



Funding Opportunities to Support the Supply Chain

Federal policy and funding opportunities changing the market for critical minerals

November 14, 2024

Olivia Alves

RMI is an independent, nonprofit organization of experts accelerating the clean energy transition. We are transforming the global energy system to secure a clean, prosperous, zero-carbon future for all.



RMI's Formula for Impact

Scaling Solutions
Around the World



BY Decarbonizing Key Sectors



Electricity



Buildings



Transportation



Industry

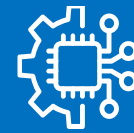
USING Powerful Market Catalysts



Capacity Building
+ Education



Policy



Technology



Communications



Climate
Intelligence



Climate Aligned
Finance

A photograph of a white electric car at a charging station. The car is partially visible, showing the front headlight and wheel. A charging cable is plugged into the car's charging port. The background shows other charging stations and a building.

Critical Minerals : A National Priority

Over the past few years, the federal government has taken action to strengthen the domestic critical mineral supply chains including mining, manufacturing, and recycling.

Why does the federal government want to support critical mineral supply chains?



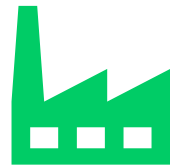
Bolster US energy security



Reduce reliance on volatile supply chains



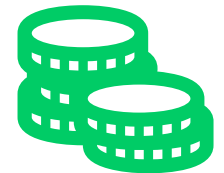
Strengthen national security



Boost American manufacturing



Create good paying jobs in mining, construction, and manufacturing



Capitalize on the generational clean energy economy expansion

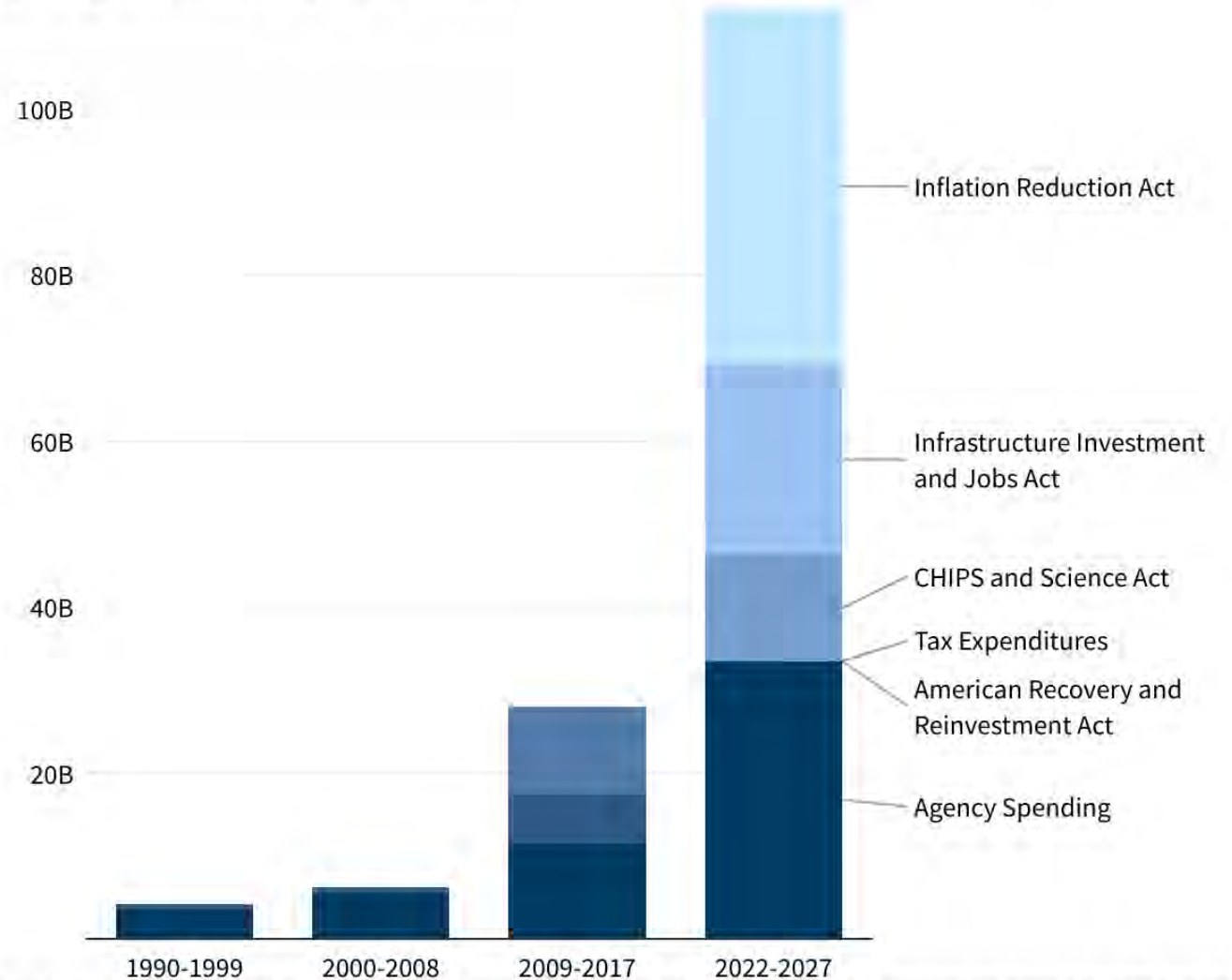
Congress and the White House worked together to pass three landmark pieces of legislation to support the domestic critical supply chain through grants, loans, and tax credits

- **Inflation Reduction Act (IRA):** The largest investment in US economic growth, climate action, and energy security through tax incentives and funding programs.
- **CHIPS and Science Act:** A strategic funding law to bolster US semiconductor capacity, strengthen research and development, and grow the STEM workforce.
- **Bipartisan Infrastructure Law (BIL) or Infrastructure Investment and Jobs Act (IIJA):** An infrastructure investment law to rebuild roads, bridges, transit systems, ports, and airports and boost national competitiveness by strengthening supply chains.

IRA+BIL+CHIPS is the largest investment in cleantech deployment and manufacturing

Federal Spending on Climate Will Exceed \$100b Annually

Spending will more than triple historic levels.



Average annual spending, adjusted for inflation. Note that the time periods shift from 2000-2008 to 2009-2017 to 1) consolidate the impact of the ARRA to one bar, and 2) address missing data between 2018-2021. Values are based on RMI estimates using agency spending data from the GAO, tax expenditure data from the JCT, and internal analysis on 2021-2022 legislation.

Source: RMI • Created with Datawrapper

The numbers so far...

\$120 billion company investment announcements in the battery and critical mineral supply chains over the past four years

250,000 clean energy jobs added last year

10 million domestic vehicle expected battery manufacturing capacity by 2030 compared to 500,000 in 2021, enough to meet domestic EV demand

\$86 billion in federal funds have already been pumped into local economies

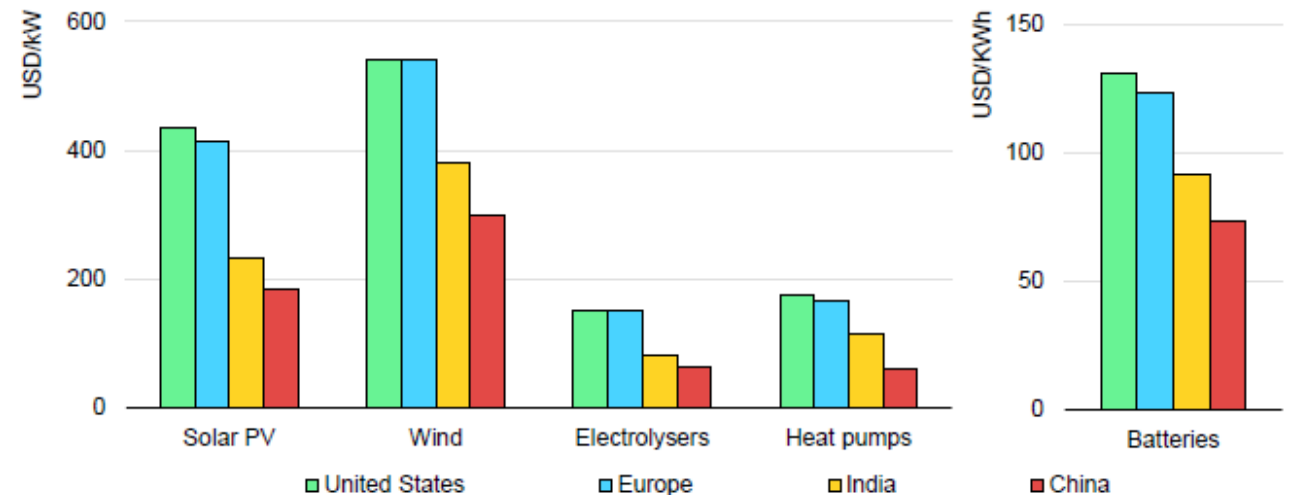
Understanding the economic opportunity

China continues to have a competitive advantage for clean technologies

Even before accounting for policy support

- China is the lowest-cost producer for all major clean technologies
- Capital costs
 - Facilities in the US & Europe are typically 70-130% more expensive

Figure 17 Estimated overnight unit capital costs for clean technology manufacturing facilities in selected countries, 2023



IEA. CC BY 4.0.

