

One Year Inflation Reduction Act

Initial Outcomes and Impacts
for EU-US Trade and Investment

Max Gruenig

Senior Policy Advisor
E3G Washington Office



In partnership with:



E3G is an independent climate change think tank accelerating the transition to a climate-safe world. E3G builds cross-sectoral coalitions to achieve carefully defined outcomes, chosen for their

capacity to leverage change. E3G works closely with like-minded partners in government, politics, business, civil society, science, the media, public interest foundations and elsewhere.

www.e3g.org

Berlin

Neue Promenade 6
10178 Berlin
Germany
+49 (0)30 2887 3405

London

47 Great Guildford Street
London SE1 0ES
United Kingdom
+44 (0)20 7593 2020

Brussels

Rue du Commerce 124
1000 Brussels
Belgium
+32 (0)2 5800 737

Washington

2101 L Street, NW
Suite 400
Washington DC, 20037
United States
+1 202 466 057

© E3G 2023

Table of Contents

Executive Summary	2
1. A preliminary stock take of changes for EU-US trade and investment in cleantech	4
2. EU-US Cleantech Trade and Investment	6
Pre-IRA EU exports to the US, focusing on cleantech.....	7
Investment flows.....	9
3. The US Inflation Reduction Act of 2022	10
Background and final form.....	10
Climate-relevant provisions.....	11
4. Challenges for the success of the Inflation Reduction Act	12
Domestic content requirements	13
Specific provisions for EV tax credits.....	14
Expected impacts on private sector investment in cleantech.....	15
5. Initial observed investments and uptake, especially by European companies	21
Clean energy sector investments.....	22
Added renewable energy capacity	24
Solar PV imports into the US	25
6. Outlook into year two of the Inflation Reduction Act	30
Annex	32
General domestic content thresholds.....	32
Electric vehicle tax credits.....	33
References	37
Author	43

Executive Summary

The Inflation Reduction Act is a complex and multi-faceted legal act, a result of the politics that it emerged from. It is evident that the environment, economic and social impacts of a legal measure as complex as the IRA cannot be reliably forecast.

It is not a given that the IRA will generate a significant economic stimulus for the US economy overall, or that it will attract significantly more foreign direct investment. It is very likely, based on the available studies, that the significant domestic and foreign investments displace other investments. That is, rather than adding growth in investments in net zero infrastructure to the fossil economy, we should see a greening of the economy while it continues on its long-term growth path. If these projections hold true, then the IRA will move the US into a net zero transition, without adding a significant stimulus.

Total investment in manufacturing construction is growing at a steep rate in the US with almost \$200bn invested in June 2023 alone. This increase in investment is very significant and supports the thesis that the new industrial policy is successful in driving new manufacturing activity. However, the data for January to April indicate that this added construction spending is more linked to impacts of the CHIPS+ Act. There is no clear directional momentum that would indicate a significant flow of foreign direct investment from other countries to the US because of the IRA (or any other new industrial policy).

Announced investments in cleantech amount to \$278bn, though this comes with all the caveats of these being purely announcements. \$10.4bn of this value, or 3.8% of total announcements, comes from EU companies. This indicates that European companies are benefiting to some degree from the provisions of the IRA, but their investments fall short of those from their Asian competitors. South Korean companies account for around a third of announced investments—almost the same as domestic US companies. They are followed by Japan and China, a result of the mature battery manufacturing capabilities in these Asian economies.

In the power sector, new clean energy capacity additions are at a record high in 2023 with solar leading at 29.1 GW, followed by 9.4 GW battery storage and 6 GW wind.¹ This also translates into higher imports of cleantech materials: solar PV module imports are doubling in 2023. However, EU businesses are not benefitting from this opportunity. EU companies are marginal solar PV exporters to the US and have minor market share in the fields of wind and battery power technology.

¹ EIA. 2023(b). "Developers added 16.8 GW of U.S. utility-scale generating capacity in first-half 2023." <https://www.eia.gov/todayinenergy/detail.php?id=57340>

EU-based car manufacturers rank 6th, 7th, 8th, 10th and 12th among the top 12 for EV sales in the first half of 2023, gaining an increasing market share. Not all these vehicles qualify for the partial or full credit and a considerable number of them are imported.

In the first half of 2023, imports of passenger Battery Electric Vehicles (BEVs) increased by 77% to almost \$9bn with EU exporters representing over 44% of all imports (Germany 34%), by far the largest market share within EV imports to the US. This indicates that the IRA's required final assembly in North America and the linked tax credits only affect some market segments and are not a cut-off point for exports to the US. Therefore, we can assume that a further tightening of the EV credits will have only a very limited impact on these numbers.

Thus, the EV sector is the one key remaining cleantech export option for EU manufacturers. Hopes to get more of a foothold in the battery storage, (offshore) wind or solar PV markets are rather elusive, given the unwelcoming combination of high labor and energy costs in the EU and a trade-restricting regulatory environment in the US.

An open route to participating in the cleantech boom in the US in these sectors is via foreign direct investment. So far, EU businesses have not shifted their investment strategies to the extent that would show a visible difference in the landscape. Rather, they seem to be lagging behind other cleantech investors, especially from Asia.

Maintaining and increasing market shares will be challenging given the powerful competition both by price and technology leaders. At the same time, the EU's export-oriented economies will need to find a way to be present in one of the key global cleantech growth markets for the next decade.

In 2023 and 2024, domestic manufacturing in the US is mostly defined by already existing plant capacity. After 2024, we will see more of an impact with new cleantech manufacturing coming online and adding more domestic opportunity for added value and employment, possibly reducing the opportunities for cleantech exports into the US further.

Overall, the IRA is expected to only have a marginal impact on the transatlantic economy, while contributing to the decarbonization in the US and, by extension, the global transition to net zero, or at least a 50% reduction of emissions by ca. 2030, with most IRA rules expiring around 2032.

Yet, the IRA is not the tool to move the US all the way to net zero, but it can be a catalyst to change course towards a 1.5 degrees-aligned economy. If all goes well the IRA will bring the US within reach of its 2030 climate goal of minus 50 to 52% reductions compared to 2008. For reaching net zero by 2050, a whole new approach will be called-for.

1. A preliminary stock take of changes for EU–US trade and investment in cleantech

This report sets out to gather initial evidence of any impacts that the Inflation Reduction Act may have for EU–US trade and investment related to cleantech. Our report focuses on the EU–US relationship and is written primarily for audiences in the EU, both policy makers, civil society and the business community.

We wanted to find answers to burning questions, fully aware that the full impacts of the law have not yet materialized:

- > Do we observe a cleantech boom in the US?
- > Are EU companies losing out on the US cleantech boom?
- > Are cleantech exports from the EU declining?
- > Are EU companies investing more in US cleantech industries?
- > Are US investments in the EU declining?
- > How impactful are the local content requirements?
- > What is the macroeconomic impact of the law and what will this mean for the EU–US economic relationship?
- > Are there signs of a rapid growth of transatlantic cleantech trade, aka the emergence of the Green Transatlantic Marketplace?²

This inquiry will provide limited but hard evidence to policy debates in the EU. It is our intention to highlight both to facts that may cause alarm on the EU side, and to those findings that show less dramatic or even beneficial outcomes of the law for EU businesses.

The report also gathers initial information that can inform US policy makers in their quest to “internationalize” the Inflation Reduction Act.³ While it is not fully defined what this implies specifically, the guiding idea here appears to be one of shared prosperity, including partners in value chains, and opening access to cleantech and financing. These questions will have to be addressed separately in more detail.

² As mentioned in <https://www.whitehouse.gov/briefing-room/statements-releases/2023/05/31/u-s-eu-joint-statement-of-the-trade-and-technology-council-2/>

³ Sengupta, S. 2023. “The United States needs a plan to take the Inflation Reduction Act abroad.” The Hill. <https://thehill.com/opinion/energy-environment/3949065-the-united-states-needs-a-plan-to-take-the-inflation-reduction-act-abroad/>



■ 1. A preliminary stock take of changes for EU–US trade and investment in cleantech

This report reflects the information available at the one-year mark of the Inflation Reduction Act. Many of the data points in this report stem from official sources yet may still undergo adjustments as is customary with very recent statistical data. Meanwhile, some data is sourced from unofficial compilations and may not stand to the same standards as official statistical data. Data on investment decisions and commitments by private businesses are in particular to be taken with a grain of salt.

We will start out with a look at the initial state of EU–US trade and investment in cleantech, before looking at the main climate-related components of the Inflation Reduction Act, followed by a summary of the main challenges that jeopardize the success of the Act. Next, we will look into the observed first impacts on trade and investment. We will close this report with an outlook into the second year of the Inflation Reduction Act.

2. EU–US Cleantech Trade and Investment

The EU and the US are each other’s largest trade and investment partners.⁴ EU–US trade in goods reached a volume of \$909 bn in 2022, and the overall transatlantic economy had a value of \$7.1tn, employing 16 million workers on both sides of the Atlantic. US companies directly employ 3.4 million people in the EU, while EU companies employ 3.8 million people in the US.⁵

The US trade deficit with the EU for goods was \$151bn in 2022, though the position of individual Member States varies.⁶ Germany exchanges the largest value of goods with the US in both directions and shows a considerable surplus; its 2022 imports valued €70bn and exports €156bn. Other countries, such as the Netherlands, have a trade deficit with the US.⁷

Any significant change in the economic structure or in the demand for specific goods and services in either the US or the EU will have significant impacts on the other economy, given the deep interconnection of the two. It is therefore of interest to first have a look at the baseline data, largely pre-IRA, to determine what potential there is for the EU to be a cleantech supplier and investor in the US.

Overall, investments and trade in goods and services for cleantech are still a relatively small share of the transatlantic economy, but they are growing, both in absolute and relative terms.

In the pre-IRA world, the EU and US present a relatively balanced trade and investment partnership in the field of cleantech with the parties being about equally committed abroad.

4 Hamilton, D. S. and Quinlan, J. 2023. “The Transatlantic Economy 2023: Annual survey of jobs, trade and investment between the United States and Europe.” Washington, DC: Foreign Policy Institute, Johns Hopkins University SIAS / Transatlantic Leadership Network. <https://tinyurl.com/bdhp2kcs>

5 Hamilton, D. S. and Quinlan, J. 2023. “The Transatlantic Economy 2023: Annual survey of jobs, trade and investment between the United States and Europe.” Washington, DC: Foreign Policy Institute, Johns Hopkins University SIAS / Transatlantic Leadership Network. <https://tinyurl.com/bdhp2kcs>

6 Eurostat. 2023. “USA–EU – international trade in goods statistics.” <https://tinyurl.com/5n6t4na8> (retrieved September 2023)

7 Eurostat. 2023. “USA–EU – international trade in goods statistics.” <https://tinyurl.com/5n6t4na8> (retrieved September 2023)

Pre-IRA US exports to the EU, focusing on cleantech

Compared to total US exports to the EU, the cleantech share is insignificant and dominated by wood pellet exports.

The US exported \$354bn of goods and \$241bn of services to the EU in 2022.⁸ In comparison, total US foreign direct investment (FDI) in the EU was \$2.694tn. The International Trade Administration U.S. Energy Trade Dashboard shows that US cleantech exports to Europe in 2022 were relatively small: \$1bn in renewable energy products and \$480m related to battery supply chains.⁹

- The renewable energy product exports are dominated by almost \$500m in wood pellets. The Netherlands is the top EU trading partner, importing \$574m from the US, of which \$272m in wood pellets.
- The battery supply chain exports were sold predominantly to Belgium (20%), Spain (15%), the Netherlands (12%) and Germany (12%).

Pre-IRA EU exports to the US, focusing on cleantech

Cleantech (excluding EVs) is only a small share of total EU exports to the US and is dominated by battery technology. The leading renewable fuel export is biodiesel.

In 2022, the EU exported \$558bn of goods and \$170bn of services to the US.¹⁰ The EU's total FDI in the US was \$2.337tn.

Cleantech exports from Europe to the US in 2022 comprised \$4bn in battery technology – a new record, up from \$2.6bn in 2021 – and over \$1.4bn for renewable energy products (compared to \$2.3bn at the maximum in 2008).¹¹ Figure 1 illustrates the major countries and products that make up these totals.

