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State Aid 2.0

Lean, clean, European

Transport & Environment

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Summary - State Aid 2.0. Lean, clean, European

T&E's analysis finds that EU State Aid guidelines do not effectively support EU manufacturing of cleantech products like batteries. The current framework is unbankable, intransparent, favors incumbents over newcomers, and does not lower the marginal cost of EU producers. To compete globally, spending more under current guidelines is unlikely to help. Europe first needs a revised State Aid framework for cleantech based on Made in EU requirements, providing clear and performance-based support to the production of sustainable products.

Reaching net zero by 2050 demands large investments in clean technologies. Yet, Europe's public funding framework is failing cleantech manufacturing, offering just 0.5% of public energy subsidies (€1 billion a year out of €200 billion of energy subsidies in the EU).

Fixing EU State Aid for cleantech

A "Make, buy, protect Europe" strategy should be at the heart of the EU Clean Industrial Deal. This report focuses on "Make Europe": **boosting the supply of EU-made cleantech products, such as batteries, through targeted and strictly conditional State Aid measures**.

State Aid spending in the EU has surged since the COVID-19 pandemic, doubling from 1% of EU GDP in 2019 to over 2% in 2020 and 2021. This sizable pot of money needs to be re-calibrated, and re-designed. This report does not focus on how much is spent or should be spent, but on how it should be spent.

EU aid policy has historically focused on minimising internal distortions. In a fast-changing geopolitical context, the key challenge for the EU is to correct external distortions, especially with China and the US.

Key shortcomings of EU State Aid guidelines for cleantech

- **Overcomplicated and contradictory**: State Aid is guided by an overlapping and contradictory set of guidelines. A battery plant could consider five different EU guidelines and funding options. Each one has different funding principles and conditions.
- **No "Made in EU" Requirements, and open to all companies**, failing to strengthen Europe's supply chain.
- **Case-by-case and not scalable**: The current rules lack clear ex ante conditions. Aid depends on slow political negotiation, typically based on a "funding gap" which instead of reducing free riding invites corporate rent seeking and rewards cost-inefficient projects.
- **Favors big players over startups**: The framework ends up favouring well-connected, slow-moving incumbents, at the expense of fast-moving newcomers that lack the time, resources, experience and political connections required to manage the process.
- **A black box**: State Aid approval and disbursements not only lack transparency for companies but also for the public and watchdogs including Parliaments.

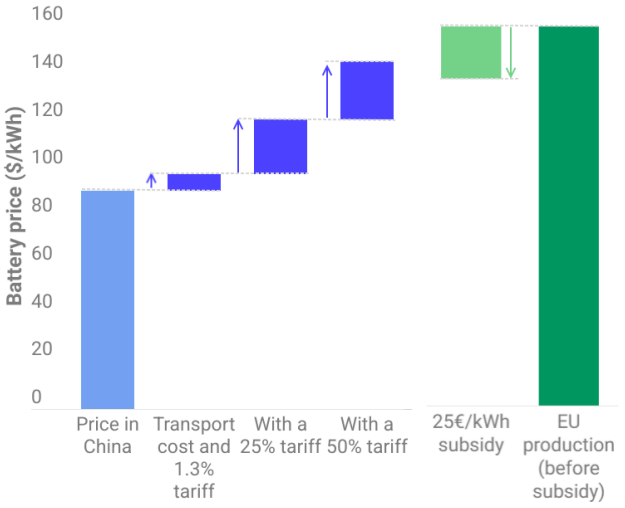
New guideline for cleantech manufacturing needed

Europe needs a sector-wide, bankable, and performance-based approach:

- **Make funding bankable**: Aid should be allocated based on fully measurable and objective ex ante criteria, instead of business cases and funding gaps.

- **Mandatory "Made in EU" criteria for manufacturing of end products**: Aid must be tied to local control, content, and use. Only companies under the ultimate control of EU entities should be eligible. Only products sold and used in the EU should receive production subsidies. Payment for output conditioned on local content and control is the most effective way of reducing EU producers' marginal cost of production and fostering a local supply chain.
- **Support products, not projects**: e.g., output-based support of €25/kWh for battery cells, phasing down over time, and a €5/kWh bonus for battery packs.
- **Cap-Ex support for supply chain**: Fixed investment aid with local control requirements.
- **Flexible and fast**: Adapt State Aid quickly to global market shifts.

Comparison of made-in-China and made-in-Europe battery price



Source: T&E analysis of BloombergNEF's battery price survey 2023 and 2024

The EU must reform State Aid rules to strengthen its cleantech manufacturing competitiveness, ensuring faster and more strategic support for technologies at the heart of the green transition.

Funding the transition

- **End fossil fuel Subsidies:** State Aid rules need sharpening to rule out fossil fuel subsidies - especially gas projects - still close to €100 billion a year in the EU. In transport, tax breaks for diesel and petrol company cars - potentially a form of State Aid - should be banned.
- **Leverage import tariffs on oil and oil products**: An 1.7% tariff on crude oil would generate around €3 billion annually in support of the transition.
- **Tax windfall profits:** Revive the solidarity contribution of fossil fuel giants and the oil and gas industry, including energy traders especially liquified natural gas.
- **Use revenues from cleantech import duties:** The new EU Chinese EV import duty is expected to raise approximately €3 billion a year based on 2023 sales. If imports reach 1 million EVs, this figure could double to €6 billion, excluding possible duties on batteries.
- **Pool resources and create synergies with EU funding:** State Aid is not a silver bullet. EU funding should address concerns about deep-pocketed Member States monopolising aid to companies. EU-level instruments - such as the Recovery and Resilience Facility, cohesion and regional funds and the Modernisation Fund - account for distributional impacts and mitigate market fragmentation. This must remain the case in the future EU budget. However, EU level funding should go to the best projects - both in economic and sustainability terms - and not be entirely geographically restricted. As proposed by Enrico Letta, Member States should allocate a fixed percentage of national State Aid to an EU fund. An additional 5% to 15% contribution could generate between €8.5 billion and €51 billion annually, supporting green industrial projects and a just transition all across the EU and enhancing EU competitiveness.

1. State Aid as one part of the financing toolbox

This report is written in the context of the EU's emerging Clean Industrial Deal. We explore how Europe can effectively support its cleantech industry by reforming State Aid rules. These rules define the conditions under which EU Member States can subsidise companies.

Commission Vice-President Teresa Ribera is tasked to *"develop a new State aid framework to accelerate the roll-out of renewable energy, to deploy industrial decarbonisation and to ensure sufficient manufacturing capacity of clean tech. This should build on the experience of the Temporary Crisis and Transition Framework and preserve cohesion objectives. Strong State aid control continues to play a key role to address market failures while avoiding inefficiencies in public spending."*

While the EU leads globally in deploying renewable energy technologies and adopting products like electric vehicles, production remains concentrated outside Europe, particularly in Asia - especially China - and the U.S. Addressing this challenge is central to the Clean Industrial Deal.

State Aid is a critical tool in this context but cannot succeed in isolation. Private investment must be incentivised through smart, coordinated policies in areas such as climate, energy, procurement, trade, skills, permitting, capital markets and insolvency.

State Aid in the EU has traditionally been assessed with the goal of minimising distortions in the internal market and ensuring a level playing field across Europe. While this objective remains important, the EU is now operating in an increasingly turbulent global environment.

Key competitors like China and the U.S. have implemented policies designed to create external distortions - prioritising competitive advantages for their domestic industries over those in other regions. China has long pursued such strategies, while the U.S. has significantly escalated its efforts with the Inflation Reduction Act (IRA), bolstering its "Made in America" agenda on a massive scale.

This new reality increasingly challenges the old principles of open markets. In response, Europe could adopt a strategy of "Make Europe, Buy Europe, Protect Europe". "Buy Europe" entails policies that favor purchasing local goods, for instance through public procurement and incentive rules. "Protect Europe" means trade measures, making imports more expensive relative to domestic manufacturing, to safeguard EU industries from external competition. This approach seeks to strengthen Europe's industrial base and resilience in the face of intensifying global competition.

This report focuses on "Make Europe": boosting the supply of EU-made cleantech products, such as batteries, through targeted and strictly conditional State Aid measures.

State Aid spending in the EU has surged since the COVID-19 pandemic, doubling from an average of 1% of EU GDP in 2019 to over 2% in 2020 and 2021 (€320.22 billion in 2020, or 2.39% of EU GDP).

The report does not focus on debates around whether there should be more or less State Aid and whether funding should come from the EU or national governments. Instead, the report focuses on the design of State Aid mechanisms: regardless of the amount allocated to support cleantech manufacturing, the key question is whether the funds are spent wisely and effectively.

To illustrate the proposed policies, we highlight examples centered on battery manufacturing - the largest cleantech product by revenue and a strategic cornerstone across multiple sectors, including transport, energy, space, and medtech.

