



MEMORANDUM

To: Evergreen Collaborative
From: BW Research Partnership
Date: February 16, 2024
Re: RISE PA Workforce Assessment

INTRODUCTION

This memorandum summarizes the workforce planning assessment conducted by BW Research Partnership in support of the Pennsylvania Priority Climate Action Plan (PCAP). This memo:

- Forecasts workforce needs for Industrial Decarbonization activities within the region;
- Identifies key occupations and skills;
- Surfaces opportunities for residents of frontline communities;
- Discusses job quality and high road approaches and the role of labor unions;
- Highlights relevant organizations and initiatives that are complementary to, and already engaged in, work that supports the activities outlined in the RISE PA RFI.¹

The memo concludes with a discussion of the strengths, weaknesses, opportunities, and threats to the region’s workforce as it seeks to support RISE PA and related activities.

The activities outlined in the RISE PA RFI will create high quality jobs in a sector that is a core component of Pennsylvania’s broader economy. Meeting the demand for these jobs with a supply of qualified and trained workers from all areas within the state will require a commitment to partnership and learning from many different stakeholders and a willingness to invest in equitable workforce development activities over the long run.

¹ <https://www.pacodeandbulletin.gov/Display/pabull?file=/secure/pabulletin/data/vol53/53-52/1796.html>





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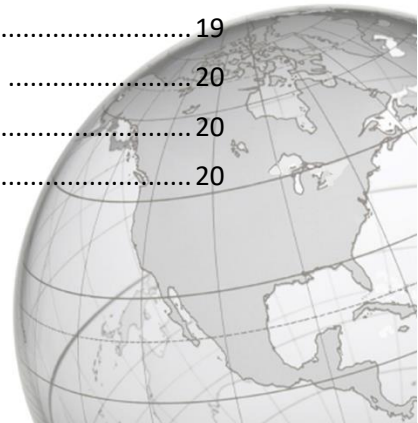
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FORECAST LABOR DEMAND AND SKILLS IN NEED

PRIORITY OCCUPATIONS

A review of literature²³⁴⁵⁶ and interviews with workforce stakeholders familiar with industrial decarbonization activities surfaced ten occupations that are crucial to the successful completion of the activities outlined in the RISE PA program. These ten occupations are not the only occupations that will be in-demand through these activities, but these occupations are likely to see some of the greatest increase in demand, and their specialized skills mean that a shortage of these workers would hinder the success the RISE PA program. For the remainder of this report, these ten occupations are referred to as the “priority occupations.”

The ten priority occupations primarily focus on installation and construction activities. Our employment forecast suggests that construction and installation activities will account for a majority of the jobs created through RISE PA through 2030. In addition to construction, a notable number of jobs in professional services and manufacturing could be created. This is discussed further in the section titled “Projected Demand” on page 7. The ten priority occupations with the descriptions of their primary roles are listed below.

- **Electricians** install, maintain, and repair electrical wiring, equipment, and fixtures.
- **Heating, Air Conditioning, and Refrigeration (HVAC/R) Mechanics and Installers** install or repair heating, central air conditioning, HVAC, or refrigeration systems, including oil burners, hot-air furnaces, and heating stoves.
- **Pipelayers, Plumbers, Pipefitters, and Steamfitters** assemble, install, alter, and repair pipelines or pipe systems that carry water, steam, air, or other liquids or gases.
- **Construction Laborers** perform tasks involving physical labor at construction sites.

² “A Roadmap for Industrial Decarbonization in Pennsylvania.” Report produced by Strategen for the Ohio River Valley Institute. December 2023.

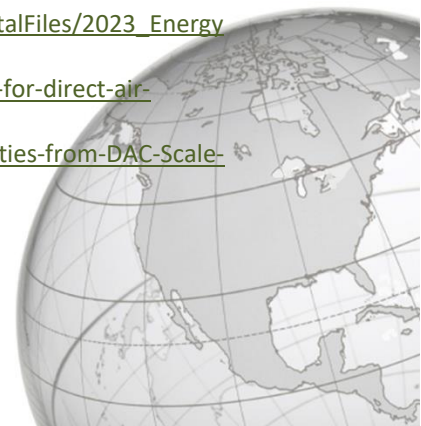
³

https://files.dep.state.pa.us/Energy/Office%20of%20Energy%20and%20Technology/OETDPortalFiles/2023_Energy_Report/PA%20EE%20Workforce%20Needs%20Report%20Final.pdf

⁴ <https://carbon180.medium.com/creating-jobs-and-meeting-climate-goals-the-evolving-case-for-direct-air-capture-428a853223d3>

⁵ <https://rhg.com/wp-content/uploads/2020/06/Capturing-New-Jobs-Employment-Opportunities-from-DAC-Scale-Up.pdf>

⁶ <https://www.bls.gov/green/biofuels/biofuels.htm#construction>





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- **Carpenters** construct, erect, install, or repair structures and fixtures made of wood and comparable materials, such as concrete forms; building frameworks, including partitions, joists, studding, and rafters; and wood stairways, window and door frames, and hardwood floors.
- **Boilermakers** construct, assemble, maintain, and repair stationary steam boilers and boiler house auxiliaries.
- **Construction Equipment Operators** operate one or several types of power construction equipment, such as motor graders, bulldozers, scrapers, compressors, pumps, derricks, shovels, tractors, or front-end loaders to excavate, move, and grade earth, erect structures, or pour concrete or other hard surface pavement.
- **Insulation Workers** apply insulating materials to pipes or ductwork, or other mechanical systems in order to help control and maintain temperature.
- **Industrial Machinery Installation, Repair, and Maintenance Workers** Repair, install, adjust, or maintain industrial production and processing machinery or refinery and pipeline distribution systems.
- **Welding, Soldering, and Brazing Workers** use hand-welding, flame-cutting, hand-soldering, or brazing equipment to weld or join metal components or to fill holes, indentations, or seams of fabricated metal products.