8 Congressional Research Service. 2023. "U.S.–EU Trade and Economic Relations." <https://crsreports.congress.gov/product/pdf/IF/IF10931>

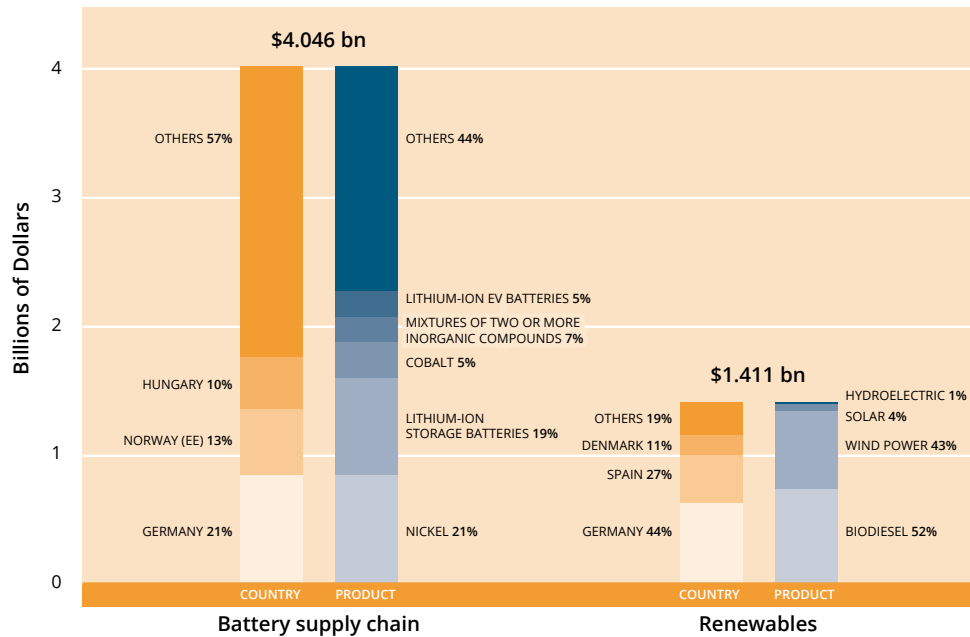
9 International Trade Administration. 2023. "U.S. Energy Trade Dashboard." <https://tinyurl.com/bd2prjuf> (retrieved September 2023)

10 Congressional Research Service. 2023. "U.S.–EU Trade and Economic Relations." <https://crsreports.congress.gov/product/pdf/IF/IF10931>

11 International Trade Administration. 2023. "U.S. Energy Trade Dashboard." <https://tinyurl.com/bd2prjuf> (retrieved September 2023)

2. EU-US Cleantech Trade and Investment

Figure 1:
Cleantech exports from the EU to the US in 2022.



SOURCE: International Trade Administration, retrieved September 2023.

Battery Electric Vehicle (BEV) & Plug-in Hybrid Electric Vehicle (PHEV) trade

Electric vehicles represent a very significant share of the transatlantic cleantech trade. Preserving this trade will be essential.

In 2020, the US exported a total of 147,400 EVs (BEV + PHEV) to Europe, worth an estimated \$8.1bn, and imported 36,900 EVs, worth about \$1.9bn.¹² Table 1 gives an overview of import and export flows of BEVs and PHEVs between the EU and the US in 2021, showing that the US is a significant trading partner for the EU for electric vehicles.

Table 1: EU electric vehicle imports to and exports from the US in 2021.

	BEVs	PHEVs
EU imports from the US	€1.9bn (17% of all EU BEV imports)	€2.5bn (42% of all EU PHEV imports)
EU exports to the US	€2.4bn (20% of all EU BEV exports)	€0.95bn (14% of all EU PHEV exports)

SOURCE: Eurostat, 2022.

¹² Bui, A., Slowik, P. and Lutsey, N. 2022. "Power play: Unlocking the potential for U.S. automotive trade with electric vehicles." Washington, DC: ICCT. <https://tinyurl.com/3mp9t2hu>

Investment flows

44% of all US 2022 FDI are in the EU.¹³ EU Member States were the leading source for FDI in the US energy sector by number of greenfield projects over the past decade.¹⁴ US investors were part of 758 cleantech deals in the EU and EU investors invested in 682 such deals in the US from 2017 to 2022, according to the Cleantech Group. US investment in 154 EU cleantech deals in 2022 alone amounted to \$7.2bn, while EU investment in 116 US cleantech deals amounted to \$6.2bn.

13 Congressional Research Service. 2023. “U.S.–EU Trade and Economic Relations.” <https://crsreports.congress.gov/product/pdf/IF/IF10931>

14 Hamilton, D. S. and Quinlan, J. 2023. Ch. 4. “The Transatlantic Economy 2023: Annual survey of jobs, trade and investment between the United States and Europe.” Washington, DC: Foreign Policy Institute, Johns Hopkins University SAIS / Transatlantic Leadership Network. <https://transatlanticrelations.org/publications/transatlantic-economy-2023/>

3. The US Inflation Reduction Act of 2022

The Inflation Reduction Act is a complex and multi-faceted legal act, owing to the politics that it emerged from. Our analysis highlights some of the IRA's climate-related provisions and programs. We also seek to identify challenges in the IRA's implementation, both for the US executive branch charged with implementing the massive piece of legislation, and for parties seeking to secure IRA funding opportunities.

Background and final form

The 725-page Inflation Reduction Act (IRA) is by far the largest climate and energy funding instrument in the history of the United States. The Act, signed into law by US President Biden on August 16, 2022, is a multi-component bill with a healthcare, a fiscal and a climate chapter. The main components are:

- > Investing \$369bn in energy security and climate change response, through a set of tax incentives, grants and loans across 119 distinct programs in 16 agencies and departments.¹⁵ The main aim is the deployment of market-ready clean technology.
- > Extending the Affordable Care Act (the 2010 legislation extending subsidized healthcare coverage in the US under President Obama's administration) by \$64bn.
- > Reducing the federal deficit by \$300bn.

The IRA has the declared goal of revenue neutrality – that is, it is meant to pay for itself – with the above provisions to be financed by raising \$739bn in revenue over the ten years of the Act's lifetime.¹⁶

Both the revenue and expense side of the equation rely on modeling results by the Joint Committee on Taxation and Congressional Budget Office.¹⁷ More recent research by Bistline et al. suggests that the cost to the public budget could be closer to \$1tn.¹⁸ Neither number reflects absolute thresholds or guarantees: both revenue and expenditure may be higher or lower than forecast due to the nature of the provisions.

¹⁵ Columbia Law School, 2023, "Inflation Reduction Act database." <https://iratracker.org/ira-database/> (retrieved September 2023)

¹⁶ US Senate Democratic Caucus. 2022. Summary: The Inflation Reduction Act of 2022. https://www.democrats.senate.gov/imo/media/doc/inflation_reduction_act_one_page_summary.pdf

¹⁷ Congressional Budget Office. 2022. "Estimated Budgetary Effects of Public Law 117-169, to Provide for Reconciliation Pursuant to Title II of S. Con. Res. 14." <https://www.cbo.gov/publication/58455>

¹⁸ Bistline, J., Mehrotra, N. R. and Wolfram, C. 2023. "Economic implications of the climate provisions of the Inflation Reduction Act." Brookings's Papers: BPEA Conference Draft, Spring. <https://tinyurl.com/43czresy>

Even so, IRA is a smaller version of the initial Build Back Better plan, which ran up to \$4tn when initially proposed by President Biden.¹⁹

Climate-relevant provisions

IRA's climate-relevant provisions can be grouped by:

- > Recipient – individuals, businesses, local governments and nonprofits.
- > Funding type – tax incentives, grants, loans, technical assistance and other.
- > Sector – electricity, mobility, energy efficiency, manufacturing, environment and climate justice, agriculture, forestry and land use, and others.

The largest share of funding, \$210bn as per the initial estimates, is expected to flow to the electricity sector. Clean electricity tax incentives are the largest item within this category (\$161bn), covering both production tax credits and investment tax credits for clean electricity, and the nuclear energy tax credit. The technology-neutral production and investment tax credits will increase demand for solar PV and wind power, both offshore and onshore, as well as battery storage.

The production tax credit can reach \$33/MWh with a phase-down triggered by progress in electricity sector decarbonization, starting in 2033.²⁰ The investment tax credit can reach up to 50% of the investment. Reaching the full amounts is contingent on fulfilling a number of criteria, including domestic content requirements. Initial modeling by REPEAT put the expected total additional investment due to the IRA at \$3.5tn with the largest share going to solar PV, followed by wind.²¹

Other important incentives are those for the purchase of private and commercial electric vehicles, and biofuels incentives. IRA provisions further cover carbon capture, clean manufacturing incentives, including hydrogen, energy efficiency investments in homes and other buildings and even investments in farmland conservation, to name just some of the areas supported by either tax incentives or direct expenditures.

It is evident that the environmental, economic and social impacts of a law as complex as the IRA cannot be reliably forecast. The range in the modeling results trying to put a full price tag on the law show how little we can say about the future uptake of the funding programs over the next decade. One finding seems guaranteed, however: with almost full certainty, the IRA will not meet the initial estimate of about \$370bn government subsidies. The volume may be higher or lower – by a lot.

What we can do, is to look in more detail at some of the key challenges and frictions that the IRA brings.

19 The White House (a). "The Build Back Better Framework: President Biden's plan to rebuild the middle class." <https://www.whitehouse.gov/build-back-better/> (retrieved September 2023)

20 Bistline, J., Mehrotra, N. R. and Wolfram, C. 2023. "Economic implications of the climate provisions of the Inflation Reduction Act." Brookings's Papers: BPEA Conference Draft, Spring. <https://tinyurl.com/43czresy>

21 Jenkins, J.D., Mayfield, E.N., Farbes, J., Schivley, G., Patankar, N., and Jones, R., 2023. "Climate Progress and the 117th Congress: The Impacts of the Inflation Reduction Act and Infrastructure Investment and Jobs Act." Princeton, NJ: REPEAT Project. https://repeatproject.org/docs/REPEAT_Climate_Progress_and_the_117th_Congress.pdf

4. Challenges for the success of the Inflation Reduction Act

There are several parameters that will accelerate – or slow down – the uptake of the offered support in the IRA and will determine how trade partners such as the EU can be part of the expected cleantech boom in the US. Some of these factors are already known and discussed, others may only emerge over time and are yet to be identified. Hence, our list is far from claiming to be complete. Rather, it offers an overview of the best available information.

We will focus on three main challenges identified in the context of EU-US trade and investment: local content requirements for energy tax credits, specific conditions for tax credits for electric vehicles, and the impacts on foreign direct investment flows. We assess to what extent these may constitute significant hurdles – both from a perspective of EU trade and investment and in terms of limiting the potential of the IRA.

The overall magnitude of the impact of the Inflation Reduction Act further depends fundamentally on:

- > availability of skilled labor for cleantech and energy sectors;
- > availability of land to build new renewable energy projects;
- > timely permitting of projects;
- > build-out of the electricity grid, including transmission lines;
- > build-out of other infrastructure such as EV charging stations;
- > availability and affordability of key commodities, including critical minerals;
- > stability of the economic outlook (inflation, GDP growth, trade and investment); and,
- > reactions by other major economies (especially the EU and China).

Within the scope of this report, we assume that policy makers can manage these factors so that outcomes align with current projections. This is not to say that these projections are the most likely outcome.

Domestic content requirements

Public procurement in the United States has been subject to local content requirements since the 1933 Buy American Act, which requires Federal agencies to prefer American materials and products.²² Federal grants and procurement activities by US states and municipal governments are not covered. The 1978 Buy America requirements set stricter domestic content provisions for federal surface transport infrastructure. The 2021 Build America Buy America Act, part of the Infrastructure Investment and Jobs Act, set a domestic content preference for “all iron, steel, manufactured products, and construction materials” in federal infrastructure projects, including transmission lines, buildings and broadband internet.²³

The leap in the IRA was to extend these domestic content requirements to private sector investments. These requirements, in turn, put foreign producers at a disadvantage since their products are now less competitive in the US market. There are sourcing requirements for the energy-focused production and investment tax credits as well as specifically for electric vehicle battery components and critical minerals in these batteries. See the Annex for details.

The domestic content thresholds for the tax credits and the domestic content requirements for structural steel and iron components will – all else unchanged – drive up the costs of cleantech in the US, simply because the US are not the least-cost provider for renewable energy technology, steel or any of the other affected product categories. This in turn will entail a slower and less dramatic shift of the economy in the US towards net zero GHG emissions.

The impact for trade partners can be two-fold. On the upside, this slower rollout can prevent an overheating of commodity and cleantech markets and can result in an “islanding” of the US cleantech market, leaving more room for other countries to roll out cleantech in their markets. This is particularly relevant for capacity constrained cleantech such as electrolyzers for green hydrogen or batteries, especially for EVs – see also the next section. On the downside, domestic content provisions may result in stymieing nascent cleantech markets – in the US, but also globally – which could cut short trade partners’ hope of using the boom in cleantech exports to the US as a catalyst for accelerating their own net zero transition, especially given that most economies lack the resources, the structure and the scale to copy the IRA successfully domestically. In that regard, the US domestic sourcing provisions could, indeed, result in a slower global decarbonization.

²² Congressional Research Service. 2022. “The Buy American Act and Other Federal Procurement Domestic Content Restrictions.” <https://crsreports.congress.gov/product/pdf/R/R46748>

²³ Office of Acquisition Management. “Build America, Buy America.” <https://www.commerce.gov/oam/build-america-buy-america> (retrieved September 2023)

Specific provisions for EV tax credits

The IRA's EV tax credits are much more prescriptive than the general cleantech tax credits. The domestic content provisions include sourcing requirements for structural iron and steel as well as an increasing threshold for the domestic content share of the components' value of an investment in order to qualify for a bonus or "add-on" on the IRA tax credit. By contrast, the provisions for EVs have a hard cut-off: manufacturers who qualify receive either 100% or 50% of the credit; all others end up at 0%. Details of the credits available are given in the Annex.

Manufacturers of passenger EVs have to jump three hurdles to getting the credit:

- The final assembly of vehicles sold is in North America (including Canada and Mexico) to qualify at all.
- Meeting the battery components threshold (50% of credit).
- Meeting the critical minerals component threshold (50% of credit).

The two portions of the credit are awarded independently.

