common resource page or directory for the telecommunications industry sector regarding workforce safety and training

For Focus Area #7, identifying ways that trends impact recruitment:
- Collect better data on the broadband workforce and structure of the broadband labor market
- Update Standard Occupational Classifications descriptions
- Update federal information portals with detailed opportunity and occupational information
- Create a framework, or leverage existing ones, for a skill-based credentialing system for broadband-related careers
- Study the application of prevailing wage and labor-market effects of broadband deployment

INTRODUCTION

The following Report was composed pursuant to the obligations imposed by the Infrastructure Investment and Jobs Act (IIJA), which was signed into law on November 15, 2021.[1] Sometimes referred to as the "Bipartisan Infrastructure Law," the IIJA is comprised of ten Divisions—the sixth of which, Division F, focuses expressly on broadband.[2] Among the provisions of Division F are $64.4 billion in appropriations for programs at the Federal Communications Commission (FCC), the National Telecommunications and Information Administration (NTIA), and the United States Department of Agriculture (USDA). The Administration has placed many broadband-specific aspects of the IIJA under the umbrella of its "Internet for All" Initiative,[3] which seeks to ensure that everyone in America can access affordable, reliable, and high-speed internet. The overarching goals of the IIJA's broadband programs are to build affordable, reliable high-speed internet infrastructure, teach digital skills, and provide necessary technology (e.g., internet-enabled hardware) that enables full participation in today's society and economy.

In Section 60602 of the IIJA, Congress required the Chair of the FCC, in partnership with Secretary of Labor, to establish within 60 days of enactment an "interagency working group to develop recommendations to address the workforce needs of the telecommunications industry, including the safety of that workforce."[4] By law, the Working Group had to be comprised of the following twelve representatives of federal agencies and relevant non-federal industry and labor stakeholder organizations:[5]

1) the Department of Education, appointed by the Secretary of Education;
2) NTIA, appointed by the Assistant Secretary of Commerce for Communications and information;
3) the FCC, appointed by the Chair of the FCC;
4) a Registered Apprenticeship program in construction or maintenance, appointed by the Secretary of Labor;
5) a telecommunications industry association, appointed by the Chair of the FCC;
6) an Indian Tribe or Tribal organization, appointed by the Chair of the FCC;
7) a rural telecommunications carrier, appointed by the Chair of the FCC;
8) a telecommunications contractor firm, appointed by the Chair of the FCC;
9) an institution of higher education described in section 371(a) of the Higher Education Act of 1965 (20 U.S.C. 1067q(a)), appointed by the Secretary of Education;
10) a public interest advocate for tower climber safety, appointed by the Secretary of Labor;
11) the Directorate of Construction of the Occupational Safety and Health Administration, appointed by the Secretary of Labor; and

---

[1] Infrastructure Investment and Jobs Act, Pub. L. No. 117-58, 135 Stat. 429 (Nov. 15, 2021) (IIJA).

[2] *Id.*, 135 Stat. at 1182, Div. F—Broadband.

[3] Internet for All, *High-Speed Internet for All*, https://www.internetforall.gov/ (last visited Jan. 5, 2023).

[4] 47 U.S.C. § 344 (codifying Section 60602 of the IIJA). Pursuant to the IIJA, Section 344 is repealed on the day after the date on which the interagency working group submits the report to Congress. IIJA, 135 Stat. at 1249, § 60602(b).

[5] 47 U.S.C. § 344(d).

12) a labor organization representing the telecommunications workforce, appointed by the Secretary of Labor.

The IIJA specifically instructed the Working Group to develop recommendations in seven areas to "address the workforce needs of the telecommunications industry, including the safety of that workforce."[6] These seven "duties" were to:

1) determine whether, and if so how, any Federal laws, regulations, guidance, policies, or practices, or any budgetary constraints, may be amended to strengthen the ability of institutions of higher education (as defined in section 101 of the Higher Education Act of 1965 (20 U.S.C. 1001)) or for-profit businesses to establish, adopt, or expand programs intended to address the workforce needs of the telecommunications industry, including the workforce needed to build and maintain the 5G wireless infrastructure necessary to support 5G wireless technology;
2) identify potential policies and programs that could encourage and improve coordination among Federal agencies, between Federal agencies and States, and among States, on telecommunications workforce needs;
3) identify ways in which existing Federal programs, including programs that help facilitate the employment of Veterans and military personnel transitioning into civilian life, could be leveraged to help address the workforce needs of the telecommunications industry;
4) identify ways to improve recruitment in workforce development programs in the telecommunications industry;
5) identify Federal incentives that could be provided to institutions of higher education, for-profit businesses, State workforce development boards established under section 101 of the Workforce Innovation and Opportunity Act (29 U.S.C. 3111) or other relevant stakeholders to establish or adopt new programs, expand current programs, or partner with Registered Apprenticeship programs, to address the workforce needs of the telecommunications industry, including such needs in rural areas;
6) identify ways to improve the safety of telecommunications workers, including tower climbers; and
7) identify ways that trends in wages, benefits, and working conditions in the telecommunications industry impact recruitment of employees in the sector.[7]

This Report addresses the seven duties in order, using each as a "Focus Area."

To accomplish its tasks, the Working Group divided into three Subgroups—each addressing a subset of the Focus Areas. The Telecommunications Worker Safety Subgroup addressed Focus Area 6, to identify ways to improve the safety of telecommunications workers. The Education Subgroup addressed Focus Area 1, to determine whether any regulations can be amended to strengthen higher education programs to address telecommunications industry workforce needs; and Focus Area 5, to identify federal programs or incentives to provide to institutions of higher education to establish or expand on programs to support the telecommunications industry. The

---

[6] *Id.* § 344(b)(1).

[7] *Id.* § 344(c).

Labor Subgroup addressed Focus Area 3, to identify existing programs to facilitate employment of Veterans and transitioning out military personnel to address the workforce needs of the telecommunications industry; Focus Area 4, to identify recruitment improvements for the telecommunications industry; and Focus Area 7, to identify trends in working conditions and wages which impact recruitment in the telecommunication industry. Finally, all the Subgroups addressed Focus Area 2 as it applies to their areas of expertise, to identify ways to improve coordination between and among federal agencies and states on telecommunications workforce needs. The Subgroups met on a regular basis to discuss any issues or obstacles that exist for each Focus Area. Based upon this work, the Subgroups determined the recommendations that comprise this Report.

By law, the Working Group was considered established on the date on which a majority of its members had been appointed. On January 14, 2022, FCC Chairwoman Rosenworcel and Department of Labor (DOL) Secretary Walsh formally established the Working Group.[8] Per the IIJA's instructions, the Working Group must therefore submit this Report on or by January 13, 2023, to:

1) the Committee on Commerce, Science, and Transportation of the Senate;
2) the Committee on Health, Education, Labor, and Pensions of the Senate;
3) the Committee on Energy and Commerce of the House of Representatives;
4) the Committee on Education and Labor of the House of Representatives;
5) DOL; and
6) the FCC.[9]

On January 9, 2023, the Working Group met and unanimously approved this Report.[10]

---

[8] *FCC Announces Establishment and Membership of the Telecommunications Interagency Working Group*, Public Notice, DA 22-46 (rel. Jan. 14, 2022).

[9] 47 U.S.C. § 344(g)(1).

[10] *See id.* § 344(g)(2). The IIJA requires both the FCC and the DOL to publish the Report on their respective websites.

Focus Area #1. Determine whether, and if so how, any Federal laws, regulations, guidance, policies, or practices, or any budgetary constraints, may be amended to strengthen the ability of institutions of higher education (as defined in section 101 of the Higher Education Act of 1965 (20 U.S.C. 1001)) or for-profit businesses to establish, adopt, or expand programs intended to address the workforce needs of the telecommunications industry, including the workforce needed to build and maintain the 5G wireless infrastructure necessary to support 5G wireless technology.

A profound skills gap exists in the telecommunications industry workforce due to technology advancement and vast new investment running into a general lack of available training and education at institutions of higher education, and secondary education feeding into them. Science, Technology, Engineering and Math (STEM) programming tends to focus on technology careers in computer networking, software developers, and IT with little emphasis on the need for STEM professionals to design and maintain the advanced communication infrastructure needed for both business and personal use. Government can play an important role in addressing this gap for generations to come by prioritizing investment in the development and expansion of telecommunications workforce programs. For instance, the much smaller cells, faster speeds, different architectures, and other attributes of 5G wireless call for different skill sets in key areas than traditional wireless.

On August 9, 2022, President Biden signed the CHIPS Act of 2022 into law.[11] The legislation is meant to strengthen American manufacturing, supply chains, and national security by investing in research and development, science and technology, and the workforce.[12] In particular, it appropriates $1.5 billion for the Public Wireless Supply Chain Innovation Fund (Innovation Fund), to support the promotion and deployment of open, interoperable, and standards-based radio access networks (Open RAN), as well as a more competitive and diverse telecommunications supply chain. By driving these developments, the CHIPS Act will simultaneously drive a greater need for a range of advanced telecommunications workforce positions—exactly the kind of good job opportunities emphasized herein that will attract workers throughout the country. The CHIPS Act also authorizes significant investment in regional innovation and technology hubs across the country and in STEM programs.[13]

As discussed throughout this Report, the investments made pursuant to the IIJA and CHIPS Act will provide more opportunities to support training and recruitment efforts for the telecommunications workforce.

---

[11] CHIPS Act of 2022, Pub. L. No. 117-167, 136 Stat. 1366, 1372, Div. A.

[12] *Id.*, 136 Stat. at 1392, § 106.

[13] *See* Press Release, White House, FACT SHEET: CHIPS and Science Act Will Lower Costs, Create Jobs, Strengthen Supply Chains, and Counter China (Aug. 9, 2022), https://www.whitehouse.gov/briefing-room/statements-releases/2022/08/09/fact-sheet-chips-and-science-act-will-lower-costs-create-jobs-strengthen-supply-chains-and-counter-china/.

A long-term growth opportunity in the telecommunications sector involves the above-mentioned Open RAN environment, which is the general disaggregation of radio access network functionality built using open interface specifications between elements instead of proprietary specifications. Open RAN would prevent vendor lock-in by enabling competition—and reduce costs for consumers and network operators by improving efficiency through automation, supporting more seamless network updates, and potentially lowering capital expenditures and operating expenses. As Open RAN becomes commonplace, given the $1.5 billion investment in the CHIPS Act, more vendors will compete to build subcomponents of radio access networks based on open interfaces and community-developed standards, providing a flexible and interoperable deployment architecture across multiple vendors. As a result, there will be a greater need for telecommunications installers, maintenance workers, software developers, and cybersecurity and hardware-security experts. This increased demand will help increase the value and compensation for such jobs, which would aid in recruiting and retaining workers for such positions.

Another area of high-growth job demand is cybersecurity. As the United States deploys next generation broadband systems, cybersecurity experts will work to protect our networks from vulnerabilities and threats. Connectivity is now fundamental to all aspects of our lives, and thus cybersecurity risks, too, loom over these aspects as well. Too many cyber events with the potential to harm the safety and well-being of persons and businesses already occur; the risks posed will only grow as our telecommunications networks advance. It is telling that demand for cybersecurity workers is already skyrocketing. From April 2021 to April 2022, U.S. employers shared 714,548 job postings for cybersecurity job roles.[14] And as of September 2022, cybersecurity jobs increased by 43% for the prior 12-month period, compared to an otherwise roughly 18% increase in demand across the entire employment market.[15] To ensure the safety of our networks, we must make opportunities and education in this burgeoning space even more available.

American secondary education and institutions of higher education have generally done a good job creating the training to support the information technology industry. There have been parallel developments regarding IT training in the extensive state and local workforce development infrastructure. That has not yet been replicated for the telecommunications field. This challenge arises almost everywhere we look.[16] We have the mechanisms, experience, infrastructure, and institutions for workforce development. But they have not been applied to this critical field yet.

---

[14] Brent Parton, DOL, *Strengthening and Diversifying the Cybersecurity Workforce* (Sept. 19, 2022), https://blog.dol.gov/2022/09/19/strengthening-and-diversifying-the-cybersecurity-workforce.

