

Advanced Manufacturing Update

April 2026

Advanced Manufacturing Overview

A brief history of manufacturing

Industry 1.0
Steam power

Industry 2.0
Electrification

Industry 3.0
Automation and IT

Industry 4.0
Cloud AI and Robotization

First factories with industrial machines

Industrial revolution | Rail



1784

Economies of scale and mass production

Fordism | Workers unions | Big factories



1870

Offshoring and Global Supply Chains

Rise of Asia/WTO | Automation | Just in time



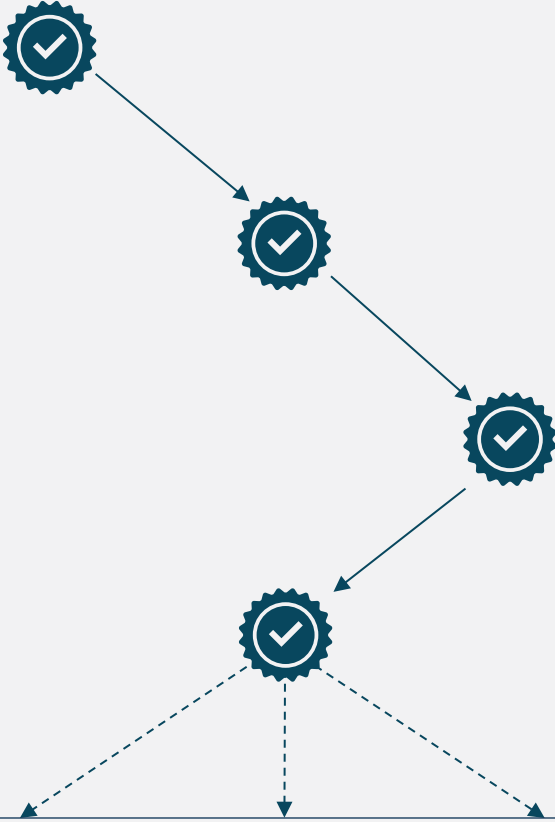
1969

Regionalized manufacturing

China plus one | Tariffs | Geopolitics | ESG

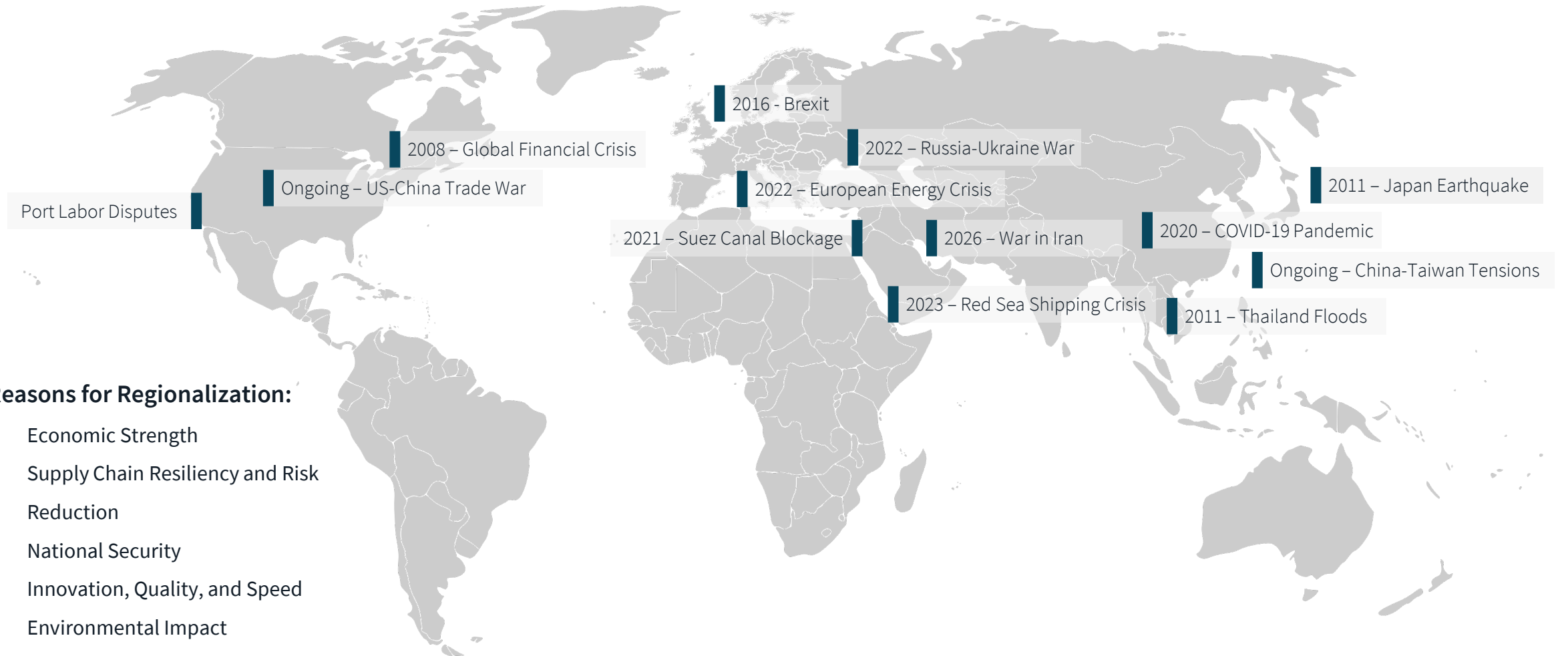


Present



What do we observe and what's next?

Manufacturing is susceptible to global shocks; regionalization is a strategy



Manufacturing is returning, but the headlines miss the full story

THE WALL STREET JOURNAL.

ECONOMY

Trump Pledged to Bring Back Manufacturing. The Sector Is Sputtering.

Uncertainty about tariffs and consumer spending continues to weigh on manufacturers

By [Chao Deng](#) and [John Keilman](#)
Aug. 6, 2025 9:00 pm ET

OPINION REVIEW & OUTLOOK

Where Are Those Manufacturing Jobs?

The jobs market is so-so, but tariffs are hurting domestic companies that make things.

By The Editorial Board
Dec. 16, 2025 5:48 pm ET

FINANCIAL TIMES

Opinion **Free Lunch**

Nostalgia for manufacturing will make the US poorer

Donald Trump's vision to onshore factory jobs reverses decades of progress

The New York Times

OPINION
GUEST ESSAY

Manufacturing Jobs Are Never Coming Back

June 6, 2025

The Economist

Finance & economics | Building gloom

America's missing manufacturing renaissance

Donald Trump's tariffs have hurt the factories they were meant to protect

The Guardian

US

Analysis

US fixation on the hard-hat economy and making manufacturing great again makes little sense

Eduardo Porter

The dream of greasy overalls is driven by nostalgia and doesn't justify policies that harm US consumers

The world must escape the manufacturing delusion

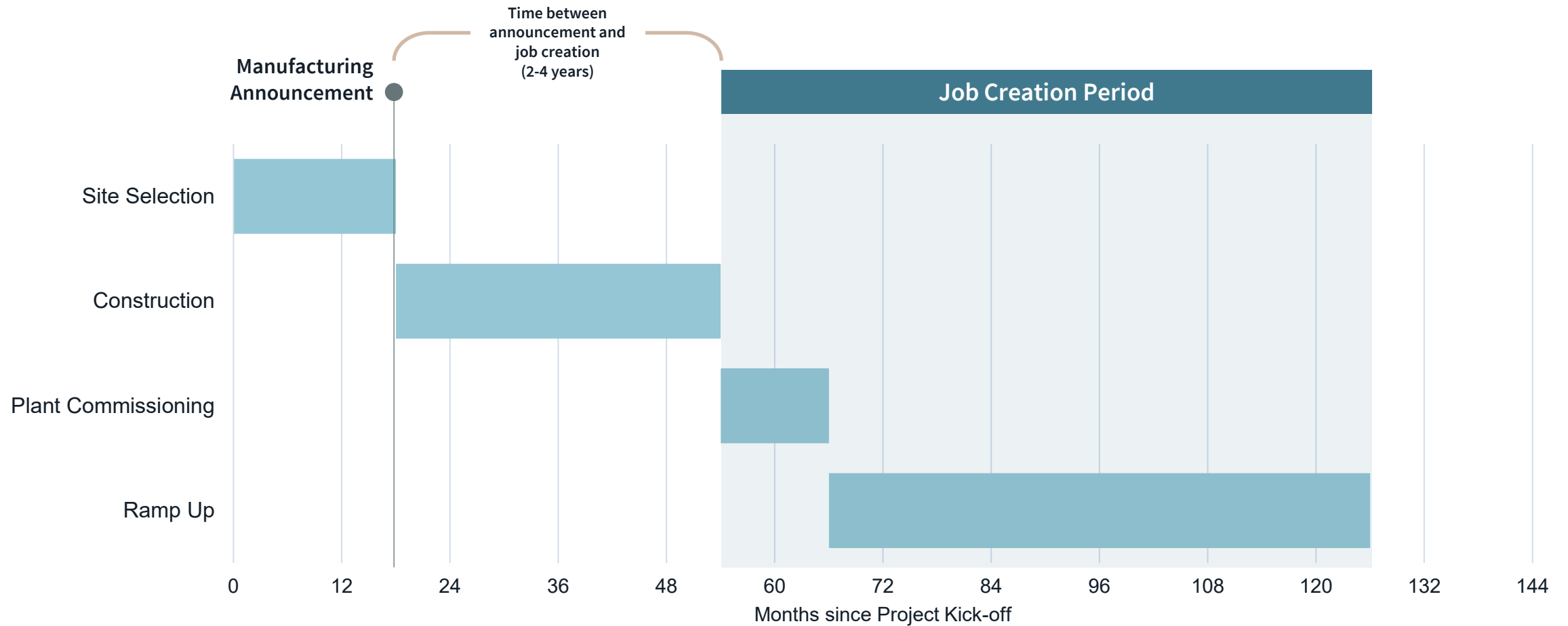
Leaders | Factory fever
Governments' obsession with factories is built on myths—and will be self-defeating

