


Transforming Clean Energy and Manufacturing in the U.S.: The Role of the Inflation Reduction Act

The background of the slide features a landscape with solar panels in the foreground and wind turbines in the distance. The sky is a mix of blue, purple, and orange, suggesting a sunset or sunrise. The solar panels are arranged in rows, and the wind turbines are silhouetted against the sky.

01 | Foreword

The Inflation Reduction Act (IRA) has created significant opportunities for large-scale construction projects in the U.S., targeting sectors such as clean energy and manufacturing. With new incentives and funding aimed at reducing carbon emissions and promoting sustainable practices, developers and manufacturers now face a unique landscape for project planning and execution filled with both benefits and challenges.

While the IRA has been opening the door to advancing construction projects and funding for key initiatives, the requirements can be difficult to interpret. The following report aims to simplify these details, examining incentives provided by the act, alongside key factors and challenges such as regulatory compliance, supply chain dynamics, workforce availability and the integration of advanced technologies. These considerations are essential for ensuring the success and sustainability of large-scale construction projects.

Linesight will continue to monitor the implementation of the IRA and its impact on large-scale construction projects.



02 | Inflation Reduction Act (IRA) Overview

Introduction

What is the Inflation Reduction Act?

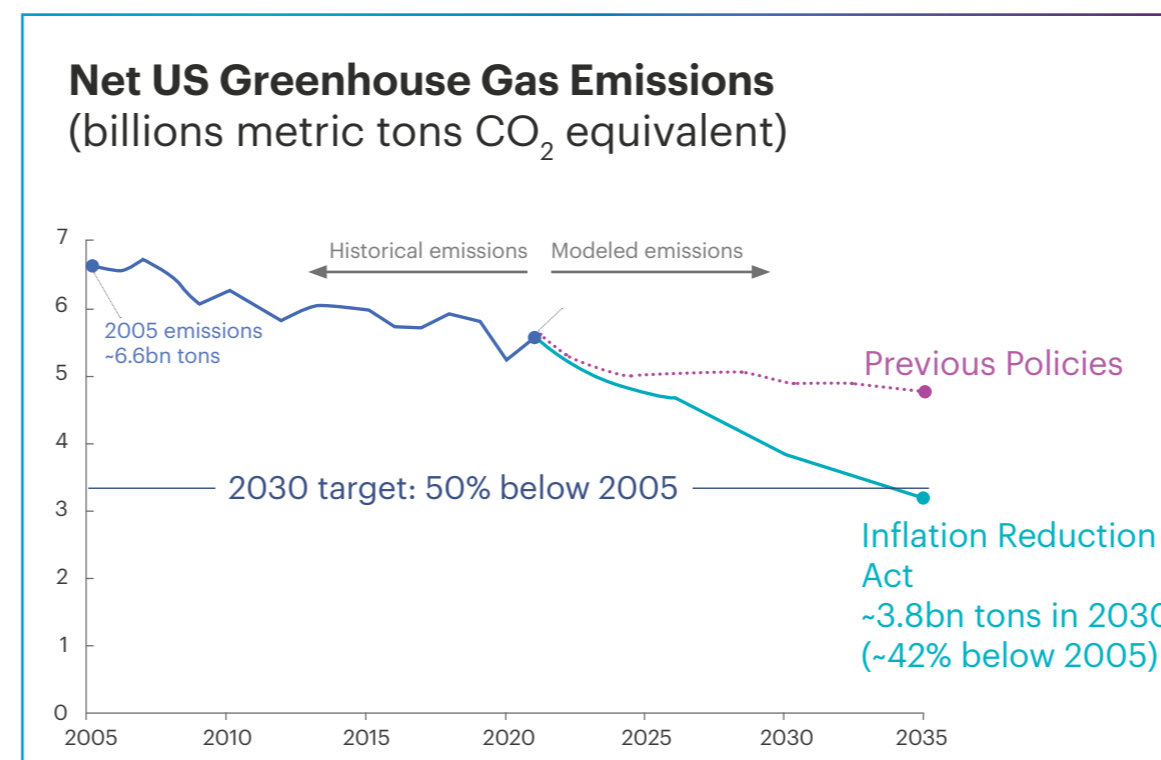
The Inflation Reduction Act of 2022 (IRA) is a U.S. federal law designed to reduce the national budget deficit, lower the cost of prescription drugs, and boost domestic energy production, with a strong focus on advancing clean energy initiatives. The IRA contains \$500 billion in new spending and tax breaks to support boosting clean energy, reducing healthcare costs, and increasing tax revenues.¹

What is the purpose of the IRA?

