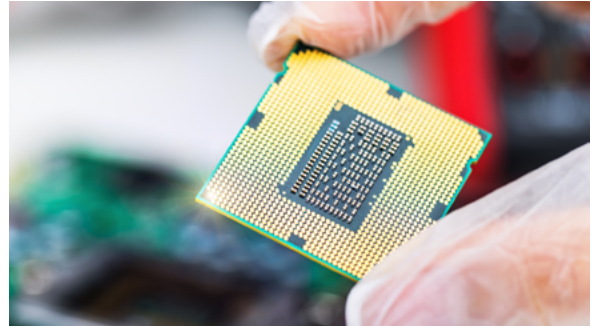


U.S. Semiconductor Manufacturing Sector Update



Supported by the CHIPS and Science Act, the nation's semiconductor industry is facing some key challenges as it gears up to meet the growing demand for chips.

In August, President Biden signed the [CHIPS and Science Act of 2022](#) into law. The legislation was put in place to help boost American semiconductor research, development and production, “ensuring US leadership in the technology that forms the foundation of everything from automobiles to household appliances to defense systems,” the White House announced upon passage of the Act.

The CHIPS and Science Act earmarked \$54 billion in grants for domestic semiconductor manufacturing. “America invented the semiconductor, but today produces about 10% of the world’s supply—and none of the most advanced chips. Instead, we rely on East Asia for 75% of global production,” it continued. “The CHIPS and Science Act will unlock hundreds of billions of dollars more in private sector semiconductor investment across the country, including production essential to national defense and critical sectors.”

Hitting Some Roadblocks

Fast-forward six months and it appears that the actual process of building new semiconductor “fabs” in the U.S. and bringing them online may be more difficult than expected. When the world’s supply networks were operating as expected, “companies had little incentive to build new fabs outside Southeast Asia,” McKinsey says. When COVID hit and began disrupting supply networks, companies started looking for ways to bring at least some of the world’s semiconductor manufacturing closer to home.

“These considerations have prompted companies to take a new interest in diversifying their fab locations and exploring US sites,” McKinsey says, adding that the availability of subsidies is one of the main considerations when evaluating potential new locations. The problem is that fabs are complex, capital-intensive projects. In the U.S., where fab building has been uncommon and construction talent is in high demand across sectors, McKinsey says semiconductor companies “may face even more challenges than usual.”

Among those issues:

- Large-scale fab construction hasn’t happened in the U.S. in over 20 years.
- Few builders possess the experience, capabilities and expertise required to complete these highly specialized projects.
- Semiconductor manufacturers have to compete for construction workers in a tight labor market.
- Companies must navigate a range of eligibility requirements in order to qualify for the CHIPS and Science Act funding.

McKinsey says fabs may also attract particular scrutiny from end customers due to the high level of emissions associated with their end products. For example, more than 70% of the lifetime mobile phone emissions are related to the actual manufacturing of the phone and the chipset. “As end custom-

ers increasingly focus on achieving net-zero emissions, more semiconductor companies are expected to commit to more aspirational and actionable emissions targets,” the company points out.

Finally, McKinsey notes that delivering large or mega capital projects on time and within budget is difficult under any circumstances. Current disruptive forces like commodity price volatility, inflation and labor constraints may further complicate semiconductor plant projects. For example, it says recent projects have been delayed due to extended lead times for mechanical, electrical and plumbing systems.

“What’s more,” the company adds, “the overheated labor market may reduce productivity because companies cannot find enough qualified construction employees, making it even more difficult to deliver facilities on time and on budget.”

Out of Their Control

In *American Machinist*, Emily Newton writes about the various challenges that American fab plant manufacturers are encountering and explains why simply constructing new semiconductor plants isn’t as straightforward as it sounds. Along with the various challenges that McKinsey pointed out, Newton says semiconductor factory construction also can be slowed by “unexpected regulatory issues” that aren’t directly within the developer’s control.

“That is the case for Wolfspeed, a company trying to build a new chip plant in North Carolina,” Newton writes. “Numerous violations at the area’s wastewater plant caused officials to issue a moratorium to prevent all new sewer connections, temporarily. That is critical because wastewater processing is a significant part of semiconductor production.”

Finding employees to staff the new factories may present additional roadblocks for American companies, namely because those employees are usually highly trained, educated and well versed on the process of transforming raw materials into finished goods. Plus, some of the positions will require postgraduate degrees at a time when people may be hesitant to go back to school for a doctoral degree “without the assurance of eventually earning high salaries,” Newton adds.

Universities Step up to the Plate

Academic institutions are addressing the semiconductor sector’s labor problems by forming international partnerships. In November, for example, [Purdue University and the Indian Institute of Technology Madras \(IIT Madras\)](#) announced that they would soon be launching a dual-degree master’s program in semiconductors. The program is part of a newly signed

agreement to collaborate in education and research into semiconductors and microelectronics.

Designed to ramp up skilled talent for the next generation of the semiconductor workforce, the dual-degree program will focus on an innovative, cooperatively developed curriculum to meet the industry’s growing needs. Purdue says undergraduate students with strong academic credentials and a deep interest in working on topics related to semiconductor devices, chip fabrication and circuits and systems will be candidates for the future master’s program.