Notes: Capital costs are shown per unit of annual rated capacity. Solar PV includes polysilicon, wafer, cell and module production facilities; Batteries includes cell, anode and cathode production facilities; wind includes nacelle, tower and blade facilities. Electrolysers and heat pumps include only the final assembly step. Costs refer to greenfield, non-integrated facilities where these attributes could be isolated in the data and constitute averages across plants of different sizes today. Data gaps filled using regional multipliers based on differentials in cost for constructing other facilities where more data are available. No explicit policy incentives (e.g. investment tax credits) are applied in this assessment. Refer to the Technical annex for more details on the analytical boundaries and methodologies used in this analysis.

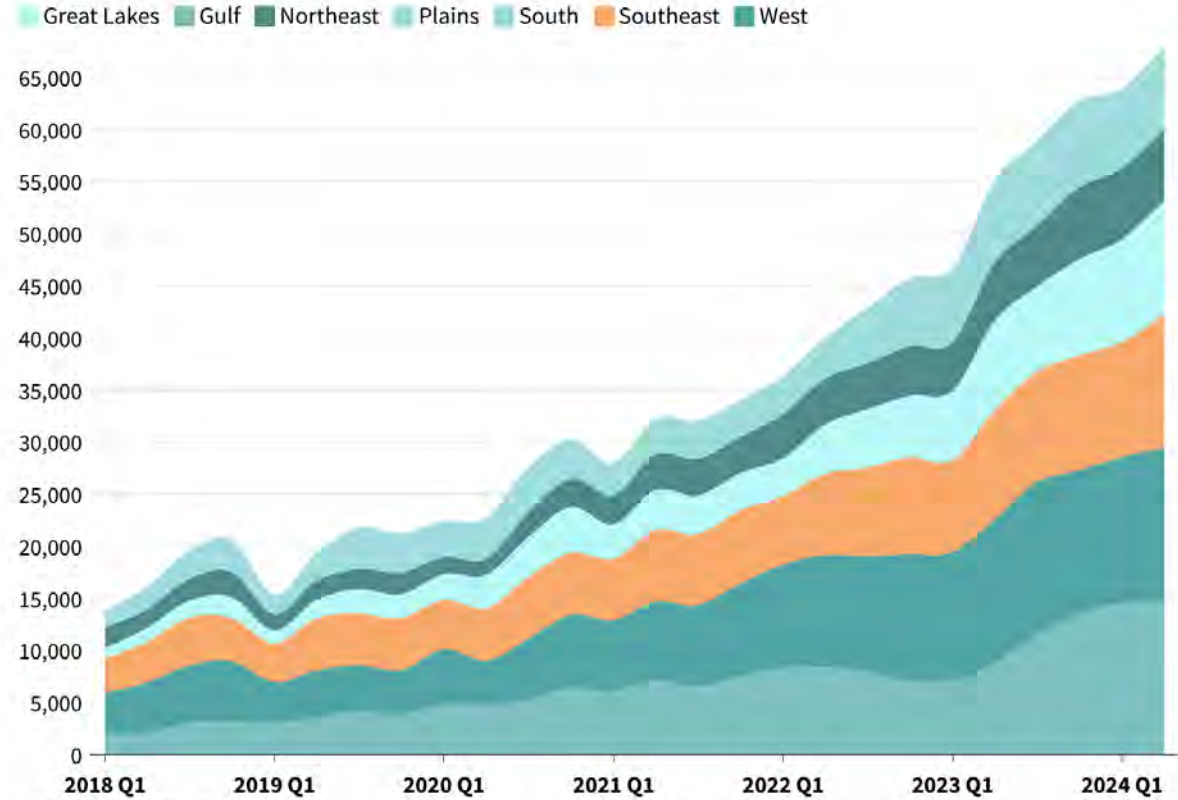
Sources: IEA analysis based on data from [Clean Investment Monitor](#), [InfoLink](#), [Ofweek](#), [Black Hawk Solar](#), [InnoEnergy](#), [ITDCW](#), [IN-EN](#), [Benchmark Mineral Intelligence](#), [IPCEI](#), [S&P Global Commodity Insights](#), [GWEC](#) and [BNEF](#).

The U.S. clean energy economy is taking off

There is a generational opportunity for the Midwest to get in on the ground floor of the energy transition

Clean energy investment in the United States is almost 5x that of 2018

In the Southeast, quarterly investment has more than doubled since the passage of the IRA in 2022, reaching \$13B a quarter.



Investment in Millions USD.
 Chart: RMI Graphic • Source: Clean investment Monitor

The big winners since the passage of the Inflation Reduction Act (IRA)

Growth in cumulative investment since 2018, indexed to Q2-2022. (2022-Q2=100)

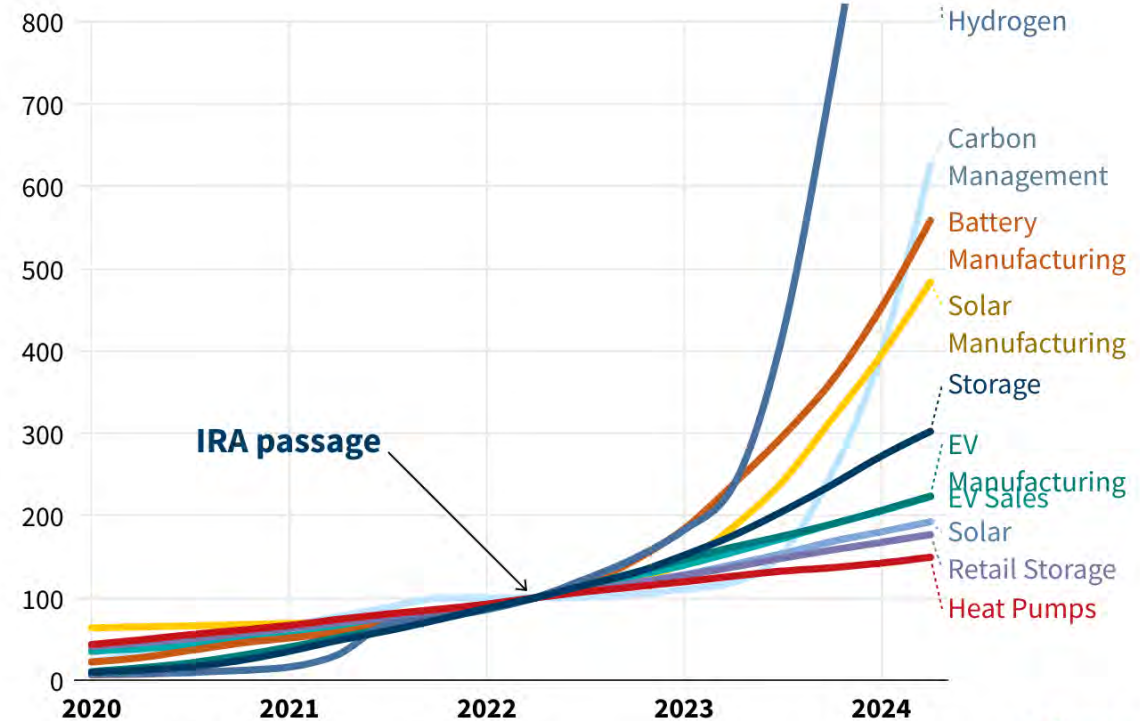


Chart: RMI Graphic • Source: Clean Investment Monitor

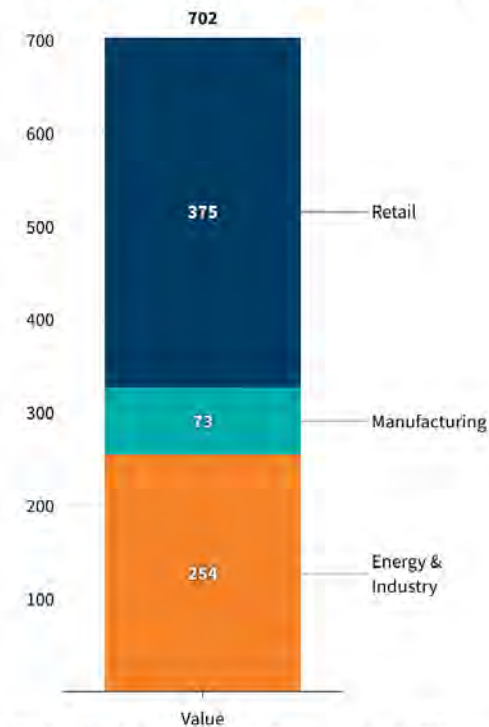


Who are the early cleantech leaders?

Across retail, manufacturing, energy, and industry sectors, **EV, battery, and solar** projects have seen the bulk of new investment.

