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the IRA consists of three sets of measures: a tax reform, a healthcare reform, and energy and climate legislation, including climate-related spending in the order of \$400 billion over 10 years<sup>1</sup>.  
The measures most relevant to the IRA's international im



for an EV would receive \$3,375 in subsidies, equivalent to roughly 30 percent of its 2022 price<sup>5</sup>.

Producers can also qualify for allocation of investment subsidies of 30 percent in tax credits when their investment is selected as part of an “  
programme<sup>6</sup>. However, a facility that received investment subsidies is excluded from the production tax credit described above (26 USC §45X (c)(1)(B)).

Producers of carbon neutral electricity are eligible for a \$0.015/kWh production subsidy, which can be higher under certain conditions<sup>7</sup>. Alternatively, electricity producers can benefit from investment tax credits of up to 30 percent of the investment value<sup>8</sup>. These incentives are complemented by support for rural and residential green electricity production, as well as support for nuclear energy production. The production of hydrogen and clean fuels (such as renewable natural gas) is also eligible for subsidies<sup>9</sup>.

Several, but not all, of these subsidies are conditional on content produced in the US and/or North America (local-content requirements, LCRs):

- The \$7500 consumer tax credit applies only to electric cars with ‘final assembly’ in North America (the US, Canada or Mexico). In addition, half of the tax credit is linked to the origin of batteries and the other half to that of raw materials used in the electric cars. To obtain either half, a minimum share of the value of battery components (presently 50 percent) or critical minerals (presently 40 percent) needs to come from the US or countries with which the US has a free trade agreement (presently 20 countries<sup>10</sup>). These thresholds will increase by about 10 percentage points per year. In addition, from 2024 and 2025, any use of batteries and critical minerals from China, Russia, Iran and North Korea will make a vehicle ineligible for the tax credit.
- Renewable energy producers are eligible for a ‘bonus’ subsidy linked to LCRs. If the steel and iron used in an energy production facility is 100% US-produced and manufactured products meet a minimum local-content share, the subsidy increases by 10 percent, with the required local-content share rising over time<sup>11</sup>. A similar bonus scheme conditional on local-content shares applies to investment subsidies for energy producers.

There are no LCRs for subsidies for commercial electric vehicles, used electric vehicles or clean-tech production and investment (other than that these need to take place in the US).

5 According to BloombergNEF, average battery electric vehicle cell prices were \$115/kWh in 2022, which implies that the production tax credit would make up approximately 30 percent of the average cell price. A producer of a 75/kWh battery pack could be entitled to a tax credit of up to \$3,375, making up approximately 28 percent of the price of a battery pack in the US in 2022. US battery pack prices averaged at  $1.24 \times \$127 = \$11,811/\text{kWh}$  in 2022. See <https://www.orrick.com/en/Insights/2022/11/Section-45X-of-the-Inflation-Reduction-Act-New-Tax-Credits-Available-to-Battery-Manufacturers>.

6 The US Treasury Secretary can allocate up to \$2.3 billion as part of such a programme, with selection according to social and environmental benefits. This programme can be extended to up to \$10 billion (26 USC §48C).

7 Projects larger than 1 megawatt have to comply with apprenticeship and labour requirements (26 USC §45Y). Under the extended legacy rules, the subsidy for wind projects can be as high as \$0.026/kWh. See <https://www.epa.gov/lmop/renewable-electricity-production-tax-credit-information>.

8 Projects larger than 1 megawatt have to comply with apprenticeship and labour requirements to be eligible for the full credit (26 USC §45E).

9 \$0.006/kg of produced hydrogen, depending on the carbon emissions involved in the production; this can rise to up to \$3/kg of hydrogen if certain labour conditions are satisfied. Clean fuels can receive up to \$1.75/gallon in production subsidies (26 USC §45V).

10 See <https://ustr.gov/trade-agreements/free-trade-agreements>.

11 For onshore wind, 20 percent in 2025, rising to 55 percent in 2028. For all other renewable energy production facilities, 40 percent in 2025, rising to 55 percent in 2027.





