



Huntsville, Alabama

Framework for a Regional Energy Economy

June 2026

**RMI is an independent,
nonprofit organization of
experts accelerating the
advanced energy transition.**

**Our mission: Transform the
global energy system to secure
a clean, prosperous, zero-
carbon future for all.**





About this document

RMI prepared this document to help regional stakeholders understand and take ownership of advanced energy-led economic development opportunities and maximize the local economic impact and benefits of these opportunities. This framework identifies feasible, equitable pathways toward the clean economy and economic mobility by identifying priority industries, local investment barriers, and key coordination needs. Stakeholders like economic development organizations and community lenders will be able to use the framework to chart a collaborative path forward while leveraging local priorities and strengths to attract private capital for locally driven impact.

Huntsville Region Framework for a Regional Energy Economy Project Overview and Goals

WHY

To identify opportunities at the intersection of economic and community development



Accelerate bankability of advanced energy tech projects



Attract private capital to previously overlooked markets



Build local industry through new approaches to advanced energy financing



Foster small businesses to ensure equitable benefits to community

WHO

Economic and community development stakeholders



Community lenders



Industry



Business associations



Economic development organizations



Nonprofits



State and local governments



Workforce training organizations

WHAT

- Place-based investment strategy to help **capitalize on local advanced energy opportunities**
- Highlight areas of competitiveness, constraints, and coordination related to advanced energy-led economic development
- Facilitate community ownership and collaboration among local stakeholders

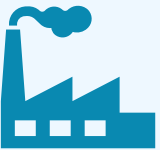
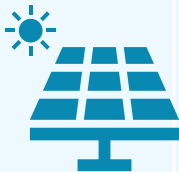
Our analysis focused on Madison, Limestone, and Morgan counties

Stakeholders interviewed include:



Advanced energy drives the energy economy

This roadmap uses a broad definition of advanced energy including deploying clean energy, manufacturing of energy technologies and energy-efficient consumer products, and research and development to support deployment and manufacturing. These are activities that can drive regional economic development by creating jobs and attracting investment.

	Manufacturing		Energy efficiency
	R&D		Energy deployment

Project key findings

Competitiveness

- Huntsville is able to attract complex, high-value industries, resulting in a diverse established economic ecosystem including aerospace, automotive, and defense industries, as well as robust research institutions.
- Building on these assets, the region is well positioned to capture advanced energy opportunities — particularly in areas like **nuclear testing, power electronics, grid equipment, heat pumps, and industrialized construction** — that leverage its manufacturing, systems integration, and testing capabilities.

Constraints

- Constraints in generation capacity, transmission, and utility coordination risk limiting Huntsville's ability to attract new manufacturing and large-load projects.
- Housing shortages and limited access to flexible capital — especially for small businesses — are constraining workforce attraction and inclusive economic development.

Coordination

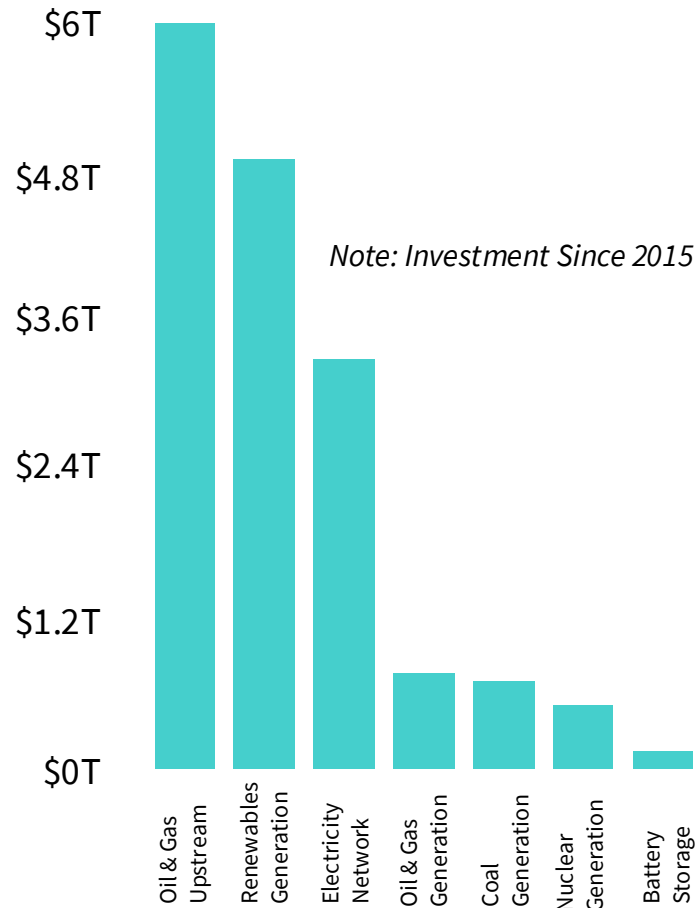
- Economic and workforce development in the Huntsville region are highly coordinated. The strong alignment across public agencies, educational institutions, and employers allow them to respond quickly to industry needs.
- Access to capital remains a challenge, as emerging coordination among community development financial institutions (CDFIs) is not yet fully aligned with banks and credit unions, limiting financing options for small businesses.



National and state context

Global trends in AI and electrification are driving record investment in energy

Cumulative global energy investment

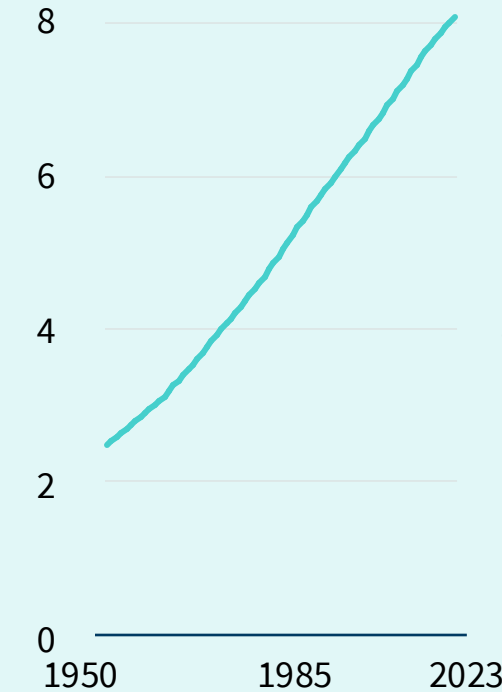


Driven by three factors: Demographics, Digitalization, Energy Innovation

Global Population

10 Billions

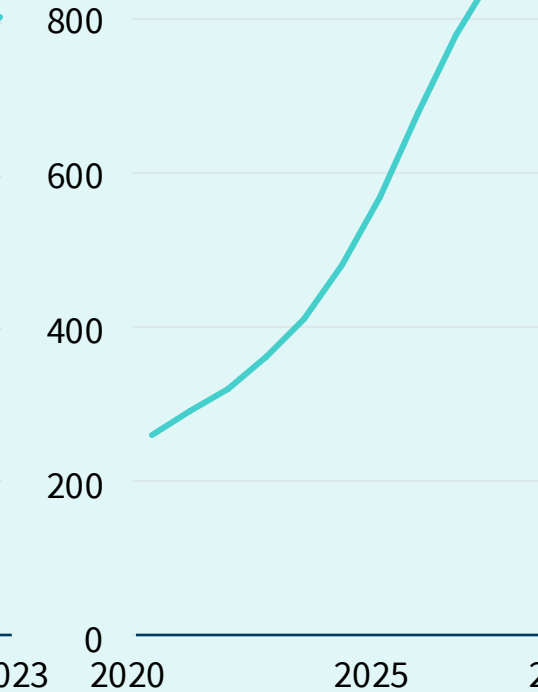
Population



Data Center Consumption

1,000 TWh

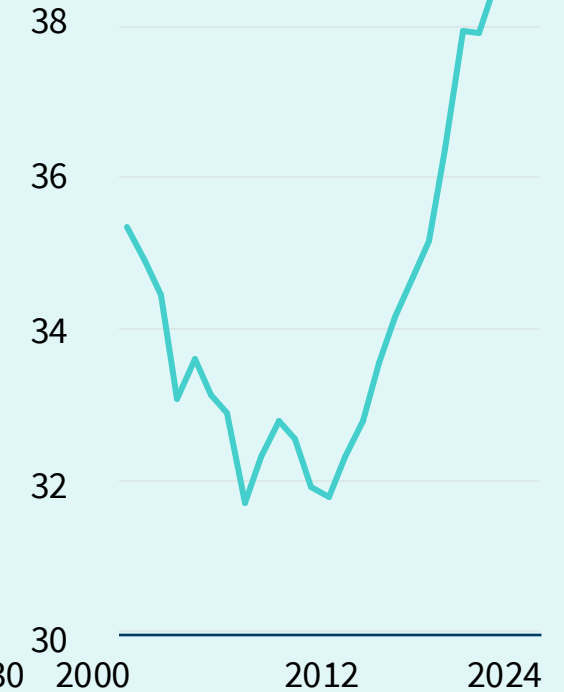
Electricity



Renewable Generation

40 % Renewable Electricity

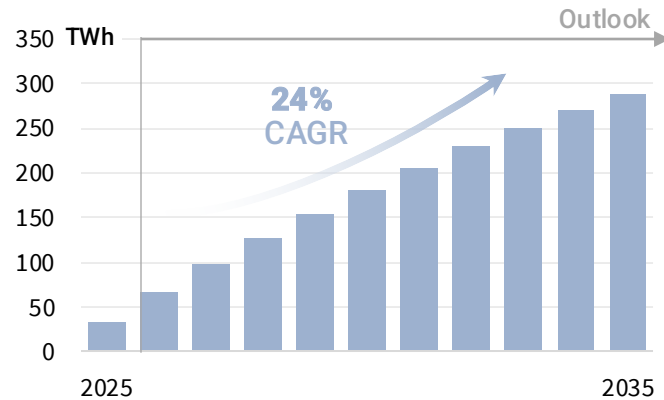
%



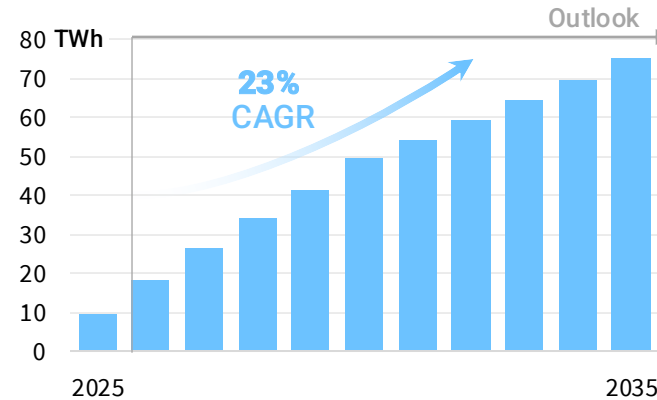
Electricity demand growth is high in the United States

Data center build for AI and electrification across the economy are driving this demand

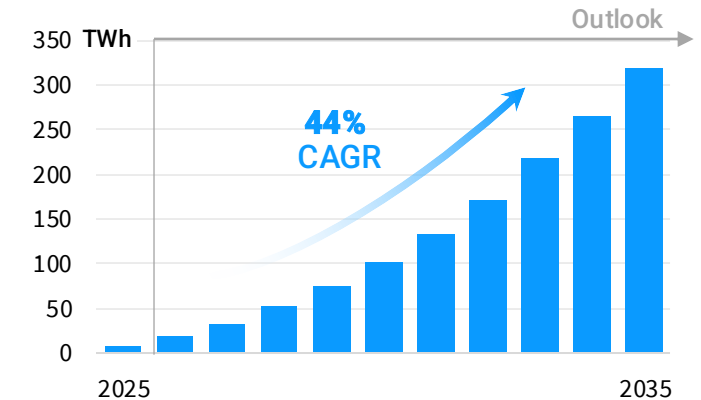
Data Centers



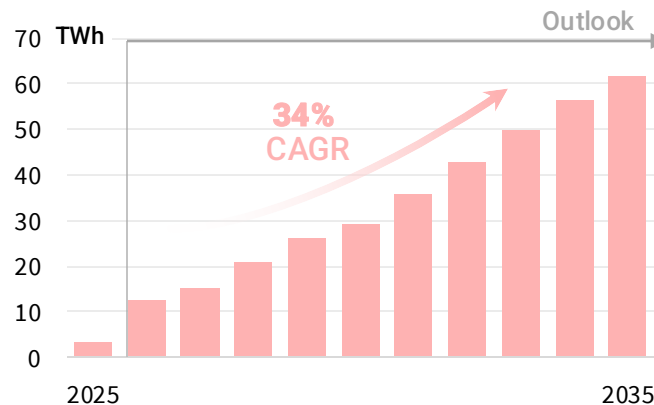
Heat Pumps



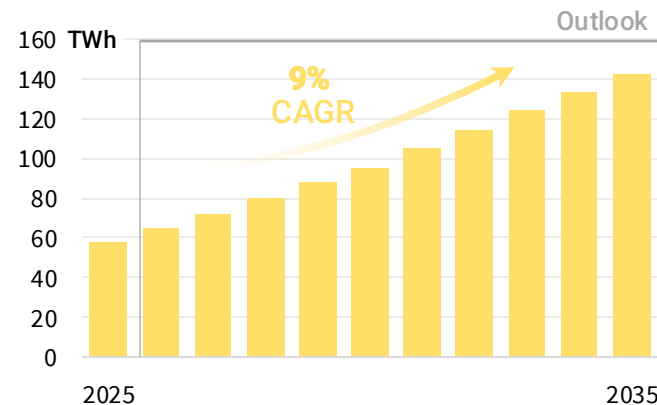
Electric Vehicles



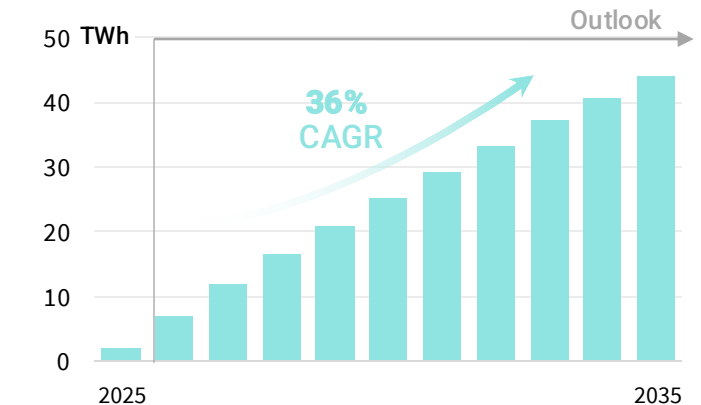
Industry



Other Building Appliances



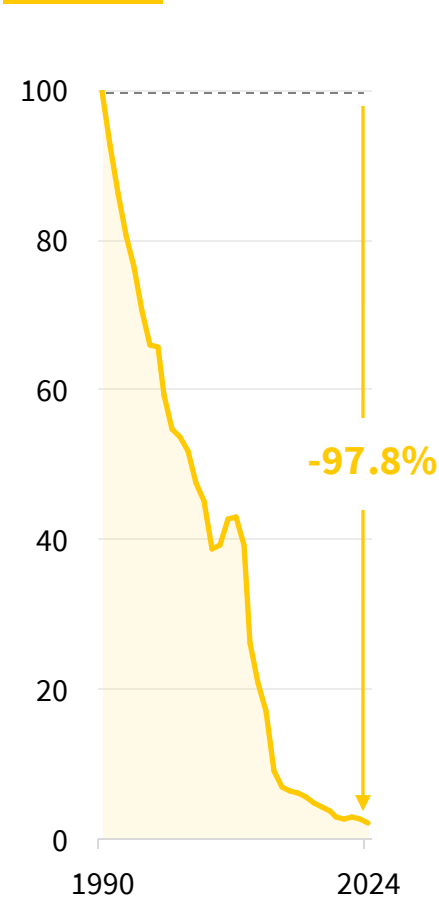
Other Sectors



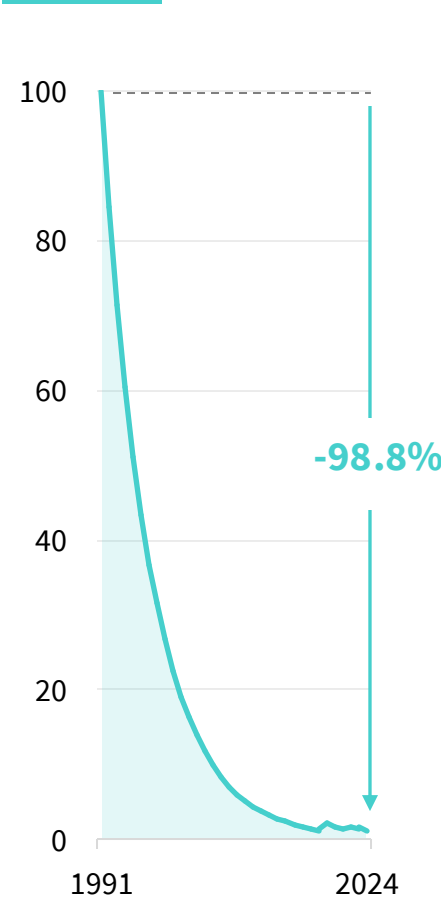
Costs are declining exponentially in electro-industrial sectors