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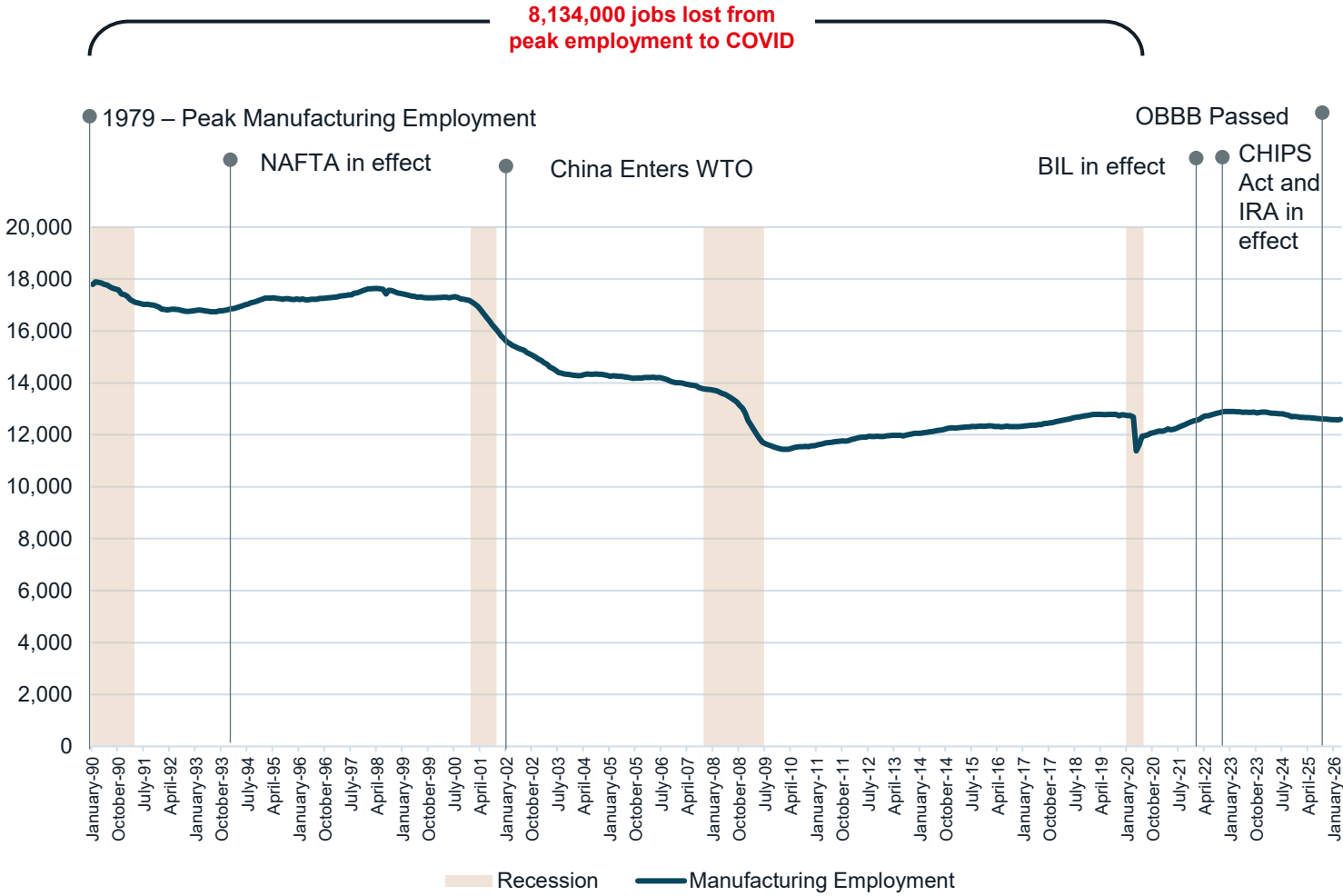
Job creation may take up to 4 years after project announcements

Example Timeline of Typical Large-Scale Site Selection Project



Even as the active sector transitions, most projects are still going forward.

Manufacturing Employment (In Thousands)



215 EV, Battery and Automotive

90 Life Sciences

86 Semiconductor/Tech

81 Energy

42 Aerospace & Defense

196 Other

710 Announcements since 2016

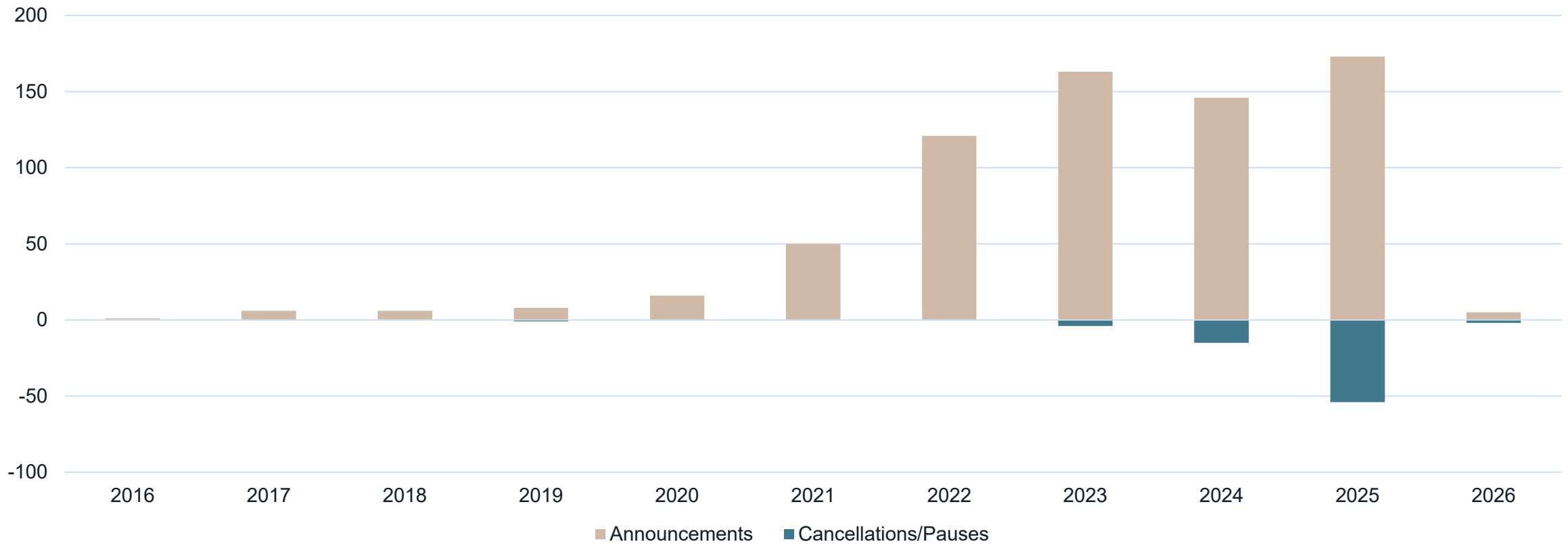
76 Cancelled Projects

Source: Bureau of Labor Statistics. JLL Research



While some battery and EV projects have been cancelled or paused, announcements continue to outpace cancellations