The IRA, signed into law on August 16, 2022, directs new federal spending toward reducing carbon emissions, lowering healthcare costs, funding the Internal Revenue Service, and improving taxpayer compliance. The act aims to catalyze investments in domestic manufacturing capacity, encourage procurement of critical supplies domestically or from free-trade partners, and jump-start R&D and commercialization of leading-edge technologies such as carbon capture and storage and clean hydrogen. It also allocates money directly to environmental justice priorities and requires recipients of many funding streams to demonstrate equity impacts. The Congressional Budget Office (CBO) estimates that the law will reduce budget deficits by \$237 billion over the next decade.²

The IRA targets a boost in domestic energy production and manufacturing to combat inflation and cut carbon emissions by approximately 40% by 2030.³

To meet these targets and reduce the national deficit, the IRA is focused on areas such as healthcare/drug prescription pricing, energy security and climate change initiatives.



Source: REPEATPROJECT, Environmental Defense Fund

Key objectives include:

Transforming the manufacturing sector:

The IRA targets the manufacturing sector to create millions of jobs through substantial funding and tax incentives. Focusing on industries like clean energy components, electric vehicles and batteries, these initiatives have already spurred record private sector investments. The act also aims to transform the sector by reducing emissions and building strong, self-reliant supply chains.

Making green energy cheaper:

The IRA offers tax credits and rebates to make green technologies - like electric vehicles, solar panels and energy-efficient appliances - more affordable for families. While these incentives might increase short-term inflation by boosting demand, they promise significant long-term savings, with families potentially saving over \$1,000 annually on energy costs.³

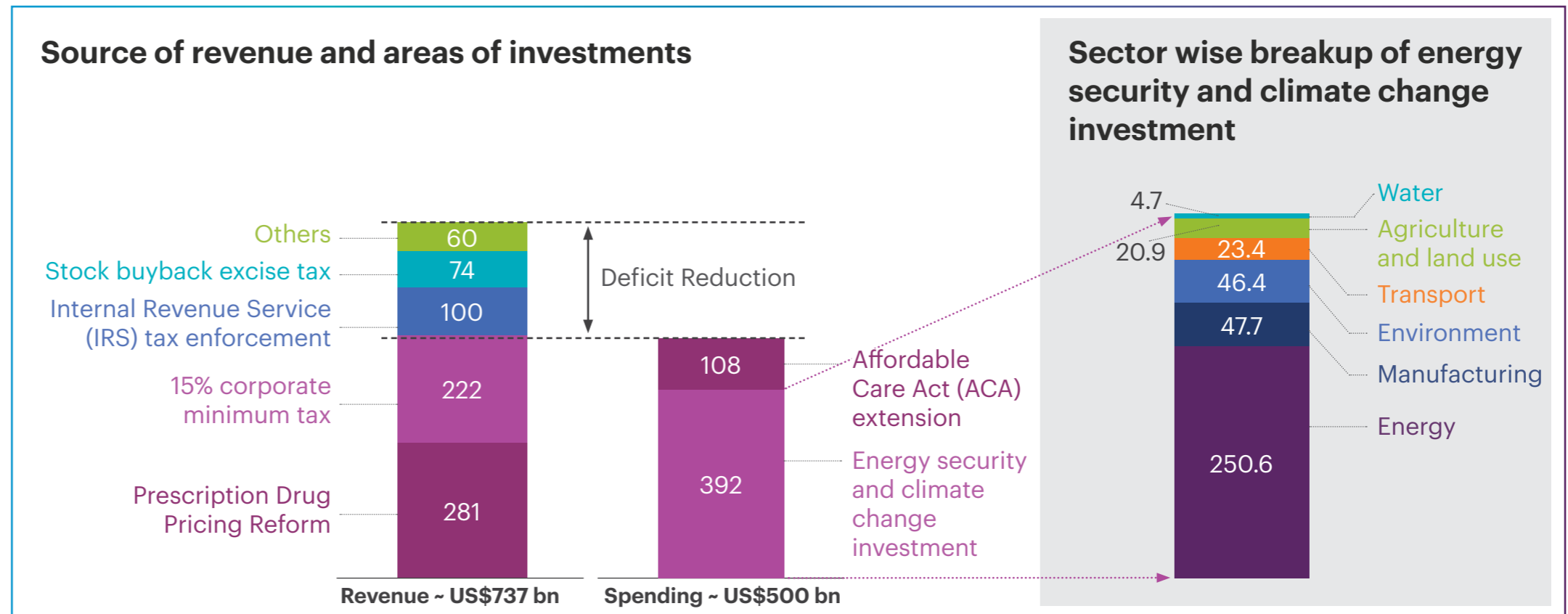
Close tax loopholes:

The IRA allocates new funding to the IRS for enforcement, imposes a 15% tax on corporations earning over \$1 billion annually and a 1% tax on stock buybacks.¹

Source of Revenue, Investments and Allocation

The IRA seeks to generate \$737 billion in revenue, invest \$500 billion and reduce the deficit by over \$237 billion.

This chart provides a breakup of revenue and investments, outlining a significant share of the investment allocated to energy security and climate change. Within the energy- and climate-related investments, the power sector has received the largest share, followed by the manufacturing sector, which has been allocated 12% of the overall budget.¹



Source: The Inflation Reduction Act: Here's what's in it – McKinsey & Company

Mechanisms through which federal programs/incentives are implemented:

The IRA provides federal funding through various mechanisms to support eligible entities, which can include states, local governments, private entities and individuals. The funding flows through several primary mechanisms noted in the following.

