How federal infrastructure investment can put America to work

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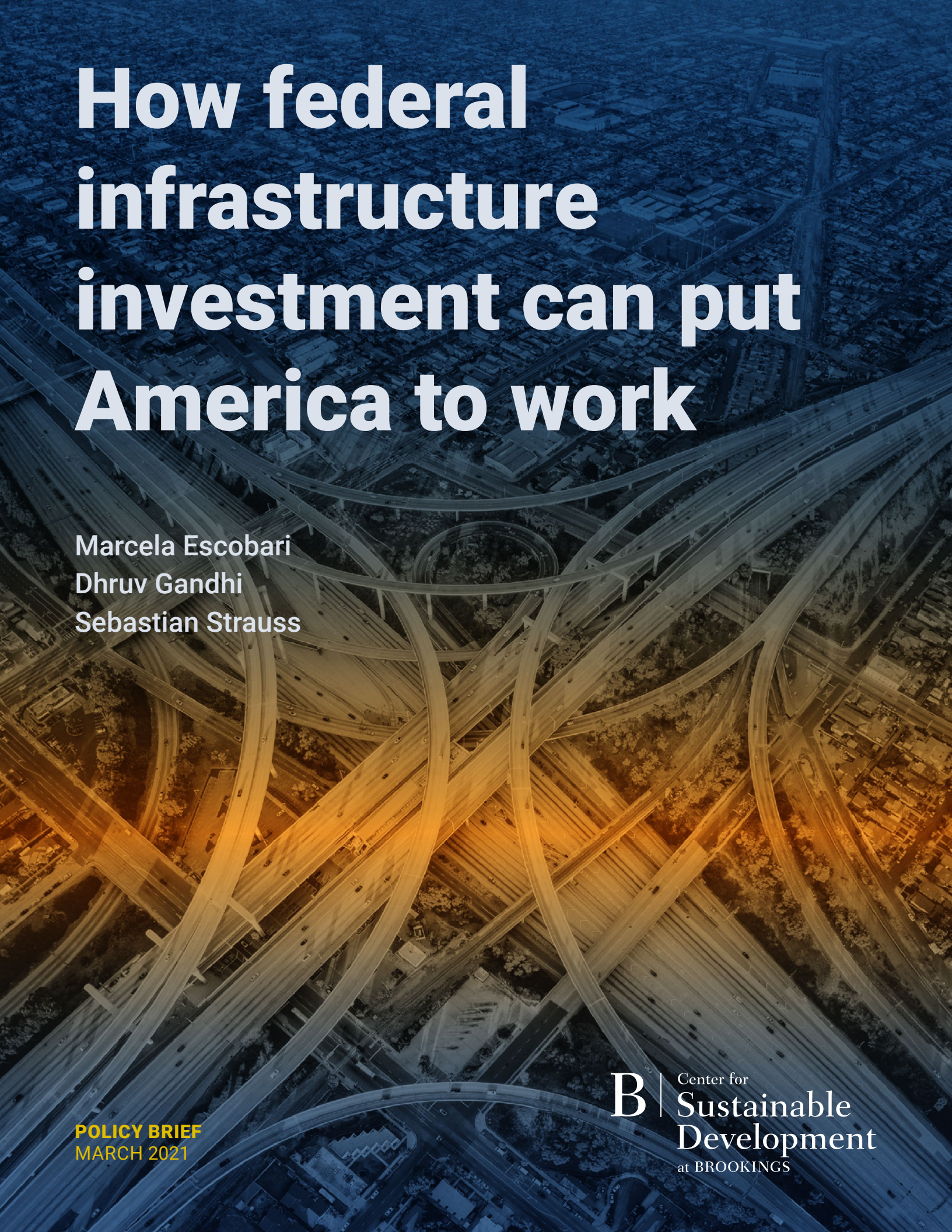

POLICY BRIEF
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Summary

As COVID-19 continues to take a toll on the economy, America faces three interrelated challenges: (1) high unemployment alongside a historically low reemployment potential; (2) a precarious labor market with too many low-wage, dead-end jobs; and (3) large infrastructure gaps that hamper productivity and growth.

The Biden administration has a historic opportunity to tackle the first two by addressing the third. A large-scale federal infrastructure investment program that is deliberately designed for maximum workforce impact can help accelerate reemployment, prevent scarring, and boost long-term inclusive and sustainable growth.

To maximize employment and opportunity for workers, policymakers should consider not only how many jobs these investments could create, but also how good the jobs are likely to be, who they will likely employ, and to what extent targeted reskilling might be needed to fill staffing gaps.

Below, we illustrate how this effort could take shape by describing an approach to assess and potentially maximize the workforce benefits of infrastructure investments and present a case study on broadband expansion.

A triple whammy of crises

America faces three interrelated challenges in the wake the of the COVID-19 pandemic.