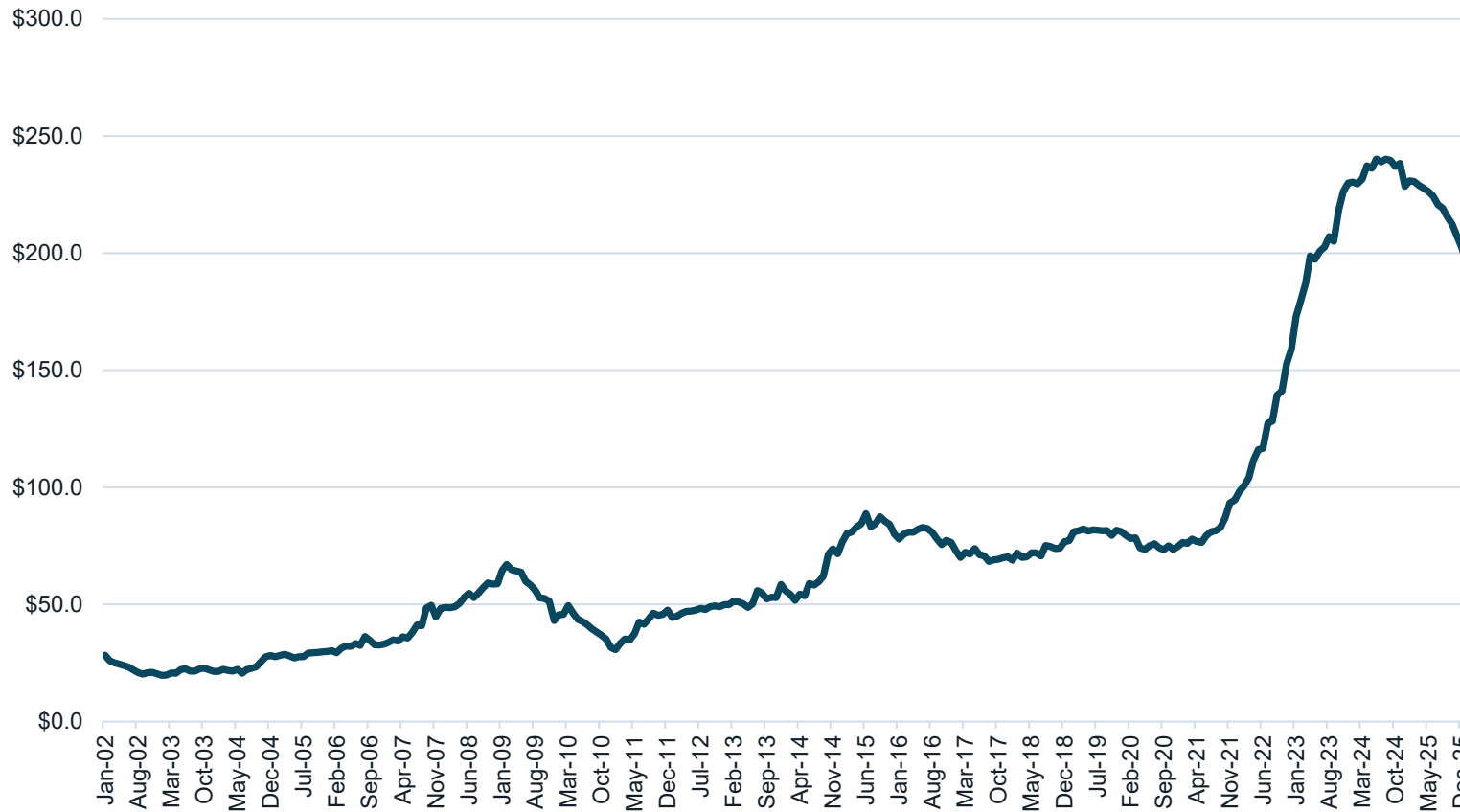
Manufacturing Announcements and Cancellations/Pauses by Year



Clean energy investments wind down as defense-related manufacturing spending it poised to accelerate.

Total Construction Spending: Manufacturing in the United States

(Seasonally Adjusted Annual Rate)



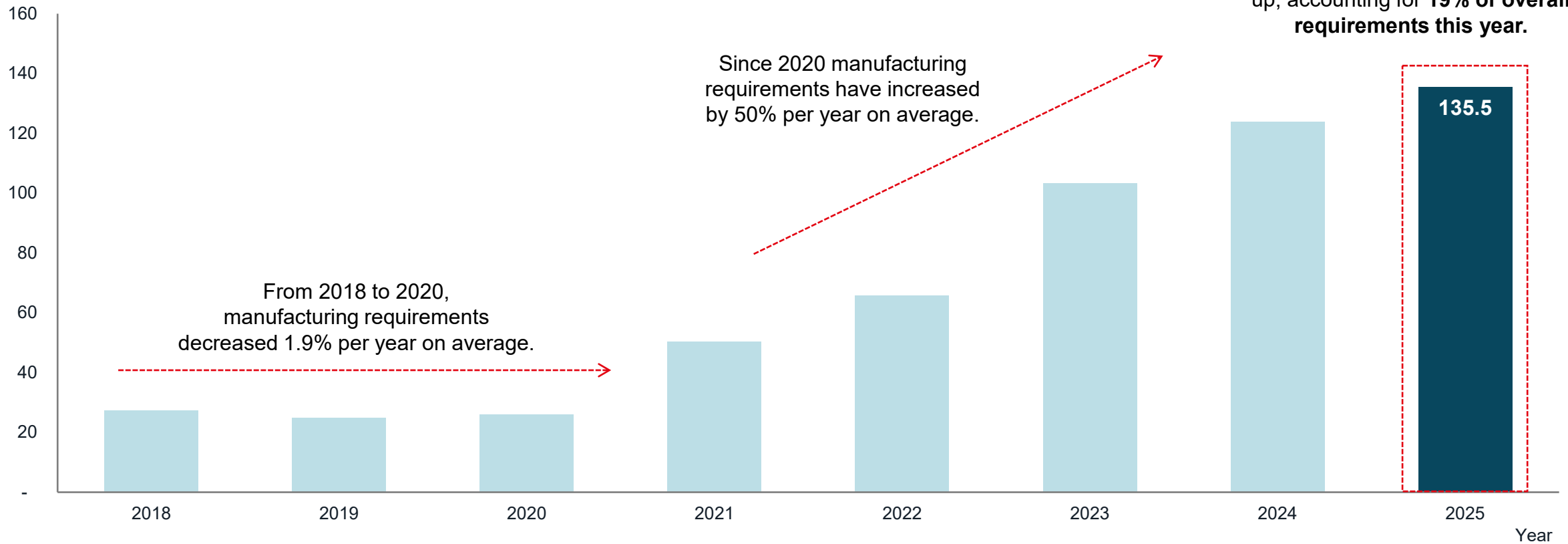
Source: Bureau of Labor Statistics. JLL Research

Key Factors at Play:

- **Clean energy funding squeeze** – Biden-era CHIPS/IRA pullbacks and venture capital constraints forcing project cancellations and delays across battery, EV, and renewable sectors.
- **Construction cycle maturation** – Successful clean energy and semiconductor projects completing construction phases and transitioning to production, naturally reducing active construction spending.
- **Tariff policy paralysis** – Trade uncertainty freezing new manufacturing investment decisions across sectors.
- **Sectoral transition gap** – Investment focus shifting from clean energy to aerospace and defense, but new projects are still in site selection phase; mirroring the 2020 clean tech timeline lag between announcements and groundbreaking.
- **Pipeline rebuilding** – Aerospace and defense announcements expected to accelerate throughout the year, with construction starts following 12-18 months behind as projects move through site selections.

Manufacturing real estate requirements have increased by 419% percent since 2020.







Square footage (in million s.f.)



Note: JLL's Industrial Tenant Demand Study is a survey of demand requirements across over 60+ JLL markets across the U.S.

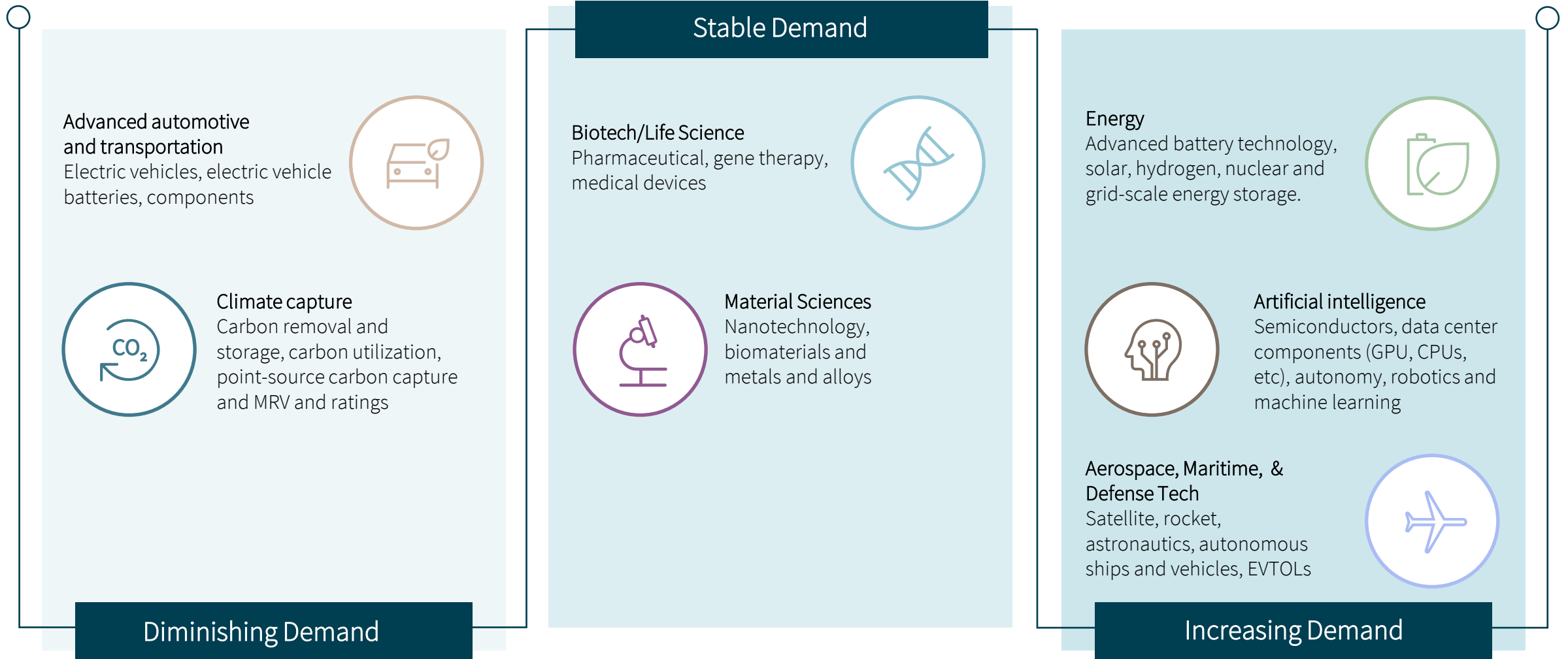
Source: JLL Research, 2025-2026 Industrial Tenant Demand Study