Despite the headlines, most clean energy investment since 2018 is in the retail sector

Only 10% of new investment since 2018 is in manufacturing.



"Manufacturing" indicates an investment in facilities or capacity to produce GHG-reducing technology. "Energy and industry" refers to the deployment of technologies that reduce GHG emissions in the bulk production of energy or industrial goods or that capture ambient carbon dioxide. "Retail" refers to the purchase and installation of technology by individual households and businesses.

Chart: RMI Graphic - Source: Clean Investment Monitor



Retail investment is led by electric vehicles and heat pumps

US consumers have spent nearly \$200 billion on battery and plug-in hybrid vehicles since early 2018, and a further \$100 billion on heat pumps.

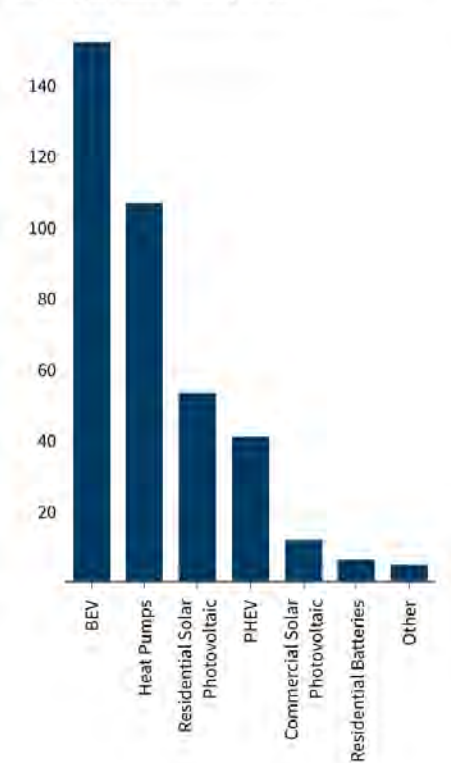


Chart: RMI Graphic - Source: Clean Investment Monitor



Manufacturing investment is dominated by the EV supply chain

Companies have invested over \$100 billion on EV, battery, and critical minerals projects since early 2018.

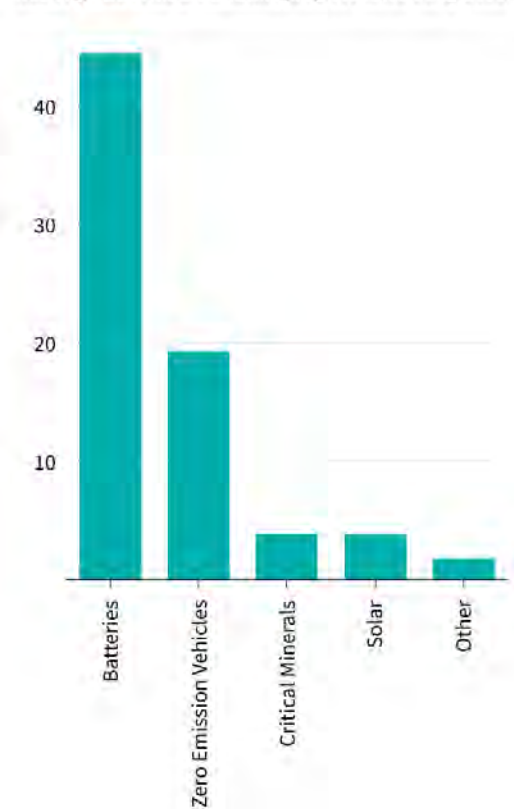


Chart: RMI Graphic - Source: Clean Investment Monitor



Solar and wind projects make up the bulk of energy and industry investments.

Developers have invested roughly \$200 billion in solar and wind projects since early 2018, and a further \$31b in storage.

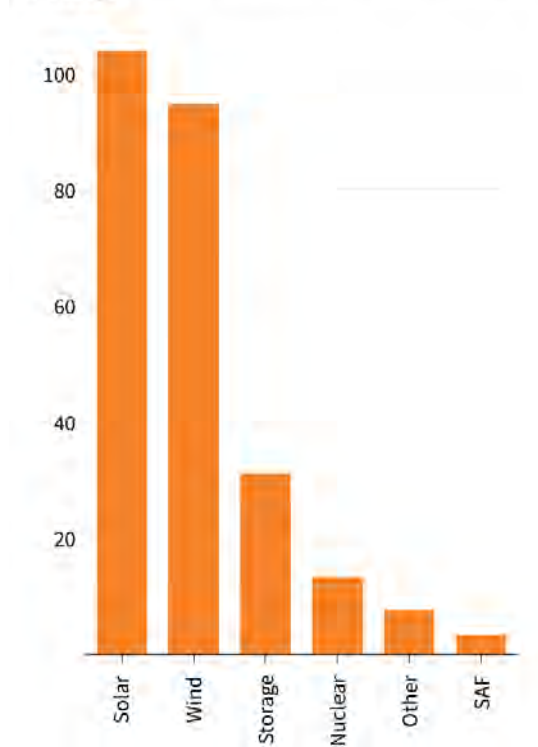


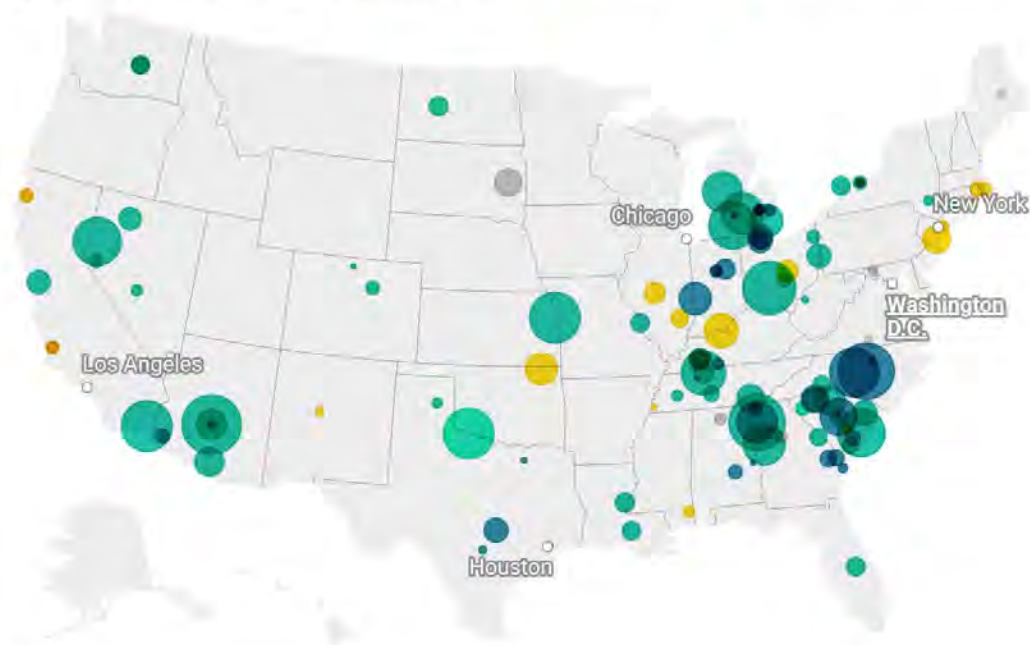
Chart: RMI Graphic - Source: Clean Investment Monitor



Cleantech manufacturing needs will scale with private demand

Over \$120 billion in new cleantech manufacturing investments have been announced since passage of the IRA

■ Batteries ■ Clean Tech ■ Electric Vehicles ■ Electrical Grid Distribution And Transmission ■ Home energy efficiency and electrification ■ Hydrogen ■ Rail ■ Renewables ■ Renewables Manufacturing ■ Sustainable Aviation Fuel ■ Transmission & Grid



Source: Climate Power + Created with Datawrapper

Manufacturing-related provisions in the IRA

The size of the manufacturing-related provisions in the IRA will depend on the scale of private demand. The Clean Vehicle and Clean Hydrogen Credits, in particular, could be several multiples greater than original estimates.

