Advanced manufacturing trends

Research

USA

2024

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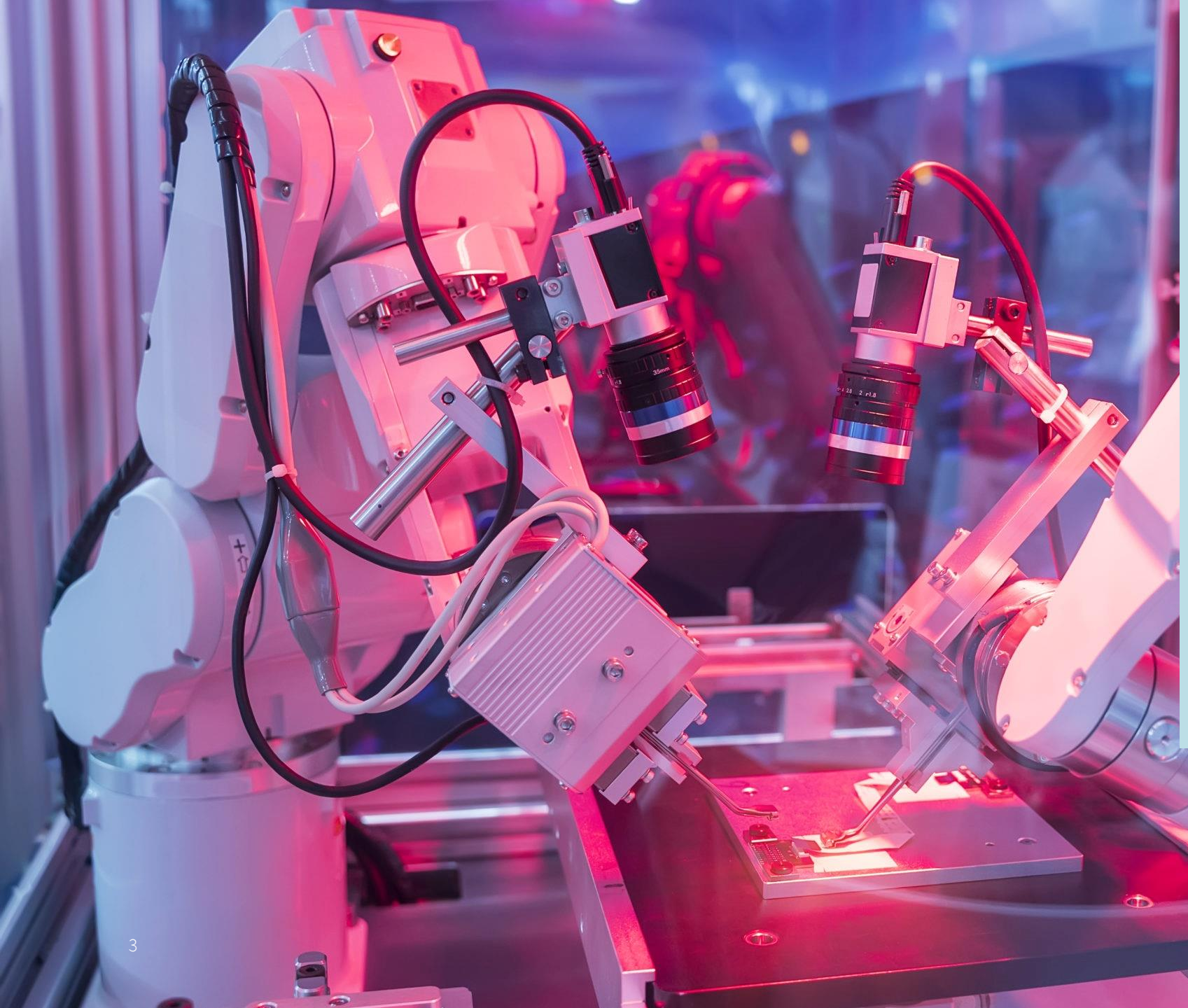
Source: JLL Research



Defining advanced manufacturing

Evolution of manufacturing

Mechanization,
water power, steam power

Mass production,
assembly line, electricity

Computer and automation

Industry 4.0 - Digitization
of additive manufacturing,
AI and advanced software

Today: Advanced manufacturing

The right-shoring of production to innovation and talent clusters with a focus on clean tech initiatives

Source: JLL Research

What is advanced manufacturing?

1

Definition of advanced manufacturing

Advanced manufacturing refers to the application of innovative technologies, processes, and approaches to improve productivity, efficiency, and customization in the manufacturing industry. It involves the integration of advanced technologies such as robotics, automation, artificial intelligence, additive manufacturing (3D printing), Internet of Things (IoT), data analytics, and cloud computing.

2

Advanced manufacturing facility

Advanced Manufacturing facilities contain a high degree of specialized and cutting-edge equipment and machinery to produce goods. Manufacturers are supported by a range of material, tooling, and component suppliers who provide resources need for production. Once produced, finished goods are readied for distribution to customers.

3

Key industries

Overall, advanced manufacturing represents a significant shift in the way products are designed, produced, and delivered, offering manufacturers a competitive edge in today's rapidly evolving market. Industries that typically use advanced manufacturing include; pharmaceutical, life sciences and healthcare, technology (semiconductors), EV, battery and automotive, energy and aviation and aerospace.

Source: JLL Research

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.

The size/scale and skill requirements of the operation will dictate the suitability of a location.

Operating margins will dictate the cost platform requirements.

Source: JLL Research

Key aspects of advanced manufacturing facilities

Powering equipment: Advanced manufacturing facilities often use a range of equipment, including robotics, automation systems, 3D printers, and other advanced machinery that require electrical power to operate. These technologies rely heavily on a stable and sufficient power supply to function effectively.

Energy efficiency: Advanced manufacturing facilities often prioritize energy-efficient technologies to reduce operational costs and environmental impact. This includes using energy management systems, LED lighting, and other energy-efficient solutions that require access to power.

HVAC and ventilation systems: To maintain a comfortable and safe working environment, advanced manufacturing facilities require heating, ventilation, and air conditioning (HVAC) systems. These systems need electricity to regulate temperature, air quality, and airflow within the facility.

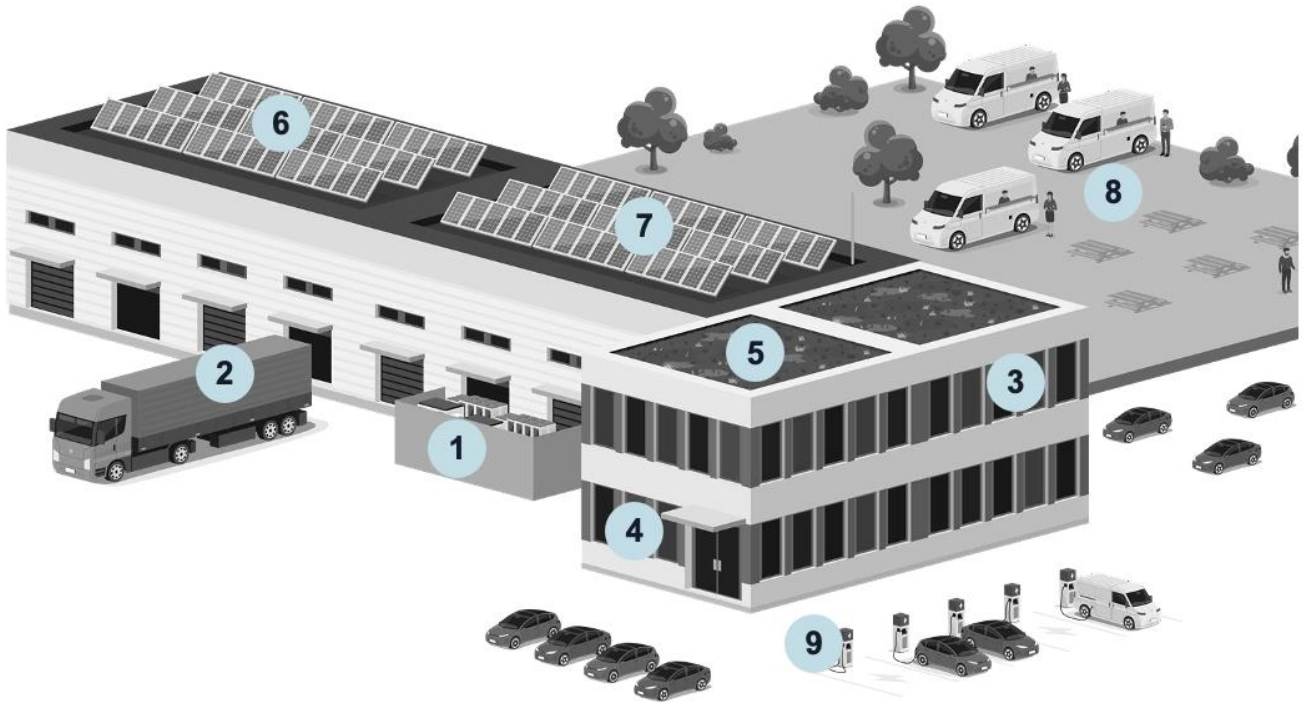
Water and drainage systems: Some advanced manufacturing processes involve the use of water, either for cooling machinery or as part of the manufacturing process itself. These processes require access to water supply and proper drainage systems to manage wastewater.

Chemical lines: Certain advanced manufacturing industries, such as pharmaceutical or chemical manufacturing, may require specialized utility connections for handling and distributing chemicals safely throughout the facility.

Safety systems: Advanced manufacturing facilities often implement various safety systems, including fire detection and suppression systems, emergency lighting, and security systems. These systems rely on electrical power to function and ensure the safety of employees and the facility.

Source: JLL Research

What does this mean for industrial real estate?

