BROADBAND INFRASTRUCTURE DEPLOYMENT JOB SKILLS AND TRAINING OPPORTUNITIES WORKING GROUP

Presented to the Broadband Deployment Advisory Committee (BDAC) of the Federal Communications Commission (FCC)

October 29-30, 2020

Washington, DC

TABLE OF CONTENTS

Page

A. EXECUTIVE SUMMARY ____ 4

B. IDENTIFICATION OF SKILLS GAP AND CHALLENGES IN EXPANDING THE BROADBAND INDUSTRY WORKFORCE ____ 7

1. Broadband Brand "Identity Crisis" ____ 8
2. Lack of standardized and nationwide training programs ____ 8
3. Unawareness or lack of Federal and State funding for training programs ____ 9
4. Lack of standardized Job Codes and Categories, Wages and Universal Credentialing ____ 9
5. Unique demands of the work: Seasonal, High Liability ____ 10
6. Dwindling Skilled Workforce Due to Retirement ____ 11
7. New Environment Created by COVID-19 Pandemic ____ 12

i. Table 1: Pre & Post COVID-19 Conditions ____ 13

C. ADAPTABLE AND SCALABLE SOLUTIONS ____ 14

1. Proposed Solution to Broadband Brand "Identity Crisis" ____ 14
2. Proposed Solution to Lack of standardized, nationwide training programs ____ 16
3. Proposed Solution to Unawareness or Lack of Funding in Training Programs ____ 16
4. Proposed solution to Lack of Standardized Job Codes, Wages and Universal Credentialing ____ 17
5. Proposed Solution to Unique Demands - Seasonal Jobs, High Liability ____ 19
6. Proposed Solution to Dwindling Workforce due to Retirements and Other Reasons ____ 19
7. Proposed Solutions to the New Post-COVID Environment ____ 19

D. SUCCESSFUL JOB TRAINING PROGRAMS ____ 21

1. Traditional Secondary Educational Institutions ____ 22

i. Wake Tech Community College ____ 22
ii. University of Maryland, Professional Masters Program in Telecommunications ____ 22
iii. Southeast Tech (Wireless Infrastructure Technician Program) ____ 23
iv. State Technical College of Missouri, Utility Systems Technician ____ 23
v. Wisconsin Broadband Academy ____ 23

vi. Aiken Technical College, Tower Installation Program _____ 24

2. Trade School and Other Specialized Training Platforms _____ 24

i. AT&T, Avaya, and Nokia Alliance (Joint Labor-Management Program with Union Employee Members of the Communications Workers of America) _____ 24
ii. Fiber Optic Association Online University (Fiber U) _____ 24
iii. SEA-TAC Airport U Program _____ **Error! Bookmark not defined.**
iv. The Last Mile (TLM)_____ **Error! Bookmark not defined.**
v. Innovative Basic Education and Skills Training ("I-BEST") _ **Error! Bookmark not defined.**

3. Apprenticeships _____ 26

i. Telecommunications Industry Registered Apprenticeship Program ("TIRAP") _____ 26
ii. Independent Electrical Contractors ("IEC") Online Electrical Apprenticeship Program _____ 26
iii. Susan Harwood Grant offered through DOL _____ 27

E. Performance metrics for job skills and training programs _____ 28

Table 2. Recommended Performance Metrics _____ 29

F. CONCLUSION _____ 32

G. DEFINITIONS, TERMINOLOGY AND GLOSSARY OF TERMS _____ 34

H. WORKING GROUP CHARGES_____ 37

I. LEADERSHIP AND MEMBERSHIP _____ 38

J. SUBJECT MATTER EXPERTS (SMEs)_____ 41

A. EXECUTIVE SUMMARY

It is widely accepted that most people in the United States either have or want personal communications services and high-speed broadband internet to enrich their daily lives. From 2010 to 2020, Americans with access to broadband internet increased from an estimated 74.5 percent to 93.5 percent.[1] An industry report estimates that if terrestrial broadband deployment rates remain the same, America could be 100 percent wired for broadband by 2030.[2] However, that statement carries a caveat that many are concerned with: ***Is there a capable and strong workforce to meet that demand?***

In 2019, the Federal Communications Commission ("FCC") created a working group within its Broadband Deployment Advisory Committee ("BDAC") called the Broadband Infrastructure Deployment Job Skills and Training Opportunities Working Group ("Working Group"). The FCC asked the Working Group to address ways to make more widely available and improve job skills training and development opportunities for the broadband infrastructure deployment workforce. [3] In response, the Working Group submits this report ("Report"), which addresses the following specific items:

1. Identification of gaps in broadband infrastructure deployment skills that could inhibit the pace of deployment of fixed and mobile broadband connectivity across the nation.
2. Presentation of formulated solutions to these workforce issues that are adaptable and scalable by stakeholders to different geographic areas and for various broadband technologies.
3. Recommendations to attract more skilled professionals to join the broadband infrastructure deployment workforce.
4. Identification of existing job skills and training programs that could serve as a model in developing measures to bridge any skills gaps in broadband infrastructure deployment.
5. Recommendations for performance metrics to gauge the effectiveness of existing and future job skills and training programs, including steps to continually improve the effectiveness of such programs.

[1] Tyler Cooper, *The Decade in Broadband: 2020 Statistics & Predictions*, BroadbandNow Research (Jan. 15, 2020), https://broadbandnow.com/research/broadband-2020.
[2] *Id.*
[3] Justin Faulb, Designated Fed. Officer, et al., Broadband Deployment Advisory Committee Overview (June 13, 2019), FCC, https://www.fcc.gov/sites/default/files/bdac-overview-06132019.pdf.

This Report highlights the following "Challenges" and "Solutions" in detail in the subsequent sections.

1. **Challenge:** Broadband Identity Crisis
   Solution:
   - To Promote the formation of (or adhesion to) a coalition of broadband-related trade associations to jointly advance workforce development initiatives and to centralize and coordinate Industry efforts.

2. **Challenge:** Lack of standardized and nationwide training programs
   Solution:
   - To undertake a targeted outreach initiative to ensure that training programs are being implemented and promoted both in rural and urban areas equally.

3. **Challenge:** Unawareness or Lack of Federal and State funding for training programs
   Solution:
   - To educate stakeholders and raise awareness around funding vehicles and grant agencies with potential to benefit the broadband workforce development.
   - To request that part of the Congressionally-approved $80 Billion budget to deploy broadband infrastructure to unserved and underserved communities be directly and urgently appropriated to address telecommunications infrastructure workforce training needs.

4. **Challenge:** Lack of Standardized Job Codes, Wages and Universal Credentialing
   Solution:
   - To undertake an initiative aimed at:
     - Gathering/surveying wages by career path/skills and the recognition of Broadband Jobs as High Skill/High Paying jobs.
     - Working with O*NET to include the term broadband in relevant job category titles.
     - Agreeing on a framework for a skill-based credentialing system for broadband related careers.
     - Educating local workforce and economic development boards on how broadband jobs and job codes are being applied in the system so that funding opportunities can be made more readily available to the workforce.

5. **Challenge:** Unique Demands of the Work: Seasonal, High Liability
   Solution:
   - To consult with lawmakers to address the age requirement for obtaining Commercial Driver Licenses for broadband-related intrastate work.
   - To explore the creation of a governmentally organized small and minority business owners program specifically classified within the broadband deployment context, wherein smaller-sized contractor companies in good standing could access group

insurance policies, financing, and general commercial terms, at a more beneficial rate if they commit to training new technicians and expanding the workforce

6. **Challenge:** Dwindling Skilled Workforce Due to Retirement and Other Reasons
   Solution:
   - To design and promote initiatives focused on outreach (especially to underrepresented communities), on-campus recruiting, mentoring new hires and recognizing the existing workforce.

7. **Challenge:** New Environment Created by COVID-19 Pandemic
   Solution:
   - To rapidly launch an aggressive outreach initiative.
   - To actively promote DOL-preapproved apprenticeship programs among all stakeholders enabling quick insertion and on-boarding to the workforce.

Through its research, the Working Group found that considerable doubt has arisen among broadband infrastructure industry ("Industry" or "Broadband Industry") stakeholders as to whether they can meet build-out projections due to current workforce challenges. Through deliberation with subject matter experts and independent research, the Working Group has identified key factors that contribute to this concern and recommends ways to deal with the issues presented. This Report will focus on addressing three main stakeholders and their unique challenges: Employers, Workers and Students, and Educational Institutions and Training Providers.

To make matters more complex, the COVID-19 Pandemic ("COVID-19") has impacted nearly every aspect of life and the global workforce. During the initial response to COVID-19, the telecommunications industry and its supporting workforce, including the Broadband Industry, were officially declared essential by the United States Department of Homeland Security.[4] Since that time, the Broadband Industry has been under enormous pressure to continue delivering infrastructure and services critical to everyone, especially during a crisis of this magnitude. Although officially designated as "essential workers" and being allowed to move around during Stay-at-Home mandates in many states. Broadband Industry workers have faced issues surrounding mobilizing, lodging, and obtaining appropriate personal protective equipment. As for workforce development in these uncertain times, as with most economic downturns, significant higher education budget cuts are being made or expected. And, prior to the onset of COVID-19, both state and national appropriations for higher education never reached the levels they enjoyed prior to the 2007-2009 Great Recession.[5] The Working Group addresses in this Report the "new normal" associated with the current times and provides recommendations accordingly.