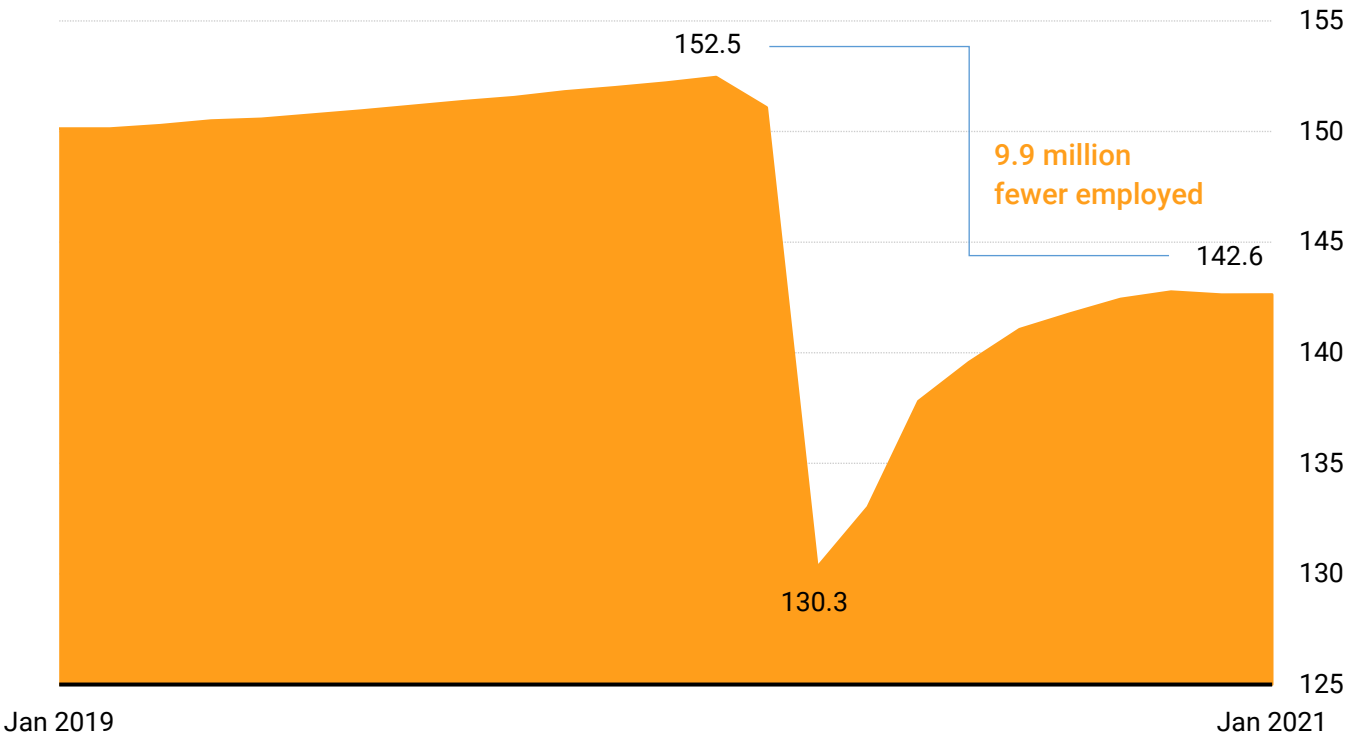
First, the U.S. economy has experienced severe job losses, with almost 10 million fewer workers employed today than before the pandemic (see Figure 1). In addition to increased unemployment, labor force participation has dropped steeply, as discouraged Americans leave the workforce entirely. Largely because COVID-19 has disproportionately disrupted high-contact occupations (e.g., cleaning, hospitality, and food services), the shock has hit low-wage workers—who are more likely to be Black, Hispanic, female, and young—the hardest. To make matters worse, these workers are having the hardest time getting back on their feet, because the occupations they have experience in have not historically offered pathways into today's in-demand occupations. The economy's potential to absorb displaced workers is at its lowest level since at least 2004 (the first year we can measure it). As we wrote in November, "Any of

today's unemployed workers may find it harder than in the past to find new jobs and advance through the labor market." And the longer these workers remain unemployed, the less employable they will become—a phenomenon known as "scarring."

FIGURE 1

Nearly 10 million fewer workers are employed today than before the pandemic

Total U.S. employment (nonfarm), millions



Note: Seasonally adjusted.
Source: U.S. Bureau of Labor Statistics.

Second, even before the pandemic, the U.S. labor market was incredibly precarious. Prior to COVID-19, almost half of the American workforce (44 percent or 54 million workers) earned low wages, with a median annual salary below $18,000. About half of low-wage workers had a high school diploma or less, with only 14 percent holding a bachelor's degree. Moreover, our research has shown that most low-wage workers churn through low-wage jobs, struggling to move up in a labor market with declining and uneven access to development and advancement opportunities—and that women and people of color have been disproportionately affected by waning job quality and economic mobility.

Third, the U.S. economy is host to large and persistent infrastructure gaps that hamper productivity and long-term growth. The American Society of Civil Engineers gives U.S. infrastructure a score of C-, classifying it as "poor" and "at risk," while the World Economic Forum's Global Competitiveness Report ranks it 13th in the world. Public spending on physical infrastructure has persistently failed to keep up with economic growth; the U.S. spends only 2.3 percent of GDP on infrastructure, while European countries spend 5 percent on average and China spends about 8 percent. Just to meet basic national needs by 2025, the U.S. faces an estimated funding shortfall of more than $2 trillion. Several more trillions in spending on clean energy and climate change adaptation and mitigation will be needed to achieve carbon neutrality by 2050.

Amid economic and social disruption, policymakers must take bold actions to accelerate reemployment while building a productive, resilient, low-emission economy that can deliver dignity, stability, and opportunity for all workers.

Seizing the moment

The Biden administration recognizes the potential for a well-designed, large-scale federal infrastructure investment program to close critical gaps, put Americans back to work, and correct economic, racial, and social inequities in employment. Incorporating a workforce lens to federal infrastructure investments can ensure they address all three of these crises simultaneously.

The case for using infrastructure spending as a countercyclical macroeconomic stabilization tool is not new. The rationale traces back to President Herbert Hoover and was later crystallized by John Maynard Keynes, who posited that public spending can offset downturns by boosting labor demand when unemployment is high. President Franklin D. Roosevelt's New Deal put this theory to the test. A gargantuan effort with an enduring legacy, the initial appropriation for New Deal infrastructure projects under the Works Progress Administration (WPA) represented 6.7 percent of GDP—equivalent to $1.4 trillion today. At its peak, the WPA provided paid work for up to 40 percent of unemployed Americans, equivalent to about 4 million jobs today.