Commercial EVs – including any leased EVs – and used EVs don't have to comply with these stringent thresholds, but also offer a smaller market potential in the US.

The impact of these strict requirements for passenger EVs is ambivalent. The first hurdle – final assembly in North America – is much less of a challenge than it might appear. Vehicle manufacturing tends to take place close to the final market in any case, once a certain sales volume is reached that justifies setting up a plant. Only low-volume models tend to be shipped over long distances. The more complicated question is whether and how manufacturers can comply with the battery and minerals requirements in the time windows provided by the IRA. This latter aspect affects both US and foreign manufacturers equally and is likely to result in a much slower uptake of EVs in the US new passenger vehicle fleet compared to a "lax" or open approach, given the higher costs for EVs and capacity constraints in terms of IRA-compliant batteries and critical minerals.

This slower transition pathway can have two main impacts. On the one hand it avoids an overheating of the EV market and ensures that key aspects of the supply chain and value chain are in the US or with qualifying partner countries, avoiding strategic dependencies on countries such as China, who happen to be leading on battery technology.²⁴ On the other hand, the slower EV market development will send contradictory signals to auto managers who will have to continue a dual strategy with both internal combustion engines and electric propulsion in their portfolios, resulting in higher costs and GHG emissions compared to a clear market signal in favor of EVs.

Given that European car exports to the US focus on higher value models, the role of the EV tax credit may be of more marginal relevance for their sales.

²⁴ Reuters. 2023. "US can't yet compete with China on EVs, Ford chairman tells CNN." <https://www.reuters.com/business/autos-transportation/ford-chairman-says-us-cant-yet-compete-with-china-evs-cnn-interview-2023-06-18/>

Expected impacts on private sector investment in cleantech

The transatlantic economy is built on trade and foreign direct investment. It is, therefore, crucial to also assess the potential impact of the IRA on investment flows.

Since the scope and scale of the IRA are unprecedented, it is yet unclear how much it will impact the market for cleantech overall. We will take a closer look at three aspects:

1. the emerging clean hydrogen market
2. the market for critical raw materials
3. indirect displacement of investment.

Hydrogen

Support for hydrogen is not limited to the IRA. The US National Clean Hydrogen Strategy and Roadmap to Build a Clean Energy Future, Accelerate American Manufacturing Boom from June 5, 2023, lays out where the travel is headed with clear goals of:

- > 10 million tons clean hydrogen annual production capacity by 2030
- > 20 million tons by 2040
- > 50 million tons by 2050.

According to reports, the 2030 target volume would require 500 GW installed electrolyzer capacity and about 750 GW of solar and wind capacity.²⁵ The US electrolyzer capacity was 18.5 MW in 2022, illustrating the level of ambition.²⁶

Funding provided under the IRA covers both the hydrogen production itself and any renewable electricity used for the production. This allows businesses to stack the incentives, which could lead to a very low-cost clean hydrogen product.

The US definition of clean hydrogen includes any product under 4 kg CO₂eq/kg H₂, well-to-gate. Just as with electricity, investors can choose between production tax credit (PTC) and investment tax credit (ITC) benefits. Under the PTC, funding reaches as high as \$3/kg H₂ for hydrogen with a manufacturing carbon intensity below 0.45 kg CO₂ eq/kg H₂. Under the ITC, the maximum funding – provided labor provisions are met – is 30% of project costs for the same low greenhouse gas intensity. Combined with the tax incentives for clean power, and with electricity representing about 60–80% of the costs of producing green hydrogen,²⁷ costs for clean hydrogen are expected to be below

25 Bansal, K. 2023. "The Inflation Reduction Act – a turning point for the global green hydrogen market." Kolkata: Ernst & Young Associates. <https://tinyurl.com/yc6zh574>

26 US Department of Energy. 2022. "PEM Electrolyzer Capacity Installations in the United States." <https://www.hydrogen.energy.gov/pdfs/22001-electrolyzers-installed-in-united-states.pdf>

27 Confederation of Swedish Enterprise. 2023. "The effects of the US Inflation Reduction Act (IRA) on EU competitiveness." <https://tinyurl.com/2k3pnc9a>

■ 4. Challenges for the success of the Inflation Reduction Act

more-environmentally damaging grey hydrogen and could be as low as \$0.50–1.50/kg H₂, far below the current \$1.50–2.00/kg H₂ cost for grey hydrogen.²⁸

The economics of the new hydrogen economy will depend on the implementation guidance on how to account for the carbon content of the produced hydrogen.²⁹ More specifically, the question centers around:

- > Annual vs. hourly 24/7 matching of clean electricity.
- > Deliverability – can renewable electricity physically reach the electrolyzer through the grid or is the facility contributing to peaking emissions in the local grid cell?
- > Additionality – is the renewable electricity added to existing capacity or is the electrolyzer eating into existing available clean power?

At the time of writing, a decision on the guidance has not yet been made.³⁰ Proponents of a less stringent set of rules argue that a nascent industry could not survive with too much red tape. Those arguing for a stricter rulebook point to the risk of a net increase in greenhouse gas emissions, undermining the intent and purpose of the IRA.

If the low-cost estimates materialize, clean hydrogen from the US will be considerably less expensive than other green hydrogen. At the same time, producing clean hydrogen in the US will be more profitable than in any other market. This could have transformative impacts on the availability of electrolyzers and also impact downward markets such as for ammonia and electrofuels, which could be readily traded and shipped in contrast to the more locally relevant hydrogen.

A low-cost, high-volume hydrogen rollout in the US would have significant impacts on both hydrogen markets and investors globally. From an investor's perspective, if hydrogen can be made at near-zero costs in the US – with no use or export restrictions – then any investment in hydrogen markets outside the US will look considerably less attractive. This could be a challenge for the EU and might prevent the development of a European hydrogen economy.

On the other hand, the US hydrogen market is open to investors from the EU, so European businesses can benefit from the tax incentives under the IRA and participate in the learning effects and economies of scale in the US market, ultimately bringing lower-cost hydrogen manufacturing to the EU, but at a much later point in time.

²⁸ Green hydrogen implies made with renewables, grey made from natural gas and blue from natural gas with carbon capture and sequestration.

Source: Bansal, K. 2023. "The Inflation Reduction Act – a turning point for the global green hydrogen market." Kolkata: Ernst & Young Associates. <https://tinyurl.com/yc6zh574>

²⁹ Poore, C. 2022. "Without guidance, Inflation Reduction Act tax credit may do more harm than good." Princeton University. <https://tinyurl.com/52h5hty4>; Ricks, W., Xu, Q., and Jenkins, J. D. 2023. "Minimizing emissions from grid-based hydrogen production in the United States." *Environmental Research Letters*, vol. 18, 014025. <https://iopscience.iop.org/article/10.1088/1748-9326/acacb5>

³⁰ St. John, J. 2023. "The great 'green hydrogen' battle." Canary Media. <https://www.canarymedia.com/articles/hydrogen/the-great-green-hydrogen-battle>

Critical raw minerals

If the projections for the IRA's cleantech deployment hold, we could see a massive increase in demand for critical raw minerals.

Table 2 shows our calculated materials requirements for renewable power technologies until 2035, compared to current global production figures. The calculations are based on IEA data on materials intensity of the three main technologies to be installed thanks to the IRA, combined with REPEAT projections for build-out of onshore wind (435 GW) and PV (1,147 GW), and the US national target for offshore wind energy.³¹

Table 2: Projected demand of key raw materials for renewable power technologies in the US to 2035 under the IRA, vs global supply.

		Copper	Zinc	Silicon	Manganese	Nickel	Chromium	Molybdenum	Rare earths
Cumulative demand by 2035	<i>Offshore wind</i>	0.24 Mt	0.17 Mt	0 Mt	0.02 Mt	0.01 Mt	0.02 Mt	0.01 Mt	0.007 Mt
	<i>Onshore wind</i>	1.26 Mt	2.39 Mt	0 Mt	0.34 Mt	0.18 Mt	0.2 Mt	0.04 Mt	0.006 Mt
	<i>Solar PV</i>	3.24 Mt	0.03 Mt	4.21 Mt	0 Mt	0 Mt	0 Mt	0 Mt	0 Mt
Total cumulative demand to 2035		4.74 Mt	2.59 Mt	4.21 Mt	0.36 Mt	0.19 Mt	0.22 Mt	0.05 Mt	0.01 Mt
Global production in 2022		26 Mt	13 Mt	8.8 Mt	20 Mt	3.3 Mt	41 Mt	0.25 Mt	0.3 Mt
Supply to 2035 at current levels (13 years)		338 Mt	169 Mt	114.4 Mt	260 Mt	42.9 Mt	533 Mt	3.25 Mt	3.9 Mt
Projected demand relative to supply		1.4%	1.5%	3.7%	0.1%	0.4%	0%	1.5%	0.3%

SOURCES: Projected demand calculated using IEA (2021) and Jenkins et al. (2022). Annual production figures from US Geological Survey Mineral Commodity Summaries (2023).

In isolation, the additional demand for raw materials linked to the renewable energy rollout under IRA projections seems manageable within the current annual supply range. In itself, this should not lead to significant global market distortions.

Table 3 shows the expected demand for materials for EVs in 2032. For simplicity's sake, the analysis only looks at passenger vehicles, because heavy duty vehicles have a much

³¹ IEA. 2021. "Minerals used in clean energy technologies compared to other power generation sources." <https://tinyurl.com/2z7x88z8>; Jenkins, J.D., Mayfield, E.N., Farbes, J., Schivley, G., Patankar, N., and Jones, R., 2023. "Climate Progress and the 117th Congress: The Impacts of the Inflation Reduction Act and Infrastructure Investment and Jobs Act." Princeton, NJ: REPEAT Project. https://repeatproject.org/docs/REPEAT_Climate_Progress_and_the_117th_Congress.pdf

4. Challenges for the success of the Inflation Reduction Act

broader range of specifications and material use. Calculations are based on the above IEA data and EV deployment projections by the ICCT which start at 7% of total sales in 2022 and grow to 62% in 2032.³² New vehicle sales in 2032 are assumed to be 15 million (based on current vehicle sales levels), of which 9.3 million would be EVs.

Table 3: Projected demand of key raw materials for passenger EV production in the US in 2032 under the IRA, vs global supply.

	Copper	Lithium	Nickel	Manganese	Cobalt	Graphite	Rare earths
Demand per EV	53.2 kg	8.9 kg	39.9 kg	24.5 kg	13.3 kg	66.3 kg	0.5 kg
New EV sales in 2032	0.5 Mt	0.083 Mt	0.37 Mt	0.23 Mt	0.124 Mt	0.62 Mt	0.004 Mt
2022 global supply	26 Mt	0.13 Mt	3.3 Mt	20 Mt	0.19 Mt	1.3 Mt	0.3 Mt
2032 demand vs. 2022 supply	1.9%	63.9%	11.2%	1.2%	65.3%	47.7%	1.3%

SOURCES: Projected demand calculated using data from IEA (2021), Slowik et al. (2023) and US Bureau of Economic Analysis (retrieved September 2023). Annual production figures from US Geological Survey Mineral Commodity Summaries (2023).

The comparison shows potential bottlenecks for lithium, cobalt, graphite, and – to a lesser degree – nickel.

Before reading too much into this analysis, we need to restate that both demand and supply are estimates. The 2032 EV sales are projections, and the materials needs will most likely evolve within ten years, as will production of the critical minerals.

Still, the risk of increasing price pressure and resource competition becomes apparent. Combined with the fact that only very select critical minerals sources qualify under the IRA EV tax incentives, this could create even higher price pressure for qualifying lithium, cobalt and graphite. The global impact will depend largely on renewable energy and electric vehicle demand outside the US, especially in China and the EU.

For EU cleantech manufacturers, especially in batteries and battery components, this has clear implications. They need to be ahead of the curve, steering clear of reliance on bottleneck materials such as cobalt and nickel. They need to anticipate market and technology trends to avoid being burdened with expensive and hard-to-sell technology.

Substitutions and innovation will play a role during this limited timespan. The dominant battery technology in 2022 was still lithium nickel manganese cobalt oxide (NMC), with its notable dependence on cobalt and nickel. However, lithium iron phosphate (LFP) is catching up quickly, growing from 7% market share in 2018 to 27%

³² Slowik, P., Searle, S., Basma, H., Miller, J., Zhou, Y., Rodriguez, F., Buysse, C., Kelly, S., Minjares, R., Pierce, L., Orvis, R. and Baldwin, S. 2023. "Electric vehicle uptake in the United States." Washington, DC: ICCT. <https://theicct.org/wp-content/uploads/2023/01/ira-impact-evs-us-jan23.pdf>

in 2022.³³ After 2030, new battery technology and new materials may relieve some of the demand pressure and, after 2040, recycling will play an increasing role.

The leading LFP manufacturers are Chinese, US, Korean and Indian, according to market research.³⁴ The first European LFP plant was opened in 2023 by ElevenEs in Serbia, a country with one of the largest lithium reserves in Europe.³⁵ ElevenEs is supported by EIT InnoEnergy.³⁶ This new facility could provide EU EV manufacturers with an entry into the promising LFP market. Serbian-made LFP batteries won't, however, qualify for the IRA EV tax credits, limiting the export potential to the US.