Tax credits and deductions: Tax credits allow project developers, manufacturers and consumers to reduce

the costs associated with their projects and purchases. About 66% of the funding will be provided through tax credits and deductions.^{1,4}

Grants: Funds that do not need to be repaid.

Loans and loan guarantees: Funds provided with the expectation of repayment, often for clean energy projects.

Bonds: Government-issued securities for raising funds, repaid with interest.

Cooperative agreements: Partnerships between federal agencies and other entities to achieve shared goals, involving substantial collaboration.

Technical assistance: Support provided to help entities navigate complex issues, often targeted at disadvantaged communities.

Incentives for Manufacturing and Sourcing

The IRA provides incentives specifically for manufacturing and sourcing through tax credits and a bonus credit. The following table outlines parameters and details for each.

Incentives for Manufacturing and Sourcing			
Parameters	Advance Manufacturing Tax Credit (45X)	Advance Energy Project Investment Tax Credit (48C)	Domestic Content Bonus Credit
Details	New credit for clean energy components produced in the U.S.	Extension of existing investment tax for clean energy technologies and equipment manufacturing, recycling, industrial decarbonization, and critical minerals-related processes	Bonus credit for energy projects that meet the domestic content requirement
Eligible entities	Manufacturing companies manufacturing solar and wind energy components, inverters, qualifying battery components and related critical minerals	Companies involved in manufacturing of renewable components/equipment, grid modernisation, low carbon fuels, EV/fuel cell vehicles and other technologies; also is expanded to cover installation of equipment that achieves an at least 20% reduction in climate pollution Selection criteria include: domestic job creation, community engagement, commercial viability, clear project timelines, greenhouse gas emissions reduction and innovation with potential for market deployment	Clean energy developers' projects that use domestically manufactured materials and parts. Structural construction materials must be 100% U.S.-made, while manufactured products need to be at least 40% domestically sourced with this requirement increasing to 55% over time.
Amount	Varies by technology	Base credit 6% can go up to 30% provided the project meets requirement for wages and apprenticeship	Increases the available PTC/ITC (for selling and producing electricity or investing in certain property used to produce electricity from renewable sources) by 10%
Timelines	Permanent for critical minerals. For others, full credit is available between 2023-29 and then phased down over 2030-32	Available from May 2023 and funding is available until 1st round of credits are allocated	Available from 2023 onwards and will be phased out as per the schedule of respective ITC or PTC
Type of incentive	Production tax credit (PTC)	Investment tax credit (ITC)	Production tax credit and investment tax credit
Funding level	\$30.6bn	\$10bn	N/A
Administering agency/ department	Treasury (IRS)	Treasury (IRS)/ DOE	Respective incentive category agency

Incentives for Manufacturing and Sourcing under 45X: Component Breakdown

Additional details specific to incentives for manufacturing are broken down in the following charts, including eligible components for the Advanced Manufacturing Production Credit (45x).^{5,6,7}

PV Modules and subcomponents

Component	Credit Amount
Solar-grade polysilicon	\$3 per kg
PV wafer	\$12 per m ²
PV cell (crystalline or thin-film)	4¢ per watt-direct current (Wdc)
Polymeric backsheet	40¢ per m ²
PV module	7¢ per Wdc
PV tracking systems	87¢ to \$2.28 per kg

Wind

Component	Credit Amount
Related offshore wind vessel	10% of the costs incurred by the taxpayer due to production of such materials
Wind energy components	2¢ to 5¢ per watt of turbine capacity

Batteries

Component	Credit Amount
Electrode active materials	10% of the costs incurred by the taxpayer due to production of such materials
Battery cells	\$35 per kWh
Battery module	\$10 (or, in the case of a battery module that does not use battery cells, \$45) per kWh
Critical minerals	10% of the costs incurred by the taxpayer due to production of such minerals
Inverter	0.25¢ to 11¢ per watt-alternating current (Wac) depending upon the type of inverter

With IRA incentives making entering the clean energy manufacturing sector more cost-effective, the U.S. energy sector gains a competitive advantage. Yet, challenges like labor shortages and political uncertainty loom as projects expand. To unlock the full potential for future growth, a collaborative government-private sector approach, supported by dedicated task forces, is imperative for sustaining the industry’s development.