	CBO Estimate	Climate-Aligned Estimate
Clean Vehicle Credit	7.5B	134.9B
Advanced Manufacturing Production Credit	36.9B	73.8B
Clean Hydrogen	13.2B	61.3B
Qualified Commercial Clean Vehicles	3.6B	48.7B
Credit for Previously-Owned Clean Vehicles	1.3B	15B
Extension of the Advanced Energy Project Credit	6.3B	6.3B
Advanced Industrial Facilities Deployment Program	5.8B	5.8B
Advanced Technology Vehicle	3B	3B
Domestic Manufacturing Conversion	2B	2B
Methane Emissions Reduction Program	1.6B	1.6B
Enhanced Use of Defense Production Act of 1950	250M	247.8M

NB: 'Climate-Aligned' refers to demand levels consistent with a 1.5C US trajectory

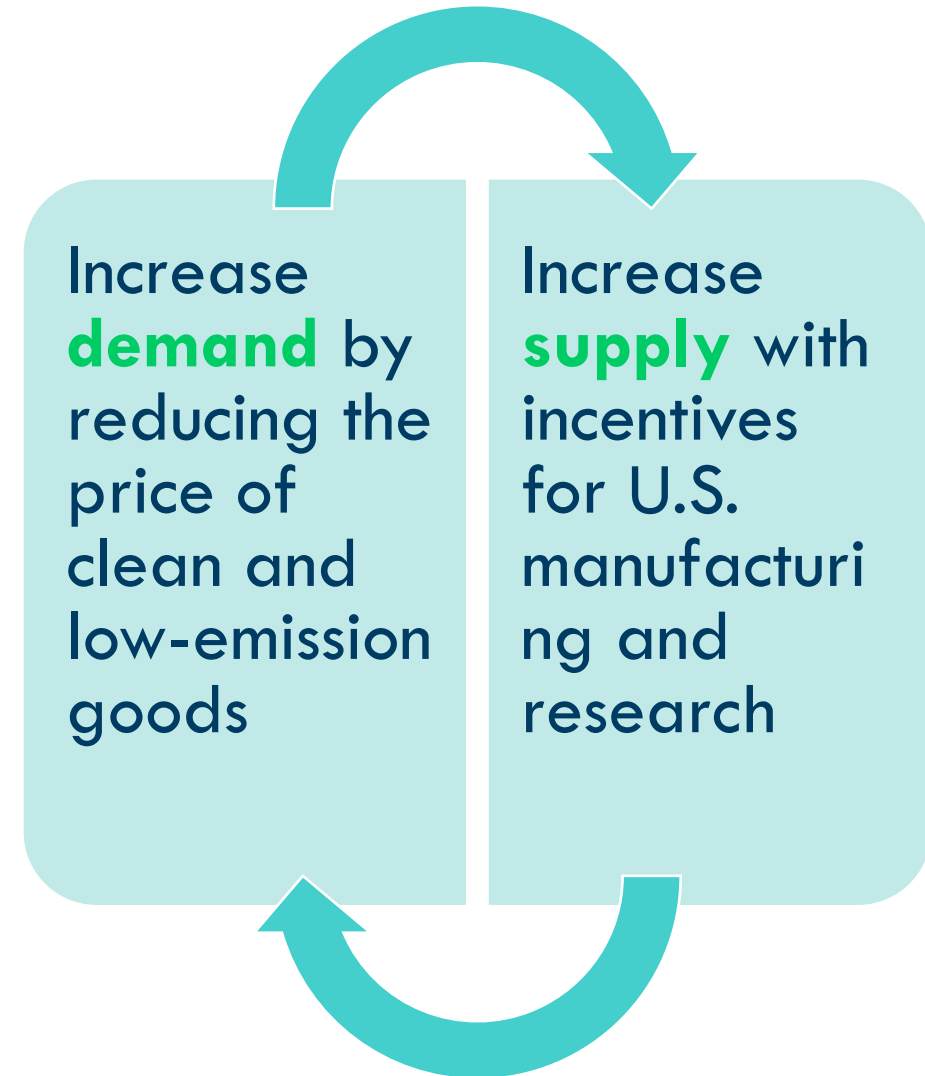
Source: RMI



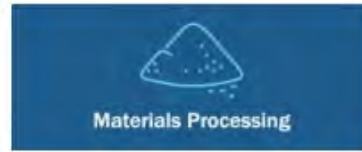
What does this federal investment look like?

What did the federal government do?

The federal government created incentives to build out new U.S. clean energy economy industries, modernize infrastructure, and increase energy resilience.



Federal investment spans the battery supply chain



Investment by supply chain stage

All

(IIJA) \$320M Earth Mapping Resource Initiative

(IIJA) \$307M for new demonstration facilities

(IRA) \$500M Defense Production Act

(IRA) \$10B for 48C clean energy manufacturing

(IIJA) \$3B Grants

(IRA) 10% Production Tax Credit for all battery material refining

(IRA) \$10B for 48C clean energy manufacturing

(IIJA) \$3B Grants

(IRA) ATVM Loans (\$3B capitalization and up to as much as \$150B in direct loans)

(IRA) 10% Production Tax Credit for battery subcomponent manufacturing

(IRA) \$35 Production Tax Credit for cell manufacturing

(IRA) \$10 Production Tax Credit for pack modules

(IRA) ATVM Loans (\$3B capitalization and up to as much as \$150B in direct loans)

(IRA) \$10B for 48C clean energy manufacturing

(IRA) EV Tax Credit

(IRA) ATVM Loans (\$3B capitalization and up to as much as \$150B in direct loans)

(IRA) Alternative Fuel Refueling Property Tax Credit

(CHIPS+) \$1.2B DOE transportation RD&D funding

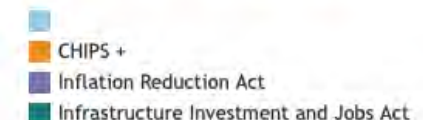
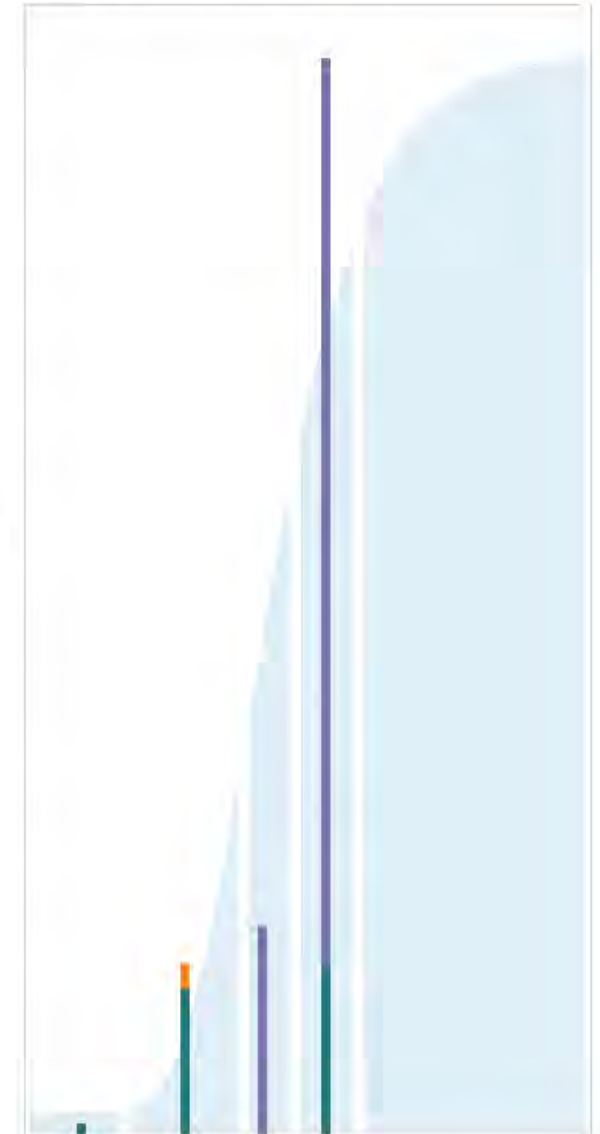
(IIJA) \$3B Grants

(IIJA) \$200M for electric drive vehicle battery recycling

Expected federal spending in the battery supply chain

All

All



CHIPS and Science Act a \$52.7 billion investment in the research and development of core battery technologies

Semiconductors enable the efficient conversion of electrical energy from the battery to power a device.

- In EVs they are essential to battery management to monitor the health and state of charge.
- In electricity generation, they are used to feed power produced by solar panels and wind turbines back into the grid.

Funding Programs

- \$39 billion for semiconductor manufacturing incentives
- \$2 billion for the legacy chips used in automobiles and defense systems
- \$13.2 billion in R&D and workforce development
- 25% investment tax credit for capital expenses for manufacturing of semiconductors and related equipment

IIJA a \$98 billion investment to fund the commercialization of the EV and battery supply chain and EV market



Funding Programs

- National Electric Vehicle Formula Program
- Grants for Charging and Fueling Infrastructure
- Earth Mapping Resources Initiative
- Battery Processing and Manufacturing Grants
- Electric Drive Vehicle Battery Recycling and Second-Life Applications Program
- Critical Minerals Mining and Recycling Research
- Department of Energy Loan Programs
- Clean School Bus Program

IRA fundamentally shifted the economics of a domestic battery supply chain to scale the market



Increase Vehicle and Battery Demand

- **Clean Vehicle Tax Credit 30D** made it cheaper to buy electric cars
- **Commercial Clean Vehicle Tax Credit 45W** made it cheaper for businesses, nonprofits, and governments to buy cheaper electric cars and truck
- **Used Clean Vehicle Credit 25E** increased the availability of affordable electric cars on the market

Increase Vehicle and Battery Supply

- **Advanced Manufacturing Production Tax Credit 45X** incentivize battery and critical mineral components produced and sold in the US
- **Qualifying Advanced Energy Project 48C** for raw material production and materials processing for clean energy supply chains
- **30D** eligibility criteria was limited to the US and North American supply chain
- **Grants and loans** for retooling existing manufacturing such as the Advanced Technology Vehicle and Manufacturing Program and Domestic Manufacturing Conversion Grants

The Advanced Manufacturing Production Tax Credit 45X is a per-unit tax credit for clean energy components domestically produced and sold in the US.