[15] *Id.*

[16] For example, the state of Arkansas has worked closely with industry to develop detailed standards for teaching information technology subjects in the state's high schools. In those standards there is only a minimal reference to telecommunications: the transport of digital information. In most career listings, telecommunications is grouped with audiovisual professions.

Recommendations:

> **1.1 Congress should reauthorize the Carl D. Perkins Career and Technical Education Act of 2006 (Perkins V), continuing to provide $1.3 billion annually for career and technical education (CTE) programs for our nation's youth and adults—with a new emphasis on aligning these to national infrastructure needs, particularly broadband and 5G.**

The Office of Career, Technical and Adult Education at the Department of Education administers Perkins V, as amended by the Strengthening Career and Technical Education for the 21st Century Act.[17] Perkins V represents an important opportunity to expand opportunities for every student to explore, choose, and follow career and technical education programs of study and career pathways to earn industry-recognized credentials, including those programs aligned to careers in the telecommunications industry. With enhanced flexibility, the Department of Education could assist in facilitating the expansion of the workforce necessary to address the nation's telecommunications needs, including broadband and 5G needs.

Perkins V is the principal source of federal funding to states and discretionary grantees for the improvement of secondary and postsecondary career and technical education programs. Its purpose is to more fully develop the academic, career, and technical skills of secondary and postsecondary students who elect to enroll in such programs, including relating to the telecommunications industry. By statute, funds are given to the states by formula; only a small percentage of the funds are discretionary. The Department of Education currently has a very modest impact on how federal career and technical education dollars are spent within the states to support both high school and postsecondary institutional programs. The IIJA requires that a high premium be placed on developing and expanding the workforce needed to address bringing high-speed internet to all corners of the nation—with particular emphasis on rural, Tribal, and other historically underserved areas and populations. At present, the nation faces a serious shortage of trained fiber-optic installers and front-line electrical workers, as well as network and cybersecurity professionals. Allowing more flexibility in the Perkins V program would enable the Department of Education to better ensure that the nation has a sufficient workforce to implement and sustain the goals of the Internet for All Initiative.[18]

> **1.2 DOL should use existing programs—in particular, the Workforce Innovation and Opportunity Act (WIOA)—to encourage training in the areas of telecommunications infrastructure and wireless technology, as well as broadband generally. It should include telecommunications as a priority sector in its investments for these purposes.**

WIOA is landmark legislation that is designed to strengthen and improve our nation's public workforce system and help get Americans, including youth and those with significant barriers to employment, into high-quality jobs and careers and help employers hire and retain skilled

---

[17] 20 U.S.C. § 2301 *et seq.*; Strengthening Career and Technical Education for the 21st Century Act, Pub. L. No. 115-224, 132 Stat. 1563 (2018) (Perkins V).

[18] *See* Internet for All, *High-Speed Internet for All*, https://www.internetforall.gov/ (last visited Jan. 5, 2023).

workers.[19] It is designed to help job seekers access employment, education, training, and support services to succeed in the labor market and to match employers with the skilled workers they need to compete in the global economy. Congress passed WIOA with a wide bipartisan majority; it is the first legislative reform of the public workforce system since 1998.

The Employment and Training Administration (ETA) at DOL administers core and discretionary programs authorized under WIOA. Within ETA, the Office of Workforce Investment (OWI) is responsible for implementing an integrated national workforce investment system that supports economic growth and provides workers with the information, advice, job search assistance, supportive services, and training for in-demand industries and occupations needed to get and keep good jobs. Training services available include both classroom and work-based learning opportunities. OWI programs also help connect employers with skilled workers seeking employment.

Refocusing the following programs could facilitate and support developing the needed telecommunications workforce:

- DOL WIOA Adult Program.[20] Workforce services for eligible adults are available through one of the six core programs authorized by WIOA. The Adult program serves individuals and helps employers meet their workforce needs. It enables workers to obtain good jobs by providing them with relevant job search assistance and training opportunities. This program could be aligned to include career pathways in broadband generally and 5G wireless technology industries.
- DOL WIOA Youth Programs and Services.[21] This comprehensive youth employment program serves eligible youth, ages 14-24 who face barriers to education, training, and employment. This program could be aligned to include career pathways in broadband and the growing 5G wireless technology industries.
- DOL Women in Apprenticeship and Nontraditional Occupations (WANTO).[22] DOL has awarded $4.1 million in grant funding to help recruit, train, and retain more women in quality pre-apprenticeship and apprenticeship programs. These apprenticeship opportunities could be accessed to promote and increase equity and opportunities for women in the telecommunications, 5G, and broadband industry.
- DOL funded-industry intermediary. DOL awarded Wireless Infrastructure Association (WIA)[23] a contract to serve as an industry intermediary to expand Registered Apprenticeships (RA) in the telecommunications, 5G, wireless, and broadband sector.

---

[19] Workforce Innovation and Opportunity Act, Pub. L. No. 113-128, 128 Stat. 1425 (2014); *see also* DOL, *Workforce Innovation and Opportunity Act*, https://www.dol.gov/agencies/eta/wioa (last visited Jan. 5, 2023).

[20] DOL, *WIOA Adult Program*, https://www.dol.gov/agencies/eta/workforce-investment/adult (last visited Jan. 5, 2023).

[21] DOL, *WIOA Youth Programs and Services*, https://www.dol.gov/agencies/eta/youth (last visited Jan. 5, 2023).

[22] Apprenticeship USA, *Women in Apprenticeship & Non-Traditional Occupations (WANTO) Technical Assistance Grant Program*, https://www.apprenticeship.gov/investments-tax-credits-and-tuition-support/women-apprenticeship-non-traditional-occupations-wanto (last visited Jan. 5, 2023).

[23] WIA represents the companies that build and maintain the wireless infrastructure ecosystem. Wireless Infrastructure Association, www.wia.org (last visited Jan. 5, 2023).

Industry Intermediaries are organizations uniquely positioned to convene employers within an industry or sub-sector to determine skill needs and workforce trends and to work with employers on a regional and national level to develop apprenticeship programs with the goal of increasing the number of apprenticeship opportunities. As a national sponsor for the Telecommunications Industry Registered Apprenticeship Program (TIRAP), WIA supports the development and scaling of RAs in the wireless/ telecommunications industry.[24]

In addition, the following existing programs could be encouraged to promote telecommunications, 5G, and broadband-related training:

- Strengthening Community Colleges Training Grants;
- The Workforce Pathways for Youth;[25]
- Job Corps programs to connect and establish partnerships;[26] and
- Wagner-Peyser Employment services[27] to connect to telecommunications employers.

Finally, the Working Group recommends issuing guidance to states that encourages assessment of occupations "in decline" to provide retraining in emerging occupations (e.g., broadband and wireless technologies), aligning programs to better utilize resources, and encouraging workforce partnerships to ensure equity and connection to supportive services.

---

[24] Apprenticeship USA, *Telecommunications*, https://www.apprenticeship.gov/apprenticeship-industries/telecommunications (last visited Jan. 5, 2023).

[25] Workforce Pathways for Youth program expands job training and workforce activities for youth, including soft-skill development, career exploration, job readiness and certification, summer jobs, year-round job opportunities and apprenticeships in out-of-school time organizations nationwide. The program allows out-of-school time organizations to partner with local workforce boards and youth-serving organizations, bridging the gap between their existing activities and the need to expose youth to career-related services to better prepare them to enter the workforce. It could also emphasize career exploration and pathways to telecommunication industries, addressing the need to expand and development a vital employment sector to address labor force shortages that hamper the broadband imperative to serve all communities. DOL, *Workforce Pathways for Youth*, https://www.dol.gov/agencies/eta/youth/workforce-pathways-for-youth (last visited Jan. 5, 2023).

[26] Job Corps, *For Businesses*, https://www.jobcorps.gov/businesses (last visited Jan. 5, 2023).

[27] The Wagner-Peyser Act of 1933 established a nationwide system of public employment offices, known as the Employment Service. Wagner-Peyser Act, Pub. L. No. 73-30, 48 Stat. 113 (codified at 29 U.S.C. § 49 *et seq.*) (1933). The Employment Service seeks to improve the functioning of the nation's labor markets by bringing together individuals seeking employment with employers seeking workers. The Wagner-Peyser Act was amended in 1998 to make the Employment Service part of the one-stop delivery system under the Workforce Investment Act. Workforce Investment Act of 1998, Pub. L. No. 105-220, 112 Stat. 936 (1998). In 2014, the Wagner-Peyser Act was amended again under title III of WIOA. Workforce Innovation and Opportunity Act, Pub. L. No. 113-128, 128 Stat. 1425 (2014). The Employment Service under WIOA builds upon the previous workforce reforms, requires colocation of the Employment Service offices into the nearly 2,500 American Job Centers nationwide, and aligns performance accountability indicators with other federal workforce programs. *See also* DOL, *Wagner-Peyser Act Employment Service Results*, https://www.dol.gov/agencies/eta/performance/results/wagner-peyser (last visited Jan. 5, 2023).

Focus Area #2. **Identify potential policies and programs that could encourage and improve coordination among Federal agencies, between Federal agencies and States, and among States, on telecommunications workforce needs.**

The federal government provides billions of dollars every year to support a multitude of cross-agency programs aimed at workforce development, with the DOL-administered WIOA[28] representing the largest federal investment targeted specifically for workforce employment and training, distributed at the state level, mostly through local boards. According to a May 2022 Government Accountability Office (GAO) Report on Broadband there were, at the time, at least 133 broadband funding programs—across 15 agencies—that could be used to support broadband access many of which have workforce development as one of their objectives. The same report highlighted that most of those programs did not align to provide logical and coordinated benefits and services, and that there is considerable program overlap, duplication, and fragmentation of effort.[29] There is currently a lack of coordination on the policies, programming, and funding opportunities available to benefit the telecommunication workforce; there is a need to streamline the distribution and communication of the availability of such programs while potentially eliminating duplicative efforts.

The need for alignment has been made all the more pressing by the historic grants that will flow out of the IIJA. IIJA provides NTIA with $48.2 billion for new grant programs, focusing on broadband access, adoption, and digital equity. NTIA will administer $48.2 billion through several programs, including the Tribal Broadband Connectivity Program, the Broadband Equity, Access, and Deployment (BEAD) Program,[30] the Digital Equity Act programs,[31] and the Enabling Middle Mile Infrastructure Program.[32] The BEAD Program specifically will provide $42.5 billion to expand high-speed internet access by funding planning, infrastructure deployment, and adoption programs in all 56 states and territories. The BEAD Program will support planning, mapping, equity, and adoption projects. States and other eligible participants in the program will be required to submit a five-year action plan detailing their proposed efforts to connect their residents. These plans must be developed in collaboration with local and regional entities, to help ensure no one is left behind.[33] Separately, the Enabling Middle Mile

---

[28] Workforce Innovation and Opportunity Act, Pub. L. No. 113-128, 128 Stat. 1425 (2014); *see also* DOL, *Workforce Innovation and Opportunity Act*, https://www.dol.gov/agencies/eta/wioa (last visited Jan. 5, 2023).

[29] GAO, *Broadband: National Strategy Needed to Guide Federal Efforts to Reduce Digital Divide*, GAO-22-104611, Appx. II (May 2022), https://www.gao.gov/assets/gao-22-104611.pdf (GAO National Broadband Strategy Report).

[30] *See* NTIA, BroadbandUSA, *Broadband Equity, Access, and Deployment (BEAD) Program*, https://broadbandusa.ntia.doc.gov/broadband-equity-access-and-deployment-bead-program (last visited Jan. 5, 2023) (providing information on the BEAD Program).

[31] NTIA, BroadbandUSA, *Digital Equity Programs*, https://broadbandusa.ntia.doc.gov/digital-equity-programs (last visited Jan. 5, 2023).

[32] NTIA, BroadbandUSA, *Enabling Middle Mile Broadband Infrastructure Program*, https://broadbandusa.ntia.doc.gov/enabling-middle-mile-broadband-infrastructure-program (last visited Jan. 5, 2023).