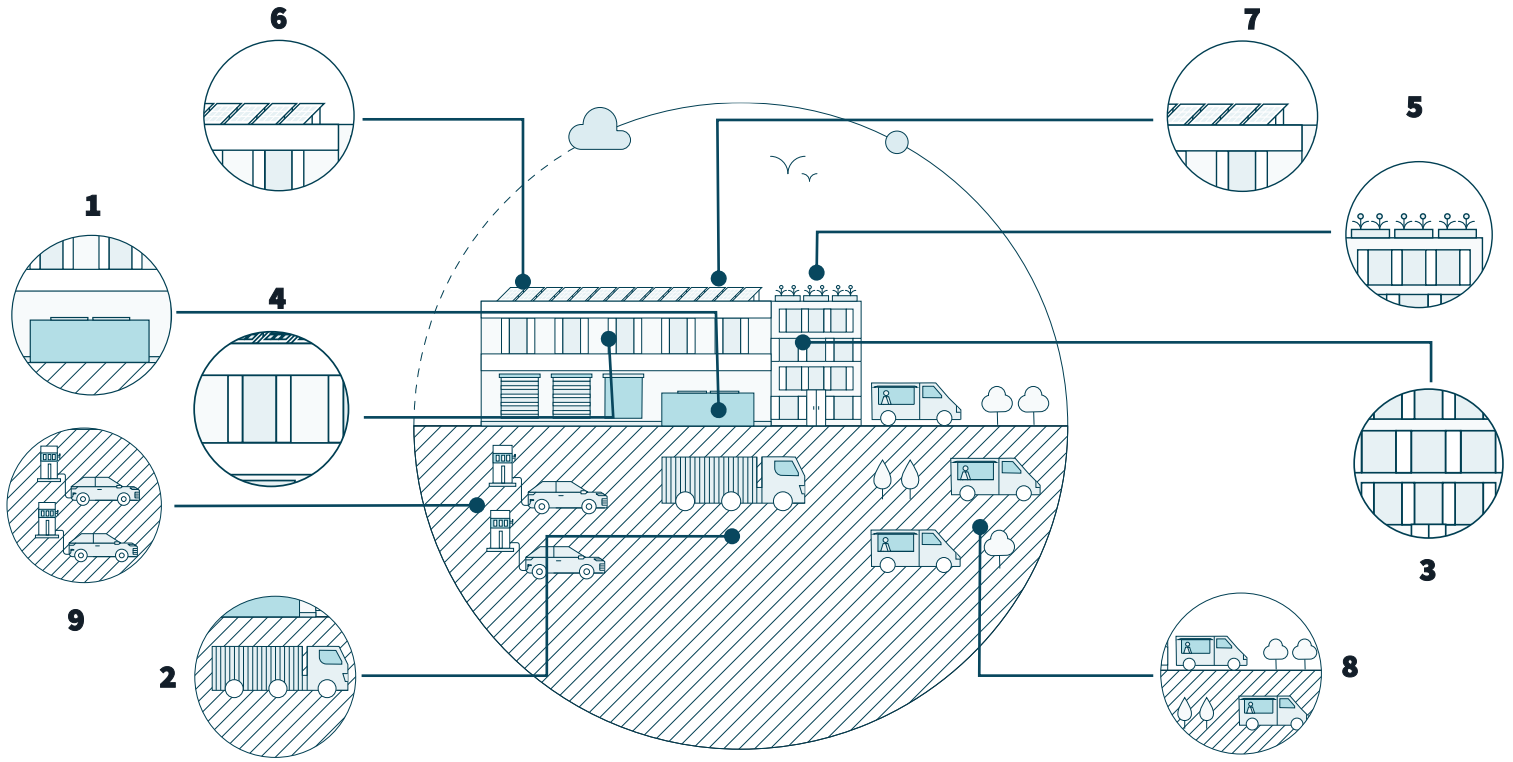


With the right infrastructure any industrial building can be an advanced manufacturing building

1. Equipment pad in dock well
2. Ability to superpark in truck courts
3. Two-story mezzanine office for collaborative work environments
4. High architectural design
5. Class A building attributes
6. Rooftop solar
7. Minimum of 4,000 amps of power without a user
8. Food truck parking area and outdoor dining courtyard
9. EV chargers

Source: JLL Research

What does this mean for industrial real estate?



Any industrial building can be an advanced manufacturing building

1. Equipment pad in dock well
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Source: JLL Research

Building for flexibility

Modern, Class A industrial buildings have the flexibility for both advanced manufacturing and logistics tenants alike. Despite the differences in the completed build-out and use of the space, the industrial buildings designed today as a spec shell can accommodate most tenants.

In addition, there is a focus on ESG policies as companies embark on a mission to decarbonize their operations. Priorities include renewable power, HVAC efficiencies, sustainable materials, EV infrastructure, and employee wellness.

	Advanced manufacturing	Warehouse/distribution
Typical build-out	60% Manufacturing 30% Warehouse 10% Office	95-97% Warehouse 3-5% Office
Power	Minimum 4,000 amps, more is better 2-3x power/sf density of distribution center	Minimum 2,500-3,000 amps, more is better. Rough RoT – 1000 amps per 100 to 200K sf
Auto parking	1.5/1,000 s.f. "As much as possible" Leverage ability to "superpark" in truck courts	1 per 1,200 to 2,000 sf for Warehouse 1.2 to 2 per 1,000 sf for Office
Loading	Roughly 30-50% of distribution reqs Could be required in different sections of building	1 loading dock per 5,000-7,000 s.f.
Trailer parking	None Some or most trailer parking frequently redesignated as auto parking	1 space per 2 dock doors +/- Highly dependent on geometry of site, coverage, and building and truck court depth limitations
Clear height	32'-36'	36'-40'
Sprinklers	ESFR	ESFR
Level of finish	Warm Shell – Base light package, spec office	Warm Shell – Base light package, full dock package on every other door, spec office
Term	10 years	3-7 years

Source: JLL Research

Building for today

Advanced manufacturers, many of them in the life sciences and healthcare vertical, view sustainability as a core value and consider sustainability across their real estate portfolio.

Power

Power availability and reliability are challenging to navigate. Reliable energy storage solutions is top of mind to avoid business disruption. Put simply, resilient and sustainable power solutions attracts tenants, especially those operating in the Bay Area.

Materials

Industrial processes to create building materials are going through a green revolution. Startups focusing on the decarbonization of concrete, cement, aggregates, and steel will provide sustainable alternatives as they scale. In addition, cross-laminated timber is a light-weight, durable alternative to traditional timber that has already seen success in office and multi-family buildings.

Wellness

To attract and retain top talent regardless of labor market cycles, employers must focus on employee wellness in industrial workspaces. The workspace should resonate with the company's mission and values toward sustainability. High identity design, two-story mezzanine offices, and more space dedicated to indoor and outdoor amenities make the workspace feel like a destination.

HVAC

Building out an HVAC system without knowing what sort of tenant will occupy the space is a challenge. It can also be a costly option many landlords are unwilling to take. A sustainable choice can be to build a radiant system when pouring the slab. The system is low energy and provides base load comfort that could then be supplemented with additional cooling units if necessary.

Transportation

Charging infrastructure is key to attracting employees and futureproofing the site. In addition, some local governments are weighing mandates for EV chargers at new construction projects. As the state mandates all new medium and heavy-duty vehicles sold to be ZEV by 2045, the ability to fast charge fleets will be crucial for business operations.

Source: JLL Research

What’s behind the increase in Advanced manufacturing?

U.S. legislation attracting manufacturing investments

Inflation reduction act (IRA)

134
Total projects

$101 Billion
Total investment dollars

81,400 Jobs
Total jobs created

+

CHIPS and science act (CHIPS)

28
Total projects

$157 Billion
Total investment dollars

25,400 Jobs
Total jobs created

=

Total impact in the U.S.

106,800 Jobs
Total jobs created
(IRA + CHIPS)

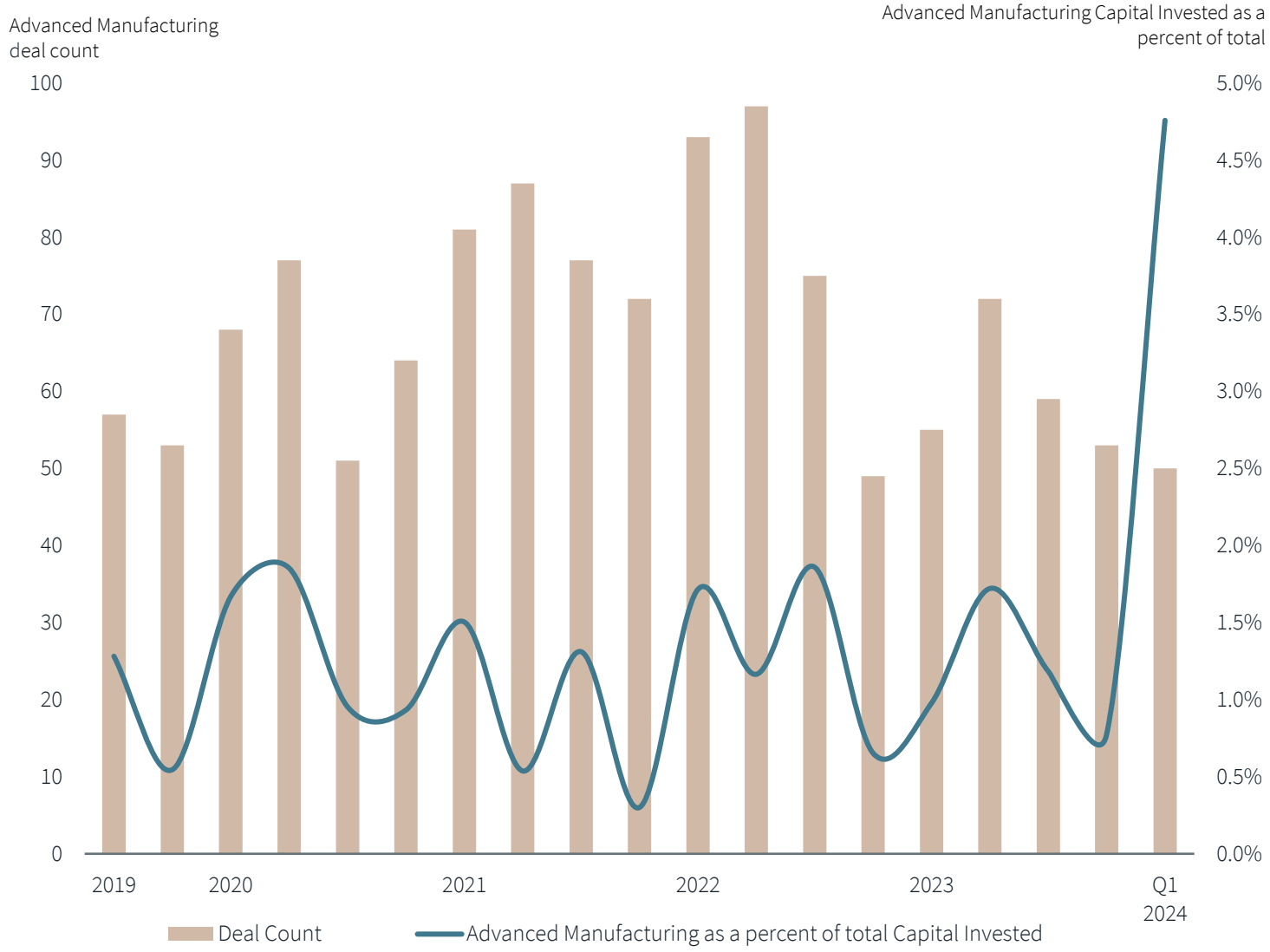
$258 Billion
Total investment dollars
(IRA +CHIPS)

On August 16, 2022 the presidential administration signed into law IRA. With tens of billions of dollars in tax credits and other incentives, companies have made significant investments into clean energy manufacturing in the United State

On August 9, 2022, the presidential administration signed into law The CHIPS and Science Act. This act provides tax credits and incentives to companies that make significant investments into semiconductor manufacturing in the United States.

