



EXPERT INSIGHT

The US Decarbonization Imperative: Once in a Generation Market Opportunity

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THE US DECARBONIZATION IMPERATIVE: ONCE IN A GENERATION MARKET OPPORTUNITY

Introduction

Driven by recent policy actions that include substantive *onshoring provisions*, we believe the US decarbonization investment theme is poised for unprecedented growth. Technology maturation, favorable unit economics, rising demand, and public and private investment in the sector are creating in our view historical market opportunities across energy efficiency, low carbon mobility, and clean energy value chains.

The Inflation Reduction Act (IRA), signed into law in August, contains **over \$60 billion to onshore clean energy manufacturing**¹. In fact, the bill's tax credit provisions will lead to much more spending to fight climate change with the Congressional Budget Office estimating the potential spend at \$374 billion while recent market reports put the bill's impact at closer to \$800 billion². Over the next decade, Credit Suisse puts climate spend in the US at \$1.7 trillion while a Princeton University Zero Lab analysis puts the number at nearly \$3.5 trillion³.

Despite a looming economic downturn, this unprecedented coupling of demand and concerted public and private sector investment is set to transform the US investment landscape for years to come. Tikehau Capital's long-standing decarbonization conviction will continue to guide our investment priorities as we explore these growing opportunities in the US market.

¹ [Democrats.senate.gov - Summary of the Energy Security and Climate Change Investments in the Inflation Reduction Act of 2022](https://democrats.senate.gov/summary-of-the-energy-security-and-climate-change-investments-in-the-inflation-reduction-act-of-2022)

² <https://www.theatlantic.com/science/archive/2022/10/inflation-reduction-act-climate-economy/671659/>

³ [Princeton University Zero Lab - Preliminary Report: The Climate and Energy Impacts of the Inflation Reduction Act of 2022, August 2022](https://www.princeton.edu/~zero/zero-lab-preliminary-report-the-climate-and-energy-impacts-of-the-inflation-reduction-act-of-2022-august-2022)

The expanding US decarbonization opportunity set

Even as CO₂ emissions have continued to increase, global average per-capita emissions have been flat for nearly a decade⁴. This suggests that the transition towards cleaner energy might be underway as the availability of commercial-scale technology solutions continue to grow. Electricity generation in advanced economies is increasingly driven by renewable sources (primarily wind and solar), replacing coal with natural gas, and higher nuclear power generation.

The increase in the adoption of renewables has been possible by a sustained reduction in their unit costs as well as the prices of batteries over the last 20 years.

Most notably, expressed in Levelized Cost of Energy (LCOE), globally, the price of solar and the price of onshore wind electricity declined by 89% and 70% respectively between 2009 and 2019⁵. Since 2012, the average total cost of an EV battery fell by more than 80%⁶. Technology available currently across the mission-critical sectors are ready for the influx of investment flows necessary for the world to meet its decarbonization milestones.

The United States, the second highest emitting economy in the world⁷, has had a reinvigorated focus on comprehensive climate policy action since 2020 to build and expand the energy transition infrastructure needed to drive economic growth, mitigate climate change impact, and put the country on a path to achieve its stated 50–52% emissions reduction by 2030 goal (over 2005 level).

Recent policy initiatives have enabled conditions to spur and sustain private investments in climate action themes. Between the IRA, the Infrastructure Investment and Jobs Act (IIJA), and

the CHIPS and Science Act, the Biden administration and Congress have committed the US to spend unprecedented amounts on climate technology and clean energy over the next decade. Furthermore, these headline federal policy actions are supplemented by robust state and local level policy frameworks that include incentives for renewables, electric vehicle (EV) manufacturing, and investments in energy efficiency and storage.

The Zero Lab analysis also projects that IRA will have the greatest impact on investment in wind power and solar PV, which nearly doubles to \$321 billion in 2030, versus \$177 billion under current policy⁸. The Act will drive substantial additional investments by households and businesses in existing technologies on the demand side of the energy system, including purchases of more efficient and electric vehicles, appliances, heating systems, and industrial process. The Act provides tens of billions of dollars in grants, tax credits, and loan programs to develop manufacturing and supply chains for clean energy components, batteries, and EVs.