Manufacturing trends continue to evolve

	2020-2024	2025, 2026, and Beyond
 Economic themes	Bidenomics, green revolution, restrained globalism	<p><i>Strategic Regionalization</i></p> <p>▶ Supply chain fragility exposed, geopolitical risk returns, national security, AI-enabled reshoring of strategic industries, and a focus on total cost over unit cost.</p>
 Growth industries	Semiconductor, Clean Energy, Battery and EV	<p><i>All Energy, AI Hardware (semiconductor), Robotics, & Aerospace and Defense</i></p> <p>▶ Growth and reshoring of high-value and strategic industries</p>
 Site preference	Brownfield	<p><i>Greenfield or Spec-to-suit availabilities</i></p> <p>▶ Available brownfields are increasingly challenging - functionally constrained sites that require substantial remediation or infrastructure investment. Recent plant closures and project cancellations may provide access to higher-quality brownfield opportunities</p>
 Power	Enough for everyone. Upgrades would take two years or less.	<p><i>Direct competition with data centers and other manufacturers.</i></p> <p>▶ Competition is intensifying for industrial buildings with adequate power. Utility upgrade timelines are extending nationally as manufacturers must prove out power demand, with projects requiring 10MW or more facing timelines up to 8 years.</p>
 Labor	Low-cost geographies with sufficient labor	<p><i>Prioritizing quality of life for highly-skilled roles and upskilling opportunities for technician labor.</i></p> <p>▶ Talent shortages are forever problems. Robotics and automation unlocks new opportunities for lower-skilled labor beyond traditional trades.</p>
 Incentives	Pursue state, local, and federal to receive anything available	<p><i>Incentives will never make a bad location a good one</i></p> <p>▶ Stringent restrictions with federal incentives and limited desirable states and counties mean the offerings may not align with operational strategies.</p>

Source: JLL Research

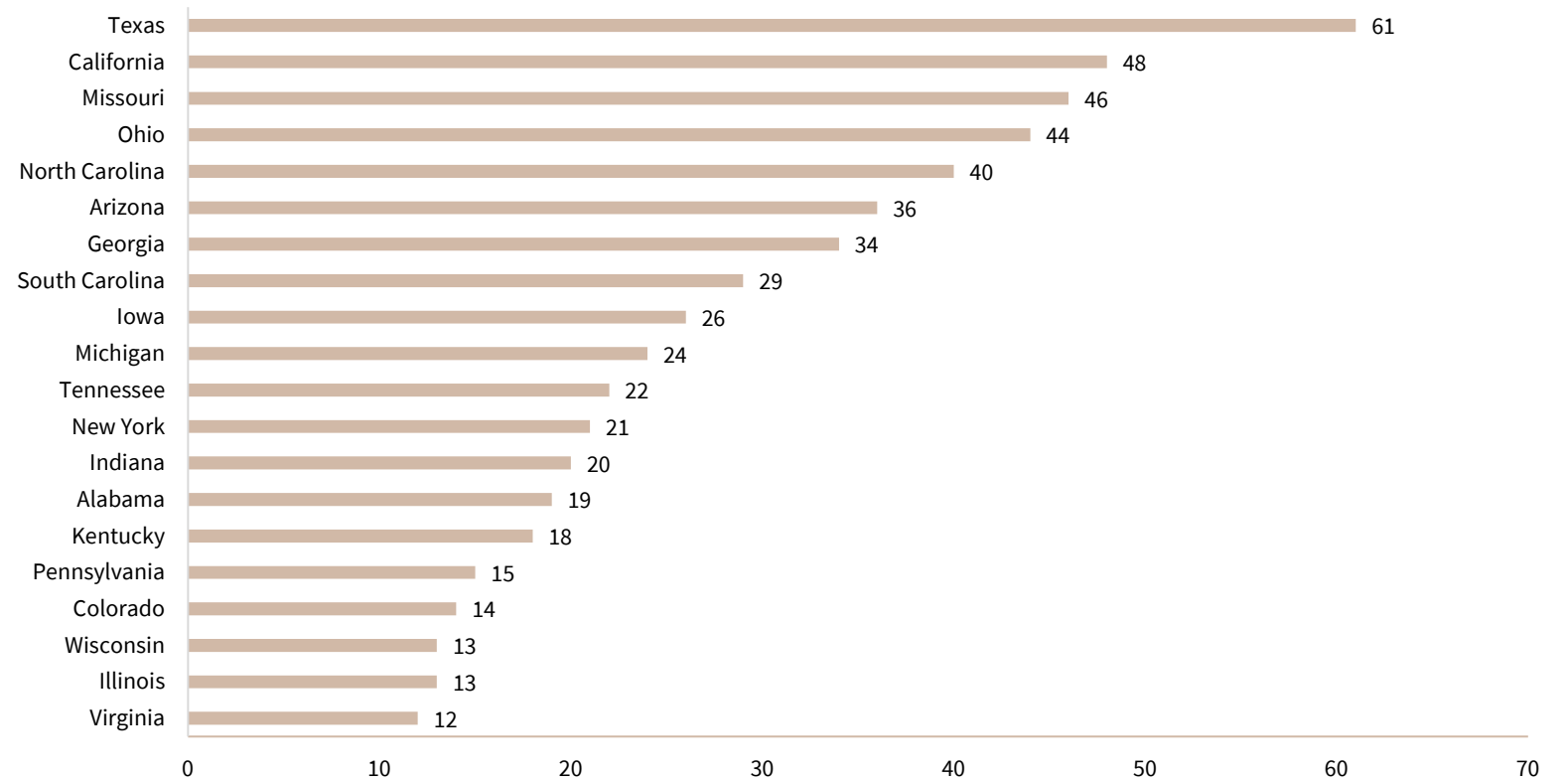
DOE to DOW: shifting priorities impacting demand



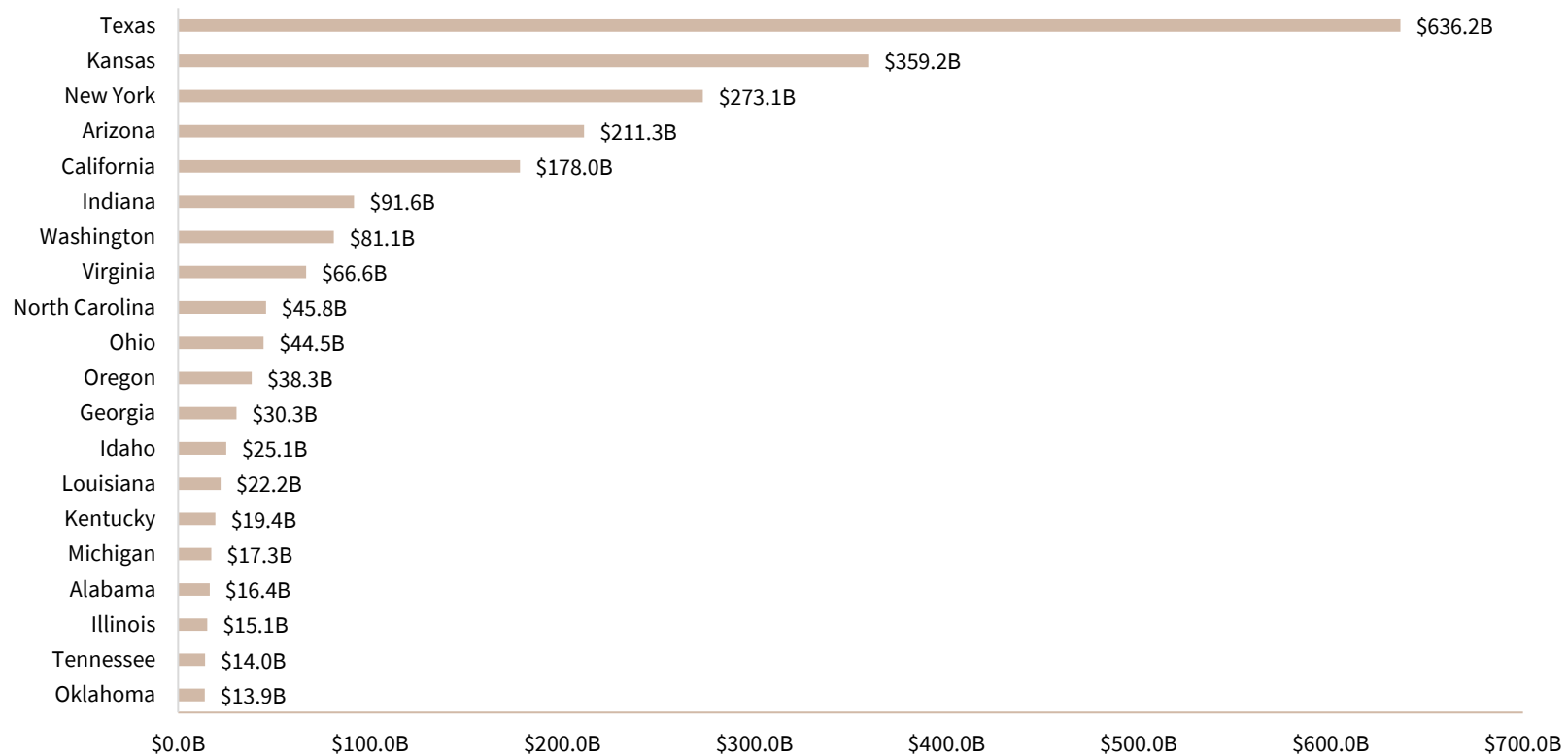
Source: JLL Research



States leading the manufacturing renaissance based on recent announcements in the U.S