Based on the typical attributes of these jobs including wages, benefits, training needed, unionization rates, and access to training pathways, the increase in demand for these occupations provides a significant opportunity to create and maintain good jobs throughout Pennsylvania as the industrial sector decarbonizes. By focusing workforce development investments and programs in support of these occupations, Pennsylvania and its residents can maximize the funding resources available and streamline engagement with critical stakeholders.





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PRIORITY OCCUPATIONS

More than 210,000 workers are employed within the ten priority occupations in Pennsylvania. Construction Laborers (51,300 jobs) and Carpenters (35,500) make up the largest share of priority occupation workers, while Insulation Workers and Boilermakers account for fewer than 1,500 jobs each across the state. Six of the ten priority occupations have location quotients—or concentration of those jobs—lower than the national average (Table 1). That means that although these occupations are crucial to supporting the RISE PA program, many of them are found in lower concentrations in Pennsylvania than the broader United States, which could worsen shortages as the demand for these workers increases.

The hourly wages of these priority occupations are attractive for many job seekers. All ten occupations offer median hourly wages that are greater than the statewide median across all jobs. Importantly, even the 25th (lowest) percentile of workers earn hourly wages that exceed the living wage⁷ for a single adult living in Pennsylvania. The median hourly wages for eight out of ten priority occupations also offer family sustaining wages for families of four with two working adults (Table 1).⁸ It should also be noted that union wages tend to be higher, and Table 1 contains combined wages for union and non-union workers. These data demonstrate that—if approved projects meet the job quality criteria outlined in the RISE PA RFI—many of the jobs created through RISE PA will offer Pennsylvanian’s jobs with high earning opportunities and upward earning potential.

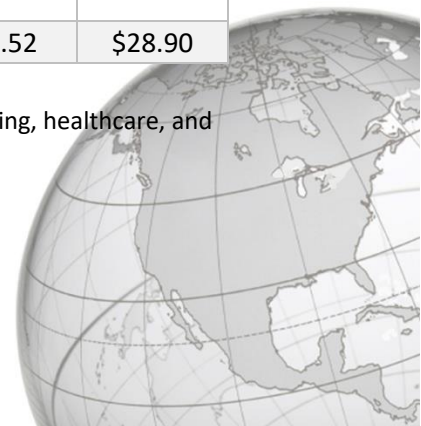
Table 1. Priority Occupations for RISE PA⁹

| | Total Employment | Location Quotient | 25th Percentile Hourly Wage | Median Hourly Wage | 75th Percentile Hourly Wage |
|------------------------------------------------------------------------------|-------------------------|--------------------------|-----------------------------------------------|---------------------------|-----------------------------------------------|
| Carpenters | 35,502 | 0.97 | \$22.10 | \$26.37 | \$33.14 |
| Heating, Air Conditioning, and Refrigeration Mechanics and Installers | 17,657 | 1.09 | \$22.90 | \$27.38 | \$33.82 |
| Electricians | 24,300 | 0.81 | \$25.37 | \$33.18 | \$45.25 |
| Plumbers, Pipefitters, and Steamfitters | 18,057 | 0.88 | \$24.24 | \$31.88 | \$43.16 |
| Construction Laborers | 51,305 | 0.92 | \$19.57 | \$23.52 | \$28.90 |

⁷ Living wages—unlike the federal poverty line—include regionally-specific costs, such as housing, healthcare, and transportation, and therefore provide a more local perspective of economic well-being.

⁸ MIT Living Wage Calculator. <https://livingwage.mit.edu/states/42>

⁹ JobsEQ. Q42023 Data.





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|---------------------------------------------------------------------------|--------|------|---------|---------|---------|
| Boilermakers | 210 | 0.37 | \$32.02 | \$40.65 | \$47.33 |
| Construction Equipment Operators | 22,804 | 1.20 | \$22.94 | \$27.94 | \$35.25 |
| Insulation Workers | 1,320 | 0.56 | \$23.20 | \$31.81 | \$39.50 |
| Industrial Machinery Installation, Repair, and Maintenance Workers | 20,818 | 1.04 | \$24.59 | \$29.61 | \$33.96 |
| Welding, Soldering, and Brazing Workers | 18,854 | 1.03 | \$21.31 | \$24.32 | \$28.28 |
| All Occupations Statewide | | | \$16.47 | \$22.99 | \$34.98 |

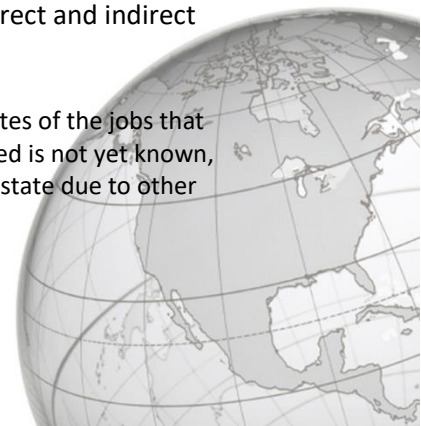
PROJECTED DEMAND AND GAP ANALYSIS

Understanding the scale of the impacts of the RISE PA grants is important to right size workforce development planning. To estimate these impacts, BW Research utilized modeled data from The Nature Conservancy’s *Potential Reconciliation Climate Policies: An Economic Impact Analysis Report, Pennsylvania*.¹⁰ The research team customized these findings to incorporate only funding streams relevant to the RISE PA grant opportunity, and then proportioned the funding amount to match the proposed \$450 million RISE PA fund, effectively serving as a proxy for generic RISE PA funding, even though the exact types of projects funded remains unknown.

The workforce projections were developed by combining BLS occupation-level demographic forecasts and the predicted additional jobs created through industrial decarbonization-relevant Inflation Reduction Act (IRA) policies, as modeled in the Nature Conservancy report. For a full methodology on how this model was tailored to better capture activities specific to RISE PA, please see Appendix A on page 23.

