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Semiconductors Practice

Reimagining labor to close the expanding US semiconductor talent gap

The US semiconductor industry is poised to expand exponentially by 2030. But how can an industry already facing attrition staff its growing operations? With a paradigm shift in its approach to labor.

This article is a collaborative effort by Bill Wiseman, with Brendan Jay, Nicholas Liao, Taylor Roundtree, and Wade Toller, representing views from McKinsey's Semiconductors Practice.

August 2024

As McKinsey has written previously, public and private investments to rapidly expand the United States semiconductor industry will total more than $250 billion by 2032.[1] This investment brings with it more than 160,000 new job openings in engineering and technician support alongside additional openings in related construction craft jobs, according to McKinsey analysis. While numerous initiatives aimed at building these critical talent pipelines are planned or under way, the expected talent gaps are considerable, and many are likely to persist, albeit to a lesser extent.

Bridging the considerable talent gaps expected will require the American semiconductor industry to confront the problem directly and embrace a sea change in its approach to cultivating, sourcing, and retaining talent.

The current semiconductor workforce and forecasted demand

The US domestic semiconductor manufacturing workforce has declined precipitously, down 43 percent from its peak employment levels in 2000.[2] At the same time (as detailed later in this article), the semiconductor industry's workforce attrition rate is substantial.

Compounding matters, American semiconductor companies face challenges when it comes to organizational health, with 50 percent of companies scoring below the median benchmark on critical organizational health metrics (compared with 67 percent of all global companies) including talent development, the working environment, and the capture of external ideas.[3] While American companies' health indicator scores are higher than those in the global semiconductor industry, they are far from ideal.[4]

CHIPS and Science Act investment[5] and—to a much lesser extent—a slight uptick in domestic production that began in 2018 helped increase the workforce ranks by 5 percent (18,000 workers) through 2023. But announced semiconductor investments will push demand far above the currently available talent supply (Exhibit 1).

About 1,500 engineers join the semiconductor industry each year, making up just 3 percent of the 52 percent of engineering graduates who enter engineering roles.[6] Contrast those numbers with 88,000—the forecast demand for semiconductor engineers by 2029—and the potential scope of the gap becomes apparent.

The talent statistics are similar for semiconductor technicians: only about 1,000 new technicians join the field each year, and by 2029, the rise in demand for these workers is forecasted to reach 75,000 (see sidebar "Methodology").

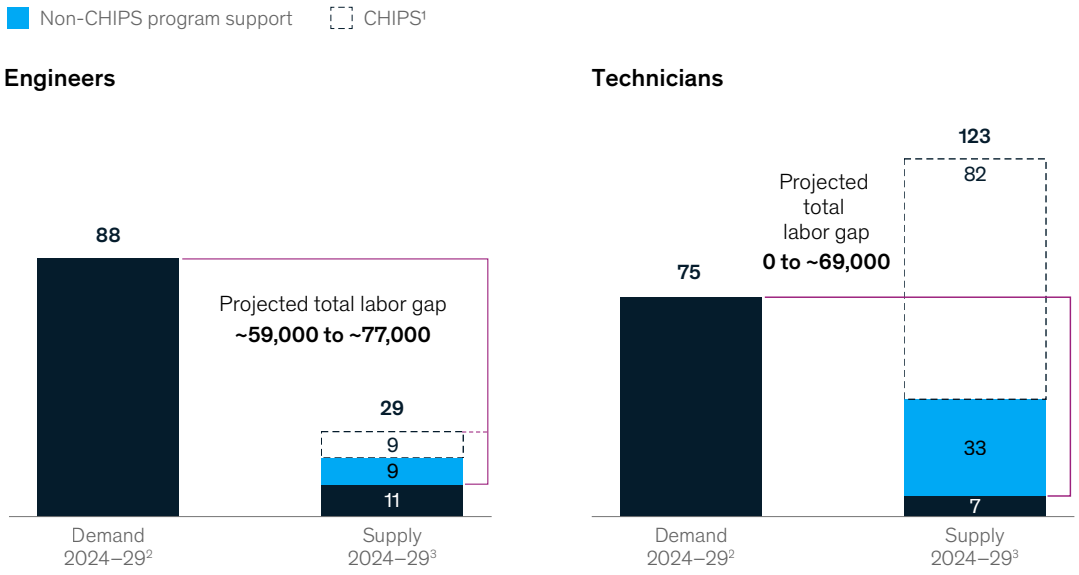
[1] "New tactics for new talent: Closing US semiconductor labor gaps," McKinsey, May 10, 2024.
[2] "Employment for manufacturing: Semiconductor and other electronic component manufacturing (NAICS 3344) in the United States," Federal Reserve Bank of St. Louis, updated April 26, 2024.
[3] McKinsey Organizational Health Index data, 2023.
[4] Ibid.
[5] "The CHIPS and Science Act: Here's what's in it," McKinsey, October 4, 2022.
[6] Jennifer Cheeseman Day and Anthony Martinez, "STEM majors earned more than other STEM workers," US Census Bureau, June 2, 2021; McKinsey analysis of historical US Bureau of Labor Statistics employment data.