At this point, there is no clear path for accelerated EV battery exports from the EU into the US. The planned EU-US Critical Minerals Agreement would open the door for critical minerals compliance – that is, half of the EV tax credit – but not address the other half linked to manufacturing a certain percentage of the battery components in North America.³⁷ (See the Annex for details on the EV tax credit requirements.)

Indirect displacement of investment

It is not a given that the IRA will generate a significant economic stimulus for the US economy, nor that it will attract significantly more foreign direct investment. It is very likely, based on the available studies, that the significant domestic and foreign investments generated by the IRA displace other investments. That is, rather than adding net zero emissions growth to the fossil economy, we should see a greening of the economy, while it continues on its long-term growth path. If these projections hold true, then the IRA will move the US into a net zero transition, but without providing a massive stimulus.

The IRA is expected to increase total investment in the US. Projections vary widely from \$3tn to \$3.5tn.³⁸

Goldman Sachs sees the main investment opportunities in:

- > power networks (\$590bn)
- > energy efficiency in buildings (\$290bn)
- > heat pumps (\$240bn)
- > charging and refueling infrastructure (\$240bn).³⁹

33 IEA. 2021. "Minerals used in clean energy technologies compared to other power generation sources." <https://tinyurl.com/2z7x88z8>

34 Expert Market Research. 2022. "Top 9 companies fuelling the global lithium iron phosphate batteries market." <https://www.expertmarketresearch.com/articles/top-lithium-iron-phosphate-batteries-companies>; Fortune Business Insights. 2022. "Lithium Iron Phosphate Battery Market Size, Share & COVID-19 Impact Analysis." <https://www.fortunebusinessinsights.com/lithium-ion-li-ion-phosphate-batteries-market-102152>

35 Ahmad, M. 2023. "Europe's first LFP batter factory is unveiled." Energy. <https://energydigital.com/articles/the-first>

36 EIT InnoEnergy. 2023. "ElevenEs opens Europe's first LFP battery cell facility to supercharge electric vehicle production." <https://tinyurl.com/5n8tt53y>

37 European Commission. 2023. "EU moves forward with Critical Minerals Agreement negotiations with the US." https://ec.europa.eu/commission/presscorner/detail/en/ip_23_3214

38 Goldman Sachs. 2023. "The US is poised for an energy revolution." <https://tinyurl.com/ys8xwwmd>; Jenkins, J.D., Mayfield, E.N., Farbes, J., Schivley, G., Patankar, N., and Jones, R., 2023. "Climate Progress and the 117th Congress: The Impacts of the Inflation Reduction Act and Infrastructure Investment and Jobs Act." Princeton, NJ: REPEAT Project. https://repeatproject.org/docs/REPEAT_Climate_Progress_and_the_117th_Congress.pdf

39 Goldman Sachs. 2023. "The US is poised for an energy revolution." <https://tinyurl.com/ys8xwwmd>

■ 4. Challenges for the success of the Inflation Reduction Act

Jenkins et al. (2022) foresee investments in:

- > carbon capture and storage (\$20bn annually by 2030)
- > hydrogen (\$3bn annually by 2030)
- > solar and wind (\$321bn annually by 2030).⁴⁰

The IRA's guaranteed support provisions, i.e., tax credits, which have no capacity caps, will reduce the risk of investment. The IRA does not exclude foreign investors, so it is likely that a portion of the additional investment will come from foreign sources.

However, several studies show only a marginal impact of the IRA on the US economy overall. For example, Zandi et al. estimate little impact of the IRA on GDP and inflation, with the highest GDP increase being 0.2% in Q4 2031.⁴¹ The model even sees a slight contraction in 2024 and 2025. Similarly, Brookings' sees no positive contribution to US GDP growth coming from the IRA in 2023 and 2024.⁴²

The Dutch National Bank modeled the impact of the IRA on US and EU GDP, while also comparing climate spending across the Atlantic.⁴³ The Dutch study points out that green public investment remains low in the US with Dutch and EU spending considerably higher as a percentage of GDP. The US is expected to peak in 2027 at 0.15% of GDP for climate spending, while Dutch investment is expected to peak in 2026 at 0.7% of GDP. The Dutch model sees a mildly positive GDP impact for the US in a scenario without additional corporate taxes, leading to no measurable EU GDP impact and just a small negative impact for the export-oriented Dutch economy. In a scenario with additional corporate taxes, the US GDP shrinks slightly. EU-US trade is negatively impacted by the IRA, with EU exports declining due to a US preference for domestic goods. The model foresees a depreciation on the US dollar in a scenario with no corporate tax increase. With corporate taxes the dollar would appreciate, dampening the negative impact of the subsidies and increasing EU exports.

While these are very early modeling results, they point to the complexity of assessing the full economic and trade impact of the IRA, specifically with a view to EU-US trade and investment.

40 Jenkins, J.D., Mayfield, E.N., Farbes, J., Schivley, G., Patankar, N., and Jones, R., 2023. "Climate Progress and the 117th Congress: The Impacts of the Inflation Reduction Act and Infrastructure Investment and Jobs Act." Princeton, NJ: REPEAT Project. https://repeatproject.org/docs/REPEAT_Climate_Progress_and_the_117th_Congress.pdf

41 Zandi, M., Yaros, B., and Lafakis, C. 2022. "Assessing the Macroeconomic Consequences of the Inflation Reduction Act of 2022." Philadelphia, PA: Moody's Analytics. <https://tinyurl.com/4brwmebs>

42 Bistline, J., Mehrotra, N. R. and Wolfram, C. 2023. "Economic implications of the climate provisions of the Inflation Reduction Act." Brookings's Papers: BPEA Conference Draft, Spring. <https://www.brookings.edu/articles/economic-implications-of-the-climate-provisions-of-the-inflation-reduction-act/>

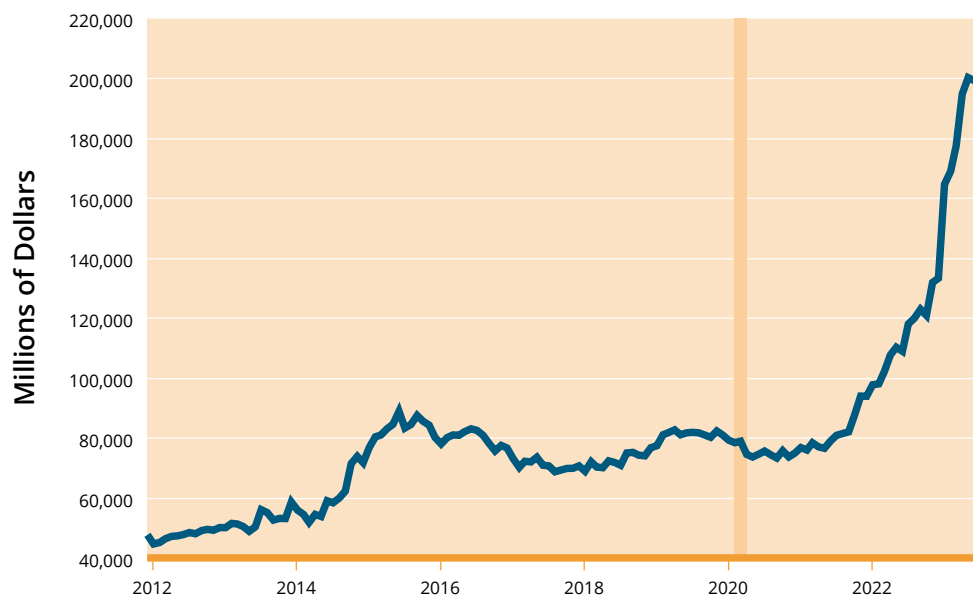
43 Rusch, J. Carceller del Arco, M., Vording, E., Heerma van Voss, B., Mavromatis, K. 2023. "Macronomic effects of the Inflation Reduction Act." Amsterdam: De Nederlandsche Bank. <https://tinyurl.com/2p82ea4p>

5. Initial observed investments and uptake, especially by European companies

Data so far is haphazard and available information is a snapshot of the situation rather than a full picture. Nevertheless, we can track some early observed investments and announcements.

Total investment in construction for manufacturing is growing at a steep rate in the US with almost \$200bn invested in June 2023 alone (Figure 2). This increase in investment is very significant and supports the thesis that the new industrial policy is successfully driving new manufacturing construction activity.

Figure 2: Total spend on construction for manufacturing in the United States.



SOURCE: US Census Bureau via FRED (retrieved September 2023).

The question is how much of this uptick in manufacturing investment is linked to the IRA. Some of the added spending might be deferred spending from the COVID years, and some is quite certainly linked to other programs such as the Bipartisan Infrastructure Law (BIL) and the Chips and Science Act (CHIPS+).

■ 5. Initial observed investments and uptake, especially by European companies

According to the US Treasury, the majority of these investments, \$166bn from January to April 2023, were in construction for computer, electrical and electronic manufacturing.⁴⁴ The main driver is here the CHIPS+ act. Other countries do not show similar upwards trends in manufacturing construction. Another factor driving the rise in construction spending overall is rising costs for labor and construction materials, which inflates the spending.

To better understand where the funding for the spending is coming from, we can look more specifically at changes in foreign direct investment. Yet, there is no clear directional momentum which would indicate a significant flow of investment from other countries to the US as a consequence of the IRA. In 2022, total FDI net inflow into the US decreased year-on-year to \$352bn, compared to \$403bn for the EU.⁴⁵ This picture does not reflect the impacts of the IRA necessarily, since there are many factors influencing FDI trends.

FDI financial flows into the US amounted to \$107bn in Q1 2023, compared to \$7bn net for the EU as a whole, or \$16bn for Germany.⁴⁶ Without having data beyond Q1 2023, which mirrored previous investment levels in 2022, FDI in the US appears to be fluctuating between \$150bn and \$500bn each year, with 2023 being closer to the upper end.⁴⁷ Manufacturing is the most prominent FDI destination in the US, representing over 42% in 2022.⁴⁸

So, while we don't observe a clear change in FDI inflow into the US, we do observe a very weak investment flow into the EU. This, however, cannot be attributed to displacement by investments into the US.

It is worthwhile to look at trade and investment in key cleantech sectors in detail.

Clean energy sector investments

As of the end of August 2023, private companies have announced \$106bn worth of investments in clean energy.⁴⁹ In addition, companies have committed to investing \$134bn in electric vehicles and batteries, their manufacturing and related technology.

These numbers are not linked solely to the IRA, but also include investments triggered by the CHIPS & Science Act, American Rescue Plan and the Bipartisan Infrastructure Law.

44 Van Nostrand, E., Sinclair, T., Gupta, S. 2023. "Unpacking the Boom in U.S. Construction of Manufacturing Facilities." U.S. Department of the Treasury. <https://tinyurl.com/4ancxv8w>

45 World Bank Group. Foreign direct investment, net inflows (BoP, current US\$) – United States, European Union. <https://data.worldbank.org/indicator/BX.KLT.DINV.CD.WD?locations=US-EU> (retrieved September 2023)

46 OECD. Statistics. 2023 "FDI main aggregates – Summary: FDI financial flows." Paris. <https://stats.oecd.org/Index.aspx?QueryId=64225#> (retrieved September 2023)

47 World Bank Group. Foreign direct investment, net inflows (BoP, current US\$) – United States, European Union. <https://data.worldbank.org/indicator/BX.KLT.DINV.CD.WD?locations=US-EU> (retrieved September 2023)

48 Bureau of Economic Analysis. 2023. "Direct Investment by Country and Industry, 2022." <https://www.bea.gov/news/2023/direct-investment-country-and-industry-2022>

49 The White House (b). "President Joe Biden – Investing in America." <https://www.whitehouse.gov/invest/> (retrieved September 2023)

■ 5. Initial observed investments and uptake, especially by European companies

The Department of Energy's Loan Programs Office (LPO) is another important accelerator for cleantech investment. It is often less visible but is a crucial part of the IRA leverage as it can de-risk and bridge technologies from pilot phase into market deployment. The IRA has provided additional funding to extend the full scale of loans by up to \$350bn:⁵⁰

- > Additional \$100bn in loan capacity through appropriating \$11.7bn for issuing new loans.
- > Additional \$250bn loan capacity through appropriating an additional \$5bn for a new Energy Infrastructure Reinvestment program (EIR).

The LPO's monthly application activity report shows the following numbers as of August 2023:

- > 167 active applications (45% under initial review, 40% under advanced review, 15% in due diligence)
- > \$143.9bn loans requested (most in clean energy)
- > 1.8 new applications per week (24-week rolling average).⁵¹

The LPO's portfolio as of June 2023 comprises over \$38bn in loans, guarantees etc. with 17 active projects and 8 commitments, resulting in over \$50bn in investments.

An initial overview of all 272 announced cleantech investments since the IRA took effect produced the following headline numbers:

- > \$278bn of investments in cleantech, of which \$230bn in manufacturing
 - \$32bn in renewable energy
 - \$44bn in electric vehicles
 - \$77bn in battery technology
 - \$12bn in hydrogen
- > 170,000 new jobs, including 124,000 permanent jobs, plus 93,000 indirect jobs.⁵²

Industry reports suggest a total of 83 new or expanded manufacturing facilities in wind, solar and batteries alone since August 2022: 52 for solar, 17 wind, and 14 battery facilities.⁵³ These numbers are still mostly announcements, but also explain largely the observed uptick in manufacturing construction spending.