According to this study, RISE PA spending could directly and indirectly create and support nearly 1,200 jobs throughout the state for five years between 2025 and 2030. The greatest share of these jobs is within the Construction sector, which could create and sustain about 670 jobs for five years (Table 2). A smaller number of Manufacturing jobs could also be sustained (although, if Pennsylvania captures a greater share of the national market share for relevant technologies and products, the number of supported manufacturing jobs could increase significantly). These estimates are for direct and indirect

¹⁰ BW Research leveraged previously conducted economic impact analyses to generate estimates of the jobs that could be created through related federal IRA funds. Because the exact profile of projects funded is not yet known, this projection merely offers insight into the scale of jobs that may be created throughout the state due to other federally stimulative activities that are similar to those eligible under the RISE PA RFI.





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jobs only.¹¹ Factoring in induced employment—which is the impact on the overall economy through workers spending their additional incomes on goods and services—would make these estimates higher.

It should also be noted that Table 2 and Table 3 showcases total workers working over a five year span to match the proposed implementation timeline. If all of this activity from RISE PA were to occur simultaneously over the course of a single year, job estimates would be five as large as those highlighted below.

Table 2. Annual Jobs Created and Sustained From Inflation Reduction Act-Generated Employment in PA Via Grants and Loans Similar to the RISE PA RFI (2025-2030)

| | Inflation Reduction Act-Generated Employment in PA Via Grants and Loans Similar to the RISE PA RFI |
|------------------------------|-----------------------------------------------------------------------------------------------------------|
| Construction | 565 |
| Professional Services | 260 |
| Manufacturing | 130 |
| Other Supply Chain | 230 |
| Total | 1,185 |

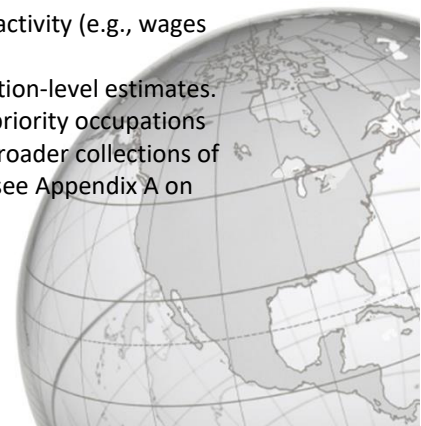
Extrapolating from the employment created in the Construction sector, the research team developed occupation-level estimates for the ten priority occupations.¹² This exercise reveals that while occupation-level job creation may not occur at a significant scale, the additional jobs created and sustained can help stem some of the jobs losses that a few priority occupations have observed over the six preceding years (2017-2023), including Boilermakers (-22%), Carpenters (-6%), and Operating Engineers and Other Construction Equipment Operators (-1%) (Table 3).

¹¹ **Direct** employment associated with the initial economic activity of a given investment or activity (e.g., changes in wages, production, or jobs).

Indirect employment associated with the supply chain connected to the initial economic activity of the original investment or activity (e.g., purchases of goods and services or business tax impacts).

Induced employment based on the additional household spending resulting from the additional direct and indirect employment that is generated from the initial economic activity of the original investment or activity (e.g., wages paid, household purchases, or household tax impacts).

¹² The research team used a collection of industry-specific staffing patterns to develop occupation-level estimates. This methodology is a conservative estimate of occupation-level employment growth for the priority occupations because RISE PA-specific activities will have a higher prevalence of priority occupations than broader collections of industries that conduct work outside of RISE-PA-type activities. For more information, please see Appendix A on page 13.





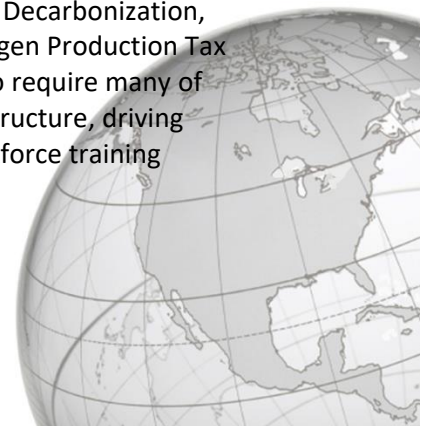
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Table 3. Annual Jobs for Priority Occupations Created and Sustained From Inflation Reduction Act-Generated Employment in PA Via Grants and Loans Similar to the RISE PA RFI (2025-2030)

| | Total Employment 2023Q3 | Historical Employment Growth (2017-2023) | Additional Workers Sustained (2025 Through 2030) | Growth Rate From 2023 |
|------------------------------------------------------------------------------|--------------------------------|-------------------------------------------------|---------------------------------------------------------|------------------------------|
| Construction Laborers | 51,305 | 6.9% | 96 | 0.2% |
| Carpenters | 35,502 | -6.1% | 78 | 0.2% |
| Electricians | 24,300 | 4.9% | 50 | 0.2% |
| Plumbers, Pipefitters, and Steamfitters | 18,057 | 0.5% | 36 | 0.2% |
| Heating, Air Conditioning, and Refrigeration Mechanics and Installers | 17,657 | 19.7% | 35 | 0.2% |
| Operating Engineers and Other Construction Equipment Operators | 22,804 | -0.8% | 21 | 0.1% |
| Welders, Cutters, Solderers, and Brazers | 18,854 | 3.9% | 4 | 0.0% |
| Insulation Workers, Mechanical | 1,320 | 1.5% | 2 | 0.2% |
| Industrial Machinery Mechanics | 20,818 | 13.2% | 1 | 0.0% |
| Boilermakers | 210 | -21.9% | < 1 | 0.0% |

One additional consideration is that the RISE PA program will not occur in a vacuum. As the nation’s housing crisis continues, the need to build more housing will continue to increase. Many priority occupations and Construction roles that will support the RISE PA program are also key occupations within the new housing construction industry.

Furthermore, other infrastructure projects and initiatives—ranging from climate resiliency projects to clean energy generation and transmission projects—are already underway or will be during the time of implementation of the RISE PA program. The Inflation Reduction Act and the Infrastructure Investment and Jobs Act combined offer \$57 billion in funding for programs relevant to Industrial Decarbonization, as well as an uncapped pool of funds for related tax credits including the Clean Hydrogen Production Tax Credit and the Credit for Carbon Oxide Sequestration. These types of projects will also require many of the same occupations as RISE PA programs, housing construction, and broader infrastructure, driving additional demand for existing workers and placing additional strain on relevant workforce training systems.