Costs have fallen by well over 90% for key electro-industrial technologies

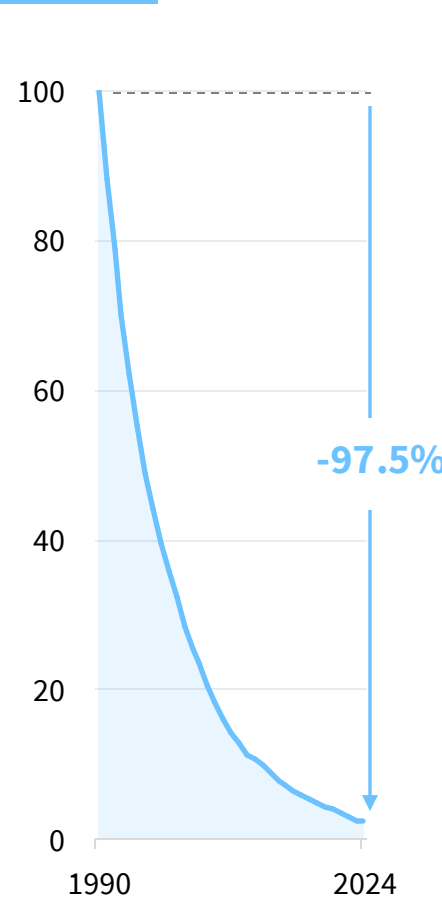
Solar PV (\$/W)



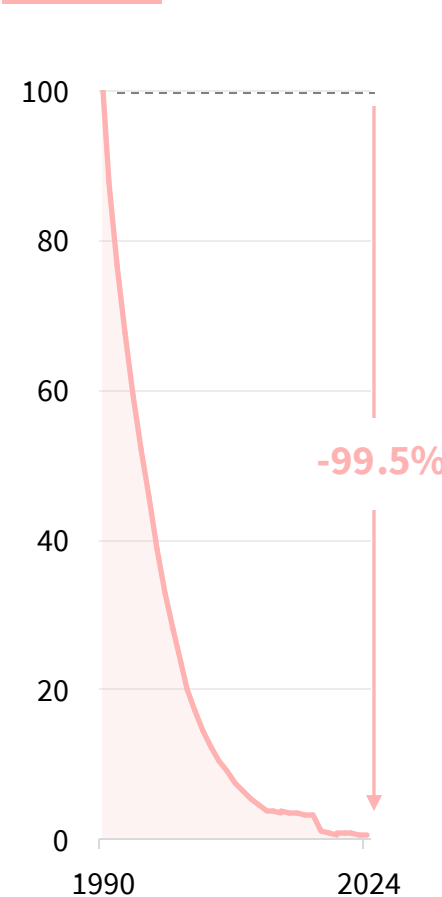
Batteries (\$/kWh)



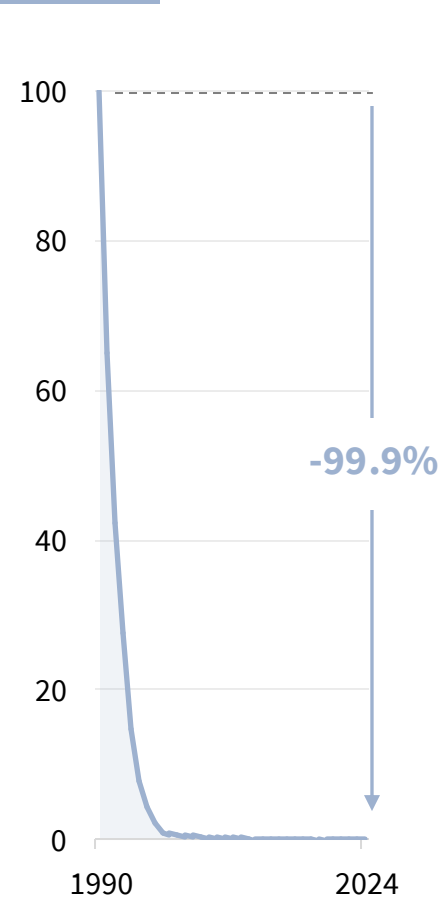
Motors (\$/kW)



Power elec. (\$/kW)



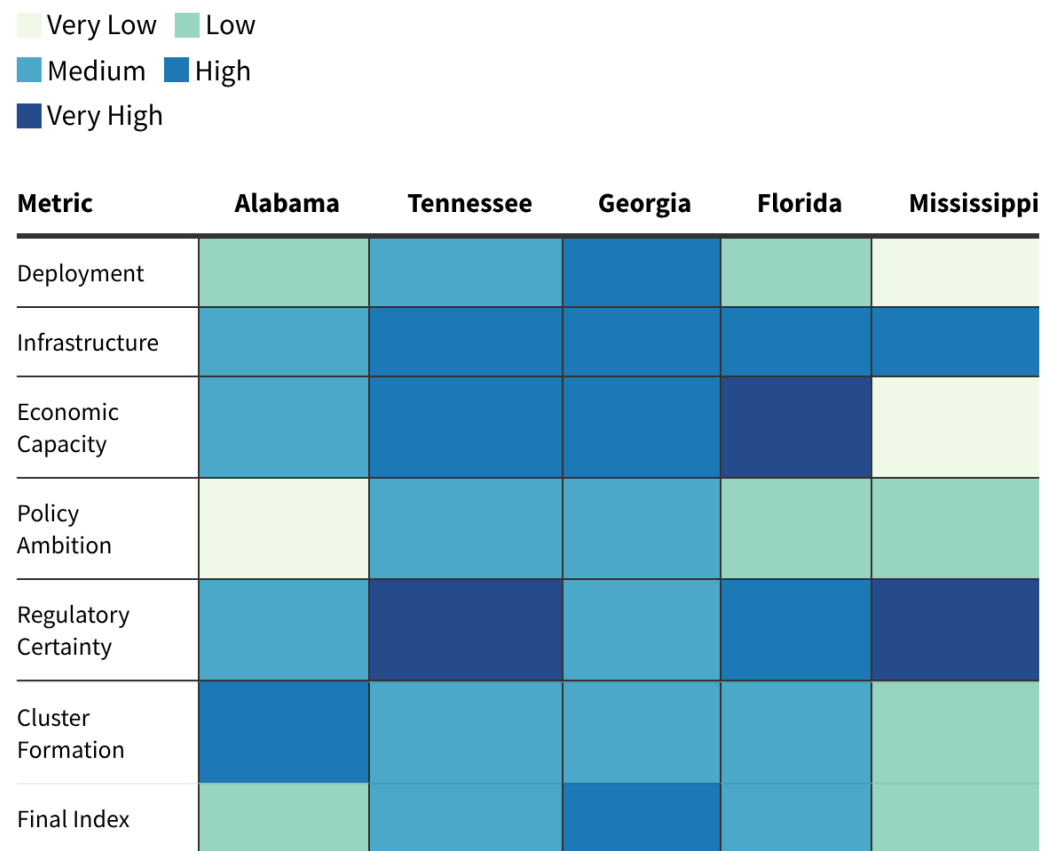
Computing (\$/DMIPS)



Source: IEA.

Alabama scores high on some metrics for advanced energy readiness but trails regional leaders overall

Advanced energy readiness in Alabama and neighboring states

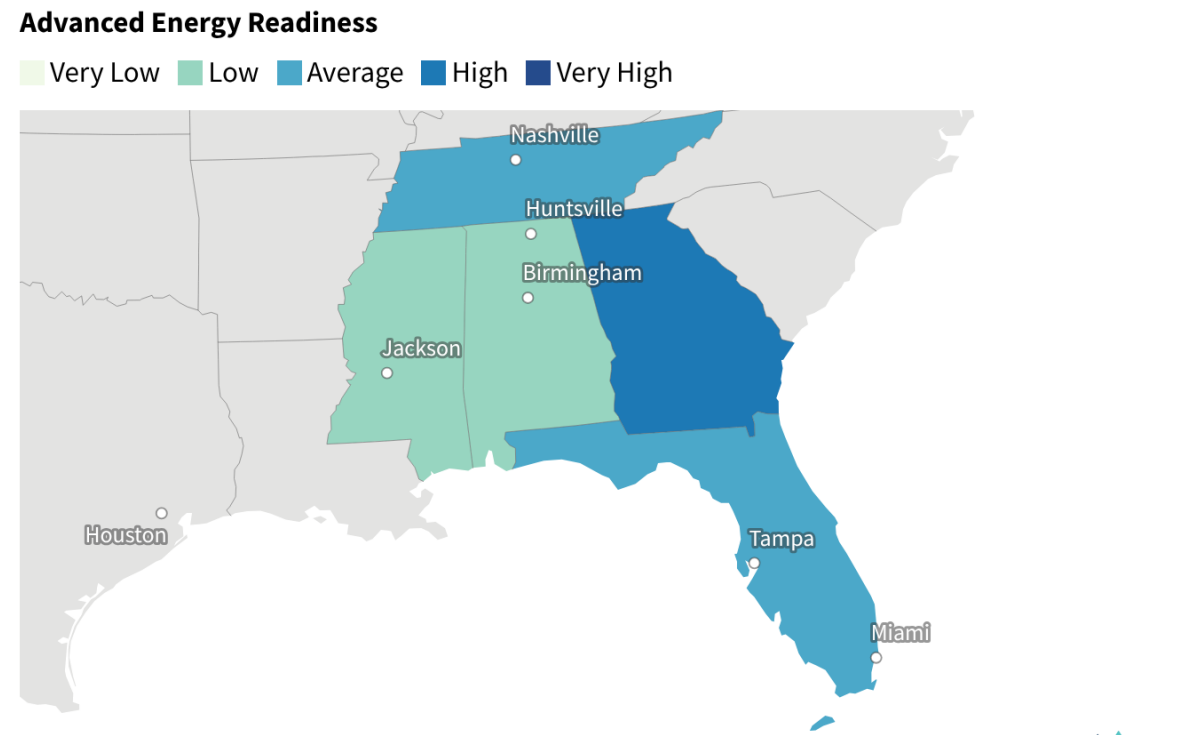


Source: RMI Analysis



Alabama and neighboring states have varying levels of readiness for the advanced energy era

The map shows states' readiness for advanced energy investment based on a composite index of five key ingredients: policy, economic capacity, physical infrastructure, deployment, and cluster formation.



Source: Author Calculations



Natural gas and nuclear dominate Alabama's electricity mix, and TVA forecasts increasing regional energy demand

Alabama electricity generation mix, 2024

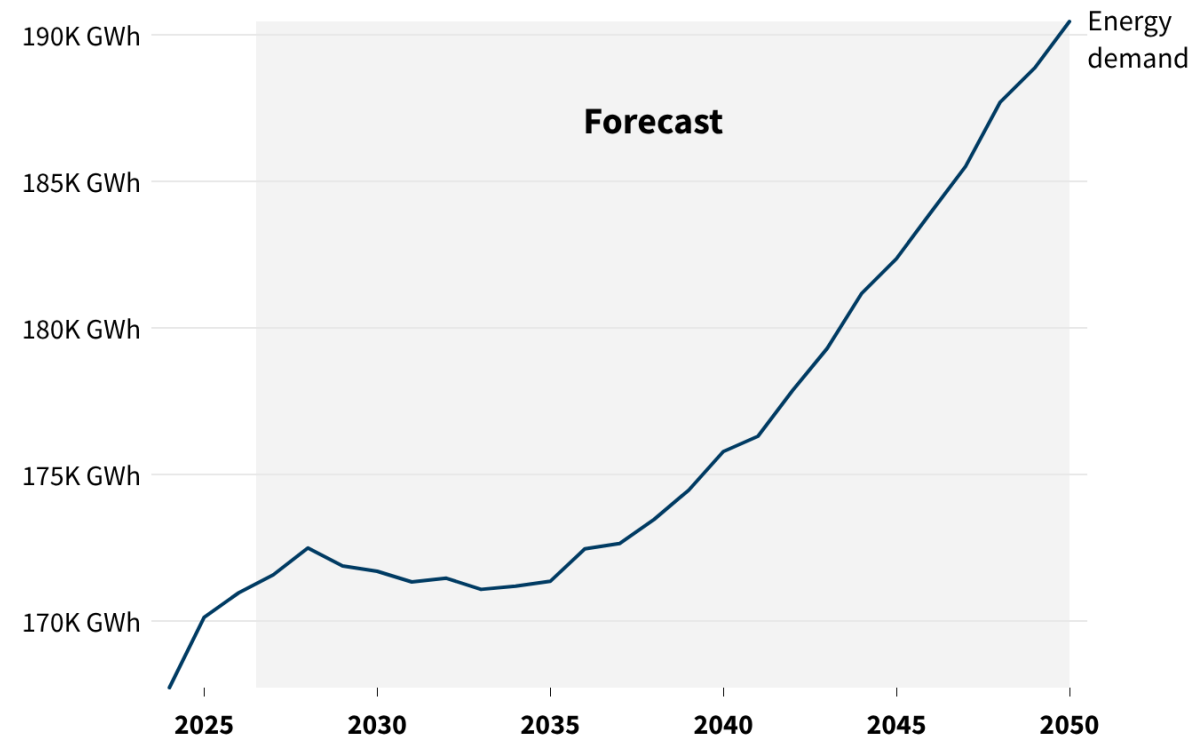
Share of Alabama electric power industry generation by source in 2024



