GenAI's Human Infrastructure Challenge

Can the United States Meet Skilled Trade Labor Demand Through 2030?

Navin Girishankar and Karl Smith

KEY TAKEAWAYS

- The GenAI infrastructure build-out presents a unique opportunity for American workers. The United States will need roughly 140,000 more electricians, HVAC pipefitters, heavy equipment operators, welders, and construction laborers by 2030. This high-case scenario, assessed by the authors, highlights ample opportunities for cultivating homegrown talent and creating pathways to durable middle-class jobs.
- Registered apprenticeships will need to expand by 50 percent, along with financing instructors and modernizing training facilities, for programs to meet the labor demand without compromising quality and safety.
- The White House's AI Action Plan commits to several actions to expand the trades workforce. To hit the mark, however, additional measures are urgently needed—specifically, creating a National AI Infrastructure Workforce Consortium modeled after the Department of Energy (DOE)'s Foundation for Energy Security and Innovation and National Science and Technology Council (NSTC)'s Workforce Center of Excellence, as a means of marshaling the nation's attention as well as its federal and state public and private resources to meet the challenge.
- While building a pipeline of homegrown skilled trade talent should be the United States' highest priority, policymakers will need to consider reasonable immigration solutions in the short run, given that efforts will take time.

BACKGROUND & CONTEXT

The U.S. AI Action Plan **frames** GenAI infrastructure as "an industrial revolution, an information revolution, and a renaissance all at once." Hyperscalers are mobilizing unprecedented levels of capital and GPUs, while utilities are adding vast generation capacity. Yet, data centers will not be wired, cooled, commissioned, or inspected without electricians, pipefitters, HVAC technicians, welders, heavy equipment operators, and construction laborers.

GenAI data centers require highly skilled trades workers to handle their complex electrical, power, wiring, and advanced cooling systems. However, there is a lack of available instructors, outdated training facilities, and inadequate support for apprentices. Moreover, the labor pipeline is slow, taking five years to produce capable workers, while roughly a fifth of construction workers are already nearing retirement. The result is a critical timing mismatch: Workforce exit rates will exceed entry rates when GenAI infrastructure demands reach historic highs.

While the industry is attempting to address the labor shortage with grants and community college partnerships, these individual efforts are insufficient in the face of the scale of projected labor demand. CSIS assesses that even conservative AI adoption scenarios will create labor demand shocks that cannot be solved by simply reallocating the existing trades workforce. The central policy question is therefore not simply whether the United States has enough chips and power generation, but whether it can mobilize enough skilled workers to build the data centers and sustain the broader GenAI infrastructure renaissance.

LEGISLATIVE OR POLICY IMPLICATIONS

The GenAI trades labor gap underscores the urgency of recently proposed bipartisan legislation, such as the Supporting Apprenticeship Colleges Act and the Leveraging Educational Opportunity Networks Act. While these bills aim to boost apprenticeship enrollment and secure federal funding for training, they could have a greater impact if the Department of Labor (DOL) were empowered to coordinate public and private efforts through a National AI Infrastructure Workforce Consortium. This may require input from key congressional committees, including the Senate and House Committees on Health, Education, Labor and Pensions; Energy and Natural Resources; Education and the Workforce; and Energy and Commerce.

The consortium would build upon the goals of the recently proposed bipartisan AI and Critical Technology Workforce Framework Act, which tasks the National Institute of Standards and Technology (NIST) with defining jobs and skills for emerging technology sectors. By convening states, credentialing boards, and industry stakeholders to create reciprocity agreements and skill verification protocols that streamline licensure, the consortium would help put that framework into action.