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1. Examining the market opportunities of: EV OEM suppliers and services

The transportation sector accounts for 30% of greenhouse gas (GHG) emissions in developed countries, making EVs an important channel of the decarbonization matrix⁹. Within the mobility sector, road transportation is by far the biggest GHG emissions producer¹⁰.

Even before the IRA, the number of EVs on US roads was projected to reach 26.4 million in 2030¹¹, building on a steady growth of 405% between 2015 and 2021¹².

The IRA contains significant provisions that would **further accelerate the ongoing electrification of US transportation**.

The IRA includes:

For the first time, used EVs will be eligible for federal tax credits of up to \$4,000 or 30% of the sales price, whichever is lower, and commercial EVs will also be eligible for federal tax credits up to 30% of the sales price.

The light-duty EV tax credit of up to \$7,500 per vehicle has been extended through 2032, which will allow millions of more consumers to easily switch to an EV.

On the cost side, according to an analysis by McKinsey, in the Network for Greening the Financial System (NGFS) Net Zero 2050 scenario¹³, after 2030 in the US, the total cost of ownership of passenger EVs would be lower than that of internal combustion engine (ICE) vehicles driven by maturation of technology and growing network effect.

⁴ <https://www.carbonbrief.org/global-co2-emissions-have-been-flat-for-a-decade-new-data-reveals/>

⁵ <https://ourworldindata.org/cheap-renewables-growth>

⁶ <https://about.bnef.com/blog/battery-pack-prices-fall-to-an-average-of-132-kwh-but-rising-commodity-prices-start-to-bite/>

⁷ <https://worldpopulationreview.com/country-rankings/carbon-footprint-by-country>

⁸ https://repeatproject.org/docs/REPEAT_IRA_Preliminary_Report_2022-08-04.pdf

⁹ https://www.un.org/sites/un2.un.org/files/media_gstc/FACT_SHEET_Climate_Change.pdf

¹⁰ https://climate.ec.europa.eu/eu-action/transport-emissions_en

¹¹ [Edison Electric Institute - Electric Vehicle Sales and the Charging Infrastructure Required Through 2030](#) (This This consensus forecast is based on four independent forecasts done by Boston Consulting Group, Deloitte, Guidehouse, and Wood Mackenzie, as well as analysis from the National Renewable Energy Lab)

¹² [IEA Global EV Outlook 2022](#) and [IEA Global EV Data Explorer](#)