Source: JLL Research, Jack Conness IRA Chip Investment, data as of 12/2023

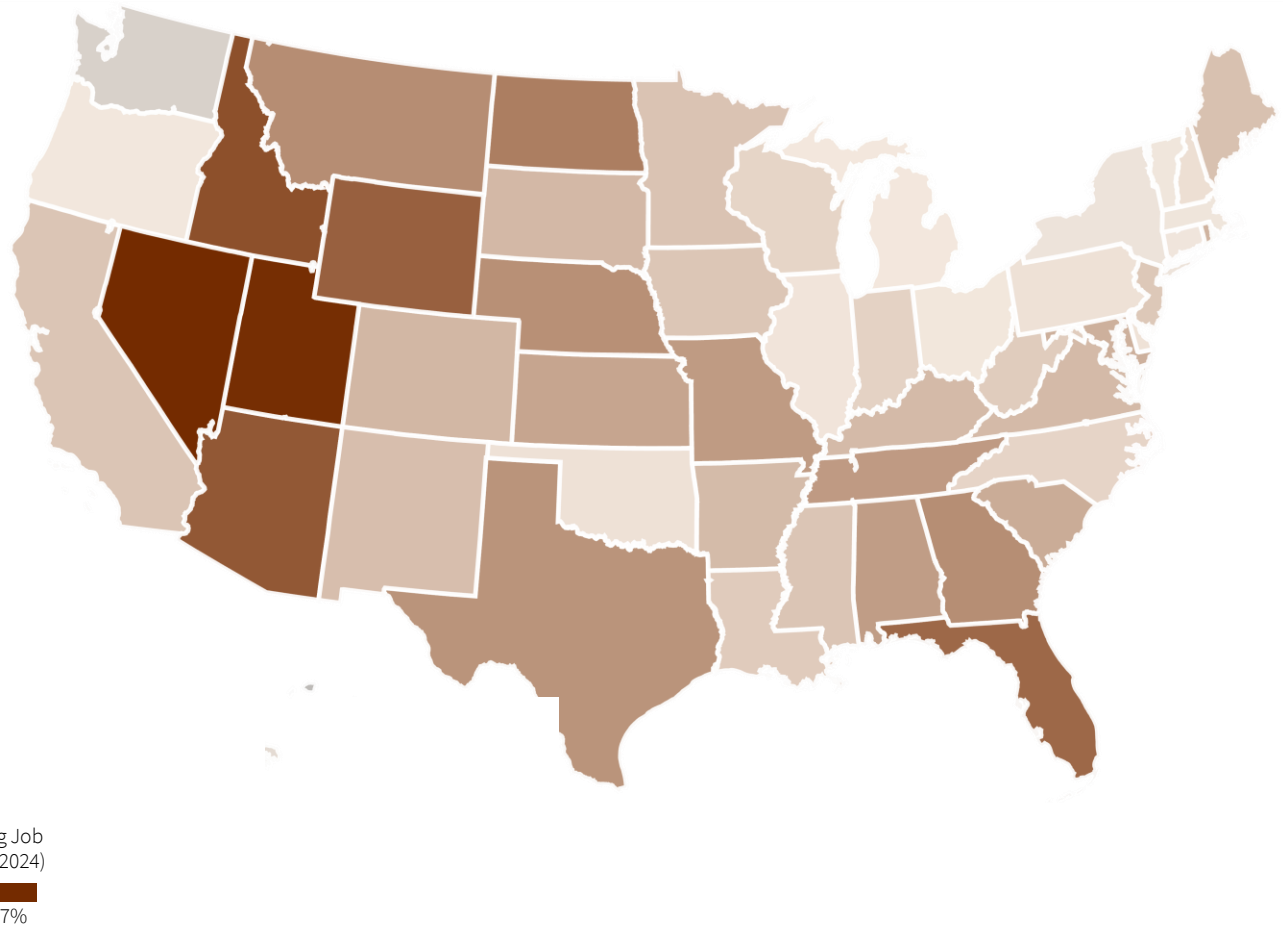
Advanced Manufacturing attracts venture capital funding, demonstrating healthy investor interest



Source: JLL Research, Pitchbook

Manufacturing jobs are picking up speed throughout the country

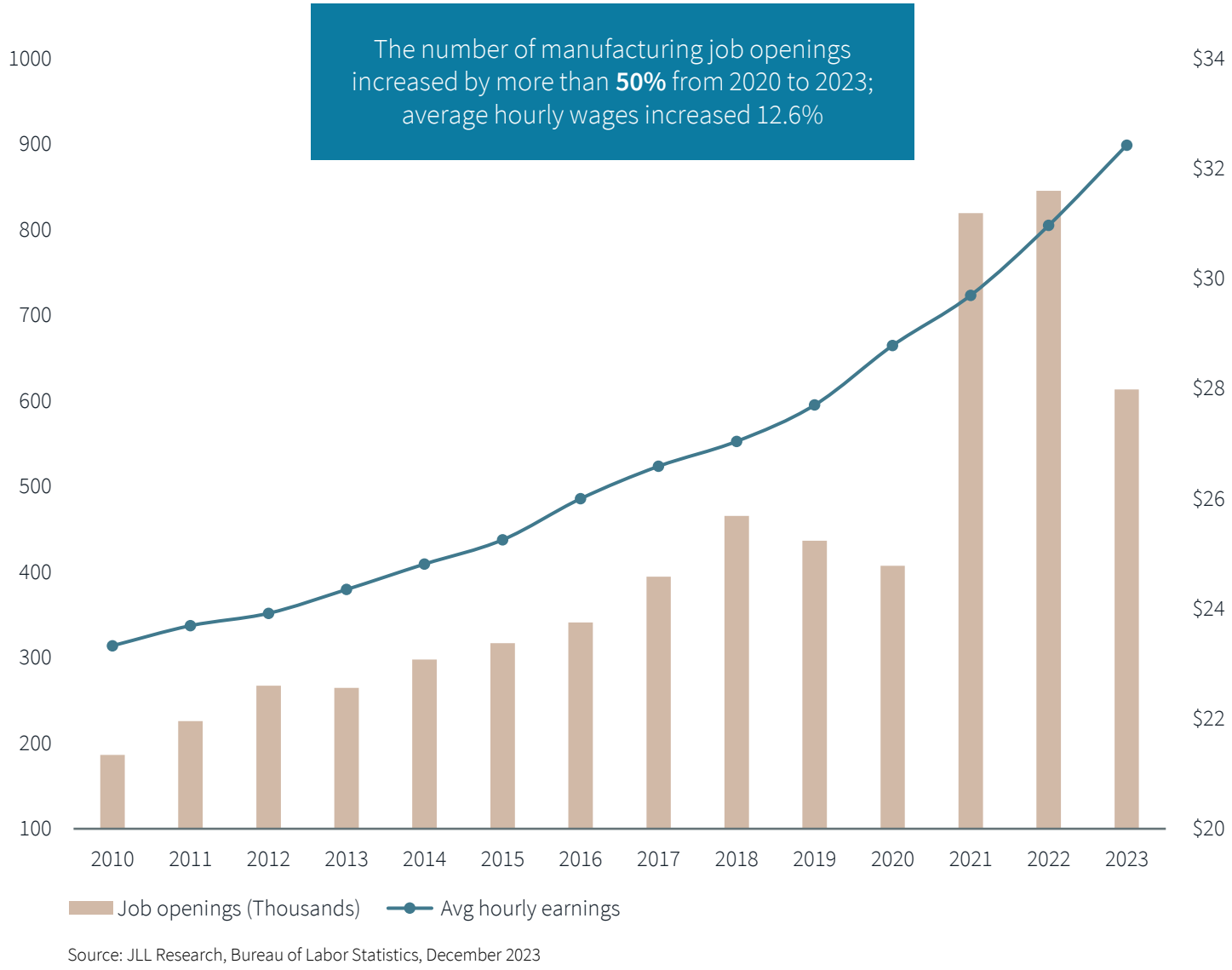
Map highlights Manufacturing job growth (2019 to 2024)



Source: JLL Research, Bureau of Labor Statistics

Manufacturers are choosing to build in the U.S.

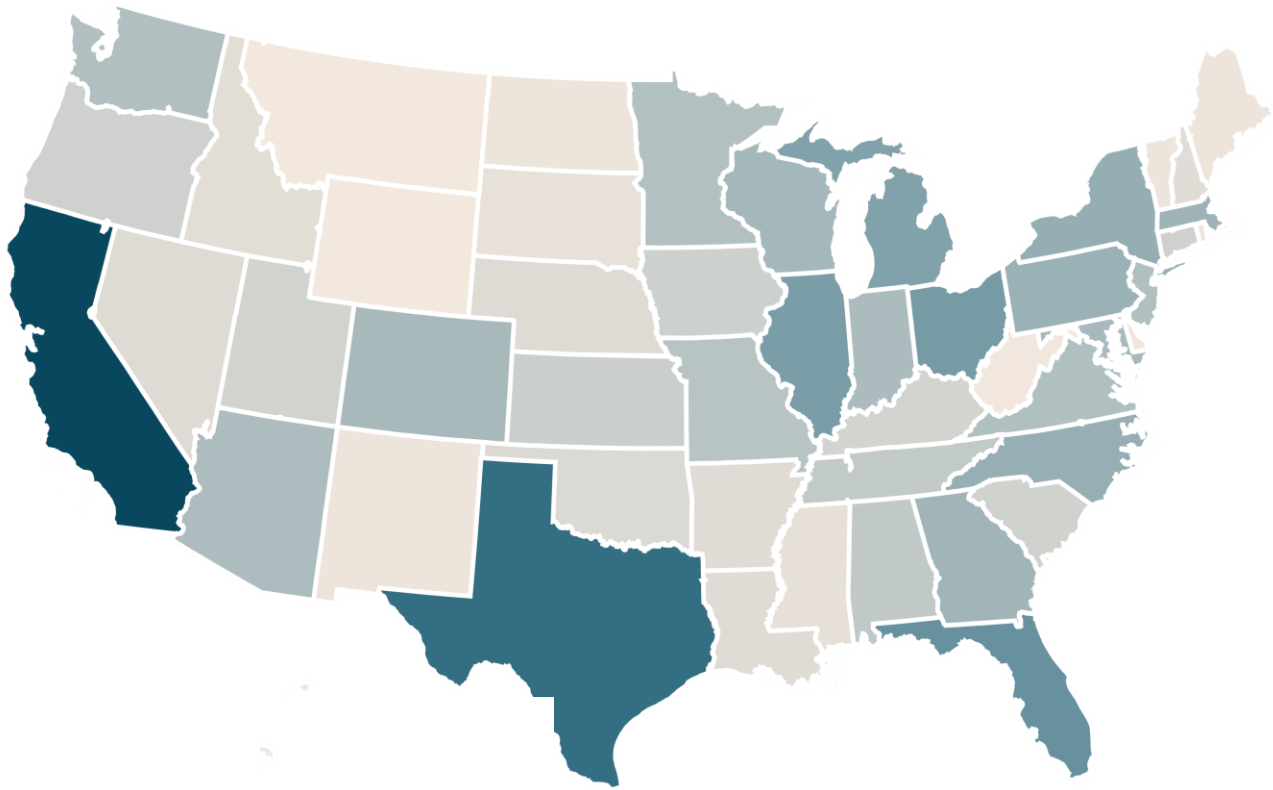
In contrast to the off-shoring trends of manufacturing during the last half of the 20th century, more companies are now choosing to build their facilities within the borders of the United States. With advanced manufacturing trends gaining steam, manufacturers are electing to capitalize upon the rich labor pool in the country, with specific emphasis and focus put into recruiting and retaining engineers.



