



Legal and Contractual Challenges and Constructing Large Semiconductor Projects in the United States

Regulatory Maze Demands Early Navigation

Environmental permits and zoning approvals often require multiple levels of government approval. Plan early to avoid costly project delays.

Logistics for Technical Equipment Can Threaten Timelines

Critical technical equipment comes from only a handful of global suppliers and requires specialized transportation challenges, which can cause costly delays.

Specialized Expertise is Scarce

The market for qualified domestic builders and contractors with specialized semiconductor experience is competitive and requires careful vetting and comprehensive risk management strategies.

Contractual Risk Allocation Prevents Disputes

Choose the right procurement method—whether design-build, design-bid-build, or construction manager at-risk—and include key contract terms to clearly define and allocate risk

IP Protection Must Be Built Into Every Contract

Technology transfer agreements and patent infringement protections are critical when sharing proprietary processes with contractors and equipment suppliers.

Legal and Contractual Challenges in Developing and Constructing Large Semiconductor Projects in the United States

BY GREG GILBERT

The semiconductor industry is one of the most critical sectors in the modern economy. With semiconductors playing a key role in everything from electronics to automotive manufacturing, average annual growth is predicted to rise six to eight percent through 2030. As demand for semiconductors has surged, the United States has seen a significant push to expand domestic semiconductor manufacturing capabilities. This includes the federal government's \$54 billion in grants for domestic semiconductor manufacturing through the CHIPS Act. The push for domestic manufacturing is largely driven by national security concerns, supply chain resilience, and economic growth considerations. Developing and constructing large semiconductor fabrication plants (fabs) in the United States, however, presents a unique set of legal and contractual challenges that must be navigated carefully to ensure project success.

Building a large semiconductor manufacturing plant is a complex and capital-intensive endeavor that involves several legal, regulatory, and contractual hurdles. These challenges span the entire duration of the project, from initial planning and development to construction and eventual operation. Addressing these issues effectively is essential for semiconductor companies, contractors, legal advisors, and government entities to ensure that such projects are completed on time and within budget.

This article explores the various legal and contractual challenges associated with developing and constructing complex semiconductor projects in the United States, including issues related to permitting, environmental regulations, intellectual property (IP) protections, labor relations, supply chain risks, and the allocation of risks in construction contracts.

Regulatory and Permitting Challenges

Developing large semiconductor projects in the United States requires compliance with a wide range of federal, state, and local regulations. These regulations are designed to protect public safety, the environment, and ensure that construction projects adhere to zoning and land-use laws. However, these regulatory frameworks can be cumbersome and time-consuming to navigate.

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ENVIRONMENTAL REGULATIONS

One of the primary legal hurdles in constructing a semiconductor facility is compliance with environmental regulations. Semiconductor manufacturing processes are resource-intensive, requiring large amounts of water, chemicals, and energy. The U.S. Environmental Protection Agency (EPA) imposes strict regulations on the discharge of chemicals and wastewater, air emissions, and the management of hazardous materials. Semiconductor plants also produce significant amounts of waste, including chemical sludge and electronic waste. To comply with these regulations, companies must secure numerous environmental permits, including those under the Clean Water Act (CWA) and the Clean Air Act (CAA). Depending on the scale of the project, a facility might be subject to a National Pollutant Discharge Elimination System (NPDES) permit or other specific state-level environmental regulations.

ZONING AND LAND-USE REGULATIONS

Zoning laws play a crucial role in the early stages of semiconductor facility development. Local municipalities often have strict zoning laws that dictate where manufacturing plants can be built. These zoning ordinances may require approvals or variances from local planning boards before construction can begin. Depending on the scope of the project, it may be subject to an environmental impact assessment (EIA) pursuant to the National Environmental Policy Act (NEPA), particularly if federal funding is involved or if the development is expected to have a significant effect on the surrounding environment. Ensuring compliance with these regulatory frameworks is essential to mitigate legal risks and avoid project delays.