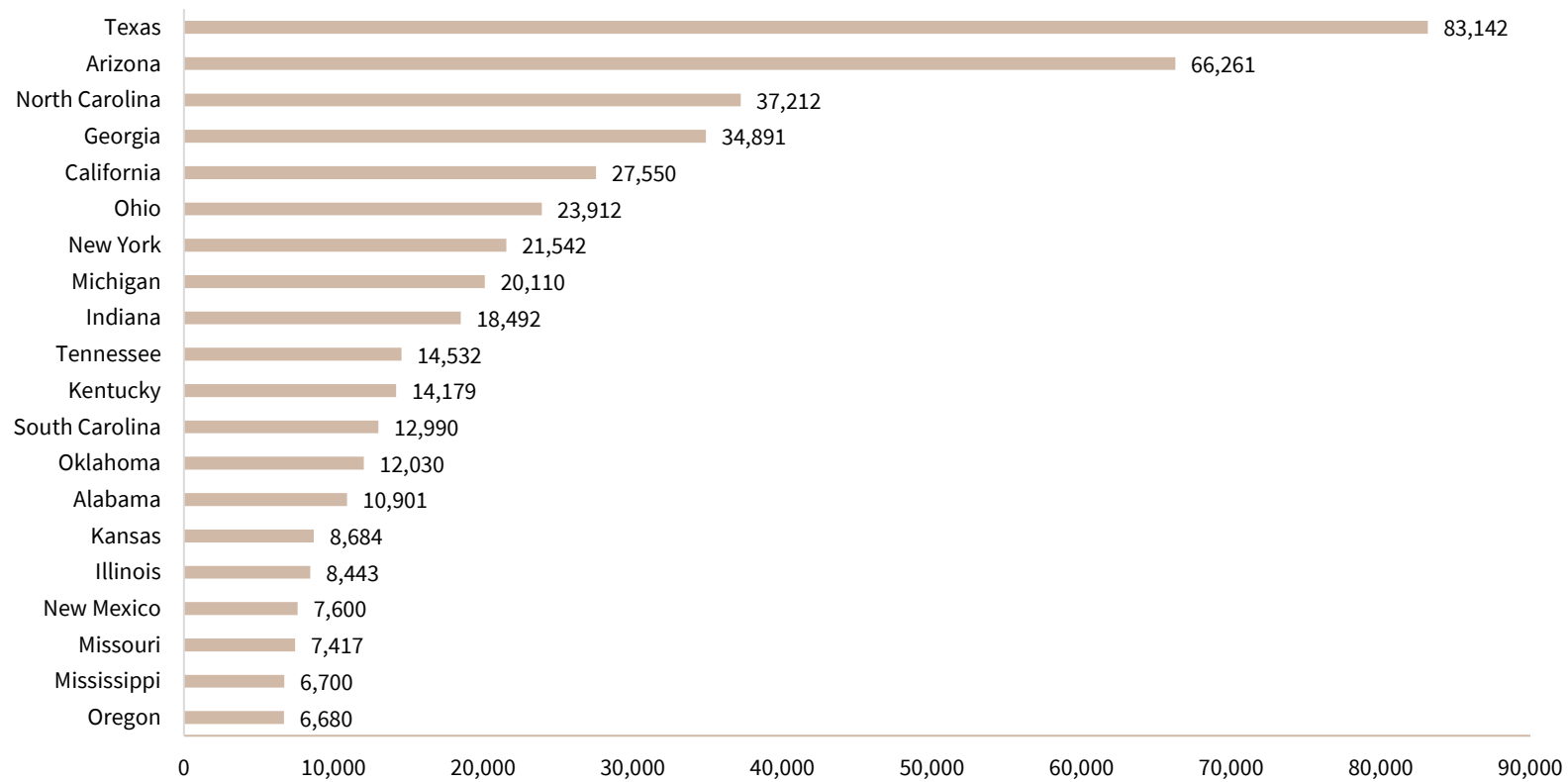
State-by-State powerhouses: manufacturing's investment from recent announcements



Source: JLL Research, Data based on top states, 4/2026



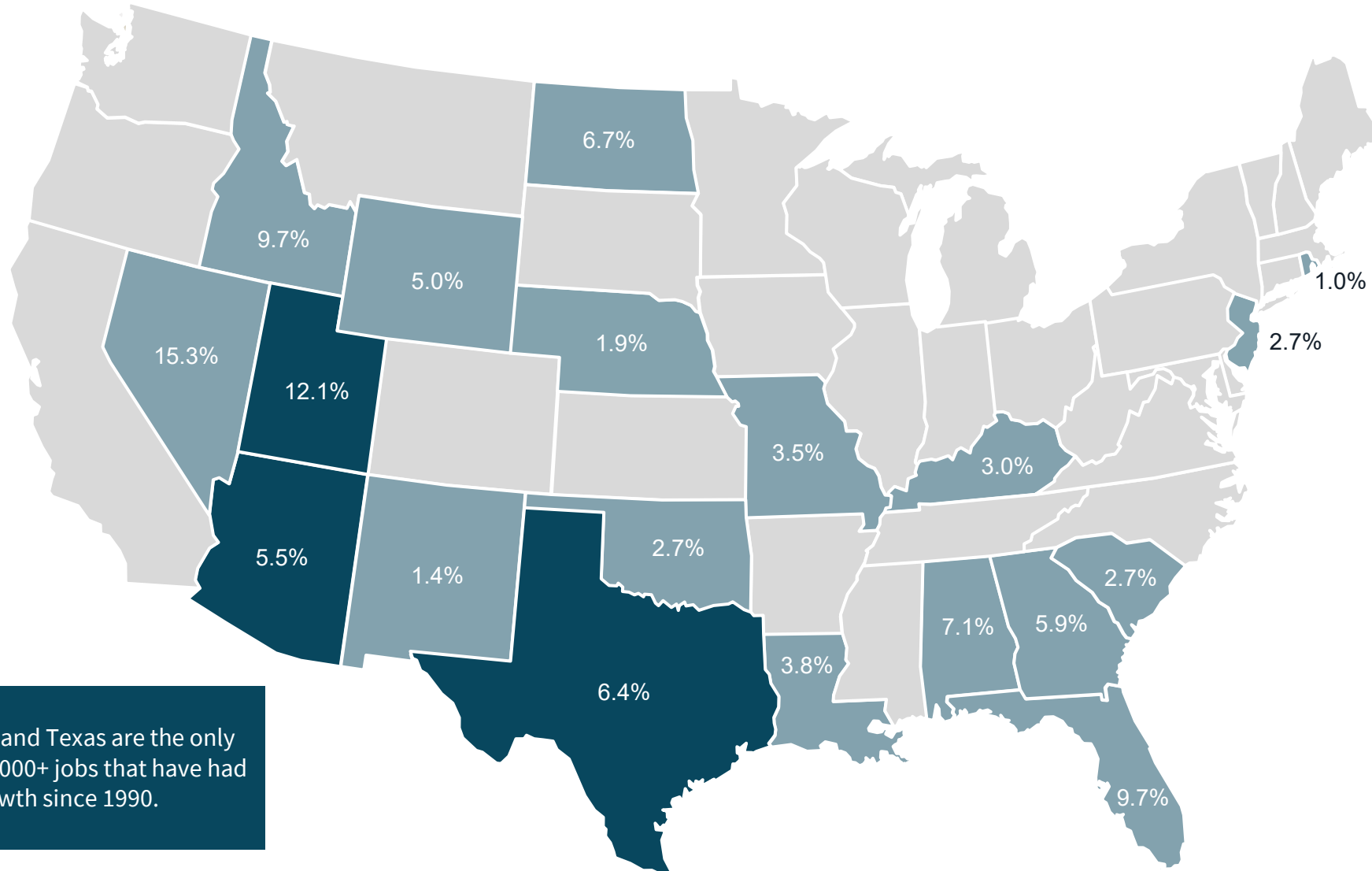
State-by-State powerhouses: manufacturing's job creation from recent announcements