Semiconductor investments will push demand far above the currently available talent supply.

Exhibit 1

Current workforce development efforts appear unlikely to meet the demand for more than 160,000 US semiconductor workers.

Total forecast semiconductor labor shortage, 2024–29, thousands of full-time equivalents (FTEs)



Note: Figures may not sum, because of rounding.
[1]Based on CHIPS Program Office estimates of 100,000 new technicians (even distribution of 12,500 new technicians year over year between 2024 and 2031) and goals to triple the number of graduates in semiconductor-related fields (assumes that the number of engineering graduates triples from 2023 levels with 52% of engineer graduates entering engineer roles and 3% entering semiconductor jobs).
[2]The projected labor demand was sized using historical headcounts (across various role types, companies, and phases of fab construction), internal McKinsey benchmarks, expert perspectives, and publicly released employment plans. The total new wafer capacity from announced US fabs (estimated at 2.9 million wafers from 2020 to 2029) was leveraged against these benchmarks and ratios to approximate a need of 107,000 FTEs between 2020 and 2029.
[3]Assumes stable (2%) year-over-year growth in engineering and technician graduates, with a consistent (52%) rate of engineering graduates entering engineering roles, of which the rate of graduates taking semiconductor jobs (3%) also remains consistent over the period (using US Census Bureau and US Bureau of Labor Statistics data).
Source: 2023 SEMI World Fab Forecast database; CHIPS Program Office; US Bureau of Labor Statistics employment data; US Census Bureau

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Methodology

The methodology for calculating the potential new labor needed to build and staff announced US semiconductor facilities (labor demand) and the likely supply of workers to meet that demand (labor supply) used McKinsey benchmark data as well as data gleaned from publicly available sources and was informed by industry experts (exhibit).

The projected labor demand was sized using historical head counts (across various role types, companies, and phases of semiconductor fabrication plant [fab] construction), internal McKinsey benchmarks, expert perspectives, and publicly released employment plans. The total new annual wafer capacity from announced US fabs (estimated at 2.9 million wafers from 2020 to 2029) was leveraged against these benchmarks and ratios to approximate a need for 107,000 full-time equivalents (FTEs) between 2020 and 2029.

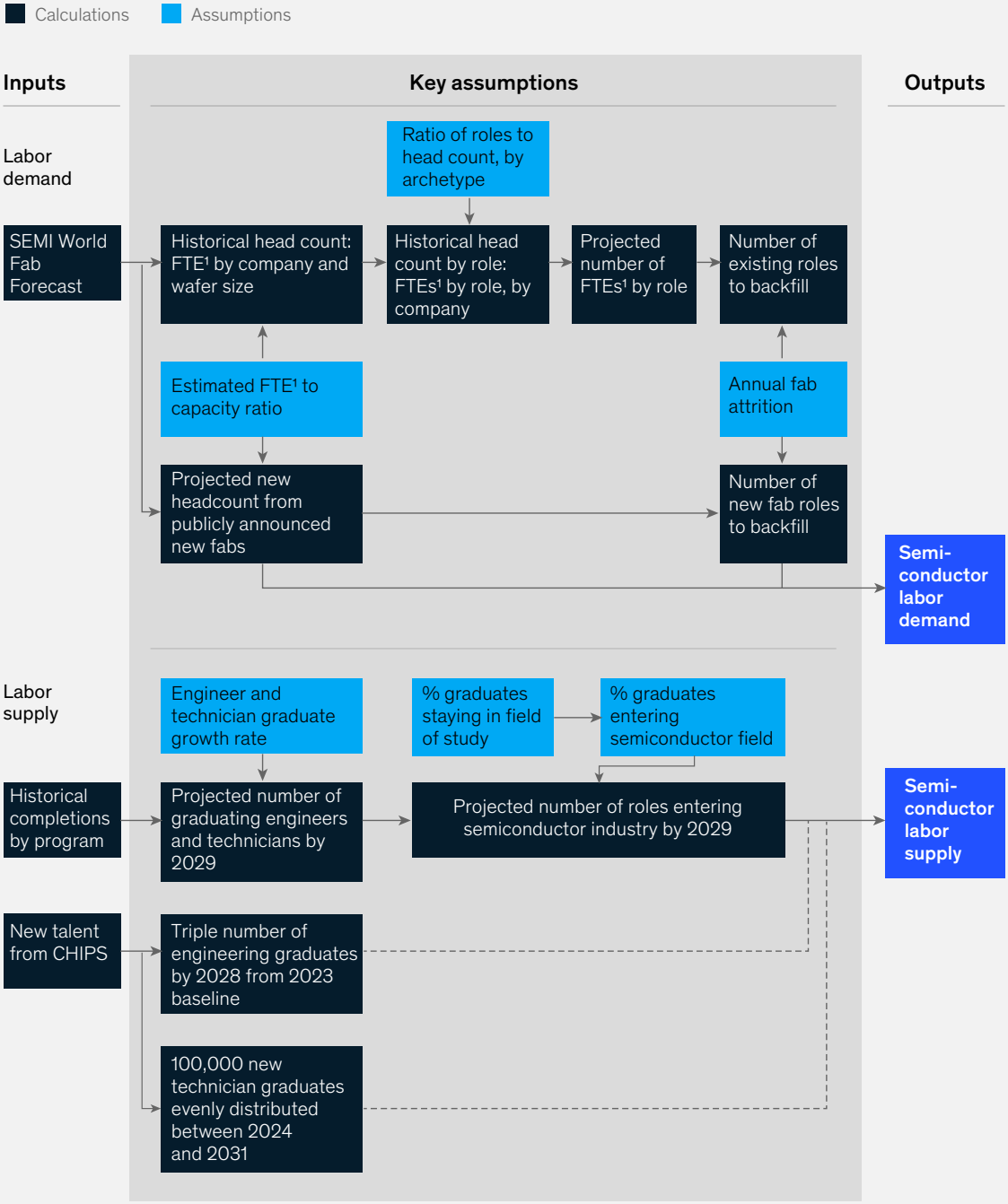
Once attrition within the existing and newly created labor force is factored in, the total labor requirement between 2020 and 2029 rises to approximately 190,000 FTEs. Narrowing the focus to 2024 to 2029, the total requirement is approximately 164,000 FTEs.