⁵⁰ Loan Programs Office (c). Portfolio. <https://www.energy.gov/lpo/portfolio> (retrieved September 2023)

⁵¹ Loan Programs Office (b). Monthly application activity report. <https://www.energy.gov/lpo/monthly-application-activity-report> (retrieved September 2023)

⁵² Airtable. Clean Energy Boom – Public Grid view. <https://airtable.com/apprTa03Gqc8RLdQO/shrARig7vmgQeFtV/tbIW6VrVxFRq1ukLa> (retrieved July 2023)

⁵³ American Clean Power. 2023. "Clean Energy Investing in America." <https://cleanpower.org/investing-in-america/>

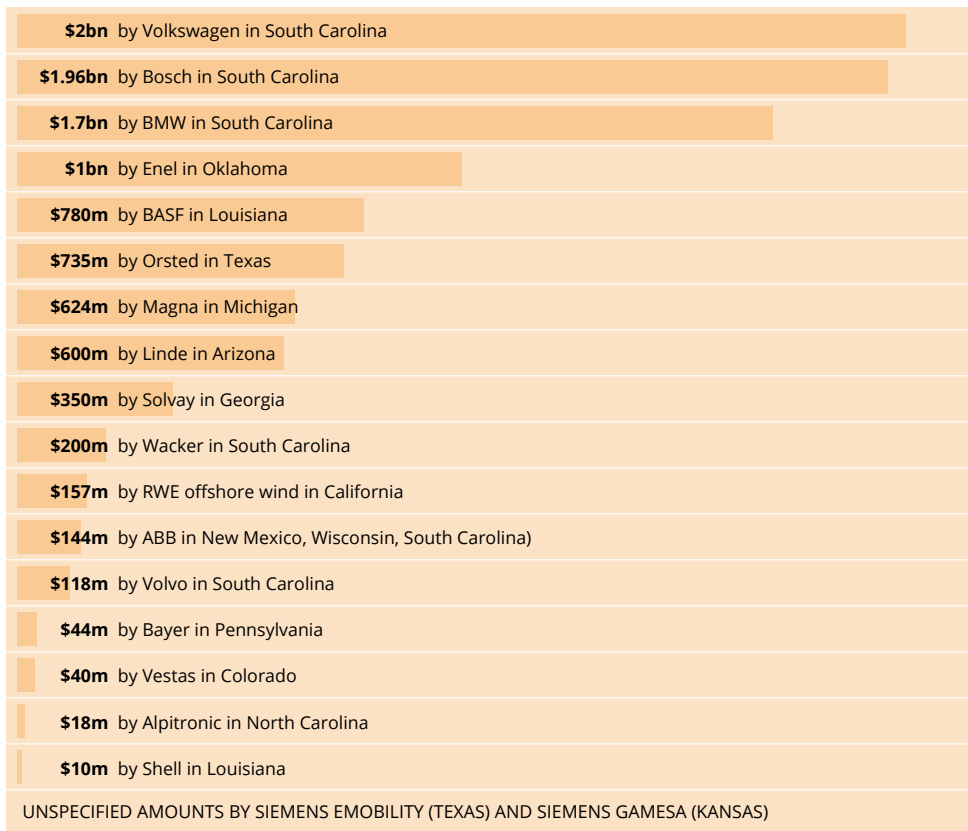
■ 5. Initial observed investments and uptake, especially by European companies

The EU’s share in the IRA investments in the US

Altogether, EU companies have made investment announcements amounting to over \$10.4bn, or 3.8% of total announcements. This is broken down in Figure 3.

The current tally of investment announcements includes (supplemented by CAP data):⁵⁴

Figure 3. Current tally of investment announcements



While these numbers indicate that European companies are benefiting to some degree from the provisions of the IRA, their investments in the field of clean manufacturing fall short of their Asian competitors. South Korean companies make up around a third of announced investments, almost the same as domestic US companies, followed by Japan and China. This is a result of the mature battery manufacturing capabilities in these Asian economies.

Added renewable energy capacity

If EU businesses are not the main investors in cleantech in the US, they can still participate in the cleantech boom by exporting clean energy components.

⁵⁴ Center for American Progress. June 15, 2023. "Biden Administration Investment Tracker". <https://www.americanprogress.org/article/biden-administration-investment-tracker/>

■ 5. Initial observed investments and uptake, especially by European companies

In 2023, the US are on track to install a record amount of new clean energy, a total of 47 GW, more than half of which will be solar PV (Figure 4). In the first half of 2023, 5.9 GW solar PV, 3.2 GW wind and 1.8 GW battery storage were installed.⁵⁵ All three product groups present trade opportunities, both for final systems and system components. We will take a closer look at each of these. Data in the following sections is extracted from DataWeb unless otherwise cited.⁵⁶

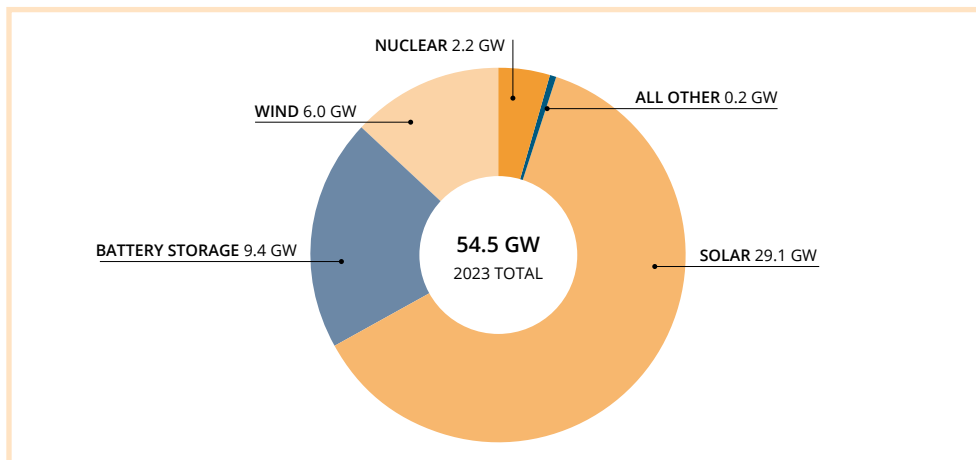


Figure 4: US planned new clean energy generation capacity in 2023.

SOURCE: EIA(a), 2023.

Solar PV imports into the US

Total solar PV imports increased from \$9bn in 2021 to \$10bn in 2022. In the first half of 2023, imports were already \$9.3bn. The only EU Member State with material share in these sales is Germany, albeit far behind Asian manufacturers (Figure 5).

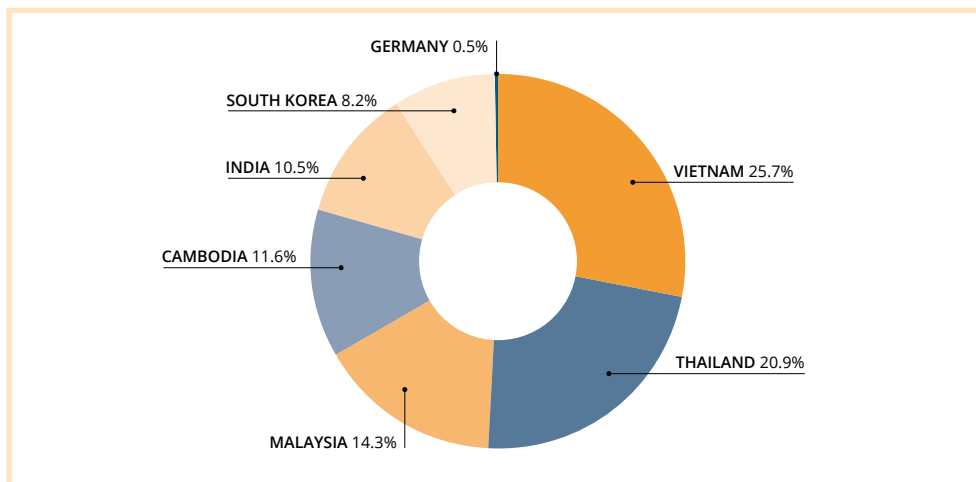


Figure 5: Import shares of solar PV modules January-June 2023.

SOURCE: DataWeb, for commodity groups 854143, 854140, 854142.

55 EIA, 2023(b). "Developers added 16.8 GW of U.S. utility-scale generating capacity in first-half 2023." <https://www.eia.gov/todayinenergy/detail.php?id=57340>

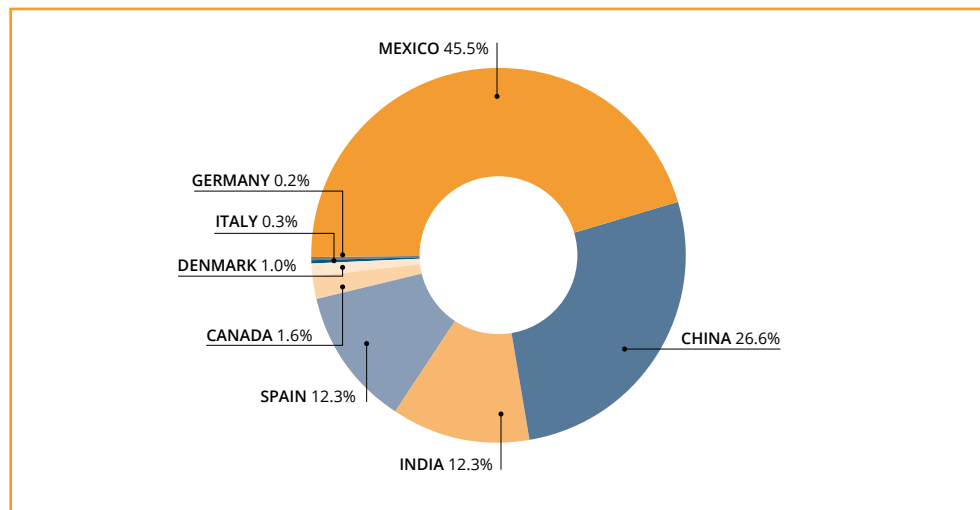
56 US Trade and Tariff Data. 2023. "DataWeb." <https://dataweb.usitc.gov/>

■ 5. Initial observed investments and uptake, especially by European companies

Wind power equipment imports

The US imported about \$2bn worth of wind power equipment in 2021, and \$1.8bn in 2022. The value for 2023 as of Q2 is \$690m, continuing the decreasing trend. While Mexico and China can sustain their levels of exports, sales from India, Spain, Canada and Denmark are markedly lower in 2023 (Figure 6). Germany's sales have decreased even more significantly, by a factor 20. This could be partly the result of domestic content requirements, partly of increased manufacturing capacity in the US.

Figure 6: *Import shares of wind power equipment January–June 2023.*



SOURCE: DataWeb, for commodities 8412909081, 850231.

Heavy and large wind power components tend to be made close to the point of use; as such, one expects a relative decrease of imports as the market matures. However, special components and systems can arguably be traded over long distances. Given the leadership of EU companies in the wind sector – such as Siemens-Gamesa and Vestas – it seems that wind power sales could be more pronounced. Considering the significant expected market for onshore and offshore wind in the US, EU wind technology exporters need to learn their lessons quickly to secure their market share.

■ 5. Initial observed investments and uptake, especially by European companies

Battery imports

The US imported around \$1bn worth of batteries and cells in 2021, followed by \$1.1bn in 2022. The slow growth rate is on track to continue in 2023. Asian manufacturers predominate, with others holding smaller market shares (Figure 7).

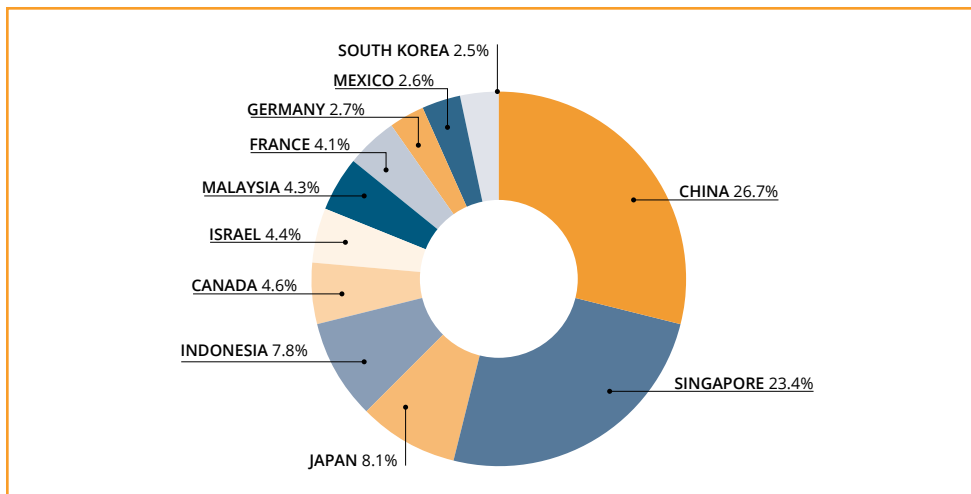


Figure 7: Import shares of batteries and cells January–June 2023.

SOURCE: DataWeb, for commodity group 8506, primary cells and primary batteries; parts thereof.