Source: EIA

TVA energy demand forecast, 2024 to 2050

Scenario 1 in TVA's 2025 Integrated Resource Plan



Source: TVA 2025 Draft Integrated Resource Plan



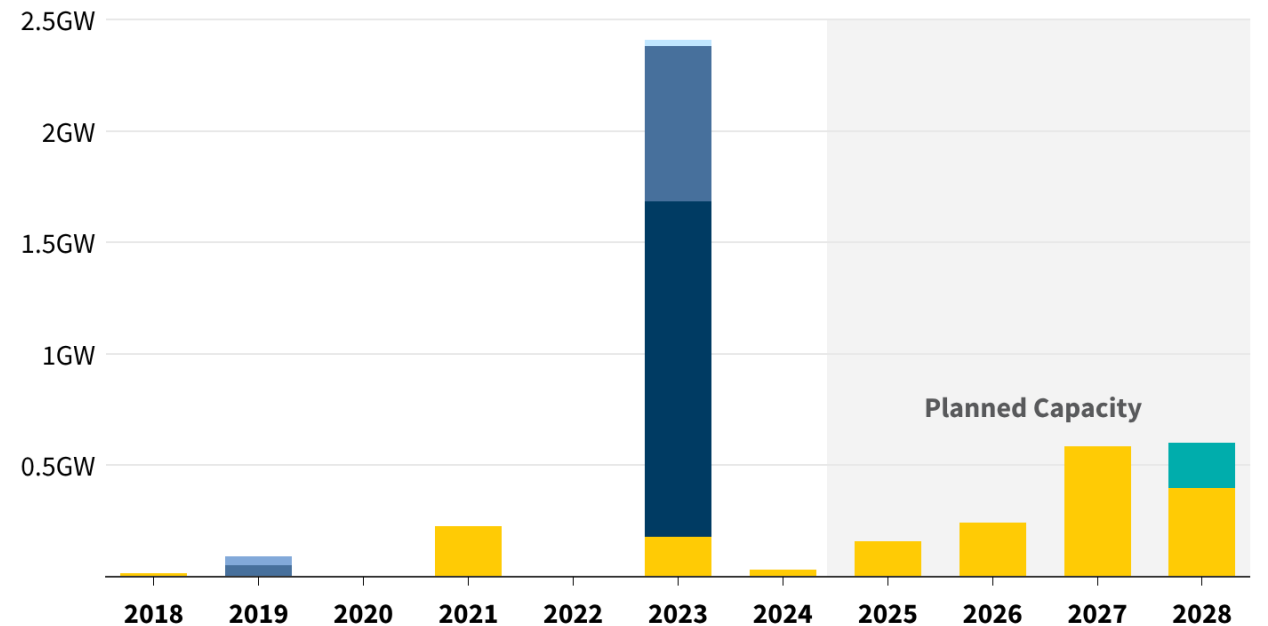
Solar dominates Alabama's planned generation additions through 2028

- 2023 saw the largest generation additions since 2018, driven primarily by natural gas
- Most planned generation additions through 2028 are solar, with a smaller contribution from battery storage

Alabama generation additions since 2018

Measured in Nameplate Capacity (GW)

Solar Photovoltaic Natural Gas Fired Combined Cycle Natural Gas Fired Combustion Turbine Batteries Wood/Wood Waste Biomass Natural Gas Steam Turbine



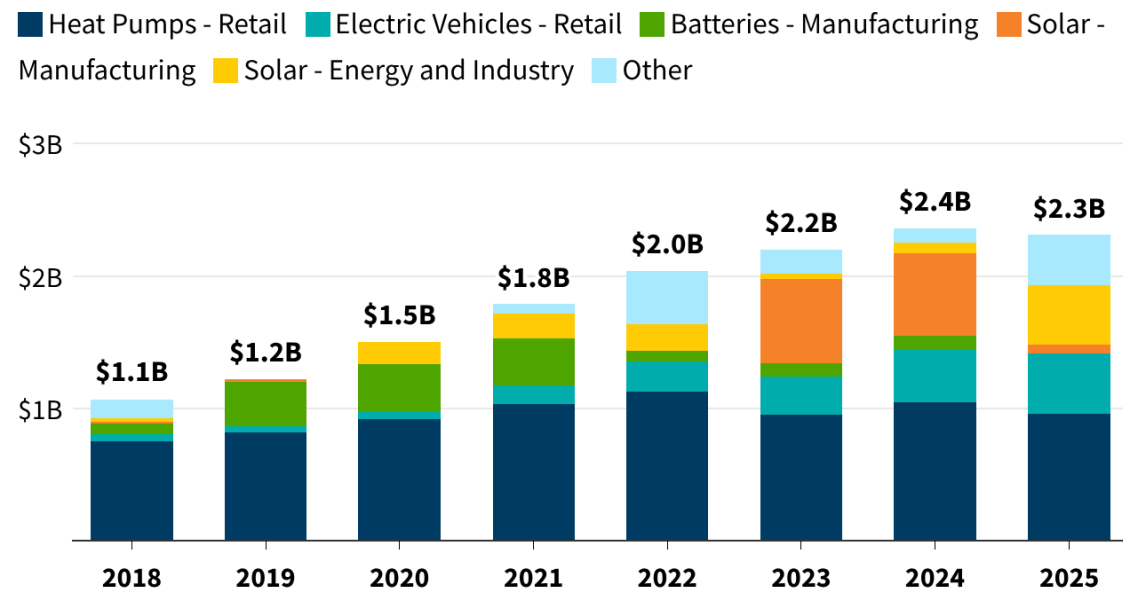
Source: EIA



Alabama advanced energy investment has grown steadily but lags neighboring states

Advanced energy investment in Alabama, 2018 to 2025

In 2024 USD



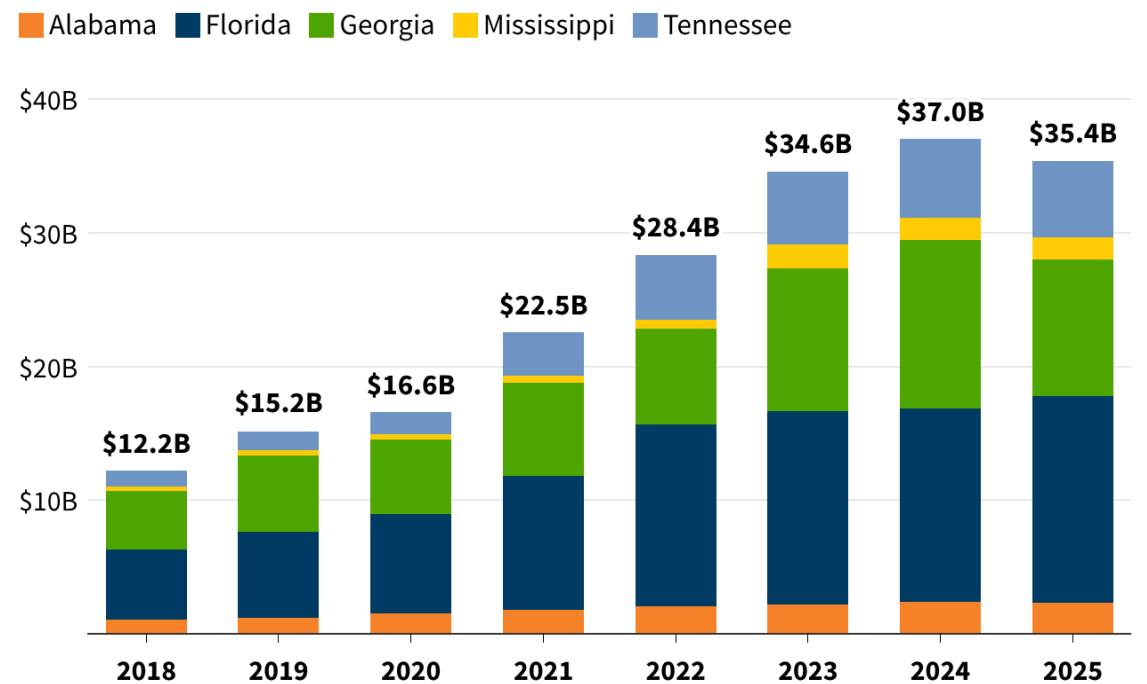
Note: Other includes all remaining Alabama clean technology investment segment and technology combinations not shown in the top five, including manufacturing (zero-emission vehicles, critical minerals, fueling equipment), energy and industry (cement, biomass), and retail distributed electricity and storage.

Source: Clean Investment Monitor



Advanced energy investment by year in Alabama and neighboring states, 2018 to 2025

In 2024 USD



Source: Clean Investment Monitor

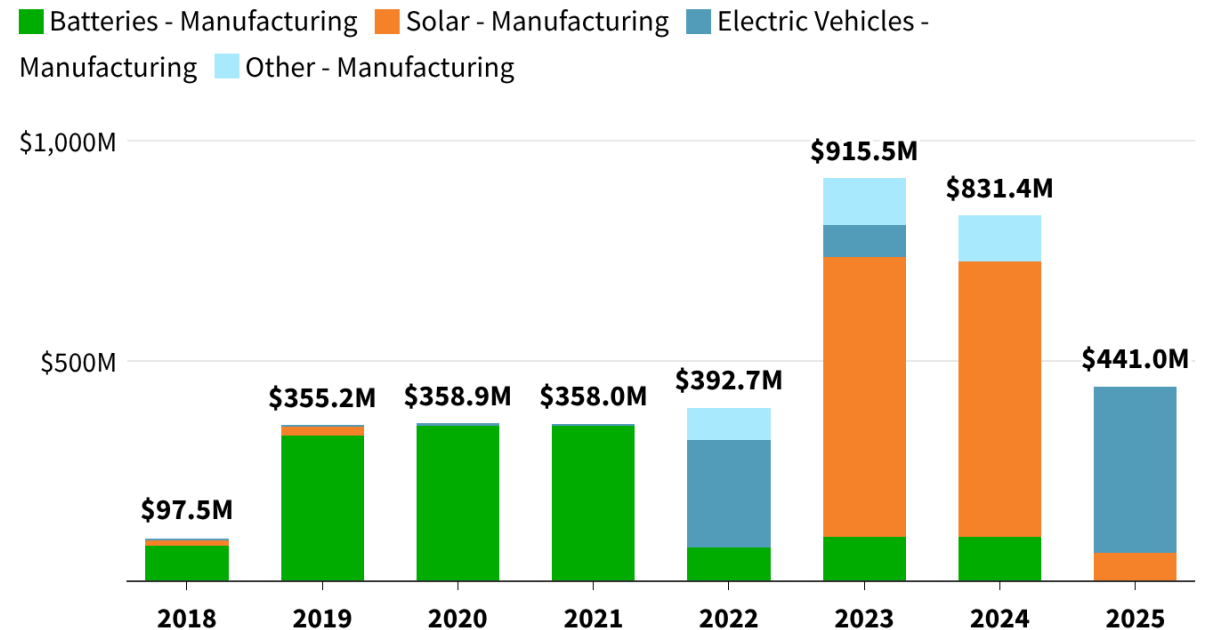


Alabama's advanced energy manufacturing investment has come in waves, broadening across batteries, solar, and EVs

- Battery manufacturing led earlier waves of investment, particularly from 2019 to 2021.
- Advanced energy manufacturing investment surged in 2023 and 2024, driven primarily by solar manufacturing investment.
- Together, these waves suggest Alabama is building a more diversified advanced energy manufacturing base.

Advanced energy manufacturing investment in Alabama, 2018 to 2025

2024 USD



"Other" includes: the remaining Alabama clean technology manufacturing categories not in the top three —Critical Minerals (Graphite) and Fueling Equipment (Electric Vehicle Chargers)

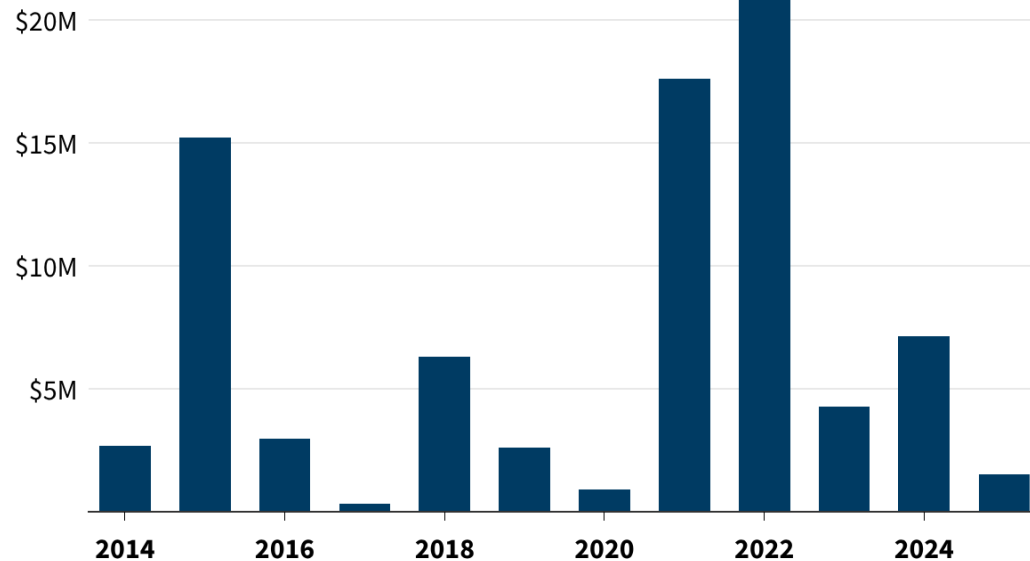
Source: Clean Investment Monitor



Advanced energy VC has been low in Alabama, especially compared to neighbors

Low cleantech VC flows are part of a broader pattern of limited advanced energy innovation activity in Alabama, including research, development, and demonstration; patenting; and publications