Qualifying Components

Solar: modules, PV cells, PV wafers, solar grade polysilicon, torque tubes, structural fasteners, polymeric backsheets

Wind: nacelles, blades, towers, offshore wind foundations, related offshore wind vessels

Inverters: central inverter, commercial inverter, distributed wind inverter, microinverter, residential inverter, utility inverter

Battery: electrode materials, battery cells, battery modules

And **critical materials** include a list of 50 minerals as defined in 45X statute



2023-29, phasing down fully by 2032

Driven **\$126B** in domestic investments to date (majority batteries)



This credit is only available to domestic manufacturers.

There is no cap for this credit



Direct pay is available to tax exempt organizations the entire time, and is available to others for five years.

The battery tax credit is among the most powerful in the IRA and aims to put the US on cost parity with China

Refining battery grade materials

10% cost of production

Includes extraction if vertically integrated with refining

Midstream components

10% cost of production

Includes input materials

Battery Cells

\$35/kWh

(30-50% tax credit)

Modules

+\$10/kWh

Includes thermal batteries and long-duration batteries

The New Clean Vehicle Tax Credit 30D provides up to \$7,500 to buy new clean vehicles

30D criteria pushed a U.S. and North American Supply Chain

Credit is divided in two halves:

- \$3,750 for vehicles with critical minerals extracted or processed in the US or FTA country or with critical minerals recycled in North America
- \$3,750 for batteries with a certain percentage of components manufactured or assembled in North America

Final assembly must be in North America

No battery or critical mineral components are manufactured, processed, or recycled by a Foreign Entity of Concern country.



Phase down in 2032

Aim to make EV's cost
competitive with gas vehicles



Credit is for individuals

The credit can be claimed at
point of sale



Two renewable energy tax credits: The Clean Electricity Investment Tax Credit 48/48E (ITC) and Clean Electricity Production Tax Credit 45/45Y (PTC)

Critical minerals are used in batteries to help distribute energy in the grid and store excess energy

Clean Electricity Investment Tax Credit 48/48E	Clean Electricity Production Tax Credit 45/45Y
<ul style="list-style-type: none">• Base credit of 6% for investment in clean electricity generation and storage equipment<ul style="list-style-type: none">• 5X increase for prevailing wage and apprenticeship requirements• 10% increase for meeting domestic content requirements for steel, iron, and other products• 10% increase if located in energy community• Credits can be transferred• Direct pay is available for tax-exempt organizations like states	<ul style="list-style-type: none">• Base credit of 0.3 cents/kWh for facilities that produce clean energy and can be adjusted for inflation<ul style="list-style-type: none">• 5X increase for prevailing wage and apprenticeship requirements• 10% increase for meeting domestic content requirements for steel, iron, and other products• 10% increase if located in energy community• Credits can be transferred• Direct pay is available for tax-exempt organizations like states

Breaking Down the Inflation Reduction Act

~100 programs, ~2 dozen tax incentives



Unhide Row 3 for column source and Row 4 for associated notes. See "Summary - Tax Incentives" tab for information on IRA tax incentives.

Basic Summary					Eligibility								
IRA Bill Section	Item Name	Sector	Primary Topic	Summary Description	By Entity Type							In Detail	
					Direct Federal	State	Local	Tribal	Business	Non-profit	Higher Education	Description of Eligible Recipients	Description of Incentive
50121	Home Efficiency Rebates	Buildings	Energy Efficiency and Electrification	To award grants to state energy offices	-	YES	-	-	-	-	-	States	States may use
50122	Home Electrification and Appliance Rebates	Buildings	Energy Efficiency and Electrification	To award grants to state energy offices	-	YES	-	YES	-	-	-	States and Tribal entities. \$22	A state energy
50123	State-Based Home Efficiency Contractor Training Grants	Buildings	Energy Efficiency and Electrification	To provide financial assistance to states	-	YES	-	YES	-	-	-	States	State may use
50131	Assistance for Latest and Zero Building Energy Code	Buildings	Energy Efficiency and Electrification	To provide grants to states or units	-	YES	YES	-	-	-	-	States and local government	Grants to assist
30002(a)(1)	Green and Resilient Retrofit Program - Contracts and Grants	Buildings	Energy Efficiency and Electrification	To cover expenses of contracts or grants	-	-	YES	-	YES	-	-	Owner or sponsor of property	Contracts or
30002(a)(3)	Green and Resilient Retrofit Program - Grants and Loans	Buildings	HUD-Assisted Properties	To provide grants and loans to HUD	-	-	YES	YES	YES	-	-	Owner or sponsor of property	To fund operations
30002(a)(4)	Green and Resilient Retrofit Program - Benchmarking	Buildings	HUD-Assisted Properties										
50173	Availability of High-Assay Low-Enriched Uranium (HALEU)	Electricity	Nuclear										
22004	Empowering Rural America (New ERA) (formerly USEE)	Electricity	Rural Areas										
22001	Electric Loans for Renewable Energy	Electricity	Technology/										
60107	Low Emissions Electricity Program	Electricity	Technology/										
50151	Transmission Facility Financing	Electricity	Transmission										
50152	Grants to Facilitate the Siting of Interstate Electricity	Electricity	Transmission										
50153	Interregional and Offshore Wind Electricity Transmission	Electricity	Transmission										
80003	Tribal Electrification Program	Electricity	Tribal Nation										
60113	Methane Emissions Reduction Program	Industry	Oil and Gas										
30001	Enhanced Use of Defense Production Act of 1950	Industry	Supply Chain										
50161	Advanced Industrial Facilities Deployment Program	Industry	Technology/										
60104	Diesel Emissions Reductions	Transportation	Air Quality										
40007(a)(2)	Fueling Aviation's Sustainable Transition-Technology	Transportation	Aviation										
60506	Low-Carbon Transportation Materials Program	Transportation	Low-Carbon M										
60102	Grants to Reduce Air Pollution at Ports	Transportation	Ports/Waterway										
60501	Neighborhood Access and Equity Grant Program	Transportation	Public Transit	To award competitive grants for	-	YES	YES	YES	-	YES	YES	(1) A state, unit of local government	Grants to im
50143	Domestic Manufacturing Conversion Grants	Transportation	Technology/Infrastructure Investm	To provide cost-shared grants for d	-	-	-	-	YES	-	-	Recipients should be manufa	Domestic pr
60101	Clean Heavy-Duty Vehicles	Transportation	Vehicles	To provide funding to offset the co	-	YES	YES	YES	-	-	-	(1) a state; (2) a municipality;	Program cov

Also check out the AFFORD Tool
<https://cityrenewables.org/afford-intro/>
 to identify, compare, and prioritize federal funding, tax credits, and other incentives

A large teal graphic element consisting of a diagonal line that divides the slide into two sections: a teal triangle on the left and a white trapezoid on the right.