[4] Cybersecurity & Infrastructure Sec. Agency, *Identifying Critical Infrastructure During COVID-19* (Aug. 18, 2020), https://www.cisa.gov/identifying-critical-infrastructure-during-covid-19.

[5] Emma Whitford, *Public Higher Ed Funding Still Has Not Recovered From 2008 Recession*, Inside Higher Ed (May 5, 2020), https://www.insidehighered.com/news/2020/05/05/public-higher-education-worse-spot-ever-heading-recession.

B. IDENTIFICATION OF SKILLS GAP AND CHALLENGES IN EXPANDING THE BROADBAND INDUSTRY WORKFORCE

Why are there skills gaps in the workforce?

In January 2020, FCC Commissioner Brendan Carr gave testimony to the United States Senate during its hearing on the 5G Workforce and Obstacles to Broadband Development regarding his observations and research in this area.[6] The Commissioner emphasized that the demand on industry participants to provide these services is real. In 2019, Internet Providers reported an increase of 16% for new homes connected to high-speed fiber. With approximately 6.5 million new homes connected, there was a reduction in the U.S. digital divide by nearly 20% when compared to 2018.[7] There are currently approximately 29,000 broadband related technicians employed in the U.S.[8] Meanwhile, the number is projected to increase by 20,000 in the next ten years in order to accommodate the broadcast repack and produce the expansion of universal broadband, public safety, and 5G across North America.[9] Telecommunications crews built over 450,000 route miles of high-speed fiber in 2019 (more than ever before in any one year), and they cannot keep pace with the expansion without more skilled hands on deck.[10]

Most Americans have home Wi-Fi, but many have no idea how it works or what it takes to deliver broadband service. When asked what they want to be when they grow up, children often say, "a nurse or police officer or teacher;" rarely, if ever, is it "a broadband engineer". The Industry should work to create an environment where potential workers consider employment in the Industry as a viable and exciting career option.

What are associated challenges to the deployment of broadband?

The Working Group researched key challenges responsible for the "skills-gap" in the Broadband Industry. In examining this, the Working Group considered many occupations and job types, from the vantage point of each stakeholder. From the Employers' perspective, absorbing the cost of training, both in-house and outside, while bearing the risk of losing newly trained employees to competing companies or industries presents one of the foremost issues. For potential Workers and Students, the primary challenge is a lack of awareness of viable and exciting career paths in the Industry. For Educational Institutions/Training providers, there is a clear disconnect between the market demand and increasing need for certain skill sets and the number of training

[6] Testimony of Brendan Carr, Commissioner, F.C.C., Before the U.S. Senate Committee on Commerce, Science & Transportation, *The 5G Workforce and Obstacles to Broadband Deployment* (Jan. 22, 2020), https://docs.fcc.gov/public/attachments/DOC-362042A1.pdf.
[7] Id.
[8] Id.
[9] Id.
[10] Id.

programs offering training and credentials applicable to the Industry. In order of relevance and salience to all stakeholders, a summary of seven different challenges are discussed herein.

1. Broadband Brand "Identity Crisis"

Among the many factors affecting workforce challenges to the deployment of broadband, the primary one may be a lack of "brand" and "identity" for Broadband Industry workers. If potential workers and students do not know what the career paths are, or how to enter the Industry, there is no starting point from which to begin. In addition, without more consistency across the Industry in job titles and the associated skills, clearer goals for workers to achieve cannot be established. Furthermore, most potential workers are not aware that there exists a Broadband Industry, nor do they know how to enter the relevant field in the Industry.

Without a clear identity of the Broadband Industry, the skills gap will likely only grow. The deficiency affects all stakeholders in that educational institutions lack awareness of employer's needs, the public lacks awareness of Broadband Industry job opportunities, workers lack visibility about potential career paths, and employers lack the funds or desire to continue sponsoring training programs for employees or potential employees that seem willing to change employers or career paths for minimum compensation increases or without a better understanding of the opportunities for advancement in the Industry.

2. Lack of standardized and nationwide training programs

Another challenge is the lack of widespread availability and marketing of training programs geared toward the Broadband Industry workforce. Correspondingly, there is no uniform credentialing for specific job titles within the Industry. For example, current broadband technicians typically have individualized skillsets, and employers or educators have a hard time grouping them together for purposes of recruiting, and training. It is true that there are some successful training programs across the country; however, those programs primarily serve local or regional markets. Many employers lack relationships with training providers necessary to recruit and secure trained talent. Some employers are fortunate to have built-in relationships with geographically close training options. For companies without relevant training programs nearby, it is more difficult to identify candidates and recruit from other local or regional training providers.

Additionally, employers and post-secondary institutions often are unaware of career and technical education ("CTE") provided in adult basic education ("ABE") programs that provide opportunities for adults who wish to re-skill. Additionally, training providers often lack information about employer demand and pay scales for employment opportunities to create and sponsor relevant training programs in the Broadband Industry.

There are several successful Broadband Industry training programs that offer courses, certificates, and diplomas across the U.S. However, these programs generally are narrowly defined, have limited capacity, and therefore do not identify a broad pathway for future graduates or produce enough graduates.

In addition, there is a general lack of Industry standardization, which makes it difficult to develop effective curricula for specialized training that supports advancement along career pathways shaped to meet the needs of a wide range of employers. Furthermore, this lack of standardization increases the cost of training and certification, by requiring each program to be tailor-made for specific services or equipment vendors, which makes it more challenging for workers and students to gain a broader set of skills. This particular aspect greatly impacts the ability to achieve scalability of nationwide training programs.

3. Unawareness or lack of Federal and State funding for training programs

As other industries work to confront and overcome their own workforce issues, Broadband Industry employers must also work proactively to address the reality of a small pool of skilled workers. There appears to be insufficient awareness regarding the return on investment with training programs such as registered apprenticeships, which could help create more productive, competitive, and profitable companies. For example, the Wisconsin Department of Workforce Development states that every dollar an employer spends training an apprentice, the company earns $1.50 back.[11]

Employers often absorb the cost of in-house training but run the risk of losing newly skilled employees to competitors or other industries after the investment in training is made. Some employers mitigate this risk with length of service commitments in exchange for tuition reimbursement.

Due to the limited number of skilled workers, the pool of dynamic or fully skilled workers is small. And skilled workers are often difficult to locate. Three-quarters of human resource professionals report difficulty recruiting because candidates lack necessary job skills.[12] More than half of human resource professionals indicate the skills gap has worsened in recent years.[13]

There is a significant lack of knowledge and unawareness by employers and training providers alike regarding historical grant vehicles and grant agencies that can assist them pursuing such opportunities. For many employers, taking a step to hire an unskilled employee currently seems like a risk without a measurable reward. It is not surprising that the U.S. is experiencing a workforce shortage.

4. Lack of standardized Job Codes and Categories, Wages and Universal Credentialing

In order to recruit and retain high quality and skilled employees, it is necessary for employers to offer competitive wages and benefits and good working conditions. Even with

[11] Department of Workforce Development, Wisconsin. Registered Apprenticeship for Employers, https://dwd.wisconsin.gov/apprenticeship/employers.htm (last visited Oct. 20, 2020).
[12] Press Release, SHRM, Skills Shortage Tightens Job Market; 83% of HR Professionals Report Difficulty Recruiting: SHRM Research (Feb. 5, 2019), https://www.shrm.org/about-shrm/press-room/press-releases/pages/skills-gap-research-workplace-immigration-report.aspx.
[13] Id.

the foregoing, employees may leave employers for better compensation or working conditions or to pursue different careers. For many jobs withing the Broadband Industry, the pay and travel requirements may not be as competitive as other industries. With better tracking of relevant job categories and Industry-wide data regarding compensation, turnover, long-term employment outlook for various job categories within the Industry, employers can obtain improved insight on how to retain their skilled employees.

As mentioned above, the Working Group believes that among various job titles used in the Industry, many require quite different duties and skill sets, which results in significant disparity in pay under the same or similar job titles. To illustrate this challenge, among the top respondents for the job title "Telecommunications Technician," AT&T Inc., Comcast Cable, Inc. and CenturyLink, propose salaries that vary by approximately $17.00 per hour, from $21.06 to $38.00).[14] Varied geographic difference (job location) and other parameters might have contributed to this disparity. However, the working group believes that job categories within wireline and wireless segments need to be defined properly.

There are no specific Broadband "Job Codes" recognized by the United States Department of Labor ("DOL"). Classification is determined by skills and education, but not necessarily by industry. Academic institutions, employers and workers are not educated on how the codes are determined, nor do they use the same codes, which has caused under-reporting of the Industry workforce. State and regional workforce development organizations have not classified Broadband Industry jobs as high skill/high wage even though such jobs can increase earning potential significantly within a short amount of time through certification and training programs. As a result, it is believed workforce development organizations and school counselors fail to recommend careers in the Broadband Industry to potential candidates.