PERMITTING TIMELINES

The permitting process for semiconductor projects can be time-consuming, particularly when multiple federal and state agencies are involved. Delays in obtaining necessary permits can significantly extend the timeline for project completion. For example, the process of obtaining air quality or water use permits may entail public comment periods and hearings, which can introduce additional delays into the regulatory timeline. This risk to project timelines is particularly significant in the semiconductor industry, where time-to-market is paramount. Delays in permitting or compliance can not only disrupt operational schedules but also have broader strategic implications, underscoring the importance of proactive management of regulatory requirements to ensure that development milestones are met efficiently and on time.

Supply Chain and Logistics Challenges

Semiconductor manufacturing requires a vast array of specialized equipment, materials, and components, many of which may need to be sourced from overseas suppliers. Reliance on foreign supply chains has become increasingly problematic in light of recent tariffs, which have amplified costs and introduced greater uncertainty.

SOURCING MATERIALS AND EQUIPMENT

The construction of a semiconductor facility requires state-of-the-art equipment, such as photolithography machines, etching systems, and chemical vapor deposition tools. These machines are often imported from countries like Japan, South Korea, or the Netherlands, and are manufactured by a small number of highly specialized suppliers. Unfortunately, bottlenecking is significant in these regions due to industry consolidation, labor cost dynamics, and technical complexity.

Delays in obtaining this equipment or raw materials can lead to costly project delays, which may have cascading effects on the overall project timeline and budget. Semiconductor companies need to establish strategic sourcing contracts and have contingency plans in place to mitigate supply chain risks, or be prepared to absorb the increased supply costs.

WORKFORCE AND LABOR AVAILABILITY

The construction of large-scale semiconductor fabs in the United States has been largely dormant for over two decades, and as a result, there is a limited pool of domestic contractors with the requisite experience, technical capabilities, and specialized expertise to successfully execute such complex projects. This scarcity of qualified builders presents a unique

challenge in the current environment, where the demand for advanced manufacturing facilities is at an all-time high. The successful development of these projects will require careful selection of skilled contractors and a comprehensive approach to managing both technical and regulatory risks.

Additionally, the construction phase of semiconductor facilities often requires highly specialized construction contractors, capable of managing the installation of sensitive equipment and ensuring that the environment within the facility is tightly controlled. Delays in hiring or training these workers can delay project timelines. Furthermore, labor disputes, union negotiations, and wage agreements can introduce additional complexities into the workforce management process.

LOGISTICS AND TRANSPORTATION ISSUES

The transportation of semiconductor manufacturing equipment, often large and sensitive, poses a logistical challenge. Specialized transport solutions are required, as well as precise planning to ensure that critical components arrive on time and in the proper condition. Shipping delays or damage during transport can have significant consequences on the project's schedule and budget.

Contractual and Risk Allocation Issues

Semiconductor construction projects involve multiple contractors, subcontractors, suppliers, and vendors, all of whom must work together to deliver the project. One of the primary legal challenges in semiconductor project development is effectively allocating risk between these parties in a manner that minimizes disputes and ensures the project is delivered on time and within budget. A well-structured risk allocation framework not only mitigates the likelihood of

conflicts but also provides a foundation for the smooth execution of the project from start to finish.

CONTRACT STRUCTURE AND PROCUREMENT METHODS

The procurement structure used for semiconductor projects typically falls under one of the following categories: design-bid-build (DBB), design-build (DB), or construction manager at-risk (CMAR). Each of these methods has its own advantages and drawbacks in terms of risk allocation.

- **Design-Bid-Build (DBB):** Under this model, the owner hires an architect to design the facility, followed by a competitive bidding process to hire a contractor for construction. This structure can lead to potential delays and cost overruns due to the lack of early collaboration between design and construction teams.
- **Design-Build (DB):** In a design-build structure, a single entity is responsible for both the design and construction, promoting collaboration and potentially accelerating the project timeline. However, it also increases the owner's reliance on a single contractor and design team, meaning that the allocation of risk and responsibility must be clearly defined in the contract.
- **Construction Manager at Risk (CMAR):** In this model, the owner hires a construction manager early in the design process who assumes responsibility for the construction phase, providing cost estimates and managing construction schedules. CMAR has the benefit of earlier collaboration but requires the construction manager to assume the risk for any cost overruns.

The choice of procurement method will significantly impact the legal structure of contracts and the allocation of risk.