The potential labor supply was calculated by determining the total number of students completing engineering and technician instructional programs as well as what percentage of that total are likely to pursue fields and develop competencies compatible with roles in the semiconductor industry.

Methodology (continued)

Exhibit

The methodology used to model new US semiconductor labor supply and demand includes a particular set of informed assumptions and calculations.



¹Full-time equivalent.
Source: McKinsey analysis of CHIPS Program Office, Lightcast, McKinsey benchmarks, OECD data, SEMI World Fab Forecast, and US Bureau of Labor Statistics data

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Public and private semiconductor workforce development programs

Based on projects announced through 2023, there are currently 18 states in which new large operations for semiconductor fabrication will be established or existing operations will expand.[7] In many of those states there are public programs managed at local, state, and federal levels; union and trade association programs; and programs sponsored by semiconductor companies, which are variously aimed at expanding the available pools of semiconductor engineering and technician talent. Some of them are described below.

Engineers

— *Scalable Asymmetric Lifecycle Engagement (SCALE).* SCALE is a microelectronics workforce development program run by a Purdue University–led collaboration between public, private, and academic organizations. SCALE launched in 2020 with $45 million from the US Department of Defense,[8] and further funding in 2023 expanded the program to 22 universities and 48 industry and government partners.[9]

— *University Partnership for Workforce Advancement and Research & Development in Semiconductors (UPWARDS) for the Future.* Micron Technology's partnership with 11 universities (six in the United States and five in Japan) is a $60 million effort that reportedly aims to provide 5,000 students annually with experiential learning in clean rooms and memory-related research, with a special emphasis on supporting gender equity in STEM.[10]

— *Michigan Economic Development Corporation (MEDC) investment.* The MEDC invested $3.6 million to promote semiconductor training and education, divided between four higher education institutions in Metro Detroit: Oakland University, the University of Michigan, Washtenaw Community College, and Wayne State University.[11] Separately, MEDC provided Michigan Technological University in Michigan's Upper Peninsula with $838,000 to expand its semiconductor training and education through microcredential offerings.[12]

Technicians

— *Maricopa County Community College District, Arizona, training programs.* These partnerships with Intel and Taiwan Semiconductor Manufacturing Company could provide training to add a reported 4,000 to 6,000 trained technicians to the local workforce in a state where both companies have made large semiconductor fabrication plant (fab) investments.[13]

— *Quick Start Semiconductor Technician Training program.* Funds from the state of Oregon and Washington County support this Portland Community College program in partnership with Intel. A ten-day paid training course prepares participants for semiconductor technician roles.[14] Separately, Mt. Hood Community College received a grant from the Higher Education Coordinating Commission's Future Ready Oregon to add a semiconductor industry training component to its Mobile Training Project.[15]

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[7] McKinsey analysis of Semiconductor Industry Association data and various company reports.
[8] "About SCALE," Purdue University, updated May 2024.
[9] Ibid.
[10] "Micron Launches U.S.-Japan University Partnership for Workforce Advancement and Research & Development in Semiconductors (UPWARDS) for the Future," Micron Technology, May 20, 2023.
[11] "MEDC, Wayne State University, U-M, Oakland University and Washtenaw Community College announce major new expansion of semiconductor education and training programs in Metro Detroit," MEDC, October 24, 2023.
[12] "State of Michigan announces $838,000 grant to help Michigan Technological University become national leader in semiconductor education, training programs," MEDC, November 27, 2023.
[13] "Community colleges partner with semiconductor industry," *Arizona Capitol Times*, July 14, 2023.
[14] "Quick Start semiconductor technician training," Portland Community College, accessed July 19, 2024.
[15] "Higher Education Coordination Commission awards $1 million innovation grant to Mt. Hood Community College," Mt. Hood Community College, October 18, 2023.