The report provides recommendations to enhance State Aid by making it:

- More effective - Stimulating innovation in Europe.
- More efficient - Achieving more with less.
- Fairer - Ensuring equal treatment across companies and countries.
- More transparent for businesses - Clearer eligibility criteria.
- More transparent for citizens - Enabling public scrutiny and tracking of recipients and effectiveness

Public support for cleantech: the manufacturing gap

The Draghi report estimates that public funding for cleantech manufacturing in Europe is only €1 billion a year, a small fraction of the total available funding. The European Commission provides an assessment of allocations under various programs in the 2021-2027 EU budget, summarised in Figure 1.

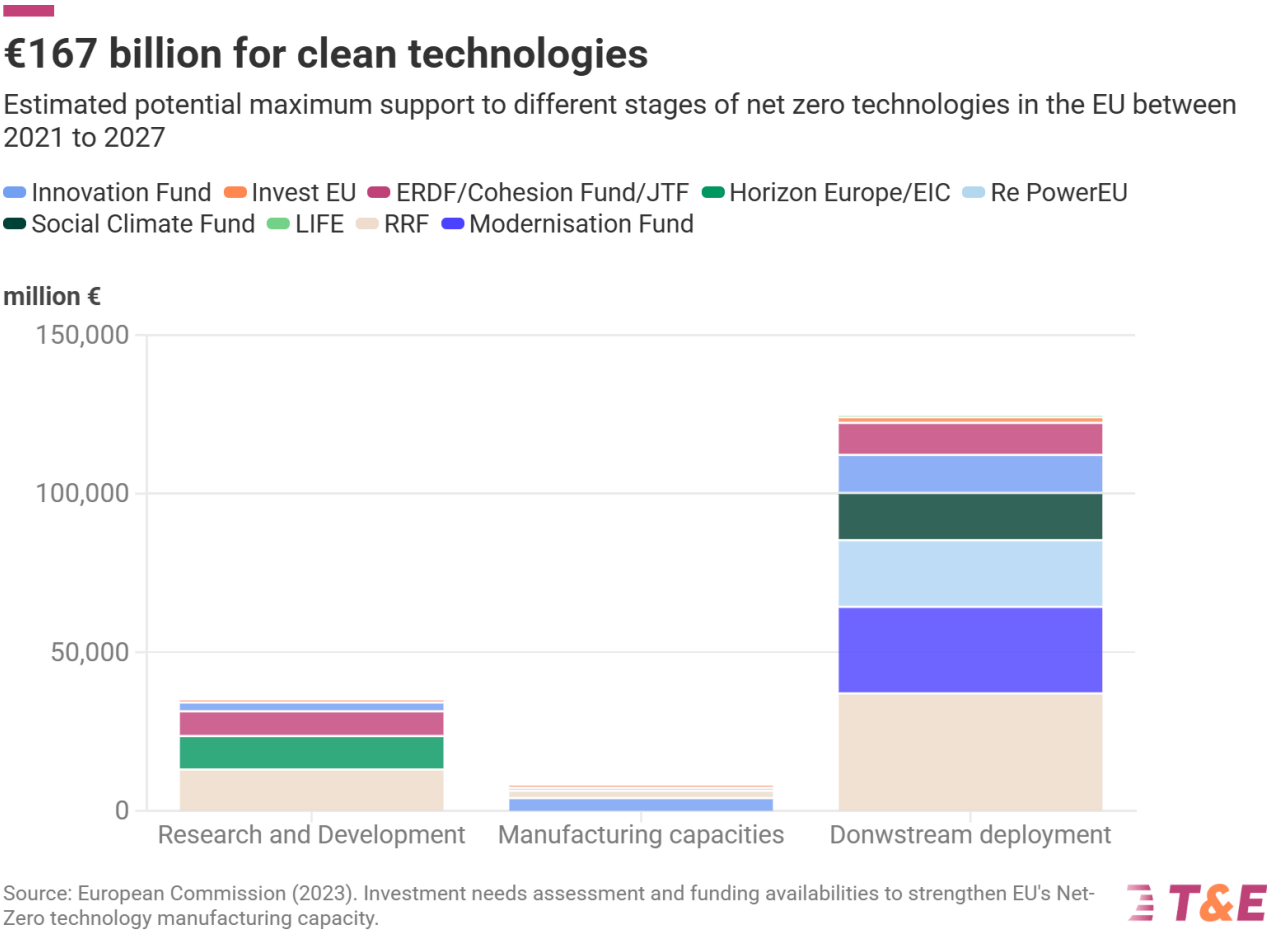


Figure 1: estimated maximum support to clean technologies.

EU-level funds allocate €24 billion per year to net-zero technologies, representing about 25% of total EU spending in this area. This funding is fragmented and primarily directed toward upstream R&D (up to €5 billion per year) and downstream deployment of technologies (up to €18 billion per year).

However, scaling up manufacturing and reshoring remains largely underfunded, with only €8 billion potentially available for first-of-a-kind installations and production plants, out of a total of €167 billion. Just €1 billion per year (around 5% of EU net-zero funding) is likely to support manufacturing directly.

Only one-third of net-zero funding is centrally managed at the EU level (e.g., InvestEU, Horizon, Innovation Fund, Modernisation Fund). The largest funding sources (e.g., regional and cohesion funds, Social Climate Fund, Recovery and Resilience Facility - RRF) are spent nationally, on the basis of national and regional plans. The Sustainable Technologies for Europe Platform (STEP), established in 2024, has re-directed €6 billion from regional and cohesion funds to the strategic objectives of STEP, potentially increasing support to cleantech manufacturing.

In contrast, the U.S. IRA has significantly boosted investment in cleantech manufacturing. Estimates vary, but investment has at least doubled or even quadrupled as a result. See Annex 3 for a summary of key IRA provisions.

Fossil fuel subsidies in the EU dwarf cleantech manufacturing support

In its latest annual report on energy subsidies in the EU published in October 2023, the European Commission estimates that energy subsidies in 2022 reached a record level of €390 billion - compared to €200 billion in 2021. Subsidies were split roughly evenly between fossil fuels and renewables. The 2022 spike was largely due to compensation for high gas prices following Russia's invasion of Ukraine. Over 90% of renewable energy subsidies have historically been spent on energy generation, deployment and consumption - not R&D or manufacturing.

Despite growing EU investment in net-zero technologies, funding remains fragmented and heavily focused on innovation and deployment rather than scaling up manufacturing. This contrasts sharply with the significantly higher support for fossil fuels, highlighting the need for a more strategic approach to cleantech industrial policy.

2. Batteries in Europe - production and aid

This chapter evaluates the current state of Li-ion battery manufacturing in Europe. A recent EU Joint Research Centre (JRC) report offers an updated analysis of Europe's battery production landscape.

Still, only a few EU Member States disclose data on the value of Li-ion battery production. This lack of transparency makes it challenging to assess the full scale of the industry across Europe. However, the available data show that the Samsung and SK On facilities in Hungary account for approximately one-third of the total production value in the EU.

These findings are further supported by data from the International Energy Agency (IEA). According to the IEA, Hungary was responsible for nearly 30% of the EU's total battery production in 2023, which amounted to 110 GWh, representing around 15% of the global market. The report also highlights that Poland contributes roughly 60% of the EU's battery production, which largely explains the data gap in the JRC report.

- In 2022, the EU was approximately 50% self-sufficient in battery production, with China supplying nearly all imports.

- Within the EU, battery manufacturing remains heavily concentrated among three South Korean firms - LG, Samsung, and SK On - which are based in Poland and Hungary and account for nearly 90% of total domestic production. LG's Wroclaw plant in Poland alone produced 65 GWh, making it one of the largest battery factories in the world.
- According to the JRC report the combined global production of LG, Samsung and SK On reached 184 GWh. According to a Korean market research firm, the total is 163 GWh. This suggests that around half of total Korean battery production takes place in the EU.
- Meanwhile, Western Li-ion battery manufacturers have only recently begun ramping up production. Currently, only about 5% of Li-ion batteries consumed in Europe are produced by European companies. In 2023, non-Asian companies produced just around 10 GWh, highlighting the dominance of Asian firms in the European battery market.

T&E estimates based on these publicly available sources are summarised in Figure 2.