While the EU has no flagship green subsidy scheme comparable to the IRA, it has a multitude of initiatives at EU and national levels that use subsidies for broadly similar purposes (see Annex III for details)

- Almost every EU country subsidises the purchase of electric vehicles. While incentives differ widely in form and value, these subsidies added up to almost €6 billion and averaged around €6,000 per vehicle in 2022. Unlike IRA tax credits, they typically do not discriminate between different producers.
- Clean-tech manufacturing is supported through a variety of instruments. These include:
  - EU Important Projects of Common European Interest (IPCEIs), cross-border projects that include support for battery and hydrogen manufacturing,
  - the EU Innovation Fund, established under the EU emissions trading system (ETS),



### 3. **Consumer tax credit for electric cars**

The IRA could through several channels have a direct impact on trade and decisions to locate production.

#### Consumer tax credit for electric cars

The IRA's \$7500 consumer tax credit on electric cars could reduce the cost of an eligible vehicle of average price by about one fifth, to the detriment of electric vehicles presently excluded from the credits<sup>19</sup>





contributes to the international perception that the Biden administration is keeping on the disruptive trade policy path chartered by President Donald Trump.

Second, the US has never before, to our knowledge, made WTO-prohibited subsidies contingent on local-content requirements. This could send a powerful signal that such LCRs can be applied even in advanced countries. For example, French President Emmanuel Macron has publicly called for reciprocal EU requirements: “

”<sup>33</sup>. Broad adoption of sourcing restrictions would render international trade more fragmented, less efficient and hence less effective in supporting the net-zero transition.

Third, the increasing disregard for WTO rules by the system’s historically most powerful sponsor comes at a moment when the WTO is already weak. The US continues to block the operation of the WTO Appellate Body, and negotiations over WTO institutional reform (as chaired by the United States) have so far not resulted in any discernible progress. An ineffective WTO is bad news for global trade and prosperity, particularly for developing countries for which trade has been, and should continue to be, a powerful source of growth and technological catch-up.

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The EU’s objectives in responding to the IRA should be informed by its external competitiveness, but also by the need to maintain a level playing field inside the EU, speedy decarbonisation both in the EU-2.9 (the) 1.1 (a of the w)-3.9 (or) 1 (ld, and br) 15 (o) 1 (ader for) 15.1 (ei) 4 (g)-2 (n p)-2 with either China (let alone Russia) or the Wa.

This broad definition of EU-objectives has some immediate implications, notably, by helping to identify what the EU should not do in reaction to the IRA:

**Local-content requirements.** The EU should not reciprocate the IRA’s local-content requirements. While LCRs might help with EU competitiveness in the short run, by redirecting demand to EU producers, they would hurt the EU on several other fronts: by harming the critical objectives of accelerating the global climate transition, by harming EU-export interests, as trading partners might reciprocate, and by harming the EU’s credibility as a global actor committed to multilateral cooperation. The latter is essential for EU foreign policy interests. The EU’s ability to persuade other countries to respect internationally agreed norms





Extending these temporary crisis frameworks in response to the IRA would also likely constitute an abuse of the legal basis underpinning these temporary frameworks, namely Article 107(3)(b) of the Treaty on the Functioning of the European Union. Even in the darkest interpretation of its effects, the impact of the IRA does not amount to a “

” anywhere near the magnitude of previous economic shocks that have justified this use of the Article, such as the global financial crisis, the pandemic and the energy price shock following Russia’s invasion of Ukraine<sup>36</sup>. It is also worth recalling that green subsidies, justified by environmental externalities and the fight against climate change, can already be approved under the existing EU legal framework, particularly since the 2022 Guidelines on State aid for climate, environmental protection and energy (European Commission, 2022b). Subsidies related to decarbonisation do not require a new or extended crisis framework.

Emulation of the IRA’s manufacturing subsidies. The EU should not seek to emulate the IRA’s clean manufacturing subsidies, even at the EU level, for two reasons. First, the EU does not in fact lag the IRA in terms of the volume of such subsidies (section 2 and Annex III), only in terms of their simplicity, EU-level consistency and predictability. Second, the IRA mostly subsidises green production that does not match the EU’s comparative advantage. Meanwhile, a strong case can be made for making EU-level and national subsidies that are compatible with EU state aid rules simpler and more predictable, like IRA subsidies.