[33] NTIA, *Fact Sheet: Biden-Harris Administration's "Internet for All" Initiative: Bringing Affordable, Reliable High-Speed Internet to Everyone in America* (May 13, 2022), https://www.ntia.doc.gov/other-publication/2022/fact-sheet-biden-harris-administration-s-internet-all-initiative-bringing.

Broadband Infrastructure Program will fund projects that increase local competition and innovation and create a more reliable connection for underserved communities across the country.[34]

Proper implementation in the next year of a critical portion of the BEAD statute and regulations could make an important contribution to this necessary integration. While it tends to receive less focus than other topics, states are required to include a detailed workforce development plan as part of their five-year plan and as part of the deployment proposal to NTIA. BEAD deployment funds can be used for workforce development efforts that include RAs and pre-apprenticeships, and community college and/or vocational training for broadband-related occupations to support network deployment, maintenance, and upgrades. BEAD allows states to spend first-dollar deployment money to implement these programs. In most states, the BEAD program is being managed by offices reporting directly to the state Governor. They are thus in a position to provide the necessary coordination between the separate agencies that have a contribution to make to each state's comprehensive workforce plan: K–12 education, higher education, labor/workforce, and, where appropriate, economic development.

Most states have yet to launch the process to develop these comprehensive plans. Encouraging them to trade ideas, best practices, and other cooperative tools could advance this important area. We note that some states have made a head start by deciding to develop a broadband workforce plan before BEAD rules were finalized. In particular, strong leadership from the Governor has resulted in Ohio having a multidimensional program underway in partnership with WIA.[35]

This historic moment presents a unique opportunity to issue a nationwide call to action to make a tangible commitment to work in unison and ensure that every single dollar of funding provided for skilling and training the broadband workforce flows seamlessly through the different array of federal and local agencies and achieves the goal of creating a stronger, highly skilled and diverse workforce.

The below recommendations were put together with the goal of providing ways that would facilitate the alignment and coordination of these efforts.

Recommendations:

2.1 Create an interagency "National Broadband Workforce Task Force."

As an overarching framework in this Focus Area, the Working Group recommends creating an interagency group to oversee the federal programs promoting the broadband workforce needs. A "National Broadband Workforce Task Force" could be comprised of representatives from the Department of Commerce, the DOL, the Veteran's Affairs Office, and the Department of

---

[34] *See, e.g.*, Internet for All, *Enabling Middle Mile Infrastructure Program*, https://www.internetforall.gov/program/enabling-middle-mile-broadband-infrastructure-program (last visited Jan. 5, 2023).

[35] *See, e.g.*, Broadband Ohio, *Strengthening Ohio's Broadband & 5G Workforce*, https://broadband.ohio.gov/explore-broadband/strengthening-ohios-broadband-5g-workforce (last visited Jan. 5, 2023).

Education to combine the expertise of these agencies. The Executive Office of the President could oversee the "National Broadband Workforce Task Force,"[36] and it could be funded through the IIJA funding opportunities. The objectives of the Task Force would include the following:

- Design a holistic and nationwide sectoral strategy for broadband workforce development to ensure all available funding streams are used in a consistent and concerted way to bolster outreach, training, recruitment, retention, and the continuation of training for the broadband workforce. When actions are aligned at the Executive Office level, states, territories, regions, employers, workers, and other stakeholders will all benefit. The America Achieves Report identifies key federal programs supporting workforce development and suggests potential uses for the funding.[37]
- Design and launch a nationwide branding campaign with a clear and effective "top-line" message aimed at educating the general population about broadband careers. The campaign should focus on marketing broadband jobs and highlighting career pathways in the broadband sector. This campaign should continue during 5G rollout and beyond to include the next generations of broadband deployment while promoting equitable diversification.[38]
- Setup a nationwide resource-hub to serve as a one-stop website for broadband workforce development, including but not limited to available federal programs, state-specific programs, talent pipeline creation and management, and training and apprenticeship opportunities. For instance, the DOL's Career Trajectories and Occupational Transition Dashboard[39] could be leveraged to create a new dashboard solely focused on broadband-infrastructure workforce opportunities. The Internet for All website could be expanded to provide a one-stop website for military personnel and others searching for careers in broadband.[40] If apprenticeships, training, and industry credentialing requirements in the existing and emerging broadband occupations are located in one website, they could be

---

[36] GAO National Broadband Strategy Report has recommended that the Executive Office of the President develop and implement a national broadband strategy. GAO National Broadband Strategy Report at 35. In the event that such recommendation is adopted, it would be the ideal entity to oversee the implementation of this overarching recommendation of the Working Group.

[37] America Achieves and Rural Innovation Strategies, Inc., *Creating and Expanding Diverse Broadband Workforce with Good Jobs and Career Pathways: Broadband Equity, Access, and Deployment (BEAD) Program Playbook for Eligible Entities* (June 22, 2022), https://americaachieves.org/wp-content/uploads/2022/06/America-Achieves-Broadband-Workforce-Report-June-2022.pdf (America Achieves Report).

[38] On October 29, 2020, the FCC's Broadband Deployment Advisory Committee (BDAC) unanimously approved the recommendations set forth by the BDAC Jobs Skills and Training working group, in which a "Broadband Identity Crisis" and lack of nationwide awareness of available broadband jobs was named as one of the most relevant causes of the skills gap and the workforce shortage. FCC, *BDAC Meeting, October 2020* (Oct. 29, 2020), https://www.fcc.gov/news-events/events/2020/10/bdac-meeting-october-2020 (containing video of the meeting and a link to the working group's report). See also the discussion of workforce needs necessary to deploy broadband and 5G in a December 2022 GAO Report. GAO, *Telecommunications Workforce: Additional Workers Will Be Needed to Deploy Broadband, but Concerns Exist About Availability*, GAO-23-105626 (Dec. 15, 2022), https://www.gao.gov/assets/gao-23-105626.pdf,

[39] DOL, *Career Trajectories and Occupational Transitions Dashboard*, https://www.dol.gov/agencies/oasp/evaluation/resources/career-trajectories-and-occupational-transitions-dashboard (last visited Jan. 5, 2023).

[40] Internet for All, *High-Speed Internet for All*, https://www.internetforall.gov/ (last visited Jan. 5, 2023).

managed across the entire nation. A good example of a government hosted nationwide resource-hub is the AmeriCorps website, which is a one-stop resource for Americans interested in community service anywhere in the country.[41]

- Serve as a liaison and provide guidance to state and local government. The proposed National Broadband Workforce Task Force would work closely with states' broadband offices, local government, Tribal governments, and territorial governments to work together and align their individual broadband workforce strategic plan and initiatives with the nationwide initiative. A key objective should be to develop strong ties into each state's broadband offices, many of them newly formed pursuant to the $42.5 billion BEAD funding contemplated in the IIJA. States can be assisted by providing best practices in telecommunications workforce development. Ohio is an excellent example, particularly in its partnership between industry and higher education.[42]

- Prompt federal agencies, on an on-going basis, to educate employers, industry intermediaries, and broadband stakeholders about available industry RA programs[43] and funding streams that can help support, develop, and accelerate the training of all Americans, especially those located in underserved and unserved areas, and whom may be even more unaware of the job opportunities the broadband sector offers.

- To immediately leverage DOL's Wagner-Peyser Employment Service,[44] as a tool to improve the functioning of the nation's broadband labor market. The Wagner-Peyser Employment Service will bring together individuals seeking employment with employers seeking workers. It will also be an exceptional, and already deployed, resource to educate employers, industry intermediaries and all broadband stakeholders about the broadband related programs and services provided by DOL.

- Develop key components for training needed in the broadband industry. These key components to be developed include knowledge, skills, and abilities, competency, and/or work processes needed to fill vacancies in the broadband sector.

2.2 Develop key performance metrics aimed at tracking progress and outcomes across all agencies.

To better coordinate workforce development efforts for the broadband workforce, we recommend developing key performance metrics. These metrics would track progress and outcomes of the broadband workforce development programs across all federal, state, and local agencies. These metrics would empower interested stakeholders to make informed, educated, and assertive decisions about the future and reach of each program. Each state agency that receives BEAD broadband funding is required to create a comprehensive workforce development program. It should include an "Annual Progress Performance Report." As part of the annual Report, state agencies could issue surveys to workers to get their perspectives on

---

[41] AmeriCorps, https://americorps.gov (last visited Nov. 15, 2022).

[42] *See* Ohio Governor's Office of Workforce Transformation, *Strengthening Ohio's Broadband and 5G Workforce* (2021), https://broadband.ohio.gov/explore-broadband/strengthening-ohios-broadband-5g-workforce (available for download).

[43] Apprenticeship USA, *Registered Apprenticeship Programs*, https://www.apprenticeship.gov/employers/registered-apprenticeship-program (last visited Jan. 5, 2023).

[44] *See supra* note 27.

training, program execution, and job quality. The responses to the survey would be included in the annual Report and would be used to create relevant metrics.

The comprehensive workforce development plans that BEAD requires each state to produce are the single best near-term opportunity to turn the attention of state workforce development infrastructure and education agencies to address this critical infrastructure sector. We encourage governors to use the opportunity of creating the required comprehensive workforce development plans to (1) launch coordination between the relevant agencies under them to give telecommunications the workforce attention it deserves and (2) closely coordinate those efforts with industry through the appointment and active involvement of an industry intermediary.

We recommend that broadband funds be utilized to create a telecommunications "sector partnership"—a public/private partnership at the state level that brings together relevant stakeholders from government, industry, and education to develop, implement, and promote workforce training programs for this key sector of the economy. WIA is serving as the industry intermediary for Ohio's Broadband and 5G Sector Partnership where it works with the Ohio State University and other schools to bring together industry and academia to create industry-driven curricula on broadband and 5G technologies for the entire state. The Governor's Office is providing strong leadership and coordination to establish this telecommunications sector partnership of industry, the education system, the workforce development sector, and community leaders. We encourage other states to take a close look at the Ohio plan and build on it as they consider workforce development planning in their states.

Focus Area #3. **Identify ways in which existing federal programs, including programs that help facilitate the employment of Veterans and military personnel transitioning into civilian life, could be leveraged to help address the workforce needs of the telecommunications industry.**

Many federal programs offer important supportive services for workforce development. To align existing federal programs with investments opportunities in broadband infrastructure, we need better coordination alongside a focused effort to create pipelines for the broadband technician workforce. Veterans, transitioning service members, and transitioning member spouses may be well suited for a career in the telecommunications industry and specifically in broadband services. Therefore, these recommendations are designed to inform military personnel transitioning into civilian life of the workforce opportunities and how to obtain the training to meet the workforce needs. The America Achieves Report includes a comprehensive list of existing federal and state programs that are great examples on how this focus area is currently addressed.[45] Furthermore, embracing existing successful programs at a nationwide level, could be a significant accelerator to address the current training needs of the broadband workforce.

Recommendations:

3.1 Request that the Department of Defense promote broadband careers in the SkillBridge program.

The Department of Defense should position and promote broadband careers as part of its "SkillBridge Program."[46] The SkillBridge Program targets active service members that are within 180 days of release from Active Duty and that are eager to explore new career options as they face the transition to civilian life. The main benefit of this program is that it also allows the service member to participate in training and development with industry and employers who are seeking high-quality skills while they are still in active duty and before they fully transition to the civilian workforce.

3.2 Connect Veterans to broadband careers through the Rapid Retraining Assistance Program (VRRAP).

The Department of Veterans Affairs should position Rapid Retraining Assistance Program (VRRAP)[47] to connect Veterans that are currently unemployed to broadband careers. The mission of this program is to provide training towards an associate's degree, non-college degree, or certificate that leads to a high-demand occupation, as determined by the DOL. DOL last issued an approved list of high-demand occupations that qualify for this program in September

---

[45] America Achieves Report at 51-54.

[46] Dep't of the Interior, *DoD SkillBridge Program*, https://www.doi.gov/veterans/skillbridge (last visited Jan. 5, 2023).