5. Unique demands of the work: Seasonal, High Liability

Unlike industries with infrastructure mostly built out, the Broadband Industry faces unique challenges due to the volume of new and upgraded infrastructure to be deployed. In many cases, Broadband Industry workers must be on-call, on the road, and face unpredictable (uneven) demand for their skills. In addition, where climate and weather limit deployment in certain seasons, affected Broadband Industry positions may have a stigma that they provide a lower level of "job security" for some. Many Broadband Industry workers or potential workers might view the job security issue differently if alternative Industry career options, and upskilling and other training programs, were available during periods when the peak demand is over.

Furthermore, many Industry positions, such as tower climbers, require working at heights. Many workers are not interested in the risk such jobs entail.

[14] PayScale, Average Telecommunications Technician Hourly Pay, https://www.payscale.com/research/US/Job=Telecommunications_Technician/Hourly_Rate(last visited Oct. 20, 2020).

Additionally, many positions require a Commercial Driver's License ("CDL"). To be a CDL driver and cross over state boundaries, the worker must be over 21 years of age. This further limits the eligibility of younger workers to enter the Industry immediately after completion of high school or junior college. Broadband service providers often maintain stringent requirements for contractors with regards to worker back-ground checks and substance abuse history (i.e. some require up to 10 years without offense or even a completely clean record) that reduces the size of the available talent pool.

In addition, other commercial contract requirements of Broadband carriers limit the ability of smaller contractors to be hired to perform deployment work. Often times insurance requirements, and extensive close-out document packages that are tedious and time-consuming to complete prevent small businesses from engaging with Broadband carriers to perform deployment work.

6. Dwindling Skilled Workforce Due to Retirement

There are 73 million baby boomers in the U.S., and by 2030, that entire generation will be age 65 or older.[15] Roughly 10,000 baby boomers are reaching the standard retirement age on a daily basis.[16] To put this into perspective, in the year 2000, just 12% of the U.S. population was over the age of 65. By 2030, that percentage will nearly double to more than 20%.[17] Many companies will confront the reality that a substantial percentage of their skilled employees will reach retirement age in the next 5 to 7 years. This issue is not unique to the Broadband Industry, but it reinforces the need to create a pipeline and candidate pool to replace the retiring workforce.

As per Janco Associates' report, telecommunications employees are aging and that could jeopardize the sector's future[18]. There are too few younger employees with sufficient experience to fill the positions within telecom sector. Workforce turnover is an especially tricky issue for field operations. For example, it can take up several years to train a lineman worker. Hands-on expertise is valuable and at risk of being lost as the workforce ages– through a combination of the large amount of retiring Baby Boomers and the length of training time for new field workers.

On the flipside of that coin, many experienced Broadband Industry workers are being laid-off well before retirement age.[19] Broadband carriers could provide more funding for programs to upskill and train experienced workers by providing certifications on new technologies necessary to continue their careers without the threat of downsizing.

---

[15] America Counts Staff, *By 2030, All Baby Boomers Will Be Age 65 or Older*, United States Census Bureau (Dec. 10, 2019), https://www.census.gov/library/stories/2019/12/by-2030-all-baby-boomers-will-be-age-65-or-older.html.
[16] Id.
[17] Id.
[18] https://ejobdescription.com/press/2012/20120930-telecom-workers-aging.html

[19] Iain Morris, *Big telcos have cut headcount by 9% since 2015*, LightReading, (June 23, 2020), https://www.lightreading.com/ai-automation/big-telcos-have-cut-headcount-by-9--since-2015/d/d-id/761906.

7. New Environment Created by COVID-19 Pandemic

Like many industries, the stakeholders in the Broadband Industry are reassessing their Pre-COVID-19 challenges, with the new normal that is being defined by the COVID-19 challenges. In February 2020, prior to the COVID-19 pandemic, the national unemployment rate was 3.5%. The low unemployment rate made it hard for businesses to find enough workers to operate at full capacity.

Thirty million people filed for unemployment in a six-week span after the pandemic started in mid-March. The unemployment rate in April spiked to 14.7%, the worst since the Great Depression. One in five Americans were without a job.

At the beginning of 2020, the Working Group focused on ways to attract fully employed individuals away from their current fields. Then, in April, the focus shifted to how to effectively recruit unemployed individuals into the field and train them quickly and effectively. The COVID-19 environment transformed the challenge from finding enough candidates into creating pathways to Industry careers by focusing on education and training of workers including the unemployed.

In the COVID-19 environment, there are new challenges in creating training opportunities. Many higher education institutions are expected to shrink the size of their operations due to budget cuts funding and reduced student enrollment. For example, on May 6, 2020, the State of Ohio announced a $110 million reduction in funding for the state's public colleges and universities. On that same day, the University of Akron announced that it will cut six (6) of its eleven (11) academic colleges.

In addition, many Industry contractors and service providers have felt pressure from Broadband carriers to keep up the pace of deployment. With the sudden increase in the availability of workers as a result of COVID-19, and the fact that working from home has become the norm, the Industry should seek to capitalize on this opportunity.

i. Table 1: Pre & Post COVID-19 Conditions

Pre COVID-19	Post COVID-19	Observations/Inquiries
VISIBIITY ON THE NATIONAL STAGE		
LOW: **No specific job classifications/occupational codes on DOL database**	HIGH: Universally recognized as essential employees	Opportunity to Re-Brand the Industry; attract new workforce
LOW: **Broadband "identity" crisis**	HIGH: Demand for broadband services in each home during Stay-At-Home orders	How much of the federal relief funds will be utilized by the Industry?
DEMAND FOR SKILLED EMPLOYEES		
HIGH: **Rural and new technology deployment has increased demand for skilled workers.**	EVEN HIGHER: Federal Funding approved to bring broadband to underserved areas and remote work and learning will increase need for skilled workforce.	Will the Industry actively recruit now that the services are in the limelight?
GENERAL CHALLENGES		
Unemployment Rate: Low	Unemployment Rate: High	More workers may be available for upskilling or training in the Industry. Are Industry stakeholders receiving employment applications in large numbers or outreaching to potential talent?
Hourly Wages & Benefits: Low	Potential for Higher Wages & Benefits to attract new workers.	Employer-specific responses to this circumstance will dictate outcomes.
Background screenings credentials and basic job qualifications: High	Unknown how this may change based on recent events; perhaps relaxed requirements.	Employer-specific responses to this circumstance will dictate outcomes.
Availability/Variety of Training & Upskilling Programs: Low	Likely that new online educational platforms will be created. State funding may help train new workforce for the Broadband Industry.	Will State and Federal governments and Educational Institutions/Training Providers prioritize funding to enhance the Industry's offerings?
Government Funding/Scholarships/Grants available to Industry stakeholders: Perceived as Low	Unknown if reimbursable emergency response spending will include economic development grant offerings and programs to train workers in the Industry.	Depends on Federal and State appropriations.

C. ADAPTABLE AND SCALABLE SOLUTIONS

The Working Group has been committed to uncovering and identifying circumstances and reasons why our country is facing a Broadband Industry workforce shortage. Some of the feedback we obtained was substantially similar within the stakeholder groups, others unique in nature but relevant, nevertheless. One thing is, however, clear. Broadband Industry workforce development needs our immediate attention and the right plan should be quickly put in place if we want to keep deployment of Broadband infrastructure to sustain and advance our country's leadership in this space.

Now more than ever, our country and the Broadband Industry need to work in close collaboration. We need to work smarter towards the same goals, avoiding duplicated efforts and redundant initiatives. The spirit of the recommendations we present hereby, will reflect just that, our group's conviction that we face a unique opportunity to help the unemployed and displaced workers that COVID-19 have been affected, while addressing the workforce shortage that existed before COVID-19 and will continue during and after the pandemic. With the implementation of these recommendations, we believe we can provide an optimistic outlook to younger generations that are in need of assurance that even if they don't pursue a college or university degree they can find a well-paying job in the Broadband Industry. We can do the same for veterans returning home and looking for a dignified civilian job using the skills they learned during their military career. Our recommendations are also intended to assist with deployment in underserved and underserved areas, rural and urban alike, that can provide best-in-class Broadband infrastructure to ensure that America is truly connected and that a digital divide no longer exists.

Our proposed solutions are set forth below.

1. Proposed Solution to Broadband Brand "Identity Crisis"

The Broadband Industry must commit to "branding" itself and pro-actively raising the visibility of its 'essential' nature. To achieve this, we recommend the formation (or adhesion to) a coalition of Broadband-related trade associations to jointly advance workforce development initiatives and to centralize and coordinate Industry workforce development efforts. As a result of the previous work presented by the Working Group, several trade associations have already expressed interest in participating in such a coalition. There have been several recent announcements regarding collaborative initiatives aimed at advancing Broadband-related causes that could very well serve as potential platforms to implement this recommendation:

- July 13, 2020: Food Companies and Rural Telecoms Form the "American Connection Project Broadband Coalition" to help Close Digital Divide[20]

[20] Press Release, Land O' Lakes, Inc., American Connection Broadband Coalition membership grows to over 100 organizations (last updated Sept. 9, 2020), https://www.landolakesinc.com/Press/News/American-Connection-Project-Broadband-Coalition.