— *Semiconductor Career and Apprenticeship Network (SCAN).* Michigan has provided $1.5 million in state funds to the SEMI Foundation, reportedly to provide job seeker support and development and coordinate with companies to attract and foster semiconductor talent via registered apprenticeship programs.[16]

— *GlobalFoundries apprenticeships.* In collaboration with Hudson Valley Community College (HVCC) and the State University of New York (SUNY), GlobalFoundries offers full-time, paid, roughly 18-month apprenticeships at its fabrication site in Malta, New York. Apprentices receive on-the-job training and take courses at HVCC funded by a SUNY apprenticeship grant.[17]

Although there are numerous privately and publicly funded workforce development programs planned or in place to help address the growing talent gap, they are unlikely to build talent pipelines sufficient to meet demand across all three major talent pools required to enable the enormous build-out of the American semiconductor industry.

Semiconductor talent supply and demand forecasts predict sizable workforce gaps

Indeed, given current growth rates and forecast demand, the potential talent gap in the semiconductor industry could total between about 59,000 and 146,000 workers across the engineer and technician labor pools by 2029. The lower end of the forecast range (59,030) represents the scenario if CHIPS Program Office estimates for its supported programs are fully realized,[18] while the higher number reflects what the situation may be if the programs or funding levels fall short of estimates (Exhibit 2).

The demand growth trajectory becomes steep as early as 2025, when the forecast annual demand growth for engineers jumps from 9,000 to 17,000 and the forecast technician demand growth doubles from 7,000 to 14,000.[19] Annual demand growth for all workers is forecasted to peak in 2027 at 20,000 engineers and 17,000 technicians.

According to McKinsey analysis, demand for talent could easily far exceed available labor—even if the numerous programs intended to bridge the gap in supply achieve their stated aims. The one notable exception is demand for technicians: if CHIPS Act programming hits its targets, it would avert a long-term technician talent shortage. However, to achieve this result, technician training programs would need to be up and running in 2024—a target that was not fully realized in the first half of the year.

In contrast, the industry's shortage of engineers will persist and worsen until planned programs begin providing increased supply in earnest and new demand growth begins to wane—roughly around 2028.

These circumstances mean the new industry paradigm will be one in which it is imperative to reduce attrition, increase attraction rates from universities and other industries, and implement other innovative solutions to reduce demand for workers, who are likely to remain in short supply.

[16] Lindsay Moore, "Michigan invests $1.5 million in semiconductor job pipeline," MLive.com, May 24, 2022.
[17] "GF Maintenance Technician Apprenticeship—Malta, NY," GlobalFoundries, accessed July 19, 2024.
[18] Based on CHIPS Program Office estimates of 100,000 new technicians (even distribution of 12,500 new technicians year over year between 2024 and 2031) and goals to triple the number of graduates in semiconductor-related fields; this assumes that the number of engineering graduates triples from 2023 levels. Based also on McKinsey analysis of US Census Bureau and US Bureau of Labor Statistics data.
[19] Net demand growth numbers were calculated by subtracting number of new supply from total demand growth; for example, total demand in 2025 is 19,000, which will be offset by 2,000 in new supply, equating to a total net demand of 17,000.

Exhibit 2

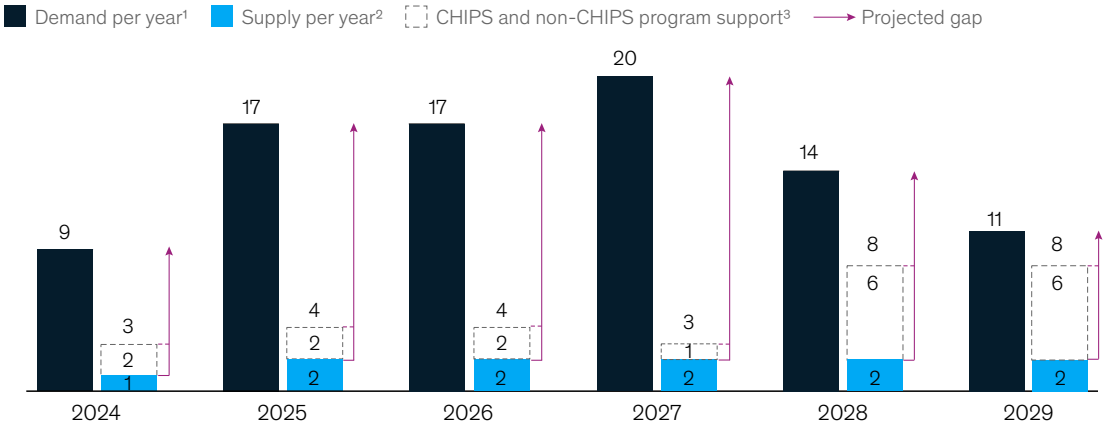
The potential engineering and technician talent gap in the semiconductor industry could total between about 59,000 and 146,000 workers by 2029.