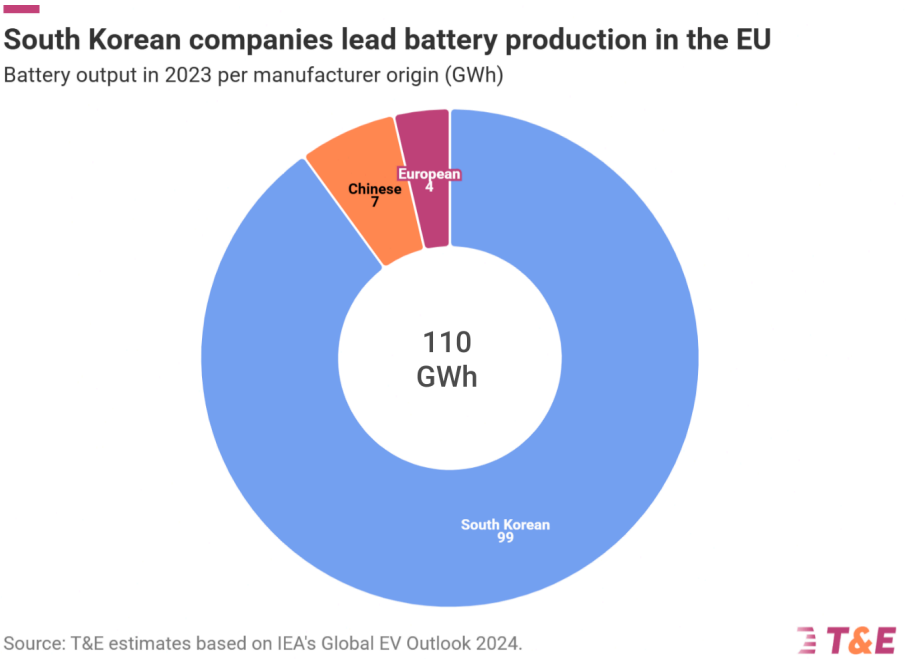


Figure 2: battery production in the EU is largely in the hands of Asian companies.

State Aid for non-European actors

Given that the vast majority of battery manufacturing in the EU is controlled by non-European companies, we examined whether State Aid has played a role in supporting these investments. Table 1 below presents an overview of State Aid approvals and ongoing procedures, including cases where no public decision has yet been announced. This information provides insight into how national governments are using public funds to attract and support battery manufacturing within Europe.

State Aid support for non-European battery makers in the EU

Approved Under consideration

Status	Date	Recipient	Amount	Legal basis
Approved	June 2021	SKBM, Hungary	€90m	Regional Aid
Approved	March 2022	LG Chem, Poland	€95m	Regional Aid
Approved	March 2022	SKBH, Hungary	€209m	Regional Aid
Approved	February 2023	Samsung, Hungary	€110m	Regional Aid
Approved	August 2023	ProLogium, France	€1500m	R&D&I
Under consideration		BYD, Hungary	€240m	Presumably TCTF
Under consideration		CATL, Hungary	€800m	Presumably TCTF
Under consideration		CATL/Stellantis, Spain	€205m	Presumably TCTF
Under consideration		Gotion/Inobat, Slovakia	€214m	Presumably TCTF
Total			€3463m	

Source: T&E, based on publicly available information

T&E

Table 1: overview of State Aid approvals and ongoing procedures.

Over the past four years, the European Commission has approved approximately €2 billion in State Aid for Asian battery manufacturers. All current Korean battery factories in the EU have received State Aid under Regional Aid, totalling around €0.5 billion. Additionally, €1.5 billion in State Aid has been approved for Prologium, a Taiwanese manufacturer.

New non-European battery production plants announced are mostly from China. The European Commission is considering additional €1.4 billion in subsidies for Chinese companies, some of which involve joint ventures with European firms. This highlights the significant level of public support allocated to non-European battery players.

The public documents available regarding these allocations do not specify any conditions related to European control, Made-in-EU requirements, or Intellectual Property (IP) for disbursing the aid. This lack of stipulations raises concerns about the long-term benefits of such investments for European industries and whether the EU's strategic interests are being adequately safeguarded in these funding agreements.

For context, the Commission has approved around €6 billion in aid for European companies under the Important Projects of Common Interest (IPCEI) framework. Additionally, €660 million has been allocated to Verkor in France, €900 million for Northvolt Germany - now in doubt - and a €1 billion funding call for battery projects has been launched in December 2024 under the Innovation Fund. In total this amounts to €8.5 billion in budgetary allocations - not actual disbursements - for European companies.

3. Five possible frameworks for a battery plant

The EU Treaty's core principle is that State Aid is prohibited, except for the exceptions in Article 107.3 TFEU. This article grants the European Commission significant discretion to approve aid that promotes economic development, supports disadvantaged regions, funds important projects of common European interest, or fosters specific economic activities without distorting competition against the common interest.

Article 108 TFEU empowers the Commission to block or revoke aid deemed incompatible with Article 107. The Council can override this only by unanimous decision.

The Council also holds exclusive authority to approve State Aid regulations, requiring unanimity, while the European Parliament is merely consulted (Article 109 TFEU). This applies to the core Council Regulation on State Aid (2015/1589), which governs how Member States notify the Commission.

The Treaty and Council regulations allow flexibility in State Aid rules. In practice, the Commission has broad authority to issue guidelines across policy areas. While these guidelines are unilateral Commission documents without formal Council or Parliament involvement, Member States are typically consulted to ensure political backing.

Over time, the Commission has developed numerous guidelines detailing approval criteria for State Aid. This chapter examines the fragmented landscape relevant to cleantech manufacturing, focusing on five key frameworks - summarised in Table 2 - for a hypothetical battery cell production facility: Regional Aid, R&D&I, IPCEI, TCTF and Innovation Fund.

State Aid guidelines for cleantech manufacturing

✓ Yes ✗ No

State Aid framework	Incentive effect	Funding gap	Clawback	Basis for Aid	Lowers Op-Ex	Link to performance	Distinction between EU and other companies
Regional Aid	✓ Counterfactual	✓ Positive NPV	✓ If job and spending criteria not met	— % of Cap-Ex	✗	✗	✗
IPCEI	✓ Counterfactual & funding gap	✓ Negative NPV	✓ If NPV funding gap appears wrong ex post	— Funding gap	✓ (labour & materials)	✗	✗
R&D&I	✓ Counterfactual	✓ Negative NPV	✓	— % of eligible costs	✓ (labour & materials)	✗	✗
TCTF Article 85	✓ Member State at programme level	✗	✗	— % of Cap-Ex	✓ (labour & materials)	✗ Lump sum payment	✗
TCTF Article 86	✓ Counterfactual investment abroad & funding gap	✓ Negative NPV	✗	— Lump sum based on funding gap	✓ Yes Payments to close subsidy gap	✗ Lump sum payment	✗
Innovation Fund	✓ Funding gap	✓ Negative NPV	✓ If <75% of planned GHG reduction achieved	— Lump sum based on funding gap		✗ Lump sum payment	✗ Except for entities on sanctions list

Source: T&E

Table 2: a summary of State Aid guidelines for cleantech manufacturing.

Option 1: Regional Aid

A battery plant located in an "assisted region" may qualify for support under Regional Aid rules. These guidelines set the framework for industrial investment aid, which is granted at the national level following notification to the European Commission.

Aid is calculated as a percentage of Cap-Ex, ranging from 3.4% for large investments by major companies in the least disadvantaged regions to 40% for smaller SME investments in the poorest areas.

To qualify, companies must demonstrate an incentive effect - proving that the prospect of State Aid was a decisive factor in the investment decision:

- Scenario 1 (Investment Decision): Aid must shift the Net Present Value (NPV) from negative to positive.
- Scenario 2 (Location Decision): The company must provide extensive documentation proving that available aid in the assisted region was the key factor in site selection, flipping the NPV in favor of that location. Aid cannot exceed the “missing” NPV.

Projects must also be economically viable, meaning they must show a positive NPV, unlike other aid frameworks that focus on a "funding gap" justification.

Additionally, projects must last at least five years and create jobs. For example, under German guidelines, an investment must generate at least one permanent job per €0.75 million, equating to approximately 1,300 jobs per €1 billion invested.

The amount of aid is relatively predictable, as it is a fixed percentage of Cap-Ex. The main uncertainty lies in whether the Commission finds the documentation on the incentive effect convincing. Since companies do not typically generate such records in the normal course of business, they must be specifically prepared in advance during the decisionmaking process with the aid application in mind - posing a greater challenge for newcomers than for established firms.

Option 2: R&D&I framework

The R&D&I framework has only recently become relevant for battery plants. Before its 2022 revision, it focused on smaller-scale development projects. The update introduced aid for "*the construction and upgrade of testing and experimentation infrastructures*", covering facilities, equipment, pilot lines, test beds, and related support services. This is a significant shift, as the Commission can now approve large-scale facilities under R&D&I.

Compared to IPCEI, this framework is less restrictive:

- It operates independently, without enforced cross-border cooperation.
- It does not require projects to be a "*global first-of-its-kind*".
- It avoids mandatory large-scale dissemination activities.

At the same time, it allows high levels of subsidization, including Op-Ex, as personnel and material costs are eligible. It also permits full Cap-Ex subsidisation, stating that publicly co-funded testing and experimentation infrastructures can receive up to 100% of eligible investment costs.

France has leveraged this framework to support battery projects, granting up to €1.5 billion for ProLogium and €660 million for Verkor - the only two large-scale projects publicly known to have been funded under the revised framework.