[47] Dep't of Veterans Affs., *Veteran Rapid Retraining Assistance Program (VRRAP) for Educational Institutions*, https://benefits.va.gov/gibill/vrrap_educational_institutions.asp (last visited Jan. 5, 2023).

2022.[48] The September 2022 list includes 240 occupations, and four of them relate to telecommunications jobs (mostly in wireless).[49] Therefore, this program can be leveraged to bring Veterans into the telecommunications workforce. It is also our recommendation that the DOL revisit this list to better align to the broader range of broadband occupations in demand across wireline and wireless infrastructure today.

3.3 Educate broadband stakeholders about specific G.I. Bill Benefits.

The Department of Veterans Affairs should create initiatives geared at educating employers, industry intermediaries, and all broadband stakeholders about specific G.I. Bill benefits. The G.I. benefits would allow broadband industry employers to leverage on-the-job training and apprenticeship programs to train Veterans, while the Veterans would retain their G.I. Bill benefits as they learn the skills necessary to accelerate broadband careers. "Earn as you learn" is a powerful recruitment model that should be aggressively promoted as it lowers the entry barrier for potential employees, including Veterans transiting to the civilian workforce.

3.4 Expand Veteran educational programs to be telecommunications workforce ready.

The Department of Veterans Affairs should add careers in 5G wireless infrastructure and 5G wireless technology in the eligible programs, such as Veterans Technology Education Courses (VET TEC).[50] Current courses include Computer Software, Computer Programming, Data Processing, Information Science, and Media Applications. Additional programs to add would include programs geared toward workforce needs in the wireless and telecommunications industry. Department of Veterans Affairs should also streamline systems for Post 911 and G.I. Bill use (certification area and traditional 2+ year programs and associate-degree programs).[51] The Department of Veterans Affairs should also expand incentives and funding for post-secondary institutions and industry partners who offer Veterans certifications in telecommunications. Examples of programs include O2O (formally VCTP Veteran Career Transition Program) and the University of Syracuse programs PMP, Cisco, and CompTIA+.[52]

---

[48] Dep't of Veterans Affs., *Veteran Rapid Retraining Assistance Program High Demand Occupations Current as of September 9, 2022* (Sept. 9, 2022), https://benefits.va.gov/GIBILL/docs/vrrap-high-demand-occupation-list.pdf.

[49] The listed telecommunications related occupations are (1) telecommunications equipment installers and repairers, except line installers; (2) computer, automated teller, office radio, cellular, and tower equipment installers and repairers; (3) electrical power-line installers and repairers; and (4) telecommunications installers and repairers. *Id*. at 4-5.

[50] *See* Dep't of Veterans Affs., *Veterans Technology Education Courses*, https://www.va.gov/education/about-gi-bill-benefits/how-to-use-benefits/vettec-high-tech-program/ (last visited Jan. 5, 2023).

[51] *See* Dep't of Veterans Affs., *Post-9/11 GI Bill (Chapter 33)*, https://www.va.gov/education/about-gi-bill-benefits/post-9-11/ (last visited Jan. 5, 2023).

[52] *See* Syracuse Univ., *About O2O: What Is Onward and Upward?*, https://ivmf.syracuse.edu/programs/career-training/about-o2o/ (last visited Jan. 5, 2023); Syracuse Univ., *Learning Pathways*, https://ivmf.syracuse.edu/programs/career-training/learning-pathways/ (last visited Jan. 5, 2023).

3.5 Educate Regional Veterans' Employment Coordinators on the broadband workforce needs.

Employment Coordinators play a critical role in assisting Veterans in securing meaningful and lasting post-separation careers. DOL should train all Regional Veterans' Employment Coordinators (RVECs)[53] on the sectoral broadband-workforce needs. In that way, Regional Veteran's Employment Coordinators are properly educated about all of the federal and local broadband-workforce development programs—such as those established under BEAD—to enable them to effectively coordinate and advise Veterans as they consider any of broadband career pathways.

3.6 Promote pre-apprenticeship programs to service members nearing the end of their service.

The Department of Defense should reach out to all commanding officers and grant permission to transitioning service members as well as spouses of transitioning service members to join pre-apprenticeship programs that guarantee direct entry into a registered telecommunications apprenticeship program, creating a clear pathway into broadband occupations. This can be accomplished through face-to-face training or by way of a combination of online/face-to-face training.

Warriors 4 Wireless (W4W) and WIA's partnership is an example of a program with great potential that should be expanded.[54] W4W is a charitable organization existing solely to help Veterans find decent paying careers in the growing 5G wireless workforce. They have connected over 3,400 Veterans to telecommunications career opportunities as of October 31, 2022. Further, W4W is a recognized pre-apprenticeship training partner aligned with WIA's RA program known as TIRAP. This partnership combines recruiting, training, and placement in well-paying RAs and careers as wireless technicians, tower technicians, fiber-optic technicians, drone pilots, and other ground-based occupations.

3.7 Allocate, and/or increase, funding to DOL to create sector-specific grants that will support training for transitioning service personnel, spouses of transitioning service personnel, and Veterans.

We recommend funding programs, such as the Veterans Electrical Entry Program (VEEP).[55] This program provides theory and hands-on training that provides pre-apprenticeship training for electrical/telecommunications apprenticeship. Upon completion of this program, the transitioning service member is guaranteed direct entry into an electrical/telecommunications

---

[53] DOL, *Regional Veterans' Employment Coordinator*, https://www.dol.gov/agencies/vets/employers/rvec (last visited Jan. 5, 2023).

[54] Warriors 4 Wireless, https://www.warriors4wireless.org/ (last visited Jan. 5, 2023).

[55] VEEP, *Jumpstart Your Career*, https://in2veep.com (last visited Jan. 5, 2023).

apprenticeship program sponsored by the International Brotherhood of Electrical Workers[56] and the National Electrical Contractors Association (IBEW/NECA).[57] The IBEW/NECA VEEP program is a joint venture between labor and management to provide training to transitioning service members in all armed forces.

DOL should offer technical assistance and funding targeted to major internet service providers who commit to strengthening recruitment of transitioning service members, spouses, and Veterans. For example, AT&T and the Communications Workers of America have agreed to work together to strengthen AT&T's recruitment efforts with Veterans' organizations to advance the goal of creating pipelines, incentives, and streamlined credentialing for these populations.

---

[56] The IBEW represents approximately 775,000 active members and retirees who work in a wide variety of fields, including utilities, construction, telecommunications, broadcasting, manufacturing, railroads, and government. The IBEW has members in both the United States and Canada and stands out among the American unions in the AFL-CIO because it is among the largest and has members in so many skilled occupations. IBEW, http://www.ibew.org/ (last visited Jan. 5, 2023).

[57] NECA is the voice of the $202 billion electrical construction industry that brings power, light, and communications technology to buildings and communities across the United States. NECA, https://www.necanet.org/ (last visited Jan. 5, 2023).

Focus Area #4. Identify ways to improve recruitment in workforce development programs in the telecommunications industry.

The broadband industry needs to improve its methods of recruiting and retaining workers in high-quality jobs. Connecting new entrants and laid off workers to training and job opportunities in the broadband industry will require a thoughtful approach that involves state coordination, Congressional support of training opportunities, support from institutions of higher education, and involvement of other industry stakeholders and government entities.

Recommendations:

4.1 Promote diversity, equity, inclusion, and accessibility (DEIA) in recruitment in development programs.

Consistent with the goals and values articulated in the President's June 2021 Executive Order entitled *Diversity, Equity, Inclusion, and Accessibility in the Federal Workforce*,[58] America's non-federal workforce is also strongest when it reflects all communities and draws from the full diversity of our nation. Empowering underserved communities[59] to take part in the building of superior connectivity will help ensure they also benefit from the same. As part of each of the seven initiatives outlined below in response to this Focus Area, policy and decisionmakers should seek to advance DEIA by adopting strategies that incorporate five foundational principles:

- the use of data and evidence-based decision-making;
- a focus on continuous improvement;
- adoption of a collaborative mandate with partnership engagement;
- prioritization of accountability and sustainability; and
- an understanding of the perspectives of the workforce and customers alike.[60]

---

[58] *Diversity, Equity, Inclusion, and Accessibility in the Federal Workforce*, Exec. Order No. 14035, 86 Fed. Reg. 34593 (June 25, 2021), https://www.govinfo.gov/content/pkg/FR-2021-06-30/pdf/2021-14127.pdf.

[59] "The term 'underserved communities' refers to populations sharing a particular characteristic, as well as geographic communities, who have been systematically denied a full opportunity to participate in aspects of economic, social, and civic life. In the context of the Federal workforce, this term includes individuals who belong to communities of color, such as Black and African American, Hispanic and Latino, Native American, Alaska Native and Indigenous, Asian American, Native Hawaiian and Pacific Islander, Middle Eastern, and North African persons. It also includes individuals who belong to communities that face discrimination based on sex, sexual orientation, and gender identity (including lesbian, gay, bisexual, transgender, queer, gender non-conforming, and non-binary (LGBTQ+) persons); persons who face discrimination based on pregnancy or pregnancy-related conditions; parents; and caregivers. It also includes individuals who belong to communities that face discrimination based on their religion or disability; first-generation professionals or first-generation college students; individuals with limited English proficiency; immigrants; individuals who belong to communities that may face employment barriers based on older age or former incarceration; persons who live in rural areas; veterans and military spouses; and persons otherwise adversely affected by persistent poverty, discrimination, or inequality. Individuals may belong to more than one underserved community and face intersecting barriers." *Id.* at 34594.

[60] White House, *Government-Wide Strategic Plan to Advance Diversity, Equity, Inclusion, and Accessibility in the Federal Workforce* at 6 (Nov. 2021), https://www.whitehouse.gov/wp-content/uploads/2021/11/Strategic-Plan-to-

4.2 NTIA should issue annual reports on the status of each state's broadband workforce development plans.

The BEAD program criteria for states encourages "high-road" employment practices[61] and workforce development strategies that connect workers with stable jobs with good wages and benefits, paid training, and respect for workers' rights. To achieve this objective, we support the current requirement for NTIA to issue annual reports to the Congressional Oversight Subcommittees on the progress of each state's workforce development plans for broadband, as required under the BEAD program. The reports should provide data to support additional training programs to enable workers to earn while they learn, particularly in-house training by Internet Service Providers and apprenticeships with progressive wage scales. Additional discussion of high-road employment can be found under Recommendation 4.8, *infra*.

4.3 Expand science, technology, engineering, and mathematics (STEM) programs.

Authorize new programs at the Department of Education and DOL and provide funding to expand the prevalence of computer science and science, technology, engineering, and mathematics (STEM) programs, which could greatly improve recruitment in the telecommunications workforce. These funds for the Departments of Education and Labor could highlight a clear pathway to broadband credentialing and occupations. For instance, the National Center for Education Statistics (NCES),[62] which is the primary federal entity for collecting and analyzing data related to education, could consider examining what would be involved in the developing a classification or definition of STEM credentials. One such program that is currently being promoted by IBEW/NECA is Interim Credentials. This program provides online training for high school programs and community colleges. The program provides a pathway into RA for Inside Wireman, Residential Wireman, and Telecommunications Technician. Additional programs similar to this could be developed to address the specific needs of the broadband, wireless, and technology related industries.

4.4 Expand industry specialized degree programs at higher-education institutions.

Allocate new or increase existing funding to the Department of Education to encourage the expansion of specialized university undergraduate and graduate programs, as well as community and technical colleges and centers. A great example of what the collaboration amongst a state, an institution of higher education, and an industry intermediary can achieve is the Ohio's

---

Advance-Diversity-Equity-Inclusion-and-Accessibility-in-the-Federal-Workforce-11.23.21.pdf (explaining the use of the five principles for improving DEIA in the federal workforce).