Jimmy Hanley

Vice President Americas, Linesight



Understanding the benefit of 45X and 48C through examples

Impact of IRA (45X) on the production of a typical battery cell manufacturing plant	
Parameters	Details
Average battery cell factory size	30-40 GWh (depending upon individual characteristics)
Average cost of production (2023) per kWh for LFP battery ¹⁶	\$125-\$130 per kWh
Total product cost before tax credit	\$3.8bn-\$5.2bn for a 30-40 GWh facility
Production tax credit ⁸	\$35 per kWh
Expected production cost after tax credit	\$90-\$95 per kWh
Total cost after credits	\$2.7bn-\$3.8bn for a 30-40 GWh facility
Reduction in cost of production	~ 30%

The example above accounts for 2023 battery production costs. Production costs have likely since reduced due to technological advancements and increased market competition. Additionally, the incentives for production costs mentioned above are considered for a specific time period (until 2029). According to the IRA, these incentives will be gradually phased out, and the corresponding tax benefits will decrease over time.

Impact of IRA (48C) on the CapEx cost of a typical battery cell manufacturing plant	
Parameters	Details
Average battery cell factory size	30-40 GWh (depending upon individual characteristics)
Average CapEx per unit ¹⁶	\$93m/GWh
Total CapEx	\$2.8bn-\$3.7bn
ITC on CapEx ⁹	6%-30%
Net CapEx per unit after credits	\$65m-\$87m/GWh
Net CapEx after credits	\$2bn-\$3.5bn

It is important to note that the 45X credit cannot be claimed for equipment produced at facilities that received the 48C credit.¹⁰

The above examples are provided solely to illustrate potential benefits of tax credits under the IRA. Actual production costs and capital expenditures for facilities vary significantly depending on multiple factors. These numbers should not be used as the basis for any assumptions, projections, or calculations.

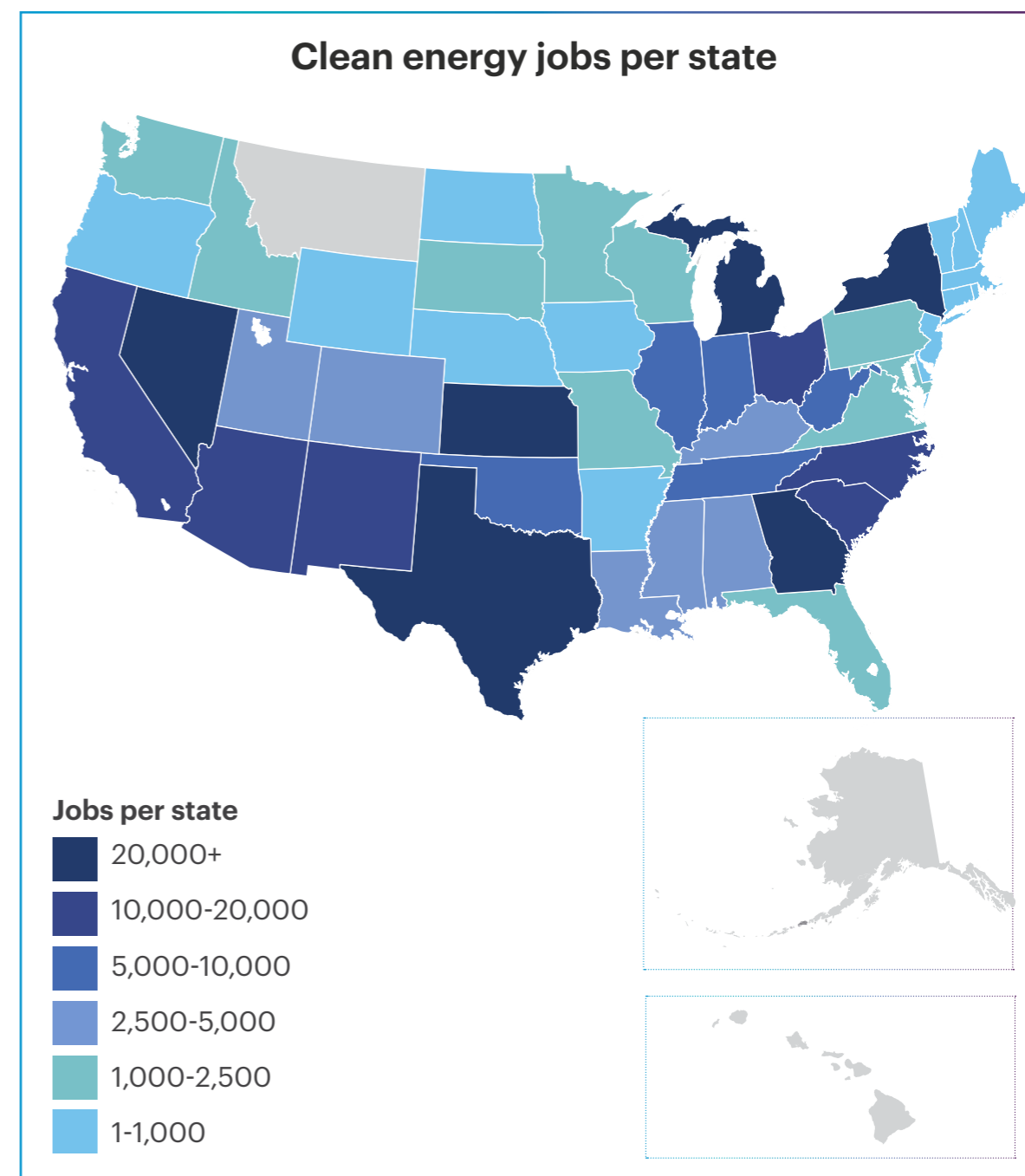


03 | Clean Investment Economic Overview: Impact, Major Upcoming Projects, and Trends

Since the enactment of the IRA in August 2022, there has been a significant surge in clean energy investments.