Source: JLL Research, Bureau of Labor Statistics, December 2023

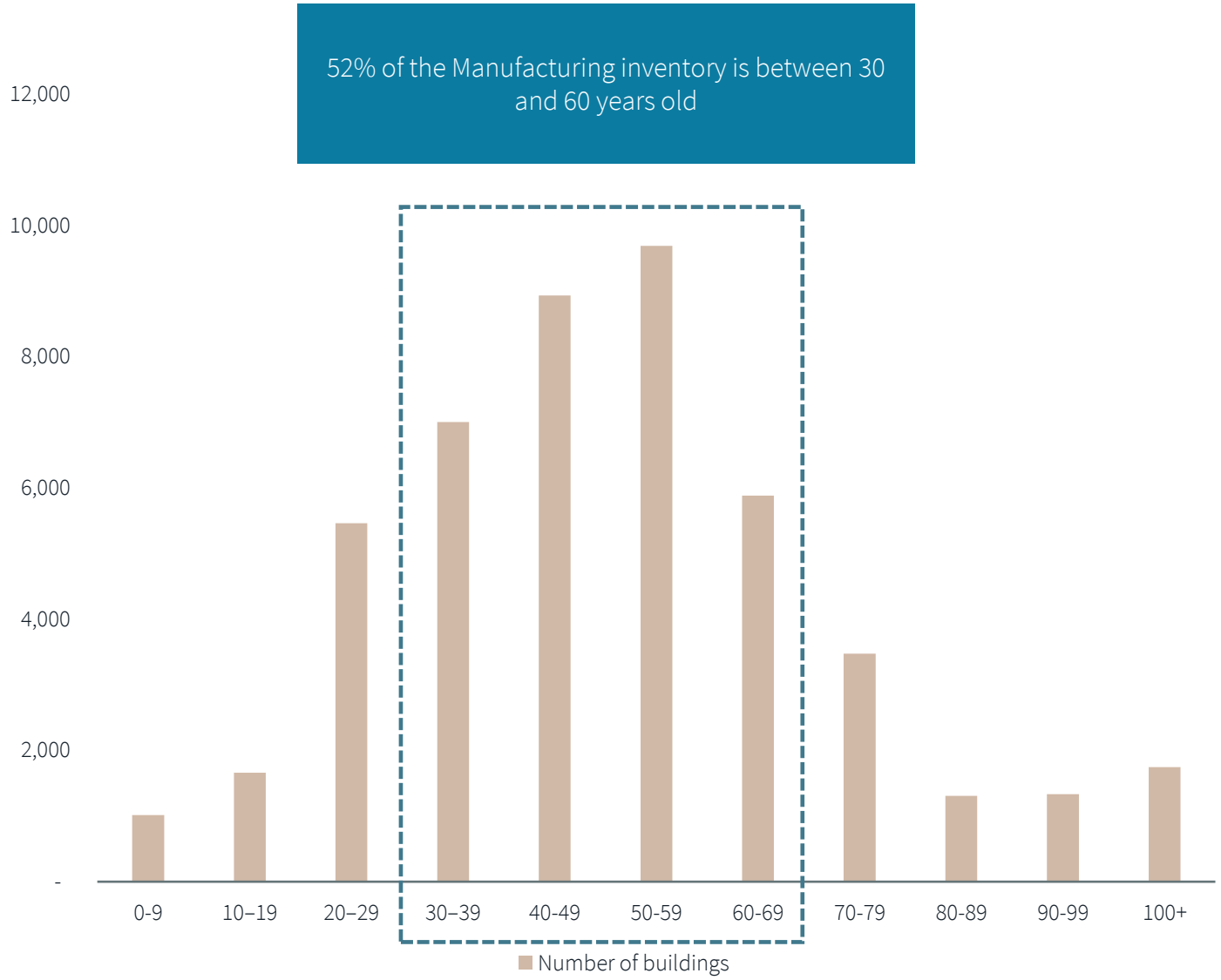
Investments and new projects are attracting manufacturing jobs

Map highlights Manufacturing job openings



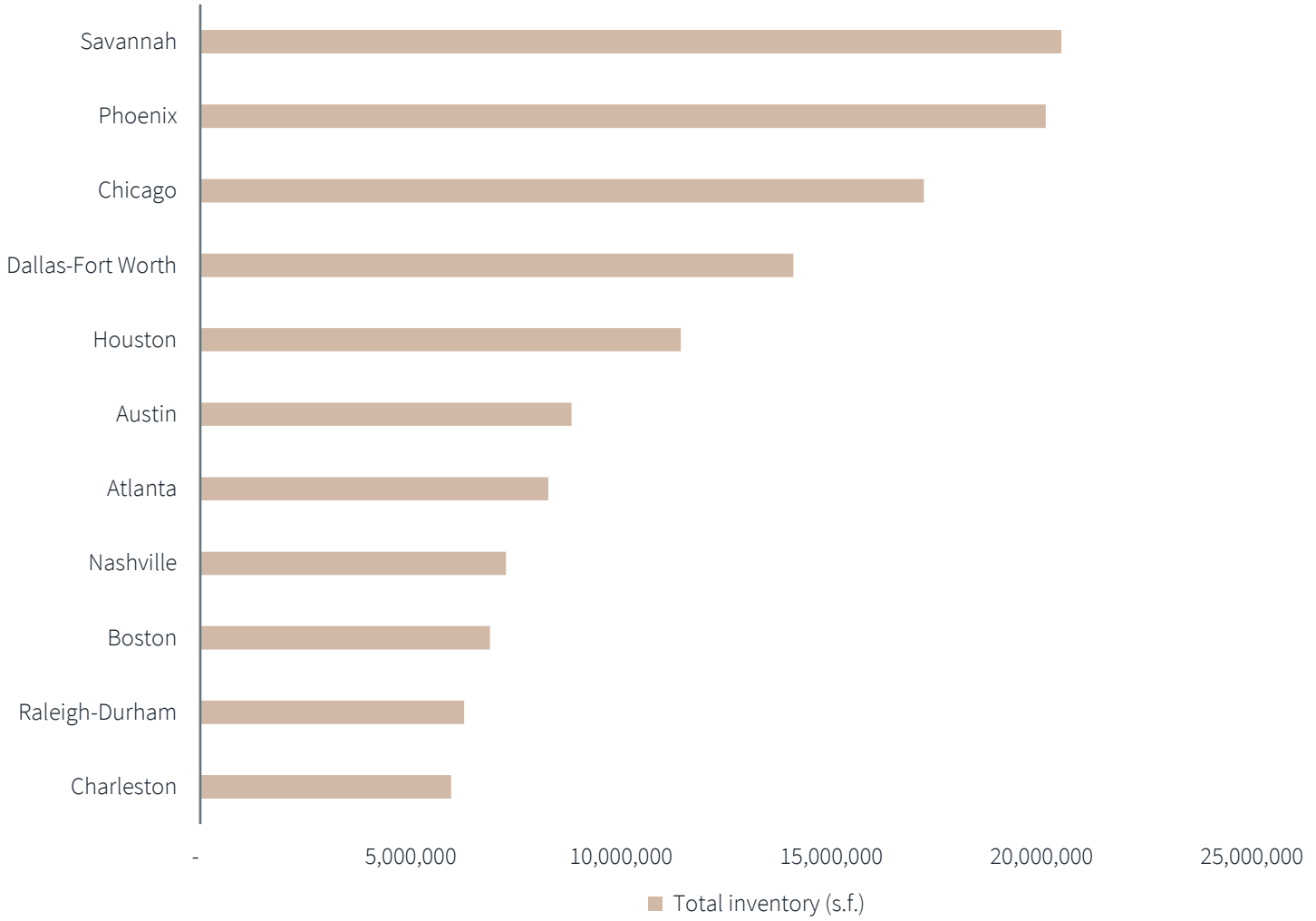
Source: JLL Research, LightCast. Data as of 12/2023

Half of the Manufacturing inventory falls within the 30 to 60-year-old range, hinting at a need for modernized infrastructure



Source: JLL Research

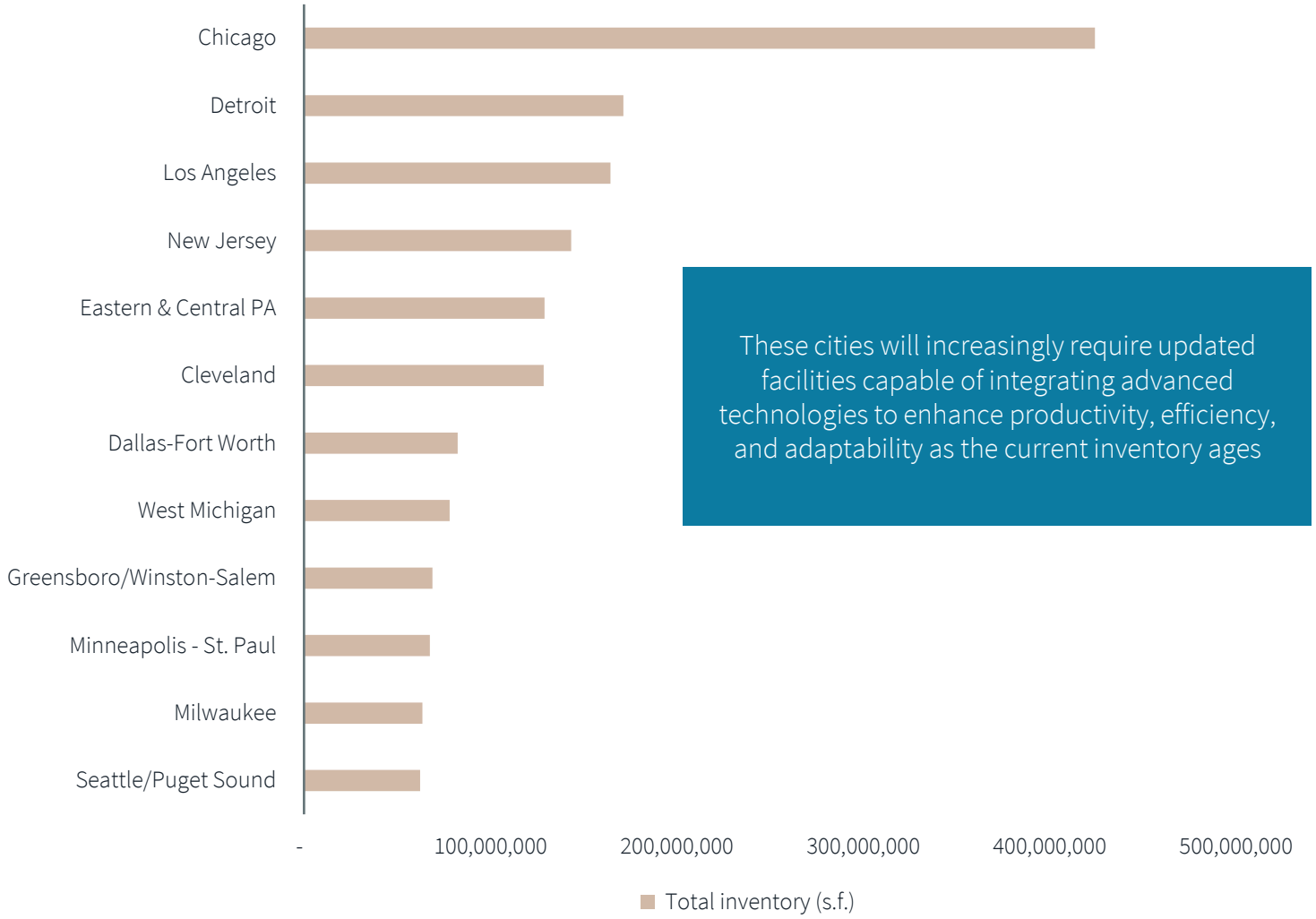
Savannah and Phoenix have the highest volume of new manufacturing that is less than 10 years old