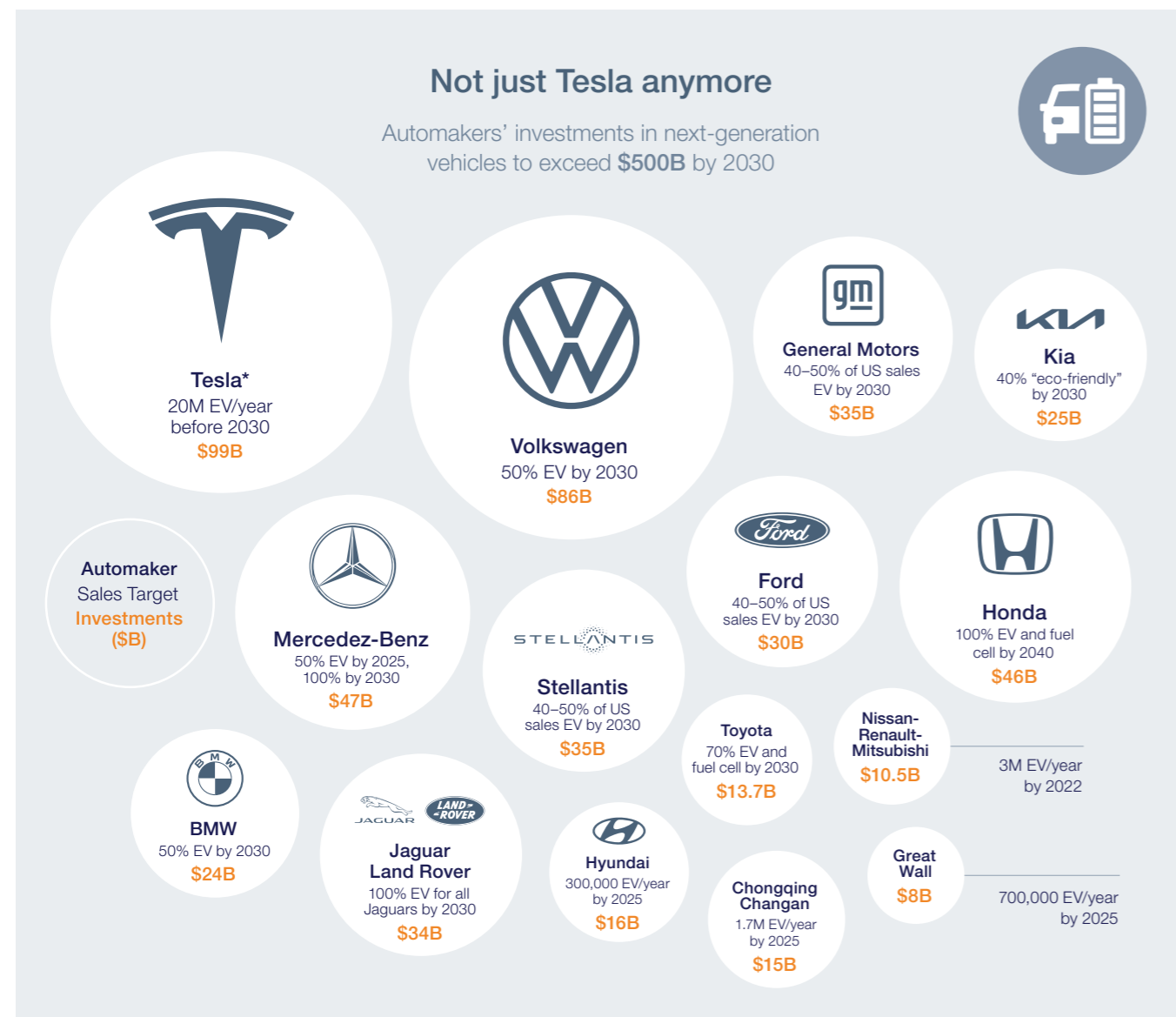
¹³ Network for Greening the Financial System (NGFS), a consortium of central banks and financial supervisors, designed a Net Zero 2050 scenario that provides an even chance of keeping postindustrial warming below 1.5°C by the end of the century. [McKinsey's analysis](#) focuses on opportunities and risks associated with the transportation sector's decarbonization trajectory in line with NGFS Net Zero 2050 scenario.



Strategic investment by OEMs

In recent years, automakers have been ramping up their investments in electric vehicles and are directing billions into a scale-up of battery and auto manufacturing, charging infrastructure, and research and development.

The growing adoption and declining cost curves coupled with landmark policy incentives means that companies throughout the mobility ecosystem including suppliers to original equipment manufacturers (OEMs), plus manufacturers and operators of infrastructure are poised for growth and capital deployment opportunities.



Data compiled as of Sept 17, 2021
Includes historic, announced investments in all forms of hybrid and pure electric and autonomous vehicles, and related technologies, as far out as 2030. Totals do not necessarily reflect all electric vehicle investments for each company. Currencies converted to U.S. dollars.
* Includes S&P Global Market Intelligence consensus estimates of expected capital expenditures through 2030.
Credit: Cat Weeks
Sources: S&P Global Market Intelligence; International Council on Clean Transportation; company announcements