Between August 16, 2022 and May 3, 2024, a total of 585 clean energy projects have been announced, with the potential to create 312,900 jobs valued at \$361 billion, which includes 173 new battery manufacturing sites, 137 new or expanded electric vehicle manufacturing facilities, 166 solar and wind manufacturing plants, among other notable projects.¹¹ The majority of these projects are concentrated in seven states: Michigan, Texas, Georgia, North Carolina, Ohio, California and South Carolina. An *analysis by Grist.org* underscores the impact of the IRA on stimulating private sector investment. For every \$1 the government has invested in clean energy, the private sector has contributed nearly \$5.50.

Clean energy investments announced post IRA enactment			
Sector	No of projects	New jobs	New Investment (in US\$bn)
Batteries	173	130,326	120.78
Clean Technology	56	44,515	147.98
Electric Vehicles	137	45,878	27.63
Grid & Transmission	28	11,779	9.22
Hydrogen	25	10,868	14.10
Solar	120	57,053	33.28
Wind	46	12,481	9.59
Total	585	312,900	361.68



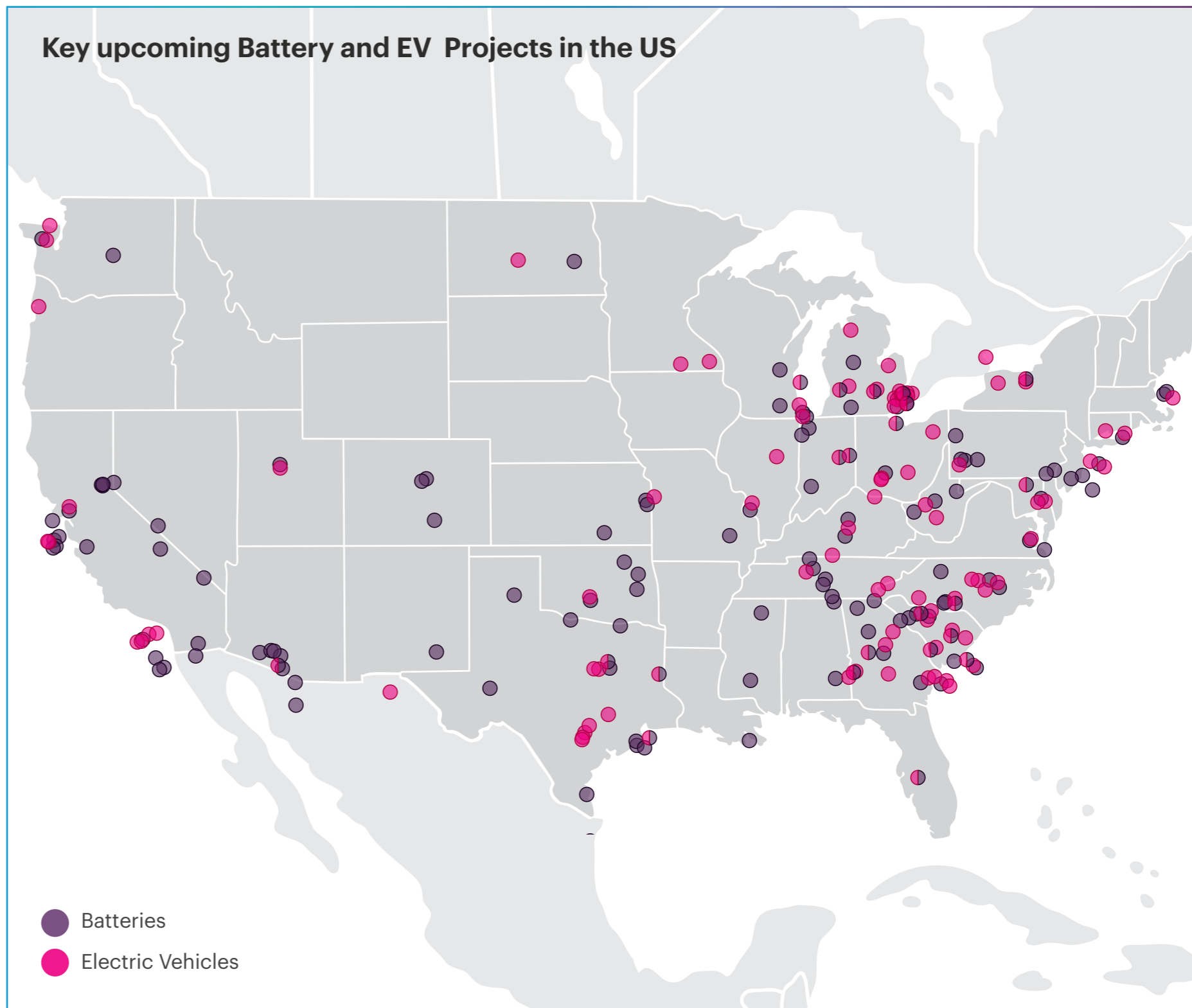