Given the expected growth of grid storage in the US, the relatively “mild” domestic content thresholds, and limited domestic production capacity, there is a potential for growing battery technology exports to the US. The key question here is whether EU companies can find technology niches to fit the US grid storage market.

Electric vehicle sales

The International Energy Agency forecasts 1.6 million EVs (BEV + PHEV), including over 1 million BEVs, to be sold in the US in 2023, up from 1 million in 2022.⁵⁷ Current data for Q1 2023 shows over 257,000 BEV registrations,⁵⁸ an increase by 63% year-on-year, representing about 7% of the market for new passenger cars, compared to 6% in 2022.⁵⁹ Sales of BEVs in January to June 2023 amounted to 556,707 vehicles, a 47% increase over 2022.⁶⁰

57 IEA. 2023(a). “Electric car sales, 2016–2023.” Paris: IEA. <https://www.iea.org/data-and-statistics/charts/electric-car-sales-2016-2023>

58 Inside EVs. 2023. “US: All-Electric Car Sale Increased in Q1 2023: 257,000 Registrations.” <https://insideevs.com/news/667516/us-electric-car-sales-2023q1/>

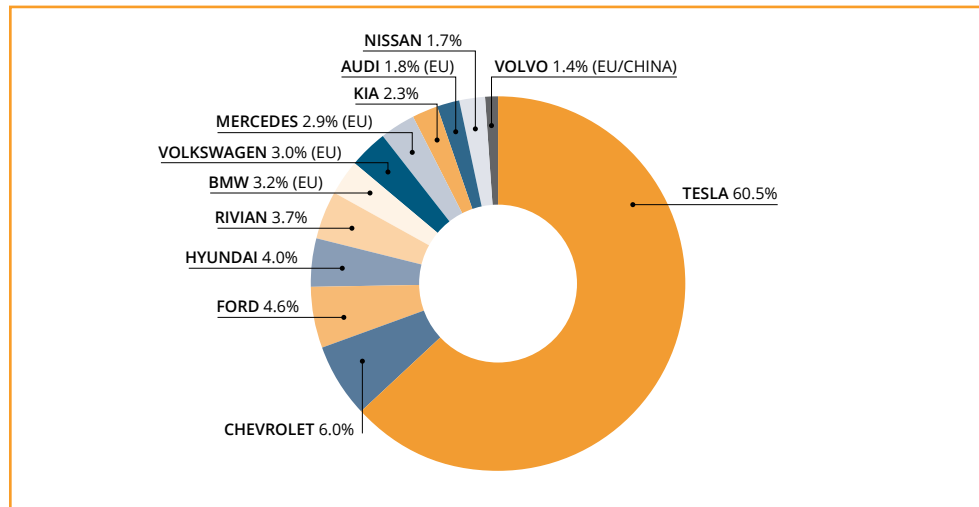
59 Experian Automotive. 2023. “Electric Vehicles 2022 Year in Review.” <https://tinyurl.com/havh4t98>

60 Kelley Blue Book. 2023. “Electric vehicle sales report – Q2 2023.” <https://tinyurl.com/bdf2b5dy>

5. Initial observed investments and uptake, especially by European companies

Figure 8 shows the market shares of the top 12 manufacturers making these sales. While Tesla still dominates the market, its market share continues to shrink and fell below 60% in Q2 2023. This shows that EU manufacturers are adapting to the evolving market to gain a foothold in the US.

Figure 8: Top 12 manufacturers of BEVs by market share of US sales in January-June 2023.



SOURCE: Kelley Blue Book, 2023

The EV models from many of these brands do not, or only partially, qualify for the new passenger EV credit. This proves that the EV credits are only one factor in the sales performance. For example, imports of EVs from the EU are subject to relatively modest most favored nation tariff of 2.5%.

Since April 18, 2023, IRA EV incentives have become more restrictive and only five manufacturers still qualify for the full credit for passenger EVs, down from nine original equipment manufacturers (OEM) before: Cadillac, Chevrolet, Ford, Tesla, and Volkswagen.⁶¹

Mercedes, BMW, Audi and Volvo have no vehicles that qualify for the full credit. Out of these, only BMW can score a half credit for one model: the 2024 model year X5 xDrive50e plug-in hybrid. None of the “i” BEV models are compliant with the passenger EV tax credit. Further restrictions of eligibility for the tax credit may result from the upcoming definition of the “entity of concern status”, expected to affect all car manufacturers (see Annex).

Imports of BEVs in the first half of 2023 illustrate the fact that not all EVs have their final assembly in North America, as required to earn the EV tax credit for new passenger vehicles (Figure 9). The total volume of EV imports in the first half of 2023 amounted to \$8.765bn, a 77% increase over the same time in 2022.

⁶¹ US Department of Energy. Undated. “Federal Tax Credits for Plug-in Electric and Fuel Cell Electric Vehicles Purchased in 2023 or After.” <https://fueleconomy.gov/feg/tax2023.shtml>;

■ 5. Initial observed investments and uptake, especially by European companies

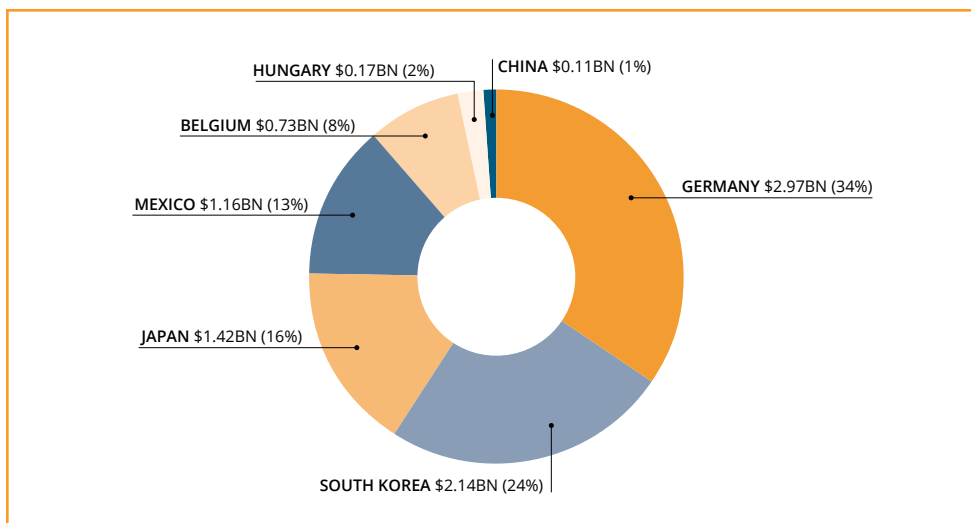


Figure 9: BEV imports by country of origin, January to June 2023 Source:DataWeb, for commodity group 8703.80, motor vehicles with only electric motor.

One reason for the solid export performance of EU manufacturers could be that all leased EVs count as commercial EVs and thus are not subject to the required final assembly in North America. Data shows that EV leasing was only 13% in 2022.⁶² In December 2022, the IRS announced the leasing option for the EV tax credit. Subsequently, leasing rates reached 25% in Q1 2023 and 37% in April 2023. The commercial EV credit is up to \$7,500 for light duty vehicles – on par with the full passenger EV credit – and up to \$40,000 or 30% of the base cost for heavy duty vehicles.⁶³

Given the arguably contradictory circumstances, with some factors promoting domestic manufacturing and others being neutral as to imports – at least from the EU – there is no evidence to suggest that imports of EU-made BEVs should decline much in the coming years. Over time, if and when sales volumes justify this step, more manufacturers might assemble more BEV models in the US. Currently, only a handful of EVs are made by EU manufactures in the US: Mercedes manufactures a range of Models in Tuscaloosa, Alabama, and Volkswagen makes its ID.4 in Chattanooga, Tennessee.

Thus, the EV sector is the one key remaining cleantech export option for EU manufacturers. Hopes of getting more of a foothold in the battery storage, (offshore-) wind or solar PV markets are rather elusive, given the unwelcoming combination of high labor and energy costs in the EU and a trade-restricting regulatory environment in the US.

An open route to participating in the cleantech boom in the US in these sectors is via foreign direct investment. So far, EU businesses have not shifted their investment strategies to the extent that would show a visible difference in the landscape. Rather, they seem to be lagging behind other cleantech investors, especially from Asia.

62 Wayland, M. 2023. "Automakers find a tax credit loophole to increase EV leasing and boost sales." <https://www.cnbc.com/2023/05/13/electric-vehicles-inflation-reduction-act-tax-credit-loophole-boosts-leasing.html>

63 IRS. 2023(a). "Commercial Clean Vehicle Credit." <https://www.irs.gov/credits-deductions/commercial-clean-vehicle-credit>

6. Outlook into year two of the Inflation Reduction Act

The new cleantech economy will transform economies across the globe – in the EU, the US and beyond. The IRA is just one of many factors accelerating and influencing the dynamic transition. It may significantly impact where investments are made, and the direction of flow for trade in goods and services.

Other main levers are the EU's response in the form of the Green Deal Industrial Plan, Net Zero Industry Act and the like. Also, to a considerable extent, China's reaction.

Most of the announcements for investments require longer timespans than one year to bear fruit as they have to go through planning, permitting and construction, even if a final investment decision has already been made. It follows that the reality on the ground will be driven mostly by what is already there, at least for the coming 12 months.

Only three battery plants are expected to start production by 2023, with 24 more plants to follow in the next three years.⁶⁴ Similarly, only two EV plants are expected to start producing EVs in 2023, while nine more will follow in the coming three years. Mature technologies such as wind and solar show less of a backlog: out of 20 announced new solar plants by 2027, 18 will come online by the end of 2024; and all planned new wind power manufacturing plants are posited to start operating in 2024.

Hence, after 2024, we will be able to observe more impacts coming from new manufacturing capacity, driving possibly more change in trade and investments across the Atlantic.

In the end, the economic impact of the IRA – both in the US and in the EU – will depend to a large degree on the general direction of the economy, the Federal Reserve's interest rate, and other factors affecting the investment climate, such as inflation or additional tax code changes, such as removing subsidies for fossil fuels.⁶⁵

⁶⁴ McCarthy, D. and Olano, M. V. 2023. "The US climate law is fueling a factory frenzy. Here's the latest tally." Canary Media. <https://tinyurl.com/38ds86sd>

⁶⁵ Rives, K. 2023. "Efforts to remove billions in US fossil fuel subsidies face uphill battle." S&P Global. <https://tinyurl.com/yfsz6ene>



■ 6. Outlook into year two of the Inflation Reduction Act

If we can trust the modeling on the IRA's economic impacts, then we will see only a very modest impact on the transatlantic economy, but a clear benefit in reducing emissions and changing the trajectory of the entire US economy towards a net zero setting by mid-century. This process will affect the entire world through the pull and push originating from what is still the planet's largest economy, the United States of America.

As with many policies that are endowed with an expiration date, it will be crucial to see how much faith investors will show in the longevity of the cleantech revolution once we reach the mid-years of the ten-year IRA bracket – around 2026 – and then, even more so, towards the end of the subsidy timespans. By then, around 2032, a different Congress and President will have to decide how to set the US on course for net zero emissions by 2050.

Annex

General domestic content thresholds

The IRA does not require domestic content of all materials and products and in many cases offers a partial tax credit even without meeting the local content threshold. Under both the production tax credit (PTC) and the investment tax credit (ITC), it is possible to secure some tax benefits without meeting the domestic content thresholds. In addition, exemptions exist for small-scale projects and transitory periods. The full benefits of the PTC and ITC can only be harnessed if project developers comply with domestic content provisions, in addition to the prevailing wage and apprenticeship requirements. If met, the domestic content bonus, a.k.a. “adder”, is 10% under the PTC and 10 percentage points under the ITC. If labor provisions are not met, the domestic content bonus reduces to 2% or 2 percentage points respectively. The requirements can be summarized as follows:⁶⁶

- > All iron and steel made in America: All manufacturing processes take place in the US, applying to all construction materials “made primarily of steel or iron and are structural in function”. This does not include manufactured products.
- > The adjusted percentage of the domestic costs of manufactured products need to meet:
 - Land-based projects: 40% initially, increasing stepwise from 2025 to 55% after 2026.
 - Offshore wind projects: 20% initially, increasing stepwise to from 2025 to 55% after 2027.

To qualify for the tax credit adder, a project needs to meet the domestic content requirements on both the iron and steel and the manufactured products threshold. As per the US Treasury’s guidance, this implies the following considerations:⁶⁷

- > To be considered under the iron and steel aspect:
 - Steel racking, piles, grounds screws or steel rebar in foundation for utility-scale PV systems.
 - Steel tower, rebar in foundation, jacket foundation for onshore and offshore wind systems.
 - Rebar in foundation for battery systems.
- > Everything else to be considered under the manufactured goods aspect.

⁶⁶ US Department of the Treasury. 2023(a). “Treasury Department Releases Guidance to Boost American Clean Energy Manufacturing.” <https://home.treasury.gov/news/press-releases/jy1477>

⁶⁷ US Department of the Treasury. 2023(b). “Domestic Content Bonus Credit Guidance under Sections 45, 45Y, 48, and 48E.” <https://www.irs.gov/pub/irs-drop/n-23-38.pdf>

Waivers are available for projects where domestic sourcing increases project costs by more than 25% or when there is no comparable domestic product available.