Source: JLL Research. Note chart includes buildings projected to deliver in late 2024 and after

Half of the Manufacturing inventory falls within the 30 to 60-year-old range, hinting at a need for modernized infrastructure

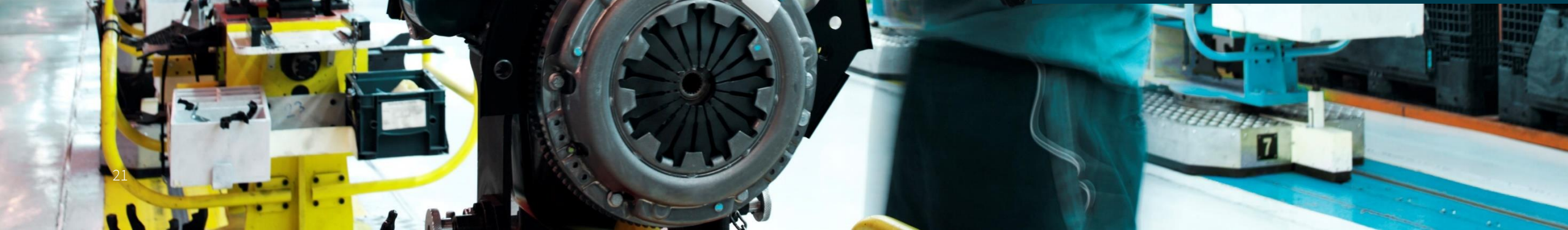
Markets with manufacturing inventory 30+ years old



These cities will increasingly require updated facilities capable of integrating advanced technologies to enhance productivity, efficiency, and adaptability as the current inventory ages

Source: JLL Research

Advanced Manufacturing announcements



Breakdown of manufacturing announcements tracked by JLL research since IRA

Total: **398**

11	Life Sciences and Healthcare
20	Technology (semiconductor)
51	Energy
248	EV, Battery and Automotive
15	Aviation and Aerospace

Source: JLL Research

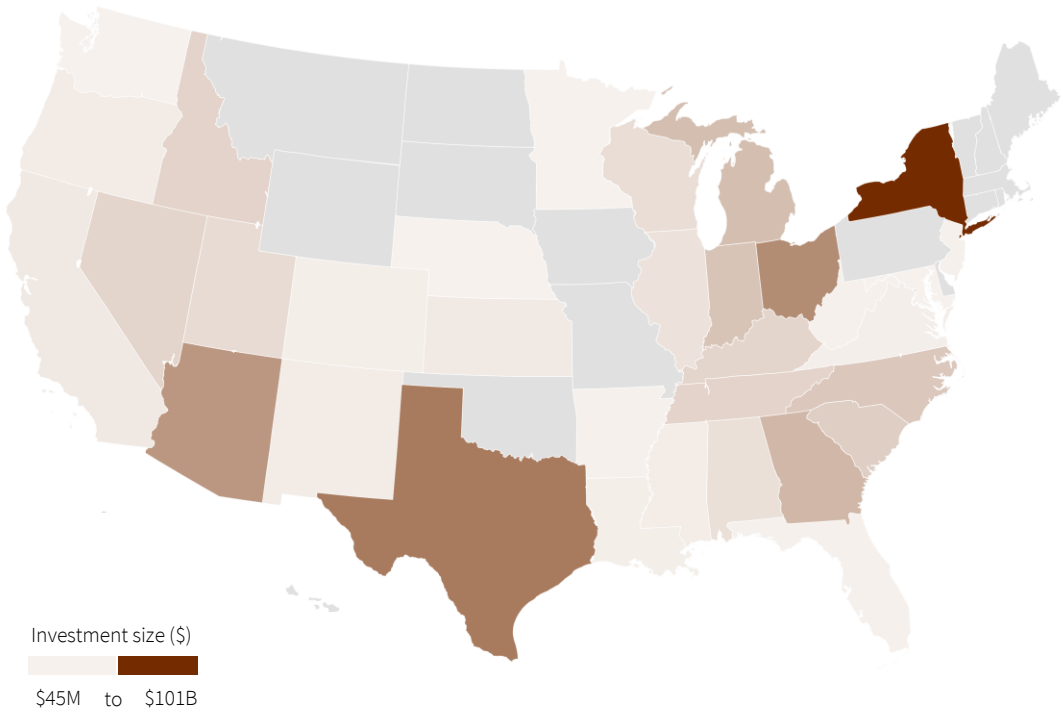
Top 20 manufacturing announcements by investment in U.S.

Company	Investment	# jobs created	State	Industry
Micron Technology	$100,000,000,000	9,000	NY	
Taiwan Semiconductor Company	$65,000,000,000	6,000	AZ	
Texas Instruments	$32,000,000,000	3,000	AZ	
Intel Corporation	$30,000,000,000	3,000	OH	
Intel	$20,000,000,000	3,000	OH	
Samsung	$17,000,000,000	2,000	TX	
Micron Technology	$15,000,000,000		ID	
Toyota	$13,900,000,000	5,100	NC	
Texas Instruments	$11,000,000,000	800	UT	
Foxconn	$10,000,000,000		WI	
Tesla Gigafactory Nevada	$9,800,000,000	4,000	NV	
Exxon Mobile	$7,000,000,000	600	TX	
BlueOval SK Battery Park	$5,800,000,000	5,000	KY	
BlueOval SK	$5,600,000,000	5,800	TN	
LG Energy	$5,500,000,000		AZ	
Volkswagen and PowerCo	$5,200,000,000	3,000	CA	
Hyundai Motor Group and SK On	$5,000,000,000	8,100	GA	
Rivian	$5,000,000,000	7,500	GA	
Honda and LG Energy Solution	$4,400,000,000	2,200	OH	
Hyundai Motor Group Metaplant America	$4,300,000,000	3,000	GA	
Panasonic	$4,000,000,000	4,000	KS	

Technology (semiconductor) EV, Battery and Automotive Energy

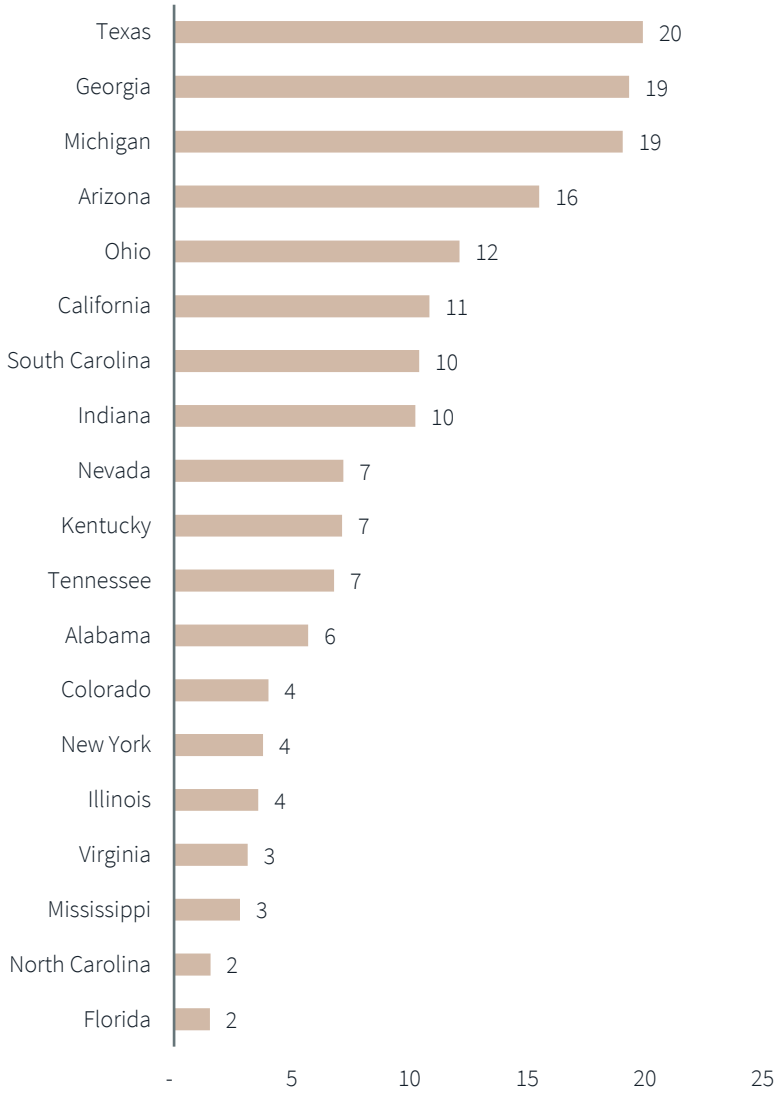
Source: JLL Research, Note CA stands for Canada

Map highlights areas with the highest investment ($)