[61] *See* Heather Boushey and Kevin Rinz, White House, *Blocking the Low Road and Paving the High Road: Management Practices to Improve Productivity* (Apr. 6, 2022), https://www.whitehouse.gov/cea/written-materials/2022/04/06/blocking-the-low-road-and-paving-the-high-road-management-practices-to-improve-productivity/ ("Employers who choose to take the "high road" focus on supporting employees' on-the-job success by meeting the needs they have in life. Employers do this in a variety of ways: paying higher wages, providing benefits such as paid leave and workplace flexibility, keeping workplaces safe, supporting workers' development through training, and maintaining respectful relationships with workers.").

[62] Nat'l Center for Educ. Stat., https://nces.ed.gov/ (last visited Jan. 5, 2023).

Broadband and 5G Sector Partnership, which is a part of a large state effort to grow the workforce needed to expand broadband access and 5G in Ohio. As part of this initiative, in January 2022, the State of Ohio awarded $3 million to Ohio State University to host the Sector Partnership and selected the WIA as the industry intermediary to lead the effort. With the awarded funds and the support of the WIA, Ohio State University will create industry-focused curriculum on broadband and 5G technologies, consult with industry and serve as a liaison to provide insights on the skills gap for broadband and assist with educational and workforce development programs from planning through execution phases. Other great examples of relevant industry specialized programs can be found in the "Biden-Harris Talent Pipeline Talent Fact Sheet."[63]

4.5 Develop effective and scalable telecommunications and broadband training programs in collaboration with a broad range of stakeholders.

To achieve this objective, we recommend recurring and systemic collaboration of educators, employers, intermediaries, and governmental agencies at federal, state, Tribal, and local levels in the development of effective and scalable telecommunications and broadband training programs. For example, the Biden-Harris Talent Pipeline Challenge[64] generated training commitments from broadband providers, industry associations, labor unions, and educational institutions, including development of new apprenticeship programs, investment in hiring and training workers both new to the industry and who have left due to job cuts, streamlined tuition assistance and supportive services for existing employees, and development of broadband-specific OSHA-10 trainings.[65]

To facilitate broadband infrastructure, effective training programs would also include the entire broadband industry such as supply chain procurement/planning, advanced manufacturing, tax and trade, operations management, cybersecurity, and job opportunities for technology systems closely related to the broadband industry.

The Broadband Development Advisory Committee's (BDAC) Jobs Skills and Training Report is also a valuable source of existing, effective and scalable broadband training programs.[66] These include training from secondary educational institutions, trade schools and other specialized training platforms, and apprenticeships. Examples discussed in the BDAC Report include Wake Tech Community College, which is North Carolina's largest community college and offers topics that include safety, rigging, fall protection, principles of electricity, fiber optics, and

---

[63] Press Release, White House, FACT SHEET: President Biden Celebrates New Commitments toward Equitable Workforce Development for Infrastructure Jobs (Nov. 2, 2022), https://www.whitehouse.gov/briefing-room/statements-releases/2022/11/02/fact-sheet-president-biden-celebrates-new-commitments-toward-equitable-workforce-development-for-infrastructure-jobs/.

[64] *Id.*

[65] Occupational Safety and Health Administration (OSHA) training teaches how to recognize and prevent safety hazards to comply with OSHA standards. *See* 360training, OSHA Campus, *OSHA Training Online*, https://www.360training.com/osha-campus/osha-training (last visited Jan. 5, 2023).

[66] BDAC, *Broadband Infrastructure Deployment Job Skills and Training Opportunities Working Group Report* at 21-27 (Oct. 29, 2022), https://www.fcc.gov/sites/default/files/bdac-job-skills-training-opportunities-approved-rec-10292020.pdf.

wireless technology cell components. Fiber Optic Association provides online specialized self-study programs that offers certificates for course completion.[67]

WIA is the national sponsor for the TIRAP.[68] WIA has a strong existing, competency-based apprenticeship program that provides a portable, industry-recognized credential and is working with Institutes of Higher Education (IHEs) to strengthen curricula and build a pipeline of apprentices. WIA also is providing access to pre-apprenticeship programs that will accelerate preparation in career and technical education and veterans' transition programs, with articulation agreements that will support continued related technical instruction. The TIRAP Advisory Committee provides program input from industry. Eighty companies are now official TIRAP apprenticeship sponsors.[69]

WIA also provides more than 40 courses on a wide variety of wireless infrastructure issues through its Telecommunication Education Center (TEC). Another example of a successful training model is Wisconsin's Broadband Academy online program at Northwood Technical College. These examples can be used as models for the development of unique training programs that address the needs of industry employers and increase the pool of potential workers by providing opportunities to traditionally underserved student populations, including immigrants and adults with non-traditional educational experience.

4.6 Promote training opportunities through American Job Centers, state and local workforce boards, and Job Corps.

Allocate additional funding for American Job Centers[70] and state and local workforce boards,[71] as well as Job Corps to promote training opportunities to people seeking employment opportunities.[72] Funding these organizations will place them in a better position to directly work with state broadband offices and broadband providers to raise awareness of those opportunities available in the broadband industry. As noted above, this will be most effective if it is done in

---

[67] Fiber Optic Association, *FOA Approved Training Programs*, https://www.thefoa.org/foa_aprv.htm (last visited Jan. 6, 2023).

[68] *See* Telecommunications Industry Registered Apprenticeship Program, www.TIRAP.org (last visited Jan. 5, 2023). WIA is responsible for managing and staffing the TIRAP program.

[69] WIA coordinates with DOL on the standards of the apprenticeship program and reviews each company's apprenticeship program to ensure it is consistent with TIRAP and DOL requirements. Each company selects which apprenticeship occupations to support and directly engages apprentices. WIA provides on-going staff support, technical assistance for participating companies as they adopt, implement, and expand RA within their company.

[70] DOL, *American Jobs Centers*, https://www.dol.gov/general/topic/training/onestop (last visited Jan. 5, 2023).

[71] *See* CareerOneStop, *State Workforce Development Boards*, https://www.careeronestop.org/Developers/Data/state-workforce-development-boards.aspx (last visited Jan. 5, 2023); CareerOneStop, *Workforce Development Board Finder*, https://www.careeronestop.org/LocalHelp/WorkforceDevelopment/find-workforce-development-boards.aspx (last visited Jan. 5, 2023) (providing state and local workforce development board information). For additional information on state and local workforce boards, see DOL & FCC, *Guidance to States on Addressing the Workforce Needs and Safety of the Telecommunications Industry* 6 (Dec. 5, 2022), https://www.dol.gov/sites/dolgov/files/ETA/advisories/TEN/2022/TEN%2010-22/TEN%2010-22%20%28Complete%20PDF%29.pdf.

[72] Job Corps, https://www.jobcorps.gov/ (last visited Jan. 5, 2023).

conjunction with state leadership focusing attention on the need for a sectoral strategy in telecommunications.

4.7 Increase funding to expand specific grants for Registered Apprenticeship programs and training in the broadband and telecommunications industry.

RA programs are an industry-driven, high-quality career pathway where employers can develop and prepare their future workforce, and individuals can obtain paid work experience, receive progressive wage increases, classroom instruction, and a portable, nationally recognized credential.[73] RA programs are industry-vetted and approved, and they are validated by the DOL or by state apprenticeship agencies. RA programs enable and energize more employers to participate, and RA programs provide employers access to larger talent pools that have been trained for entry-level to management positions, thereby meeting industry demands and reducing unemployment rates across the country. Specifically, RAs are jobs where workers "earn and learn." While working on the job, employees receive one-on-one full-time training from a skilled craftsperson as well as related classroom instruction. An apprentice is "sponsored" by an employer or association and is paid according to a progressive pay scale.

As a mid- and longer-term strategy, DOL should also work closely with related RA programs to expand the programs to include broadband occupations. We recommend allocating more funding to the DOL to expand specific grants for training in the broadband and telecommunications industry. The DOL should promote those broadband and telecommunications-related RA programs that already exist (e.g., TIRAP and Telecommunications Technician), to accelerate and ramp-up outreach and training in the short term. The industry already is taking steps to create additional broadband apprenticeships.

Additionally, DOL can partner with the American Job Centers, state and local workforce boards, Job Corps, and middle-schools and high schools, including career and technical education, to develop additional education and training programs to compound the outreach. This will be most effective if governors provide the coordinating leadership to get their educational and workforce organizations and infrastructures to focus on telecommunications as they have on other industries.

4.8 Target IIJA broadband workforce development funding to high-road employers.

NTIA should work with states to target IIJA broadband workforce development funding to programs that can certify job placement with high-road employers, such as through RA programs or the presence of a collective bargaining agreement.

Government, business, and labor groups have defined a "high-road workplace" as one that offers good jobs and invests in sustainability, in that it will "provide family-friendly benefits, offer flexibility, pay a livable and fair wage, invest in employee growth and development, cultivate

---

[73] *See* Apprenticeship USA, *Registered Apprenticeship Programs*, https://www.apprenticeship.gov/employers/registered-apprenticeship-program (last visited Jan. 5, 2023).

inclusion, govern fairly and transparently, engage with communities, manage the supply chain responsibly, drive environmental best practices, and promote health and safety."[74]

Following this model, the NTIA BEAD Notice of Funding Opportunity (NOFO) requires states to incorporate "fair labor practices" as one of three primary criteria on which subgrantees will be evaluated, with baseline requirements[75] and flexibility for states to add criteria to ensure "an effective plan for compliance with federal labor and employment laws," including binding commitments to comply with "strong labor standards." These standards include the following criteria:

- using a directly employed workforce, as opposed to a subcontracted workforce;
- paying prevailing wages and benefits to workers;
- using project labor agreements or labor peace agreements and/or commitments to union neutrality;
- using local hire provisions;
- using an appropriately skilled workforce (e.g., through RAs or other joint labor-management training programs that serve all workers, particularly those underrepresented or historically excluded);
- using an appropriately credentialed workforce (i.e., satisfying requirements for appropriate and relevant pre-existing occupational training, certification, and licensure); and
- taking steps to prevent the misclassification of workers.[76]

---

[74] *See, e.g.*, Am. Sustainable Bus. Council, *The High-Road Workplace: Route to a Sustainable Economy* (2017), https://www.asbcouncil.org/sites/main/files/file-attachments/asbc_building_the_high_road_report_2017.pdf; Inclusive Economics, *High Road Workforce Guide for City Climate Action* (Apr. 2021), https://www.usdn.org/uploads/cms/documents/workforce-guide_4.12.21_form.pdf.

[75] NTIA, Notice of Funding Opportunity: Broadband Equity, Access, and Employment Program at 56-57 (May 13, 2022), https://broadbandusa.ntia.doc.gov/sites/default/files/2022-05/BEAD%20NOFO.pdf (BEAD NOFO). NTIA requires that, at a minimum, states evaluate information on subgrantees' records of labor compliance and their plans to comply with labor laws. For record of compliance, states must evaluate: (1) information on a subgrantee and any subcontractors' record of compliance with federal labor and employment laws on broadband deployment projects in the last three years; (2) data on historical use of subcontracting arrangements, including staffing plans; and (3) at least one example of each subcontractor's past performance in the context of a similar project. For plans to comply with labor laws, states must evaluate a subgrantee and any subcontractors' wage scales and wage and overtime practices, and how the subgrantee will ensure the implementation of workplace safety committees.

[76] BEAD NOFO at 57.

Focus Area #5. **Identify Federal incentives that could be provided to institutions of higher education, for-profit businesses, State workforce development boards established under section 101 of the Workforce development boards established under section 101 of the Workforce Innovation and Opportunity Act (29 U.S.C. 3111), or other relevant stakeholders to establish or adopt new programs, expand current programs, or partner with Registered Apprenticeship programs, to address the workforce needs of the telecommunications industry, including such needs in rural areas.**

Although there are successful programs for workforce development in the telecommunications industry, they represent a fraction of employers, education providers, workforce development agencies, and other stakeholders. The projected demand for telecommunications workers, driven by private-sector deployment and federal and state investment in broadband infrastructure, far exceeds the supply of workers who are entering the sector from current education and job training programs. Federal investment in RA programs, for example, resulted in a 51% increase in apprentices in the United States from 2009 through 2020. A tiny fraction of that investment, however, has been directed to telecommunications. Incentivizing relevant stakeholders to adopt new programs will require shaping federal subsidy eligibility such that participation is as frictionless as possible.