- July 15, 2020: The Multicultural Media, Telecom and Internet Council (MMTC) and 25 other Organizations ask Congress to Support Broadband Stimulus Voucher[21]
- August 12, 2020: A Coalition of Industry Organizations advocate for Workforce Development in Letter to Congress [22]

In our view, these initiatives should be coordinated, and consolidated into a single coalition to the extent they relate to the Broadband workforce. We believe the coalition's "call to action" should center around the following initiatives to maximize the unique recruiting and outreach opportunities that currently exist:

(a) Create a centralized clearinghouse for all things related to the Broadband workforce. This could include a website to enable unified messaging and a single and consistent point of "information dissemination" for Broadband Workforce initiatives. The website could provide interested individuals with up-to-date information about the Industry and career opportunities. In addition, a national talent pool database of potential and existing Broadband workers could be part of the website, allowing employers to reach potential employers more readily.

(b) Develop and implement an outreach strategy to promote Broadband Industry jobs to potential workers and students. Outreach to girls and boys clubs, veteran groups, multicultural groups, and schools and educational institutions could assist with making Broadband a better known, viable career path for many. The outreach could also include creating and promoting Advanced Placement (AP) and CTE options for high school curriculum.

(c) Invite representatives of the three stakeholder groups to join the coalition and actively support Broadband workforce development" initiatives, such as creation and promotion of additional training programs for the Industry

(d) Promote the creation of "Job Codes" recognized by the U.S. DoL that relate specifically to Broadband Industry jobs and help ensure that academic institutions, employers, and workers are educated and aware about advances made on this front.

The following is a list of Industry associations that we consider a good fit for the proposed coalition. This list is not exhaustive, and consideration should be given to other organizations that might be approached

- CTIA
- CompTIA
- Fiber Broadband Association
- Fiber Optic Association

[21] Letter from The Multicultural Media, Telecom & Internet Council (MMTC), et al. to Hon. Roger F. Wicker, Chairman, Committee Commerce, Science & Transportation, et al. (July 15, 2020),https://www.mmtconline.org/wp-content/uploads/2020/07/.

[22] Inside Towers, *Coalition of Industry Organizations Lobby Congress for Workforce Development* (Aug. 13, 2020), https://insidetowers.com/cell-tower-news-coalition-of-industry-organizations-lobby-congress-for-workforce-development/.

- NATE: The Communications Infrastructure Contractors Association
- NTCA: The Rural Broadband Association
- NRECA: National Rural Electric Cooperative Association
- PCCA: Power & Communications Contractors Association
- TIA: Telecommunications Industry Association
- USTelecom: The Broadband Association
- WIA: The Wireless Infrastructure Association
- Wi-Fi Alliance
- WISPA: Wireless Internet Service Providers Association
- WTA: Western Telecom Alliance - Advocates for Rural Broadband

If a Coalition is formed, it could lead many of the additional recommendations proposed in subsequent sections of this Report.

2. Proposed Solution to Lack of standardized, nationwide training programs

Increased awareness of training programs throughout the country will provide benefits for Broadband employers and the workforce. Once there's unified messaging and a collaboration effort in place that sets a strategy to be followed, we recommend a specific focus in reaching out to local communities to ensure that training programs are being implemented and promoted, in rural and urban communities. Initiatives that can help with development, promotion and standardization of training programs include:

a) Create recurring in-person or virtual "summits", at a local/state level, to bring together employers and training providers and help align their initiatives and goals. Use local workforce development boards to elevate visibility of employer needs and post-secondary training and support creation of articulated content, such as basic skills learning ABE programs.
b) Foster more partnerships between industry and training providers to establish additional training paths and degree programs that lead to careers, not just narrowly defined jobs, for the Broadband workforce.
c) Endorse and assist with potential expansion of existing, successful training programs.
d) Coordinate nationwide standardization among training programs and develop formal credentialing of relevant skillsets.

3. Proposed Solution to Unawareness or Lack of Funding in Training Programs

a) Educate stakeholders and raise awareness of existing federal funding vehicles that could support the creation and operation of Industry training programs. The following are examples:

(i) Department of Labor
- Workforce Innovation and Opportunity Act (WIOA)

- Regional Workforce Development Boards (WDB)
- Employment and Training Administration (ETA)
- Reentry Employment Opportunity (REO)
- Apprenticeship USA

(ii) Department of Education
- Office of Special Education and Rehabilitative Services
- Rehabilitation Services Administration
- Vocational Rehabilitation Services (VocRehab)

(iii) National Science Foundation

(iv) Department of Defense Education Activity (DoDEA)

There are several existing training programs, such as CTE, ABE, and apprenticeships for which federal and state funding is available. The Federal "Perkins V" program, signed into law on July 31, 2018, provides $1.3 billion annually for CTE programs. Its purpose is to ensure workforce skills taught in CTE programs align with labor market needs. The Workforce Innovation Opportunity Act ("WIOA"), Title 2 funds adult basic skills training programs, although available funding falls short of meeting national needs. WIOA funded programs serve just over 1 million adults with basic skills needs, yet approximately 20 million American workers employed in key service-sector industries lack basic training.

b) The U.S. House of Representatives has recently passed a bill[23] that provides $80 billion to deploy broadband infrastructure to unserved and underserved communities. The Working Group recommends that consideration be given to advocating for a change to the proposed law that would direct a portion of the proposed funding to Broadband workforce training initiatives, as generally described in this Report, Such funding could directly preserve and create new jobs in the Broadband Industry.

Congress is engaged in considering other workforce-related funding through various bipartisan legislation.[24]

4. Proposed solution to Lack of Standardized Job Codes, Wages and Universal Credentialing

Creating standardized DoL Job Codes and better-defined roles and career paths for Broadband workers will promote a better understanding of career opportunities in the Industry. To that end, we recommend the following:

[23] Moving Forward Act, H.R. 2, 116th Cong. (2nd Sess. 2020);

[24] Communications Jobs Training Act of 2019, H.R. 1848, 116th Cong. (1st Sess. 2019); Telecommunications Skilled Workforce Act, S. 3355, 116th Cong. (2nd Sess. 2020); TOWER Infrastructure Deployment Act of 2019, H.R. 3255, 116th Cong (1st Sess. 2019); TOWER Infrastructure Deployment Act of 2019, S. 2363, 116th Cong. (1st Sess. 2019).

a) Undertake a Broadband Industry data gathering/surveying initiative that will provide a clearer understanding of career paths, the skillsets required and compensation that can be expected in various jobs within the Industry. The Working Group has determined that employment classification systems have created a barrier to tracking and supporting Broadband jobs. As mentioned in the challenges section of this Report, job codes that relate to workers, within the O*NET database, are classified by skills and education. Industries are tracked separately through the North American Industry Classification System ("NAICS").

b) Since job codes within O*NET are not specifically classified as Broadband jobs, academic institutions, Industry employers and workers should help develop recommendations for specific Broadband jobs codes under the O*NET. This will help ensure that Broadband jobs are classified correctly, and data regarding the jobs can be captured. In the O*NET system, category 49-2021.00 (Radio, Cellular, and Tower Equipment Installers and Repairers) could be one of the main codes used to encompass wireless Broadband jobs. This category could be used as a starting point and relevant job titles related to Broadband could be added. Codes 49-9052.00 (Telecommunications Line Installers and Repairers) and 49-2020.00 (Telecommunications Equipment Installers and Repairers, Except Line Installers) could be the starting point for wired Broadband infrastructure. We recommend that industry partners work with O*NET to include the term "broadband" in relevant job category titles. This change will help the Industry, academic institutions, and workers find the jobs more easily.

c) Encourage public and private stakeholders to contact the local, state, and regional workforce development organizations mentioned above to make sure that broadband jobs within these identified codes are classified as high skill/high wage. Since workers can be trained to fill these jobs through certificate programs within a short amount of time and increase their earning potential significantly, they should qualify for this designation.

d) Educate local, state and regional departments of labor, workforce development boards, and economic development organizations about how Broadband-related jobs and current job codes are being used and applied in the system so that funding opportunities can be directed to support the Industry and its workers.

e) Bring together stakeholders to work on a framework for a skills-based credentialing system for Broadband related careers. Defining a certification/credentialing framework is a valuable way to establish a common nationwide "language" around skills and opportunities. Workers can use digital credentialing as a way to document and evidence the worker's skills and competencies, as validated by third parties such as employers and other training providers. The digital approach enables the worker to have "control" over his/her credentials as it is often hard to obtain verification of credentials directly from the training institutions well after a training program is completed.

5. Proposed Solution to Unique Demands - Seasonal Jobs, High Liability

As noted above, the seasonality and potentially dangerous nature of certain jobs within the Industry create unique challenges to attracting workers for those jobs. To address these challenges, we recommend the following:

a) Consult with lawmakers to address the age requirement for obtaining CDLs for Broadband-related intrastate work. The issue concerning the shortage of workers with a valid CDL was a recurring subject of discussion, by members of the Working Group and several SMEs invited to Working Group meetings.
b) Explore creation of a government sponsored "Small and Mid-Sized Business Contractors" program where small and medium-sized contracting companies in good standing can access insurance and financing at more beneficial terms if they commit to training new technicians and expanding the Broadband workforce. Other industries use liability-sharing programs as a mechanism to lower the prohibitive cost of insurance.