Source: JLL Research, Data based on top states, 4/2026

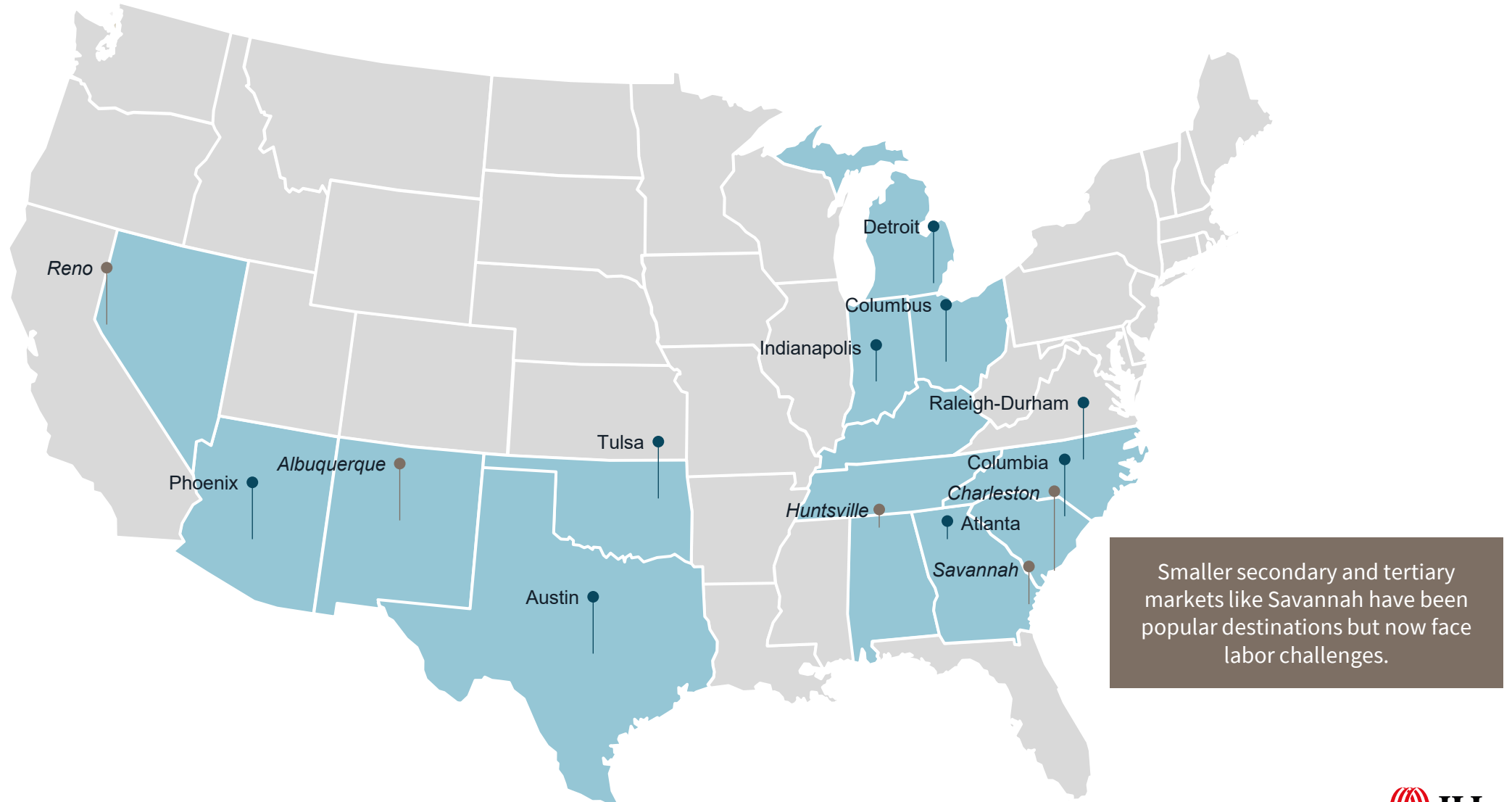


Twenty-three states have had positive manufacturing job growth since 2020.

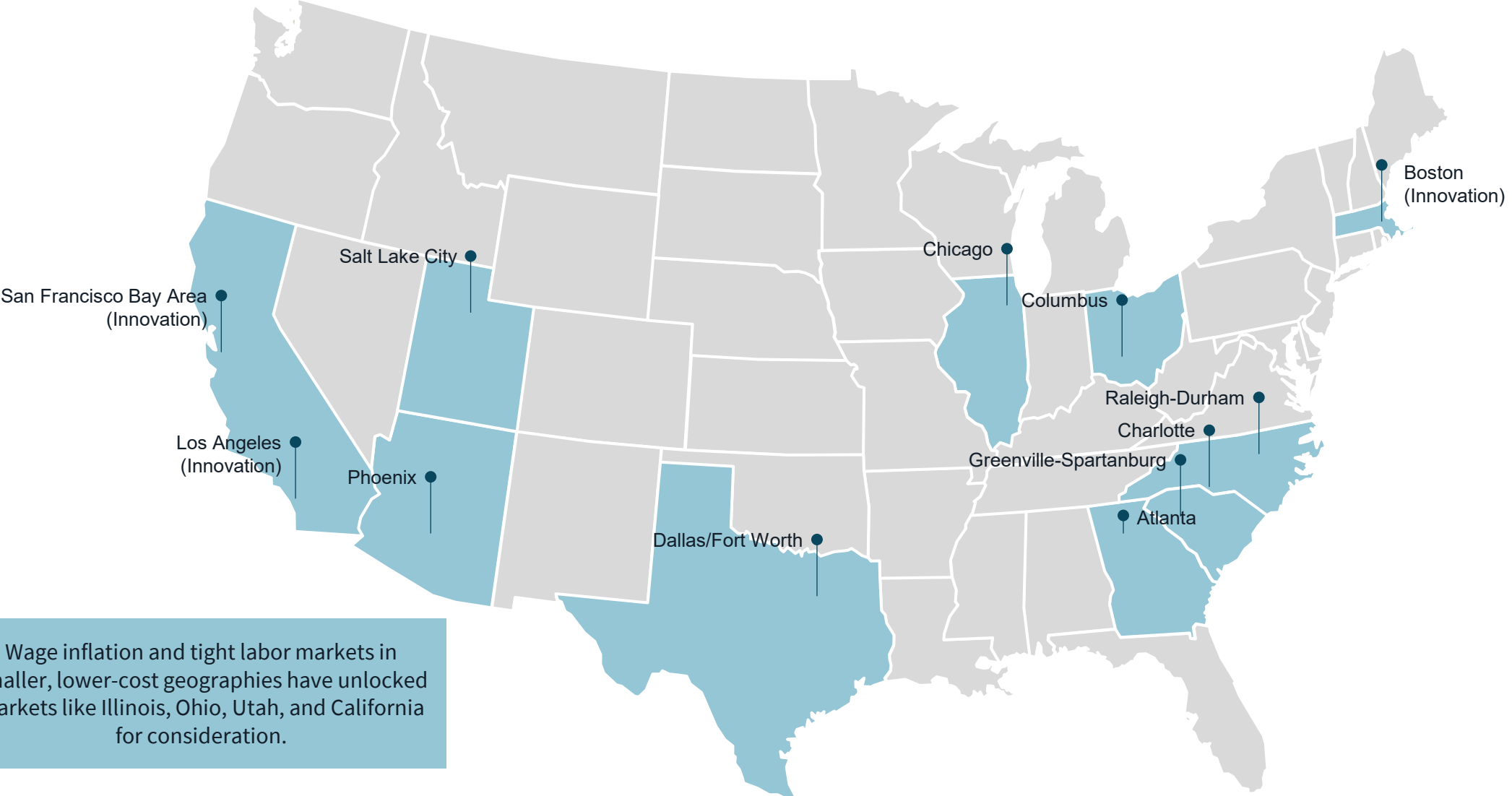


Utah, Arizona, and Texas are the only states with 150,000+ jobs that have had job growth since 1990.

The South, Southwest, and Midwest led early manufacturing investment



Manufacturers now prioritize labor and real estate quality over cost alone



Wage inflation and tight labor markets in smaller, lower-cost geographies have unlocked markets like Illinois, Ohio, Utah, and California for consideration.

The manufacturing priorities remain the same

1

People

Skilled labor in a tight labor market



2

Place

Suitable land and business friendly environments



3

Power

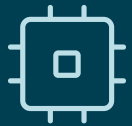
Strained grid utility access challenges



Source: JLL Research

Advanced Manufacturing Building Characteristics

Definition of advanced manufacturing



Advanced manufacturing is the use of innovative technology to improve products or processes, with the relevant technology being described as advanced, innovative, or cutting edge. Advanced manufacturing increasingly integrates new innovative technologies in both products and processes



What does this mean?

Any industrial building with the proper infrastructure can be an advanced manufacturing building



Which one of these is an advanced manufacturing building?