Recommendations:

    5.1 Consider allowing Pell Grants to be used as financial support for short-term credentials programs.

Federal Pell Grants, which provide up to $6,895 for the 2022–23 award year, can be used to enroll in sub-bachelorette certificate programs as short as 600 hours or 16 semester credit hours over a minimum of 15 weeks and in graduate or professional level certificate programs as short as 300 hours or 8 semester credit hours. There appears to be bipartisan support, and from community colleges and business and industry, to expand Pell to include short-term credentials beyond what is currently allowable.

For instance, the bipartisan proposal H.R.4521 United States Innovation and Competition Act of 2021 would permit short-term Pell if enacted.[77] If signed into law, this legislation would allow training programs as short as 8 weeks, to be Pell-Grant eligible.[78] Student aid programs make up a bulk of the over $150 billion in annual funding available through the Department of Education. Shortening the program duration eligibility from 15 weeks to 8 weeks could increase interest in prospective candidates and become an accelerated and attractive pathway into broadband careers.

---

[77] United States Innovation and Competition Act of 2021, H.R.4521, 117th Cong.

[78] Benefits.gov, *Federal Pell Grants*, https://www.benefits.gov/benefit/417 (last visited Jan. 5, 2023).

5.2 Identify model programs, promising practices, and other information on what makes for successful telecommunications pathways from current federal and non-federally sponsored research and programs. Develop and disseminate a compendium of information to stakeholders.

There are existing programs and promising practices that point to successful pathways into telecommunications careers. Many have been documented, such as by BDAC's Broadband Infrastructure Deployment Job Skills and Training Opportunities Working Group[79] and by America Achieves in its Broadband Equity, Access, and Deployment (BEAD) Program Playbook.[80] These efforts have been important precursors, but a comprehensive and ongoing review of programs, their scope, and their efficacy will allow stakeholders to expand on success without reinventing the wheel. A virtual "Center of Excellence for the Telecommunications Industry" would be ideal to review and disseminate effective practices, with communication through the Department of Education, DOL, NTIA, and other agencies.

5.3 Align existing Registered Apprenticeship programs with available federal funding through the use of industry intermediaries.

RA programs are a proven means to efficiently prepare and develop a qualified workforce. RA programs define the skills and competencies individuals need to succeed, with specific training outlined for on-the-job training and classroom learning. Although employers, institutions of higher education, and other entities can develop their own programs, established industry intermediaries are well placed to provide technical assistance, support startup and operation, troubleshoot, and connect employers with education resources. Since 2020, WIA has been the recognized industry intermediary for RAs for the telecommunications industry. In addition, the TIRAP is a competency-based RA aimed at growing the productivity of the workforce within the telecommunications industry.[81] The IBEW/NECA registered telecommunications apprenticeship program focuses on the wired telecommunications and associated technologies. This program is a time-based apprenticeship program that has been established since the late 1990s. Steps should be taken to align these programs with funding criteria for the new federal subsidies outlined above, to ensure new funds can be channeled into preexisting successful initiatives. We recommend replicating this sectoral structure, matching government leadership with an industry intermediary at the state level.

---

[79] BDAC, *Broadband Infrastructure Deployment Job Skills and Training Opportunities Working Group Report* at 21-27 (Oct. 29, 2022), https://www.fcc.gov/sites/default/files/bdac-job-skills-training-opportunities-approved-rec-10292020.pdf.

[80] NTIA: BroadbandUSA, *Broadband Equity, Access, and Deployment (BEAD) Program*, https://broadbandusa.ntia.doc.gov/resources/grant-programs/broadband-equity-access-and-deployment-bead-program (last visited Jan. 5, 2023).

[81] *See* TIRAP, https://www.tirap.org/ (last visited Jan. 5, 2023).

5.4 Prioritize telecommunications when allocating federal funding to state workforce agencies and state and local boards.

Workforce development agencies and state and local boards are critical partners to coordinate programs and expend resources within states and regions. They also can leverage and braid disparate funding, including WIOA, ARPA, and state programs. State and local workforce development boards can offer Requests for Proposals for programming within the telecommunications industry. Federal investments to workforce development agencies should include several elements of success:

- States to provide leadership and oversight when delegating execution to regional/local workforce boards for execution.
- The focus needs to be targeted narrowly on broadband and telecommunications. Although they may leverage existing programs in cybersecurity, IT, and other related sectors, telecommunications need-specific resourcing.
- Funding should be dedicated to employer connections, training, and wraparound services.
- States and localities should be empowered and encouraged to connect with national programs, including federal RA programs, as a way to support multistate employers and to build off successful programs.

Examples of successful state-led programs in telecommunications, broadband, and 5G-related credentials include:

- TechCred, which helps Ohioans learn new skills and helps employers build a stronger workforce with the skills needed in a technology-infused economy.[82] The program has expanded to include 5G credentials.
- Ohio Broadband Expansion Grant Program, which is applying federal funding to support 5G wireless infrastructure and technology.

These and other successful state programs should be incented to seek federal funding by lowering barriers to entry for state/federal-program partnership. Doing so should serve as a force multiplier both by ensuring preexisting thriving workforce development programs receive additional funding and by encouraging the development of similar programs elsewhere in the country.

5.5 Focus Perkins funding for middle school through high school.

Secondary and postsecondary education career and technical programs better enable high schools and community colleges to prepare talent for the telecommunications workforce. The Department of Education should encourage grantees to use Perkins funding to support evidence-based career and technical education programming in middle grades through high school. The effort could include the following grantee initiatives:

---

[82] *See* Ohio TechCred, *Upskill Your Workforce Today with TechCred*, https://techcred.ohio.gov (last visited Jan. 5, 2023).

- Encourage a third party to develop a nationally recognized credential for educators that indicates their technological and pedagogical expertise teaching fixed and mobile broadband technologies.
- With a growing need for access to telecommunications services in fixed and mobile broadband technologies, we will need a new workforce, with new skills to support the deployment and build-out of infrastructure. This will take the combined efforts of government agencies to address gaps in educational opportunities K–12 and post-secondary. States or consortia of states could consider and develop educational standards for fixed and mobile broadband.
- Surface the needs of emerging careers in fixed and mobile broadband infrastructure and support the alignment of federal funding to incentivize public and federally funded schools to re-align career and technical education and post-secondary education.

Dedicated funding for these programs would assist in:

- The identification of characteristics and features of programs that have succeeded in scaling effective telecommunications skills development.
- Branding a career in telecommunications as an enticing and approachable opportunity for middle-school, high-school, and college students.
- Enabling students to overcome cost and other barriers to an education in telecommunications and STEM-related fields.
- Expanding the number, rigor, and quality of telecommunications educational programs across secondary and postsecondary education (high schools, community colleges, 4-year institutions) by enabling training and education institutions to overcome barriers to increased offerings, including those due to cost of facilities and equipment.
- Increasing the skills and number of educators needed to expand telecommunications career pathways.

5.6 Align funding of post-secondary education (trades, 2-year, 4-year+) programming with the needs of the workforce.

Federal workforce and training programs, including apprenticeship and certificates, should allow more flexibility and responsiveness to emerging telecommunications labor-force needs that align with infrastructure investments in the IIJA and CHIPS Act. This includes training and preparing instructors in these programs to address both their expansion and current shortages in instructors and teaching faculty in Career and Technical Education (CTE) and postsecondary programs by providing high-quality, comprehensive preparation.

Focus Area #6. Identify ways to improve the safety of telecommunication workers, including tower climbers.

The Occupational Safety and Health Act of 1970 sets the minimum safety standards for employers to assure that "each and every worker is provided a safe and healthful working environment." The Occupational Safety and Health Administration (OSHA) is charged with setting and enforcing standards and providing training, outreach, education, and assistance. This includes working with state and territory partners together to help resolve industry issues regarding worker safety through program grants, enforcement activities, and cooperative agreements. OSHA's mission is dependent on working together with federal agencies, its partner state plans, and consultation programs to ensure the safety of workers on worksites throughout our Country. To aid in the facilitation of safer worksites funded by the IIJA, it is vitally important that employers and their workers know how to access information on how to provide worker protections on these projects.

Construction safety is a top concern for the telecommunications industry. Of note, construction activities are among the most hazardous work activities in the country, and construction inspections comprise over 50% of OSHA's total inspections every year due to that factor. In 2020, data from the Bureau of Labor Statistics indicate there were 986 fatal on-the-job injuries to construction workers—more than in any other single industry sector and over one out of every five work-related deaths in the United States that year. Also in 2021, private industry construction workers had a fatal occupational injury rate nearly three times that of all workers in the United States: 9.4 per 100,000 full-time equivalent construction workers versus 3.6 for all workers in other industries.

As the IIJA is affording opportunities for businesses to engage in a growing fixed- and mobile-broadband work environment, we must understand that workers who build and maintain communication towers, erect or climb poles or other structures supporting small-cell networks, perform directional drilling or excavation work to construct cabling systems, or work on rooftops of buildings and homes will be exposed to hazards that must be controlled through implementation of safety work practices and training. Many of these activities in this industry involve exposures to hazards to falls, electrical, struck-by, and caught-between hazards. These hazards account for over 60% of all worker fatalities in the construction industry and are called the "Focus Four" hazards. It is vital that an employer have a safety and health management system in place before work begins to ensure workers are trained on how to work safely while performing work on their worksite. Working conditions can change from day to day: it is important that employers ensure worksite safety rules are understood in language workers can understand, that each employer has a safety and health management system that "finds and fixes hazards," and that employers ensure worksite safety rules are followed in a diligent manner.

Improved worker safety is enhanced by ensuring employers have implemented a Safety and Health Management System (SHMS) that contains these key elements:

- Management leadership: Managers at all levels continually demonstrate their commitment to improved safety and health.   Accountability and diligence is maintained at every level of the organization.

- Worker participation: Workers are involved in all aspects of the system and understand their roles and responsibilities under the system and what they need to do to carry them out effectively.
- Hazard identification and assessment: Procedures are put in place to continually identify workplace hazards and evaluate risks, both job-specific and systemic.
- Hazard prevention and control: A plan is developed to ensure that hazard controls are implemented, to track progress, and to verify the effectiveness of controls once they are implemented.
- Education and training: All supervisors and workers are trained to understand how the system works and how to carry out the responsibilities assigned to them under the system.
- System evaluation and improvement: Processes are established to monitor system performance, to verify system implementation, to identify system deficiencies and opportunities for improvement, and to take actions necessary to improve the system and overall safety and health performance.
- Communication on multiemployer workplaces: Host and contract employers coordinate on work planning and scheduling to identify and resolve any conflicts that could impact safety or health.[83]

Another key element to ensuring worker safety is ensuring everyone is aware and trained on the impacts of the "Focus Four" hazards that impact the construction industry. About two-thirds of construction related fatalities every year are caused by what have become known as the Construction Focus Four hazards: falls, struck-by, electrocutions, and caught-in / -between.[84] It is vital that telecommunications industry employers and their workers understand what these hazards are and how to find and fix these hazards before they injure or kill workers on the job. OSHA, state partners, and OSHA Consultation Programs have resources that are available to help workers and their employers understand how they can identify these hazards and prevent these incidents through their employer's Safety and Health Management System.

In addition, it is important that employers use resources that are free and available to assist them in providing a safe workplace. All 50 States and U.S. Territories have an OSHA Consultation Program that is available for employers to assist them in developing a SHMS that will help them identify hazards, engage workers, and mitigate hazards in their workplace.[85] These programs as well as state training grants for safety programs are available in every state.

OSHA and its partners also have grants and training opportunities for workers that are available for the public. Harwood Grant training materials[86] are available at no cost, and OSHA 10- and

---

[83] For more information on safety and health management systems, see OSHA's Safety and Health Program Management Guidelines at https://www.osha.gov/safety-management (last visited Jan. 5, 2023).