Cleantech VC investments in Alabama over time, 2014-2025

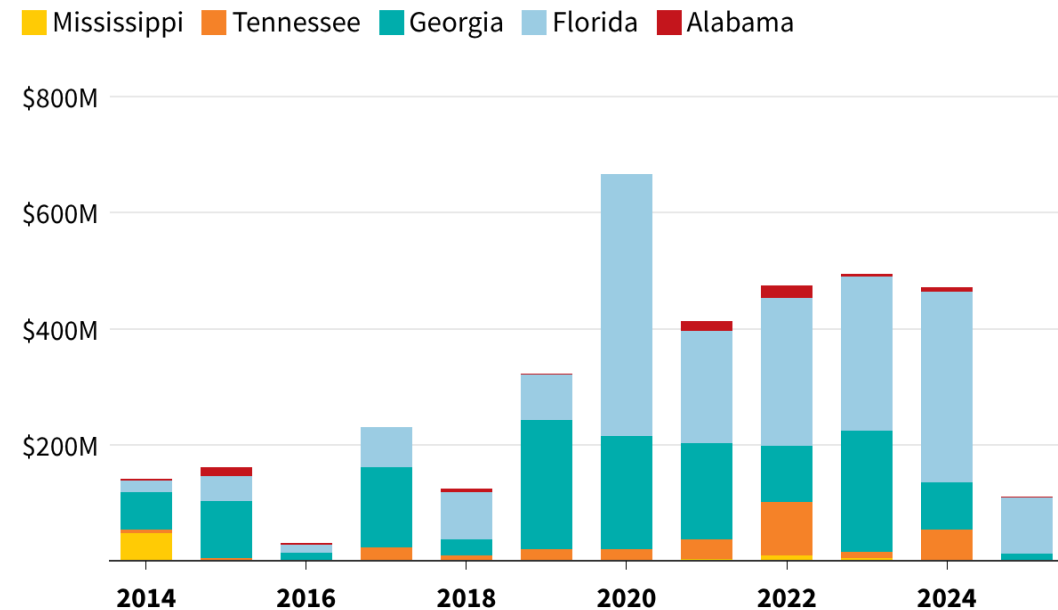


Note: Data through Q1 2025

Source: Pitchbook



Cleantech VC investments in Alabama and neighboring states, 2014-2025

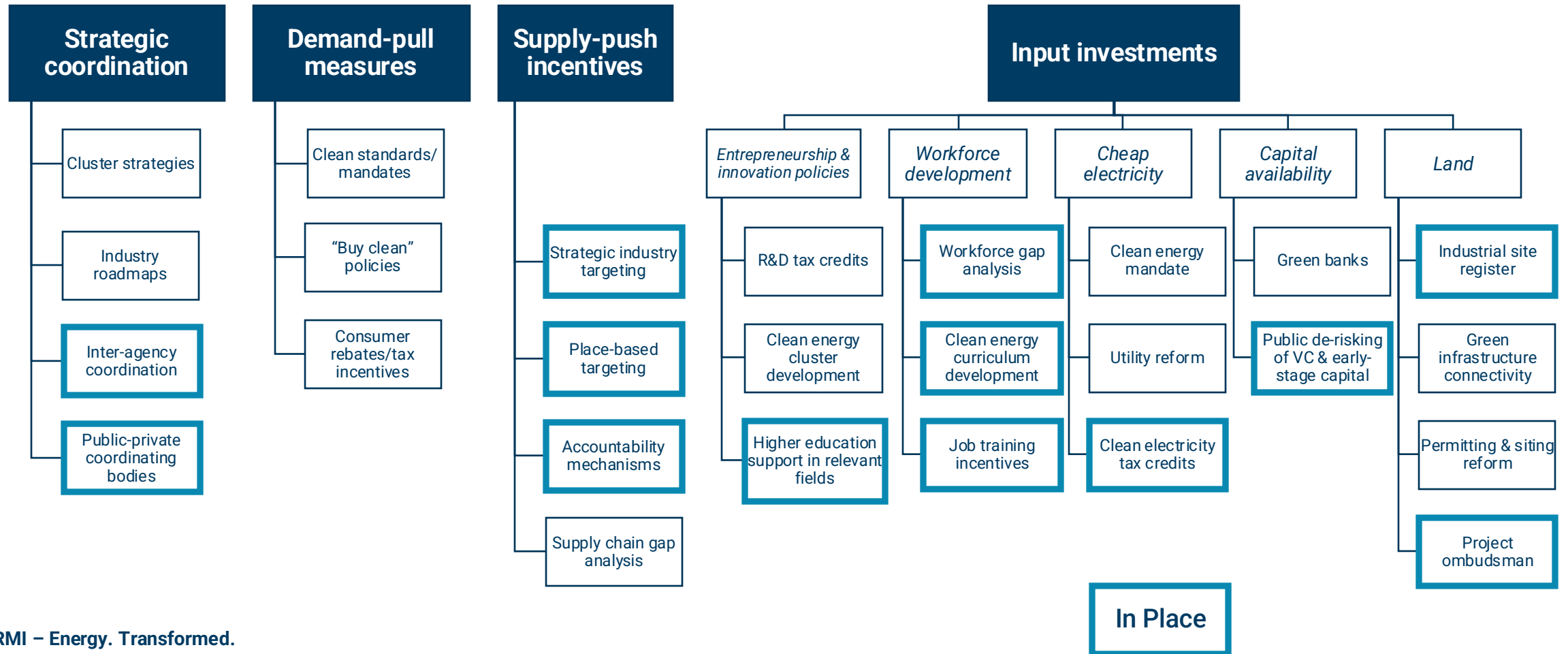


Note: Data through Q1 2025

Source: Pitchbook

Alabama has policy measures that support advanced energy but not in all domains

Alabama has scattered supportive measures but lacks the coordinated industrial strategy, demand-pull, and innovation tools that other states have

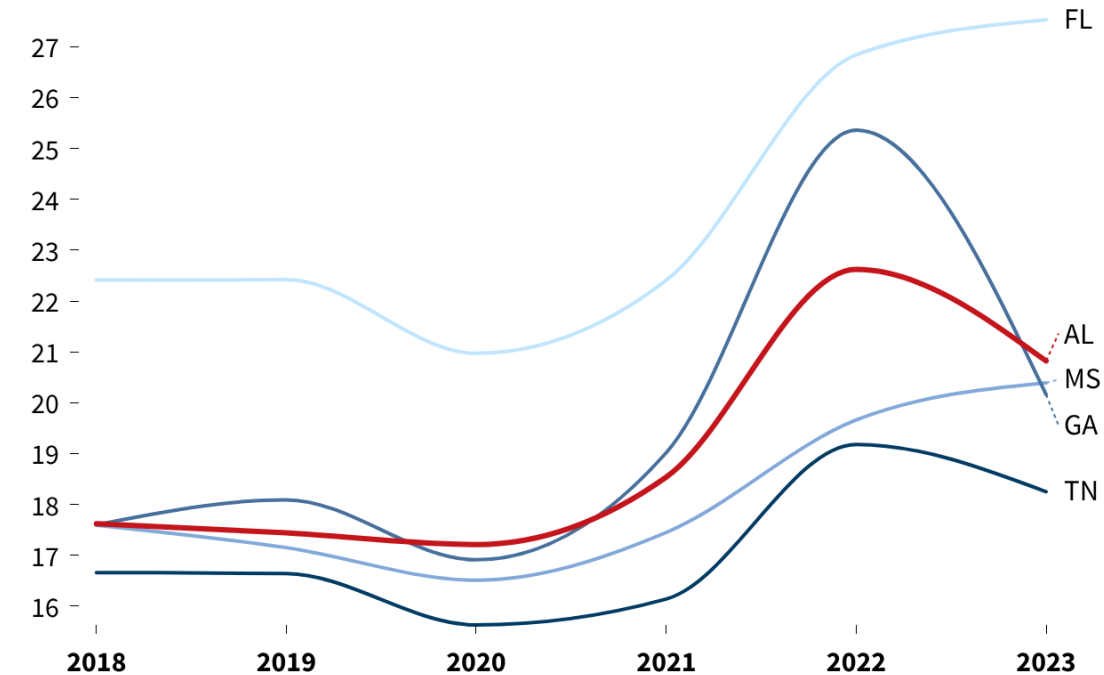


Alabama's industrial electricity prices are similar to neighboring states

Low industrial electricity prices can attract manufacturers and other large load users

Industrial electricity prices, 2018-2023

Alabama has similar industrial electricity prices to neighboring states



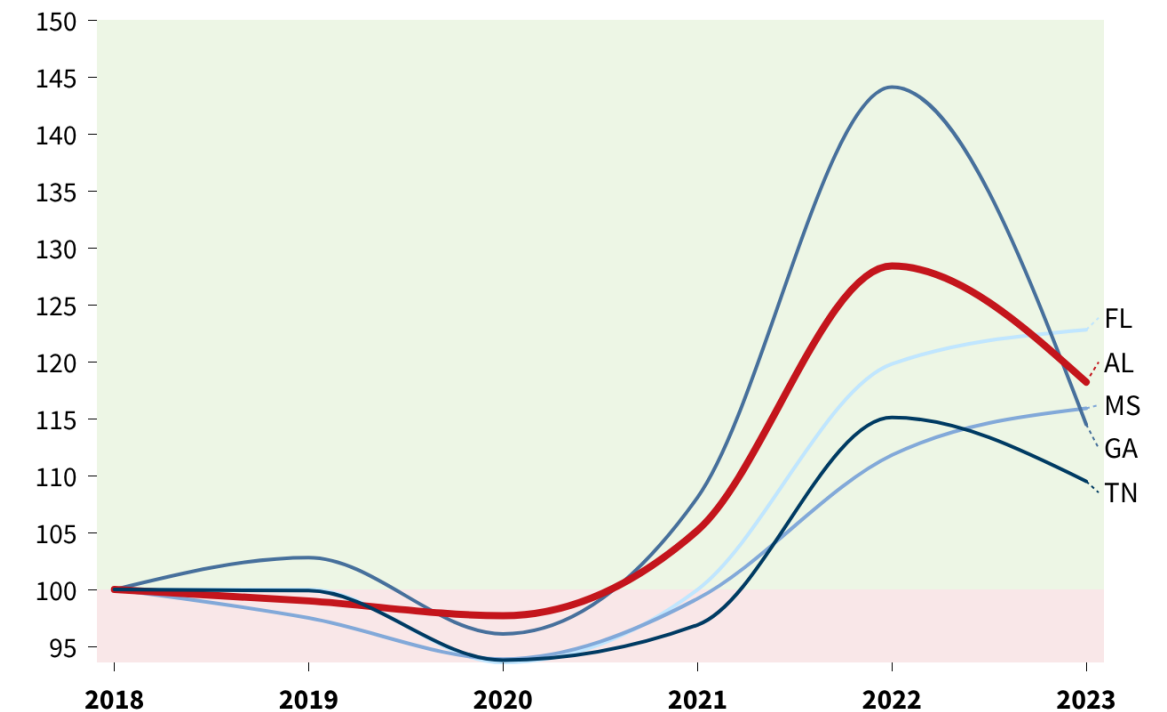
Note: Prices in \$/MMBtu

Source: EIA SEDS



Industrial electricity price growth, 2018-2023

Indexed to 2018



Source: EIA SEDS





Competitiveness

Competitiveness key messages



Huntsville's economic development success is anchored in its ability to attract complex, high-value industries, supported by strong aerospace, automotive, and defense ecosystems.



The region has deep technical and manufacturing capabilities, reinforced by research assets like Redstone Arsenal and Cummings Research Park and a coordinated workforce pipeline.



Huntsville is well positioned for advanced energy opportunities that build on existing strengths in manufacturing, systems integration, and testing.

Huntsville is a national leader in economic development

- Huntsville's economic development success is driven by its ability to attract complex industries and support a diverse manufacturing ecosystem.
- The region is nationally recognized for research-intensive work, supported by anchors such as Cummings Research Park and Redstone Arsenal.
- These assets, alongside established aerospace and automotive industries, have positioned Huntsville as a durable destination for new investment.

Huntsville wins another prestigious national honor, coming in only behind Fayetteville, Arkansas

Updated: Jan. 28, 2026, 8:26 a.m. | Published: Jan. 28, 2026, 8:15 a.m.

Huntsville is the second-best performing city in America according to [rankings](#) released Tuesday by the Milken Institute.

Only Fayetteville, Arkansas, ranks ahead of the Rocket City in the 2026 Best Performing Cities report. Huntsville moved up two spots from the previous year's rankings. Charleston, South Carolina; Boise, Idaho; Raleigh, North Carolina; Provo, Utah; Salt Lake City, Utah; Orlando, Florida; Austin, Texas; and Olympia, Washington round out the top 10.

Huntsville prioritizes smart growth as population continues to increase

Published on **August 8, 2025**

Numbers crunched by the City of Huntsville's Planning Department, in its annual estimates, continue to illustrate the city is maintaining its pace for growth.

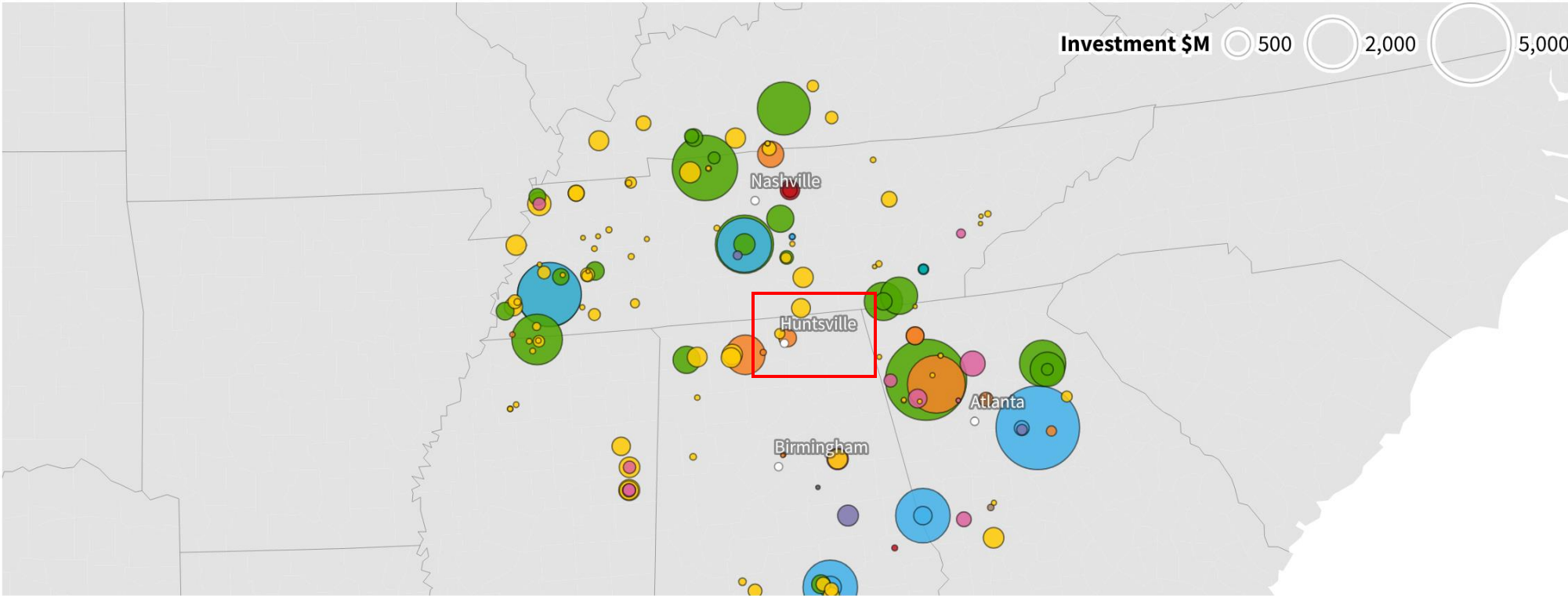
As of July 1, Huntsville's estimated population reached 249,102 – a 15.9% increase since the 2020 Census. In raw numbers, that's more than 34,000 new residents over the past five years, or about 18 new people choosing Huntsville as home each day.

The Huntsville area sits within a broader Southeast cluster of advanced energy investments since 2020

Advanced energy investment announcements, 2020 to September 2025

The Huntsville MSA region has seen \$241.9 million of advanced energy investment since 2020

■ Battery manufacturing ■ Cement Energy and Industry ■ Critical Mineral Manufacturing ■ Electric Vehicle Manufacturing ■ Fueling Equipment
■ Manufacturing ■ Hydrogen Energy and Industry ■ SAF Energy and Industry ■ Solar Energy and Industry ■ Solar Manufacturing ■ Storage Energy and Industry



Note: facility status includes operating, announced, and under construction.