The unique opportunity for the Midwest

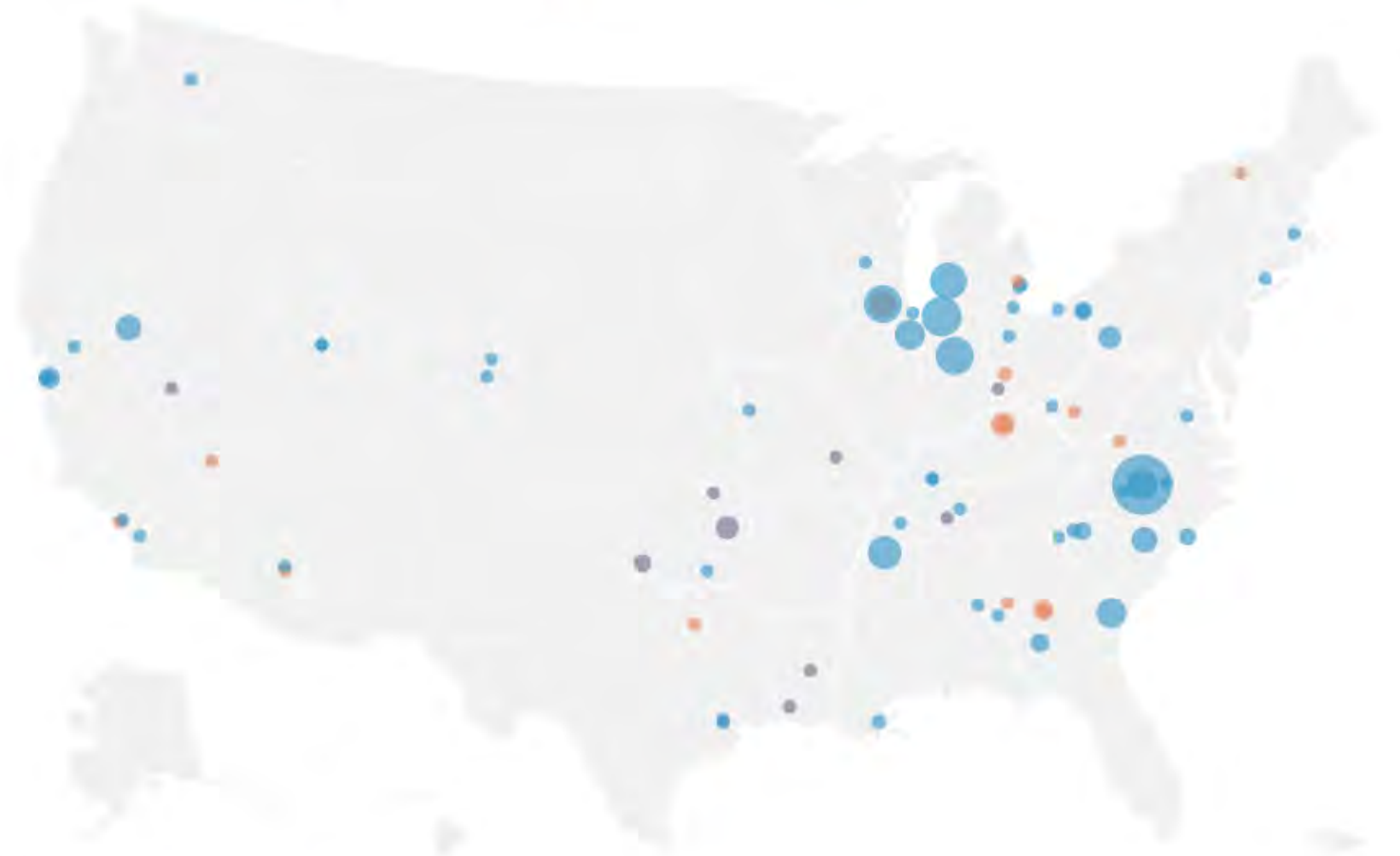
The Midwest is already seeing the benefits with \$120 billion battery and critical mineral announcements over the past four years

Manufacturing investment announcement locations

Last 4 quarters

\$4B   \$8B

 Batteries  Electrolyzers  Solar  Wind  Critical Minerals  Zero Emission Vehicles  Fueling Equipment



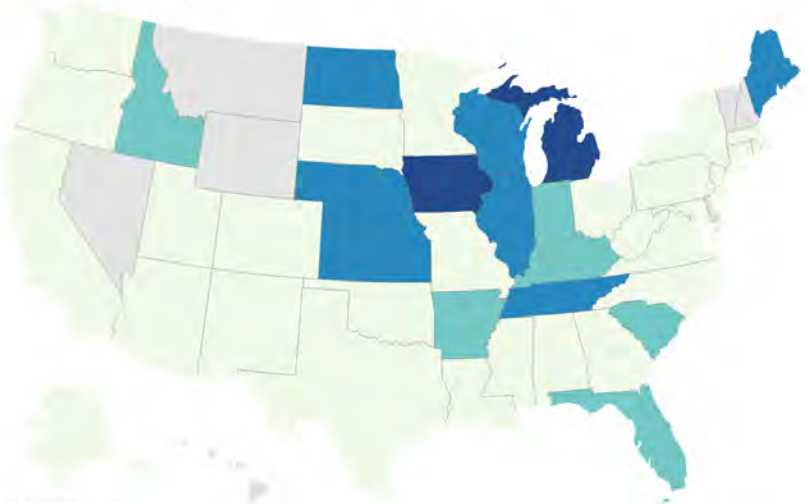
Source: Rhodium Group-MIT/CEEPR Clean Investment Monitor

State-level exposure to the EV transition depends on existing specializations in the auto manufacturing supply chain

OEM Manufacturing Specialization

Location Quotient of Manufacturing Specialization by State

<1 1-2 2-5 ≥5

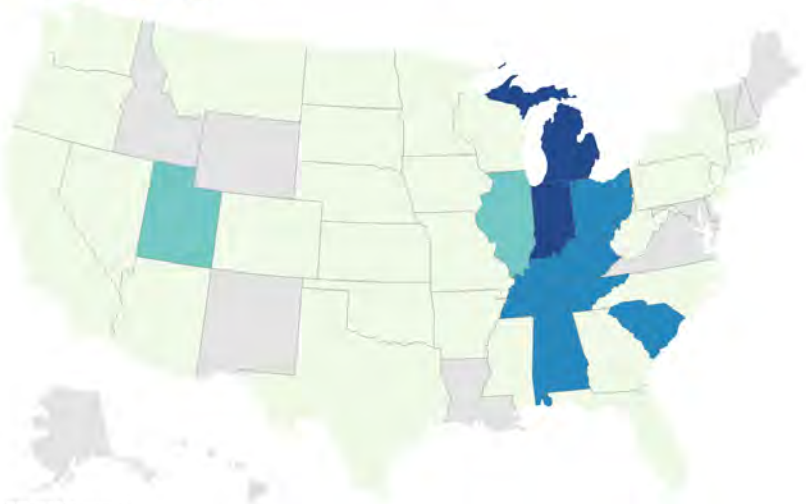


Created with Datawrapper

Parts Manufacturing Specialization

Location Quotient of Manufacturing Specialization by State

<1 1-2 2-5 ≥5

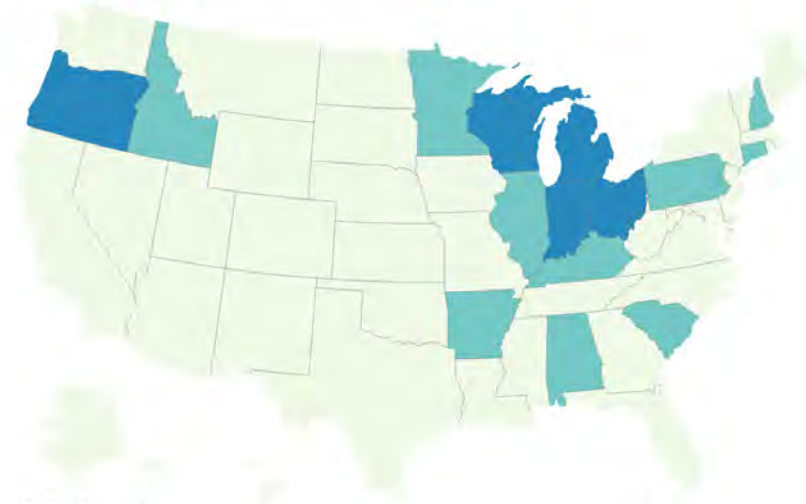


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Upstream Supplier Specialization

Location Quotient of Manufacturing Specialization by State

<1 1-2 2-5 ≥5



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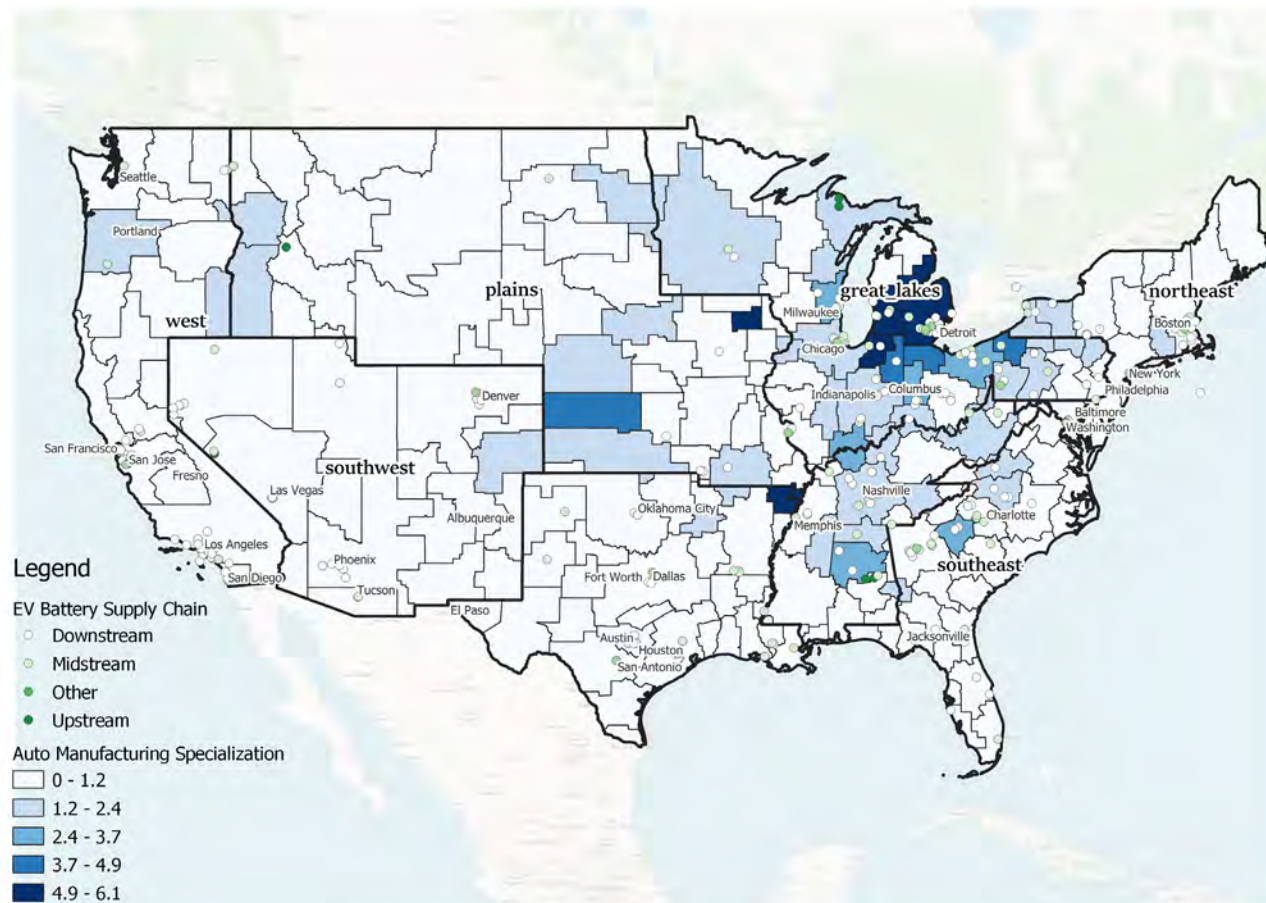
Regions with upstream suppliers are more likely to have EV battery supply chain establishments