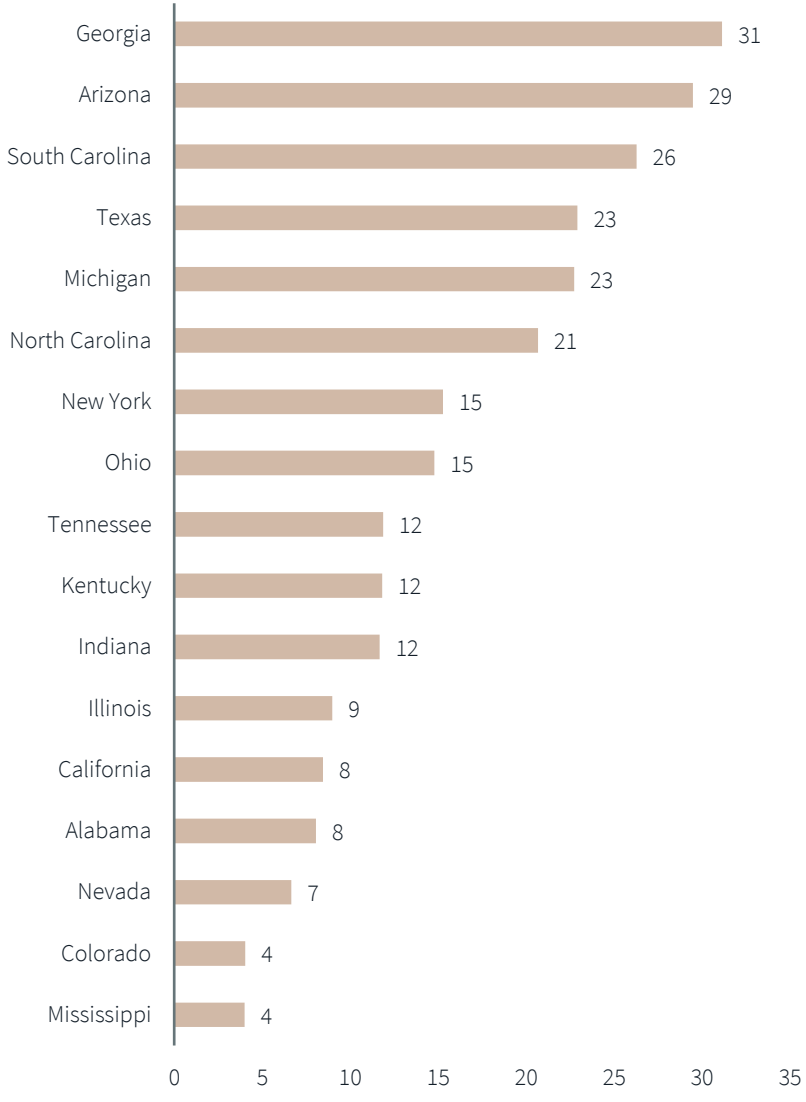


Recent manufacturing announcements in the U.S.

Total Manufacturing s.f. announced by state (in millions)

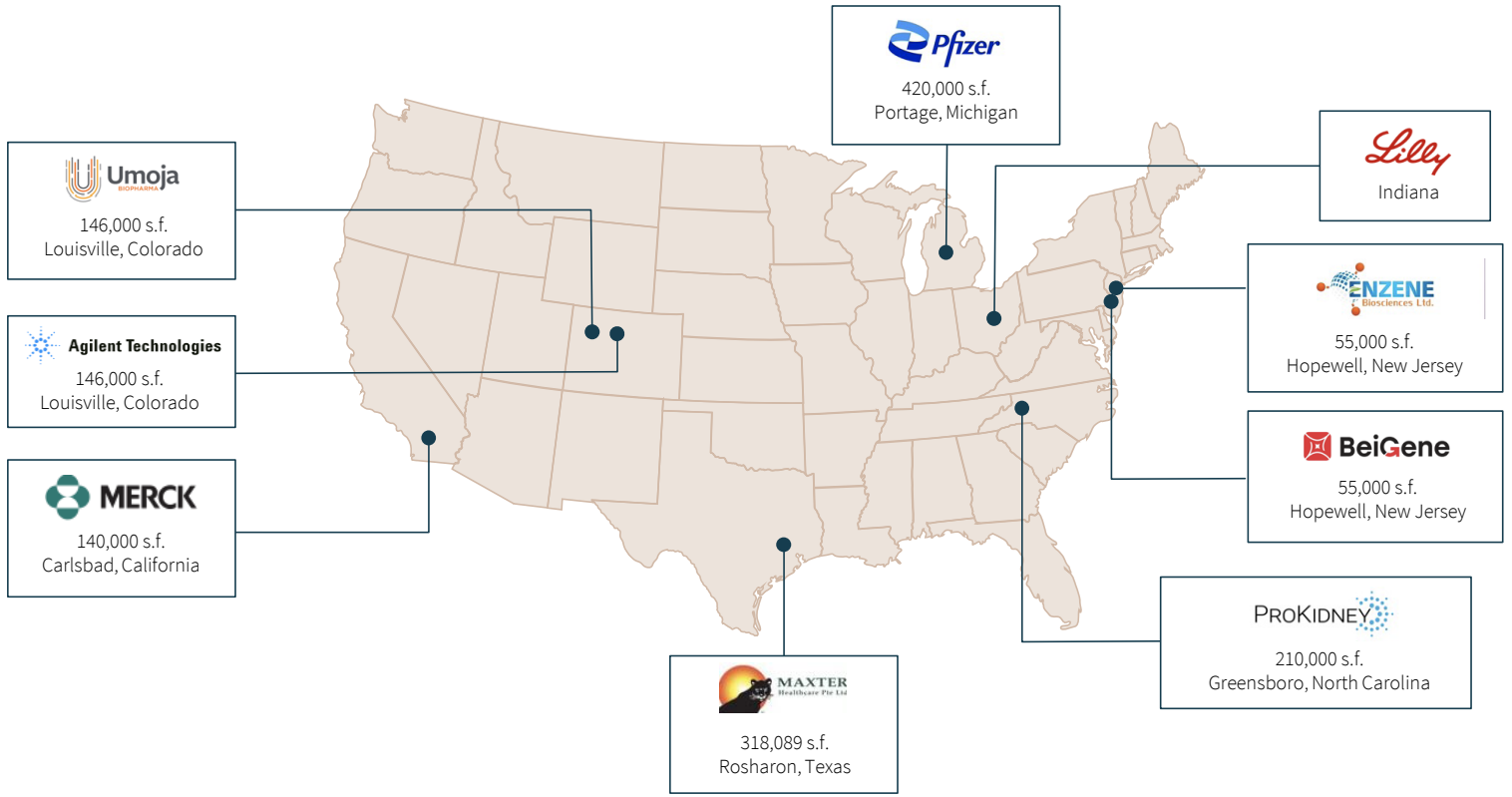


Total Manufacturing jobs created by state (in thousands)



Source: JLL Research, Updated February 2024

Where do Life Sciences and Healthcare companies want to go?



States with significant Life Sciences and Healthcare projects

Michigan
1 project
420,000 s.f.

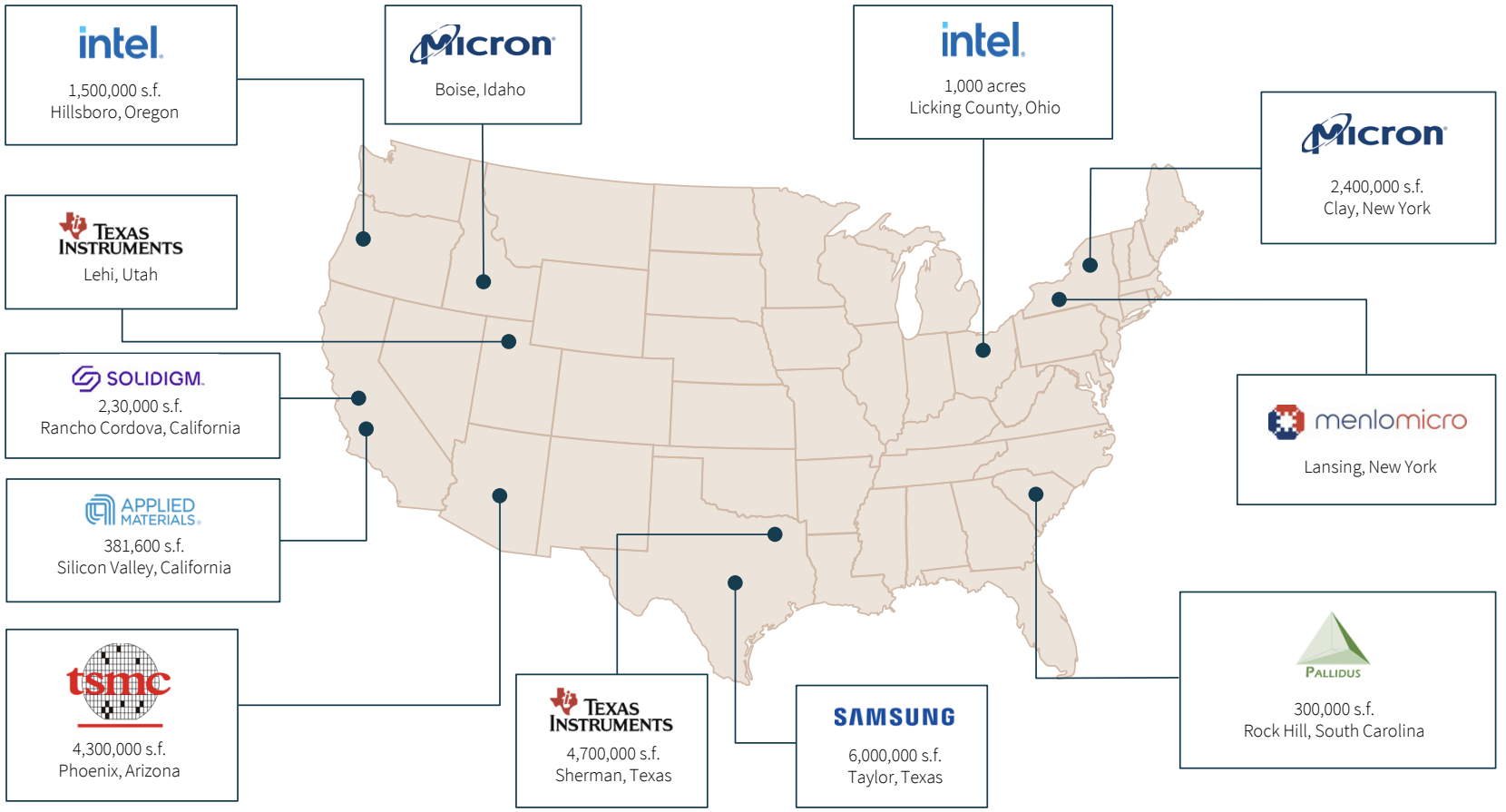
New Jersey
2 projects
455,000 s.f.

Texas
1 project
318,000 s.f.

North Carolina
1 project
210,000 s.f.

Source: JLL Research. Expansions not included on map. Updated February 2024

Where do Technology (semiconductor) companies want to go?