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The additional workforce demands from activities outside of the RISE PA program for the same priority occupations will place additional strain on the talent pipelines and support systems highlighted throughout this memo. This will require increased coordination and planning across industries and the workforce ecosystem, especially including employers and worker organizations such as unions. It also underlines the importance of moving quickly on the funding and other programmatic recommendations highlighted in this memo.

CONSIDERATIONS FOR MEETING DEMAND

HIRING DIFFICULTY

With unemployment near all-time lows, stories of hiring difficulty across industries have become more commonplace. In fact, the 2023 US Energy and Employment Report found that 59% of non-union construction firms in clean energy reported it was very difficult to find new workers, while only 31% of union signatory or PLA firms reported the same level of difficulty.¹³ The energy sector in Pennsylvania is no different; two-thirds of non-labor signatory firms reported it was ‘very difficult’ to find workers compared to 28% of labor signatory firms. In fact, 44% of labor signatories reported no challenges finding talent at all (Table 4).

Table 4. Hiring Difficulty for Labor Signatory and Non-Labor Signatory Construction Firms in Energy¹⁴

| | Very difficult | Somewhat difficult | Not at all difficult |
|-------------------------------------|----------------|--------------------|----------------------|
| Union Signatory or PLA Firms | 28.1% | 28.1% | 43.8% |
| Non-Signatory Firms | 65.8% | 32.8% | 1.4% |

KEY SKILLS

The ten priority occupations overwhelmingly do not require workers with a four year degree. In fact, between 85% and 95% of workers in each of the priority occupations do not have a four year degree, compared to 58% of all workers throughout the Pennsylvania economy (Figure 1). This data makes it clear that these occupations do not have extensive educational requirements or barriers.

¹³ <https://www.energy.gov/sites/default/files/2023-06/2023%20USEER%20REPORT-v2.pdf>

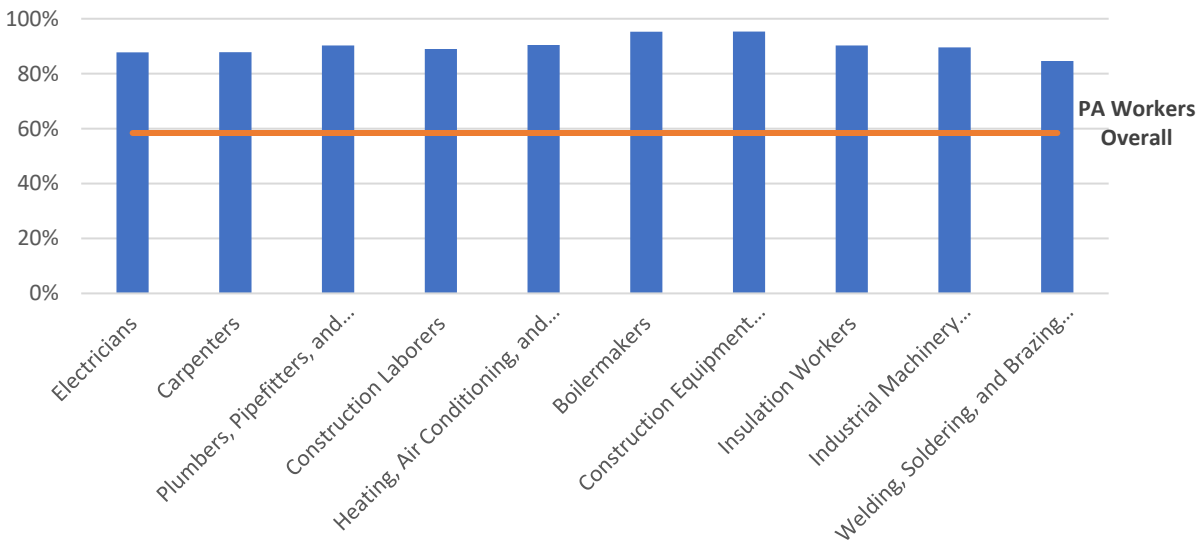
¹⁴ USEER Extrapolations





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Figure 1. Share of Workers With Less Than Four-Year Education By Occupation



The priority occupations also have many shared top knowledge attributes, skills, and abilities. For example, nine out of ten priority occupations require ‘Mechanical’ knowledge, and eight out of ten priority occupations have ‘Critical Thinking’ as a top skill. The similarities in knowledge attributes, skills, and abilities means that pre-apprenticeship and other career entry programs can support many of these occupations simultaneously without the need to specialize curriculum.

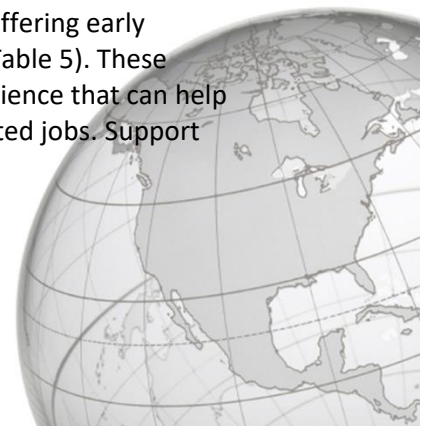
Table 5. Top Three Knowledge, Skills, and Abilities Across All Priority Measure Occupations¹⁵

| Knowledge | Skills | Abilities |
|---------------------------|-----------------------|---------------------|
| Mechanical | Critical Thinking | Problem Sensitivity |
| Building and Construction | Operations Monitoring | Near Vision |
| Mathematics | Troubleshooting | Manual Dexterity |

Common Entrance Ramps for Priority Occupations

Pre-apprenticeships and vocational and technical schools can benefit job seekers by offering early experience and teaching foundation skills, including key areas like those outlined in (Table 5). These programs offer fundamental skills and experience that provide job seekers with experience that can help them take the next step in specializing in any of the priority occupations or other related jobs. Support

¹⁵ Top KSAs identified through O*NET





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services for these types of pre-apprenticeship and early-stage training programs are crucial. For example, if a training center is only accessible by car, even the most motivated job seeker won't be able to regularly attend the trainings if consistent transportation is a challenge for them.