New Battery Electric Vehicles On The Horizon	
Automaker	Forthcoming Model(s)
American Honda Motor Co	Acura EV which will be produced in 2024.
BMW North America	In all, BMW says it will bring roughly a dozen new EVs to market by 2025. An electric Rolls-Royce Spectre is expected in 2023.
Ford Motor Company	Ford introduced an electric version of its popular F-150 pickup, dubbed F-150 Lightning, for sale in spring 2022. Ford says it will produce more than 2 million EVs annually by 2026 and projects that EVs will be half of its global sales volume by 2030.
General Motors (GM)	GM aims to have 20 EVs available in the US by 2025 as it moves to an all-electric model lineup by 2035.
Kia Motors America	Kia has set a target of 1.2 million annual battery electric vehicle (BEV) sales worldwide by 2030. Key to achieving that goal is increasing its EV lineup to 14 electric models by 2027.
Mercedes-Benz USA	Mercedes-Benz has announced that all newly launched vehicle platforms will be electric-only from 2025 onwards. Three platforms are scheduled to launch in 2025: MB.EA (medium and large cars), AMG.EA (performance cars), and VAN.EA (vans and light commercial vehicles).
Nissan North America	Nissan has sold around half a million Leaf EVs, one of the first mass market EVs available in the U.S. The next North American all electric model is the Ariya, a small SUV scheduled for launch in fall 2022. The automaker is targeting carbon neutrality across all vehicle life cycles by 2050.
Stellantis	Stellantis (including the Alfa Romeo, Chrysler, Dodge, Fiat, Jeep, Maserati, and Ram brands in the North American market) is aiming for a first battery electric vehicle by 2025 and an all-electric lineup by 2028.

Source: Consumer Reports - Automakers Are Adding Electric Vehicles to Their Lineups. Here's What's Coming, June 2022

Growth and onshoring of EV supply chain

Suppliers across the EV supply chain, from material processing to battery manufacturing to automotive assembly to battery recycling, have evolved to keep pace with growing investments by OEMs in electrification providing parts and solutions for batteries and the charging infrastructure.

The \$7,500 in tax credits for consumers who purchase EVs contained within the IRA only applies when final assembly of the vehicles occurs in North America. Another requirement: The components used in EV batteries must not have been “extracted, processed, or recycled by a foreign entity of concern,” which includes China and Russia. These requirements will provide additional impetus to the EV battery production capacity expansion in the US and the diversification away from China that is already underway.

The government approved close to \$3 billion to boost production of advanced battery supply chains in February 2022 under the IIJA which included funding for upstream battery materials and refining as well as for production plants, battery cell and pack manufacturing facilities and recycling facilities. Car companies and suppliers such as LG Energy, SK Innovation, Panasonic, and Samsung are investing more than \$38 billion through 2026 to boost battery production in the US, according to AlixPartners¹⁴.