Source: Clean Investment Monitor

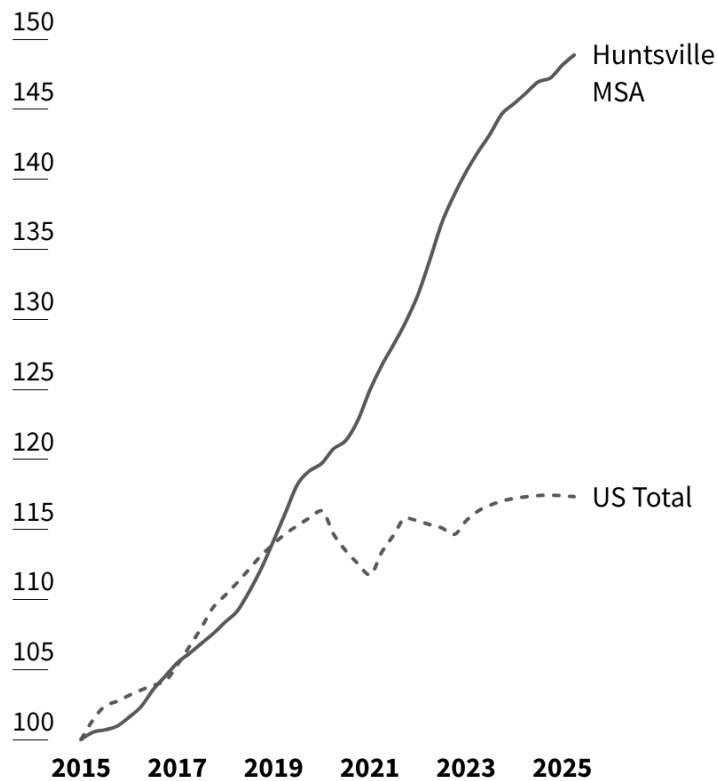


Automotive vehicle component manufacturing leads growing advanced energy employment in Huntsville MSA

Defense and aerospace drive professional and technical services employment

Advanced energy-aligned employment growth

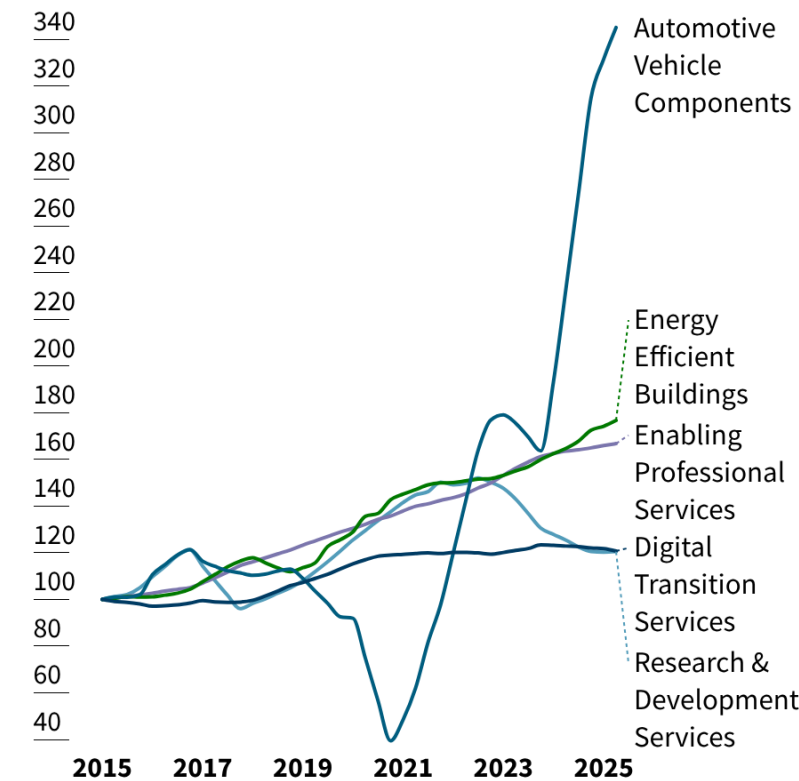
Indexed to 2015 (2015 = 100)



Source: Clean Growth Tool, BLS QCEW

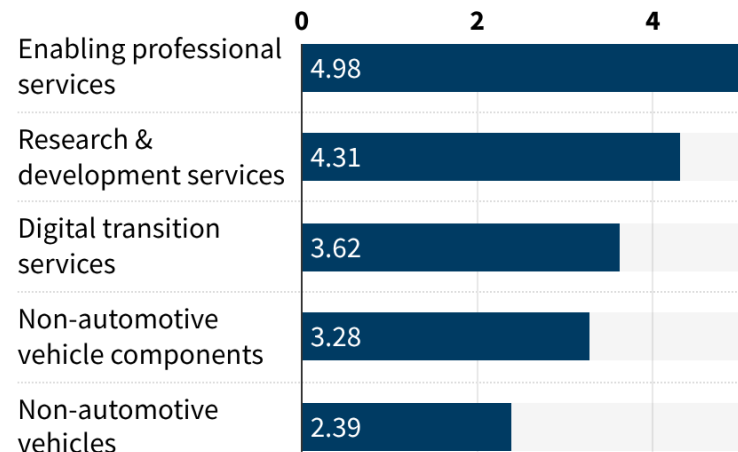
Top 5 fastest-growing advanced energy-aligned industries by employment

Indexed to 2015 (2015 = 100)



Source: Clean Growth Tool, BLS QCEW

Top 5 advanced energy-aligned employment concentrations

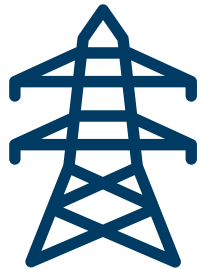


Note: concentration measured by location quotient (LQ)

Source: Clean Growth Tool, BLS QCEW

Local utilities have prioritized grid resilience investment

Huntsville, Limestone, and parts of Morgan county are served by municipal utilities that purchase nearly all their electricity from TVA. These municipal utilities have more flexibility and control over their infrastructure and utility investments, in contrast to much of the state, which is dominated by investor-owned utilities.



This flexibility has allowed the Huntsville region to drive forward focused efforts on grid resilience following the impact of the 2011 tornadoes. The region increased investment in backup power and solar-plus-storage solutions, especially at critical sites like Redstone Arsenal. This investment in reliable power supply has supported local economic development efforts by providing manufacturers with uninterrupted power.

The defense and aerospace industries support a regional ecosystem of contractors

Startups in the region often work across defense, aerospace, and advanced energy

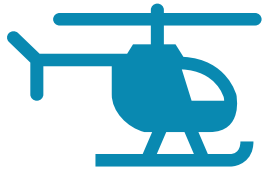


Marshall Space
Flight Center



- **Assets including NASA's Marshall Space Flight Center, Redstone Arsenal, the Missile Defense Agency, and US Space Command make the region a leader in aerospace and defense.**
- **An ecosystem of small businesses has developed to support and sustain the aerospace and defense industries.**

The Huntsville region has strong and growing manufacturing capabilities



North Alabama, particularly the Huntsville area, is experiencing growth in advanced manufacturing, aerospace, aviation, defense, and automotive.

Morgan County is a major manufacturing hub, with about 140 manufacturers spanning chemical, steel, agricultural, and aerospace sectors, benefiting from its riverfront location and transportation network.



The region has seen major investments in manufacturing from Mazda Toyota and Eli Lilly, demonstrating proven success of attraction efforts.

Huntsville has worked to diversify the types of manufacturing in the region.

The state has worked hard to attract EV manufacturers.

The workforce development pipeline is aligned through economic development and tech partnerships to ensure responsiveness to industry needs

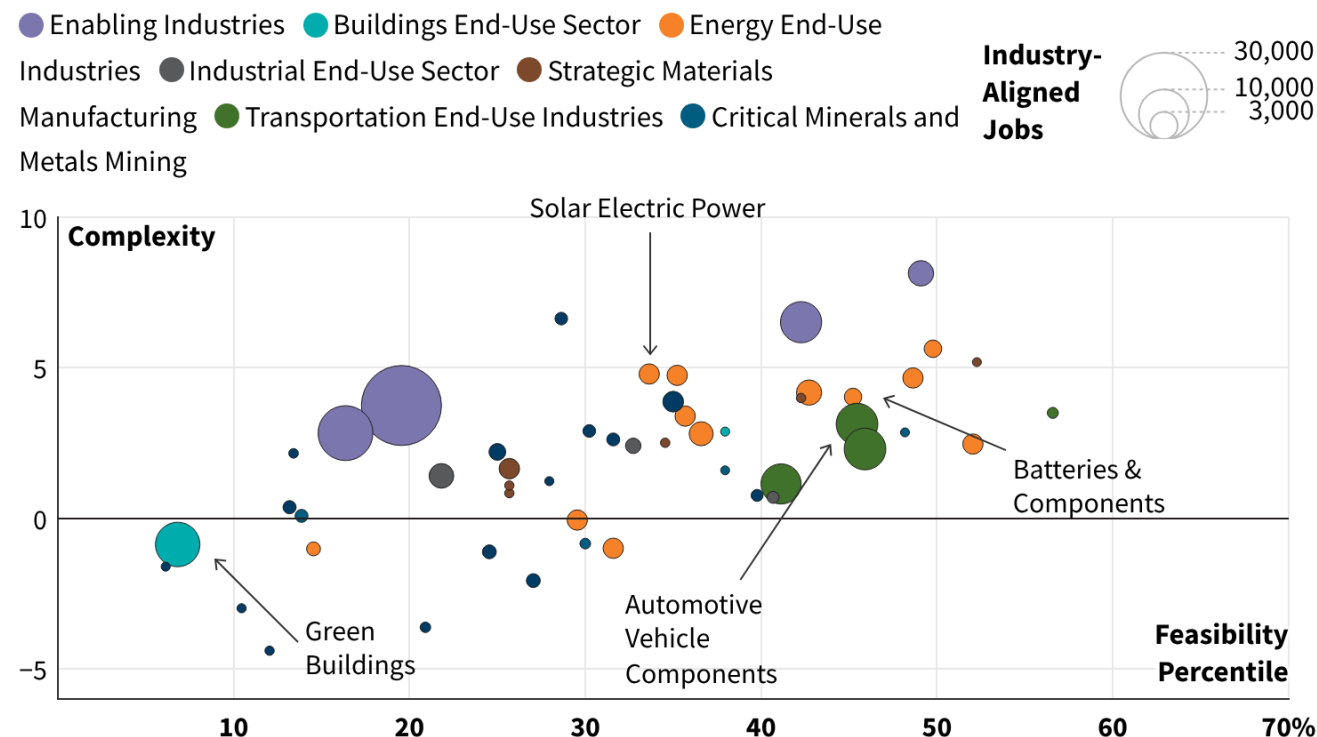
- **The integration of economic development in workforce development creates a foundation to draw new industry to the area**
 - Alabama had a biotech training offering before Eli Lilly's regional investment, allowing them to rapidly train up the workforce needed to support the new manufacturing facility.
- **The workforce development pipeline is present from K-12, with dedicated trade high schools, through to university and community college programs**
 - Community colleges in the Huntsville region offer training in construction trades such as carpentry, plumbing, electrical, and HVAC, reflecting the demand created by regional growth.
 - To address resource limitations in K-12 career tech programs, Alabama Community College System (ACCS) collaborates with school systems to provide dual enrollment opportunities, allowing students to access advanced equipment and certified instructors at community college campuses.
- **As the state's workforce development training incentive program, Alabama Industrial Development Training (AIDT) provides comprehensive training and retraining services for new and expanding businesses at no cost, demonstrating Alabama's strong workforce development offerings**
 - AIDT operates an automation campus, the Robotics Technology Park, which delivers advanced automation training to manufacturers.
- **The Alabama Mobility and Power (AMP) Center supports EV-related R&D and workforce development making the state manufacturing-ready**
 - AIDT's EV Technology Center and the state's National Electric Vehicle Infrastructure Program has also supported EV investment through workforce training and charging infrastructure.

Advanced Energy Opportunities

Quantitative approach: Industry
prioritization matrix

Huntsville has a range of high feasibility advanced energy opportunities

Advanced energy sectors in the Huntsville MSA



Note: Industry-aligned jobs is a proxy for estimated employment, mapped from BLS QCEW average employment over the last 8 available quarters, not a direct count of jobs in each sector.

Source: Clean Growth Tool



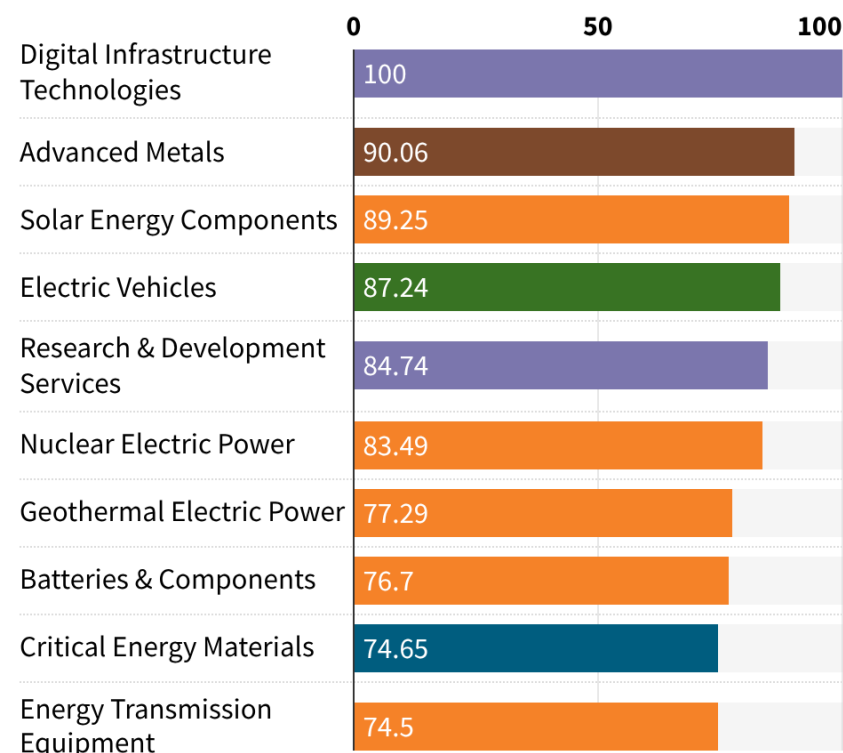
- Feasibility percentile reflects each sector's relative position in the Huntsville MSA compared with other areas nationally.
- Huntsville shows high feasibility scores across multiple advanced energy technologies.
- Technologies in the automotive supply chain, including batteries and components, score particularly high.

Huntsville scores well across a diverse set of advanced energy sectors

- This index ranks advanced energy sectors based on their feasibility in the region and their potential to support economic development and innovation.
- Solar energy components ranks as the highest-scoring energy end-use sector, consistent with Alabama's expanding solar capacity additions.
- Electric vehicles rank as the highest-scoring transportation end-use sector, reflecting the region's automotive manufacturing presence and EV supply chain base.
- Research and development services also score highly, reflecting the region's capabilities in defense and aerospace research.

Advanced energy sector index results

■ Enabling Industries ■ Strategic Materials
■ Manufacturing ■ Energy End-Use Industries ■ Transportation
■ End-Use Industries ■ Critical Minerals and Metals Mining



Note: Index based on feasibility percentile and complexity values.

Source: Clean Growth Tool, BLS QCEW



Constraints

Constraints key messages



Generation capacity, transmission constraints, and utility coordination challenges threaten to limit Huntsville's ability to land new manufacturing and large-load projects.



While the region has strong defense, aerospace, and manufacturing talent, these industries have not consistently spread skills and innovation into the broader startup and small business ecosystem.



Housing supply has not kept pace with population and job growth, limiting the region's ability to attract and retain workers across income levels.



Limited access to flexible capital — particularly for small businesses and CDFIs — continues to constrain inclusive economic growth and entrepreneurship.

Constrained energy supply and the complicated utility landscape have hindered economic development efforts

- **Local economic growth has been constrained by power supply and transmission infrastructure issues, which have led to missed manufacturing deals, and local leaders are looking to prioritize grid upgrades and demand-side management.**
 - While TVA is often able to provide lower rates than other regions, as a government entity, the utility is limited in how quickly it can support requests for additional capacity when compared to a private provider.
- **The multiplicity of providers in the region in combination with infrastructure crossing multiple jurisdictions has made coordination for new projects complex and requires concerted coordination between counties, cities, and utilities, which takes additional time and effort.**

While defense and aerospace are anchor industries for the region, these skills remain somewhat contained

Defense contracting has supported an ecosystem of small businesses, but the nature of the defense sector has reduced the permeation of skills to the broader marketplace.



High-tech, high-wage jobs and skillsets are siloed in sensitive, classified, or highly regulated fields.



Academic or research-related skillsets have been able to permeate out from the defense and aerospace ecosystem to the start-up world, but capabilities for precision manufacturing have not disseminated as easily given the training required.

Despite a strong training pipeline, manufacturers struggle to recruit and retain



Despite successful regional job creation, limited affordable housing, transportation, and childcare for the workforce constrain both hiring and retention.