Beyond short run job creation, federal infrastructure investment can have several other positive effects. Boosting employment would increase aggregate demand and could put upward pressure on wages. As many studies have shown and policymakers increasingly recognize, running a high-pressure economy can be an effective way to reduce income inequality and narrow racial and gender wage gaps (provided it's

accompanied by complementary policies). Moreover, improving the nation's infrastructure would increase long-run productivity growth. Finally, even if infrastructure investment had no impact on employment, productivity, and growth, it'd still deliver public goods that should be available to all but that may not be profitable to produce privately (such as rural broadband). Since many of the benefits of infrastructure spending are externalities—meaning that they accrue to society as a whole and individuals cannot be easily prevented from enjoying them—government provision is often efficient.

Despite approving trillions of dollars in COVID-19 relief to avert mass unemployment, Congress has allocated comparatively little for infrastructure spending. By contrast, America's main peers and competitors all plan to massively increase infrastructure investment. The U.S. failure to follow suit is puzzling given infrastructure's public support and bipartisan appeal; during a divisive election year, both 2020 presidential campaigns supported $1.5 trillion to $2 trillion increases in infrastructure spending.

Historically low interest rates offer plenty of fiscal space for the government to spend on high multiplier activities like infrastructure without crowding out private investment—especially if such spending can accelerate reemployment, prevent scarring and support long-term inclusive growth. As the Biden administration and the 117th Congress consider further stimulus, they would be wise to take advantage of this momentous opportunity.

Jobs, good jobs, jobs for all

The case for a large-scale federal infrastructure program as a means to putting people to work while confronting inequities is strong. To realize these goals, policymakers may want to select projects that are not only economically worthwhile, socially beneficial, and politically feasible, but also that are intensive in the kind of labor that is currently idle. Compared to New Deal efforts, the scope for easy job creation is more limited today; while WPA projects employed large numbers of unskilled workers, current infrastructure projects are likely to be much more capital- and skill-intensive. Thus, a key variable is how the selected projects match the currently unemployed workforce in order to maximize reemployment and opportunity dividends.

As policymakers contemplate the pros and cons of different infrastructure projects, they should consider three important questions:

How many and what kinds of workers will they employ?

The answer depends on a complex web of factors, not least on the government's choice of priorities and spending on each. Once policymakers have narrowed down a list of priorities, they must assess the scale of the needs (e.g., 2,000 miles of roads, 400 bridges, etc.) and put a price tag on them.

Armed with these spending assessments, policymakers can then estimate how many workers each project will require, by geography and by occupation. Each project will require a unique occupational mix, and occupations employ different kinds of workers and have different characteristics—such as current employment, demand, pay, barriers to entry, mobility prospects, etc. These will affect how much a project costs and how quickly it can be staffed, among others.

Understanding the characteristics of the workers currently employed in the occupations that projects will require is key to estimating the extent to which federal investments might create equitable employment opportunities for historically marginalized communities. Some occupations (such as management and engineering) disproportionately employ older white men, while others (such as food prep and retail sales) disproportionately employ young Black and Hispanic women. As noted above, occupations with large shares of women and minority employees have been hit much harder by the COVID-19 crisis. At the same time, our research has found that most infrastructure occupations disproportionately employ older white men. Given this occupational segregation, creating equitable employment opportunities may be difficult. This is in line with findings by our colleague Joseph Kane, who proposes diversity and inclusion focused sector strategies, work-based learning programs, and supportive services to address inequities in infrastructure jobs.

How good will the jobs be?

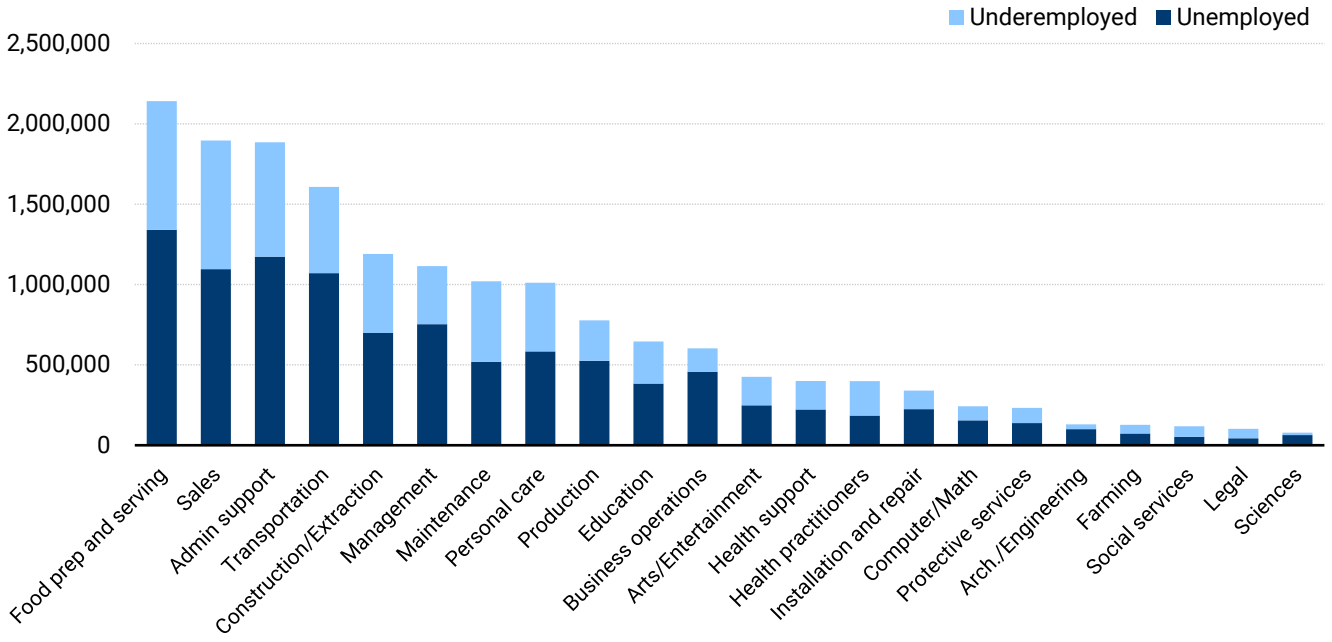
Occupations also differ in the extent to which they offer accessible, high-quality, and future-proof employment opportunities. Some occupations require a bachelor's degree or higher, while others have no formal education requirements. Some pay a living wage and offer benefits like health insurance, while others don't pay enough to make ends meet. Some offer pathways to upward mobility, while others are dead-end jobs. Given the urgency to accelerate reemployment, policymakers may favor investments that create jobs with low natural barriers to entry and that provide a living wage, basic labor protections, and stability. Our research finds that most infrastructure jobs are well-paid (above the national median), stable, *and* accessible to workers without college degrees.