Source: Climatepower.US, June 2024

The IRA has led to a manufacturing boom in the US

The IRA has led to a manufacturing boom in the U.S. Investments in clean energy manufacturing increased by 136% in 2023 over 2022 after the introduction of the IRA. In 2018, manufacturing contributed only 3% to the overall clean investment. This increased to 17% in 2023 and 23% in the first quarter of 2024.¹²

Gigafactories

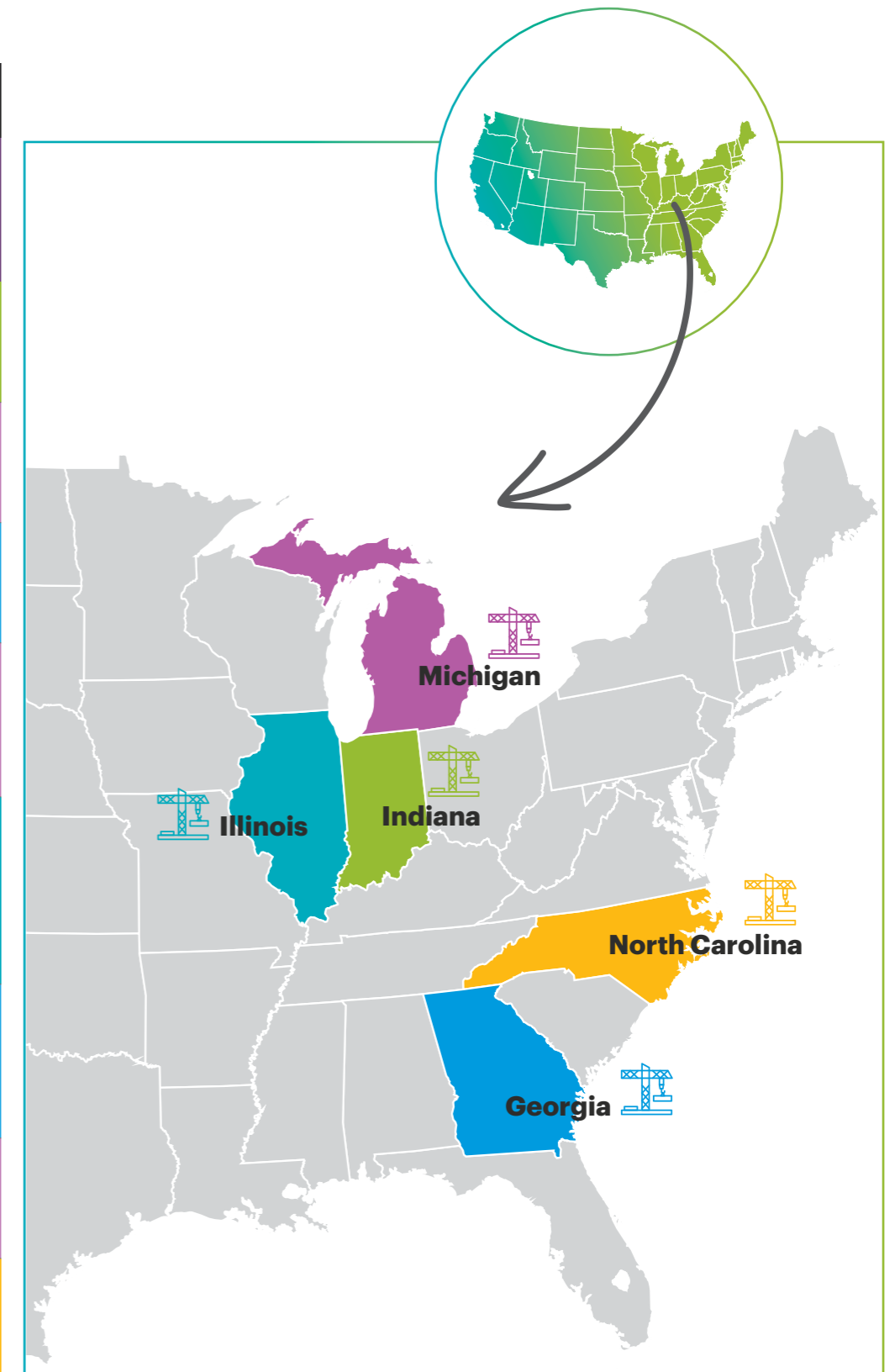
The IRA has contributed to a gigafactories boom in the US that increased the forecast of battery capacity roughly by 70%. US gigafactory capacity projected for 2030 has surged from 700 GWh in July 2022 to over 1.2 TWh as of July 2023.¹³ The US capacity of battery cell manufacturing grew three-fold between 2021 and 2023 to reach 188 GWh, as per clean investment monitor.¹⁴ According to TechCrunch, in 2019, the US had two operating battery factories and two under construction. As of the publishing of this report, there are approximately 34 battery factories planned, under construction, or operational.¹⁵