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It is easy to say what the EU should not do in response to the IRA, but harder to say what it should do. An EU response can be explored under three main headings: (1) structural

### Single market regulations favouring clean technology

The EU has several non-subsidy mechanisms at its disposal to support the development and roll-out of clean-tech manufacturing (European Commission, 2023). These include regulations aimed at setting time limits for each stage of permitting procedures, a measure that can accelerate developments in areas vital to decarbonisation thus enlarging more quickly markets for clean-tech. For example, in December 2022 EU countries agreed a temporary emergency regulation to fast-track permits for renewable energy infrastructure and grids (Council Regulation (EU) 2022/2577). Similarly, tighter European standards can foster global competitiveness by demonstrating marketability and attracting investment in firms that comply with standards. One example, agreed by the EU in December 2022, is the introduction of stronger environmental sustainability requirements for all batteries sold in the EU

reduce costs for electricity consumers, by being priced at a level close to the average cost of supplying electricity, rather than the potentially very high marginal cost.

A more direct measure to expand renewable capacity could be to set up a European fund that guarantees a feed-in premium for newly connected wind and solar plants, in addition to the other regular cash flows<sup>41</sup>. The fund could guarantee a premium for 10 years for the first gigawatt produced under the scheme, and a lower premium for any additional gigawatt. As a first-come first-served scheme, this could encourage the accelerated deployment of renewables needed to lower European industrial energy costs in the medium-term and to drive power-system decarbonisation.

A complementary measure would be to simplify, accelerate and harmonise the regulatory process for infrastructure projects connecting the electricity grid, particularly for cross-border connecting infrastructure.

## Skills

The speed of manufacturing and roll-out of clean technologies is correlated closely with the simultaneous development of a qualified workforce to implement clean projects. Ensuring a sufficient capacity of skilled workers is of prime importance for Europe, both to avoid shortages and to ensure a high level of productivity for its clean-tech industry. This is also a crucial item when it comes to the just transition, as part of the workforce currently employed in carbon-intensive sectors can be re-skilled and re-employed in green-energy projects (IEA, 2022).

Recognising these factors, the EU has put forward a European Skills Agenda (European Commission, 2020) to help individuals and businesses develop more and better skills in these sectors. It has earmarked sizeable funds to support worker training: the €61.5 billion European Social Fund Plus (ESF+), and also the Just Transition Fund (JTF) and the Recovery & Resilience Facility (RRF).

The European Commission (2023) has stressed that the EU and its members can do more. For instance, as Europe seeks to develop pan-European clean-tech supply chains, it would be efficient to have integrated continuous monitoring at EU level of the status of supply and demand in green skills and jobs. The EU single market for clean skills could be promoted by developing a Europe-wide strategy for clean-tech higher qualifications, and by easing intra-EU mobility of talent, linked also to Erasmus+ funding. Sector-level efforts should also be made through links to European industrial alliances. The establishment in February 2023 of a large-scale skills partnership for onshore renewable energy under the Pact for Skills<sup>42</sup> is a welcome first step in this direction.

## Banking and capital markets union

The cost of accessing finance is an important factor in firms' clean-tech investments. The EU financial system is highly bank-dominated and fragmented along national lines, which makes it ill-suited to enabling the massive investments needed for the green transition through the provision of private capital. Major policy initiatives have been undertaken to that effect,

banking union is necessary but not sufficient, and a properly defined set of actions on capital markets union must complement it (Véron, 2014).

Completing the banking union is best defined as breaking the vicious circle between banks and sovereigns and improving the EU's governance framework for resolving banks and managing banking crises (Beck *et al.*, 2022). Steps already taken, mostly the integration of euro-area banking supervision centred on the European Central Bank, have not been sufficient to achieve this. Negotiations during the last seven years ended in stalemate at a June 2022 Eurogroup meeting<sup>43</sup>. The sequence illustrates the political difficulty of completing the banking union, linked to thorny issues of cross-border risk-sharing through deposit insurance, reform of some aspects of banks' business models through the introduction of general depositor preference, and strengthening of market discipline for sovereign debt issuance through regulatory curbs on banks' concentrated domestic sovereign exposures. Many entrenched interests resist reform, both in the banking sector and among the public authorities that oversee it. Still, completing the banking union would arguably be less politically challenging than what was achieved in 2012, with the decision to replace national bank supervisory frameworks with European banking supervision.

As for capital markets union, some of the initiatives undertaken since 2014 (the latest announced in December 2022<sup>44</sup>) are significant, including steps towards a European Single Access Point for corporate disclosures and a post-trade consolidated tape, or single dataset of prices and volumes for securities traded in the EU, both proposed in November 2021. Nevertheless, much more should be done to defragment Europe's capital markets, starting with the supervisory architecture. Major decisions should be centralised in a reformed European Securities and Markets Authority, with a changed governance and funding framework to make it more effective and more independent. Reform should streamline the jumble of market infrastructures, asset management and auditing frameworks that currently prevent an efficient pan-European allocation of European savings to European projects, including those needed for the green transition.