What reskilling may be required?

Workforce impact analysis can help answer a key question: How many unemployed and underemployed workers can a potential project absorb? This requires comparing, for each occupation required by a project, the number of jobs estimated to be created with the number of workers currently unemployed and underemployed. Some occupations (such as retail sales) are so large or have been hit so hard by the COVID-19 shock that enough qualified workers will be available to fill the created positions. In other occupations, however, there may not be enough idle qualified workers to meet projected demand (see Figure 2).

FIGURE 2

Labor underutilization by occupational group



Note: Underemployed is defined as employed part-time for economic reasons.
Source: Current Population Survey (CPS) microdata, Census Bureau, October 2020.

If staffing shortages exist, projects could fill them by hiring unemployed and underemployed workers in similar occupations who could feasibly transition to the required occupations with little to no reskilling. One way to identify these similarities—or occupational "adjacencies"—is to examine historical data on the flow of workers between occupations. These transitions represent implicit skill overlaps; if there are not enough unemployed workers in a required occupation, workers in adjacent occupations could potentially be absorbed without major reskilling. Policymakers can leverage tools like Mobility Pathways, developed by the Workforce of the Future initiative to trace common pathways into and out of 441 occupations across 130 industries. To maximize absorption, employers will need to be proactive and consider workers from "adjacent"

occupations who may not fit the job description but have historically transitioned into the required occupations.

If enough idle workers cannot be found in *adjacent* occupations to meet the projected staffing demands of a potential infrastructure project, it may be necessary to hire and train unemployed and underemployed workers from *non-adjacent* occupations. To do this quickly and cost-effectively, policymakers can target workers with the smallest occupational distance to the required occupations.

Estimating reskilling needs can help streamline and inform training programs. These estimates would be especially helpful for community colleges and other small local training providers. An efficient reskilling architecture featuring pre-apprenticeship and community-based programs would allow education and training providers to focus on skills differentials and address only the incremental skills that workers will need, enabling more rapid and cost-effective scaling of high-quality training that leads to employment.

Box 1 applies the analytical framework described in this section to a hypothetical broadband expansion project.

BOX 1

Workforce analysis case study: Broadband expansion

Between 21 and 43 million Americans lack access to high-speed broadband internet. The digital divide plays out along racial, socioeconomic, and geographic lines, to the detriment of the country's most marginalized communities. This gap is especially harmful in light of digital connectivity's growing importance—only heightened by COVID-19—for access to employment, education, and health services. As this reliance grows, it threatens to exclude the most vulnerable from opportunity.

To address this critical deficit, President Biden's platform calls to "Expand broadband, or wireless broadband via 5G, to every American." In Congress, the Accessible, Affordable Internet for All Act (2020), sponsored by Rep. James E. Clyburn, proposes investing $80 billion to deploy high-speed broadband infrastructure nationwide. We estimate that this spending would create approximately 200,000 job-years in about 130 occupations, principally in Installation, Maintenance, and Repair occupations. The following table breaks down estimated job creation for the top six highest-volume, most critical (i.e., those with the highest relative intensity of employment in broadband) occupations:

TABLE 1

Estimated job creation by occupation for broadband

Top broadband occupations	% of jobs	# of jobs
Telecommunications Equipment Installers and Repairers, Except Line Installers	13.5	26,357
Telecommunications Line Installers and Repairers	9.2	18,437
Electrical Power-Line Installers and Repairers	4.1	8,282
Electronics Engineers, Except Computer	2.2	4,374
Radio, Cellular and Tower Equipment Installers and Repairers	0.8	1,626
Helpers—Installation, Maintenance and Repair Workers	0.3	582