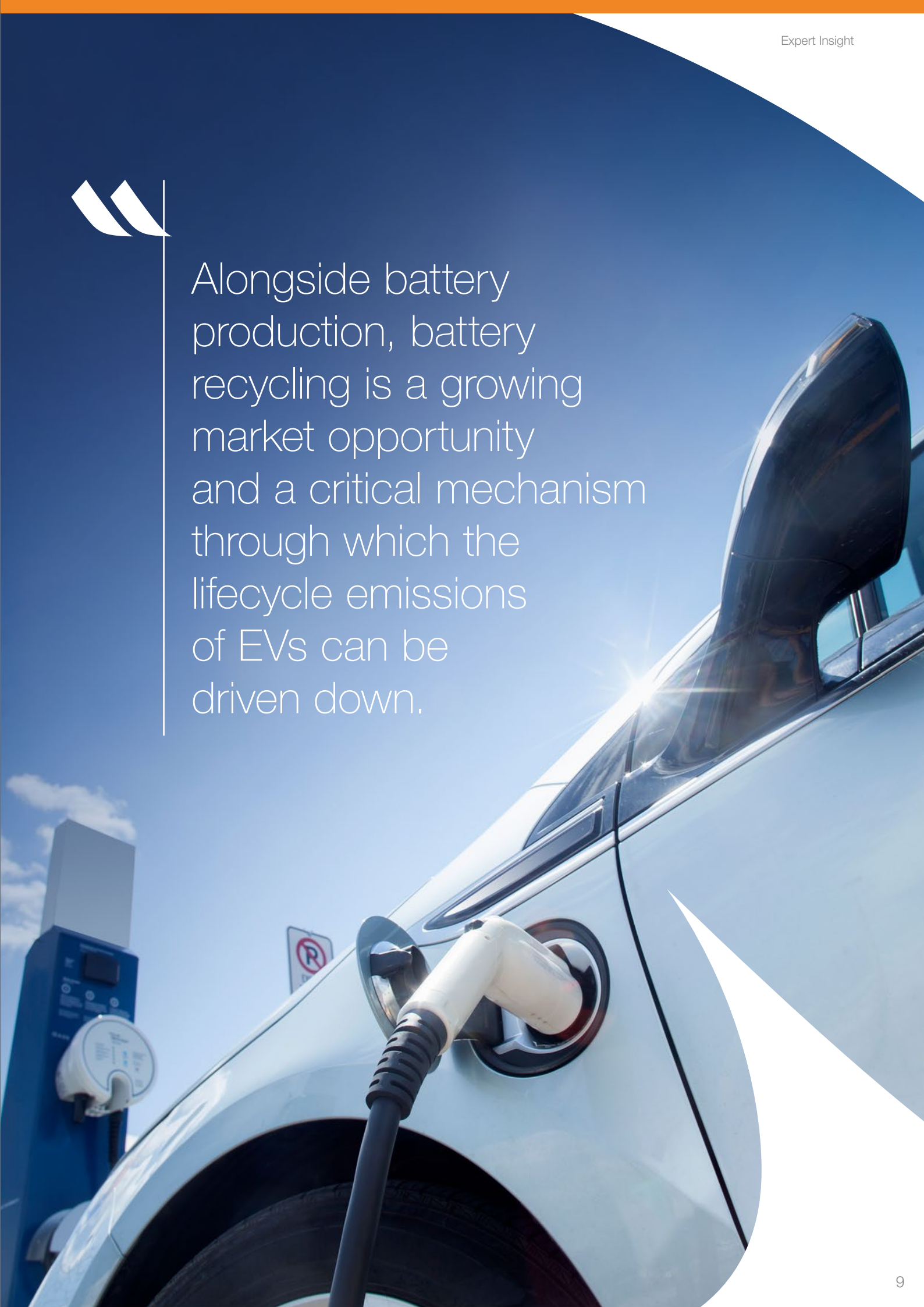
Alongside battery production, battery recycling is a growing market opportunity and a critical mechanism through which the lifecycle emissions of EVs can be driven down. Recycling could also alleviate some of the pressure on critical mineral supplies. The global lithium-ion battery recycling market is projected to grow from \$4.6 billion in 2021 to \$22.8 billion by 2030, at a CAGR of 19.6%¹⁵, with North America projected to be a major regional market.

In response to the deepening investment opportunity set of the EV battery value chain, **venture capital (VC) and growth equity funds have invested nearly \$42 billion into battery technology startups across almost 1,700 deals, according to an analysis by PitchBook and TechCrunch¹⁶**. What’s more, about 75% of the investments happened in the last two years alone.

VC firms aren’t new to the battery world. But the more remarkable story has been in growth equity. In the past, private equity (PE) deals in the battery sector were sporadic. However, in the last year, **growth equity firms have invested \$13.4 billion into areas such as battery materials, manufacturers, and recyclers**. This is a testament to investors’ confidence in technology and unit economics that have progressed from R&D stages to commercial-scale manufacturing and deployment.

Moving beyond batteries, electronic-related content represents >50% of the bill of materials of an EV compared to <10% in a traditional ICE vehicle¹⁷. According to research by UBS, as EV penetration grows, there will be exponential growth within tech supply chains that could dwarf the PC/smartphone market by 2030. **UBS anticipates >\$100bn opportunities in both auto semiconductor and powertrain modules, as well as material growth in lenses and substrates**.

As electrification of US road transport gains further momentum, it will continue to drive capital towards domestic providers of products and services across the EV value chain.



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¹⁴ TechCrunch – Battery Investment Moves Onshore to Kickstart US EV Production, August 2022

¹⁵ MarketsandMarkets- Lithium-ion battery recycling market, October 2021

¹⁶ TechCrunch - Batteries Have Become VC And PE's Most Electric Investment Opportunity, May 2022

¹⁷ UBS - Q-Series: Tech reshaping the electric vehicle supply chain – where is the opportunity?

2. Examining the market opportunities of: Renewable asset equipment and services

Electricity is expected to play a prominent role in the future global energy mix. With a projected 60% growth in electricity demand by 2040, the power sector is expected to generate roughly half of all energy supply investments through 2040 (over \$20tn in generation and transmission and distribution)¹⁸.