Building 1



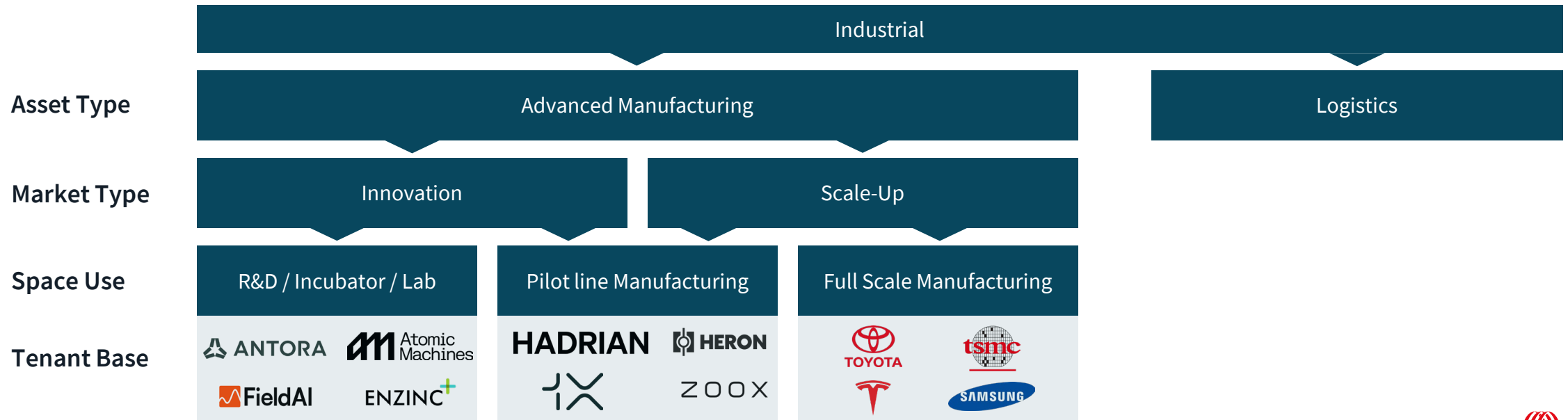
Building 2





What is an advanced manufacturing building?

As a horizontal, advanced manufacturing buildings don't necessarily fit into well-defined categories. Manufacturers are increasingly utilizing modern logistics facilities for their operations, effectively blurring the lines between property type designations. For production processes without highly-specialized physical requirements, manufacturers are afforded speed to market and cost savings by fitting their operations within a standard industrial shell. That said, building for flexibility with the end user and the type of operation in mind can help position assets to capture as much of the market as possible. Ultimately, advanced manufacturing uses and requirements look different based on the type of market they are in (Innovation and Scale Up) and which stage in their growth process.



Innovation Markets



Innovation markets are dynamic ecosystems where dense concentrations of talent, capital, world-class research, and industry converge. This unique collaboration allows them to pioneer and deploy the next generation of technology at scale.

Rather than simply producing goods, these hubs are dedicated to reinventing how goods are produced. They are centers for advanced research and development that bridge the critical gap between initial concepts and scalable production, often proving out new technologies on pilot lines before they are commercialized.

These markets are often defined by their specialization in key high-tech verticals:

- **Aerospace & Defense:** Los Angeles, San Diego, South Florida
- **Technology (Semiconductors & Robotics):** Bay Area, Phoenix, Boston, Pittsburgh
- **Automotive & Transportation:** Detroit, Austin
- **Life Sciences:** Raleigh-Durham, Boston



Scale-Up Markets

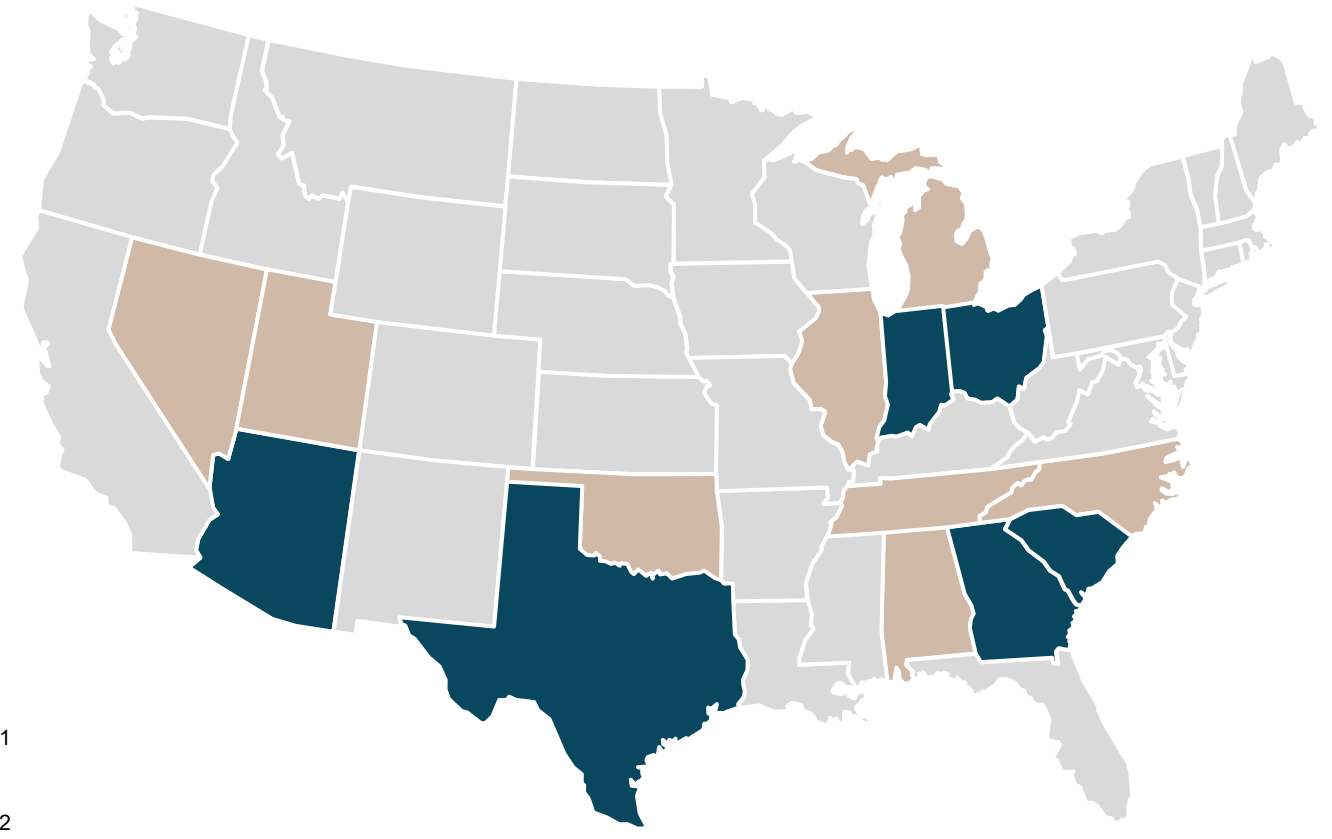


A scale-up manufacturing market is a geographic region optimized for the efficient, high-volume production of a proven product. Unlike innovation hubs focused on R&D, these markets are chosen for their ability to minimize costs, streamline logistics, and deliver finished goods reliably and at scale.

The key is a business ecosystem built for execution. This includes a cost-competitive operating environment, a readily available technical workforce, and world-class supply chain connectivity.

Prime examples of these strategic production hubs are emerging across the country:

- **Electric Vehicle & Battery Production:** The Southeast corridor from Georgia to South Carolina and Tennessee has become the epicenter for gigafactories.
- **Semiconductor Fabrication:** Ohio and Arizona have successfully attracted "mega-fab" projects, leveraging their strengths in infrastructure and government support.
- **Aerospace & Heavy Industry:** The Gulf Coast states, from Alabama to Texas, continue to be go-to locations for large-scale industrial manufacturing due to their logistics and energy advantages.



- Tier 1
- Tier 2

Advanced manufacturing activities within the walls

Despite a modern industrial building resembling a concrete tilt-up structure with a glass-lined office in the corners and dock doors lining the side, there are a diverse array of functions that occur within the walls. In general, an industrial building can be split into three main functions:



Warehouse



Transportation



Manufacturing



Research and development (Innovation)

The initial phase of the prototyping process, where investigation and the tinkering of new products begins. Versatile, open space, consisting of minimal office and the ability to receive/send varying sizes of materials.



Pilot line manufacturing facility

A small-scale manufacturing facility for the purpose of prototyping new products or processes before implementing a full-scale production line. The purpose is to replicate the production process in a controlled environment where engineers can identify possible issues and inefficiencies and make adjustments quickly to minimize risks once scaled for mass production.



Full-scale advanced manufacturing facility

A full-scale facility where goods are produced. These buildings contain a high degree of specialized, cutting-edge equipment and machinery to improve the efficiency and productivity of the production process. In many cases, tall clear heights and spans are necessary to accommodate bulking equipment such as cranes, presses, extruders, pullers, cutting machines, and vats. Equipment could require complex foundations, pits, cranes, special fire protection requirements and extensive utility demands.





cGMP facility


Standing for Current Good Manufacturing Practices, a cGMP facility is designed and operates to FDA regulatory guidelines to ensure pharmaceuticals, foods, and other healthcare products are manufactured for cleanliness, hygiene, quality, and safety. Buildings generally feature extensive mezzanine infrastructure to support cleanroom operations, equipment, and utilities. To maintain environmental control and contamination barriers, the building envelope must achieve exceptional seal-tightness, meaning fewer dock doors and specialized interior finishes.