The introduction of domestic content requirements into private investment is new and entails a significant administrative burden on both the investor and the administration, for example the US Treasury. Applicants who wish to receive the benefit of the PTC or ITC need to certify compliance with domestic content requirements in a Domestic Content Certification Statement to be attached to the tax filings for each year the bonus is claimed.

This approach seems to indicate that the bonus and any tax credit is subject to the same Internal Revenue Service (IRS) statutes of limitation as generally apply to tax filings, which is usually three to six years for audits.⁶⁸

Given the uncertainty regarding the self-assessment of the domestic content, this could require companies to create reserves to reflect the legal risk involved.

Electric vehicle tax credits

Tax credits for electric vehicles are available for commercial vehicles and for new and used personal vehicles.

Commercial clean vehicle credit⁶⁹

- > Up to \$40,000 tax credit (or \$7,500 for vehicles under 14,000 pounds, 6.35t) for either up to 30% of the vehicle base price or the incremental cost of the vehicle – whichever is the lesser.
- > No limit on the number of vehicles per claimant – businesses and tax-exempt entities.
- > From a qualified manufacturer (US-based manufacturers, not prohibiting importing of vehicles, no requirement to manufacture in North America).⁷⁰
- > Minimum battery size of 7 kWh for light commercial vehicles under 6.35t and 14 kWh for larger commercial vehicles.
- > Open for all leased vehicles (as all leased vehicles are considered commercial).⁷¹

68 IRS. 2023(b). "IRS audits." <https://www.irs.gov/businesses/small-businesses-self-employed/irs-audits>

69 IRS. 2023(c). "Commercial Clean Vehicle Credit." <https://www.irs.gov/businesses/small-businesses-self-employed/irs-audits>

70 IRS. 2023(d). "Manufacturers for Qualified Commercial Clean Vehicle Credit." <https://www.irs.gov/credits-deductions/manufacturers-for-qualified-commercial-clean-vehicle-credit>

71 IRS. 2022. "Frequently asked questions related to new, previously-owned and qualified commercial clean vehicle credits." <https://www.irs.gov/pub/taxpros/fs-2022-42.pdf>

Used clean vehicle credit

- > Up to \$4,000, 30% of the sales price.
- > Vehicle sales price under \$25,000.
- > Buyer's income must be under \$150,000 for joint filers, \$125,000 for heads of household or otherwise \$75,000.
- > No restrictions on manufacturers or battery content.⁷²

Credits for new clean vehicles (from April 18, 2023)

- > Up to \$7,500 tax credit.
 - \$3,750 for meeting the critical minerals requirement. This states that at least 40% of the value of the battery's critical minerals must be extracted or processed in the US or in a country associated to the US with a free-trade agreement, increasing to 50% in 2024, 60% in 2025, 70% in 2026, and 80% from 2027 on. From 2025 on, any critical minerals extracted, processed or recycled by an "entity of concern" are disqualified altogether.
 - \$3,750 for meeting the battery components requirement. This states that at least 50% of the value of the components must be manufactured or assembled in North America, increasing to 60% in 2024 and 2025, 70% in 2026, 80% in 2027, 90% in 2028 and 100% from 2029 on. From 2024, any vehicles with battery components manufactured or assembled by an "entity of concern" are disqualified altogether.
- > Final assembly in North America (including Canada and Mexico).
- > Manufacturer's suggested retail price under \$80,000 for "vans, sport utility vehicles and pickup trucks" and under \$55,000 for all others.
- > Buyer's income limit of \$300,000 for joint filers, \$225,000 for heads of household and \$150,000 for all others.
- > Minimum battery size of 7 kWh and gross weight under 6.35t.⁷³

⁷² IRS. 2023(e). "Used Clean Vehicle Credit." <https://www.irs.gov/credits-deductions/used-clean-vehicle-credit>

⁷³ IRS. 2023(f). "Credits for New Clean Vehicles Purchased in 2023 or After." <https://www.irs.gov/credits-deductions/credits-for-new-clean-vehicles-purchased-in-2023-or-after>



Entities of concern

The IRA refers to the Infrastructure Investment and Jobs Act of 2021 for the definition of “entity of concern” which includes entities (bold emphasis by the author):

- “(A) designated as a foreign terrorist organization by the Secretary of State under section 219(a) of the Immigration and Nationality Act (8 U.S.C. 1189(a));
- (B) included on the list of specially designated nationals and blocked persons maintained by the Office of Foreign Assets Control of the Department of the Treasury (commonly known as the “SDN list”);
- (C) owned by, controlled by, or subject to the jurisdiction or direction of a government of a foreign country that is a covered nation (as defined in section 2533c(d) of title 10, United States Code);
- (D) alleged by the Attorney General to have been involved in activities for which a conviction was obtained under—(i) chapter 37 of title 18, United States Code (commonly known as the “Espionage Act”); (ii) section 951 or 1030 of title 18, United States Code; (iii) chapter 90 of title 18, United States Code (commonly known as the “Economic Espionage Act of 1996”); (iv) the Arms Export Control Act (22 U.S.C. 2751 et seq.); (v) section 224, 225, 226, 227, or 236 of the Atomic Energy Act of 1954 (42 U.S.C. 2274, 2275, 2276, 2277, and 2284); (vi) the Export Control Reform Act of 2018 (50 U.S.C. 4801 et seq.); or (vii) the International Emergency Economic Powers Act (50 U.S.C. 1701 et seq.); or
- (e) determined by the Secretary, in consultation with the Secretary of Defense and the Director of National Intelligence, to be engaged in unauthorized conduct that is detrimental to the national security or foreign policy of the United States.”⁷⁴

Covered nations currently include China, Russia, North Korea, and Iran. It remains to be further clarified what “control” and “ownership” or other terms mean in practice.

So far, the guidance for a specific identification of “entity of concern” is still lacking. The same term “foreign entity of concern” appeared in the CHIPS & Science Act but it does not imply that the definition will be fully aligned.⁷⁵ Both the US Treasury and the Department of Commerce have proposed a definition under the CHIPS & Science Act.⁷⁶ A broad interpretation could mean that any ownership over 25% and any principal place of business in a covered nation would qualify a business as an entity of concern. A narrower reading would require proof in each case that “control” etc. are being effectuated.

74 US Congress. 2021. H.R.3684 – Infrastructure Investment and Jobs Act. <https://www.congress.gov/bill/117th-congress/house-bill/3684/text>

75 Jack, W. A., Levine, D. B., and Koo, J. 2023. “Will Treasury Adopt the Same Interpretation of ‘Foreign Entity of Concern’ for both the Section 48D Credit under the CHIPS Act and the Section 30D Credit under the Inflation Reduction Act?”

76 IRS. 2023(g). “Section 30D New Clean Vehicle Credit. Proposed Rule. 88 FR 23370.” <https://www.federalregister.gov/documents/2023/04/17/2023-06822/section-30d-new-clean-vehicle-credit>



On April 17, 2023, the US Treasury has proposed a rule for a methodology for assessing the value of components and materials under the above credit.⁷⁷ The comment period closed on June 16, 2023, and a final rule is expected later in 2023. The methodology covers:

- > For the critical minerals requirement:
 - determination of supply chains
 - identification of critical minerals
 - calculation of critical minerals content.
- > For the battery components requirement:
 - identifying components made or assembled in North America
 - determining the incremental value of each component
 - determining the total incremental value of all components together
 - calculating the share of qualifying content by dividing the qualifying incremental value by the total incremental value.

The proposed rule also sets out criteria for when critical minerals agreements satisfy the meaning of “free trade agreement”: “Reduce or eliminate trade barriers on a preferential basis, commit the parties to refrain from imposing new trade barriers, establish high-standard disciplines in key areas affecting trade, and reduce or eliminate restrictions on exports or commit the parties to refrain from imposing such restrictions on exports, including for trade in the critical minerals contained in electric vehicle batteries.”⁷⁸

Finally, the IRA text leaves room for interpretation as to how to define “final assembly” as this can take place at a “plant, factory, or other place from which the vehicle is delivered to a dealer or importer”. This makes the requirement of final assembly in North America an issue of lesser urgency.

77 IRS. 2023(h). “Advanced Manufacturing Investment Credit. Proposed Rule. 88 FR 17451.” <https://www.federalregister.gov/documents/2023/03/23/2023-05871/advanced-manufacturing-investment-credit>

78 US Department of the Treasury. 2023(c). “Treasury Releases Proposed Guidance on New Clean Vehicle Credit to Lower Costs for Consumers, Build U.S. Industrial Base, Strengthen Supply Chains.” <https://home.treasury.gov/news/press-releases/jy1379>

References

- Ahmad, M. 2023. "Europe's first LFP battery factory is unveiled." Energy. <https://energydigital.com/articles/the-first>
- Airtable. Clean Energy Boom – Public Grid view. <https://airtable.com/apprTa03Gqc8RLdQO/shrARig7JymgQeFtV/tblW6VrVxFRq1ukLa> (retrieved July 2023)
- American Clean Power. 2023. "Clean Energy Investing in America." <https://cleanpower.org/investing-in-america/>
- Bansal, K. 2023. "The Inflation Reduction Act – a turning point for the global green hydrogen market." Kolkata: Ernst & Young Associates. https://www.ey.com/en_in/energy-resources/the-inflation-reduction-act-a-turning-point-for-the-global-green-hydrogen-market
- Bistline, J., Mehrotra, N. R. and Wolfram, C. 2023. "Economic implications of the climate provisions of the Inflation Reduction Act." Brookings's Papers: BPEA Conference Draft, Spring. <https://www.brookings.edu/articles/economic-implications-of-the-climate-provisions-of-the-inflation-reduction-act/>
- Brookings. 2023. "Hutchins Center Fiscal Impact Measure." <https://www.brookings.edu/articles/hutchins-center-fiscal-impact-measure/>
- Bui, A., Slowik, P. and Lutsey, N. 2022. "Power play: Unlocking the potential for U.S. automotive trade with electric vehicles." Washington, DC: ICCT. <https://theicct.org/publication/us-can-evs-power-play-unlock-potential-of-auto-trade-with-elec-vehicles-jun22/>
- Bureau of Economic Analysis. 2023. "Direct Investment by Country and Industry, 2022." <https://www.bea.gov/news/2023/direct-investment-country-and-industry-2022>
- Columbia Law School, 2023, "Inflation Reduction Act database." <https://iratracker.org/ira-database/> (retrieved September 2023)
- Confederation of Swedish Enterprise. 2023. "The effects of the US Inflation Reduction Act (IRA) on EU competitiveness." https://www.svensktnaringsliv.se/bilder_och_dokument/lac0de_rapport-ira-analysis-korr-5pdf_1197474.html/Rapport+IRA+Analysis+KORR+5.pdf
- Congressional Budget Office. 2022. "Estimated Budgetary Effects of Public Law 117-169, to Provide for Reconciliation Pursuant to Title II of S. Con. Res. 14." <https://www.cbo.gov/publication/58455>

Congressional Research Service. 2022. "The Buy American Act and Other Federal Procurement Domestic Content Restrictions." <https://crsreports.congress.gov/product/pdf/R/R46748>

Congressional Research Service. 2023. "U.S.–EU Trade and Economic Relations." <https://crsreports.congress.gov/product/pdf/IF/IF10931>

DataWeb. <https://dataweb.usitc.gov/>

Department of Commerce. 2023. "Preventing the Improper Use of CHIPS Act Funding. CHIPS Program Office, National Institute of Standards and Technology, Department of Commerce. Proposed Rule. 88 FR 17439." <https://www.federalregister.gov/documents/2023/03/23/2023-05869/preventing-the-improper-use-of-chips-act-funding>

EIA. 2023(a). "More than half of new U.S. electric-generating capacity in 2023 will be solar." <https://www.eia.gov/todayinenergy/detail.php?id=55419>

EIA. 2023(b). "Developers added 16.8 GW of U.S. utility-scale generating capacity in first-half 2023." <https://www.eia.gov/todayinenergy/detail.php?id=57340>

EIT InnoEnergy. 2023. "ElevenEs opens Europe's first LFP battery cell facility to supercharge electric vehicle production." <https://www.innoenergy.com/news-events/elevenes-opens-europes-first-lfp-battery-cell-facility-to-supercharge-electric-vehicle-production/>

European Commission. 2023. "EU moves forward with Critical Minerals Agreement negotiations with the US." https://ec.europa.eu/commission/presscorner/detail/en/ip_23_3214

Eurostat. 2022. "International trade in hybrid and electric cars." https://ec.europa.eu/eurostat/statistics-explained/index.php?title=International_trade_in_hybrid_and_electric_cars (retrieved September 2023)

Eurostat. 2023. "USA–EU – international trade in goods statistics." https://ec.europa.eu/eurostat/statistics-explained/index.php?title=USA-EU_-_international_trade_in_goods_statistics#EU_and_the_United_States_in_world_trade_in_goods (retrieved September 2023)

Experian Automotive. 2023. "Electric Vehicles 2022 Year in Review." <https://us-preview.experian.com/content/dam/marketing/na/automotive/infographic/EV-Infographic/electric-vehicle-insights-2022-year-in-review.pdf>

Expert Market Research. 2022. "Top 9 companies fuelling the global lithium iron phosphate batteries market." <https://www.expertmarketresearch.com/articles/top-lithium-iron-phosphate-batteries-companies>