Formal apprenticeship programs are important for several reasons. First, these programs offer “learn and earn” environments that can be more financially feasible for job seekers, particularly those from disadvantaged backgrounds. Second, the absence of a state licensing board for most of the priority occupations means that job seekers may struggle to identify a clear pathway to becoming a professionally trained trades worker, and informal job shadowing or short-term training programs may cost hundreds of dollars and leave job seekers with inadequate skills. Union apprenticeships are offered for each of the ten occupations identified.

The most common pathways to entry in these priority occupations are summarized below, and highlight the breadth of entry points, the importance of experienced workers in training new workers, and the time required to complete training.

Electricians: A typical first step for job seekers include instruction at community colleges, adult schools, and/or apprenticeships through union JATCs (Joint Apprentice and Training Committee) or apprenticeships organized through the Associated Builders and Contractors. For licensure at the local level, most jurisdictions will accept a formal apprenticeship training program (typically four years), two years of trade school and two years of relevant work experience, or ten years of work supervised by a licensed Electrician.

Heating, Air Conditioning, and Refrigeration (HVAC/R) Mechanics and Installers: Common pathways into HVAC/R Mechanic and Installer roles typically entail enrollment in an apprenticeship or secondary educational program which takes 2-4 years to complete. Since there is no statewide license, specific certifications may be required for specific cities or counties, the exception is that an EPA Section 608 Certification is typically required for any handling of refrigerants.

Plumbers: The pathway to becoming a plumber in Pennsylvania is similar to that of an HVAC/R Mechanic or Installer. An apprenticeship or secondary education is a common entry point, but no formal license is required. Similarly, some localities require some form of licensure.

Carpenters: The pathway for carpenters is similar to that of HVAC/R Mechanics and Installers and Plumbers. There is no formal statewide licensure, but apprenticeship or secondary education is common.

Construction Laborers: Of the priority occupations, Construction Laborers have the least formal requirements or pathways. Job seekers are often hired based on prior job site experience, so vocational or technical schools, pre-apprenticeships, apprenticeships, and potentially even some secondary education can be useful in helping candidates distinguish themselves in the hiring process.





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Boilermakers: Nearly all Boilermakers in Pennsylvania are union members, meaning that a union apprenticeship through a JATC is the primary way to become a Boilermaker in the Commonwealth.

Construction Equipment Operators: Heavy equipment operators must have some formal training before operating machinery on a job site. There are several training options for job seekers, including training through a private training program, vocational school, or an apprenticeship. Some heavy equipment may require specific certifications (such as cranes), but a commercial driver’s license is useful for most equipment.

Insulation Workers: These roles have similar training pathways to Construction Laborers. While securing an entry-level job may not have many formal training requirements, trainings that allow for specialization and knowledge can help workers differentiate themselves and advance in their careers. A union apprenticeship program is a great way to train as a commercial Insulation Worker. Most private training programs are oriented towards residential insulation.

Industrial Machinery Installation, Repair, and Maintenance Workers: A job seeker will likely pursue formal education before shadowing an experienced professional. An industrial service technician certificate through a private training program or a community college, followed by a year of shadowing is a typical pathway. Job seekers may also seek out an apprenticeship through the Machinists union.

Welding, Soldering, and Brazing Workers: Learning formal welding and safety practices is important, and there are a number of community colleges, adult schools, and private training programs. A union apprenticeship through the Plumbers and Pipefitters union may also provide relevant skills and direct pathways into relevant careers.

ECONOMIC OPPORTUNITY FOR LOW DISADVANTAGED COMMUNITIES

Nearly 3.1 million people live within disadvantaged communities¹⁶ in Pennsylvania, accounting for a quarter (24%) of the population. Residents within these communities have far fewer economic opportunities than their non-disadvantaged neighbors; the unemployment rate is nearly twice as high, the labor force participation rate is 5 percentage-points lower, and household income is nearly half as high (Table 6). The severity in discrepancy highlights the historic lack of investment and opportunity flowing into these communities and reflects both a need and an opportunity for these communities. Greater effort and resources are needed to attract and access the greater share of potential job seekers that live within disadvantaged communities. Offering wraparound support services to job seekers can increase retention and completion rates of training programs and help individuals segway into their new careers.

¹⁶ Climate and Economic Justice Screening Tool. <https://screeningtool.geoplatform.gov/en/#3/33.47/-97.5>





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Table 6. Economic Opportunity for Disadvantaged Communities in Pennsylvania

| | Unemployment Rate | Labor Force Participation Rate | Household Income |
|--------------------------------------|--------------------------|---------------------------------------|-------------------------|
| Non-Disadvantaged Communities | 4.4% | 64.2% | \$108,245 |
| Disadvantaged Communities | 9.0% | 59.4% | \$58,200 |

Connecting Displaced Workers to Opportunity

Pennsylvania’s industrial sector has broadly been struggling for the past several decades. The sizable employment losses in the Coal Mining industry have been dwarfed by the employment losses in Manufacturing. Between 2001 and 2022, Manufacturing employment in Pennsylvania declined by 31%, amounting to a loss of 262,700 workers or 4.2% of the state’s 6.3 million jobs.¹⁷ Federal and state funding can help bring some of that employment back as local content provisions incentivize developers to use products developed domestically.

Decarbonizing industry can also make domestic industry more attractive. Technology like Electric Arc Furnaces are already becoming more popular within the steel manufacturing industry,¹⁸ as the technology is considered to be more efficient, less expensive, and produces less carbon dioxide.¹⁹ Reviving these industries with cutting-edge and cleaner technologies can help Pennsylvania’s manufacturers regain their footing and provide accessible high quality jobs to residents.