Industrial maintenance technicians are in highest demand, with community colleges and the Alabama Office of Apprenticeship providing training and apprenticeship programs to address workforce shortages and retention challenges for manufacturing.



Rapid population and economic growth in Huntsville and North Alabama have led to capacity and facility constraints for community colleges and school systems, necessitating ongoing capital improvement projects to meet demand.

The existing housing stock is dated, but retrofit incentive programs struggle to tackle energy affordability at scale



Many homes, especially those built in the 1960s to 1980s, require significant structural repairs, but there is a lack of programs equipped to handle major rehabilitation projects.



A portion of the population are renters or live in older homes, presenting unique challenges for energy efficiency upgrades due to lack of funds and greater scope of retrofit needs, including physical upgrades needed in addition to energy interventions.



There is a critical need for energy efficiency improvements, including HVAC units, hot water heaters, insulation, windows, and doors, but most homeowners cannot afford these upgrades.

- **Most homeowners are interested in energy efficiency upgrades, particularly HVAC improvements, and benefit from TVA's rebate programs, although these have been inconsistent over time.**
- **While upgrading HVAC may provide energy cost savings in the long run, first costs can be \$7,000 to \$10,000, which is unaffordable for many low-income families.**
- **Retrofits and energy efficiency upgrades are not widely addressed in affordable housing due to limited incentives, with the state relying on federal programs.**

There are few CDFIs in the region, and regional capital is constrained

- **Lenders and financiers need education and technical assistance to better understand advanced energy technologies and market needs.**
- **While C-PACE is available in Alabama, there is no implementation strategy, and statutory restrictions limit use.**
- **Alabama has few CDFIs and their network is limited, constraining access to capital for small businesses and entrepreneurs.**
- **There is a pressing need for more philanthropic and low-cost capital to enable CDFIs to make loans to underserved businesses, as they are best positioned to serve these markets.**
 - Community banks are hesitant to provide significant lending capital to CDFIs due to unfamiliarity with CDFI underwriting.
 - Resourcing CDFIs is a major constraint leading to a lack of capital for small business, affordable housing, and innovation in advanced energy.

Lack of small business financial literacy makes banks hesitant to provide capital



Start-ups and small businesses in Huntsville and North Alabama face tightened lending standards from local banks, making it difficult to secure traditional financing without a track record.

Larger companies typically have established banking relationships, while smaller businesses may need help navigating Small Business Administration (SBA) and traditional lending.



Many clients' lack of financial literacy hinders their ability to access capital and grow their businesses.

Some resources and trainings are provided by lenders but are not fully utilized by small businesses, further exacerbating the capital access challenge.



Because of these constraints, small businesses face high barriers to entering the advanced energy market and few have engaged meaningfully.

As VC activity is limited, and small businesses and start ups struggle to find financing, their presence in the advanced energy market is limited in the Huntsville region.



Coordination

Coordination key messages



Economic development in the Huntsville region is highly coordinated across state and local agencies.



Workforce development coordination is strong, driven by close partnerships among economic development entities, community colleges, universities, and employers to rapidly respond to industry needs.



While CDFIs have begun coordinating through a newly established collaborative, limited alignment with banks and credit unions continues to constrain access to capital for small businesses.

The whole region is in lock step when it comes to economic development coordination

Economic development organizations lead coordination, with supporting organizations operationalizing priority industries and sectors.



Economic development and advanced manufacturing investment drive workforce development coordination



Strong partnerships between universities and research parks support ongoing industry growth.

Alabama Community College System's economic development team coordinates across community colleges and training organizations adapting to local and regional partners' specific targets, ensuring responsiveness to varying economic development priorities.



The region focuses on a STEM-rich workforce pipeline from K–12 through postgraduate levels demonstrating coordination.



Regular surveys and direct engagement with local employers to identify workforce needs, including specialized skills for new industries allows for training providers to rapidly adapt educational programs in response.

While housing NGOs act as strong collaborators, more private sector and industry collaboration is needed to deliver affordable housing

- **The City of Huntsville's Community Development office, Limestone County EDA, and Habitat for Humanity River Valley have coordinated to deploy workforce housing and single-family affordable housing.**
 - Collaboration outside of Huntsville has been more difficult to coordinate, with some cities less willing to allocate or lacking their own CDBG funds for new construction or infrastructure projects supporting low-income families.
- **There is an ongoing disconnect between real estate developers and local EDAs.**
 - Stronger coordination between economic development efforts and real estate development would allow for workforce housing to be deployed in coordination with new manufacturing job creation to ensure housing is affordable and accessible to employees.

CDFI coordination exists through a newly established collaborative, but coordination with credit unions and banks is limited

Local coordination presents some strengths:

- **The Alabama Capital Access Collaborative established in 2025 provides coordinated lending opportunities for CDFIs.**
- **CDFIs like NCI and Sabre have collaborated on loan financing but are looking for opportunities to build out a stronger CDFI network.**

Remaining gaps:

- **CDFIs could better coordinate with credit unions and banks.**
- **More coordination is needed between economic development organizations and financial institutions to support small business needs and showcase their importance.**

Possible solutions:

- **There is an opportunity to replicate the quarterly meeting that local financial institutions in the Birmingham region hold to enhance coordination among lenders in Huntsville.**
 - **This could enable knowledge sharing and capacity building and enhance coordination between CDFIs and other types of lenders.**

Advanced energy sector opportunities

- **Nuclear components**
- **Power electronics**
- **Industrialized construction**
- **Grid equipment**
- **Heat pumps**



Mapping the Huntsville Region's Advanced Energy Opportunities

Three steps to mapping the Huntsville region's current capabilities onto new advanced energy opportunities

Identify existing capabilities

Use desk research, data, and interviews to understand current regional strengths. Look at major employers, key industries, workforce skills, and recent investments.



Identify advanced energy opportunities

Use regional strengths to identify a short list of advanced energy industries that could realistically grow from current capabilities. Prioritize industries that are not present currently, fit local strengths, and have strong market demand.



Identify transferable capabilities to connect the two

Identify the shared skills, equipment, and suppliers that connect the region's current capabilities with the target opportunities. Focus on transferable capabilities that can serve as "launch pads" to build these new advanced energy opportunities.

Mapping Huntsville’s advanced energy opportunities highlighted several priority sectors

Capability-to-opportunity matrix

Five advanced energy opportunities across two supply chain stages

Scoring Key

Strong

Med

Weak

Testing and Qualification

Manufacturing, assembly, and systems integration

Existing Capabilities

Space propulsion development and testing

Testing culture; materials validation

Testing & reliability culture

Thermal management know-how

Limited hardware overlap

Limited engineering overlap

Safety critical systems engineering and integration

Safety and quality documentation

Rigorous standards with limited system failure

Cyber-secure controls

Controls & sensor integration

Systems integration

High-reliability electronics manufacturing

High quality design standards

Durable and weather-proof electronics

High quality design standards

High quality design standards

High quality design standards

High-volume precision manufacturing

Assembly and testing of complex machines

Machining & fabrication

Fabrication for intricate components

Appliance-style assembly systems

Assembly of complex modular components

Chemical and polymer manufacturing

Specialty materials; materials quality assurance

Materials and coatings manufacturing

Materials and coatings manufacturing

Refrigerant and polymer inputs

Insulation and adhesives

5 existing capabilities



Coloring is a qualitative assessment to assess the strength of overlapping capabilities between the rows and columns.



Rationale for choosing current capabilities

Rationale table



The region's local companies serve as anchors for the skillsets and specializations in the area.

		Qualitative justification	Quantitative justification	Local companies
	Space propulsion development and testing	The region has a large NASA center with specialized propulsion test facilities.	High concentration of aerospace engineers (LQ 39.67); 6000 employees at NASA.	NASA Marshall Space Flight Center; Blue Origin
	Safety critical systems engineering and integration	Redstone Arsenal functions as a dense cluster of defense organizations functioning as a local base for systems engineering.	Architecture & engineering employment share is structurally high (7.7% vs 1.7% nationally).	Redstone Arsenal; U.S. Army Redstone Test Center
	High-reliability electronics manufacturing	The region focuses on complex system integration for defense-focused electronics.	Electrical engineers have LQ 7.04 and electronics engineers have LQ 5.00.	Futaba
	High-volume precision manufacturing	The region has major vehicle and automotive manufacturing plants like Mazda Toyota and Polaris.	Toyota Motor Manufacturing employs more than 2,400 team members and builds more than 3,000 engines each day.	Mazda-Toyota; Polaris
	Chemicals and polymer manufacturing	Morgan County has a concentrated materials and process manufacturing base with multiple companies like 3M.	High local employment counts: 3M with over 600 employees, Daikin with over 400 employees, and Xylenes & PTA with over 300 employees.	3M, Daikin; Xylenes & PTA

Rationale for choosing advanced energy opportunities

Rationale table

 *The region's current industrial base provides the strongest reason for choosing these advanced energy opportunities.*

		Market potential	Huntsville fit assessment	Local economic development value
	Nuclear components Parts and systems used in nuclear reactors and safety equipment.	US nuclear capacity is projected to triple from roughly 100 GW in 2024 to 300 GW by 2050 according to DOE.	Strong fit for nuclear qualification and testing services leveraging NASA's test culture and Redstone's safety critical integration ecosystem. High-reliability electronic expertise provides overlapping capabilities for development of grid equipment with ruggedized electronics.	Employment growth in quality assurance and testing roles; nuclear certification anchor for the region.
	Grid equipment Hardware that moves and manages electricity across the grid.	Long lead times of "36-months" for grid components according to DOE's <i>Large Power Transformer Resilience</i> report, and load growth requires grid updates.		High employment growth and sustained momentum due to national load growth and grid congestion issues.
	Power electronics Semiconductor-based systems that convert and control electric power	DOE cited market for power electronics to reach \$33.3B by 2028.	The region's capabilities in circuit board assembly and electronics integration are relevant to developing electronics for energy applications. High throughput manufacturing (e.g., Toyota engines) supports component-scale production methods.	Increased employment growth in high-wage electronics manufacturing jobs.
	Heat pumps High-efficiency electric systems for heating and cooling buildings.	IEA reports global heat pump sales are growing (e.g., in 2022 heat pump sales grew by 11%).		Region can serve as an anchor for heat pump manufacturing and systems integration leading to new investment.
	Industrialized construction Factory-made housing components assembled on site.	McKinsey estimates modular construction could reach roughly \$130B in Europe and the US by 2030.	High throughput manufacturing and Morgan County's materials manufacturing base creates a strong platform for structural components.	Creation of manufacturing jobs while scaling high performance, quality homes to increase naturally occurring affordable housing.



Nuclear components

Testing and R&D

Rising electricity demand is increasing interest in nuclear energy

Main nuclear deployment pathways



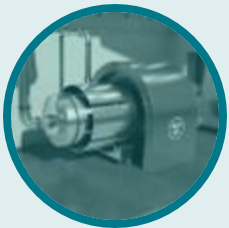
Large reactors

Typically gigawatt-scale Gen III+ light-water designs



Small modular reactors

Typically ~50–350 MW per module; modular designs can add capacity as demand grows

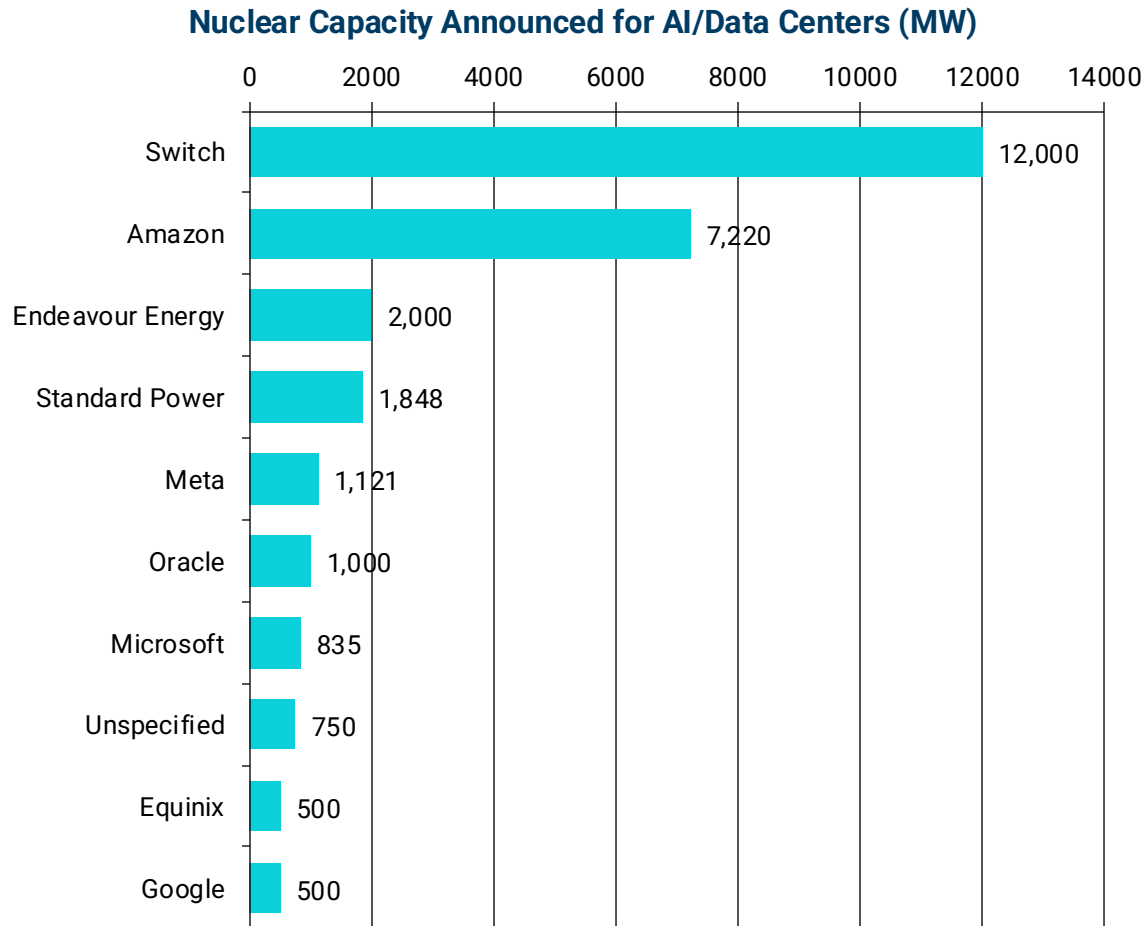


Microreactors

Generally under 50 MW; suited for remote, defense, and industrial sites that need resilient backup or dedicated power