Fortune Business Insights. 2022. "Lithium Iron Phosphate Battery Market Size, Share & COVID-19 Impact Analysis." <https://www.fortunebusinessinsights.com/lithium-ion-li-ion-phosphate-batteries-market-102152>



Goldman Sachs. 2023. "The US is poised for an energy revolution." <https://www.goldmansachs.com/intelligence/pages/the-us-is-poised-for-an-energy-revolution.html>

Hamilton, D. S. and Quinlan, J. 2023. "The Transatlantic Economy 2023: Annual survey of jobs, trade and investment between the United States and Europe." Washington, DC: Foreign Policy Institute, Johns Hopkins University SIAS / Transatlantic Leadership Network. <https://transatlanticrelations.org/publications/transatlantic-economy-2023/>

IEA. 2021. "Minerals used in clean energy technologies compared to other power generation sources." <https://www.iea.org/data-and-statistics/charts/minerals-used-in-clean-energy-technologies-compared-to-other-power-generation-sources>

IEA. 2023. "Global EV Outlook 2023." Paris: IEA. <https://www.iea.org/reports/global-ev-outlook-2023>

IEA. 2023(a). "Electric car sales, 2016-2023." Paris: IEA. <https://www.iea.org/data-and-statistics/charts/electric-car-sales-2016-2023>

Inside EVs. 2023. "US: All-Electric Car Sale Increased in Q1 2023: 257,000 Registrations." <https://insideevs.com/news/667516/us-electric-car-sales-2023q1/>

International Trade Administration. "U.S. Energy Trade Dashboard". <https://www.trade.gov/data-visualization/us-energy-trade-dashboard> (retrieved September 2023)

IRS. 2022. "Frequently asked questions related to new, previously-owned and qualified commercial clean vehicle credits." <https://www.irs.gov/pub/taxpros/fs-2022-42.pdf>

IRS. 2023(a). "Commercial Clean Vehicle Credit." <https://www.irs.gov/credits-deductions/commercial-clean-vehicle-credit>

IRS. 2023(b). "IRS audits." <https://www.irs.gov/businesses/small-businesses-self-employed/irs-audits>

IRS. 2023(c). "Commercial Clean Vehicle Credit." <https://www.irs.gov/businesses/small-businesses-self-employed/irs-audits>

IRS. 2023(d). "Manufacturers for Qualified Commercial Clean Vehicle Credit." <https://www.irs.gov/credits-deductions/manufacturers-for-qualified-commercial-clean-vehicle-credit>

IRS. 2023(e). "Used Clean Vehicle Credit." <https://www.irs.gov/credits-deductions/used-clean-vehicle-credit>

IRS. 2023(f). "Credits for New Clean Vehicles Purchased in 2023 or After." <https://www.irs.gov/credits-deductions/credits-for-new-clean-vehicles-purchased-in-2023-or-after>

IRS. 2023(g). "Section 30D New Clean Vehicle Credit. Proposed Rule. 88 FR 23370." <https://www.federalregister.gov/documents/2023/04/17/2023-06822/section-30d-new-clean-vehicle-credit>

IRS. 2023(h). "Advanced Manufacturing Investment Credit. Proposed Rule. 88 FR 17451." <https://www.federalregister.gov/documents/2023/03/23/2023-05871/advanced-manufacturing-investment-credit>

Jack, W. A., Levine, D. B., and Koo, J. 2023. "Will Treasury Adopt the Same Interpretation of 'Foreign Entity of Concern' for both the Section 48D Credit under the CHIPS Act and the Section 30D Credit under the Inflation Reduction Act?"

Jenkins, J. D., Mayfield, E. N., Farbes, J., Jones, R., Patankar, N., Xu, Q., and Schivley, G. 2022. "Preliminary Report: The Climate and Energy Impacts of the Inflation Reduction Act of 2022." Princeton, NJ: REPEAT Project. https://repeatproject.org/docs/REPEAT_IRA_Preliminary_Report_2022-08-04.pdf

Jenkins, J.D., Mayfield, E.N., Farbes, J., Schivley, G., Patankar, N., and Jones, R., 2023. "Climate Progress and the 117th Congress: The Impacts of the Inflation Reduction Act and Infrastructure Investment and Jobs Act." Princeton, NJ: REPEAT Project. https://repeatproject.org/docs/REPEAT_Climate_Progress_and_the_117th_Congress.pdf

Kelley Blue Book. 2023. "Electric vehicle sales report – Q2 2023." <https://www.coxautoinc.com/wp-content/uploads/2023/07/Q2-2023-Kelley-Blue-Book-Electric-Vehicle-Sales-Report.pdf>

Loan Programs Office (a). "Inflation Reduction Act of 2022." <https://www.energy.gov/lpo/inflation-reduction-act-2022> (retrieved September 2023)

Loan Programs Office (b). Monthly application activity report. <https://www.energy.gov/lpo/monthly-application-activity-report> (retrieved September 2023)

Loan Programs Office (c). Portfolio. <https://www.energy.gov/lpo/portfolio> (retrieved September 2023)

McCarthy, D. and Olano, M. V. 2023. "The US climate law is fueling a factory frenzy. Here's the latest tally." Canary Media. <https://www.canarymedia.com/articles/clean-energy-manufacturing/the-us-climate-law-is-fueling-a-factory-frenzy-heres-the-latest-tally>

OECD. Statistics. 2023 "FDI main aggregates – Summary: FDI financial flows." Paris. <https://stats.oecd.org/Index.aspx?QueryId=64225#> (retrieved September 2023)

Office of Acquisition Management. "Build America, Buy America." <https://www.commerce.gov/oam/build-america-buy-america> (retrieved September 2023)

Poore, C. 2022. "Without guidance, Inflation Reduction Act tax credit may do more harm than good." Princeton University. <https://engineering.princeton.edu/news/2022/12/20/without-guidance-inflation-reduction-act-tax-credit-may-do-more-harm-good>



Reuters. 2023. "US can't yet compete with China on EVs, Ford chairman tells CNN." <https://www.reuters.com/business/autos-transportation/ford-chairman-says-us-cant-yet-compete-with-china-evs-cnn-interview-2023-06-18/>

Ricks, W., Xu, Q., and Jenkins, J. D. 2023. "Minimizing emissions from grid-based hydrogen production in the United States." *Environmental Research Letters*, vol. 18, 014025. <https://iopscience.iop.org/article/10.1088/1748-9326/acacb5>

Rives, K. 2023. "Efforts to remove billions in US fossil fuel subsidies face uphill battle." *S&P Global*. <https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/efforts-to-remove-billions-in-us-fossil-fuel-subsidies-face-uphill-battle-75649055>

Rusch, J. Carceller del Arco, M., Vording, E., Heerma van Voss, B., Mavromatis, K. 2023. "Macronomic effects of the Inflation Reduction Act." Amsterdam: De Nederlandsche Bank. <https://www.dnb.nl/media/3gjkqqvk/dnb-analyse-macroeconomic-impact-of-the-inflation-reduction-act.pdf>

Sengupta, S. 2023. "The United States needs a plan to take the Inflation Reduction Act abroad." *The Hill*. <https://thehill.com/opinion/energy-environment/3949065-the-united-states-needs-a-plan-to-take-the-inflation-reduction-act-abroad/>

Slowik, P., Searle, S., Basma, H., Miller, J., Zhou, Y., Rodriguez, F., Buysse, C., Kelly, S., Minjares, R., Pierce, L., Orvis, R. and Baldwin, S. 2023. "Electric vehicle uptake in the United States." Washington, DC: ICCT. <https://theicct.org/wp-content/uploads/2023/01/ira-impact-evs-us-jan23.pdf>


St. John, J. 2023. "The great 'green hydrogen' battle." *Canary Media*. <https://www.canarymedia.com/articles/hydrogen/the-great-green-hydrogen-battle>

US Bureau of Economic Analysis, Total Vehicle Sales [TOTALSA], retrieved from FRED, Federal Reserve Bank of St. Louis. <https://fred.stlouisfed.org/series/TOTALSA#0> (retrieved September 2023)

US Census Bureau, Total Construction Spending: Manufacturing in the United States [TLMFGCONS], retrieved from FRED, Federal Reserve Bank of St. Louis. <https://fred.stlouisfed.org/series/TLMFGCONS> (retrieved September 2023)

US Congress. 2021. H.R.3684 – Infrastructure Investment and Jobs Act. <https://www.congress.gov/bill/117th-congress/house-bill/3684/text>

US Department of Energy. 2022. "PEM Electrolyzer Capacity Installations in the United States." <https://www.hydrogen.energy.gov/pdfs/22001-electrolyzers-installed-in-united-states.pdf>



US Department of Energy. Undated. “Federal Tax Credits for Plug-in Electric and Fuel Cell Electric Vehicles Purchased in 2023 or After.” <https://fueleconomy.gov/feg/tax2023.shtml>

US Department of the Treasury. 2023(a). “Treasury Department Releases Guidance to Boost American Clean Energy Manufacturing.” <https://home.treasury.gov/news/press-releases/jy1477>

US Department of the Treasury. 2023(b). “Domestic Content Bonus Credit Guidance under Sections 45, 45Y, 48, and 48E.” <https://www.irs.gov/pub/irs-drop/n-23-38.pdf>

US Department of the Treasury. 2023(c). “Treasury Releases Proposed Guidance on New Clean Vehicle Credit to Lower Costs for Consumers, Build U.S. Industrial Base, Strengthen Supply Chains.” <https://home.treasury.gov/news/press-releases/jy1379>

US Geological Survey. 2023. Mineral Commodity Summaries (index). <https://pubs.usgs.gov/periodicals/mcs2023/>

US Senate Democratic Caucus. 2022. Summary: The Inflation Reduction Act of 2022. https://www.democrats.senate.gov/imo/media/doc/inflation_reduction_act_one_page_summary.pdf

Van Nostrand, E., Sinclair, T., Gupta, S. 2023. “Unpacking the Boom in U.S. Construction of Manufacturing Facilities.” U.S. Department of the Treasury. <https://home.treasury.gov/news/featured-stories/unpacking-the-boom-in-us-construction-of-manufacturing-facilities>

Wayland, M. 2023. “Automakers find a tax credit loophole to increase EV leasing and boost sales.” <https://www.cnbc.com/2023/05/13/electric-vehicles-inflation-reduction-act-tax-credit-loophole-boosts-leasing.html>

The White House (a). “The Build Back Better Framework: President Biden’s plan to rebuild the middle class.” <https://www.whitehouse.gov/build-back-better/> (retrieved September 2023)

The White House (b). “President Joe Biden – Investing in America.” <https://www.whitehouse.gov/invest/> (retrieved September 2023)

World Bank Group. Foreign direct investment, net inflows (BoP, current US\$) – United States, European Union. <https://data.worldbank.org/indicator/BX.KLT.DINV.CD.WD?locations=US-EU> (retrieved September 2023)

Zandi, M., Yaros, B., and Lafakis, C. 2022. “Assessing the Macroeconomic Consequences of the Inflation Reduction Act of 2022.” Philadelphia, PA: Moody’s Analytics. <https://www.moodyanalytics.com/-/media/article/2022/assessing-the-macroeconomic-consequences-of-the-inflation-reduction-act-of-2022.pdf>

Author



Max Gruenig

Senior Policy Advisor, E3G Washington Office



Max is primarily connecting the dots in the areas of climate-compatible trade, climate-compatible finance & investment, and green hydrogen. In these three fields, Max supports the Climate Diplomacy team at E3G in setting up transatlantic dialogues between various entities: governments, legislators and civil society.

From 2007 until 2020, Max worked with the Ecologic Institute, first in Berlin and from 2014 on in Washington DC.

Max is a trained economist with a focus on emissions trading and game theory. Outside of work, he enjoys gardening and experimental cooking & baking.



The Konrad-Adenauer-Stiftung (KAS) is a German political foundation and think tank. Worldwide, KAS is in charge of over 200 projects in more than 120 countries, where it promotes freedom and liberty, peace, and justice. KAS also focuses on consolidating democracy, the unification of Europe and the strengthening of transatlantic relations, as well as on development cooperation. The KAS office in Washington DC was established in the late 1970s and to this day it stands for and sees itself as a promoter of these values.

Published by:

Konrad-Adenauer-Stiftung USA
1233 20th Street, NW
Suite #610
Washington, DC 20036
U.S.A.
Tel.: +1(202) 464-5840
www.kas.de/usa

Disclaimer:

All rights reserved. No part of this publication may be reprinted or reproduced or utilized in any form or by any electronic, mechanical or other means, now known or hereafter invented, including photocopying or recording, or in any information storage or retrieval system, without permission from the publisher.

The views, conclusions and recommendations expressed in this report are solely those of its author(s) and do not reflect the views of the Konrad-Adenauer-Stiftung, or its employees. This publication of the Konrad-Adenauer-Stiftung e. V. is solely intended for information purposes. It may not be used by political parties or by election campaigners or supporters for the purpose of election advertising. This applies to federal, state and local elections as well as elections to the European Parliament.



The text of this work is licensed under the terms of the "Attribution-ShareAlike 4.0 International, CC BY-SA 4.0" (accessible on <https://creativecommons.org/licenses/by-sa/4.0/deed.en>)



Konrad-Adenauer-Stiftung USA
1233 20th Street, NW
Suite #610
Washington, DC 20036
U.S.A.
www.kas.de/usa