Across countries, capacity is being ramped up and annual renewable capacity additions broke a new record in 2021, increasing 6% to almost 295 GW¹⁹.

In the US, almost 5% of the energy consumed across sectors was from renewable sources in 2020²⁰. **Renewables made up 19.8% of electricity generation in 2020 and even without taking into account the IRA, the share was expected to rise to 35% by 2030**, with most of the increase expected to come from wind and solar²¹. The provisions of the IRA are designed to drive growth at an even more rapid pace.

The IRA includes:

- Production tax credits to accelerate US manufacturing of solar panels, wind turbines, batteries, and critical minerals processing, estimated to invest \$30billion.
- \$10 billion investment tax credit to build clean technology manufacturing facilities, like facilities that make electric vehicles, wind turbines, and solar panels.

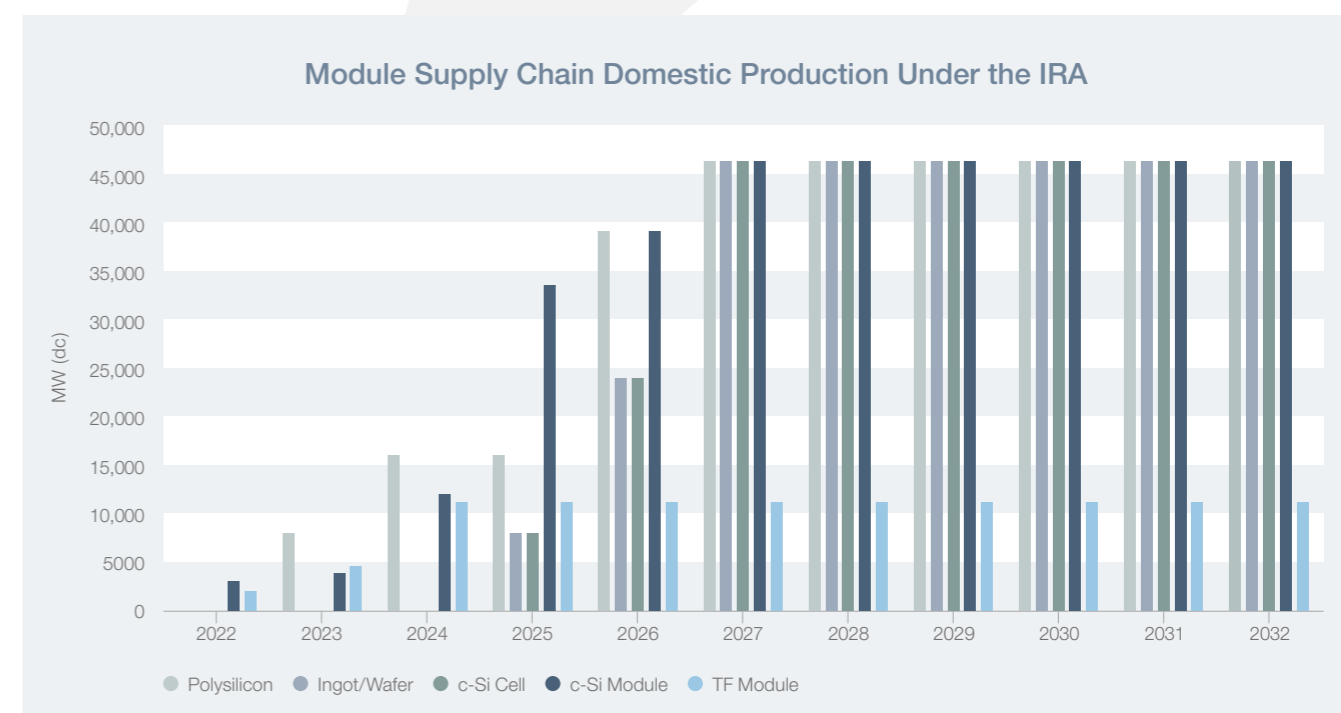
These historic investments will spur investor interest in products and services throughout the clean energy value chain including renewable equipment manufacturers and renewable asset management service providers.