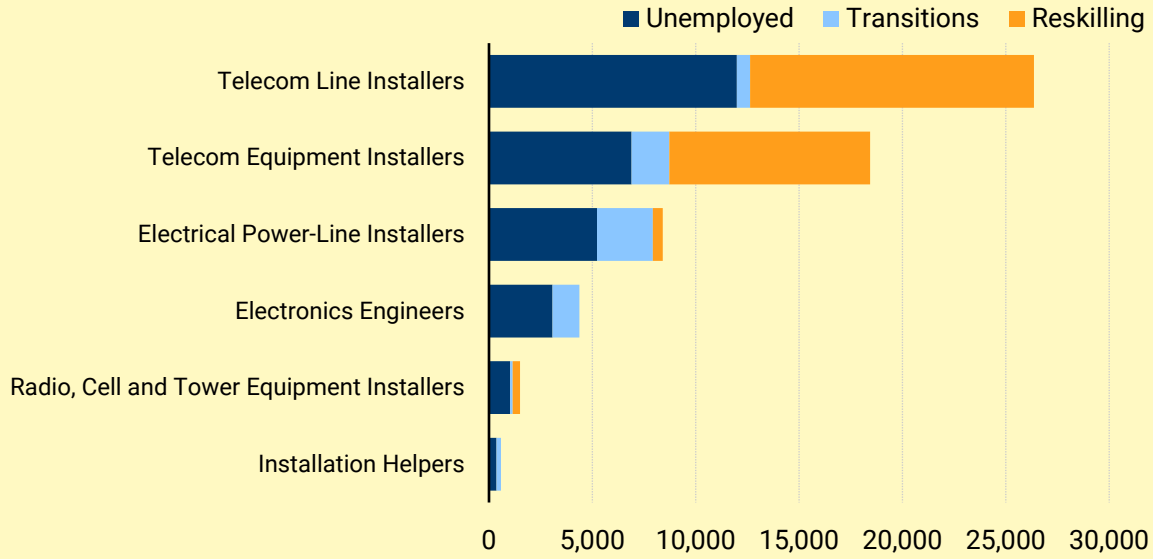
The typical broadband worker is a prime-age (25-54 years) non-Hispanic white male without a four-year college degree. Compared to the general workforce, broadband workers are more male, older, have less formal education; they are also better paid, more likely to work full-time, more likely to be covered by a union, and face lower barriers to entry. Compared to the current unemployed and underemployed population, they are also more likely to be white. On the flip side, broadband occupations offer limited pathways to higher-paying jobs and are expected to grow less over the next decade than most other occupations.

If all 200,000 of these hypothetical jobs were created at once, we estimate that about 169,000 positions could be filled by currently unemployed and underemployed workers in broadband occupations. In the most critical broadband occupations (which would employ a subset of 60,000 workers), displayed in Figure 3, there are not enough currently unemployed and underemployed

workers to meet the estimated demand surge. These shortages could be partially filled by currently unemployed and underemployed workers from adjacent occupations such as Electricians, Engineers, A/V Equipment Installers and Repairers, and Construction Laborers (7,000 "Transitions" workers), who could feasibly transition to the requisite occupations with little to no reskilling. But as Figure 3 shows, significant gaps would remain, particularly in four critical broadband occupations. For these, workers would need to be trained or reskilled. To minimize costs and ramp-up time, this reskilling should target workers from occupations with the shortest skill distance.

FIGURE 3

Estimated jobs created in the six most critical broadband occupations



Note: For illustrative purposes, the broadband case study assumes the 200,000 jobs would be created at once instead of being spread out over a number of years. For further details on the analysis and methodology used to obtain these estimates, see the Appendix.

The potential for the project to absorb currently unemployed workers and the extent to which reskilling would be required depends on how job creation is distributed over time. If all 200,000 job-years were created in the first year, 40 percent of those in the six most critical occupations would require reskilling. By comparison, a phased approach that created 50,000 jobs in the first year that would last four years may require no major reskilling, because all the jobs created could potentially be filled by currently unemployed and underemployed workers in the required occupations. Targeted reskilling would still be required given that the geographic distribution of the currently unemployed and underemployed may not match where the jobs are located, or concurrent investments created additional demand for these occupations. This type of scenario can help policymakers assess feasibility, timing, and the effects on displaced workers of infrastructure investments at a local level.

Conclusion

While our estimates are for illustrative purposes and subject to significant uncertainty, workforce analysis can be a useful tool for assessing the potential workforce implications of infrastructure investments. At the same time, job creation should not be the sole or primary goal of a federal infrastructure program, particularly since unemployment levels could be significantly lower by the time Congress and the Biden Administration agree on a bill. Instead, policymakers should prioritize projects that address large, urgent, and currently unmet national needs, and that are economically and politically viable—such as climate change mitigation, universal healthcare, and quality education, all of which pay for themselves in the long run and enjoy broad popular support.

That said, workforce impact is an important second-order concern that should enter into policymakers' cost-benefit and feasibility analyses. This does not simply mean maximizing total job creation; policymakers must also address the challenges and frictions faced by workers as they try to transition to jobs created by large-scale federal investments.

Policymakers must act swiftly if they want to take advantage of this watershed opportunity. If history is any guide, the window won't be open for long.

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Appendix A: Expanding broadband

This document presents a step-by-step analysis of the potential workforce needs and impact of a broadband expansion project. The analysis seeks to determine to what extent large-scale federal investment in broadband can create good jobs, address equity gaps, and reemploy workers who have been sidelined by the COVID-19 recession. Insofar as there are not enough idle workers in the required occupations to meet the estimated demand surge, we analyze job-to-job transition frequencies to determine whether idle workers in "adjacent" occupations (i.e., occupations from which workers historically transition at high frequency to the required occupations) could feasibly be hired. We also estimate whether and where targeted reskilling may be needed to fill remaining staffing gaps.

All estimates below are for illustrative purposes only. Estimates of this kind are inherently riddled with data lags, sampling biases, measurement errors, and uncertainty writ large. The analytical framework to obtain them is nonetheless useful to think through and compare the potential workforce implications of different investments.