Given their complexity and political sensitivity, these objectives for banking union and capital markets union cannot be met in the current EU legislative term. But they should be high on the list of priorities for the next EU leadership after the 2024 European Parliament elections.

### EU-level subsidies for green innovation

While the EU should not copy the IRA's production subsidies, there is probably a case for more EU subsidies for green R&D, innovation and early-stage deployment of next-generation green technologies, in which EU companies could build and maintain globally competitive positions. Likewise, there is likely a case for building or maintaining within the EU minimum levels of capacity in certain critical areas for the green transition, to make the EU more resilient to natural or political shocks.

The EU needs to design such subsidies without harming the single market's level playing field. It calls for an EU-level approach to early-stage, high-risk projects. It should deliver far more in terms of synergies, integration of knowledge spillovers and cost and risk sharing, than an approach based on national subsidies. The EU's current approach, based on the cross-border coordination of national projects through IPCEIs, or projects envisaged by the European Chips Act<sup>45</sup>, may not be optimal. Current schemes are bureaucratically heavy and end up mostly supporting a few large incumbent firms that have the ability and experience to propose and manage such projects, which typically take place in the EU countries that

43 See Paola Tamma, 'Eurozone countries kill banking union plan,' *Politico*, 9 June 2022, <https://www.politico.eu/article/eurozone-countries-kill-banking-union-plan/>.

44 See European Commission press release of 7 December 2022, [https://ec.europa.eu/commission/presscorner/detail/en/ip\\_22\\_7348](https://ec.europa.eu/commission/presscorner/detail/en/ip_22_7348).

45 See Garcia-Herrero and Poitiers (2022).



have sufficiently deep pockets to support them (Weil and Poitiers, 2022a; 2022b). While large firms can play an anchor role in such projects, it is important to ensure that smaller players and radically new clean eco-systems can find their place. Otherwise, the risk is that the

into finished products take place in North America, and domestic production subsidies, such as the clean manufacturing tax credit, will likely be unaffected by the US regulatory process. If the guidelines issued in March 2023 do not sufficiently address the EU's legitimate commercial interests, it will need to assess its trade policy options.

The EU could immediately initiate a WTO dispute targeting the LCRs attached to the electric vehicle and clean-energy tax credits. Pursuing this option would send an unambiguous political signal that the EU continues to invest in the WTO's rules-based system, values the balance of concessions codified in the WTO agreements, holds the US accountable for breaches of obligations, and seeks leverage for prospective bilateral negotiations with the US Trade Representative (USTR). Given the obvious breach of WTO rules that prohibit LCRs, the findings of a WTO panel could reasonably be expected within a year. If and once IRA production subsidies evidently harm EU interests, a WTO legal complaint could also target these elements of the legislation. USTR may appeal the panel report, in which case it would remain unadopted, as the WTO Appellate Body is not operational. However, the EU could retaliate against the in-breach IRA measures under the reformed EU Trade Enforcement Regulation (Regulation (EU) 2021/167).