Source: Climatepower.US, June 2024

Select Large-Scale Battery Manufacturing Projects Announced Post IRA Enactment

Project Name	Capacity	Project Stage	Project Announcement Quarter	State
GM/ Samsung SDI – New Carlisle Electric Vehicle Battery Cell Plant	35 GWh	Execution	2023 Q1	Indiana
Gotion – Big Rapids EV Battery Components Manufacturing Plant	N/A	Planning	2022 Q3	Michigan
Hyundai Corp/ LG Energy – Bryan County Battery Manufacturing Plant	30 GWh	Planning	2023 Q2	Georgia
GM/ Samsung SDI – Michigan Electric Vehicle Battery Manufacturing Plant	45 GWh	Planning	2023 Q1	Michigan
Gotion – Manteno EV Lithium Battery Manufacturing Plant	40 GWh cells; 10 GWh packs	Planning	2023 Q3	Illinois
Hyundai Motor Co/ SK on – Cartersville Electric Vehicle Battery Manufacturing Facility – Georgia	35 GWh	Execution	2022 Q3	Georgia
Amperex Tech/ Ford Motor – BlueOval Battery Park – Michigan	20 GWh	Execution	2022 Q3	Michigan
Toyota – Liberty	30 GWh by 2030	Expansion	2023 Q (for expansion)	North Carolina



Source: Global data, techcrunch.com

04 | Key Challenges: Construction of Clean Energy Projects

While there is a surge in announcements of clean energy manufacturing projects in the U.S., the renewable energy sector faces a variety of challenges.



Demand

The demand and sales for EVs in the U.S. are hitting a plateau due to concerns over affordability, inadequate infrastructure and a short-term consumer preference shift towards hybrid vehicles. In the first quarter of 2023, EV sales in the US experienced the first decline since 2020. Although annual EV sales are still increasing, the pace of growth has slowed. This deceleration has prompted automakers to postpone their spending plans, causing delays in construction for some projects. Despite these challenges, the market share for electric and hybrid vehicles in the US saw an increase in the second quarter of 2024, rebounding from a slight decline in the first quarter.



Delays

There have been delays reported in several battery manufacturing plants due to a variety of reasons. These include a conservative outlook by Asian battery manufacturing companies due to a comparatively slower

EV market compared to the previous year, an increase in construction costs due to labor and material prices and lingering subsidy uncertainties ahead of the upcoming elections. Companies have also reported delays in construction due to concerns regarding the environment and strikes because of the scaling back of facility sizes.



Political uncertainty

The November 2024 election will shape the IRA's future and its funding. The outcome of the election could affect unallocated funds and those allocated but not yet spent. Although experts anticipate that a complete rollback of these incentives is unlikely, given the significant investments and job creation they have fostered, the rate of new investments has experienced a noticeable deceleration.



Compliance, cost and funding

These large-scale projects necessitate multiple approvals and regulatory compliance, particularly concerning safety

standards. Despite significant government incentives aimed at promoting these projects, the overall permitting process remains complex. Each state's interpretation and implementation of federal policies and guidelines add further layers of complication to the regulatory landscape. For manufacturing incentives within the IRA, the rules for 45X are quite straightforward whereas 48C, which involves capital expenditure support, requires more extensive documentation and presents more challenges in determining what is included or excluded.



Elevated material prices and tight supply chain

An increase in material prices and persistently long lead times, particularly for electrical equipment, are adding to the cost of many large-scale projects. In the past year, while steel prices have been normalizing, copper prices have been rising, and prices of energy-intensive materials like cement and concrete remain at elevated levels and have started increasing again. In the near term, these prices are not expected to decrease.



Interconnection delays

Clean energy expansion faces obstacles from a mounting backlog of renewable power projects awaiting connection to the electric grid. The Lawrence Berkeley National Laboratory reported that by the end of 2022, almost 2,000 gigawatts of renewable energy and storage capacity were stuck in interconnection queues, a 40% surge from the prior year.



Funding

Start dates for construction projects are being delayed due to the extended timelines required to secure funding. This delay is further exacerbated by the need to develop and agree on onerous forms of contract that are necessary to provide the required assurances to funders. These factors are collectively contributing to significant setbacks in the commencement of various construction initiatives.