Goal and assumptions

- **Goal:** Deploy high-speed broadband infrastructure nationwide[1]
- **Investment estimate:** $80 billion (cumulative)[2]
- **Job creation multiplier:** 2.5 direct job-years per $1 million[3]
- **Estimated direct jobs created:** 200,000 job-years[4]
- **Time dimension:** Federal investment in broadband (or any infrastructure project) would create employment over a given period. For the current exercise, this document abstracts away from the time dimension in modeling job creation and instead reports cumulative job creation, i.e., job-years. The entire budget is assumed to be spent, and all jobs are assumed to be created, in a single year. To obtain employment estimates in terms of jobs-per-year, all figures below (except for the unemployment and

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1 Accessible, Affordable Internet for All Act (HR 7302), https://www.majoritywhip.gov/?press=clyburn-rural-broadband-task-force-and-house-democrats-introduce-accessible-affordable-internet-for-all-act.
2 Ibid. An alternative to the Clyburn bill estimate is the CWA proposal, which calls for $350 billion: https://cwa-union.org/national-issues/secure-sustainable-jobs/broadband-buildout.
3 "Job Creation Estimates Through Proposed Economic Stimulus Measures" (Pollin and Chakraborty 2020, p. 5).
4 Obtained by multiplying the $80bn budget by the direct job creation multiplier for broadband expansion (2.5 jobs per $1 million) estimated in Pollin and Chakraborty (2020).

underemployment numbers, which do not scale past the current pool) can simply be divided by the number of years in question. This assumption has implications on the reskilling needs, which are likely to be higher the more compressed the timeline.

- **Geographical dimension:** Given data limitations, it is not possible to pinpoint where in the U.S. the unemployed/underemployed in a given occupation are located. Therefore, the occupational analysis in this document takes place at the national level and implicitly assumes that labor is perfectly mobile (i.e., workers can be relocated from and to anywhere in the country). This analysis could be replicated at a regional level using local unemployment numbers.
- **Other modeling assumptions:**
  1. Aside from labor, there are no supply constraints: it is just as feasible to produce 1,000 ft of optical-fiber cable as it is to produce 100,000,000 ft.
  2. There are fixed industrial structures: increasing production in a certain industry does not change its reliance on other industries as a proportion of total output.
  3. Relative prices (including wages) remain fixed.
  4. There are no economies of scale: the effect of output on employment within a given sector is roughly linear.
  5. Public investment in infrastructure does not crowd out private sector activity in the affected sectors.
  6. There is no natural rate of unemployment, churn or mismatch: all unemployed and underemployed workers in a given occupation can and would be employed if offered a job.

Occupational mix

First, we obtain the mix of industries involved in expanding broadband infrastructure from Pollin et al. (2020).[5] This entails mapping the likely cost structure of broadband expansion into industry shares of total output created by the spending activity. Next, we crosswalk the industry codes from IMPLAN to NAICS classification. The resulting industry mix is described in Table A1.

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5 Robert Pollin, Jeannette Wicks-Lim, Shouvik Chakraborty, and Gregor Semieniuk. "Impacts of the Reimagine Appalachia & Clean Energy Transition Programs for Ohio: Job Creation, Economic Recovery, and Long-Term Sustainability," PERI at University of Massachusetts Amherst, October 2020, p. 107.

TABLE A1

Broadband expansion industry mix

NAICS	Industry	Weight
515210	Cable and Other Subscription Programming	10%
237130	Power and Communication Line and Related Structures Construction	25%
517311	Wired Telecommunications Carriers	20%
517312	Wireless Telecommunications Carriers	20%
335921	Fiber Optic Cable Manufacturing	10%
335999	Miscellaneous Electrical Equipment and Component Manufacturing	15%

Finally, we obtain the occupational staffing patterns for each industry above from Emsi, weigh their employment shares by the industry weights above, and combine this information with the direct job creation total estimated to result from an increase in final demand in broadband expansion.

The full occupational mix consists of 130 occupations in which more than 100 jobs are estimated to be created, which comprise 97 percent of all employment in the broadband initiative. Table A2 lists estimated jobs created by major occupational group. Table A3 lists estimated job creation by occupation for the highest-volume occupations. Table A4 lists estimated job creation by occupation for the most critical occupations for broadband expansion.[6]

TABLE A2

Estimated jobs created by major occupational group, sorted by estimated employment

Occupational groups	% of jobs	# of jobs
Installation, Maintenance, and Repair	31.45	62,904
Office and Administrative Support	13.51	27,051
Computer and Mathematical	11.60	23,182
Construction and Extraction	11.13	22,252
Sales and Related	10.11	20,163
Business and Financial Operations	6.35	12,731
Management	5.38	10,747

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6 By "critical" and "specialized", we interchangeably mean those occupations that have the highest intensity of employment in broadband relative to the rest of the economy. These should be fairly representative of those occupations that are most specialized for and/or unique to broadband expansion. This list includes occupations with a relative intensity of employment equal or greater than 20 in which more than 500 jobs are estimated to be created.

Architecture and Engineering	3.33	6,643
Production	1.50	2,980
Transportation and Material Moving	1.16	2,325
Others	4.48	9,022

TABLE A3

Estimated jobs created by occupation, sorted by estimated employment

SOC	Occupation	% of jobs	# of jobs
49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	13.18	26,357
49-9052	Telecommunications Line Installers and Repairers	9.22	18,437
41-3091	Sales Representatives of Services, Except Advertising, Insurance, Financial Services and Travel	6.38	12,755
43-4051	Customer Service Representatives	6.28	12,567
47-2061	Construction Laborers	4.71	9,421
49-9051	Electrical Power-Line Installers and Repairers	4.14	8,282
15-1256	Software Developers and Software Quality Assurance Analysts and Testers	2.65	5,296
13-1198	Project Management Specialists and Business Operations Specialists, All Other	2.44	4,882
49-1011	First-Line Supervisors of Mechanics Installers and Repairers	2.44	4,872
17-2072	Electronics Engineers, Except Computer	2.19	4,374

TABLE A4

Estimated jobs created by occupation, sorted by how critical (i.e., specialized) they are to broadband expansion