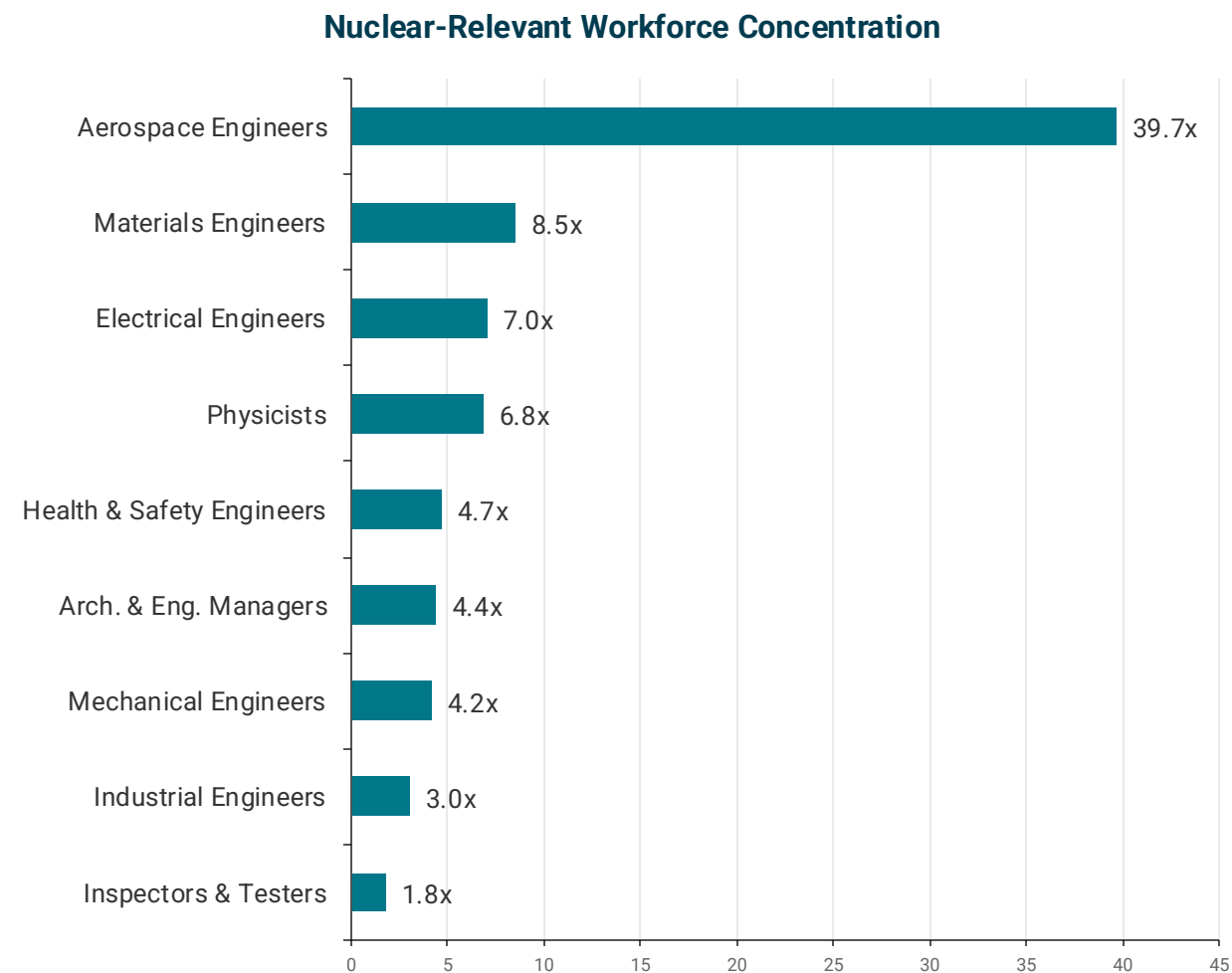
- **Nuclear energy provides always-on baseload electricity, making it valuable for firm power.**
- **Demand for firm power is expected to drive 100 GW–400 GW of new nuclear capacity in the United States by 2050.**
- **Nuclear supply chain buildout will create demand for fuel fabrication, precision manufacturing, instrumentation and control systems, and testing/qualification.**

The market outlook for nuclear is driven by new demand from data centers



- **Over 28 GW of nuclear capacity announced for AI/data center use since 2023**
- **Hyperscalers (Switch, Amazon, Meta) contracting directly with nuclear developers for clean firm power**
- **Signals strong private-sector willingness to commit capital, de-risking supply chain investment**

Huntsville has the workforce and capabilities to support nuclear testing and research



Location quotient >1.0 = above-average concentration vs. national average. Huntsville MSA includes Madison and Limestone counties. Source: BLS OEWS, May 2024

Many nuclear design and testing occupations have high employment concentrations in the region.

Testing assets connect directly to nuclear qualification needs.

- NASA Marshall’s NTREES “Nuclear Thermal Rocket Element Environmental Simulator” facility tests nuclear propulsion fuel elements at extreme temperatures.
- Redstone Test Center provides safety-critical systems testing.

TVA provides regional nuclear operating experience.

- Browns Ferry provides nearby nuclear operating experience; TVA is evaluating advanced nuclear options through its IRP.



Grid equipment

Manufacturing

Grid equipment demand is accelerating as the United States races to modernize infrastructure

Grid equipment encompasses the physical hardware that moves electricity from generators to end users. The core categories include:

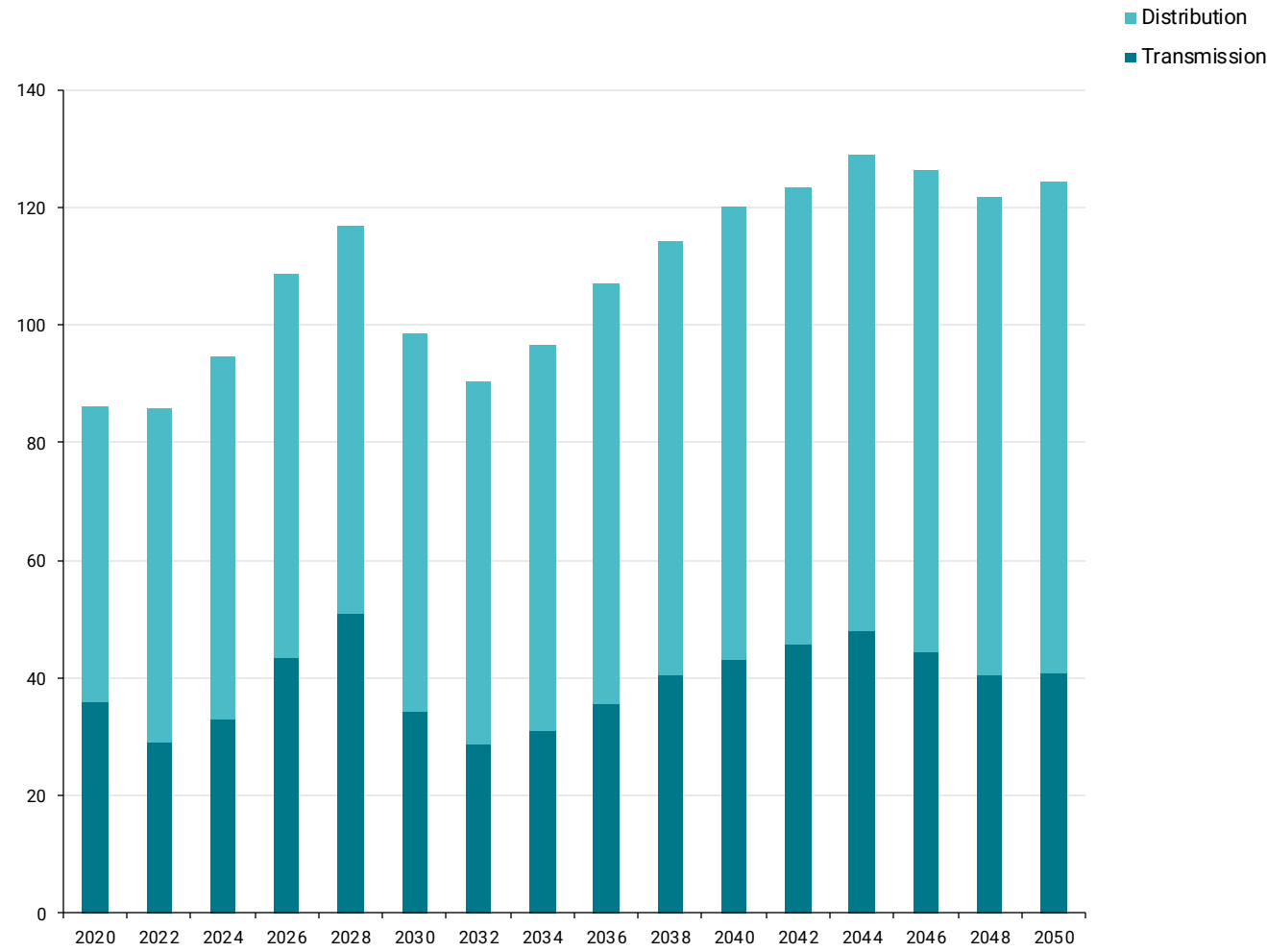
-  **Transformers**
-  **Switchgear & circuit breakers**
-  **Conductors & cables**
-  **Substation components**
-  **Grid-scale energy storage**

Three drivers are converging to create unprecedented demand for grid equipment:

-  **Aging infrastructure**
 - Lead times for large power transformers exceed two years (128–144 weeks)
-  **Increasing load growth**
 - Power transformer demand up 119% since 2019; generator step-ups up 274%
-  **Grid modernization support**
 - DOE \$1.9B SPARK “Speed to Power through Accelerated Reconductoring and other Key Advanced Transmission Technology Upgrades” program for grid upgrades

US grid investment is projected to exceed \$120 billion annually by the 2040s

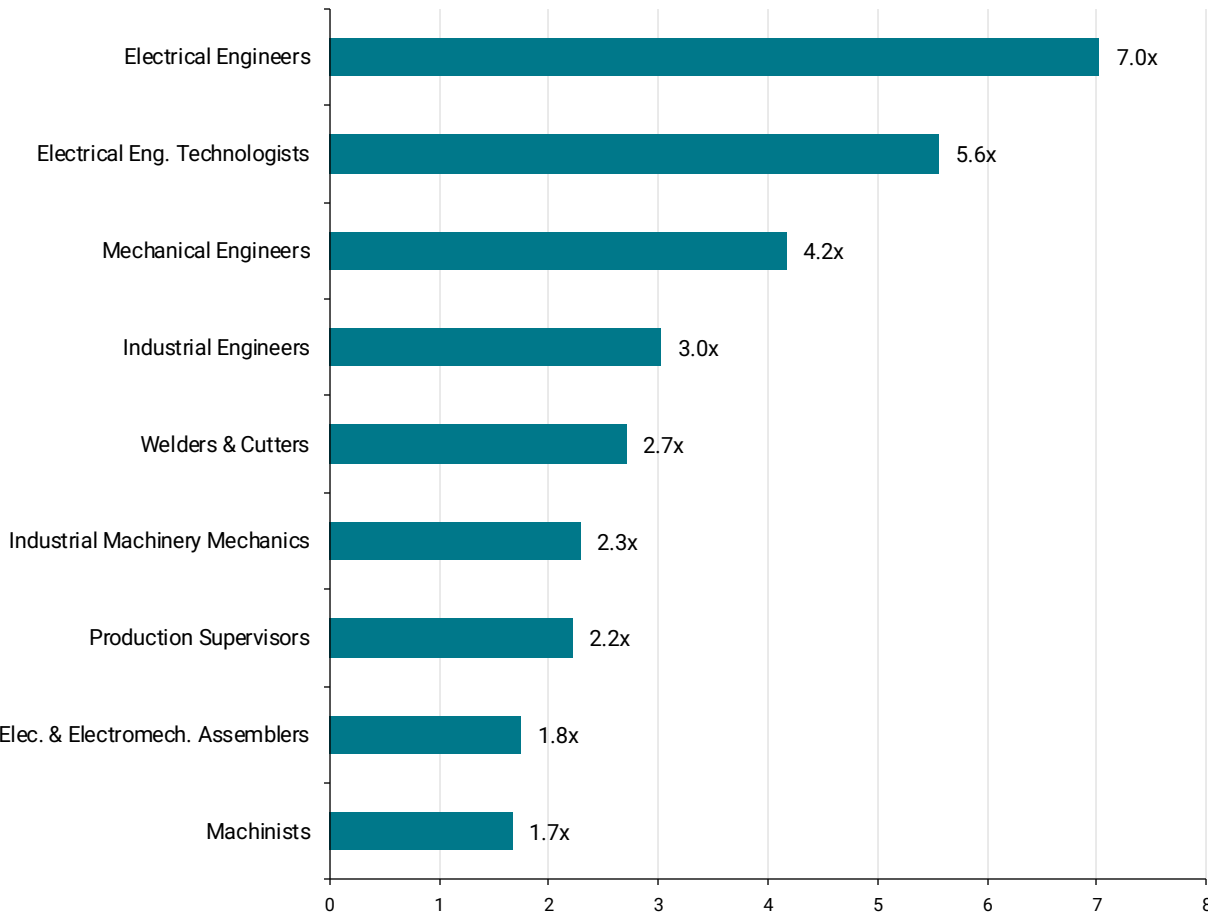
US Grid Investment Outlook (\$B, real 2024)



- **Investment rises above 2020 levels and remains elevated through 2050**
- **Distribution spending makes up ~60% of total grid investment, the segment most dependent on transformers and switchgear**

Huntsville has the workforce, production infrastructure, and proximity to demand for grid equipment manufacturing

Grid Equipment Manufacturing Workforce (LQ)



Location quotient >1.0 = above-average concentration vs. national average. Huntsville MSA includes Madison and Limestone counties. Source: BLS OEWS, May 2024

Many grid-relevant occupations have high employment concentrations in the region.

Proven production infrastructure and cost advantage:

- Mazda Toyota plant demonstrates the region can attract and operate high-volume advanced manufacturing
- Lower labor and site costs vs. coastal metros, with available industrial land

Proximity to TVA demand and the Southeast grid manufacturing corridor:

- TVA’s service territory is one of the largest utility systems in the United States with major grid modernization needs.
- The Southeast is emerging as the US hub for grid equipment manufacturing, with new OEM plants within a day's drive of Huntsville.



Power electronics

Manufacturing

Power electronics demand is surging as data centers and electrification drive need for power conversion

Power electronics is the technology that converts and controls electric power. Yole projects this market will grow from \$23.8B in 2023 to \$35.7B in 2029.

 **Power modules**

 **Power conversion equipment**

 **Motor drives and controllers**

 **Data center power systems**

Three drivers are accelerating demand for power electronics:

 Electrification of transportation

- IEA projects global EV sales to exceed 20M in 2025.

 Advanced energy and storage growth

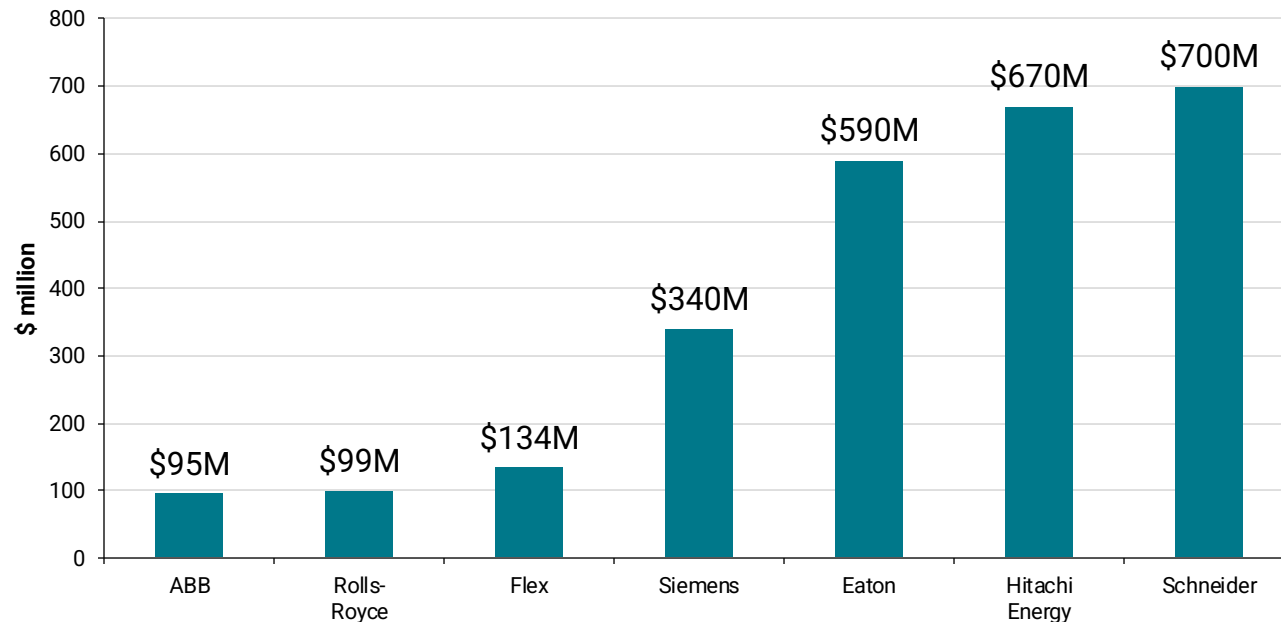
- IEA projects 4,600 GW of new global advanced power capacity from 2025 to 2030.