6. Proposed Solution to Dwindling Workforce due to Retirements and Other Reasons

In order to address this particular challenge, our recommendations are the following:

a) Design training programs aimed at reskilling the workforce.
b) Engage in more on-campus recruiting, high-school outreach and develop information sessions about the Industry.
c) Find ways to keep the existing workforce motivated and engaged and honor the work they do and recognize that they are an essential workforce.
d) Leverage the opportunity that the COVID-19 pandemic has presented and invest in adding diversity to the workforce by appealing to underrepresented communities, women, and veterans.

7. Proposed Solutions to the New Post-COVID Environment

As a result of the sudden high number of unemployed Americans caused by the COVID-19 pandemic, the Working Group has shifted its attention to focus even more on training and education of the existing workforce and attracting new workers to the Industry.

Our recommendations for training and education include:

a) Active promotion of apprenticeship programs by and with all stakeholders. Besides being a cost-efficient alternative for the employer, apprenticeship programs provide an "earn-while you learn" option to the apprentice, which in times like this can be a game changer. Aggressive enrollment in DoL-approved apprenticeable occupations can help to quickly get people back to work, in an industry where they are much needed.
b) Aggressive Outreach by Industry employers that promotes awareness of job opportunities and career paths within the Industry. Outreach to girls and boys clubs,

veteran groups, federal, state and local workforce boards should be pursued. In addition, attendance at jobs fairs, community events, and youth career events. In addition, offering scholarships to college students, and adding CTE and AP programs at the high school level, will increase awareness of opportunities to work in the Industry (e.g., the New York State Wireless Association provides scholarships to two and four year degree college students who are pursuing a degree in a Broadband-related field).

c) Pursue attraction of skilled workers. Work with O*NET to create specific job codes that will help reflect accurate demand and growth in specific job categories. Consider ways to create "branding" for the Industry that increases awareness of job and career opportunities for current workers and the unemployed and underemployed.

D. SUCCESSFUL JOB TRAINING PROGRAMS

To determine performance metrics and effectiveness of any training program, the Working Group reviewed various existing programs that support the Broadband Industry. This exercise allowed the Working Group to:

i. Become familiar with existing and past programs, along with their offerings.
ii. Learn about Industry players that are endorsing these programs and how the graduates of these programs are fulfilling the Industry's workforce needs.
iii. Understand how these programs are supported financially.
iv. Identify their strengths and weakness.
v. Understand whether measurable performance metrics are in place for these programs.
vi. Assess their potential for scalability.

The list of existing programs summarized is not comprehensive but is believed to be representative of those that support the needs of the Broadband Industry.

Community and technical colleges have an important role to play in expanding the Broadband Industry workforce. Working as partners with employers, governmental agencies in federal, state, and local governments, and other stakeholders, they can collaborate in the development of effective and scalable training programs. Examples of successful training models, which are summarized in this Report, include the Wireless Infrastructure Association's (WIA) Telecommunications Industry Registered Apprenticeship Program (TIRAP) and Telecommunication Education Center (TEC), and Wisconsin's Broadband Academy online program at Indian Head Technical College ("WITC"). 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.

Despite state-level budget cuts, there will be opportunities that colleges can pursue to increase enrollment and access new federal funding. For example, the U.S. DoL published on March 10, 2020 a final rule that established a system for advancing the development of high-quality, Industry-Recognized Apprenticeship Programs (IRAPs). The Secretary of Labor, Eugene Scalia, said, "This new rule offers employers, community colleges, and others a flexible, innovative way to quickly expand apprenticeship in telecommunications, health care, cybersecurity, and other sectors where apprenticeships currently are not widely available."[25] The Working Group believes the final rule will provide colleges and employers with an opportunity to utilize the "new" apprenticeship model to address the Broadband Industry workforce needs. More opportunities can be found in the U.S. DoL 's 4/30/2020 announcement about the availability of

[25] News Release, U.S. Dep't of Labor, U.S. Dep't of Labor Issues Industry-Recognized Apprenticeship Program Final Rule, Release No. 20-386-NAT (Mar. 10, 2020), https://www.dol.gov/newsroom/releases/eta/eta20200310.

up to $312 million in funding for creating job training and employment search services for older Americans, as well as the support for higher education provided by Congress under the Federal CARES Act.

1. Traditional Secondary Educational Institutions

In this high-level summary of the training programs available, the Working Group started by evaluating traditional secondary educational institutions.

i. Wake Tech Community College
Location: Raleigh, North Carolina
Website: https://www.waketech.edu/

Overview: Wake Tech is North Carolina's largest community college, serving over 74,000 adults annually. Wake Tech is launching five apprenticeship opportunities. Topics will include safety, rigging, fall protection, principles of electricity, fiber optics, wireless technology cell component, and more. The program is funded by "Wake Works," a Wake County Commission initiative that allocates funding for this purpose. Includes: Tuition, books, fees and uniforms for pre-apprenticeships and apprenticeships students.

Strengths: Credits are stackable and upon course completion students are eligible to take the NWSA Certification. TEP plans to scale nationwide aiming to use locations where they have offices (nineteen in the U.S. and Canada). Recruiting outreach directly targets Fort Bragg Military Base in North Carolina, seeking a steady pipeline of candidates for the program.

Endorsed/Supported By: NATE, NWSA, WIA, and TIRAP.

ii. University of Maryland, Professional Master's Program in Telecommunications
Location: University of Maryland, College Park, Maryland
Website: http://telecom.umd.edu/

Overview: University of Maryland is one of several universities that offer a "Professional Programs in Telecommunications" (others include Colorado University, George Mason University, and George Washington University). All these programs are at master's level and integrate an "interdisciplinary" approach. Most of them are taught by adjunct faculty members who bring their Industry experience into the classroom. Because these programs integrate practical hands-on exercises, they are not offered online. Students would have to be local in order to take classes at the campuses. The programs are very popular for creating quality students for Broadband operators, chip-manufactures, service integrators, and handset manufacturers. Since the programs include some exposure to the business courses, many of the graduates also find jobs in the consulting and sales domain of the Broadband Industry.

Strengths: This one in particular is an interdisciplinary program with 40% of courses offered by the business school. Courses are taught by adjunct faculty who have a strong understanding of Industry practices, and incorporate many hands-on projects which prepare students for the day-to-day Industry demands.

Professional courses get frequently updated by the faculty members to keep the content current and valid.

Endorsed/Supported By: T-Mobile, Qualcomm, Apple, CommScope, Hughes, Cisco, TeleWorld, and Juniper.

iii. Southeast Tech (Wireless Infrastructure Technician Program)

Location: Sioux Falls, SD

Website:https://www.southeasttech.edu/programs/wireless-infrastructure/index.php

Overview: Southeast Tech's Wireless Infrastructure Technician certificate program prepares students for careers as tower technicians. The coursework includes basic rigging, fall protection, safety, fiber optics, wireless technology cell components, antenna basics, principles of electricity and spectrum management are taught in hybrid format with classroom, hands-on training, and online components.

Endorsed/Supported By: VIKOR is a partner.

iv. State Technical College of Missouri, Utility Systems Technician

Location : Linn, Missouri

Website: https://www.statetechmo.edu/programs/industrialtech/ust/

Overview: The Utility Systems Technician program equips students with a broad set of skills to prepare them for careers with a variety of utility contractors and public utilities. Students learn underground and overhead construction skills and how to install and maintain various utility systems, including fiber optic and copper communications, water, wastewater, oil pipeline transmission, and natural gas distribution. Students also participate in an internship with an employer in the utilities industry. Students are prepared to earn a Fiber Optic Technician Certification through The Fiber Optic Association ("FOA"), Occupational Safety and Health Administration ("OSHA") 10-hour training, CPR, First Aid, Flagger, Excavation and Trenching, and Confined Space Entry Certifications. Safety and code requirements are stressed in all classes.

v. Wisconsin Broadband Academy

Location: Wisconsin Indianhead Technical College ("WITC") has four campuses in northwest Wisconsin.

Website:https://www.witc.edu/continuing-education-and-training/professional-development/broadband-academy

Overview: The Broadband Academy program is offered fully online and provides three-level training for employees with the most up-to-date technical content.

Strengths: This is a flexible program that allows students to complete one, two or all three training levels. Students have the opportunity to take courses that seamlessly transfer toward Industry-recognized certifications or a technical diploma. The program is supported by a federal IMPACT grant.

Endorsed/Supported By: Wisconsin State Telecommunications Association ("WSTA") and Governor Scott Walker.

vi. Aiken Technical College, Tower Installation Program

Location: Aiken Technical College, Aiken, South Carolina

Website:https://www.atc.edu/Study/Programs-of-Study/Technical-Education/Tower-Installation

Overview: The Aiken Technical College program offers a twelve-day course for entry level wireless technicians. The program trains students in the basics of tower climbing and acclimates them to working at heights. Students complete the program with multiple nationally-recognized certifications, including CPR, OSHA 10-Hour, and Competent Climber Certification.

Strengths: The Aiken Technical College program is a short format program that provides hands-on training for students that are new to the Industry. At the end of the program, students leave with all the basic certifications and basic familiarity with tower climbing work and are recruited by a variety of tower contractors. Aiken Technical College has partnered with Jobs Corps programs and Warriors for Wireless to recruit students.

Endorsed/Supported By: Aiken Technical College.