Option 3: Temporary Crisis and Transition Framework (TCTF)

In response to rising global competition in cleantech, particularly the U.S. IRA, the European Commission launched the Green Deal Industrial Plan in 2023 to boost domestic clean technology production. A key pillar of this plan was relaxing EU State Aid rules. In March 2023, the Commission adopted a revised Temporary Crisis and Transition Framework (TCTF) and amended the General Block Exemption Regulation (GBER) to accelerate and expand funding for net-zero industrial value chains.

These changes targeted sectors crucial to Europe's climate transition and most at risk from the IRA, including wind turbines, batteries, solar panels, heat pumps, and green hydrogen. The TCTF also supports the manufacturing and recycling of key components and critical raw materials.

Sections 2.5 to 2.8 of the TCTF are the most relevant for transport decarbonisation, particularly section 2.8 which governs "*Aid for accelerated investments in sectors strategic for the transition towards a net-zero economy*".

Article 85 in section 2.8 of the TCTF is designed to mirror the IRA Section 48C, simplifying investment aid for projects under €1 billion. It allows Member States to submit umbrella programs that, once approved by the Commission, enable 15-35% Cap-Ex contributions to strategic sectors without requiring individual project notifications.

This program-level approval can be seen as a "stealth" extension of the GBER. Unlike under other frameworks, companies are not required to prove funding gaps or business cases, nor do they face clawback risks, as long as individual project Cap-Ex remains below €1 billion.

Since its introduction, Article 85 has triggered over €14 billion in national applications, with major submissions from Germany (€3 billion), France (€2.9 billion), Italy (€1.1 billion), Spain (over €3 billion), Hungary (€2.4 billion), and Slovakia (€1 billion).

Article 86 in TCTF Section 2.8 is designed to mirror the U.S. IRA Section 45X production credits, allowing aid up to the level of subsidies available in another jurisdiction - primarily the U.S.

This marks a major shift in EU State Aid policy, as it is the first time the Commission has explicitly justified aid to address distortions of competition caused by foreign subsidies. As former Commission Vice-President Margrethe Vestager put it: *"If a company is offered $1 billion by a third country to support, for instance, a new battery plant, a Member State could offer the same, up to the funding gap."*

However, Article 86 is far from matching 45X in practice. Eligibility requires extensive justification, particularly proving a "*funding gap*" and a "*counterfactual*" scenario - i.e., demonstrating that the investment would otherwise go to the U.S. unless subsidized by the EU. This demands a carefully constructed case supported by internal documentation.

Unlike IRA 45X, which provides per-unit production credits rather than fixed grants, Article 86 aid is granted as a lump sum. So far, the only known example of Article 86 being used is a €0.9 billion subsidy for a Northvolt facility in Heide, Germany. The Commission decision on this aid indicates that:

"NV [Northvolt] calculated the expected amount of this tax advantage for this investment, based on the guidance of the relevant legislation and the guidance provided by two consultancy firms. The calculation, including the assumptions made by NV, was then validated by an independent expert. The benefit of the IRA tax advantage is basically calculated by multiplying net sellable capacities in kWh by USD 35, as laid down by the IRA." … "As regards that last form of IRA benefit (tax credit sold to other taxpayers), NV assumed, on the basis of a [name of the independent expert] benchmark, that it would only be able to sell the IRA credits at 80 % of their value. It also assumed, on the basis of actual negotiations with clients, that only […] % of the value of the IRA benefit would be actually captured by NV, whereas […] % would be passed on to customers (not in the form of a price reduction as such but as a direct payment)."

This shows that the €0.9 billion subsidy for Northvolt's Heide facility is a lump sum based on a series of company assumptions and opinions by hired external entities, not tied to actual output or performance, as IRA 45X does. This makes TCTF Article 86 a flawed attempt to mimic IRA 45X. It does not address the EU's key competitiveness issue: that the: U.S. and China have a significantly lower marginal cost of cell production.

Option 4: IPCEI

IPCEI was the first set of State Aid guidelines to allow funding for large-scale facilities, with an update to the 2014 rules in 2021. Key criteria include:

- Funding eligibility for "*first industrial deployment*", covering large and first-in-kind facilities (e.g., scaling up pilot or demonstration plants).
- Funding can cover up to 100% of the funding gap.
- Incentive effect demonstrated through a "funding gap".
- Eligible costs include Op-Ex (labor and materials).
- Mandatory cross-border participation.
- Clawback provisions apply.

The "*first-in-kind*" concept, unique to IPCEI, remains undefined but is generally understood to mean a global first in its category. This presents two key issues:

- The EU is not a leader in many cleantech sectors, yet IPCEI requires projects to be unprecedented - "merely" catching up with the global state-of-the-art is not sufficient.
- Every project has at least some first-in-kind elements, making the determination of whether a project qualifies ultimately a political decision.

This first-in-kind criterion reportedly contributed to Tesla withdrawing its large application for the Brandenburg cell facility in 2021, as the company was simultaneously building a similar facility in Austin, Texas. Perhaps drawing lessons from this episode, the EU Chips Act, adopted after the COVID-related semiconductor crisis, eliminated the global first-in-kind requirement, replacing it with a European one.

Total funding committed under IPCEI exceeds €37 billion, with half allocated to the four hydrogen IPCEIs (see Annex 1). About 16% of this funding supports the two battery IPCEIs, amounting to approximately €6 billion in public money (€3.2 billion and €2.9 billion) - less than €1 billion per year over the lifetime of the two projects. Funding is sourced from national budgets, with Member States also allowed to use RRF funds for IPCEI.

Despite the significant public money involved, there is no data to assess whether IPCEIs are successful, or even on track. For example, while there are four hydrogen IPCEIs, public announcements of final investment decisions in the hydrogen sector are scarce, suggesting progress is patchy. Additionally, it remains unclear whether the allocated funds have been disbursed as intended and, whether projects are executed as intended, let alone the link between the two.

Option 5: Innovation Fund

The European Commission has introduced a fifth option through the call for proposals of the Innovation Fund for battery projects in December 2024. While not strictly an aid guideline, the call documents and cost methodology align closely with State Aid guidelines, notably the use of a "*funding gap*" to justify the aid request. Further award criteria are "*degree of innovation*", "*GHG emission avoidance potential*", "*manufacturing carbon footprint reduction*", "*project maturity*", "*replicability*", "*security of supply and countering dependency*", and "*location of the project*" - without clarity in advance on which locations are favoured. As with other funding options, the conditions are ambiguous and not clearly defined in advance.

Shared characteristics of EU State Aid rules for cleantech manufacturing

- Project-specific: All guidelines are based on individual projects by companies, not sector-wide or performance/output-based.
- Lack of transparency: Since no information is made public post-notification, it is delicate to assess the success of the aid.
- All programmes allow Cap-Ex subsidies, and all except Regional Aid allow Op-Ex subsidies - labour and materials.
- Cumbersome application process: The process begins with a project outline and involves multiple refinement steps leading to a final proposal.
- Most frameworks, except for Regional Aid, calculate aid based on the "funding gap", which intends to prove an incentive effect but is more likely to encourage corporate rent-seeking instead, given the impossibility of anticipating years in advance the costs and revenues of manufacturing projects. And even if such a calculation is possible, basing subsidies on the funding gap means the less cost efficient a project is, the more subsidy it receives?
- External competitiveness: Only TCTF Article 86 addresses external competitiveness, but in a convoluted way.

Contradictions and current issues

- Incentive effect. Some guidelines require individual projects to prove the incentive effect, others require it at the programme level, and some do not require it at all.
- Business case. Most guidelines require proving a negative business case to demonstrate the funding gap, while Regional Aid requires demonstration of a positive business case to show economic viability.
- Clawback. Some frameworks have clawback provisions if the business case improves or unforeseen events occur, while others do not.
- Scale-up frameworks: IPCEI and R&D&I frameworks differ significantly. IPCEI imposes strict requirements on cross-border operations, dissemination, and sharing with third parties. The R&D&I framework, covering up to TRL 8, lacks such provisions.

State Aid for cleantech manufacturing is fragmented, contradictory, and cumbersome. This has led to "*framework shopping*", such as France's €2 billion aid to Prologium and Verkor under the R&D&I framework, likely to avoid the stricter requirements of IPCEI.

A recent report of the European Court of Auditors also highlights that *"different conditions may apply for the same measure under various frameworks"*, leading to a complex and inconsistent set of frameworks and guidelines for State Aid in the EU's industrial policy. The Court stresses inconsistencies in market failure definitions, aid intensity, cumulation rules, and the requirement for ex post evaluation.

4. Shortcomings of current State Aid rules

No EU State Aid framework addresses Europe's higher cleantech production costs

Aid amounts are approved on a lump sum basis, unrelated to output or performance. Even TCTF Article 86 - intended to mimic IRA's 45X per-unit subsidy - offers lump sum payment, failing to close the

marginal cost gap with the U.S. and China. While good for balance sheets, lump-sum aid does not improve long-term competitiveness.