Catalyzing America-based clean energy value chains

Solar Energy Manufacturing for America Act

Baked into the IRA are provisions of the **Solar Energy Manufacturing for America (SEMA) Act**, which incentivizes **US production throughout the solar value chain**. The new tax credit is allowed for certain solar components, including photovoltaic cells and wafers, solar grade polysilicon, and a non-integrated solar module able to generate electricity when exposed to sunlight.

The US currently has capacity to produce metallurgical grade silicon, polysilicon, steel, aluminum, resins, racking and mountings and other key materials. The IRA includes a long-term extension of the solar investment tax credit which should facilitate a solid demand outlook incentivizing investments to expand and improve the competitiveness of existing manufacturing capacity.



Source: In response to the passage of IRA and SEMA, the Solar Energy Industries Association (SEIA) released a white paper on August 16 with near- and long-term steps to drastically scale America's solar manufacturing sector.

IRA extends tax credits for wind projects

A 10% production tax credit (PTC) adder applies for wind projects placed in service after Dec. 31, 2022, that satisfy a domestic-content requirement. To qualify for this new 10% bonus, it must be certified that any steel and iron, or any manufactured product that is a component of the facility, was produced in the US.

The mega ramp up of renewable energy capacity in the US, to a large part, will be **led by domestic sourcing and manufacturing**, to be eligible for the "bonus" IRA tax credits. This provides a favorable outlook for businesses and continued investor interest along the US clean energy value chain including equipment and services.

¹⁸ Based on IEA data from World Energy Outlook © OECD/IEA 2019, www.iea.org/statistics, License: www.iea.org/t&c; as modified by Tikehau IM

¹⁹ IEA – Renewable Energy Market Update, May 2022

²⁰ EIA - Primary Energy Consumption by Source

²¹ EIA – Annual Energy Outlook, March 2022

3. Examining the market opportunities of: **Energy efficiency**

Energy efficiency in buildings and industrial end markets is a key decarbonization lever and a mature industry with long-running efficiency standards and labelling programs. Energy efficiency has large, near-term impact: An analysis of nine large countries and regions, including the US, the EU, and China showed that efficiency standards helped save about 1,500 TWh of electricity per year in 2018, equivalent to that year's total generation from wind and solar in those countries²².

"We consider energy efficiency to be the 'first fuel' as it still represents the cleanest and, in most cases, the cheapest way to meet our energy needs."

Faith Birol
Executive Director, IEA

The growing adoption has now received a further boost from the IRA. **By targeting both retrofits and new buildings, the IRA provides substantive opportunities to scale the market for US building electrification.**

Expanding the energy efficiency market

- The IRA has **significantly increased** the already permanent **179D tax deduction** from the current maximum of \$1.88 per square foot in 2022 to \$5 per square foot to incentivize the construction of energy efficient commercial buildings and multifamily buildings.
- 45L tax credits have been retroactively extended for 2022 through the end of 2032, creating significant benefits for multifamily developers and homebuilders.
- The IRA rebates prioritizes low- and moderate-income households most in need of relief from high fuel prices, providing up to \$14,000 for electric appliances (such as heat pump water heaters, heat pump HVAC, electric ovens/stoves). **This will enable roughly one million low- and moderate-income households to go electric²³, unlocking opportunities for businesses to serve a bigger clientele.**
- The Advanced Industrial Facilities Deployment Program would invest nearly \$6 billion to help the largest industrial emitters in the most emissions-intensive industrial sectors, like cement and steel plants, adopt technologies that can help them significantly slash their GHG pollution. This will drive major investments into existing energy efficiency technologies in the industrial end market.

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Conclusion

The growing acknowledgment of decarbonization as a secular trend and the large-scale, whole-of-country, multi-sectoral policy initiatives have created a once-in-a-generation opportunity for businesses and investors across the energy efficiency, low carbon mobility, and clean energy sectors.

At Tikehau, we are committed to investing in US decarbonization-aligned businesses and technologies that are facing demand and supply side tailwinds.