CSIS | CENTER FOR STRATEGIC & INTERNATIONAL STUDIES

CHALLENGES & RISKS

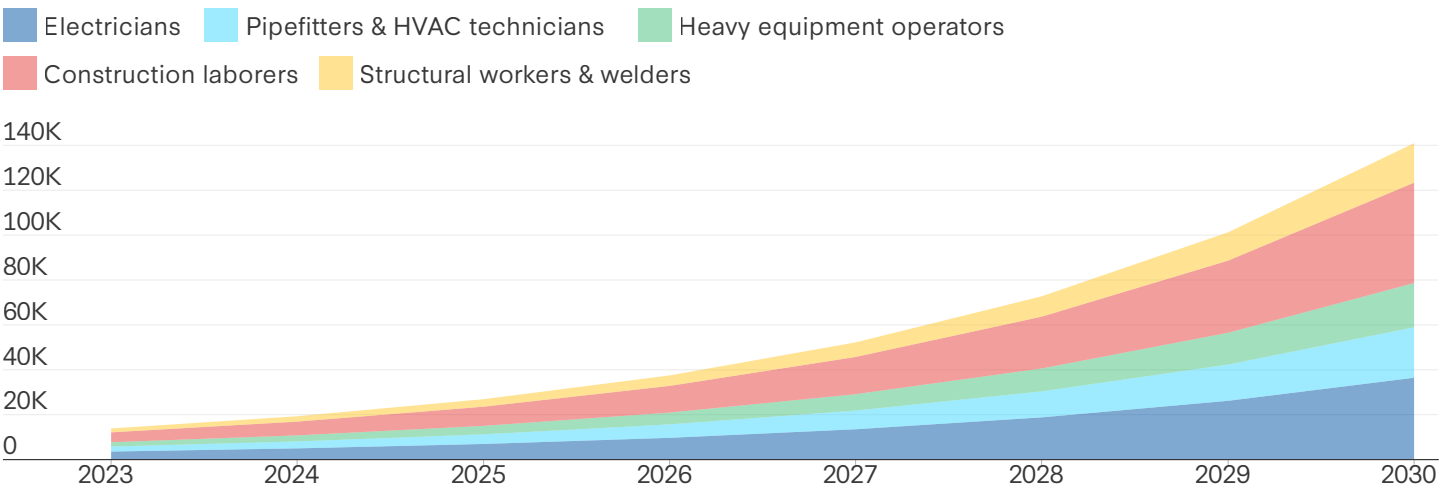
Establishing a robust pipeline of skilled trade talent faces multiple challenges. A significant instructor shortage exists because qualified tradespeople can earn more in the field, a problem compounded by inadequate wage replacement and unclear liability frameworks. Training quality risks being compromised if the expansion in apprenticeships is not accompanied by investment in specialized equipment and the establishment of adequate quality assurance systems, accreditation processes, and oversight. Furthermore, apprenticeship wage levels that fall below living wage requirements and unaffordable housing in metropolitan areas risk forcing students to drop out of apprenticeships to meet immediate family financial needs, underscoring the need for income and housing support.

The White House's AI Action Plan proposes several actions, but its implementation faces challenges in balancing goals and interests—long-term and short-term, public and private, and federal and state. Given these realities, the United States may need to consider reasonable short-term immigration solutions to avoid construction delays and falling behind in the GenAI infrastructure race, involving creating bridge curricula to help internationally trained tradespeople swiftly transition into licensed U.S.-based roles. The success of proposed actions also assumes a well-coordinated effort across industry and all levels of government, as a lack of unified support could lead to project delays and wasted investment. However, securing the necessary bipartisan support for such short-term immigration solutions and cross-agency coordination remains a key challenge.

RECOMMENDATIONS

- Task the DOL and Department of Commerce with establishing a National AI Infrastructure Workforce Consortium, modeled after the DOE's Foundation for Energy Security and Innovation and the NSTC's Workforce Center of Excellence.
- Expand registered apprenticeships by 50 percent in priority trades positions such as electricians and HVAC technicians, with standardized profiles and state seat target allocations linked to regional AI builds.
- Stand up an Instructor Corps with fast-track certification, wage replacement stipends, and liability templates, and rotate experienced craft workers into teaching and inspection roles.
- Modernize training facilities through federal-state matching funds and vendor contributions aligned with widely usable training models for electrical, cooling, and automation systems.
- Lower frictions that create bottlenecks through reciprocity compacts, transition programs for internationally trained workers, and completion support packages such as housing stipends and mentorship in high-cost metros.

DEMAND FOR SKILLED TRADE WORKERS EXPECTED TO SOAR BY 2030 UNDER HIGH-GROWTH SCENARIO



ADDITIONAL RESOURCES

Navin Girishankar, Joseph Majkut, Cy McGeady, Barath Harithas, and Karl Smith, "Securing Full Stack U.S. Leadership in AI," CSIS, *Commentary*, March 3, 2025, **https://www.csis.org/analysis/securing-full-stack-us-leadership-ai**.

Karl Smith, Joseph Majkut, Cy McGeady, and Barath Harithas, *The AI Power Surge: Growth Scenarios for GenAI Datacenters Through 2030* (Washington, DC: CSIS, March 2025), **https://www.csis.org/analysis/ai-power-surge-growth-scenarios-genai-datacenters-through-2030**.