Annual forecast semiconductor labor shortage, 2024–29, thousands of full-time equivalents (FTEs)

Engineers

Projected total labor gap

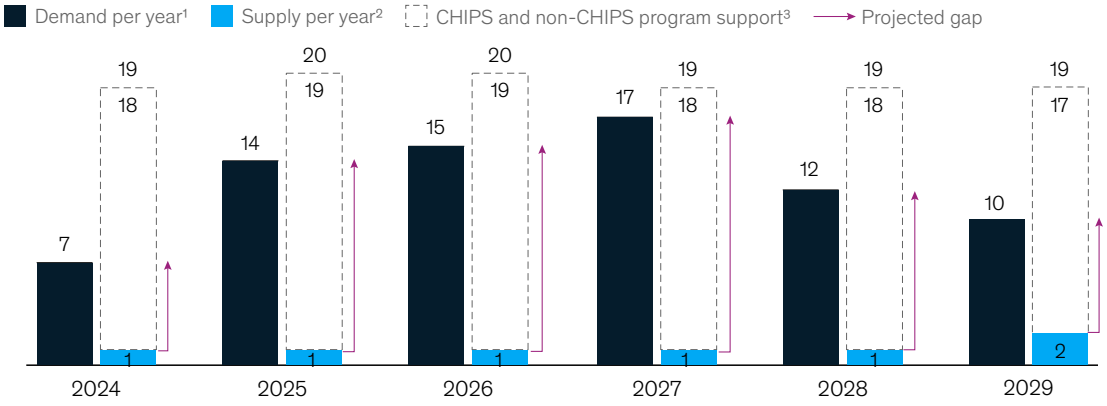
Optimistic = **~59,000** Pessimistic = **~77,000**



Technicians

Projected total labor gap

Optimistic = **N/A** Pessimistic = **~69,000**



[1]The projected labor demand was sized using historical headcounts (across various role types, companies, and phases of fab construction), internal McKinsey benchmarks, expert perspectives, and publicly released employment plans. The total new wafer capacity from announced US fabs (estimated at 2.9 million wafers from 2020 to 2029) was leveraged against these benchmarks and ratios to approximate a need of 107,000 FTEs between 2020 and 2029.
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Source: 2023 SEMI World Fab Forecast database; CHIPS Program Office; US Bureau of Labor Statistics employment data; US Census Bureau

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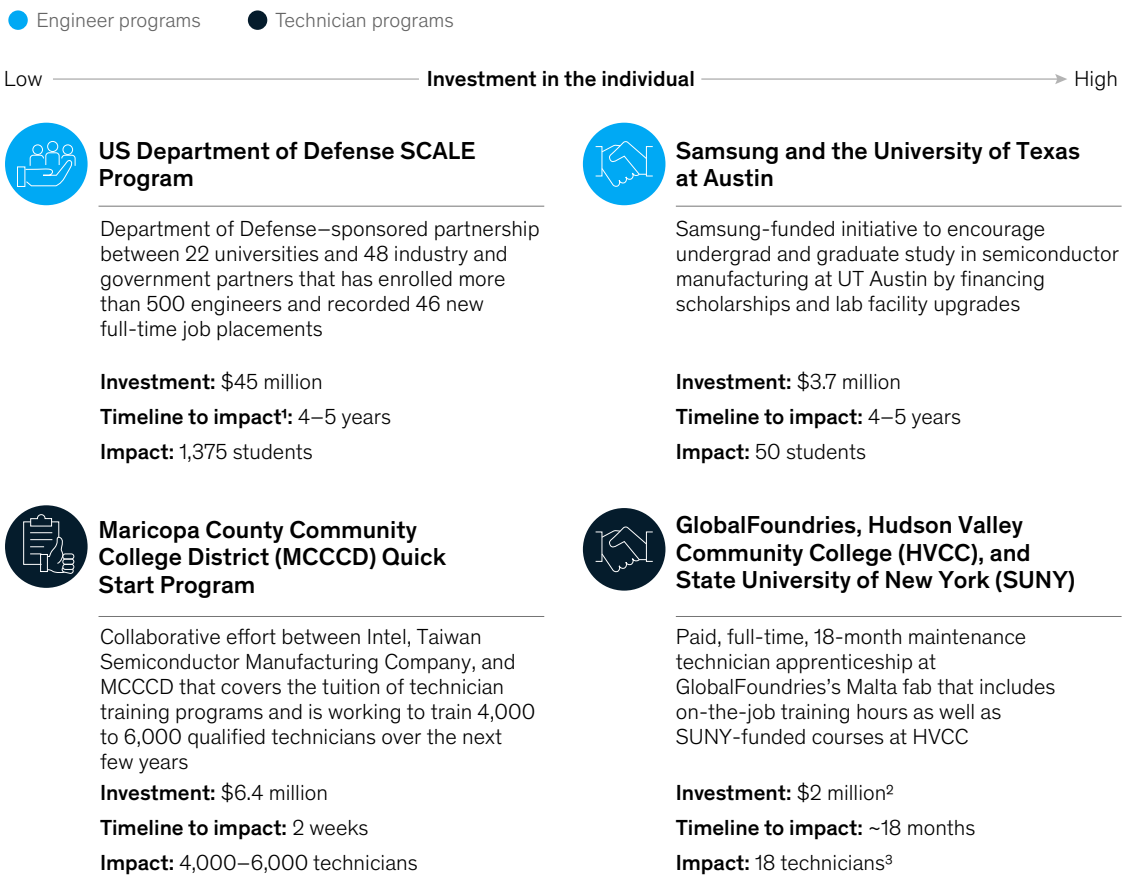
How semiconductor companies can help mitigate anticipated labor shortages