2. Trade School and Other Specialized Training Platforms

i. AT&T, Avaya, and Nokia Alliance (Joint Labor-Management Program with Union Employee Members of the Communications Workers of America)

Location: Nationwide

Overview: Although no longer in practice, this program was a training cooperative amongst stakeholders in the Industry. It appeared to be highly successful based on the number of certifications achieved by employees of the participating entities. Incentive-pay was the significant motivating factor for many employees who enrolled. The Alliance website states that the program was discontinued due to changes in funding streams, which appears to be unfortunate considering its wide participation.

Endorsed/Supported By: Microsoft, Cisco, Nortel, and Dell.

ii. Fiber Optic Association Online University (Fiber U)

Location: Online Virtual

Website: https://fiberu.org/

Overview: Founded in 1995, Fiber Optic Association ("FOA") is an international non-profit educational association chartered to promote professionalism in fiber optics through education, certification, and standards. It is the leading international certifying body for fiber optics. It sets standards for and administers technical certification programs. It evaluates and approves training schools which offer FOA certification training. Fiber U is the FOA's free online learning website. One can find free online self-study programs, tutorials, textbooks, videos and links to other FOA pages that helps students learn about fiber optics and premises cabling. Once a free Fiber U online self-study program is completed, one can get a "Fiber U Certificate of Completion" for the course for a nominal charge.

Strengths: This training platform was created by a non-profit trade association and the courses are endorsed by most of the member companies. Self-study online programs with variety of multimedia resources. Free courses which can train for other certification programs. Unique courses which are not found elsewhere (e.g. Outside Plant OSP Construction, Premises Cabling, Fiber Optic Testing, Fiber to the Antenna, and Fiber for Wireless).

Endorsed/Supported By: FOA Members, Wireless and Cable Operators.

iii. SEA-TAC Airport U Program

Location: SEA-TAC International Airport, Seattle, Washington

Website: https://www.portseattle.org/page/airport-university

Overview: Program offers certificate programs that results in college degrees and credentials recognized by the Industry. Federal and state funded adult basic education programs partner in this work, as do public career and technical colleges.

Strengths: Close collaboration among the Port of Seattle, SEA-TAC airport, Air Alaska, and area community and technical colleges ensures that worker-learners have opportunities for relevant coursework and certificate programs and that employers have access to a talent pipeline of potential employees with the qualifications need to succeed in high-demand positions.

Endorsed/Supported By: Air Alaska.

iv. The Last Mile (TLM)

Location: Currently operating in nineteen correctional facilities across five states including California, Kansas, Oklahoma, Indiana, and Michigan.

Website: https://thelastmile.org/

Overview: TLM is a nonprofit 501(c)(3) organization that offers coding and technology training programs to inmates in correctional facilities. TLM's Code.7370 program offers three levels of coding certifications and teaches a variety of coding languages, including HTML, CSS, Python, Git, and JavaScript. Since launching in San Quentin State Prison in 2010, TLM has expanded into nineteen correctional facilities and served over 600 students. Originally focused on web development, the software engineering skills taught by TLM could also be used to help prepare inmates to enter the Broadband Industry workforce upon release.

Strengths: TLM boasts a 0% recidivism rate for program graduates, compared to an overall recidivism rate of 55% for formerly incarcerated individuals. And using a franchise model with its safe and secure Learning Management System, TLM's coding programs can be easily replicated throughout the country to help train inmates to enter the Broadband Industry workforce upon release while also reducing the costs of incarceration born by federal and state governments by reducing recidivism.

Endorsed/Supported By: Google.org, Stand Together, Chan Zuckerberg Initiative, Slack, W.K. Kellogg Foundation, and FREEAMERICA.

v. Innovative Basic Education and Skills Training ("I-BEST")

Location: Community and technical colleges across Washington state.

Website: https://www.sbctc.edu/colleges-staff/programs-services/i-best/

Overview: I-BEST is a workforce development and education program meant to speed certificate and degree attainment for adults with basic academic skill needs, working to earn their secondary certificate or diploma, or currently taking part in transfer programs. It is intended to quickly move learners into credit bearing college courses. I-BEST teaches students literacy, work, and college-readiness skills so they can achieve their education goals and move into well-paying jobs.

Strengths: I-BEST uses a team-teaching approach, one teacher provides job-training and the other teaches basic skills in reading and math. The combined teaching method allows students to work on college-level studies right away, covering multiple levels with one leap.

Endorsed/Supported By: Washington state board for community and technical colleges.

3. Apprenticeships

i. **Telecommunications Industry Registered Apprenticeship Program ("TIRAP")**

Location: Nationwide

Website: https://www.tirap.org/

Overview: TIRAP is a joint venture of telecommunications companies, industry associations, and the U.S. DoL that develops registered apprenticeship programs available to qualified employers for career development of the telecommunications workforce. TIRAP's mission is to partner with stakeholders to promote safety, enhance quality, and enable education and advancement opportunities in the telecommunications workforce that can meet Broadband network infrastructure build-out needs.

Endorsed/Supported By: The Wireless Infrastructure Association ("WIA") is the National Sponsor of TIRAP. Many of the member companies of WIA are participating in the program by accepting the apprenticeship standards of TIRAP.

ii. **Independent Electrical Contractors ("IEC") Online Electrical Apprenticeship Program**

Location: Offices in Maryland and Virginia.

Website: https://www.iecchesapeake.com/home

Overview: The IEC' s four-year Online Electrical Apprenticeship Program is designed to elevate the student to the level of a qualified, professional electrician. The Program includes intensive study designed to provide the necessary electrical theory and practical training to earn the status of Journeyman Electrician. The online system does not eliminate the classroom but gives a different delivery method for those that wish to become an electrician or are deemed eligible by their employer to continue to achieve their goal.

Endorsed/Supported By: IEC.

iii. Susan Harwood Grant offered through DOL

Location: Nationwide

Website: https://www.osha.gov/harwoodgrants

Overview: This is a U.S. Occupational Safety and Health Administration ("OSHA") program within the DOL has sponsored with grant program to ensure safe and healthful working conditions for working individuals by setting and enforcing standards and by providing training, outreach, education and assistance. The Susan Harwood grant program is a key component in support of this mission, having provided outreach and education to an estimated 1.8 million workers since the program's inception. OSHA began awarding training grants in 1978. Since that time, approximately $205 million dollars has been awarded to approximately 1,000 non-profit organizations to provide training on a variety of safety and health topics. This type of grant provides safety and health training to workers and employers on the recognition, avoidance, and prevention of safety and health hazards in the workplace. These are audiences who might otherwise not receive training, including small business workers and employers, hard-to-reach, or low-literacy workers, and especially workers in vulnerable and high-hazard industries. Solicitation for the Susan Harwood Grant Program is a function of U.S. Congressional budgetary approval and appropriation by the DOL.

Strengths: Many industries apply for grants which ensure focus on specific needs, easily scalable, and has a long-term history of success.

Endorsed/Supported By: OSHA/DOL.

E. PERFORMANCE METRICS FOR JOB SKILLS AND TRAINING PROGRAMS

As part of the Working Group's charges, the Working Group was tasked with recommending possible performance metrics to gauge the effectiveness of existing and future job skills and training programs and develop steps that can be taken to continually improve the effectiveness of such programs. In general terms, it is important to provide assessment of an employee's or trainee's skill set and performance before and after a training session. Visual assessment or snapshots of a learner's abilities can give a clear picture of performance and skill improvement. An effective training program should conduct a pre- and post-assessment test for each participant. Performance improvement after the training needs to be measured, and a set of recommendations need to be provided for further training.

Some organizations also measure the effectiveness of the training through the concept of "Social Ownership." This is an ability to teach others after completing your training. For the Industry, this practice would help since it not only shows how well a participant understood the concepts, but her/his ability to teach others in future. This trait is particularly helpful in apprenticeship programs. Social Ownership provides a new way to get employees engaged and increase training effectiveness.

Clearly defining what should be measured is of the utmost importance, as something that is not measured can also not be controlled and/or improved. The following table suggests performance metrics that should be tracked by stakeholders at a national level, so that eventually, performance benchmarking can be performed. To emphasize that it is equally important to have a continuous improvement mechanism, the Working Group also added actionable steps that may ensure that.