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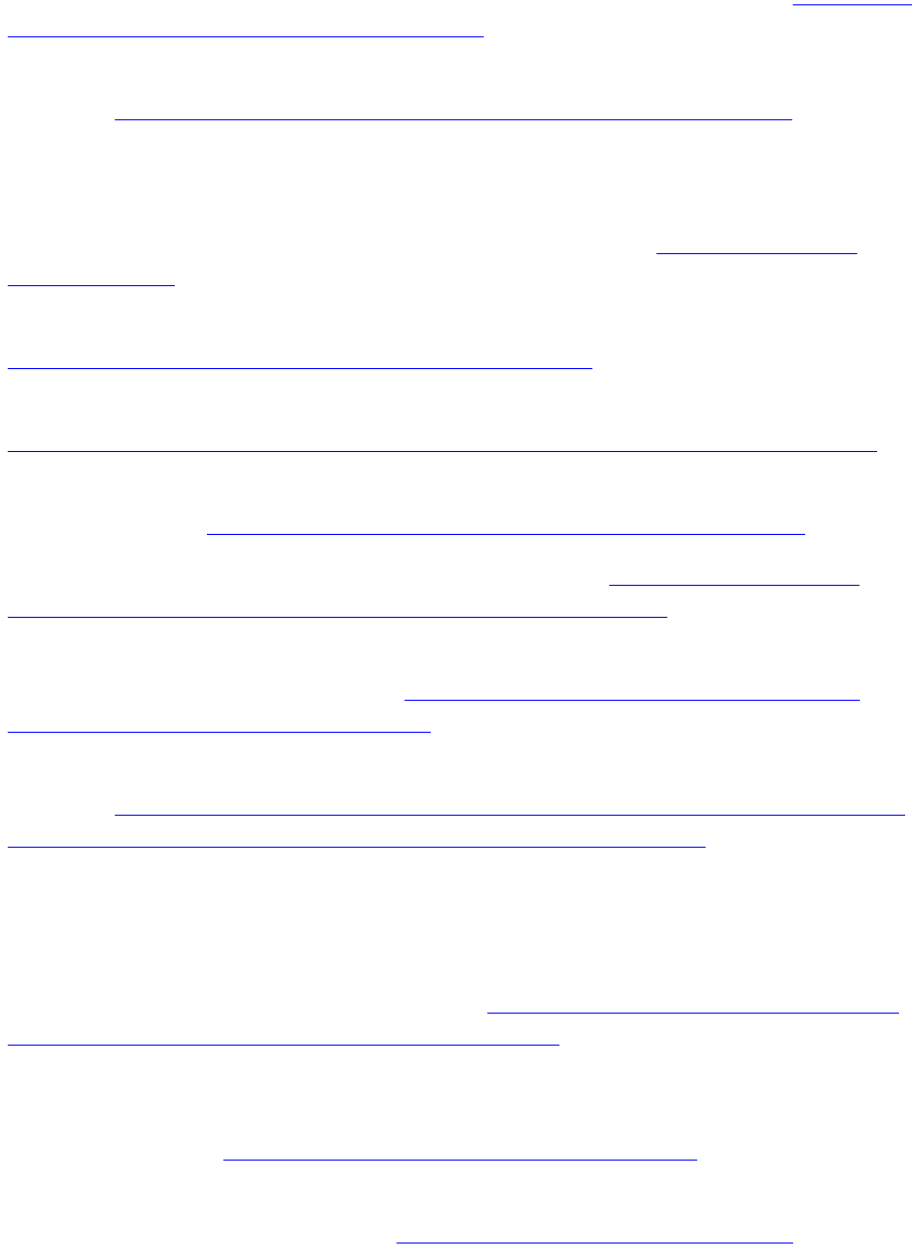
Autor, D., D. Dorn and G. Hanson (2021) 'On the persistence of the China shock,'  
w29401, National Bureau of Economic Research

Beck, T., J.-P. Krahenen, P. Martin, F.C. Mayer, J. Pisani-Ferry, T. Tröger, N. Véron, B. Weder di Mauro and  
J. Zettelmeyer (2022) 'Completing the banking union: Economic requirements and legal conditions',  
119, Centre for Economic Policy Research

Blanchard, O., C. Gollier and J. Tirole (2022) ' e Portfolio of Economic Policies Needed to Fight Climate  
Change,' 22-18, Peterson Institute for International Economics, available at  
<https://www.piie.com/sites/default/files/2022-11/wp22-18.pdf>

Cannas, G., S. Ferraro, A. Mathieu Collin, and K. Van de Castele (2022) 'Looking back at the State aid  
COVID Temporary Framework: the take-up of measures in the EU,' 3/2022,  
End leansf 1.5 Td04g39.ef 1.\_CR1o3C2ooansf 1.5 Tk ID8k ID8k er, N. Vn CdoC.-P)127 (. Kr)11.1 (ahnen, P31b31 7L3

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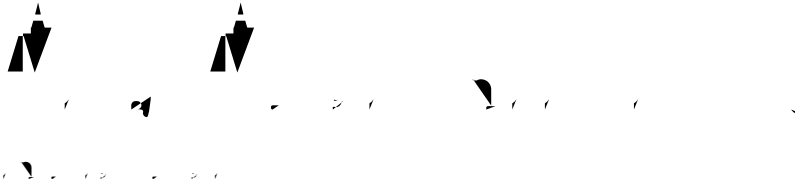