SOC	Occupation	% of jobs	# of jobs
49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	13.18	26,357
49-9052	Telecommunications Line Installers and Repairers	9.22	18,437
49-2021	Radio, Cellular and Tower Equipment Installers and Repairers	0.81	1,626

49-9051	Electrical Power-Line Installers and Repairers	4.14	8,282
49-9098	Helpers--Installation Maintenance and Repair Workers	0.29	582
17-2072	Electronics Engineers, Except Computer	2.19	4,374

Demographics

Table 5 compares demographic indicators for workers in the 130 target occupations for broadband with all unemployed, underemployed, and employed workers across all occupations.[7]

TABLE A5

Demographic indicators

	Target occupations	All unemployed	All underemployed	All employed
Gender				
Male	74%	51%	50%	53%
Female	26%	49%	50%	47%
Race/ethnicity				
Non-Hispanic White	62%	48%	50%	63%
Hispanic	20%	23%	28%	17%
Black	10%	18%	12%	11%
Age				
16-24	9%	22%	19%	12%
25-54	70%	58%	60%	64%
55+	21%	20%	22%	24%
Educ. attainment				
Less than HS	5%	11%	13%	7%
High school only	29%	33%	33%	25%
Some college or AD	32%	29%	26%	27%
Bachelor's or more	34%	26%	28%	41%

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7 The data on unemployed and underemployed (defined as employed part-time for economic reasons) workers is an average of August-October 2020 estimates from CPS. This measure of labor underutilization is closest to U-6 but differs in that it does not include persons marginally attached to the labor force.

The typical worker employed in the target occupations is a prime-age, non-Hispanic white male without a college degree but with an associate or technical education. Compared to the typical unemployed and underemployed worker, they are much more likely to be white and male, and they are older and more educated.

Job quality

Table 6 compares several indicators of job quality for target occupations, broadband-critical target occupations, and all other occupations. Table A7 lists the weighted average of the most common (i.e., modal) level of education, training and experience required for target occupations and for broadband-critical target occupations.

TABLE A6

Job quality indicators

	Target occupations	Critical occupations	All occupations
Annual wage			
25th percentile	$47,068	$46,231	$27,080
Median	$62,858	$62,743	$39,810
Mean	$67,384	$64,282	$53,490
75th percentile	$82,595	$81,727	$64,240
Union coverage	16%	33%	12%
Full-time workers	92%	96%	82%
Certification/license required	11%	12%	20%
Mobility Index[8]	0.3	0.4	0
Projected growth 2019-29[9]	2.4%	-1.2%	3.7%

TABLE A7

Natural barriers to entry

	Target occupations	Critical occupations
Typical education required		
Less than HS	7%	0%
High school only	47%	46%

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8 The mobility index reflects the relative wage prospects of workers leaving an occupation. A higher mobility index means that workers move into higher-wage jobs when they switch occupations compared to workers at their wage level. The index is scaled from -5 to 5.
9 Bureau of Labor Statistics Employment Projections; https://www.bls.gov/emp/tables/emp-by-detailed-occupation.htm

Some college	21%	47%
Bachelor's or more	25%	7%
Typical training required		
No training	34%	7%
Apprenticeship	2%	0%
Short-term on-the-job training	18%	1%
Moderate on-the-job training	31%	47%
Long-term on-the-job training	15%	45%
Typical experience required		
None	85%	100%
Less than 5 years	8%	0%
More than 5 years	7%	0%

Workers in the target occupations for broadband are paid better, are more likely to work full-time and be covered by a union, and face lower barriers to entry than workers in other occupations. The same can be said for workers in the critical occupations for broadband, who are even more likely to be covered by a union and to work full-time. Both target and critical occupations are expected to grow more slowly than the broader labor market during the next decade, according to Bureau of Labor Statistics (BLS) forecasts. Critical occupations typically require significantly less prior work experience and educational credentials but more and longer on-the-job training than other target occupations.

Absorption potential

Identify currently unemployed and underemployed populations in the target occupations, and if applicable, estimate shortages

Table 8 lists the number of currently unemployed and underemployed workers—along with the number of estimated job-years (cumulative) created for the highest-volume target occupations (representing 54 percent of all jobs created), sorted by estimated jobs created. Table A9 lists the same but for the most critical occupations for broadband, sorted by relative intensity (as defined in footnote 7).

TABLE A8

Unemployed and underemployed workers in the highest-volume target occupations

Occupation	Currently unemployed[10]	Est. jobs created
Telecommunications Equipment Installers and Repairers, Except Line Installers	14,816	26,357
Telecommunications Line Installers and Repairers	4,070	18,437
Sales Representatives of Services, Except Advertising, Insurance, Financial Services and Travel	58,788	12,755
Customer Service Representatives	334,586	12,567
Construction Laborers	431,061	9,421
Electrical Power-Line Installers and Repairers	5,222	8,282
Software Developers and Software Quality Assurance Analysts and Testers	85,511	5,296
Project Management Specialists and Business Operations Specialists, All Other	12,064	4,882
First-Line Supervisors of Mechanics Installers and Repairers	5,694	4,872
Electronics Engineers, Except Computer	3,074	4,374

TABLE A9

Unemployed and underemployed workers in the most broadband-critical target occupations

Occupation	Currently unemployed[11]	Est. jobs created
Telecommunications Equipment Installers and Repairers, Except Line Installers	14,816	26,357
Telecommunications Line Installers and Repairers	4,070	18,437
Radio, Cellular and Tower Equipment Installers and Repairers	1,021	1,626
Electrical Power-Line Installers and Repairers	5,222	8,282
Helpers—Installation Maintenance and Repair Workers	362	582
Electronics Engineers, Except Computer	3,074	4,374

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10 Total unemployed and underemployed (defined as employed part-time for economic reasons), August-October 2020 average from CPS.
11 Ibid.