A system favoring incumbents

EU State Aid operates project-by-project, requiring extensive negotiations on funding gaps and documentation. This favors incumbent firms with established state aid departments over newcomers unfamiliar with the process. It also disadvantages smaller Member States. Key reasons include:

- Cost and resources: A recent paper by LUHNIP estimates close to €1 million per company just for application support. It leads to exclusion: non-IPCEI participants are all small Member States. Incumbents are better equipped with the necessary legal and consultancy resources to navigate complex rules, while startups struggle with this.
- Time: The prolonged negotiation process - often over two years for IPCEIs - does not match timeframes startups operate in.
- Anti-change bias: Any significant change to the approved plan risks altering subsidy conditions, forcing renegotiation with uncertain outcomes. This favors stable, incumbent companies less likely to alter their strategies, and discourages innovation.
- Unbankability: Incumbents have financial buffers, making the subsidy's unbankability a lesser issue for them, while startups find it a major obstacle.

Flaws in the incentive effect and funding gap approach

EU State Aid guidelines (IPCEI, TCTF, Regional Aid, R&D&I) require proof of an incentive effect - ensuring subsidies only support projects that would not happen otherwise. This is meant to prevent free riders and ensure "additionality" of public funding. In practice, it encourages rent seeking and makes the subsidy unbankable:

- Proving the funding gap is arbitrary - minor changes in assumptions on material cost or revenues can sway the NPV from billions negative to billions positive. For instance, the profitability of a battery plant will largely hinge on battery material costs, market prices, capacity utilisation and scrap rate (% of faulty batteries). All these factors are impossible to predict, even in the short term. The first two are even outside a company's control. This encourages companies to tweak input assumptions so that the NPV becomes strongly negative, justifying a higher subsidy. The funding gap requirement does not avoid free riding, it invites rent seeking instead.
- Even if funding gaps can be calculated accurately, basing subsidies on the funding gap implies that the less cost efficient a project is, the more subsidy it can receive. This is the exact opposite of what is needed to improve cost competitiveness of the industry as a whole.
- Subsidies are determined by political bargaining instead of objective parameters. Some governments will try harder to negotiate down the inflated funding gaps than others, making subsidy levels arbitrary and unpredictable.
- It favours large incumbent firms. For smaller companies and newcomers the process is a mirage.
- Adverse effect: companies that can afford to live with unpredictable subsidies will still apply, while those that truly need certainty may avoid the process. The subsidy is not bankable and cannot be integrated into business decisions, meaning companies cannot rely on it when planning their projects. Those who are less reliant on the subsidy, again often larger incumbents, are more likely to undertake the project.

The result is a convoluted system where politics, instead of economic need, dictates subsidy allocation.

A virtual scenario for battery aid

Two companies apply for State Aid to build similar 50GWh battery plants, each with a projected €100 billion lifetime NPV of revenues.

- Manipulated funding gaps: One company has a less efficient manufacturing process and may inflate its funding gap to €10 billion, while another includes important process improvements that reduce cost and hence estimates only €1 billion.
- In a State Aid negotiation, the company has an incentive to present an NPV template with a high funding gap, hence a strongly negative business case. Conversely, the European Commission typically sees its role as minimising distortions of competition and is hence incentivised to argue the counter case. Member States are standing in between: they support the project but want to keep subsidy levels manageable.
- Subjective decision-making: The European Commission and national governments negotiate subsidies with no fixed criteria, leading to unpredictable outcomes.
- Political influence: Despite identical projects, final aid amounts are highly likely to differ because they depend on political judgment and negotiation.

Opaque and unpredictable actual subsidy payments

Once approved - often after years of negotiation - actual aid disbursement remains unclear:

- Complex and rigid project plans: Proposals can span hundreds of pages with KPIs, benchmarks and cost breakdowns, but real-world execution will always be different from this plan.
- Unclear payment triggers: No defined criteria determine when deviations from the plan or missed KPIs impact subsidy payouts - leaving decisions to political discretion once more.
- A transparency black box: Payment details and project performance are rarely disclosed, making it impossible to track whether subsidies achieve their intended goals, and for citizens and Parliaments to evaluate the impact of public funds. State Aid agreements for individual companies and projects are highly confidential, resulting in significant opacity. Only the initial approval document is made public, which outlines maximum subsidies based on company plans, leaving execution and disbursement unclear.

IPCEI partnerships: implicit discrimination between insiders and outsiders

IPCEIs are built on mandated cooperation between designated EU companies, involving a complex web of partnerships between countries and companies. But this top-down designation of inside partners raises concerns:

- Distorted competition: IPCEI de facto assigns privileged partners, creating unfair advantages towards companies outside the system and fostering rent-seeking behaviour by protected inside partners.
- Unclear rules: The guidelines do not specify whether switching to a non-IPCEI partner affects subsidy payments, leaving companies in limbo.

- Political decision-making: A company seeking a more competitive partner - whether from another EU country or outside the EU - has to ask permission on a case by case basis in order to keep its subsidy, adding political slowing innovation and adding risk.

This ambiguity makes IPCEIs inefficient, uncertain, and prone to favouritism and rent seeking, compromising their intended goal of fostering European industrial leadership and innovation.

The think tank Bruegel highlights that there is no public tender before an IPCEI, benefiting incumbents over disruptors. Moreover, throughout the process, detailed project information, performance metrics, and subsidy payments are not made available, exacerbating the lack of accountability and transparency.

A 2021 paper by 11 EU Member States - but excluding the countries disbursing most State Aid, namely Germany, France or Italy - highlighted this as well: *"There is a risk that a proliferation of IPCEIs will lead to a less dynamic and less competitive economy in the EU. This brings along the risk of further widening the economic disparities between Member States, creating unequal access to IPCEI initiatives as well as increasing national debt levels." "Clarification is needed in order for the legal requirements to be clear to participants and nonparticipants alike".*

Clawback provisions can be a punishment for success

IPCEI and R&D&I frameworks allow subsidy clawbacks to prevent companies from receiving excessive aid, but the rules are vague and inconsistent, creating unpredictability, discouraging efficiency and innovation:

- Unclear criteria: Subsidies can be reclaimed if market conditions improve unexpectedly - such as lower material costs or higher product quality, for instance a scrap rate lower than expected.
- Distorted incentives: Companies performing better than projected in the business case may lose their funding, while underperformers may keep theirs. This represents punishment of success.

This is all a consequence of basing payouts on unclear criteria. It is much better to use objective metrics: either output-based payments as in IRA 45X, or a fixed Cap-Ex based subsidy (e.g., 30%).

Recommendations: State Aid 2.0 - Clean, lean, European

New State Aid guidelines for clean manufacturing

EU State Aid rules are insufficient to support cleantech manufacturing. None of the five existing cleantech frameworks were designed with manufacturing in mind. To address the scale of the challenge, a new, dedicated framework for cleantech manufacturing is essential. Minor amendments to existing frameworks, such as TCTF Articles 85 and 86, would not be enough.

1	Base funding on measurable ex ante criteria
2	Support products, not projects
3	“Made in EU” requirements for manufacturing of end products
4	For supply chain: bankable Cap-Ex support with local control
5	Flexibility and swift adaptation to external circumstances
6	Creating synergies between national and EU-level public funding

1. From company-by-company to sectoral approach: base funding on measurable ex ante criteria, not business cases and funding gaps

Cleantech manufacturing companies should have clear, upfront knowledge of the funding available for specific activities, without the need for complex negotiations to prove how unviable a business case is. The current system, intended to prevent free riders, fails to achieve this and instead fosters rent-seeking and allocates funding to the least cost efficient projects.

A company should be able to easily predict the public money available for performing certain activities, making the aid bankable and effective. Predictability can be achieved through performance-based payments for cleantech end products or a fixed share of Cap-Ex for the supply chain. Europe should adopt a bankable, sector-wide approach, rather than a company-by-company, project-by-project system.