Table 2. Recommended Performance Metrics

Category	Performance Metric	Key Performance Indicator	Continuous Improvement
Institutions/Programs	Matriculation	Retention rate for moving from one competency level to the next	Implement intervention processes to support struggling students
	Contextualized learning of developmental skills	Rate at which ABE students transition into CTE certificate programs	Articulation agreements between ABE providers and CT Colleges Evident of iBEST model on campus Ensure adequate support services to ensure persistence
	Completion	Graduation Rate	Selection Criteria Developmental Skills: Reading, Writing, and Math
	Cost	Return on Investment (ROI)	Increase enrollment Use online learning
	Equity	Percentage of graduates from socially disadvantaged backgrounds or who have a learning difficulty or disability compared with the total across the organization	Use targeted recruitment Increase support for socially disadvantaged students
Learners/Graduates	Employment	Percentage of graduates employed within six months of graduation	Provide job placement support to graduates Enhance skills of graduates until they find a job

	Employment Retention	Percentage of graduates remaining employed for one year	Institution and employer work together during the 90-day probationary period to provide professional development to graduates to ensure continuation of employment Institution addresses knowledge and skill gaps reported by employers through instructor support and curriculum improvements Confirm retention at the 90 days, 6 months and one-year benchmarks
Employers	Recruitment Cost	Average and Median Recruitment Cost for program graduates (vs. baseline or other programs)	Employer involvement in the training
	Skill Gains	Percentage of required skills that graduates have on their day of hire	Communicate required skills to training providers Provide on-job training to students
	Productivity	Percentage of graduates who do not need further training to become fully productive on their day of hire	Communicate required skills to training providers Provide on-job training to students while still in training program
	Turnover	Graduates Turnover vs. Typical Turnover	Provide professional development to employees

	Employee Earnings	Average and Median Earnings	Enhance skills of graduates after employment Confirm wages at the 90 days, 6 months and one-year benchmarks

F. CONCLUSION

5G is a disruptive technology. No wonder there is a global race for leadership over it and a concern that we are experiencing a shortage of skilled workers needed to deploy the infrastructure needed for 5G networks. 5G with a strong fiber backbone will fuel the "digital economy" to a degree that we cannot yet fully envision. Its low latency will enable the "Internet of Things" and the real-time connectedness needed for robotics and automation, autonomous vehicles, telemedicine and smart energy grids at the core of smart cities. We need to ensure deployment keeps up with the projected pace of new 5G technologies and that delays in deployment do not broaden the digital divide, due to a lack of the necessary workforce in rural areas and underserved communities.

It is critical that all stakeholders—namely, Industry stakeholders and associations, the federal, state and local governments, and their agencies, including U.S. DoL, employers, educators, community and technical colleges, and accreditation bodies—work together to define pathways for training opportunities that are aligned with nationally-recognized credentials and that lead to real employment opportunities. We cannot get this done without a collaborative spirit amongst the stakeholders.

The Working Group identified early on in its skills gap discovering phase that there is a Broadband Industry "identity crisis". This is a crisis shared by those who implement and deploy the infrastructure, as well as those who use and depend on broadband services in their daily lives. The Working Group believes there is a need to promote the existence of the Broadband Industry workforce and the opportunities for others to join it. The creation of an Industry Coalition is the best way to align vision, interests, and actions so that tangible steps toward building a larger and strong workforce can be achieved. Initiating outreach activities, nationally and locally, to raise awareness of the workforce opportunities is at the center of what this Coalition would promote. Training providers noted that an obstacle to scaling their programs is that potential students lack awareness of the large size and social importance of the Industry. Stakeholders need to improve public awareness of broadband deployment careers, especially aimed at students and adult learners.

Addressing the challenges that are causing the shortage is more a matter of coordination and true collaboration than anything else. The Broadband Industry needs to act as one, with regards to workforce development, and be in sync to achieve the result it seeks.

The July 2020[26] approval by the House of Representatives of an $80 billion budget over five years to expand broadband infrastructure and the U. S, DoL announcement, on September 2020,[27] of its intention to continue its efforts to expand the number of apprenticeship opportunities in growing sectors across the country, naming Telecommunications and 5G specifically, are encouraging. These actions provide the Industry with much-needed traction to claim national attention on the workforce shortage. By aggressively engaging and educating employers about

[26] https://www.congress.gov/bill/116th-congress/house-bill/2

[27] News Release, U.S. Dep't of Labor, U.S. Dep't of Labor Awards Over $22 Million to Industry Intermediaries to Support Continued Apprenticeship Expansion & Opportunity, Release No. 20-1863-NAT (Sept. 25, 2020), https://www.dol.gov/newsroom/releases/eta/eta20200925-3.

apprenticeship programs with pre-approved DOL occupations, such as TIRAP (which was evaluated in this Report), there is incredible potential to expand the qualified workforce quickly.

Now more than ever we have tasted the "essential" quality of robust and reliable connectivity (or lack thereof). If the reality of the digital divide was worrisome, the thought that some children are not able to attend online classes for lack of broadband connection should be intolerable. By embracing the recommendations issued by this Working Group, not only the workforce shortage issue will improve, but the measures will help put displaced workers due to the pandemic back to work in an industry that not only needs them, but is now considered essential.

G. DEFINITIONS, TERMINOLOGY AND GLOSSARY OF TERMS

"Adult Education" refers to "academic instruction and education services below the postsecondary level that increase an individual's ability to --(A) read, write, and speak in English and perform mathematics or other activities necessary for the attainment of a secondary school diploma or its recognized equivalent; (B) transition to postsecondary education and training; and (C) obtain employment."[28]

"Apprenticeship" "means an arrangement that includes a paid-work component and an educational or instructional component, wherein an individual obtains workplace-relevant knowledge and skills."[29]

"Career Pathways" "means a combination of rigorous and high-quality education, training, and other services that - (A) align[] with the skill[s] needs of industries in [a] State or regional economy . . . ; (B) prepare[] an individual to be successful in . . . a full range of secondary or postsecondary education, [including Registered Apprenticeships]; (C) include[] counseling to [help] individual[s] achiev[e] [their] education and career goals; (D) include[], as appropriate, education offered concurrently with and in the same context as workforce preparation activities and training for a specific occupation or occupational cluster; (E) organize[] education, training, and other services to meet the particular needs of an individual in a manner that [helps] accelerate[] the[ir] educational and career advancement . . . ; (F) enable[] an individual to attain a secondary school diploma or . . . equivalent, and at least 1 recognized postsecondary credential; and (G) help[] an individual enter [into] or advance within a specific occupation or occupational cluster."[30]

''Career and Technical Education'' "means organized educational activities that" provide "relevant technical knowledge and skills needed to prepare for further education and careers in current or emerging professions." It "include[s] competency-based, work-based, or other applied learning that supports the development of . . . employability skills [and] technical skills."[31] The term "vocational education" was previously used but has fallen out of favor with most educators.

"Credentialing" is the process of establishing the qualifications of certain professional or non-professional.

"Government" means any Federal, State, county, municipal, and other local governmental authority, or any subdivision or instrumentality of any of the foregoing.

---

[28] *See* Workforce Innovation & Opportunity Act § 203(1), 29 U.S.C. § 3272(1).
[29] Exec. Order No. 13801, 82 Fed. Reg. 28,229 § 3(a) (June 15, 2017), https://www.whitehouse.gov/presidential-actions/3245/.
[30] *See* Workforce Innovation & Opportunity Act, § 3(7), 29 U.S.C. § 3102(7), https://www.congress.gov/113/plaws/publ128/PLAW-113publ128.pdf.
[31] *See* Carl D. Perkins Career & Technical Education Improvement Act of 2006, 20 U.S.C. § 2302(5); *see also* The Glossary of Education Reform, "*Career and Technical Education*" (last updated Apr. 29, 2014), https://www.edglossary.org/career-and-technical-education/.

"Learning Pathway" means "specific courses, academic programs, and **learning experiences** that individual students complete as they progress in their education toward graduation. In its plural form, the term *learning pathways*—or any of its common synonyms, such as *multiple pathways* or *personalized pathways*—typically refers to the various courses, programs, and learning opportunities offered by schools, community organizations, or local businesses that allow students to earn academic **credit** and satisfy graduation requirements."[32]

"NAICS" means **The North American Industry Classification System,** the system used to classify businesses and track the growth of the US economy.

"O*NET" means **The Occupational Information Network**, an online database that contains hundreds of occupational definitions to help students, job seekers, businesses, and workforce development professionals to track occupational statistics.

"On-the-Job Training" is a hands-on-method of teaching skills, knowledge and competencies needed for employees to perform a specific job in the workplace.

"Perkins V" means "Strengthening Career and Technical Education for the 21st Century Act (Perkins V) [that] was signed into law by President Trump on July 31, 2018. This bipartisan measure reauthorized the Carl D. Perkins Career and Technical Education Act of 2006 (Perkins IV) and continued Congress' commitment [to] provid[e] nearly $1.3 billion annually for career and technical education (CTE) programs for the nation's youth and adults."[33]

"Professional Degree Programs" means educational programs that are designed to prepare students for a practice-oriented profession where coursework teaches students about everyday situations and often requires real world experience.

"Telecommunications" means the transmission, emission, or reception of signs, signals, writing, images, graphics, and sounds or intelligence of any nature by wire, radio, optical, or other electromagnetic systems.

"Telecommunications Industry" means the group of companies and other organizations that provide, and/or support the provision of, Telecommunications facilities or services, for use by the public, for hire.

"Small and medium-sized businesses" or **"SMBs"** means a small and medium-sized businesses whose personnel numbers fall below certain limits. SMBs are sometimes also referred to as "small and medium sized enterprises" or "SMEs", as used by international organizations such as the World Bank, the European Union, the United Nations and the World Trade Organization. Small businesses are generally those companies with **fewer than 50 employees**. Medium-sized businesses are generally those companies with **between 50 and 499 employees. Any company** with 500 or more employees is generally considered a large business.

---

[32] *See* The Glossary of Education Reform, *Learning Pathway* (last updated Sept. 23, 2013), https://www.edglossary.org/learning-pathway/.