Owners must carefully assess the most appropriate structure to mitigate risk while still ensuring flexibility and cost control. The chosen structure must strike a delicate balance—protecting the owner's interests from potential liabilities and delays, while ensuring that the project remains agile and responsive to market dynamics and technological advancements. Careful consideration of contractual frameworks, stakeholder roles, and risk-sharing mechanisms is critical to achieving these objectives.

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FORCE MAJEURE CLAUSES

The COVID-19 pandemic demonstrated the impact that force majeure events can have on large construction projects. Semiconductor plant construction involves global supply chains and transportation networks, both of which can be disrupted by unforeseen events like pandemics, natural disasters, or geopolitical tensions.

Force majeure clauses in construction contracts can help protect the parties from liability for delays caused by such uncontrollable events. However, the language of these clauses must be carefully negotiated to ensure that they are broad enough to cover all potential risks but also narrowly defined to prevent misuse.

LIABILITY FOR DEFECTS AND DELAYS

A significant source of legal disputes in semiconductor construction projects arises from the allocation of liability for defects in design or construction. Given the highly specialized nature of semiconductor manufacturing facilities, even minor defects in the building infrastructure or equipment can disrupt critical operations, resulting in substantial financial losses.

To effectively manage this risk, it is essential that contracts comprehensively define warranties, performance guarantees, and clear procedures for addressing defects or delays. Particularly in the context of semiconductor projects, where precision is paramount, construction agreements must impose detailed obligations on contractors regarding the performance of specialized systems, including clean rooms, air filtration, and temperature control systems. Ensuring these systems meet stringent operational standards is

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vital, and as such, the contracts should specify not only the required performance benchmarks but also the remedies available in the event of non-compliance. These provisions are essential to mitigate potential disputes and safeguard the project's long-term success.

INSURANCE AND BONDING

Due to the significant investment involved in building a semiconductor facility, adequate insurance and bonding are essential to protecting all parties from financial loss in the event of an accident, defect, or unforeseen circumstance. The owner, contractor, and subcontractors must negotiate comprehensive insurance coverage that includes general liability, workers' compensation, builder's risk, and product liability insurance. These projects typically will incorporate substantial OCIP.

In addition, bonding requirements are common in large construction projects to ensure that contractors complete the work according to the terms of the contract. A well-structured bonding agreement can help mitigate the risk of financial failure, especially in projects as capital-intensive as semiconductor manufacturing plants.

Intellectual Property and Technology Considerations

Semiconductor manufacturing is an extremely technology-driven industry, and as such, the protection of intellectual property (IP) is a critical concern throughout the project's duration. Ensuring that IP rights are clearly defined and protected in construction and procurement contracts is essential to preventing disputes and preserving the competitive advantage of the manufacturing processes.

TECHNOLOGY TRANSFER AND LICENSING

For semiconductor companies, transferring proprietary technology to construction contractors and equipment suppliers can create potential IP risks. Contracts should include provisions that protect the company's technology and ensure that any technology transfer is appropriately licensed, documented, and protected.

IP INFRINGEMENT AND LIABILITIES

Another potential IP risk is the possibility of patent infringement, particularly in the design and construction of specialized manufacturing equipment. Construction contracts should contain clear provisions addressing potential IP infringement and the indemnification of the parties involved in the project if an infringement arises.

Conclusion

Developing and constructing large semiconductor manufacturing plants in the United States is a highly complex process that involves numerous legal and contractual challenges. From navigating environmental regulations and zoning laws to addressing supply chain disruptions and allocating risks among contractors, the legal landscape of semiconductor project development is multifaceted. The challenges are compounded by the technological complexity of these facilities, which require sophisticated equipment and highly specialized labor.

To successfully navigate these challenges, semiconductor companies must engage experienced legal advisors, carefully select procurement methods, and negotiate contracts that allocate risks appropriately. Effective risk management, comprehensive insurance, and clear IP protections are also critical to ensuring the success of these large-scale projects. As the U.S. government continues to invest in bolstering domestic semiconductor manufacturing, it is likely that we will see further evolution in the legal frameworks and contractual practices governing these critical facilities.



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