- Hoppmann, J., J. Huenteler and B. Girod (2014) 'Compulsive policy-making— the evolution of the German feed-in tariff system for solar photovoltaic power,' *Energy Policy* 43(8): 1422–41, available at <https://doi.org/10.1016/j.respol.2014.01.014>
- IEA (2022) *Skills development and inclusivity for clean energy transitions*, International Energy Agency, available at <https://iea.blob.core.windows.net/assets/953c5393-2c5b-4746-bf8e-016332380221/Skillsdevelopmentandinclusivityforcleanenergytransitions.pdf>
- Jenkins, J.D., E.N. Mayfield, J. Farbes, R. Jones, N. Patankar, Q. Xu and G. Schivley (2022) Preliminary *REPEAT IRA Preliminary Report 2022-08-04*, Princeton University - Zero Lab, available at [https://repeatproject.org/docs/REPEAT\\_IRA\\_Preliminary\\_Report\\_2022-08-04.pdf](https://repeatproject.org/docs/REPEAT_IRA_Preliminary_Report_2022-08-04.pdf)
- Kleimann, D. (2023) 'Climate versus trade? Reconciling international subsidy rules with industrial decarbonisation,' *Energy Policy* 103/2023, Bruegel, available at <https://www.bruegel.org/policy-brief/climate-versus-trade-reconciling-international-subsidy-rules-industrial>
- Larsen, J., B. King, H. Kolus, N. Dasari, G. Hiltbrand and W. Herndon (2022) *Climate Clean Energy Incentive Reduction Act*, Rhodium Group, available at <https://rhg.com/research/climate-clean-energy-incentive-reduction-act/>
- Lazard (2021) 'LAZARD's levelized Cost of Energy ('LCOE') Analysis — version 15.0,' Lazard, available at <https://www.lazard.com/media/451905/lazards-levelized-cost-of-energy-version-150-vf.pdf>
- Leggett, J.A. and J.L. Ramseur (2022) *Renewable Energy Production Tax Exemption Extension* ( ), CRS Report R47262, Congressional Research Service, available at <https://crsreports.congress.gov/product/pdf/R/R47262>
- Mazzucato M. (2013) *Mission-oriented innovation policy: Innovation and industrial strategy in the UK*, Anthem Press, London
- Poitiers, N. and P. Weil (2022a) 'Opaque and ill-defined: the problems with Europe's IPCEI subsidy framework,' *Bruegel Blog*, 26 January, available at <https://www.bruegel.org/blog-post/opaque-and-ill-defined-problems-europes-ipcei-subsidy-framework>
- Poitiers, N. and P. Weil (2022b) 'Is the EU Chips Act the right approach?' *Bruegel Blog*, 2 June, available at <https://www.bruegel.org/blog-post/eu-chips-act-right-approach>
- Rodriguez Quintero, R., C. Vidal Abarca Garrido, H. Moons, M. De Oliveira Gama Caldas, O. Wolf, I. Skinner, A. Van Grinsven, M. Hoen and H. Van Essen (2019) *Energy Storage in the EU Energy System*, JRC Science for Policy Report, Joint Research Centre
- Roy, N., D. Burtraw and K. Rennert (2021) 'Cost Analysis and Emissions Projections under Power Sector -1 (s)4 (gr) (s IP)-8.9 (CEI s)3 (ubE)7.1 (mis)2 (s)1 (ions Pr)15 (oj)-1 (ins)-4 (e)1 IPel Blog

[interconomics.eu/contents/year/2021/number/6/article/fostering-the-industrial-component-of-the-european-green-deal-key-principles-and-policy-options.html](https://interconomics.eu/contents/year/2021/number/6/article/fostering-the-industrial-component-of-the-european-green-deal-key-principles-and-policy-options.html)

Taylor, M. (2020) 'Energy subsidies: Evolution in the global energy transformation to 2050', 1/2020, International Renewable Energy Agency, available at [https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Apr/IRENA\\_Energy\\_subsidies\\_2020.pdf](https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Apr/IRENA_Energy_subsidies_2020.pdf)

Véron, N. (2014) 'Defining Europe's Capital Markets Union,' 2014/12, Bruegel, available at <https://www.bruegel.org/policy-brief/defining-europes-capital-markets-union>



The WTO Agreement on Subsidies and Countervailing Measures (ASCM) prohibits subsidies outright if they are made contingent on the use of domestic over imported goods. The agreement thus gives justice to the notion that subsidies subject to local content requirements are a priori considered to be trade distortive. In WTO dispute-settlement proceedings, a finding of a prohibited subsidy is a finding of a violation of Article 3.1 of the ASCM. (WTO, 2014, p. 15)



Europe does not have a flagship clean-tech deployment scheme comparable to the IRA. Instead, it has a multitude of policy initiatives and tools at different levels (regional, national, EU), which are generally uncoordinated, if not conflicting (Table A1).