[84] OSHA, *Construction Focus Four Training: Focus Four Hazards*, https://www.osha.gov/training/outreach/construction/focus-four (last visited Jan. 5, 2023).

[85] OSHA, *On-Site Consultation*, https://www.osha.gov/Consultation (last visited Jan. 5, 2023).

[86] OSHA, *Susan Harwood Training Grants: Grantee Materials—by Topic*, https://www.osha.gov/harwoodgrants/grantmaterials/bytopic/ (last visited Jan. 5, 2023).

30-hour card trainings[87] are available for workers and supervisors for reasonable costs through both vendors and the OSHA Training Institute Education Centers.[88]

Finally, it is important for the telecommunications industry to ensure that workers are aware of the special circumstances regarding the environments where they will be working. For tower climbers, it is especially critical to be aware of the daily weather patterns when working at heights on buildings or on structures. These jobs require physical conditioning as well, as they involve climbing to and working from varying heights. In addition, there may be other hazards such as extreme heat or cold while working at elevations.

Recommendations:

6.1 Continue to engage and support state and local workforce boards on safety matters involving communications infrastructure.

These mechanisms are integral in helping telecommunications employers and workers understand the importance of workplace safety. State and local agencies should be engaged to ensure that they are fully aware of programs offered by their federal partners to aid in worker safety efforts. OSHA ensures safe and healthful working conditions for workers by setting and enforcing standards and by providing training, outreach, education, and assistance. It will continue to aid states through approved state program grants and other means. Federal and state government agencies have numerous resources available to support local agencies, employers, workers, and other stakeholders.

6.2 Safety and Health Management Systems. Continue to require and emphasize the importance of safety and health programs at all levels.

A safety and health management system is key to worker safety and will help ensure workers are protected by IIJA supported appropriations. OSHA and approved state plans specifically require that employers create and implement a Safety and Health Program providing for worker protections when conducting construction activities. OSHA has specific and general requirements for the safe construction of buildings, roadways, and other types of construction, including communication towers and the construction of broadband systems. In addition, national industry best practices should be used to augment contractor safety programs. For communication towers, these standards are specific for the construction and maintenance of structures and equipment are available through organizations such as the American National Standards Institute (ANSI), Telecommunications Industry Association (TIA), and American Society of Safety Professionals (ASSP) A10 Committee. As part of this initiative, OSHA will continue to provide information on how employers can create, implement, and utilize a Safety and Health Management System through its federal and state programs nationwide.

---

[87] OSHA, *Outreach Training Program (OSHA 10-Hour & 30-Hour Cards)*, https://www.osha.gov/training/outreach/ (last visited Jan. 5, 2023).

[88] OSHA, *OSHA Training Institute Education Centers*, https://www.osha.gov/otiec (last visited Jan. 5, 2023).

6.3 Enforcement and Compliance Assistance. Continue support for enforcement of applicable federal and state safety regulations and funding of grants for compliance assistance, which help to educate the industry to provide a safe workplace.

Through inspections, the DOL and its partners at the state and local level will enforce safe worksites for all. In addition, compliance assistance information will be provided online and through OSHA's offices in both federal and state locations. The IIJA allocates significant funding for broadband and telecommunications tower infrastructure projects. The DOL and OSHA will ensure that operations where communication towers and broadband systems are being constructed will have compliance assistance resources available to them and that OSHA enforcement will also focus on these activities. OSHA and its partners in each state offer free OSHA consultation for smaller employers to help them set up their own safety programs, and OSHA has been providing funding for consultation services for the telecommunications industry, specifically in the tower industry for years.

The agency will also focus on the broadband construction hazards related to cable and antenna installation and other construction activities through directional boring cables underground as well. Ensuring that contractors have the safety and health controls in place for the hazards faced by their employees before the work begins is important to worker safety. OSHA compliance assistance and cooperative programs in the field, such as consultation or partnerships in addition to online resources provided by the agency, and the DOL will help to fill the industry's safety needs. The workgroup is also recommending that stakeholder groups, including labor organizations and unions, assist the industry in this endeavor. Stakeholders such as the FCC, the National Association of Tower Erectors (NATE), the National Wireless Safety Alliance (NWSA), Communication Workers of America (CWA), the Telecommunication Industry Foundation (TIF), WIA (including TIRAP), Power & Communication Contractors Association (PCCA), Fiber Broadband Association (FBA), and many others within the industry provide information, services, and training for their members.

Another measure used by OSHA is provided through partnership with industry sectors, such as the telecommunications industry. OSHA is currently partnered with NATE and the FCC to support tower safety.

6.4 Focus Four Hazards. Continue training of workers in the telecommunications industry on the focus four hazards and how to mitigate them in the workplace.

Construction activities in the telecommunications sector will be affected by the Focus Four hazards—falls, electrocutions, struck-by, and caught-between hazards—which historically have led to over 60% of all construction fatal incidents. The goal is to provide information which will orient the construction sector, particularly to highlight these hazards, among others when they are working in the telecommunications industry. Falls from height and struck-by hazards have contributed significantly to telecommunications tower fatal incidents. Federal, state, and local entities should continue to focus on these hazards and ensuring that controls are in place to prevent serious injuries and fatalities caused by these hazards. In addition, as the directional boring of cables are becoming prevalent in communities, safe procedures are needed to ensure that struck-by, electrical, and caught-between hazards are properly identified and controlled as

cables are bored in many cases adjacent to existing infrastructure. OSHA has created an infrastructure safety webpage for the industry highlighting the Focus Four hazards, this page is targeted primarily for construction contractors and their workers.[89]

6.5 Training of Workers. Continue federal and state support for training grants involving worker safety.

Training workers on the hazards of ongoing and future work operations is of utmost importance to worker safety. This should be a focus for workforce development. The many avenues for exploring safety training unique to this industry may not be fully known to new companies coming into the industry as a result of the IIJA so it is paramount to provide assistance through all available means. Worker safety training in this industry sector are provided through a combination of state and federal agencies, unions, private and public sector resources, and apprentice programs. This is paramount to providing safe jobs for workers. Stakeholders such as the FCC, NATE, NWSA, CWA, WIA (including TIRAP), PCCA, FBA, and many others within the industry provide services and training for their members. OSHA offers free consultation services for smaller employers and is available in all states and territories. In both federal and state plans, OSHA is committed to providing information to enhance the importance of training. OSHA area offices and state plan offices have or have access to compliance assistance staff to assist employers with compliance of the applicable regulatory requirements, guidance, and best practices. In addition, OSHA Training Institute Education Centers are available to provide outreach training on hazards in the construction industry and other safety and health topics. The DOL will continue to focus robust efforts in compliance assistance and training programs to assist employers in worker safety and health.

6.6 Special Circumstances. Consider specific factors affecting the environmental and physical working conditions unique to this industry.

Tower climbing and other aspects of the telecommunications industry's construction activities require that workers be aware of weather conditions. The physical demands of climbing to the work location are unique, whether on a tower, pole, rooftop, or other location. As the IIJA anticipates moving communication infrastructure such as towers, small-cell technologies, and cable systems being constructed nationwide, it is paramount that worker protections include consideration of the environmental and physical working conditions. Emergency services for rescue while working at heights and other factors such as traffic control for small-cell technology installations near roadways and communications in remote locations must be considered and planned for before work begins. It is important for the telecommunications workforce to focus on working with partner agencies and stakeholders to address the unique issues in this industry.

---

[89] OSHA, *Infrastructure Safety and Health*, https://www.osha.gov/construction/infrastructure (last visited Jan. 5, 2023).

6.7 Resources for contractors. Create a common resource page or directory for the telecommunications industry sector regarding workforce safety and training.

The website should focus on providing supportive resources for contractors who are undertaking work under the IIJA and in the telecommunications industry. As part of this workforce initiative, DOL will share state, federal, and other partners resources that will provide information and tools on how to make their jobsites safer. OSHA has created an infrastructure webpage that directly addresses worker safety on the agency website that is intended to be a one-stop resource for infrastructure activities, including the telecommunications industry.[90] OSHA is asking industry stakeholders for safety and health information that can be publicly shared on this site and expect significant participation.

---

[90] OSHA, *Infrastructure Safety and Health*, https://www.osha.gov/construction/infrastructure (last visited Jan. 5, 2023).

Focus Area #7. Identify ways that trends in wages, benefits, and working conditions in the telecommunications industry impact recruitment of employees in the sector.

The Bureau of Labor Statistics (BLS) data on occupational titles and trends in employment for the broadband workforce are difficult to determine due to overly broad job categories and lack of granular information of the actual wages and working conditions. Analyzing the driving forces behind the industry's wage and employment trends requires not only reviewing more detailed workforce data, but an in-depth analysis of the structure of the labor market and employers.

Recommendations:

7.1 Collect better data on the broadband workforce and structure of the broadband labor market.

DOL should begin to collect, analyze, and report "Broadband Workforce Data," as described below.

Currently, a lack of granular data presents a challenge in crafting recommendations on ways that trends in wages, benefits, and working conditions in the telecommunications industry impact recruitment of employees in the sector. Data from the Census show a long-term stagnation of broadband technician wages, particularly for lower-wage workers.[91] However, as demand for broadband deployment has increased, surveys indicate that some broadband employers are having difficulty hiring workers, even when they offer increased starting pay. For example, a 2022 survey of NTCA-member companies found that even as 55% of respondents are offering higher pay to attract hourly workers, 58% of respondents are experiencing a longer average recruiting time for some or all new hires in hourly positions compared to three years ago, while the same is true for 44% of union-represented positions.[92]

Existing data have limited explanatory power to assess challenges in recruiting workers because it lacks detail on the full scope of compensation and non-economic conditions like scheduling and commuting, and the data cannot be disaggregated by type of employer and industry segment. BLS should improve data collection to better capture the realities of the labor-market structure, types of jobs, and compensation factors that impact broadband workers' pathways.

---

[91] The December 2022 Congressional Research Service report states that industry stakeholders appear to disagree on whether a broadband workforce issue exists. Cong. Rsch. Serv., IF12111, Bridging the Digital Divide: Broadband Workforce Considerations for the 118th Congress 1-2 (updated Dec. 30, 2022), https://crsreports.congress.gov/product/pdf/IF/IF12111.

[92] NTCA*, 2022 Compensation + Benefits Report*, https://www.ntca.org/publications/human-resources/2022-compensation-benefits-report (last visited Jan. 5, 2023) (available for purchase); *see also* Marcela Escobari et al., Brookings Institution, *How Federal Infrastructure Investment Can Put America to Work* at 8 (Mar. 2021), https://www.brookings.edu/wp-content/uploads/2021/03/Federal-infrastructure-investment.pdf ("Compared to the general workforce, broadband workers are […] better paid, more likely to work full-time, more likely to be covered by a union, and face lower barriers to entry"); John Schmitt and Jori Kandra, Economic Policy Institute, *Decades of Slow Wage Growth for Telecommunications Workers* (Oct. 2020), https://www.epi.org/publication/decades-of-slow-wage-growth-for-telecommunication-workers/.

The DOL should work with stakeholders to build a team of broadband workforce data experts and collaborators to report on current needs. This group should be tasked with estimating and projecting future industry needs by specific occupations and career paths. This improved data-collection effort will allow policymakers and workers to better understand firm structure in the industry and the important differences in wages, benefits, and terms and conditions of employment tied to firm structure. At a minimum this would entail:

- Gathering data by occupation that differentiates between employment with large firms (1,000+ employees), subcontracting firms, temporary staffing firms, and self-employment.
- Gathering data on the full range of compensation in the industry, by occupation, including prevalence of employer-provided health insurance where the employer pays at least part of the premium; retirement plans where the employer makes at least some contribution; paid sick days; paid vacation days; paid parental leave; and others.
- Gathering data by occupation on the prevalence of overtime, weekend and evening work, irregular schedules and scheduling predictability, and work outside the commuting zone where a worker resides.