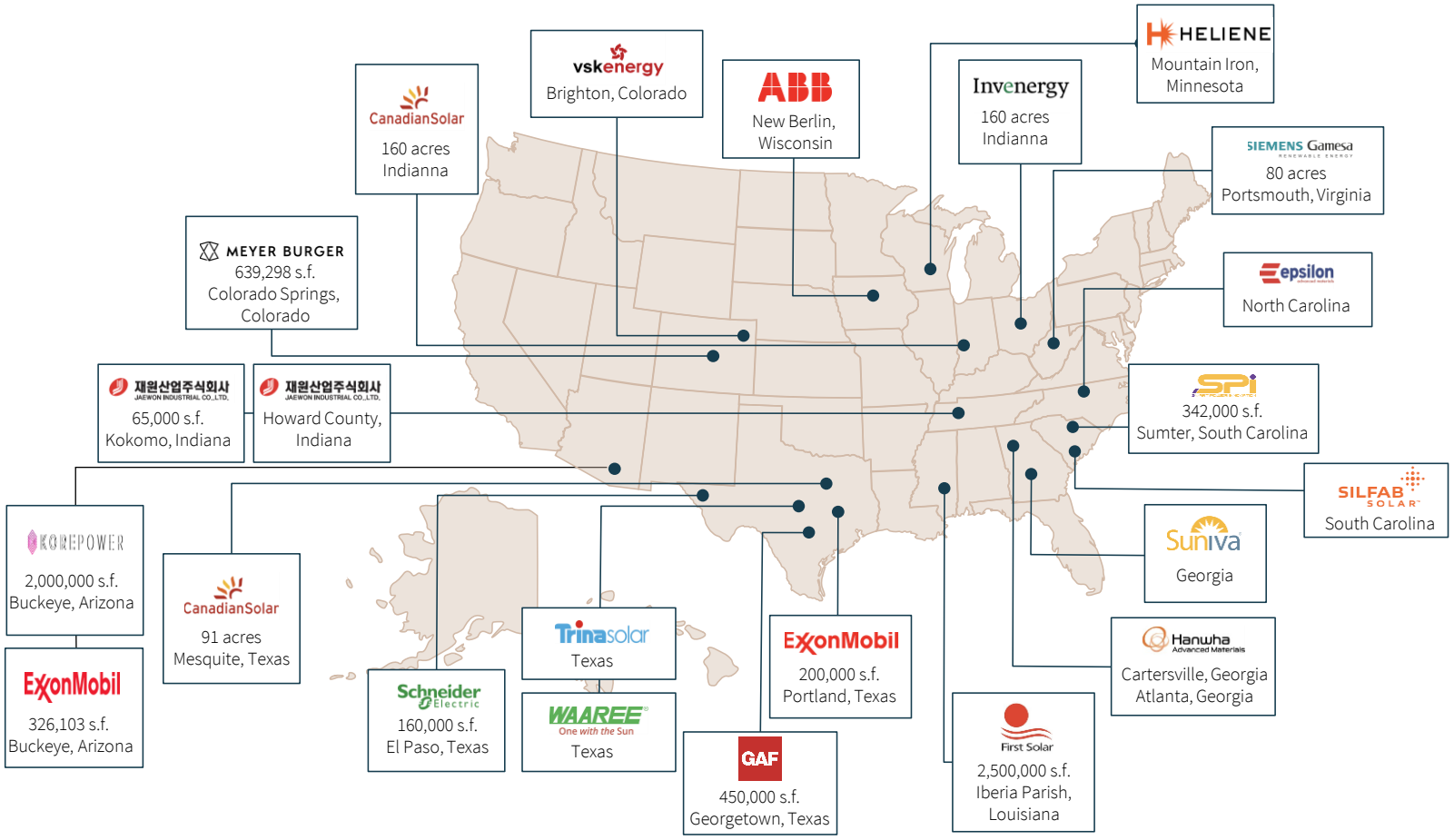


States with significant Technology (semiconductor) projects

- **Ohio** — 3 project
- **Texas** — 2 projects
- **California** — 2 project
- **New York** — 2 project
- **South Carolina** — 1 project
- **Oregon** — 1 project

Source: JLL Research. Expansions not included on map. Updated February 2024

Where do Energy companies want to go?



States with significant Energy projects

Texas
7 projects
971,000 s.f.

South Carolina
5 projects
1.1 million s.f.

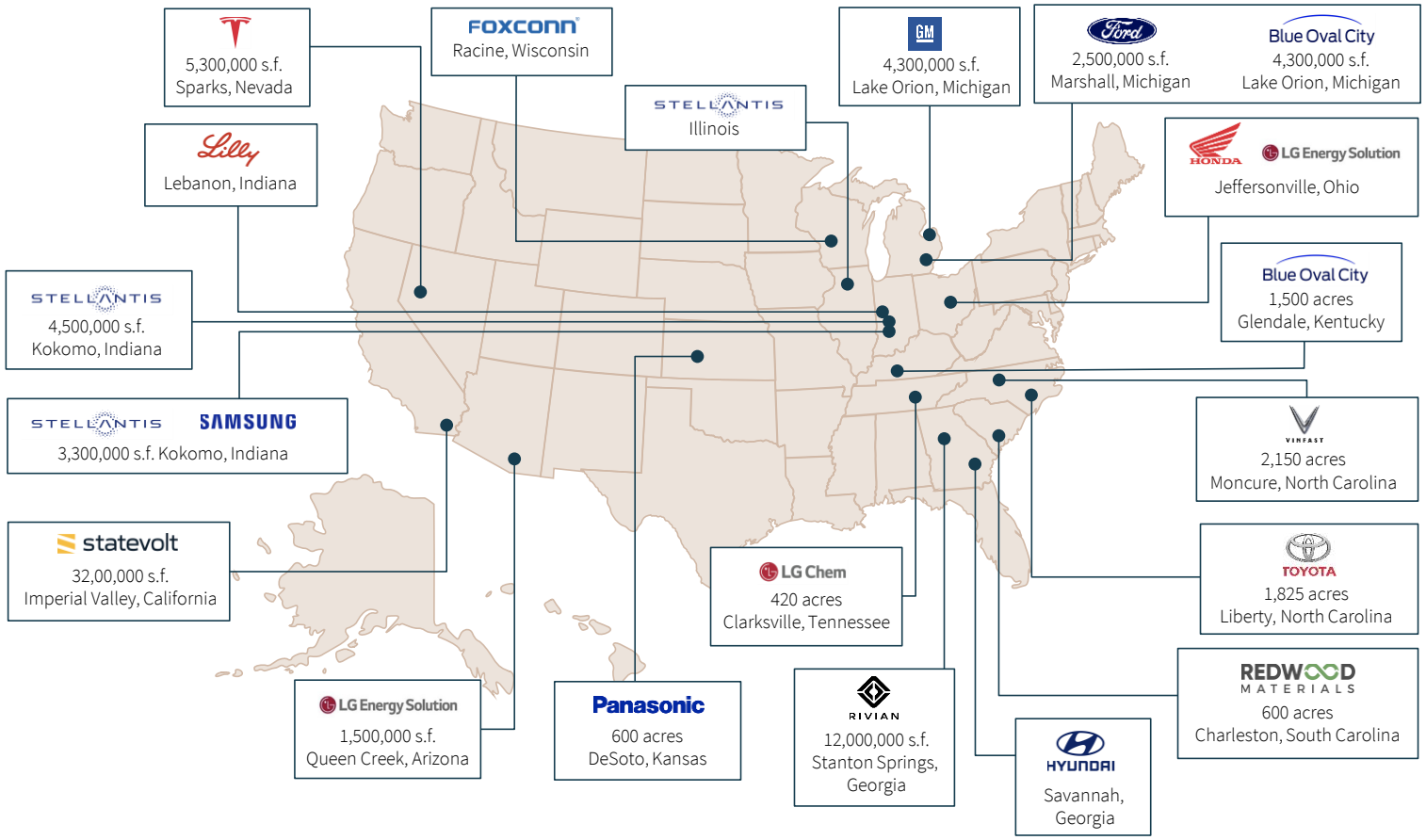
Colorado
4 projects
1.5 million s.f.

Georgia
4 project

Indiana
4 project

Source: JLL Research. Expansions not included on map. Updated February 2024

Where do EV, Battery and Automotive want to go?



States with significant EV, Battery and Automotive projects

Georgia
24 projects
16.4 million s.f

Michigan
23 projects
18.3 million s.f.

California
4 projects
10 million s.f.

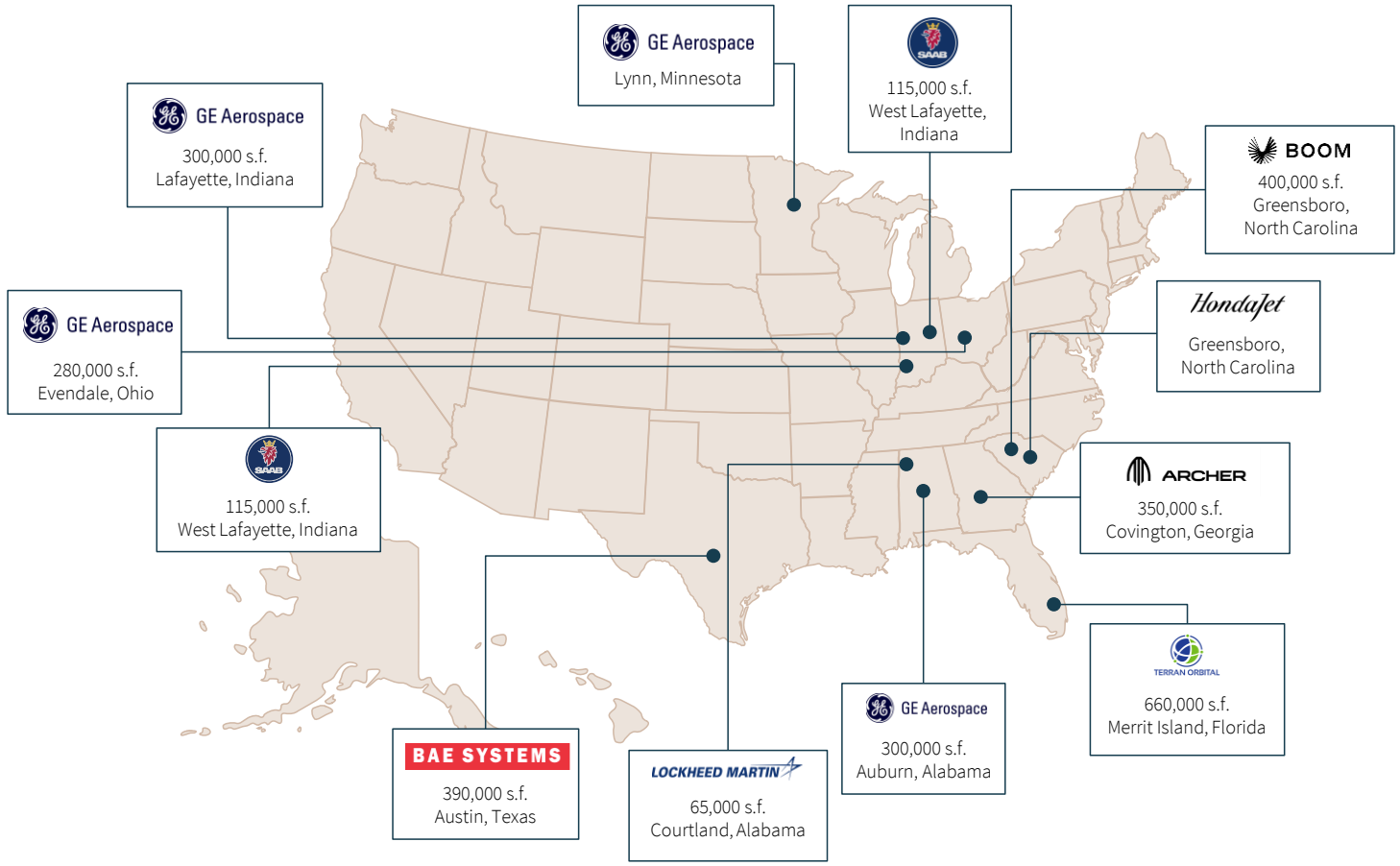
Arizona
7 projects
9.2 million s.f.