The RISE PA RFI outlines several opportunities to bring investment to these communities. First, Low-Income, Disadvantaged, and Energy Communities are one of seven evaluation criteria for deciding which projects get funded. Community Benefits, Community Engagement, and Energy Community Transition are the three means through which proposals are evaluated. The deployment of these practices can help ensure a community’s voice is heard, offer economic opportunity to residents of these communities, and begin to address some of the challenges that these communities face.

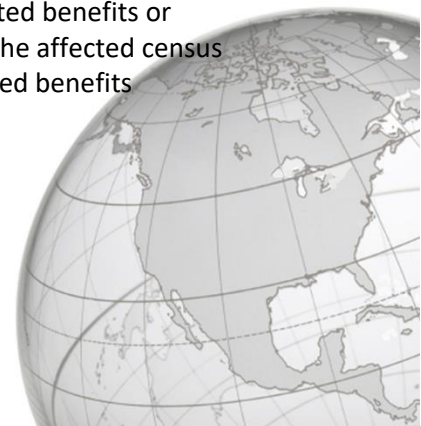
Community Benefits

This component requires proposers to provide a comprehensive assessment of expected benefits or harms to low-income and disadvantaged communities and requires proposers to list the affected census block groups. Proposers are also evaluated on their plan to assess and report associated benefits

¹⁷ JobsEQ. 2023Q4

¹⁸ <https://e360.yale.edu/digest/steel-industry-carbon-coal-electric-arc-furnaces>

¹⁹ <https://www.servicesteel.org/resources/electric-arc-furnace-vs-blast-furnace>





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(including emissions reductions and co-pollutants) and the extent to which a project will provide economic opportunity to the local community. These proposal requirements will help ensure that developers are considering community impacts from their projects and will incentivize thoughtful action to mitigate any harm and increase benefits.

Community Engagement

This component asks proposers to explain how low-income and disadvantaged communities were incorporated into the application and describe how meaningful engagement was conducted and will continue to be conducted if the project goes forward. This engagement section also requires proposers to include thoughtful consideration of the community regarding timelines and opportunities for an adequate—and ideally local—workforce. These provisions can help foster interest and conversations in these communities around industrial decarbonization careers.

Energy Community Transition

This final component of the Low-Income, Disadvantaged and Energy Communities evaluation criteria for the RISE PA RFI asks proposers to consider “specific and high-quality” actions to include transition opportunities for workers in the coal and other energy sectors. Proposers are also graded on their utilization of resources the currently or previously used to support the coal industry. These provisions are crucial to support coal workers that have been displaced in Pennsylvania. In 1990 there were roughly 16,000 workers involved in coal mining in Pennsylvania. In December 2023 that number was down to 4,200—a 74% decline²⁰ over 32 years, and climate goals and macroeconomic factors are unlikely to lead to a full revival of coal. This information underscores the importance of projects that can support high road employment for those who have experienced this loss of employment, and the RFI incentivizes bidders to consider this opportunity.

JOB QUALITY & HIGH-ROAD OPPORTUNITIES

DEFINING HIGH QUALITY JOBS

The RISE PA program has the opportunity to create “high quality jobs”²¹ that will bring benefits to the businesses, workers, and to the communities involved in the program, but defining “high quality jobs”

²⁰ <https://fred.stlouisfed.org/series/SMU42000001021210001>

²¹ The terms ‘high-quality’ jobs, ‘high road’ jobs and ‘good’ jobs tend to be used interchangeably by academics, advocates and workforce professionals. For example the Department of Labor uses all three in its brief “Good Jobs in Federal Investments: a Toolkit for Employers, Workers and Government.” Distinctions and differences in





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and “good jobs” is important. The criteria considered in determining job quality varies considerably. Job quality definitions increasingly integrate more holistic criteria that capture the totality of the working experience and worker well-being. For example, the Department of Labor defines “good jobs” through a set of principles²² that include (descriptions of each principle modified from original):

- 1) **Recruitment and Hiring** – applicants are recruited from all communities, and evaluated free of discrimination, based on skill-based requirements
- 2) **Benefits** – workers are provided and encouraged to use family-sustaining benefits such as health insurance, a retirement plan, and work-family benefits
- 3) **Diversity, Equity, Inclusion, and Accessibility** – all workers have equal opportunity in a workplace that centers DEIA.
- 4) **Empowerment and Representation** - workers can form and join unions and have agency in the performance and direction of their work.
- 5) **Job Security and Working Conditions** – workers operate in a safe workplace, with job security and predictability, and proper classification of their status.
- 6) **Organizational Culture** – workers are valued and engage in respected work
- 7) **Pay** – workers are fairly paid a living wage that increases with increased skills and experience
- 8) **Skills and Career Advancement** – workers have equitable opportunities to advance and access to training and education

EXPANDING ACCESS TO HIGH ROAD JOBS

As the Aspen Institute highlights in a recent report: “jobs don’t fall on a “good jobs/bad jobs” binary; rather, they fall somewhere along a continuum.”²³ Depending upon labor standards, procurement approaches, use of project labor and community workforce agreements, apprenticeship, and wage requirements—among other elements—any job within these ten priority occupations has the chance to be a high quality/high-road job as defined by the DOL Good Jobs Principles.

RISE PA RFI and High Road Jobs

The RISE PA RFI incorporates a range of workforce and job quality evaluation criteria that incentivizes proposals to pursue the high road. The RFI includes specific requirements to:

definition revolve around what to consider in defining a job as “good/high-quality/high-road” beyond economic factors, such as broader worker well-being, social good, justice, environmental sustainability, and unionization opportunities.