Note: Sorted by relative intensity as defined in footnote 6.

Based on this analysis, if the entire $80 billion budget were spent to create all 200,000 jobs at once, the majority of estimated jobs created—169,000 positions, or 85% of all jobs created—could be filled by currently unemployed and underemployed workers in the target occupations. Out of 130 target occupations, 119 have more currently unemployed and underemployed workers than there are estimated job-years created.

The remaining 11 target occupations—in which we estimate 64,000 jobs would be created—do not have enough currently unemployed and underemployed workers to meet the estimated demand surge. Most of these occupations happen to be the most critical to broadband expansion—which is consistent with industry expert assessments that assert that the labor market for broadband-related specialized occupations is currently tight. Of the 6 critical occupations for broadband expansion, which equal 60,000 jobs, there is a 52 percent shortage, or 31,000 workers. Table A10 lists estimated gaps between the number of estimated jobs created and the number of currently unemployed and underemployed workers for the most broadband-critical target occupations estimated to face shortages.

TABLE A10

Estimated shortages in broadband-critical target occupations

Occupation	Estimated shortage
Telecommunications Line Installers and Repairers	14,367
Telecommunications Equipment Installers and Repairers, Except Line Installers	11,541
Electrical Power-Line Installers and Repairers	3,060
Electronics Engineers, Except Computer	1,300
Radio, Cellular and Tower Equipment Installers and Repairers	605
Helpers—Installation Maintenance and Repair Workers	220

These numbers should be interpreted with caution, given that our model assumes all jobs are created at once. In reality, of course, these gaps would not all need to be addressed before work commences. If spending and job creation were spread out over several years, the estimated gaps may be less relevant or may disappear altogether. For example, if the $80 billion were spent evenly over the course of 4 years, approximately 50,000 jobs would be created each year. On the first year, 4,609 jobs would be created for Telecommunications Line Installers and Repairers, while 6,589 jobs would be created for Telecommunications Equipment Installers and Repairers (except Line Installers). Because there's currently 4,070 unemployed and underemployed workers in the former and 14,816 in the latter, there would still be a shortage (albeit a smaller one)

of Line Installers and Repairers, but not of Equipment Installers and Repairers. Given that it is not possible to project the number of unemployed and underemployed workers by occupation in the future, we could only estimate shortages in the first year of the project (assuming the first year is 2021).

If gaps exist, identify "transition" populations who could feasibly transition from other ("feeder") occupations

Data on historical job-to-job transitions can be matched with unemployment data to identify additional labor pools ("feeder occupations") for critical occupations with potential gaps. Flows of workers between occupations represent implicit skills overlaps (as well as overlaps in workers' preferences, job availability, barriers to entry, and other factors). Currently unemployed or underemployed workers from these feeder occupations could feasibly fill gaps in broadband-critical target occupations without additional reskilling. Table A11 lists the number (~7,000) of currently unemployed and underemployed workers in feeder occupations that could feasibly transition to the broadband-critical target occupations which may face staging shortages (assuming that all job years are created at once).

TABLE A11

Potential to fill staffing shortages with unemployed and underemployed workers from adjacent occupations

Critical occupation	Estimated shortage	Transitions[12]
Telecommunications Line Installers and Repairers	14,367	642
Telecommunications Equipment Installers and Repairers, Except Line Installers	11,541	1,828
Electrical Power-Line Installers and Repairers	3,060	2,702
Electronics Engineers, Except Computer	1,300	2,017
Radio, Cellular and Tower Equipment Installers and Repairers	605	126
Helpers—Installation Maintenance and Repair Workers	220	1,826

Note: Assuming that all job-years are created at once.

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12 Total number of unemployed and underemployed who could feasibly transition into target occupations (calculated as the sum of target populations in feeder occupations weighted by the transition frequencies into the destination target occupations). We only count transitions where either more than 5 percent of workers in the feeder occupation go to the target occupation, or a feeder occupation accounts for more than 5 percent of transitions to the target occupation.

The majority of the currently unemployed and underemployed workers who could feasibly transition to broadband-critical target occupations with estimated shortages come from the feeder occupations listed in Table A12.

TABLE A12

Feeder occupations of unemployed and underemployed workers that could transition to broadband occupations

Feeder occupation	Target populations[13]
Electricians	2,640
Engineers, All Other	1,674
Audiovisual Equipment Installers and Repairers	1,072
Mechanical Engineer	859
Sales Engineers	551
Aerospace Engineers	528
Construction Laborers	526

Because the data show that transitions between these feeder occupations and the broadband-critical target occupations occurred in the past, these workers could fill—partially or fully, depending on the occupation—the estimated shortages without any reskilling.

If transitioning workers from feeder occupations cannot fill potential gaps, identify and quantify reskilling needs by occupation

After accounting for the additional pool of idle labor that could transition into the target occupations with no reskilling, we are left with four broadband-critical target occupations for which significant staffing gaps may remain, listed in Table A13. If these gaps emerge and cannot be filled, additional workers from other, less "adjacent" occupations would need to be trained or reskilled (~24,000).

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13 Total number of unemployed and underemployed in feeder occupations weighted by the transition frequency of each feeder occupation into the destination target occupations.

TABLE A13

Estimated reskilling need for broadband-critical target occupations

Occupation	Estimated reskilling need
Telecommunications Line Installers and Repairers	13,725
Telecommunications Equipment Installers and Repairers, Except Line Installers	9,713
Electrical Power-Line Installers and Repairers	479
Radio, Cellular and Tower Equipment Installers and Repairers	358

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