2. For manufacturing of end products: support products, not projects

The EU should follow the IRA's example, like Article 45X, and base support for net-zero technology manufacturing on actual product output rather than project proposals. This approach offers several advantages:

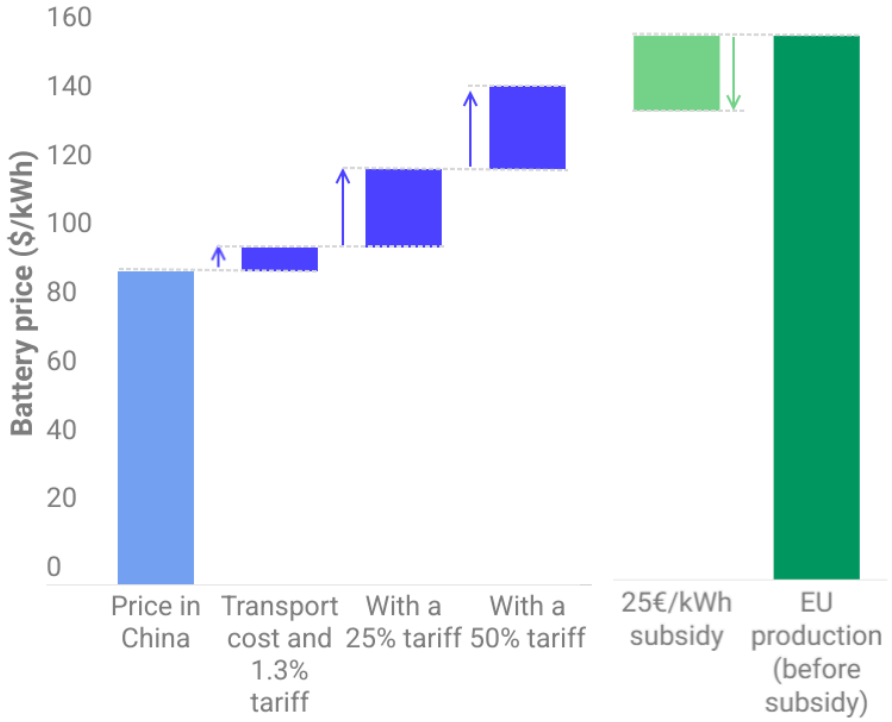
- It directly tackles the problem that EU cleantech production is often more expensive than in China and the U.S.
- Limited taxpayer risk: With output-based support, aid is only given for successful outcomes, while the company - and banks, venture capital funds - assumes the risk of failure.
- No ambiguity or negotiations: Mitigates opportunities for favoritism or corruption.
- Bankable for industry: A predictable revenue model tied to actual production incentivises companies and maximises additionality. This system rewards the most efficient companies, while traditional cost-based subsidies favor the most costly ones.
- Transparency for companies, citizens, and Parliaments alike.
- No artificial processes: Removes the need for proving incentive effects, funding gaps, or business cases, encouraging new companies to participate.

The European Commission should establish clear, simple criteria for output-based support for net-zero technologies. For example:

- Up to €25/kWh for battery cells, reducing over time, and a €5/kWh bonus for battery packs. The credit could be higher for ultra high-density batteries to encourage technology breakthroughs for instance for aviation, space and the medical sector.
- Similar structured incentives for heat pumps, solar PV, wind turbines, green hydrogen, and other key net-zero technologies.

Coupled with tariffs on the imports of batteries produced in China, output-based support for "Made-in-Europe" batteries would bring down the price of EU-produced batteries close to the price of lithium-ion batteries produced in China. The cost gap does not have to be zero, since many benefits of onshoring exist including resilience, proximity to market and lower risks from transport hurdles or geopolitical tensions.

Comparison of made-in-China and made-in-Europe battery price



Source: T&E analysis of BloombergNEF's battery price survey 2023 and 2024

Some EU-level programmes already follow best practices in bankability, clear upfront criteria, and payment for results:

- The Alternative Fuels Infrastructure Facility (AFIF) under the Connecting Europe Facility funds charging points based on actual performance (€20-30k "unit contribution" per point installed along the TEN-T network), making previously unviable locations viable.
- Contracts-for-Difference (CfDs) support renewable electricity by paying the difference between the market and strike price, ensuring predictable revenue for investors based on the amount of electricity produced.

These models do not require proving an incentive effect or clawbacks. The penalty for underperformance is simple: less subsidy.

3. "Made-in-EU" requirements for manufacturing of end products

When the EU supports cleantech manufacturing (battery cells, packs, heat pumps, wind turbines, etc), it must set clear conditions on where products are made, controlled, and used.

Local control: State Aid should only be available to companies under the ultimate control of EU entities. The IRA sets a 25% foreign control limit and excludes "foreign entities of concern" in its Section 30D consumer credits, but not in Section 45X production credits. If the EU includes such local control criteria in its aid guidelines, it can be more effective than the IRA.

It is key for the EU to develop an EU-wide comprehensive framework on foreign direct investment (FDI), including majority local ownership and decision-making rules, local workforce and supply chain provisions, and requirements on intellectual property (IP) and manufacturing expertise. It is especially crucial to ensure majority control for EU-based companies within a joint venture (JV), with preference for 100% locally owned licensing deals. Majority control should apply to all key aspects of governance, including decision-making, voting rights and product strategy.

Local content: State Aid should require stringent "Made in EU" rules, ensuring batteries - and electronics - contain a growing share of domestically sourced materials.

Preferential Trade Agreements, like the EU-UK Trade and Cooperation Agreement (TCA), rely on strict Rules of Origin, in the TCA case particularly for EVs and batteries. Similarly, the IRA's Section 30D defines how local content is measured. The EU can build on these frameworks to ensure its manufacturing subsidies support a resilient, locally anchored cleantech supply chain.

Unlike the IRA, which ties local content rules only to consumer incentives (30D) and not to production credits (48X), the EU can directly apply them to production subsidies, ensuring a direct and effective transfer of incentives throughout the supply chain.

The EU could leverage "Made in EU" rules for strategic "friendshoring," aligning with its international raw materials partnerships. Like the IRA, which includes Free Trade Agreements (FTA) countries in local content rules for battery materials, the EU could adopt a similar approach or use it to strengthen critical raw material agreements with key partners.

Additionally, "Made in EU" rules on end products would encourage strong bottom-up cooperation and competition in the cleantech supply chain, as customers would need EU content to qualify for aid.

Local sale and use: The EU could require that only net-zero products sold and used within the EU receive production subsidies.

This approach has four key advantages: it reduces costs, avoids State Aid serving as an export subsidy in disguise, ensures EU taxpayer money stays within the region, and lowers the risk of retaliation from third countries because their markets are not distorted.

4. For supply chain: bankable Cap-Ex support with local control

The European cleantech supply chain would indirectly benefit from production credits for the manufacturers of end products it supplies to, meaning that manufacturers of local battery materials and components may not need additional support.

Still, to accelerate and de-risk investment in the supply chain (e.g., cathode manufacturing, battery materials, inverters), a simple programme could grant a fixed percentage, such as 30%, of Cap-Ex support for predefined cleantech investments.

This mirrors IRA 48C and is close to TCTF Article 85, but is more automatic because it does not depend on a member state programme. Companies should not be allowed to cumulate production credits and Cap-Ex support to avoid further distorsions. No additional local content and use rules would be required as they would already be covered by end-product regulations. Local control, however, should remain a key condition for receiving support in order to maximise spillovers.

5. Flexibility and swift adaptation to external circumstances

The EU can refine its cleantech support programme to make it more effective and cost-efficient compared to the IRA, without increasing complexity. Key adjustments could include:

- Refine production credits to partly depend on volumetric and gravimetric energy density, to give clear incentives for high-end cell manufacturing for strategic sectors like aviation, space or medical applications.
- Limit cumulative support per company to ensure startups have a fair chance.
- Phase out support per unit over time, to encourage rapid action.
- Phase out support if other regions follow suit, promoting a global subsidy phaseout.
- Restrict support to products sold and used in the EU only.

6. Creating further synergies between national and EU-level public funding

The purpose of this paper is not to delve into specific financing models, but rather to examine how funds are allocated. However, potential funding sources to support manufacturing in Europe could include:

Shifting focus from renewables deployment and usage toward manufacturing. The costs of cleantech are rapidly lowering. Solar panels are now below €0.10 per watt - a 95% decrease since 2010. Battery packs for EVs have dropped below €100 per kWh, long expected to be only reached by 2030, meaning battery pack costs for a medium-sized EV have halved to €5,000. Price parity between BEVs and ICE vehicles is within reach. As the need to incentivise deployment reduces, supporting EU manufacturing becomes more feasible.

Halting fossil fuel subsidies. EU member states still spend around €100 billion a year on subsidising fossil fuels and general use of energy. Although State Aid rules have made progress in reducing support for fossil energy, they are still not fossil free - especially fossil gas projects can still qualify for substantial aid in various forms. Redirecting these funds could accelerate the transition to cleaner, more sustainable technologies.

Wider import duties on oil and oil products. EU tariffs for mineral fuels and oils sit between 0 and 5%. The current import duties for petrol and diesel are 3.5% and 4.7% respectively. There is policy space. Bound tariffs for crude oil range from 0.7% to 1.7%, but the actual rate is zero.