 Data center and AI expansion

- Yole projects data center power supply market to reach \$14B by 2030 at 15.5% CAGR from 2024.

There is growing investment in the US power electronics industry

Manufacturing investment in data center power and electrical equipment manufacturing since 2023 (\$M)



\$2.6 billion in announced investment across 25 projects since 2023. Source: BNEF.

- **\$2.6 billion in new data center power and electrical equipment across 25 projects since 2023**
- **18 mergers and acquisitions in power equipment since 2021**

Huntsville's current capabilities creates a path for power electronics

1



Defense electronics expertise

- Companies like Northrop Grumman already build defense electronics, sensors, and integrated systems.
- Electrical engineers and mechanical engineers have an employment concentration at 7 times and 4.2 times the national average, respectively.

2



Advanced manufacturing capabilities

- The region's high volume precision manufacturing and circuit board assembly base can translate into power electronics systems.
- High-quality production standards in the region align with high-reliability power equipment manufacturing.

3



Local grid modernization and load growth creating demand for power electronics

- TVA is deploying smart inverters, microgrids, and building energy controls.
- Growing Southeast data center buildout drives demand for power electronics equipment.

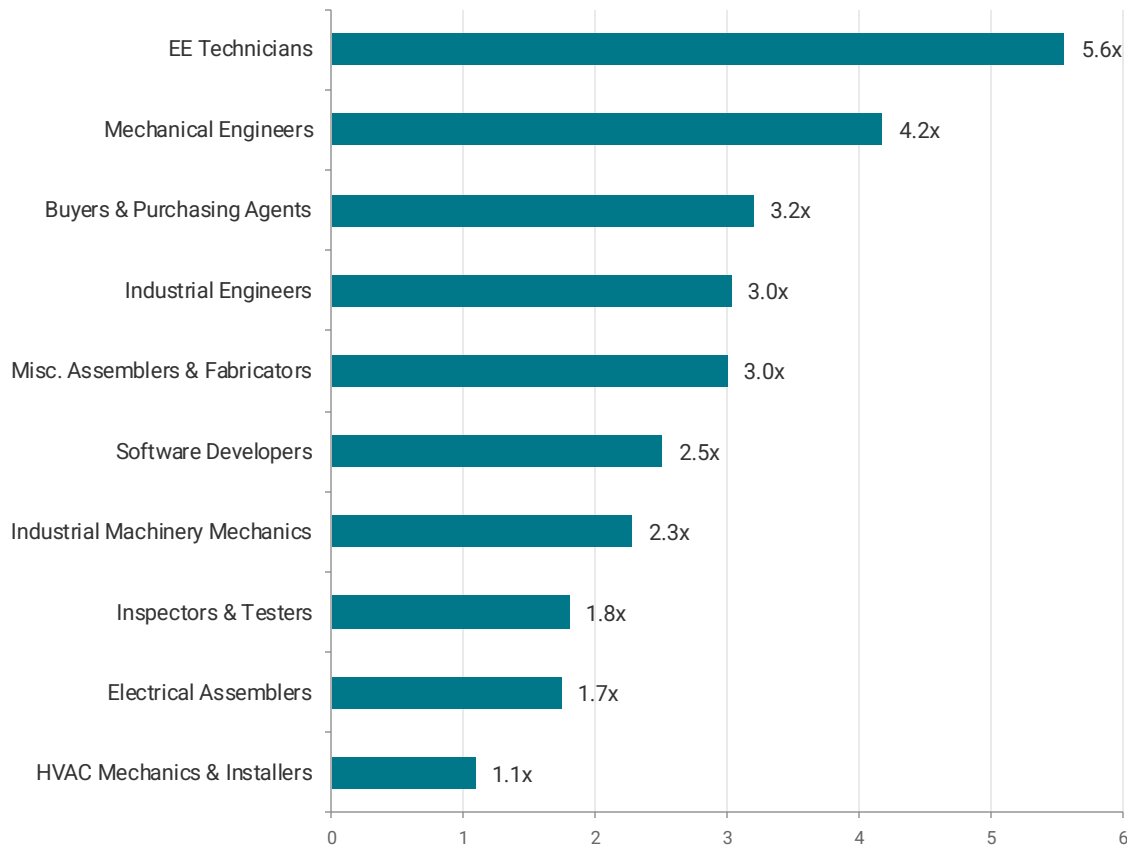


Heat pump

Manufacturing

Heat pump manufacturing leverages the Huntsville region's existing skills

Heat Pump-Relevant Workforce Concentration



Location quotient >1.0 = above-average concentration vs. national average. Source: BLS OEWS, May 2024

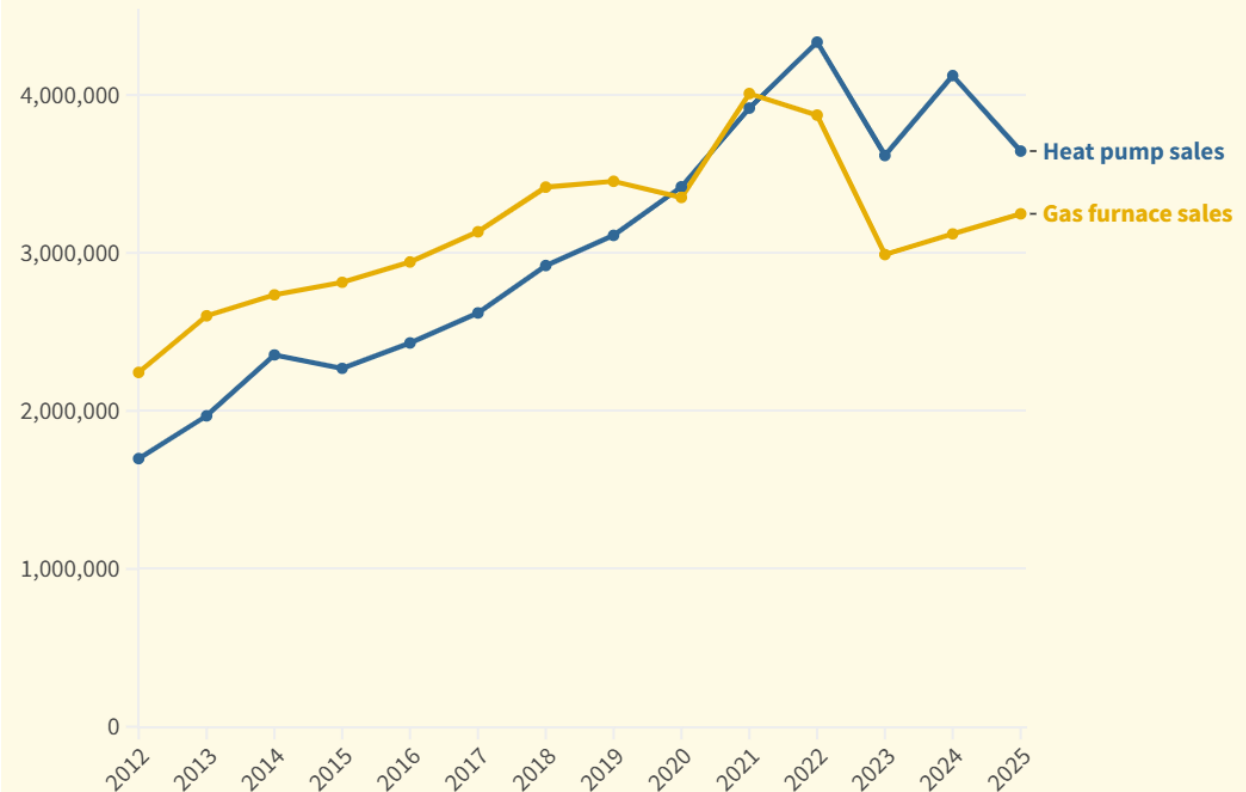
- **Heat pump manufacturing utilizes a typical production/assembly process of component sourcing, subassembly lines, final assembly, and testing and quality control, similar to other appliance or automotive manufacturing.**
- **Skills needed include:**
 - Manufacturing — *assembly line workers, machine operators, quality inspectors*
 - Skilled technical workers — *HVAC technicians, electrical technicians, maintenance technicians*
 - Engineering — *mechanical engineers, electrical/software engineers, industrial engineers*
 - Adjacent capabilities — *supply chain and procurement, product design and R&D*
- **To support a manufacturing hub, a region needs:**
 - Component suppliers — *metal fabrication, electronics, compressors*
 - Logistics infrastructure — *trucking, warehousing*
 - Training pipelines — *trade schools, HVAC certification*
 - Industrial energy and reliable utilities
 - Proximity to end markets — *heat pumps are bulky to ship*

The market opportunity for heat pump manufacturing is strong, especially in the Southeast

- **The US heat pump market is already strong and established in the South and is growing nationwide.**
 - The heat pump market has outpaced the gas furnace market in recent years, and this trend is expected to continue.
- **Heat pumps present a growing opportunity for domestic manufacturing.**
 - The United States currently lags China in manufacturing scale, creating a domestic manufacturing opportunity.
 - OEMs are actively:
 - Expanding US factories
 - Onshoring compressor production
 - Investing in workforce training
- **The US heat pump industry has a need for:**
 - Additional factories to support higher domestic production
 - R&D to provide simplified, modular products specific to domestic needs
 - Retrofit from gas products
 - Heat pumps for a range of climates
 - Integrated manufacturing and training ecosystems

Heat pumps continue to outsell gas furnaces in the U.S.

Units shipped per year



The Huntsville region is poised to meet these industry needs

Huntsville's existing skills and capabilities		Heat pump manufacturing needs
Aerospace research and expertise	>	Thermal systems engineering
Defense systems	>	High-quality manufacturing standards
Precision manufacturing	>	Assembly-line production
Mechanical engineers	>	Mechatronics
Electrical engineers	>	Controls engineering
R&D and systems testing	>	HVAC system design

- **Huntsville presents a cost and scalability advantage with lower labor costs, land costs, and operating costs for manufacturing.**
- **The region's positioning within the Southeast provides access to suppliers, easing procurement, and the region holds a logistics advantage.**
 - Huntsville is well positioned to ship to near high-growth housing markets.
 - Huntsville's location enables a regional distribution model, lowering shipping costs.
- **These factors make Huntsville a strong candidate to become a regional hub for heat pump production, especially if paired with:**
 - Workforce training programs
 - Supplier ecosystem development — *presenting additional economic development opportunity*
 - Co-location with electrified retrofit or new construction demand



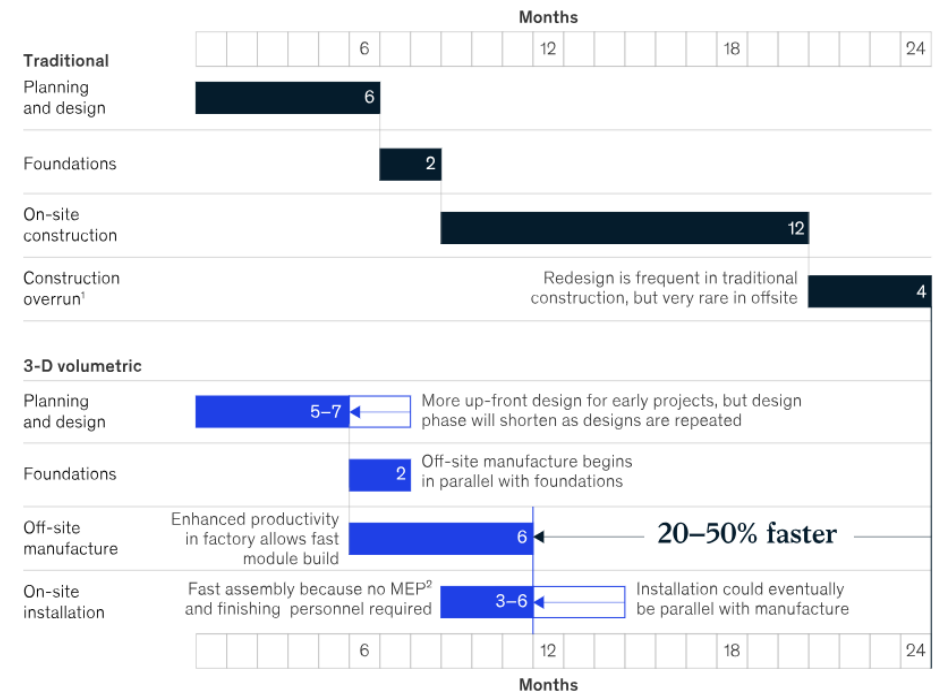
Industrialized Construction

Manufacturing

Industrialized construction saves time and money – and can scale these savings

- Industrialized construction is an approach to building that aims to transform traditional building practices into more systematic and predictable processes. Techniques emphasize efficiency by uniting advanced manufacturing, integrated supply chains and digital capabilities.
- Industrialized construction can be used for single-family, multifamily, ADUs, or components of a building, such as bathroom pods.
- Industrialized construction can accelerate project timelines by up to 50% while reducing costs by up to 20% and may be easier to execute on urban job sites with less storage and preparation space.

Example apartment-project-construction duration, traditional vs off-site 3-D volumetric, months



Alabama has an opportunity to be a North American leader in industrialized construction

- **Despite these apparent benefits, the approach has struggled to gain acceptance in North America.**
 - Less than 4% of current US housing stock was built using modular techniques, compared to 15% of homes in Japan, and 45% in Finland, Norway, and Sweden.
- **The Southeast is the epicenter of US construction demand, The country faces a ~4 million home shortage, and the South has the largest gap (~1.6M units) – more than any other region**
 - The scale and speed required to close the housing gap cannot be met with traditional site-built methods alone.
- **Labor shortages + cost pressures are pushing developers toward off-site, factory-based delivery models.**
- **The Southeast's growth pattern (large subdivisions, multifamily, logistics hubs) aligns well with:**
 - Repeatable product types
 - Standardized designs
 - High-volume delivery
- **Alabama's location enables:**
 - Potential localized mass timber supply chains
 - Reduced transportation costs for heavy engineered wood products

Huntsville’s location and workforce pipeline make industrialized construction feasible and competitive

Lower costs: Compared to coastal metros, Huntsville offers lower labor, land, and operating costs, improving industrialized construction factory economics.

Strategic location: Proximity to Southeastern population growth corridors enables efficient factory-to-site distribution of modular units or panels.

Workforce: Local universities and technical programs produce engineers, technicians, and skilled trades aligned with industrialized production.

Economic development support: Alabama and Huntsville actively recruit advanced manufacturing with incentives, land, and infrastructure.



Location quotient >1.0 = above-average concentration vs. national average. Source: BLS OEWS, May 2024



Thank you

Aaron Brickman – abrickman@rmi.org

Jon Ekberg – jon.ekberg@rmi.org

Julia Meisel – jmeisel@rmi.org

Sabina Flandrick – sflandrick@rmi.org