South Carolina
19 projects
8.3 million s.f.

Indiana
7 projects
7.9 million s.f.

Source: JLL Research. Expansions not included on map. Updated February 2024

Where do Aviation and aerospace manufacturers want to go?



States with significant aviation and aerospace projects

Indiana
3 projects
530,000 s.f.

Ohio
2 projects
280,000 s.f.

North Carolina
2 projects
400,000 s.f.

Florida
1 project
660,000 s.f.

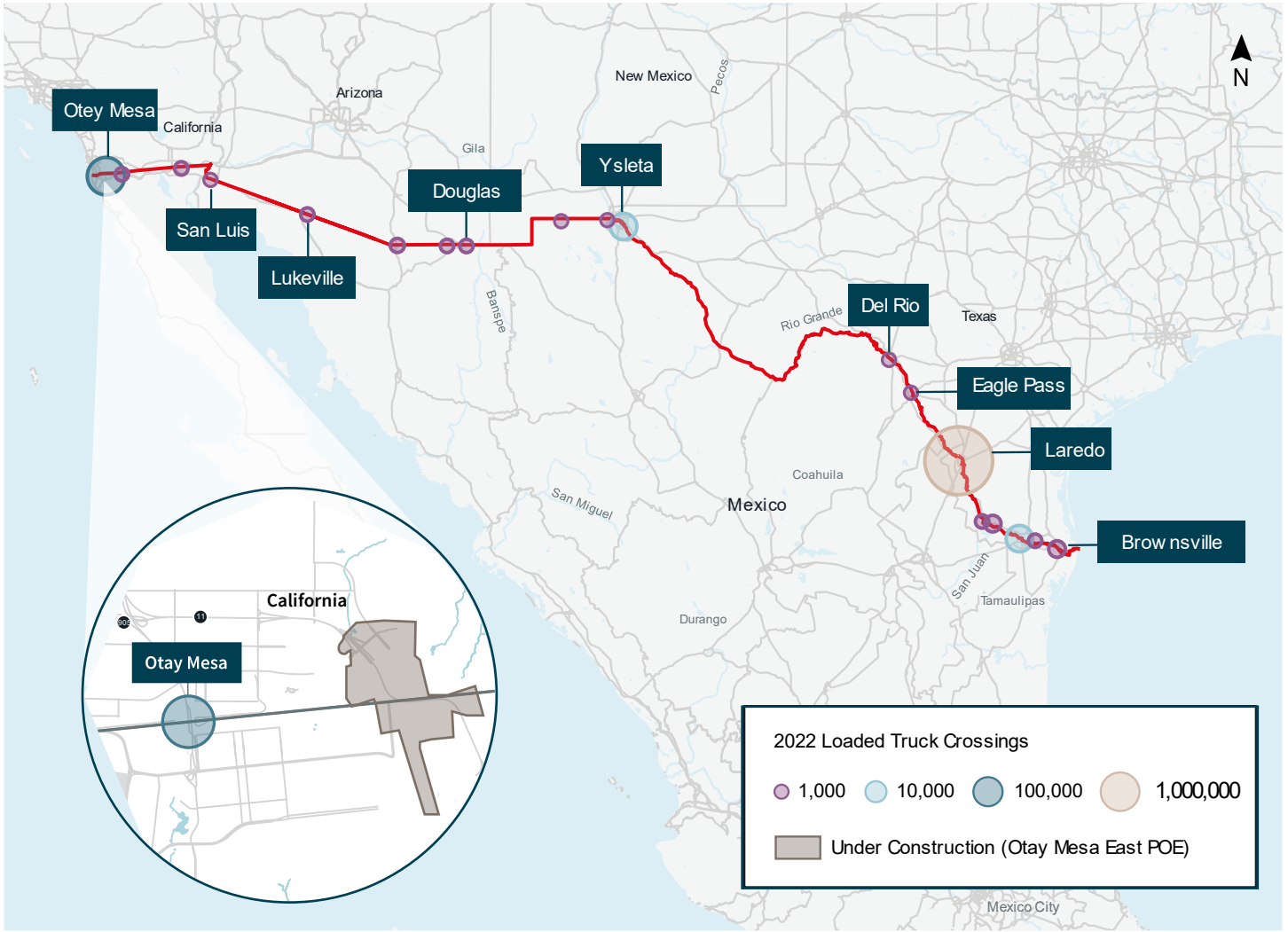
Georgia
1 project
350,000 s.f..

Texas
1 project
390,000 s.f.

Source: JLL Research. Expansions not included on map. Updated February 2024

Truck crossings from Mexico increase as companies nearshore manufacturing operations

Over a 5-year span loaded cargo trucks has increased by 14%. In 2022 U.S. imports from Mexico reached $459.2 billion USD. Laredo's port of entry in Texas has consistently surpassed all other ports of entry with over 2 million loaded truck crossings



Outlook and future forecast

Manufacturing challenges and opportunities in U.S.

Challenges

Power

These facilities require a high voltage to operate the sophisticated technology.

Labor

As manufacturing processes become more advanced and technology-driven, there is a growing demand for workers with specialized skills in fields like engineering, programming, data analysis, and automation.

Sustainability and environmental impact

Manufacturers face the challenge of reducing their environmental impact. This includes minimizing waste, adopting eco-friendly practices, and implementing sustainable supply chain strategies.

Supply chain management

Any disruptions or inefficiencies in the supply chain can result in delays, increased costs, and customer dissatisfaction.

Land

Availability of land to assemble build-to-suit facilities that require heavy power for operation.

Opportunities

Adoption to emerging technology

Implementing new technologies like 3D printing, robotics and artificial intelligence can enhance productivity, improve quality, reduce costs, and enable mass customization.

Market expansion

With the right strategies, manufacturers can enter international markets, establish partnerships, and capitalize on emerging economies.

Sustainable manufacturing

Manufacturers that adopt eco-friendly practices, use sustainable materials, reduce waste, and lower their carbon footprint can differentiate themselves in the market and attract environmentally conscious consumers.

Source: JLL Research

Characteristics of markets that may benefit from manufacturing

Many markets and areas in the country are poised to benefit from the electrification of vehicles. These areas possess a set of common traits:

1 **Electric automobile ecosystem:**
Electric vehicles require thousands of parts to produce, so metros that have developed relationships with not just manufacturers, but suppliers as well, stand to benefit the most.

2 **Regulatory acceptance:**
Areas with strong governmental incentives and funding will continue to attract manufacturers.

3 **Manufacturing infrastructure:**
In order to produce electric vehicles at scale, there needs to be a strong infrastructure in place.

4 **Existing relationships:**
Metros that already have existing relationships with manufacturers tend to fare better than regions that do not have those relationships.

5 **High concentration of intellectual capital:**
Manufacturers will focus on areas with high concentrations of intellectual capital, particularly with hardware and software.

Source: JLL Research

Impact on the industrial and logistics real estate sector

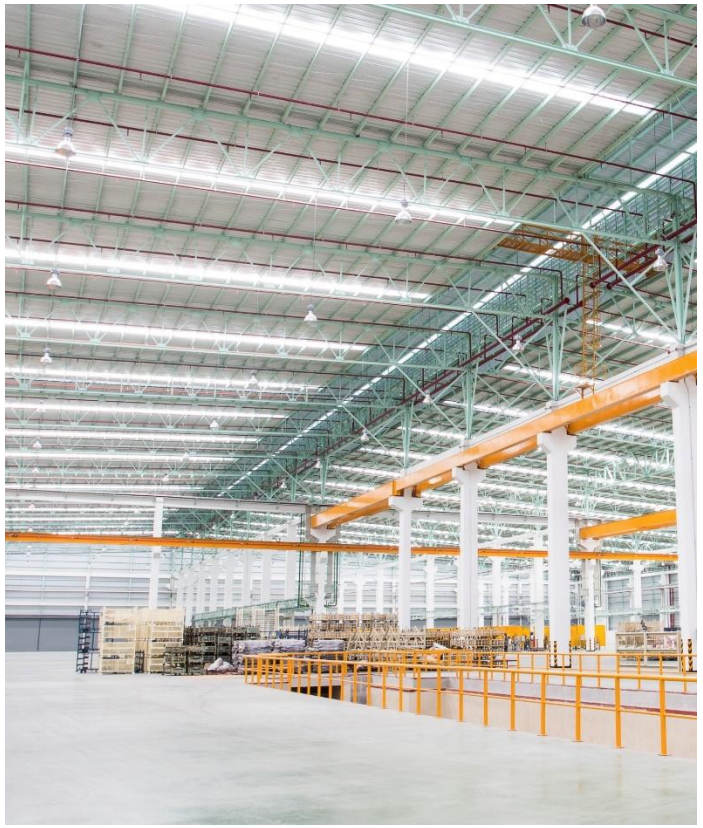
1 **Increased demand and competition from users** looking for land to assemble build-to-suit facilities that require heavy power for operations.

2 **Onshoring will surge demand** for logistics and manufacturing space. As companies move their operations into the U.S. its prompting their suppliers to follow suit. And build out supply chain network.

3 **Increased emphasis on sustainable construction practices** and the construction of energy-efficient buildings has the potential to push demand from the construction and building materials industry.

4 **Proposed incentives to building owners to convert to energy efficient buildings could benefit tenants** by reducing electricity bills in buildings where owners have tapped into these tax credits.

5 **Tenants looking for IRA incentives may align timing with funding and eventual disbursements.** Many are actively searching for space while also considering grants and availability of labor.



Source: JLL Research

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Research at JLL

JLL's research team delivers intelligence, analysis and insight through market leading reports and services that illuminate today's commercial real estate dynamics and identify tomorrow's challenges and opportunities. Our more than 550 global research professionals track and analyze economic and property trends and forecast future conditions in over 60 countries, producing unrivalled local and global perspectives. Our research and expertise, fueled by real-time information and innovative thinking around the world, creates a competitive advantage for our clients and drives successful strategies and optimal real estate decisions.

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