²² <https://www.dol.gov/general/good-jobs/principles#:~:text=Diversity%2C%20Equity%2C%20Inclusion%2C%20and,systemic%20barriers%20in%20the%20workplace.>

²³ “Lessons and Takeaways from Supporting Small Businesses To Improve Job Quality: Seven Tips for Workforce Organizations”, The Aspen Institute, April 2022





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- Develop commitments to job quality and labor standards for a diverse workforce
- Create and retain high-quality and good-paying jobs with employer-sponsored benefits
- Engagement with the local community to support a local and diverse workforce
- Allow employees to organize and bargain collectively
- Plan to minimize risk of labor disputes or disruptions, which is language that encourages the adoption of Project Labor Agreements.

The RFI also contains specific language that requires some types of project applicants to meet prevailing wage requirements for any construction, alteration, or repair of projects. Apprenticeship requirements ranging from 10% - 15% of total labor hours are also included, which ensures that job seekers and new entrants have ample opportunity to learn on the job under the supervision of trained professionals.

When viewed in aggregate, these job quality and workforce stipulations will show overwhelming preference for high road employment opportunities, and organized labor unions will be in particularly advantageous position to complete these projects.

The Role of Unions and High Quality Jobs

In 2023 Pennsylvania had the 11th highest unionization rate in the country, with 14.2% of the workforce represented by a labor union. An economy founded in manufacturing, mining, and construction has helped cement union's crucial role in supporting Pennsylvania's high quality jobs. The RISE PA program has the opportunity to bolster labor's role in Pennsylvania's climate change economy, ensuring that meeting climate change goals and expanding high road employment opportunities are two aligned and complimentary outcomes.

The fossil fuel economy has historically provided thousands of high road jobs in Pennsylvania. Up until recently, the two goals of high road employment and addressing climate change were often thought to be at tension, and the framing was that one side needed to cede to the other. But that landscape has changed. Some types of fossil fuels have lost favor; Coal Mining employment in Pennsylvania declined by 50% between 2001 and 2022²⁴ due to stricter environmental standards and competition in international energy markets, and employment gains in Natural Gas have not been large enough to offset these job losses. Simultaneously, federal and state policy have helped shift the conversation, and have incentivized climate-oriented developers to pursue the high road. Industrial decarbonization in particular offers a strong path forward for both high road employment and climate goals. Heavy industry is a heavily unionized sector that requires well-trained and skilled workers to complete complex jobs safely, and decarbonizing industry will require many such workers.

²⁴ JobsEQ 2023Q4





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Labor Needs to Be Part of the Solution

Building new projects is a process that often takes years. Permitting and land surveying, environmental reviews, financing, and other project planning can extend project development timelines and ultimately jeopardize projects themselves. Developers increasingly have to also worry about workforce. In December 2023, the unemployment rate in Pennsylvania was 3.5%--the lowest it has been since at least 1976—which means that virtually all those that are looking for a job are able to find a job.²⁵²⁶ Such a labor market means that competition for workers may be at a lifetime high. This also means that high road employers have a significant edge in attracting talent. However, hiring challenges remain (Table 4), which may be in part due to a communication problem between job seekers and employers. Programs that support employers—particularly those that may lack the resources to extensively pursue or recruit talent—connect with job seekers could help mitigate some of these challenges.

Unions are perhaps uniquely positioned to help resolve workforce challenge. Labor unions already have robust recruitment and training systems already in place, and while those systems are facing the same challenges of the broader training ecosystem, their paid training, higher wages and benefits, and guarantee to meet a project’s workforce demands mean they may have an easier time attracting, training, and getting talent of all backgrounds into the field.

KEY PARTNERS AND OTHER INITIATIVES TO COORDINATE WITH

Pennsylvania’s workforce is used to adapting to tectonic shifts. From the decline of coal and manufacturing to the shale oil boom and a nation-leading robotics cluster, Pennsylvania and its workers have always been able to adapt to macroeconomic and technological shifts. One such reason is the close cooperation of organized labor, community colleges, pre-apprenticeship and vocational schools, industry, and government to ensure the workforce is prepared for these shifts. The TEAM Consortium, which supports workforce and economic development related to natural gas and the Pittsburgh Robotics Network are two great examples of a range of industry stakeholders working together to quickly develop a robust industry-specific workforce. Below are a few organizations that may be or already are engaged in developing a skilled industrial decarbonization workforce.

EDUCATION AND TRAINING

- **Pittsburgh Works Together**
- **United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry**
- **International Brotherhood of Electrical Workers**

²⁵ <https://fred.stlouisfed.org/series/paur>

²⁶ <https://fred.stlouisfed.org/series/NROU>





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- **International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers and Helpers**
- **Laborers' International Union of North America**
- **International Union of Operating Engineers**
- **International Association of Heat and Frost Insulators and Allied Workers**
- **International Union of Painters and Allied Trades**
- **United Steelworkers**
- **International Union of Electrical Workers**
- **International Association of Machinists and Aerospace Workers**
- **United Autoworkers**
- **BlueGreen Alliance**
- **Pennsylvania Career Link**
- **Penn State**
- **Carnegie Mellon University**
- **Pennsylvania Commission for Community Colleges**
- **Pennsylvania Department of Education Career and Technical Education**
- **Pennsylvania Department of Labor and Industry**
- **Pennsylvania Department of Community and Economic Development**

ORGANIZATIONS INVOLVED WITH INDUSTRIAL DECARBONIZATION

- **Ohio River Valley Alliance**
- **Industrial Energy Consumers of PA**
- **PA Chambers of Commerce**
- **PA American Sustainability Business Network**
- **Team PA²⁷**
- **Keystone Research Center**
- **PennFuture**
- **CONNECT**
- **ReImagine Appalachia**
- **Catalyst Connection**

PILOT PROJECTS

- **Mid-Atlantic Clean Hydrogen Hub (MACH2)**

²⁷ <https://teampa.com/2022/07/team-pennsylvania-foundation-announces-cross-sector-collaborative-to-reduce-carbon-emissions-and-accelerate-economic-growth/>





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- **Appalachian Hydrogen Hub (ARCH2)**
- **Pennsylvania Department of Conservation & Natural Resources Geological Survey**
- **CONSOL Energy’s Advanced PFBC Power Plant Project**