Advanced manufacturing activities within the walls

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 Warehouse

 Transportation

 Manufacturing

Research and development (Innovation)

Footprint: 5,000 to 50,000	Dock Yes
Jobs: 1/250	Clear height: 18'-24'
CapEx: \$50-\$100 per	

Pilot line manufacturing facility

Footprint: 20,000 to 100,000	Dock Yes
Jobs: 1/400 to 1/1,500	Clear height: 18'-36'
CapEx: \$75-\$150 per	

Full-scale advanced manufacturing facility

Footprint: 100,000 to 1,000,000+	Dock Yes
Jobs: 1/250	Clear height: 36'
CapEx: \$50-\$100 per	

cGMP facility

Footprint: 100,000 to 500,000+	Dock Yes
Jobs: 1/500 to 1/1,600	Clear height: Varying
CapEx: \$200-\$1000 per	

Building for flexibility



	Innovation	Advanced manufacturing	Warehouse/distribution
Typical build-out	33% Warehouse/manufacturing 33% Office 33% Lab	60% Manufacturing 30% Warehouse 10% Office	95-97% Warehouse 3-5% Office
Power	At least 800 amps per 20,000 More is better	Minimum 4,000 amps per 100,000 More is better with ability to expand	Minimum 4,000 amps per 500,000 with ability to expand
Auto parking	1/1000	1.5/1000 Ability to super park to 2/1000 using truck courts	1/1000
Trailer parking	None	None Assigned trailer parking would be redesignated as auto parking or other yard needs	Market dependent Rule of thumb is 1 per dock door over 200,000
Clear height	18'-32'	32'-36'	36'-42'+
Sprinklers	Standard	ER	ER
Level of finish	Spec	Warm Shell – Base light package, spec office	Shell – Base light package, full dock package on every other door, spec office
Term	5-7 years	10 years	3-7 years

Use table by vertical

Category	Advanced transportation	Energy	Robotics and industrial automation	Advanced aerospace and defense	Built environment	Logistics
Building sizes ()	50K - 500K	50K - 400K	50K - 500K	50K - 500K	100K – 500K	50K – 1M
Clear height (ft)	32'+	32'+	32'+	32'+	32'+	36'+
Dock door ratio	1 per 10K	1 per 15K	1 per 15K	1 per 15K	1 per 10K	1 per 5K
Access to rail	Moderate need	Low need	Low need	Moderate need	High need	Medium need
Auto parking per of building	1.5:1000	0.5-1:1000	1.5:1000	1.5:1000	1.5-2:1000	0.6-1.2:1000
Yard needs	Trailer storage for larger buildings	Staging and equipment	Staging and equipment	Test tracks; security	Secure perimeter. Staging, outdoor yard	Yes
Utility needs	Higher power	Heavy power, water	Heavy power	Heavy power	High security	Baseline
Power requirements amps or MW	8,000-12,000 amps	10-20 MW	8,000-12,000 amps	8,000-12,000 amps	8,000-12,000 amps	4,000-8,000 amps
Clear span requirements	Moderate	Large	Moderate	Large	Moderate	Moderate

Use table by specific example (inc. Megasite)

Category	Semiconductor manufacturing	Pharmaceutical production	E-commerce fulfillment centers	Biotechnology labs	Food processing plants
Building sizes (')	200K – 4M	100K – 500K	200K – 1M	50K – 200K	50K – 500K
Clear height (ft)	40'	40'	40'-55'	40'	40'
Dock door ratio	1 per 20K	1 per 20K	1 per 5K	1 per 15K	1 per 20K
Access to rail	Moderate Need	Low Need	Low Need	Low Need	Moderate Need
Auto parking per of building	1:1000	1:1000	1.5:1000	1:1000	1:1000
Yard needs	Trailer storage for larger buildings	Trailer storage for larger buildings	Trailer storage for larger buildings	Staging	Secure perimeter
Utility needs	Heavy power, Water	Water	Baseline	Standard to high power	Heavy power
Power requirements amps or MW	75-200 MW	8,000-12,000 amps	8,000 amps	8,000-12,000 amps	10 MW
Peak water requirements (Gallons per day)	1.7M – 10M for Fab 5,000 for PCB (pilot) Insignificant for PCBA	80,000 for Fill and Finish Up to 158,000	Insignificant	Insignificant	150,000 – 340,000
Clear span requirements	Moderate	Moderate	Moderate	Moderate	Moderate

Use table by specific example (inc. Megasite)

Category	Automotive assembly manufacturing	Energy storage systems manufacturing	Battery cell manufacturing	Heavy manufacturing (e.g. Aluminium smelting, copper foil production, etc)	Solar manufacturing (ingot/wafer/cell)
Building sizes (')	2M - 9M	350K - 1M	2M - 7M	1M - 1.5M	400K - 1M
Clear height (ft)	40'-60'	40'	40'-60'	60-100'	40'-80'
Dock door ratio	Varies	Varies	1 per 175K	N/A	Varies
Access to rail	High Need	Medium Need	Low Need	High Need	Medium Need
Auto parking per of building	0.5-1:1000	0.5-1:1000	0.5-1:1000	Highly Variable	0.5-1:1000
Yard needs	Secure perimeter	Secure perimeter	Secure perimeter	Secure perimeter	Secure perimeter. Staging and equipment
Utility needs	Heavy power	Heavy power	Heavy power, Natural Gas, Steam	Heavy power, Natural Gas, Steam	Heavy power. Water
Power requirements amps or MW	50 MW	7-20 MW	220 – 270 MW	Up to 90-900 MW	115 MW
Peak water requirements (Gallons per day)	500,000 – 1M without paint 700,000 – 1.2M with paint	Insignificant	900,000 – 2.1M for Cell 700,000 – 800,000 for Battery Pack and Module 233,500 – 1.5M for Battery Recycling	2,849 for Copper Foil 1,930 for Hydrogen Electrolyzer 142,000 for Nuclear Fuel Recycling 22,442 for SMR Fabrication	19M for Ingot 10M for Wafer 450,000 – 580,000 for Cell
Clear span requirements	Moderate	Large	Moderate	Large	Moderate

Frequently Asked Questions (FAQ's)

Ft²

Building specifications

What are the minimum square footage requirements?

Innovation Markets require 20,000+ while Scale-Up Markets require 100,000+ .

What are the fiber and telecommunications requirements?

Buildings must have fiber optic access to dual service providers.

What column spacing is required?

Column spacing should be minimum 50-56' x 50', with no less than 50' x 50' acceptable.

What is the minimum clear height requirement?

Buildings must have a minimum clear height of 32'.

What type of wall construction is preferred?

Concrete Tilt Up construction is preferred. Plan for window knockouts in the tilt wall design along end walls and near entry locations for natural light when clients install large offices.

What roof specifications are required?

60 mil TPO roofing is standard. Plan for solar and HVAC loads in the design.

What are the maximum building depth limits?

Building depth should be no deeper than 300 feet.

What is the floor load capacity requirement?

Variable. Typical specs are 6" for 32' clear height and 7" for 36' clear height. Some manufacturers may require 8"+ reinforced slab for equipment, although most users will tear out slab and reinforce according to their needs.

Frequently Asked Questions (FAQ's)



Infrastructure requirements

What are the power requirements?

Minimum 4,000 amps per 100K is required. Factor in future HVAC load as available power is reduced once HVAC is added. Plan for larger starting capacity or pre-install additional service entrances with primary feed conduits and tranormer pads. One minimum service with the ability to expand is expected. For larger buildings, two services are common.

What are the water requirements?

Access to a large water main nearby is preferred, with a goal of 10" diameter or larger near the site. For extreme water users, diameters of 16" or larger would be preferred. The concern is typically fire-related rather than process-related.

What about waste water requirements?

Most manufacturers install their own pre-treatment systems. Install multiple sanitary lines in the building to allow proximity during build out, typically one on each side of the building (North and South bays).

What are the slab specifications?

Variable. Typical specs are 6" for 32' clear height and 7" for 36' clear height. An 8" reinforced slab can provide flexibility for improved load capacity while appealing to more users; however, users with heavy equipment or mezzanine structure requirements will reinforce as needed with new foundations. Some buildings targeting biomanufacturing clients will not pour the slab.

Frequently Asked Questions (FAQ's)



Loading and access

How many dock doors are required and what are the specifications?

1 dock door per 10,000 minimum is required, with at least 5 dock doors minimum. Typical size is 9' x 10' with side loading (no cross docks). Use knockout panels or glass line for remaining locations to maintain flexibility for future expansion. Plan for at least two drive-in ramps (one at each end), with most spec buildings having 12' x 14' doors at the ramps.

What truck court depth is needed?

135' minimum for smaller buildings, and 185' minimum for larger buildings

Is excess paved coverage required?

No for innovation markets, but the ability to super park truck courts is needed. Yes for Scale-Up markets.



Office and parking

What are the parking requirements?

1.5 parking spaces per 1,000 .

What office specifications should be included and what percentage of total buildable area?

Spec 5,000 SF with mezzanine capability, but no larger than 10,000 SF. Some markets (like the Bay Area) prefer a two-story office with a glass line overlooking the production area. Many clients want an outdoor break area, so plan for green space near office areas.

Frequently Asked Questions (FAQ's)



Building systems

What HVAC specifications are preferred?

Preference for pre-installed HVAC or "Air Tempering" methods, which combine minimal AC with increased ventilation.

Are there fireproofing or insulation requirements?

None except for roof insulation, which is usually R-19.

What sprinkler system is required?

ESFR (Early Suppression Fast Response) sprinkler systems are required.



Additional features

What specialty items should be considered?

EV charging stations are a plus, LEED certification is recommended, and skylights should comprise at least 2% of the roof area.

What security features are needed?

Buildings should be fenced and secured with separate ingress/egress if demised. Consider including CTPAT compliant areas in the base design, though these can be added fairly easily if not initially included.