The forecast supply and demand figures illustrate why semiconductor companies are working with public, academic, and private partners to expand the US talent pipeline, especially in states where those companies have announced new or expanded fabrication operations. When examining companies' investments in technicians and engineers—where talent needs are greatest—and timelines for implementing their programs, it also becomes apparent that cultivating engineering talent requires a greater investment of time and money than developing technician talent does (Exhibit 3).

Exhibit 3

Workforce development programs for technicians and engineers vary by implementation timeline and investment size.



[1]Presumed length of time between program enrollment and completion.
[2]Assumes average salary (plus benefits) paid during ~1.5-year development period in addition to local community college tuition.
[3]Estimated through 2029.
Source: "About SCALE," Purdue University, updated May 2024; "UT and Samsung partner to develop talent pipeline for Texas' semiconductor ecosystem," UT Austin, September 1, 2023; "$6.4 million in funding to Maricopa Community Colleges advances careers," Maricopa County, January 25, 2023; "Community colleges partner with semiconductor industry," *Arizona Capitol Times*, July 14, 2023; "Semiconductor Technician Quick Start: Frequently asked questions (FAQs)," MCCCD, 2023

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Given these factors, one approach semiconductor companies can take to help bridge certain engineering talent gaps is upskilling and expanding technicians' roles, either permanently or temporarily.

Additionally, to meet the impending spike in need for construction craft workers, semiconductor companies could invest more funds in supporting workforce development programs in this critical area. And although the total number of active apprenticeships in the United States has risen greatly in recent years—construction-related apprenticeships specifically have risen by more than 18,000 since 2020—apprenticeship completion rates are less than 35 percent.[20] Further, most apprenticeship programs take four years to complete, highlighting the importance of acting sooner rather than later.

The American construction labor shortage is hardly unique to the semiconductor sector.[21] In fact, the shortage also predates the passage of the CHIPS Act. The number of unfilled jobs in the domestic construction workforce was at a historic high—more than 400,000[22]—before the Bipartisan Infrastructure Law of 2021 and the Inflation Reduction Act of 2022 pumped more than a trillion dollars into infrastructure construction projects. Workforce development efforts to date have not been sufficient to close the gap, which continues to widen. Accordingly, current labor growth levels will likely not provide enough construction craft laborers needed to meet the demand generated by new semiconductor investments.

To meet near- and long-term demand for skilled talent, the semiconductor industry will need to fundamentally shift its approach toward and thinking on workforce development and talent sourcing, including adapting certain job requirements and tapping into nontraditional talent pools.

This section will explore some of the strategies that can help achieve this transformation. Other industries have already implemented these strategies (see sidebar "How other industries have addressed labor shortfalls").

[20] "Apprentices by state," Apprenticeship.gov, updated June 4, 2024; "Overview of United States apprenticeship," US Department of Labor, November 2021.
[21] Garo Hovnanian, Ryan Luby, and Shannon Peloquin, "Bridging the labor mismatch in US construction," McKinsey, March 28, 2022; "Strategies for building US semiconductor fabs: Finding skilled labor," McKinsey, February 7, 2023.
[22] "Bridging the labor mismatch," March 28, 2022.

The semiconductor industry will need to fundamentally shift its approach toward workforce development and talent sourcing.

How other industries have addressed labor shortfalls

The American semiconductor industry no doubt faces a daunting challenge. But semiconductor players need only look to other industries that have faced similar labor shortage challenges for inspiration.

IT. With an aging workforce and geopolitical volatility limiting its ability to utilize offshore outsourcing, the IT industry has begun upskilling its current employees via training programs and implementing flexible work arrangements to increase retention. Additionally, IT industry employers have partnered with higher education institutions to train and recruit new talent in response to requests to make educational programming better simulate workplace expectations. In the IT public sector, government agencies offer educational scholarships as incentives for working in for public service to compete with private sector salary hikes.