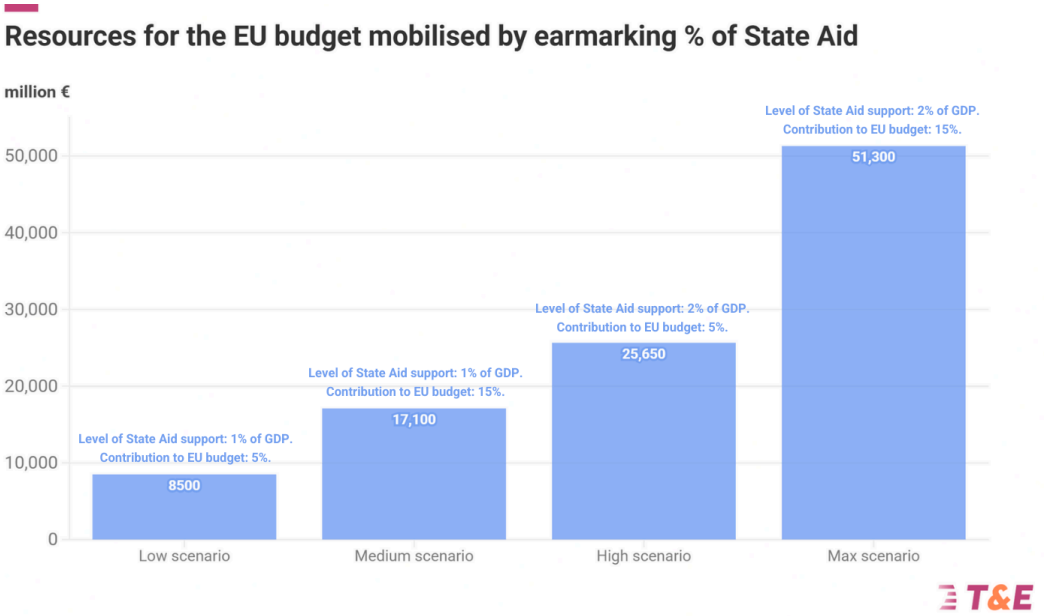
A modest 1.7% import duty on crude oil could generate around €3 billion annually. This would help close the price gap between fossil and clean energy, and potentially capture windfall profits from oil-producing nations if applied selectively. Additionally, it aligns with the objectives of the Energy Tax Directive without requiring unanimity in the Council.

Using revenues from EV import duties. The new EU Chinese EV import duty is expected to raise approximately €3 billion a year based on 2023 sales. If imports reach 1 million EVs, this figure could double to €6 billion, excluding possible future duties on batteries. For comparison: total revenue from customs duties in 2023 was €24 billion of which 75% goes to the EU budget.

The future State Aid framework should prioritise joint funding mechanisms, enabling the EU to co-finance cleantech projects with national governments. The future European Competitiveness Fund should be at the heart of this effort, providing EU co-financing of industrial policy projects in tandem with the new cleantech manufacturing State Aid framework.

This approach could leverage the EU's fiscal flexibility, encouraging national contributions without violating the Stability and Growth Pact. The new EU fiscal rules exclude the co-financing of EU-funded programs from the monitoring of National medium-term fiscal-structural plans. This can enable Member States constrained by the European fiscal framework to still grow and support the cleantech industry. The fact that 13 National Recovery and Resilience Plans under the RRF support IPCEIs shows the potential for building more synergies between EU-funded projects and co-financing of MS to support green industrial projects. State Aid rules do not benefit all Member States equally. Therefore, it is crucial to design EU-wide solutions, which avoid fragmenting the single market and create economic opportunities for all Member States.

The Letta Report suggests requiring Member States to contribute a fixed percentage of their State Aid allocations to a common EU funding pot. We estimate that an additional contribution ranging from 5% to 15% of State Aid funding could generate between €8.5 billion and €51 billion annually, supporting green industrial projects and enhancing EU competitiveness. The low scenario assumes that the total State Aid expenditures in the EU go back to their average level in the 2010s - 1% of EU GDP - while our high scenario assumes State Aid expenditure accounting for 2% of EU GDP.



Annex 1: Other relevant Aid frameworks for cleantech

General Block Exemption Regulation (GBER)

Since the Lisbon Treaty, the Council Regulation 2015/1588 empowers the Commission to adopt and amend the General Block Exemption Regulation (GBER). The GBER defines the type of aid that Member States can provide without notification or oversight requirements.

GBER has expanded to cover aid for ports, airports, energy infrastructure, innovation clusters, broadband networks, and increased notification thresholds for R&D&I and Regional Aid. It was further adapted to allow unnotified aid for SMEs and startups during the COVID-19 pandemic and to boost aid to renewable energy following the Ukraine invasion.

According to the Delors Institute, State Aid under GBER has grown significantly, reaching €60 billion (0.5% of EU GDP) in 2020. By 2022, 84% of all State Aid fell under GBER, highlighting its increasing role - especially in environmental protection.

Climate, Energy and Environmental Aid Guidelines (CEEAG)

The 2022 guidelines focus on deployment, not manufacturing, replacing the 2014-2020 rules.

Article 13 explicitly excludes *"State aid for the design and manufacture of environmentally-friendly products, machinery, equipment or means of transport"*, on the ground that *"Environmental aid is generally less distortive and more effective if it is granted to the consumer/user of environmentally-friendly products instead of the producer/manufacturer of the environmentally-friendly product"*.

Some restrictions on fossil fuel projects have been tightened with the 2022 guidelines. The guidelines also set competitive bidding as the new default instrument for awarding aid. Contracts for Difference (CfD) are the preferred mechanism for renewable energy aid, aligning with the Electricity Market Regulation.

Aid for purchasing or leasing clean vehicles (Chapter 4.3.1) has stricter eligibility but fails to limit support exclusively to zero-emission vehicles.

A new chapter (4.3.2) introduces rules for recharging infrastructure. Member States now must demonstrate that a counterfactual scenario - without aid, and despite other regulatory interventions - would not deliver the desired outcome. Competitive bidding is preferred., with a 30% cost coverage cap unless a funding gap analysis and ex-post. Member States can cover 30% of costs (and a higher aid intensity for SMEs and poor regions). But if the aid intensity is higher, Member States need a funding gap analysis, and an ex-post clawback mechanism is applied.

Important Projects of Common European Interest (IPCEIs)

The Delors Institute summarises IPCEIs awarded as of December 2024 - figure A1.

No	IPCEI	Member States (+ third countries)	Industry actors	Projects	Public funding (in bn €)	Private funding (in bn €)	Start date	End date
1	Microelectronics 1 (ME1)	4+1: Austria, France, Germany, Italy + United Kingdom (Austria joined in March 2021)	29	43	1.9	6.5	12/2018	2024
2	Batteries 1 (Bat1)	7: Belgium, Finland, France, Germany, Italy, Poland, Sweden	17	22	3.2	5	12/2019	2031
3	Batteries 2 (Bat2 | EuBatIn)	12: Austria, Belgium, Croatia, Finland, France, Germany, Greece, Italy, Poland, Slovakia, Spain, Sweden	42	46	2.9	9	01/2021	2028
4	Hydrogen 1 (Hy2 | Hy2Tech)	15: Austria, Belgium, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Italy, Netherlands, Poland, Portugal, Slovakia, Spain	35	41	5.4	8.8	07/2022	tbc
5	Hydrogen 2 (Hy2 | Hy2Use)	13+1: Austria, Belgium, Denmark, Finland, France, Greece, Italy, Netherlands, Poland, Portugal, Slovakia, Spain, Sweden + Norway	29	35	5.2	7	09/2022	2036
6	Microelectronics 2 (ME2 | ME/CT)	14: Austria, Czechia, Finland, France, Germany, Greece, Ireland, Italy, Malta, Netherlands, Poland, Romania, Slovakia, Spain	56	68	8.1	13.7	06/2023	2032
7	CIS	7: France, Germany, Hungary, Italy, Netherlands, Poland, Spain	19	19	1.2	1.4	2023	2031
8	Hydrogen 3 (Hy3 | Hy2Infra)	7: France, Germany, Italy, Netherlands, Poland, Portugal, Slovakia	32	33	6.9	5.4	2024	2029
9	Hydrogen 4 (Hy4 | Hy2Move)	7: Estonia, France, Germany, Italy, Netherlands, Slovakia, Spain	11	13	1.4	3.3	2024	2031
10	Medicines 1 (Med1 | Med4Cure)	6: Belgium, France, Hungary, Italy, Slovakia, Spain	13	14	1	5.9	2024	2036

Figure A1: **Overview of all notified industrial policy IPCEIs until September 2024. Source: Institut Delors.**

Annex 2: Energy subsidies in Europe

The European Commission's 2023 report on energy subsidies in the EU shows that half of the subsidies was directed to fossil fuels and generic energy support, whereas the other half was spent on renewables and electricity support - the latter being key to stimulate electrification.