Most EV Supply Chain facilities are located in parts of the country with existing auto-manufacturing capabilities, particularly upstream suppliers.

This conforms with expectations that upstream industries are less at risk of disruption from the EV transition because these basic components are used in both EV & ICE equipment.

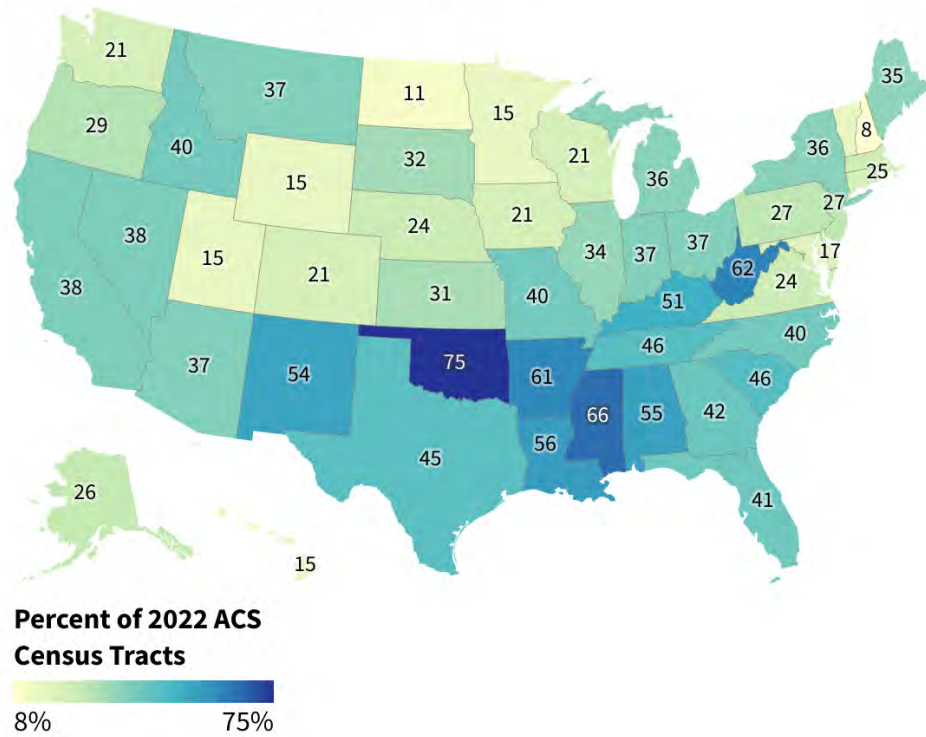
Share of EV Supply Chain Facilities Co-locating with Existing Auto Supply Chain

ICE/EV Supply Chains	Downstream	Midstream	Upstream	Other
OEMs	14%	14%	11%	16%
Parts Manufacturers	19%	18%	17%	20%
Upstream Suppliers	32%	32%	33%	32%
NA	36%	36%	39%	33%



Under Justice40 Initiative, 40% of the overall benefits must flow to disadvantaged communities

Percent of Census Tracts Identified as Disadvantaged by CEJST

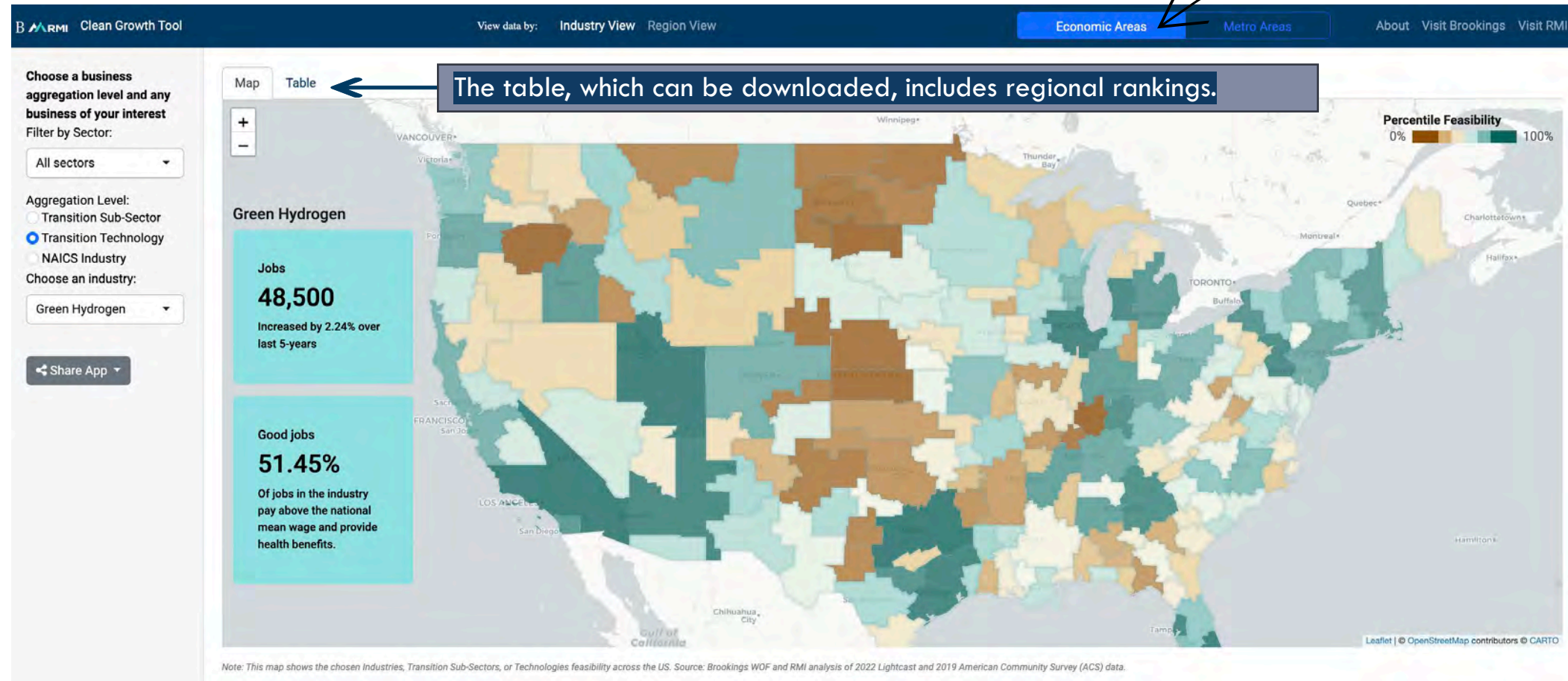


- **Justice40 targets these disadvantaged communities identified by CEQ's Climate and Economic Justice Screening Tool for federal funding**
 - Uncapped tax credits are exceptions
 - Grants and loan programs must factor in J40
 - GGRF goes above the J40 requirements for certain programs
- **A census tract is identified as disadvantaged if it:**
 - Meets the threshold for a climate or environmental burden
 - Has associated socioeconomic burden
 - Is completely surrounded by disadvantaged communities
 - Is above 50th percentile for low income

Which technologies in which places? (+ why)

Use the Clean Growth Tool to help identify cleantech ripe for investment

Geographic filters include **economic areas** (EAs) and **metropolitan statistical areas** (MSAs).
Coming soon: counties.



The Industry View puts regional potential in a national context.