Oil and gas. Despite boasting soaring salaries and plentiful jobs, the industry is seeing record-high attrition rates because of arduous working conditions, remote locations, and global shifts to renewables. Broader concerns for the industry's ability to carve out new business and articulate energy transition strategies explain, in part, the historic lows in the number of young people interested in pursuing degrees in petroleum engineering: students want to know that the skills they are investing in and building will be valued for years to come. Companies such as bp are funding scholarship and apprenticeship programs to increase exposure to the energy and petrochemical sector.[1] Some companies have also expanded their recruitment strategies by looking into industries with transferable skill sets, such as sales and business development or the technology and engineering sectors.

Healthcare. Since 2020, industry trends heightened by the COVID-19 pandemic have resulted in severe nursing care shortages at hospitals. These labor shortages and hospitals' consequent reliance on contracted labor have exacerbated existing systemic challenges and increased risks around quality of care, length of hospital stay, and patient mortality, as well as labor costs.

Also noteworthy is that for every industry that has adapted to address labor shortages, another industry has suffered the consequences of taking inadequate action or outright inaction.

[1] Collin Eaton and Mari Novik, "Big oil's talent crisis: High salaries are no longer enough," *Wall Street Journal,* August 6, 2023.

Addressing labor shortages: Near-term strategies

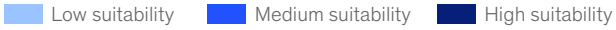
The traditional talent pools for semiconductor engineers and technicians are overstretched and will take time to build. To fill these roles in the meantime, industry companies will need to expand their sourcing.

Adjacent industries. To source technician talent with relevant transferable skills such as clean room manufacturing, heavy equipment, and machining, semiconductor companies can look to several comparable industries, including pharmaceuticals, medical devices, chemical and aerospace manufacturing, military maintenance, power generation, and automotive and engine manufacturing (Exhibit 4).

Immigrant communities. Individuals recently settled in the United States (including those admitted as refugees) who are seeking entry-level employment may not be aware of positions available in the semiconductor industry such as facilities maintenance, wafer mover operator, and others. Companies could appeal to individuals in these communities with advantageous educational opportunities, internal programs, and strategic community engagement.

Exhibit 4

Clean room manufacturing and heavy capital equipment workers have transferrable skills suitable for semiconductor fab roles.



Relevant industry	Examples	Relevant skill sets	Suitability for fab-related role
Clean room manufacturing	Pharmaceuticals and bio-technology Medical-device manufacturing Chemical manufacturing Food and beverage processing Aerospace manufacturing	Knowledge of good manufacturing practices (eg, traceability, repeat-ability, and reproducibility) Familiarity with ISO[1] and rigorous safety standards and protocols Attention to document and quality control	Facilities Maintenance services Module operator Area operator Equipment technician
Heavy capital equipment and machining	Military maintenance crews Power generation systems (eg, turbines and transformers) Plastics and rubber machinery (eg, injection molding and extruders) Automotive and engine manufacturing	Mechanical aptitude to repair, install, and maintain machinery Technical proficiency and ability to read equipment blueprints Troubleshooting familiarity and ability to diagnose issues and perform corrective maintenance	Facilities Maintenance services Module operator Equipment technician

[1]International Organization for Standardization.

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Educational offerings could include, for example, weekly English-language skills classes for employees. Additionally, companies could sponsor employees' enrollment in educational or certification programs that help them develop relevant technical skills. A company mentorship program could focus on helping those new to the United States advance within the organization and connect with others in their new community. Supporting non-native English speakers with on-the-job translation technology can also enable potential employees to access certain roles.

In terms of community engagement, companies could collaborate with reputable organizations that serve immigrant and refugee communities to help identify and connect qualified candidates for roles in fabrication operations. And to enable their employees to commute to work, companies could partner with local governments and other stakeholders to help provide safe, reliable transportation networks and transit systems.

The Chobani yogurt plant in upstate New York was able to substantially expand its workforce with programs geared toward recent immigrant communities and refugees in particular. The company tailored its policies to boost hiring of individuals with refugee status and encouraged workers to refer those in their networks—family members, friends, neighbors, and others—to apply for positions at the plant. Its success prompted

Chobani to expand these policies to its other factories as it grew, and a sizable percentage of the company's workers are refugees.[23]

Educational partnerships. To create a pipeline for entry-level roles in the semiconductor industry, companies can partner with local educational institutions. Companies can help local high school and college students learn about potential careers in the semiconductor industry by inviting them to tour their facilities, offering job shadowing and internship opportunities, donating machining equipment, and partnering with schools to build hands-on lessons within the classroom to help students develop relevant skills. Alumni from local institutions who work at fabrication operations can also help forge connections by delivering presentations at school career fairs and similar events. Community organizations such as SkillsUSA can also be a resource to help companies identify and connect with area students interested in technical careers in manufacturing.