7.2 Update Standard Occupational Classifications descriptions.

BLS should revisit its Standard Occupational Classifications (SOC)[93] system, which is a federal statistical standard[94] used by federal agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data, to ensure that broadband occupations are clearly represented. The ability of the BLS to properly reflect the structure of the changing workforce in the SOC system in a timely and accurate manner is paramount to properly collect and analyze industry specific workforce data. While federal agencies that publish occupational data for statistical purposes are required to use the SOC, state and local government agencies are encouraged, but not obliged, to use this national system to promote a common language for categorizing and analyzing occupations. True occupational code standardization, across public and private entities, is the only way to ensure that accurate data are gathered and reported by federal and state agencies.[95]

---

[93] Bureau of Lab. and Stat., *Standard Occupational Classification*, https://www.bls.gov/soc/ (last visited Jan. 5, 2023).

[94] White House, *Statistical Programs and Standards*, https://www.whitehouse.gov/omb/information-regulatory-affairs/statistical-programs-standards/ (last visited Jan. 5, 2023).

[95] A 2020 Economic Policy Institute report highlights that "changes in industries and occupations create significant challenges for statistical agencies, prompting them to revise classification systems in ways that better reflect current reality, but that often also make it harder to track changes over time." John Schmitt and Jori Kandra, Economic Policy Institute, *Decades of Slow Wage Growth for Telecommunications Workers* 2 (Oct. 2020), https://www.epi.org/publication/decades-of-slow-wage-growth-for-telecommunication-workers/.

7.3 Update federal information portals with detailed opportunity and occupational information.

DOL should be tasked with ensuring that all relevant federal websites and platforms such as O*NET,[96] BLS Career Outlook,[97] and CareerOneStop.org[98]—the main federal portals on jobs, training, and employment—present consistent, granular, and accurate information. Inaccurate and inconsistent data frustrate solutions to relevant workforce issues. To have a broadband related category, with all related occupations, in the standard occupational classification is crucial for the reporting quality of these platforms. To achieve this goal, there also needs to be training provided to the local-workforce and economic-development boards on how broadband jobs and job codes are being applied in the federal system so that opportunities can be easily identified.

7.4 Create a framework, or leverage existing ones, for a skill-based credentialing system for broadband-related careers.

According to a 2021 report from the President's National Infrastructure Advisory Council (NIAC),[99] while many jobs in critical infrastructure require special training in job or industry-specific credentials, the United States lacks a unified set of standards and processes to obtain credentials. DOL should define, in collaboration with broadband-industry stakeholders, a nationally recognized, portable, and stackable skill-based credentialing system for broadband-related careers. We also recommend leveraging an existing or create a new centralized national credential database, to bring greater transparency to credentialing and ensure a more streamlined pipeline of skilled broadband workers. A good example of a national credential platform that is already in place and that could be leveraged to this end is the one created by Credential Engine, a non-profit whose mission is to map the credential landscape with clear and consistent information, fueling the creation of resources that empower people to find the pathways that are best for them.[100]

---

[96] The O*NET system is maintained by a regularly updated database of occupational characteristics and worker requirements information across the U.S. economy. It describes occupations in terms of the knowledge, skills, and abilities required as well as how the work is performed in terms of tasks, work activities, and other descriptors. DOL, *O*NET*, https://www.dol.gov/agencies/eta/onet (last visited Jan. 5, 2023).

[97] Bureau of Labor and Stat., *Career Outlook*, https://www.bls.gov/careeroutlook/about.htm (last visited Jan. 5, 2023).

[98] CareerOneStop, *State Workforce Development Boards*, https://www.careeronestop.org/Developers/Data/state-workforce-development-boards.aspx (last visited Jan. 5, 2023).

[99] NIAC, *Workforce Talent and Management Study* (Sept. 2021), https://www.cisa.gov/sites/default/files/publications/NIAC_Workforce%20and%20Talent%20Management%20Study_Final%20508.pdf.

[100] Credential Engine, *About Us*, https://credentialengine.org/about/ (last visited Jan. 5, 2023); *see also* Bureau of Lab. Stat., Occupational Requirements Survey, Credentials (2022) https://www.bls.gov/ors/factsheet/pdf/credentials.pdf.

7.5 Study the application of prevailing wage and labor-market effects of broadband deployment.

The Department of Treasury and the Department of Commerce should collaboratively design an initiative aimed at requesting a sampling of payroll records across a range of projects. In addition, to study the prevailing wage and labor market, small, medium, and large employers working on broadband deployments or projects should evaluate whether federally funded projects have undercut prevailing wages and, if so, recommend that Davis-Bacon[101] be attached to any future federally funded broadband deployment programs.

---

[101] The Davis-Bacon and Related Acts apply to contractors and subcontractors performing on federally funded or assisted contracts in excess of $2,000 for the construction, alteration, or repair of public buildings or public works. Davis-Bacon Act and Related Act contractors and subcontractors must pay their laborers and mechanics employed under the contract no less than the locally prevailing wages and fringe benefits for corresponding work on similar projects in the area. DOL is responsible for determining prevailing wages, issuing regulations and standards to be observed by federal agencies that award or fund projects subject to Davis-Bacon labor standards, and overseeing consistent enforcement of the Davis-Bacon labor standards. On March 11, 2022, DOL announced the publication of the proposed rule, "Updating the Davis-Bacon and Related Acts Regulations." DOL proposes to amend regulations issued under the Davis-Bacon and Related Acts that set forth rules for the pre-determination of Davis-Bacon wage rates and the administration and enforcement of the Davis-Bacon labor standards that apply to federal and federally assisted construction projects. DOL, Updating the Davis-Bacon and Related Acts Regulations, 87 Fed. Reg. 15698 (Mar. 18, 2022).

REFERENCED DATA AND REPORTS

America Achieves and Rural Innovation Strategies, Inc., *Creating and Expanding Diverse Broadband Workforce with Good Jobs and Career Pathways: Broadband Equity, Access, and Deployment (BEAD) Program Playbook for Eligible Entities* (June 22, 2022), https://americaachieves.org/wp-content/uploads/2022/06/America-Achieves-Broadband-Workforce-Report-June-2022.pdf.

American Sustainable Business Council, *The High-Road Workplace: Route to a Sustainable Economy* (2017), https://www.asbcouncil.org/sites/main/files/file-attachments/asbc_building_the_high_road_report_2017.pdf.

Benton Institute for Broadband & Society, John B. Horrigan, *Adapting Jobs Programs for Today and Tomorrow* (Aug. 2020), https://www.benton.org/sites/default/files/AdaptingJobsPrograms.pdf.

Brookings Institution, Testimony of Nicol Turner Lee, Director, Center for Technology Innovation; Senior Fellow, Governance Studies, Before the United States House of Representatives Committee on Economic Disparity & Fairness in Growth Hearing on "Connecting Americans to Prosperity: How Infrastructure can Bolster Inclusive Economic Growth"; *Building for the Future: Advancing Digital Competitiveness through Broadband Access and Adoption* (Feb. 9, 2022), Nicol-Turner-Lee-Testimony-Feb.-2-2022.pdf.

Brookings Institution, Marcela Escobari et al., *How Federal Infrastructure Investment Can Put America to Work* (Mar. 2021), https://www.brookings.edu/wp-content/uploads/2021/03/Federal-infrastructure-investment.pdf.

Bureau of Labor Statistics, Occupational Requirements Survey, Credentials (2022) https://www.bls.gov/ors/factsheet/pdf/credentials.pdf.

Communications Workers of America, Testimony of Christopher Shelton, President, before the U.S. House Energy and Commerce Committee (Feb. 17, 2021), HHRG-117-IF16-Wstate-SheltonC-20210217-U2.pdf.

Congressional Research Service, *Bridging the Digital Divide: Broadband Workforce Considerations for the 118th Congress*, IF12111 (updated Dec. 30, 2022), https://crsreports.congress.gov/product/pdf/IF/IF12111.

Department of Labor & Federal Communications Commission, *Guidance to States on Addressing the Workforce Needs and Safety of the Telecommunications Industry* (Dec. 5, 2022), https://www.dol.gov/sites/dolgov/files/ETA/advisories/TEN/2022/TEN%2010-22/TEN%2010-22%20%28Complete%20PDF%29.pdf.

Department of Veterans Affairs, *Veteran Rapid Retraining Assistance Program High Demand Occupations Current as of September 9, 2022* (Sept. 9, 2022), https://benefits.va.gov/GIBILL/docs/vrrap-high-demand-occupation-list.pdf.

Economic Policy Institute, *Decades of Slow Wage Growth for Telecommunications Workers* (Oct. 2020), https://www.epi.org/publication/decades-of-slow-wage-growth-for-telecommunication-workers/.

Federal Communications Commission, Broadband Development Advisory Committee, *Broadband Infrastructure Deployment Jobs Skills and Training Opportunities Working Group Report* (Oct. 29, 2022), bdac-job-skills-training-opportunities-approved-rec-10292020.pdf.

Government Accountability Office, *Telecommunications Workforce: Additional Workers Will Be Needed to Deploy Broadband, but Concerns Exist About Availability*, GAO-23-105626 (Dec. 15, 2022), https://www.gao.gov/assets/gao-23-105626.pdf.

Government Accountability Office, *Tribal Broadband: National Strategy and Coordination Framework Needed to Increase Access*, GAO-22-104421 (Jun. 2022), https://www.gao.gov/assets/gao-22-104421.pdf.

Government Accountability Office, *Broadband: National Strategy Needed to Guide Federal Efforts to Reduce Digital Divide*, GAO 22-104611 (May 2022), https://www.gao.gov/assets/gao-22-104611.pdf.

Inclusive Economics, *High Road Workforce Guide for City Climate Action* (Apr. 2021), https://www.usdn.org/uploads/cms/documents/workforce-guide_4.12.21_form.pdf.

NTCA–The Rural Broadband Association, *2022 Compensation + Benefits Report* (2022), https://www.ntca.org/publications/human-resources/2022-compensation-benefits-report (available for purchase).

National Telecommunications and Information Administration, *Fact Sheet: Biden-Harris Administration's "Internet for All" Initiative: Bringing Affordable, Reliable high-Speed Internet to Everyone in America* (May 13, 2022), https://www.ntia.doc.gov/other-publication/2022/fact-sheet-biden-harris-administration-s-internet-all-initiative-bringing.

Ohio, Governor's Office of Workforce Transformation, *Strengthening Ohio's Broadband & 5G Workforce Strategy* (Sept 2021), https://broadband.ohio.gov/explore-broadband/strengthening-ohios-broadband-5g-workforce (available for download).

President's National Infrastructure Advisory Council, *Workforce and Talent Management Study* (Sept. 2021), https://www.cisa.gov/sites/default/files/publications/NIAC%20Workforce%20and%20Talent%20Management%20Study%20Fact%20Sheet_508.pdf.

White House, FACT SHEET: President Biden Celebrates New Commitments Toward Equitable Workforce Development for Infrastructure Jobs (Nov. 2, 2022), https://www.whitehouse.gov/briefing-room/statements-releases/2022/11/02/fact-sheet-president-

biden-celebrates-new-commitments-toward-equitable-workforce-development-for-infrastructure-jobs/.

White House, FACT SHEET: CHIPS and Science Act Will Lower Costs, Create Jobs, Strengthen Supply Chains, and Counter China (Aug. 9, 2022), https://www.whitehouse.gov/briefing-room/statements-releases/2022/08/09/fact-sheet-chips-and-science-act-will-lower-costs-create-jobs-strengthen-supply-chains-and-counter-china/.

White House, Heather Boushey and Kevin Rinz, *Blocking the Low Road and Paving the High Road: Management Practices to Improve Productivity* (Apr. 6, 2022), https://www.whitehouse.gov/cea/written-materials/2022/04/06/blocking-the-low-road-and-paving-the-high-road-management-practices-to-improve-productivity/.

White House, *Government-Wide Strategic Plan to Advance Diversity, Equity, Inclusion, and Accessibility in the Federal Workforce* (Nov. 2021), https://www.whitehouse.gov/wp-content/uploads/2021/11/Strategic-Plan-to-Advance-Diversity-Equity-Inclusion-and-Accessibility-in-the-Federal-Workforce-11.23.21.pdf.