Deployment policy tools	Overall enabling framework
<ul style="list-style-type: none"> <li>Single market rules</li> <li>European Alliances</li> <li>IPCEIs</li> <li>NextGenerationEU</li> <li>EU Innovation Fund</li> <li>European Innovation Council</li> <li>European Investment Bank</li> <li>EU Cohesion Funds</li> </ul>	<ul style="list-style-type: none"> <li>Trade and investment policy</li> <li>Competition policy</li> <li>Environmental standards</li> <li>Climate policy (eg ETS)</li> <li>Energy policy</li> </ul>
State aid	



Source of funding	Instruments	Period	Value (€ billions)
NGEU - RRF <sup>b</sup>	Loans and grants		0.3
IPCEI <sup>c</sup>	Loans, grants, guarantees, tax advantages		1.3
EIB <sup>d</sup>	Loans	2022	3.3
EU Innovation Council <sup>e</sup>	Grants and equity	2022	0.7
EU Innovation Fund <sup>f</sup>	Grants	2021	1.2
			<b>4.4</b>
EIB <sup>g</sup>	Loans	2022	4.4
National support schemes <sup>h</sup>	Various (mainly feed-in-tariffs)	2020	80
National support scheme	Purchase allowance <sup>i</sup>	2022	€6,000 avg.

Source: Bruegel based on data provided by the European Automobile Manufacturers Association and government websites. Notes: a Support to clean manufacturing includes support to green hydrogen and batteries. b This estimate includes the amount of loans and grants approved under the RRF for battery-related projects and divides it by the number of years of its duration (2020-2026). The large share of the funding available for projects related to hydrogen falls under the umbrella of the IPCEIs. Based on data from the Bruegel dataset on European Union countries' recovery and resilience plans. c The estimate for the IPCEIs includes the overall amount of public funding granted by EU countries for four IPCEIs (two batteries- and two hydrogen-related) divided by the number of years they are expected to run. Based on data provided by European Commission. d This estimate includes the overall amount of loans and grants.

transport and industrial sectors in 2022; we estimate that approximately €3.3 billion was targeted at clean-technology projects. The EIB is also responsible for the implementation of around 75 percent of the EU guarantees allocated to the InvestEU programme.

Except for the IPCEIs, the estimates presented in Table A2 do not include state aid, the largest subsidy category (green and not) in the EU by far. The Treaty on the Functioning of the European Union prohibits state aid but allows exceptions, including for IPCEIs, “  
”; and “  
” (Article 107(3); see Box 1). It is not possible to precisely identify the volume of non-IPCEI state aid for clean-tech manufacturing based on European Commission data; however, this is unlikely to be very large compared to the IPCEIs and particularly compared to renewable energy subsidies<sup>51</sup>.

In 2020, the latest year for which consolidated figures are available, subsidies given by EU members to electricity production from renewable energy sources (RES) amounted to €80 billion (0.57 percent of EU GDP), with Germany leading the ranking (0.94 percent of GDP, or €33 billion). Feed-in tariffs and feed-in premiums represented 79 percent of total RES subsidies in 2020, for a total of €63 billion. In terms of technology, solar energy received the largest share of subsidies (€30 billion), followed by wind (€21 billion), and biomass (€18 billion). Renewable energy is also supported by EIB loans (roughly €4.4 billion in 2020).

<sup>51</sup> The European Commission reports state aid disbursements in broad policy categories, several of which (including ‘Environmental protection including energy savings,’ ‘Regional development,’ ‘Sectoral development,’ ‘SMEs including risk capital’ and ‘Other’) could in principle contain such support. European Commission (2022a), Annex II also lists the largest individual aid items in these categories disbursed in 2020, the most recent year for which this data is available. Except for the IPCEIs (reported in ‘Other’) we were not able to find any item in this list that specifically reflects clean-tech manufacturing support. However, some of the generic industry support packages reported in the categories ‘Regional development’ and ‘SMEs including risk capital’ could reflect disbursements to clean tech producers.