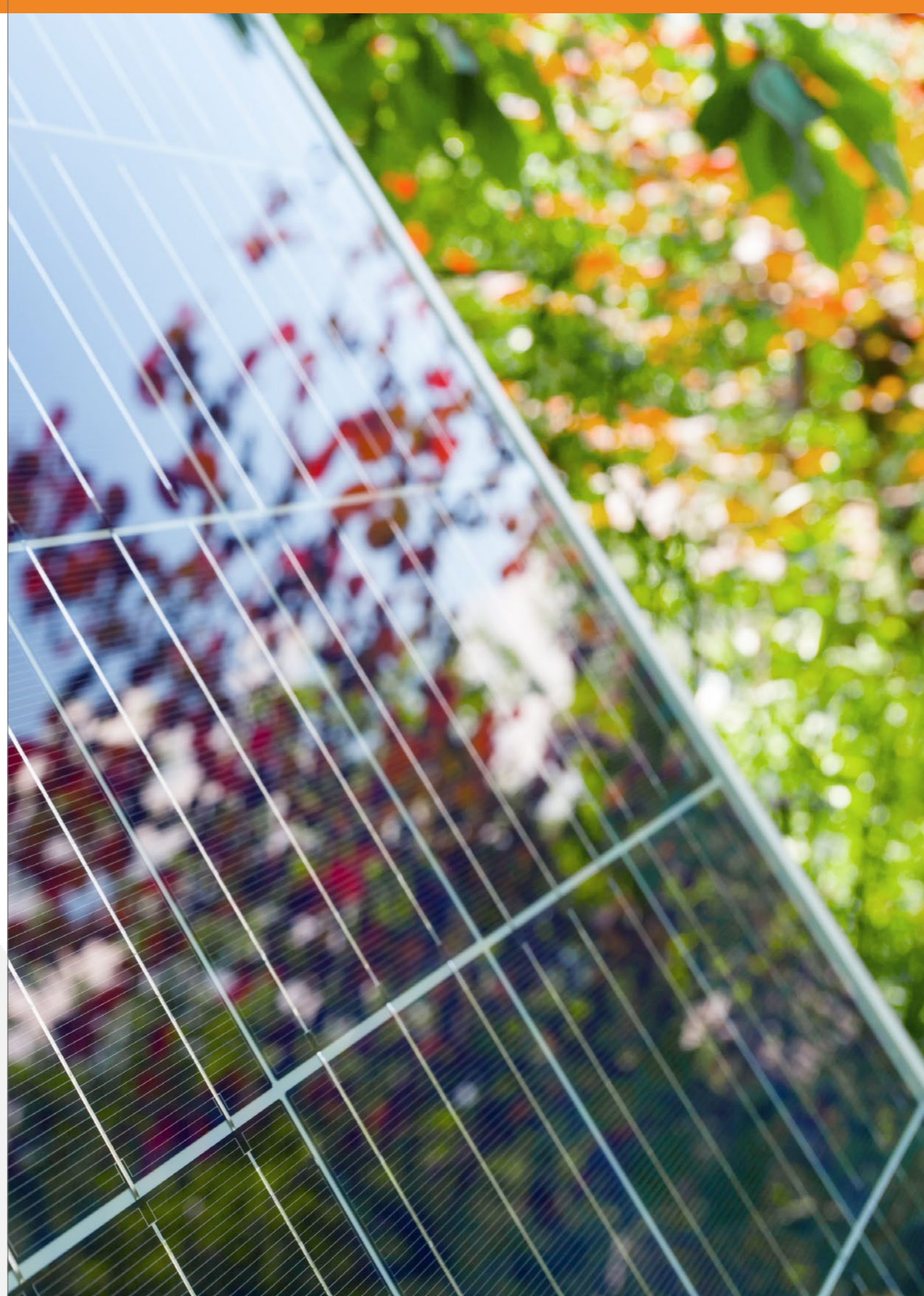
Through future content and convening efforts, we will continue to explore the evolving growth dynamics of the US decarbonization ecosystem as it enhances capacity to cater to growing demand and materially reduce emissions.

²² IEA - Energy Efficiency 2021, November 2021

²³ Rewiring America - The Electric Explainer: Key programs in the Inflation Reduction Act and what they mean for Americans

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