Military veteran outreach. Many veterans have transferable skills and cultivated personal traits that make them desirable and well-rounded candidates for a variety of roles in fabrication operations. To increase their recognition among active military and veteran populations, companies can apply for awards and recognitions that demonstrate their commitment to helping veterans succeed, such as the federal HIRE Vets Medallion Award. Dedicated veteran recruiters can help develop trust-based relationships with veteran organizations such as Hire Our Heroes or the Wounded Warrior Project to help veterans transition into the fabrication workforce as well as provide service members on military bases with opportunities to learn about careers in the semiconductor industry.

Engaging workforce reentrants. To attract individuals reentering the workforce, fabrication operations may need to adjust how they source and structure work. Setting up such individuals for success includes matching their past experience and skills to the right role in the operation—for example, matching a candidate with demonstrated mechanical skills with an equipment technician role. Offering a variety of options for shift work—for example, a flexible six-hour shift four days per week—can make employment more accessible to a wider array of individuals. And establishing a network of sponsors and mentors can help increase talent retention and help those reentering the workforce acclimate, feel included, and advance within the organization.

Addressing labor shortages: Long-term strategies

While the efforts outlined in the preceding section can help to shore up gaps in the near future, sizable shortages will persist in the long term unless semiconductor companies augment existing workforce development initiatives with additional strategic investments in sourcing new talent.

Geographic expansion. Fabrication operations may consider investing in local geographic expansion policies to attract a wider pool of labor. To ascertain whether such an expansion is warranted, companies can begin by assessing the likelihood of whether it will be effective in ameliorating their current talent gaps. If expansion appears to be a promising option, companies can then evaluate the best path for achieving it, such as purchasing a company shuttle or partnering locally to expand bus routes. Finally, companies should analyze the expected impact of the expansion in terms of how many new employees would be reached. Once companies have implemented a geographic expansion, they can solicit feedback from employees and readjust their approach as the local community and their workforce evolve.

In 2023, Hemlock Semiconductor implemented a geographic expansion for its Thomas Township, Michigan, facility and successfully grew the pool of local talent.[24] By partnering with a local transit authority to subsidize a new bus route to its facility, the company was able to widen its talent pool while reducing transit expenses for employees.

[23] Christine Lagorio-Chafkin, "Chobani founder: 'Almost 30 percent of our workforce is refugees. This is the American way,'" *Inc.*, January 18, 2019.
[24] "Michigan Hemlock Semiconductor expansion project," Center for American Progress, October 6, 2023; Justin Engel, "After new route to Hemlock Semiconductor, Saginaw transit official eyes jobs-centric destinations," MLive.com, March 17, 2023.

Certification programs. Collaborations between fabrication operations and academic networks in the surrounding areas to offer semiconductor-related certification programs can help cultivate a pipeline for local talent.

A potential approach to creating a certification program could include the following:

- defining the scope of the program in terms of length and objectives, such as whether it will be aimed at filling a specific fabrication operation's needs or creating a national certification program that benefits multiple semiconductor operations
- sourcing partners via outreach to relevant stakeholders (such as academic networks) to create and deliver course offerings
- applying for funding from an organization that focuses on the development of the local workforce (such as the CHIPS Program Office or a state-level organization such as New York's Empire State Development) to support the program
- developing course offerings to prepare individuals for entry-level roles such as equipment technician and module operator
- training individuals via online, in-person, or hybrid instruction to develop familiarity with the fab environment and role-specific skills
- offering first-round interviews and placement services for program graduates

Apprenticeships. Companies can expand US Department of Labor–registered apprenticeship programs with coursework and on-the-job training subsidized through local economic development grants.

The steps involved in developing apprenticeship programming may include the following:

- defining the program structure in terms of length, compensation, and training
- evaluating the best approach to outreach to raise awareness of the program within the local community

Collaborations between fabrication operations and local academic networks to offer semiconductor-related certification programs can help cultivate a pipeline for local talent.

In 2022, US semiconductor manufacturer SkyWater Technology announced a partnership with Hennepin Technical College and the National Institute for Industry and Career Advancement[25] to provide registered apprenticeships at its facility in Bloomington, Minnesota.[26] By doing so, the company has better positioned itself to attract talent to fill its equipment maintenance technician positions in the Bloomington facility and expects to expand the program to its operations elsewhere.

It is not only possible for the semiconductor industry to address its growing labor shortages head on—it is imperative. The alternative of a chronically understaffed industry that struggles to remain competitive in the global market is not an option. The stakes—a stable domestic economy and national security—could not be higher. The semiconductor industry touches nearly all facets of modern life, from household electronics to healthcare and transportation. And recent geopolitical instability highlights the strategic importance of rebalancing America's semiconductor supply and demand profile to ensure autonomy in manufacturing, design, and intellectual property rights.

[25] Previously branded as the National Institute for Innovation and Technology.
[26] "SkyWater launches apprenticeship program to support employee career growth and domestic semiconductor workforce development," SkyWater Technology, January 19, 2022.

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