[33] Perkins Collaborative Resource Network, *Perkins V*, https://cte.ed.gov/legislation/perkins-v (last visited Oct. 20, 2020); *see also* Strengthening Career & Technical Education for the 21st Century Act, 20 U.S.C. § 2301 *et seq*. https://www.congress.gov/115/plaws/publ224/PLAW-115publ224.pdf.

"Subject Matter Expert" or **"SME"** means a specialist in a specific field.

"Skilled Worker" means any worker who has special skill, training, knowledge, and (usually acquired) ability in their work. A skilled worker may have attended a college, university or technical school. Or, a skilled worker may have learned their skills on the job.

"Upskilling" is a tool that **encourages employee engagement and retention**, presenting clear benefits to the organization's bottom line, and the well-being of the workforce – especially as it relates to employee performance. Each time a business replaces a salaried employee, the cost of replacing him/her can be significant.

"US DOL" means the United States Department of Labor.

"Workforce development" means the coordination of public and private sector policies and programs that provides individuals with the opportunity for a sustainable livelihood and helps organizations achieve exemplary goals, consistent with the societal context.[34] It encompasses many different areas of education, training, or business activity.[35] It is distinguished from training or education by its explicit focus on economic development.[36]

"Workforce Innovation and Opportunity Act (WIOA)" was enacted in 2014 to strengthen and improve the 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 workers.[37] The law was the first significant update since the Workforce Investment Act of 1998.

---

[34] Ronald L. Jacobs & Joshua D. Hawley, *The Emergence of 'Workforce Development': Definition, Conceptual Boundaries and Implications*, In *International Handbook of Education for the Changing World of Work* (Rupert Maclean & David Wilson eds., Springer Netherlands 2009), https://www.researchgate.net/profile/Joshua_Hawley/publication/226306067_The_Emergence_of_%27Workforce_Development%27_Definition_Conceptual_Boundaries_and_Implications/links/555008e508ae12808b37d649.pdf, at 12.

[35] *Id.* at 12.

[36] *Id.* at 16.

[37] Workforce Innovation & Opportunity Act, Pub. L. No. 113-128, 128 Stat. 1425 (2014); *see also* U.S. Dep't of Labor, Employment and Training Administration, *Workforce Innovation and Opportunity Act*, https://www.dol.gov/agencies/eta/wioa(last visited Oct. 20, 2020).

H. WORKING GROUP CHARGES

WORKING GROUP CHARGES ASSIGNED BY THE FCC

Develop recommendations to make more widely available and improve job skills training and development opportunities for the broadband infrastructure deployment workforce. In developing recommendations on this topic, the Working Group should specifically:

1. Identify any gaps in broadband infrastructure deployment skills that could inhibit the pace of deployment of fixed and mobile broadband connectivity across the nation.
2. For each issue identified, formulate possible solutions that stakeholders could implement. Proposed solutions, to the extent possible, should be adaptable and scalable to different deployment areas and technologies to encourage widespread adoption.
3. Recommend possible steps that stakeholders could take to attract more skilled professionals to join the broadband infrastructure deployment workforce.
4. Identify any existing job skills and training programs that could serve as a model for stakeholders in developing measures to bridge any skills gaps in broadband infrastructure deployment.
5. Recommend possible performance metrics to gauge the effectiveness of existing and future job skills and training programs and develop steps that can be taken to continually improve the effectiveness of such programs.

In each case, the Working Group should consider and address different challenges facing rural and urban areas. How can all parties help ensure that there are enough skilled workers to deploy broadband in both rural and urban areas? To the extent possible, the Working Group's recommendations should be in the form of concrete steps and procedures that the Commission and other stakeholders could adopt. The Working Group's recommendations will aid the Commission in its efforts to "encourage the deployment" of high-speed broadband "to all Americans."[38]

[38] *See, e.g., In re Accelerating Wireline Broadband Deployment by Removing Barriers to Infrastructure Inv.,* 33 FCC Rcd. 7705, 7773, n.500 (2018) (quoting 47 U.S.C. § 1302(a)); *In re Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Inv.,* 33 FCC Rcd. 9088 (2018), *review granted, decision vacated in part sub nom. City of Portland v. United States*, 969 F.3d 1020 (9th Cir. 2020); *see also In re Communications Marketplace Report*, GN Docket No. 18-231, FCC 18-181, paras. 290-312, 321-25 (Dec. 26, 2018).

I. LEADERSHIP AND MEMBERSHIP

**indicates a member of the Broadband Deployment Advisory Committee*

Working Group Chair: Leticia Latino, Chief Executive Officer, *Neptuno/SmartTecPort* *

Working Group Vice-Chair: Rikin Thakker, Ph.D., Chief Technology Officer, *Wireless Infrastructure Association (WIA)*
(The work for this report was completed as a representative of Multicultural Media, Telecom and Internet Council) *

Working Group Members:
Nayef Abu-Ageel, Dean of Academics and Chair of Engineering
Capitol Technology University

Earl Buford, Chief Executive Officer
Partner4Work

Kelleigh Cole, Manager of Strategic Projects*
Utah Education and TeleHealth Network

Todd Crump, Vice President, Training and Safety
ConnectGen

Robert Debroux, Director, Public Policy and Federal Regulatory Affairs*
TDS Telecommunications, LLC

Douglas Dimitroff, Board Member*
New York State Wireless Association

Bill Esbeck, Executive Director
Wisconsin State Telecommunications Association

Zane Farr, Research Economist
Communications Workers of America

Michael Hain, Chief Technology Officer *
Nittany Media

Kyle Hitchcock, Division Manager
Davey Resource Group

Eve Lewis, Assistant City Attorney*
City of Coconut Creek, Florida

Marquita Rockamore, Director of Health Industry Solutions
Cuyahoga Community College

Steve Sellenriek, President, Sellenriek Construction
Power and Communication Contractors Association

Dileep Srihari, Vice President & Senior Policy Counsel *
CompTIA

Brent Skorup, Senior Research Fellow, Technology Policy Program*
Mercatus Center, George Mason University

Curt Stamp, Vice President, Government Affairs*
Cox Communications

Larry Thompson, Chief Executive Officer, VantagePoint*
NECA

Jenifer Vanek, Director of Digital Learning and Research, EdTech Center
World Education, Inc.

Jeffrey Westling, Technology & Innonvation Policy Fellow *
R Street Institute

Designated Alternates:
Julie Darrington for Larry Thompson.
Tim Ulrich for Robert Debroux.
Sara Cole for Robert Debroux.
Tondi Allen for Marquita Roquemore.

Designated Federal Officers:
Justin Faulb, Federal Communications Commission.
Zachary Ross, Federal Communications Commission.
Belinda Nixon, Federal Communications Commission.

Working Group Liaisons:
Elizabeth Cuttner, Federal Communications Commission.
Jordan Marie Reth, Federal Communications Commission.

Acknowledgement for Working Group members that contributed to this report but left the working group prior to it being completed:
Miranda Allen, Chief Executive Officer, RSI Corp.
National Association of Tower Erectors

Charles McKee, Vice President of Government Affairs, Federal and State Regulatory*
Sprint

Grant Seiffert, Vice President of Workforce Development and Executive Director, Telecommunications Industry Registered Apprenticeship Program
Wireless Infrastructure Association

Tom Struble, Manager & Counsel, Technology & Innovation Policy*
R Street Institute

Debbie Goldman, Research and Telecommunications Policy Director
Communications Workers of America

J. SUBJECT MATTER EXPERTS (SMEs)

We want to acknowledge the invaluable contribution, in knowledge and time, of the following Subject Matter Experts:

Tim Armstrong, Training Facility Manager
Ericsson

Deb Bennett, Director of Apprenticeship (TIRAP)
Wireless Infrastructure Association

Scott Crockett, Subcontractor Services
Ericsson

Mayor Claudia Cubillos, *President Miami Dade County League of Cities*
City of El Portal, Florida

Will Durden:**,** Policy Associate for I-BEST
Washington State Board for Community and Technical Colleges

Commissioner Keon Hardemon, Vice President of Miami Dade County League of Cities
City of Miami District 5, Florida

Jane Henry, Chief Executive Officer
SeeHerWork

Commissioner Andreana Jackson
City of North Bay Village

Peter Janzow, Vice President, Business Development
Credly

Jon Kerr**,** Director of Basic Education for Adults
Washington State Board for Community and Technical Colleges

Paul Kostner, Utility Construction Technician Instructor Broadband Academy. *Wisconsin Indianhead Technical College*

Lesley Liarikos**,** Vice President
Towers Systems South

Duane Macentee, Executive Director
National Wireless Safety Alliance (NWSA)

Shane McBride, Subcontractor Services
Ericsson

James McQueen , Chief of Staff
City of Miami District 5, Florida

Chang Menon, Sourcing
Ericsson

Rod Olson, Chief Executive Officer,
Vernon Communications

Nick Rogness, Director of Engineering and Operations.
Golden West Telecommunications

Cesar Ruiz, President and Chief Executive Officer
Learning Alliance Corporation

Todd Schlekeway, President and Chief Executive Officer
National Association of Tower Erectors (NATE).

Chris Taylor, Chief Operating Officer
SeeHer Work

Mark Wilson, Network Operations Manager
Mitchell Technical Institute

Chad Young: Chief Executive Officer,
Norvado