STRENGTHS, WEAKNESSES, OPPORTUNITIES, AND THREATS FOR PENNSYLVANIA’S RISE WORKFORCE

STRENGTHS

- **A well-trained workforce is readily deployable to industrial decarbonization activities.** The scale of additional jobs from RISE PA mean that new workforce systems directly related to the program are unlikely to be needed, but instead workforce efforts should focus on supporting and reinforcing existing workers and training systems, and increasing accessibility for job seekers to enter relevant occupations.
- **There is a strong history and presence of organized labor in Pennsylvania and within Industry.** This history means that the labor unions relevant to each of the identified priority occupations already have strong attraction and talent development systems in place.
- **A wide range of stakeholders are already bought into industrial decarbonization.** From labor to policy, industry, and environmental advocacy, industrial decarbonization is viewed as a “win-win” for the state and its workers. Such robust interested and agreement in industrial decarbonization may lend itself to successful cooperation and collaboration between parties as projects are funded.

WEAKNESSES

- **Very low unemployment means that job seekers may be hard to find and attract.** Job seekers that are available may require additional supports as they enter pre-apprenticeship or relevant training programs. Support services such as transportation, housing, and childcare assistance, case management, stipends, and other services can help increase accessibility and retention rates to job seekers.
- **Low concentrations of key priority occupations (Table 1).** Six of the ten priority occupations have a concentration of those occupations than the national average. A low concentration can





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mean that shortages of particular occupations can become more acute and less-quickly remediated.

OPPORTUNITIES

- **Strong workforce and job quality provisions in the RFI can support creation of high road jobs.** The RISE PA RFI heavily incentivizes program applicants to pursue many key aspects—including project labor agreements—to job quality. Furthermore, the industrial and commercial construction industry in Pennsylvania already has high union density, meaning that a significant pool of high road contractors is prepared to get to work on awarded projects.
- **Federal legislation has increased demand for domestically-produced industrial goods.** This can help support demand for many of these industrial producers' goods, which can provide cash flow and incentivize further investment in decarbonized production processes.
- **When dealing with novel technologies and pilot projects like hydrogen hubs and carbon capture facilities, it can be difficult to know if a workforce is ready.** Fortunately, in Pennsylvania there is a significant workforce that is already prepared to meet the technical specifications for these new technologies.

THREATS

- **International pressures on trade and manufacturing.** Despite federal legislation supporting domestic products, commodities and products from overseas continue to be an option for some project developers. If demand continues to follow trends observed over the past decades, local workers could continue to suffer displacement.
- **Timeline delays for project development.** There is a lot of optimism across stakeholders about industrial decarbonization projects, though long project planning and financing processes and uncertain start dates can make it difficult to ensure enough workers are trained but also have enough work between projects. The delay of pilot of “first-mover” projects extends the timeline for larger scale deployment and workforce opportunities.





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CONCLUSIONS

The industrial decarbonization activities and the accompanying workforce provisions outlined in the RISE PA RFI present the opportunity to make Pennsylvania’s industrial processes cleaner and more competitive, all while creating and supporting communities and high quality jobs. Importantly, the RISE PA program also supports domestic industry more broadly by enabling industry first movers to pave the way for other firms to learn from best practices. Cleaner and more modern industrial processes are more competitive in today’s global market, and federal and state incentives for domestic and local content can help spur further demand for decarbonized industry in Pennsylvania. Furthermore, the development of key infrastructure—such as carbon transportation pipelines—can also have knock-on effects that encourage development of additional decarbonization technologies in the surrounding areas, spurring additional economic growth and demand for a greater number of workers. The RISE PA program offers an initial first step that is broadly supported by stakeholders, and the activities it promotes will help support a more prosperous and less GHG emission-intense industrial sector and its workforce.

MEASURING OUTCOMES

Using metrics to track the progress and accomplishment for outlined goals is an imperative step in understanding a program or initiative’s success. Below is a list of metrics that could help quantify and track the success of high road employment outcomes for communities within the Bay Area.

- Demographics of the workforce involved in RISE PA projects (gender, race, ethnicity, educational attainment)
- Geographic distribution of workers
- Share of workers from within frontline or low-income and disadvantaged communities
- Median and average wages and benefits rates for workers
- Number of apprentices involved with projects
- Usage rate of project labor agreements
- Usage rate of community benefit plans or community benefit agreements
- Number of projects that involve or engage with energy communities
- Union utilization rates on awarded projects





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APPENDIX A: EMPLOYMENT FORECASTING METHODOLOGY

The research team derived estimated occupational demand from The Nature Conservancy *Potential Reconciliation Climate Policies: An Economic Impact Analysis Report, Pennsylvania*, which “analyzes the economic impacts of federal investments in climate policies, including clean energy tax credits, infrastructure investments, transportation and building electrification investments, and reforestation and conservation grants.” The sources from this funding include: the Advanced Energy Tax Credit, the Zero Emission Facility Tax Credit, the DOE Loan Program, and the Advanced Industrial Facilities Deployment Grant Program. The cumulative projections for these funding opportunities were then proportioned to \$450 million to match the proposed pool of RISE PA funds.

From these industry employment estimates, the research team used industry staffing patterns to develop occupational projections, assumed to be supported consistently for 5 years, resulting in the detailed estimates reported here. For more information on The Nature Conservancy’s analysis, please visit [the full report](#).

The Secondary Employment Outputs (SEOs) provide insight into the specific occupations and wage tiers of the jobs created as a result of the policies analyzed. This analysis uses the direct and indirect jobs modeled in the Initial Employment Outputs (IEOs) as inputs and secondary data from the Bureau of Labor Statistics (BLS).

The analysis uses staffing patterns by SOC code for the four industry groups modeled in the IEOs, specific to the state of Pennsylvania, and accounting for the projected occupational growth by 2030 using the BLS 10-year forecast from the Employment Projections program.

The research team also conducted a deeper analysis of priority installation occupations within the Construction industry to estimate job creation in select occupations relevant to the future of Industrial infrastructure development.