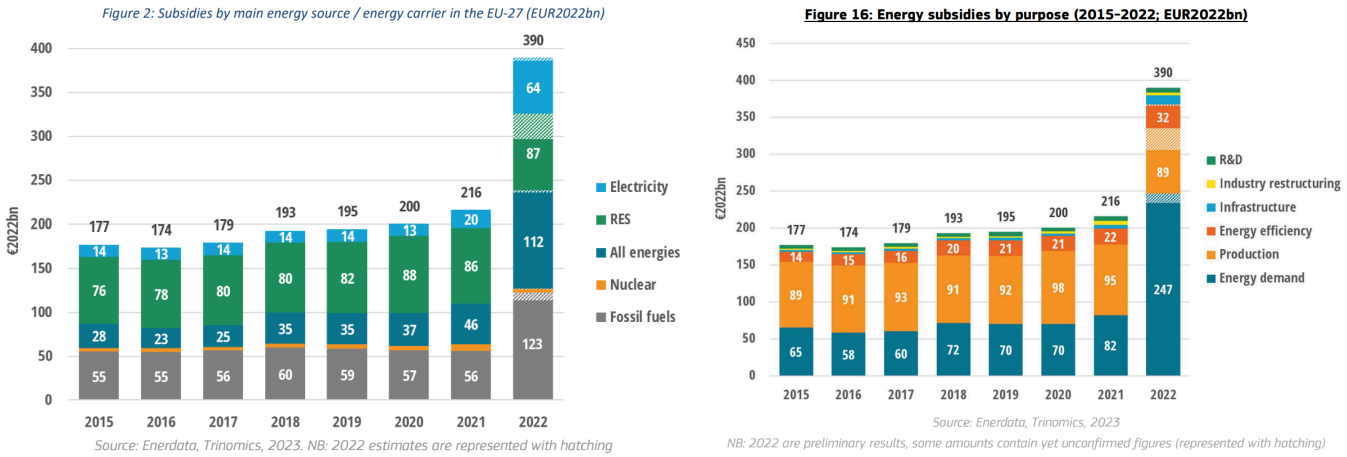


Figure A2: energy subsidies by energy source and purpose. Source: JRC.

Energy production and demand (including efficiency) accounted for over 90% of public support, whereas infrastructure, industrial restructuring and R&D together hit below 10%. Rather unsurprisingly given spending patterns, the EU has been more successful in deploying, producing and using renewables than actually keeping or developing manufacturing industries.

Annex 3: The US IRA: output and origin

On August 16 2022, former President Biden signed the Inflation Reduction Act into law, fundamentally reshaping global cleantech manufacturing.

While many observers focused on its funding size - $370 billion budget over 10 years ($37 billion annually) - the real game-changer is its design. This sum is not wildly out of proportion with resources at EU level, especially when considering the €200 billion spent annually on energy subsidies in the EU. Unlike the EU's fragmented approach, the IRA is output-based and origin-based, directly incentivising domestic production.

30D - the Federal Clean Vehicle (consumer) credit

The 30D credit provides up to $7,500 for the purchase of new electric vehicles. This credit is available for eligible vehicles placed in service through December 31, 2032. The US Treasury issued definitive guidance in May 2024.

Vehicles must be assembled in North America - positive origin requirement - and listed on www.fueleconomy.gov. Price caps apply to the vehicles - $55k for cars and $80k for SUVs and trucks,

and income limits to the applicants - $300k for married couples filing jointly, $225k for heads of households, and $150k for all other filers.

The $7,500 credit is divided into two parts of $3,750 each, the Critical Minerals Requirement and the Battery Components Requirement.

Critical minerals must be extracted or processed in the U.S. or in a country with which the U.S. has a free trade agreement, and recycled in North America. Percentage requirements are value based, increasing from 40% to 80% for 2023-2027 and beyond.

The EU does not have a free trade agreement with the U.S. In response, the EU has been trying to negotiate a so-called Critical Minerals Agreement (CMA), hoping it would qualify as a free trade agreement in this area, to ensure that critical minerals extracted or processed in the EU can qualify for the 30D credit. As of February 2025, no CMA has been signed.

Battery components must be manufactured or assembled in North America - positive origin requirement. Percentage requirements are value based and increase from 50% to 100% for 2023-2029 and beyond.

Vehicles with battery components or critical minerals from so-called “Foreign Entities of Concern” (FEOCs, e.g., China) are ineligible for the credit - negative origin requirement.

The 45X ”Advanced Manufacturing Production Tax Credit”

45X provides an incentive for U.S.-based manufacturers - positive origin requirement - producing eligible components for renewable energy systems, notably battery cells and packs, solar and wind energy components, inverters and critical minerals.

The 45X programme would qualify under EU rules as State Aid. It provides direct support to industry, in contrast with 30D targeting consumers. The credit is available for production starting in 2023 and runs through 2032 for most components. The U.S. Treasury issued final guidelines in October 2024.

The credit amount is generally based on the production output, but for critical minerals it is 10% of production costs. For battery cells the credit is $35 per kWh, for packs it is $10 per kWh (i.e., for cells plus pack $45 per kWh), for PV cells $0.04 per watt, for modules $0.07 per watt, and $3/kg of renewable hydrogen. BNEF estimates that in 2024, battery packs cost $115/kWh, meaning the $45/kWh subsidy represents more than a third of production costs on average.

Although 45X is called a tax credit, it is in effect a straight subsidy. Even companies that do not (yet) pay tax can claim it, either through “direct payment” (Section 6417) or through a “Transferrable Tax Credit” (TTC, Section 6418), selling the credit to companies that do have tax liabilities. This typically happens at approximately 10% discount on the nominal value.

Manufacturers do not need to write an application. If they are eligible they can simply claim the credits on their tax returns, provided they have documented production and sales.

45X does not have a FEOC provision, so in theory Chinese companies could receive credits. However this is generally seen as a drafting mistake and there is strong bipartisan political support to “repair” this provision if necessary. Several bills that would stop companies owned or controlled by foreign entities have been progressing but none has been adopted yet.

Still, the threat of legislation has influenced decisions by US companies like Ford and Tesla in designing their interactions with Chinese battery makers - CATL in this case. CATL supplies the equipment and all Cap-Ex and control lies with the US company as well as Intellectual Property transfer.

The carrot for CATL is a share of the 45X production credits. Importantly, this means that CATL has an incentive to make the equipment work as well as possible. Trouble in making Chinese equipment work well is often cited as one of the reasons for Northvolt's bankruptcy - Chapter 11 - filing.

Section 48c Cap-Ex subsidy programs

IRA Section 48c sets up Cap-Ex subsidy programs for various technologies - subsidising typically 6-30% of "tangible property" such as equipment and machinery but not buildings. The rate depends on labour commitments, notably pay and apprenticeship programs. Project applications are necessary but without proof of funding gaps, incentive effects or clawbacks. All relevant criteria are set ex ante. The subsidies are bankable: companies can safely anticipate the subsidy's level and can build business cases on it.

45X and 48c cannot be cumulated. This means 45X is especially attractive for facilities focusing on production of cleantech end products, whereas 48c is relevant to all other facilities e.g. suppliers or smaller-scale, experimental projects.

The FEOC concept and its origins

The Bipartisan Infrastructure Law, specifically section 40207, defines a "foreign entity of concern". Key criteria include:

- Entities designated as foreign terrorist organizations.
- Those on the Specially Designated Nationals (SDN) list.
- Entities owned by, controlled by, or subject to the jurisdiction of certain covered nations.
- Those alleged by the Attorney General to have been involved in specific illegal activities.
- Entities determined by the Secretary to be engaged in unauthorized conduct detrimental to U.S. national security or foreign policy.

The US Department of Energy issued final guidelines on FEOC interpretation in June 2024. Specifically, China, North Korea, Russia and Iran are on the list so EVs containing components or materials from these countries are not eligible for 30D consumer credits.

Annex 4: Towards a wider set of environmental and social conditions tied to State Aid

Beyond the "Made-in-EU" conditions proposed in this report, any support under EU State Aid rules should be linked to strong environmental and social conditions.

Both the Letta and the Draghi reports stress the need to make a smart use of conditionalities in State Aid to achieve desired policy outcomes. For subsidies in Europe to better benefit local skills and jobs and contribute to EU climate objectives, clearcut and enforceable horizontal criteria e.g. on local employment, intellectual property via joint ventures, and on the implementation of the "do-no-significant-harm" (DNSH) principle, should be at the forefront of State Aid schemes and direct subsidies to corporates.

Currently, the DNSH principle is not fully embedded in the State Aid framework: it is required for IPCEIs but only a guiding principle in regional aid guidelines and in the CEEAG, while it only partially applies to the TCTF.

The current provisions under the TCTF do not amount to stringent environmental conditions to State Aid: the framework only "invites" Member States to set environmental conditions for two - out of the eight - aid categories part of the TCTF.

Placing environmental and social conditions on companies to benefit from public funding will be key for the Clean Industrial Deal to align with and go beyond requirements developed under other pieces of legislation – for example the need for companies to develop science-based transition and decarbonisation targets.

DG COMP's enforcement role is to maintain competition (Art. 107 TFEU) but that must also be balanced by the treaty's requirements to pursue environmental protection (Art. 191 TFEU). We recommend prioritising operations based on their quality and added-value for the climate and environment instead of their low cost and affordability only.

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