How States Can Get the Competitive Edge

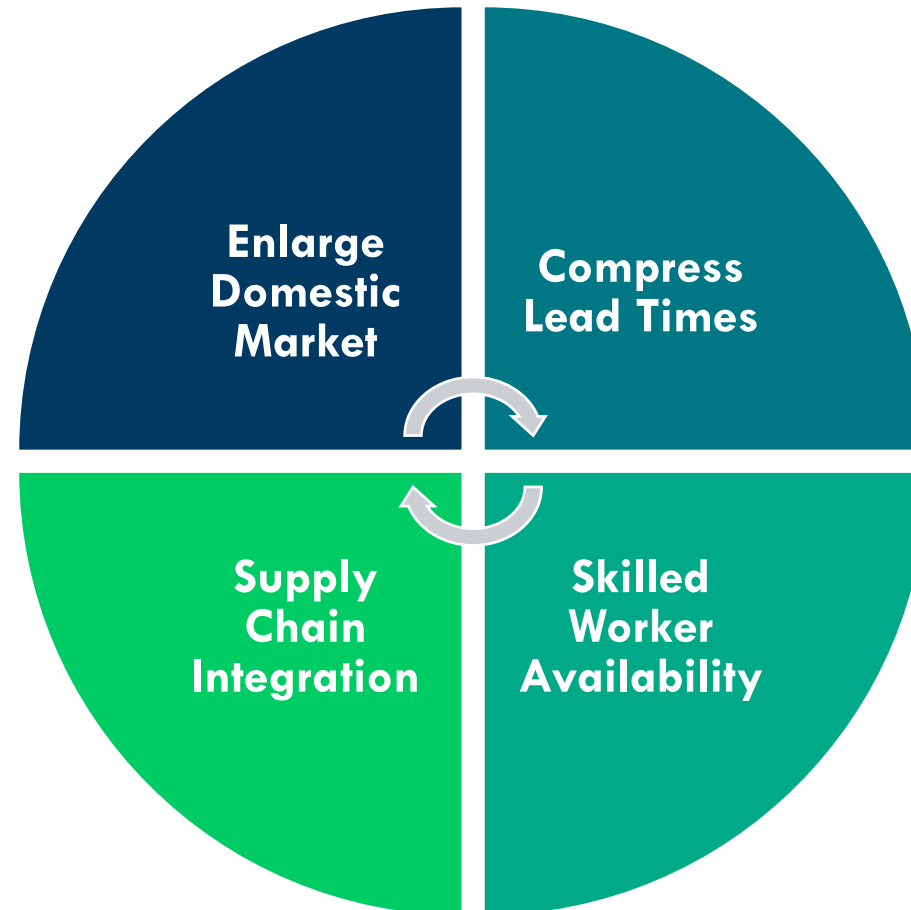
Market and existing capabilities should determine state action

	Batteries	Critical Minerals
Key competitiveness factors	Integration w/ EV supply chain (L-ion) OR Existing high-heat industrial capacity (Thermal Batteries)	Skills & expertise. (Chemical and metallurgical)
Related industries	Auto manufacturing, electric equipment manufacturing	Mining, upstream metals processing
Risk Factors	Supply availability of raw materials (especially Lithium); availability of electricity	Supply availability of raw materials.
Development opportunity	EV Value chain development in 'battery belt'; University-affiliated entrepreneurship	Workforce development and cluster creation in heavy industrial areas

What can States do to improve competitiveness?

- IRA is the core driver
- State demand-side policies can mobilize markets (tax credits, low-cost financings, grants)

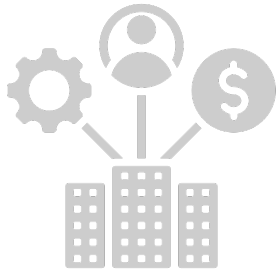
- Global partnerships and business integration
- Knowledge sharing and attraction of leading edge producers



- Create international, state, local, and regional strategy
- Permitting and siting streamlining for key facilities
- Industrial site availability
- Infrastructure preparedness (power, water, land)

- Skills gap analysis
- Curriculum development
- Address housing and other labor mobility factors

Planning can help states improve agency processes and tackle political complexities



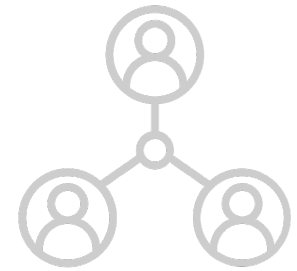
Develop a strategic plan to map out priorities, key stakeholders, existing state capacity, and industries



Engage with communities and stakeholders and be a facilitator



Permitting project engagement and reform



Build government capacity for project support, get involved early, and streamline programs and permitting

States can build capacity for a critical minerals supply chain

Increase energy generation and grid distribution

- Work with utilities and companies and utilize IRA renewable electricity tax credits

Strengthen waste and wastewater systems

- Use federal grant programs to fund projects

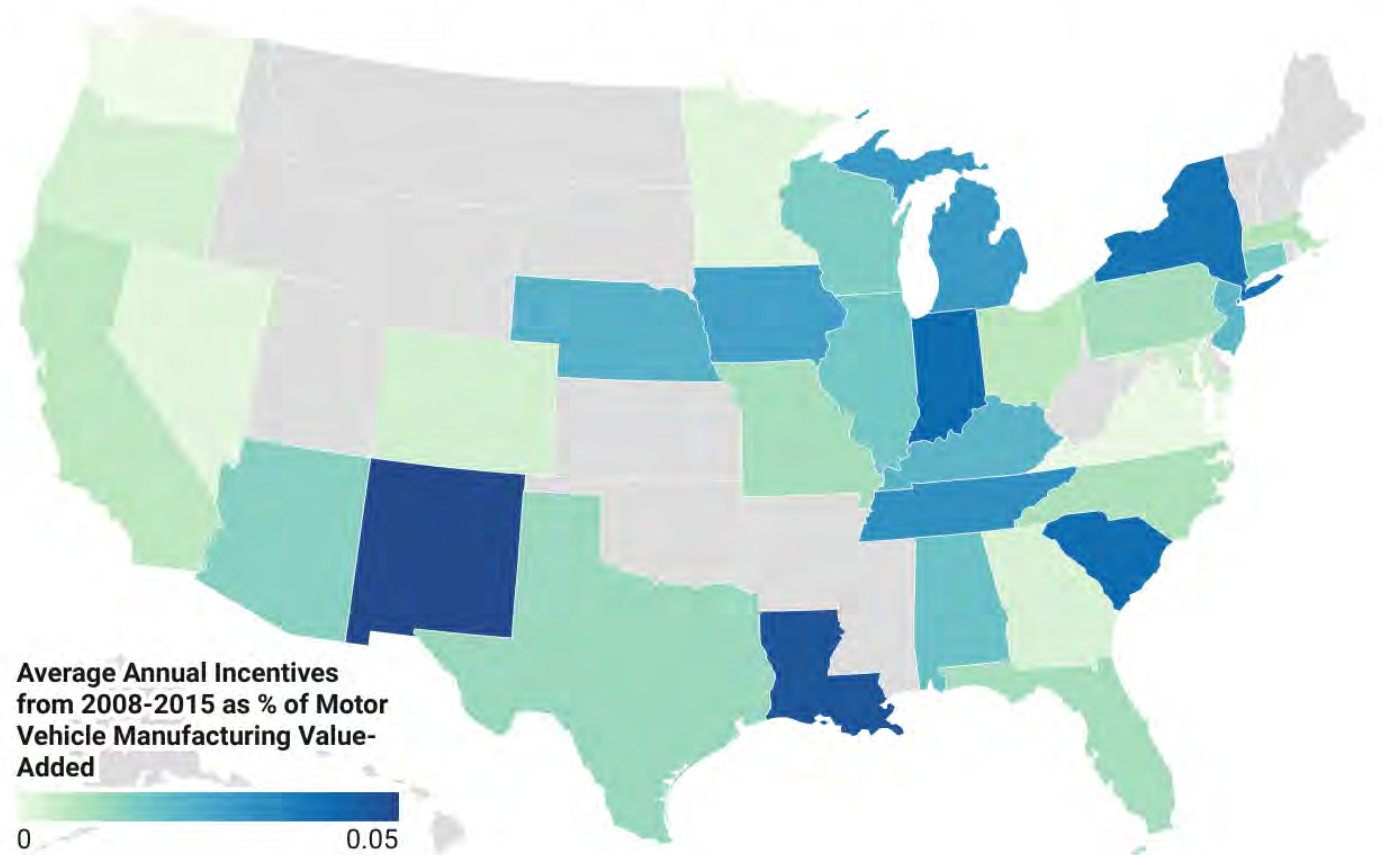
Invest in workforce training for new industries to staff new facilities

- Partner with educational institutions and industry to create training programs

Go further and create new incentives to attract the specific industries with tax credits, low-cost funding, and grants

Total Incentives for Motor Vehicle Manufacturing Varies Significantly by State

Between 2010-2015, New Mexico, Louisiana, and Indiana gave out the most generous incentives to motor vehicle manufacturers, relative to the size of the industry



Source: Upjohn Institute PDIT Database • Created with Datawrapper