Labor cost and availability

The US is currently facing a shortage of skilled construction workers, exacerbated by an aging workforce and a lack of new entrants into the industry. Gigafactories, with their advanced construction needs, require highly skilled laborers proficient in intricate electrical work and the creation of pristine, contaminant-free environments controlled by air pressure. The increasing number of project announcements across several states is widening the gap between supply and demand for specialized workers. Project owners are grappling with higher costs for labor mobilization, often sourcing workers from different states. Additionally, some projects mandate unionized labor, further intensifying the scarcity of available workers.

Addressing this challenge requires a multifaceted strategy involving educational shifts to prioritize apprenticeships over traditional degrees, incentives for companies to develop on-the-job training programs, and contractual adjustments to support local hiring and sustainable community employment.

05 | Way forward

Key considerations for setting up a large-scale construction project

The IRA has created significant opportunities for large-scale construction projects in the US, particularly in sectors such as clean energy and manufacturing. With new incentives and funding aimed at reducing carbon emissions and promoting sustainable practices, developers now face a unique landscape for project planning and execution. However, navigating these opportunities requires careful consideration of key factors such as regulatory compliance, supply chain dynamics, workforce availability, and the integration of advanced technologies. These considerations are essential for ensuring the success and sustainability of large-scale construction projects.



Multiple stakeholders with varied specialties

Setting up a gigafactory is a complex task that requires careful planning and coordination due to the involvement of multiple independent specialists. It demands the integration of various experts, with unique construction processes and requirements. Adopting a multi-contracting strategy might help.

Although this approach introduces additional complexity and risk, it helps manage interface risks related to design, technology, information exchange, physical coordination, and scope gaps.



Effective cost and risk management

Effective cost and risk management is crucial for gigafactory or large-scale project construction. Lenders will closely examine strategies for controlling cost overruns and ensuring project completion. This includes analyzing construction phase risks both broadly and for specific events. Flexibility in procurement, with adaptable terms and long-lead procurement planning, is essential for accommodating changes and ensuring smooth project progression. As per **Porsche Consulting**, for a large-scale factory, a delay of six months can quickly equate to a loss of revenue exceeding \$1 billion.



ESG consideration

Environmental, social, and governance (ESG) considerations are increasingly important in gigafactory projects. The battery minerals industry faces supply chain risks related to human rights violations, environmental damage and compliance issues. Developers must be diligent and transparent about their ESG obligations, incorporating risk management procedures into agreements, auditing raw material suppliers and assigning responsibilities.



Modularization

One of the key initiatives to enhance efficiency in construction is modularization. This approach significantly boosts productivity by allowing construction elements to be pre-assembled, which reduces installation time on-site. Consequently, labor can be reallocated more quickly to subsequent projects, helping to mitigate some workforce challenges.

Conclusion

The IRA has provided a significant boost to clean energy and manufacturing investments. Still, there is a need to create a task force to address key challenges within various sectors and among stakeholders, including lenders, unions, contractors, investors and manufacturers. As we are still in the early stages of these projects coming online, it is crucial to develop best practices and establish a robust supply chain to support them effectively.

Looking to the future, the recent decline in demand for EVs is leading to a shift towards hybrids. We may also witness a significant focus on battery recycling as the early models of electric cars approach retirement. These factors underscore the presence of open questions that will undoubtedly be addressed in the coming year.

As the landscape continues to change, Linesight remains committed to monitoring these developments and providing the resources necessary to navigate them.

06 | About Linesight

Who we are

Delivering professional construction consultancy services and strategic support to multiple sectors globally.

over **50 years'**
experience

Global reach

Established in Ireland in 1974, Linesight now has extensive global reach. With offices across four continents, we have delivered projects in over 45 countries.

33 offices
globally

Local expertise

We employ highly skilled professionals and train them to world-class standards, bringing global knowledge and local expertise to bear for our clients.

1,500+
employees

Trusted partner

Our bold ambition, honesty and confidence to deliver, together with our commitment to build meaningful relationships is what sets us apart.



Our services

Our services are tailored to your project, delivering maximum efficiency from inception to completion. We specialize in key areas, to provide faster project delivery, greater cost efficiency and maximum value.



Cost Management

Ensuring optimum value throughout the construction lifecycle.



Procurement

Adopting the most appropriate strategy to suit both public and private sectors.



Supply Chain Management

Efficient logistic strategies to streamline the delivery of equipment and services.



Planning and Scheduling

Project schedule control to ensure maximum performance, progress transparency and critical path analysis of the effect of change.



Program Management

Managing a network of projects simultaneously in order to deliver program success.



Project Management

Project success through strategic planning and stringent controls.



Health and Safety

Assuring compliance and providing design teams and clients with expert advice and independent review.



Benchmarking

Providing clients with benchmarking data across multiple industry sectors.



Project Controls

Controlling every aspect of a project to ensure maximum performance and long-term success.



Fund Monitoring

Managing, monitoring lender debt to mitigate funding risk.



Consultancy

Providing professional, hands-on advice and guidance throughout every stage of your project.



Market Intelligence

Detailed research and analysis undertaken to educate our teams and keep our clients informed.

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