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1. Introduction

The accelerating urgency of climate crisis has placed energy transition at the core of political, economic and regulatory agendas worldwide. Governments across advanced economies are increasingly designing industrial policy frameworks not only to decarbonize their energy systems but also to capture the economic opportunities of clean technology opportunities. Against this backdrop, questions of how quickly and effectively such frameworks can be implemented have moved to the centre of both scholarly and policy debates. It is no longer sufficient for governments to adopt ambitious targets; their ability to deliver timely, predictable and coordinated support for renewable deployment and green industry has become a decisive factor in shaping the trajectory of the transition.

The concept of *regulatory agility* captures this institutional dimension. It refers to the ability of governance systems to adapt to rapidly changing technological and ecological demands by executing rules, procedures and incentives in a timely and coordinated manner. Agility encompasses not only the speed of decision-making and permitting, but also the complexity of procedures, the predictability of outcomes and the degree of institutional coordination. In this sense, regulatory agility is not simply a technical detail: it is a defining condition of whether ambitious green industrial policies can translate into actual deployment on ground.

The question central to this study is assessing whether regulatory agility is necessary to accelerate the green transition. In doing so the thesis adopts a comparative lens, analysing two flagship policy frameworks: the United States' *Inflation Reduction Act* (IRA) of 2022 and the European Union's *Green Deal Industrial Plan* (GDIP) introduced in 2023. The IRA represents the most comprehensive climate and industrial policy in U.S. history, centred on over $370 billion in tax credits, grants, and loans to accelerate clean energy deployment and manufacturing. Its centralized, rules-based design reflects the federal governance structure, relying heavily on fiscal incentives administered by the Department of Treasury, the Internal Revenue Service and the Department of Energy. The GDIP, by contrast, embodies the EU's multi-level approach. Rather than creating entirely new instruments, it temporarily relaxes on state aid rules through the Temporary Crisis and Transition Framework (TCTF) and mobilizes existing funds such as Horizon Europe, the Innovation Fund, InvestEU and REPowerEU. The plan seeks to safeguard European competitiveness in the global race for green technologies while respecting subsidiarity and internal market principles.

The rationale for comparing these two frameworks is twofold. First, the U.S. and EU represent two of the largest global markets for clean technologies, whose policies are shaping not only their own transitions but also the contour of international competition.

Second, the IRA and GDIP illustrate two contrasting governance models: one centralized and streamlined, the other decentralized and layered. This contrast provides a fertile ground for analysing how institutional design affects regulatory agility and how different trade-offs emerge between speed, coordination and inclusiveness.

Methodologically, the analysis builds on the conceptual indicators of agility developed in the theoretical framework: institutional cooperation, procedural complexity, implementation timelines and degree of discretion. These are operationalized through empirical evidence on renewable capacity deployment, permitting times and case studies of subsidies allocation in 2023-2024. By integrating institutional analysis with empirical data, the study aims to offer a nuanced picture of how regulatory structures facilitate or hinder green industrial deployment.

The contribution of this thesis is threefold. First, it provides an updated empirical comparison of the IRA and GDIP at a moment when both policies are in their implementation phase. Second, it highlights how structural features of governance – federal centralization versus EU multi-level governance – shape outcomes beyond the scale of financial commitments. Finally, it seeks to enrich the debate on regulatory governance by suggesting that agility should not be understood solely in terms of speed, but also in relation to broader institutional capacities and societal objectives.

2. Theoretical Framework

2.1 Introduction: The New Green Industrial Policy and the Current Context

This section provides an overview of the key theoretical frameworks and relevant literature that inform the comparative analysis of green industrial policy in the EU and the US. It begins by discussing the idea of "new industrial politics", which is distinguished by its more sophisticated, collaborative, and goal-oriented nature, which is defined in terms of innovation and production[1]. Contrary to the past, the state intervention does not aim to replace the market dynamics, but rather to correct inherent mistakes such as environmental degradation, technological uncertainty, and inter-sector coordination issues, and to address new and legitimate geopolitical issues, such as global technological competition and the need to support strategic autonomy in a less intrusive manner.[2] This modern perspective views governments as active market shapers as well as regulators, encouraging a proactive approach to tackling difficult issues like technological advancements and climate change.[3] Nowadays, environmental sustainability is firmly positioned as the primary focus of international political agendas. The primary goal of these green industrial policies is twofold: first, to speed up decarbonization and sustainability; second, to promote economic interest and regional or national competition in the leading field of clean technology. This "new industrial politics" is best shown by the European Union's Green Deal Industrial Plan (GDIP) and the United States' Inflation Reduction Act (IRA), which both purposefully use regulatory frameworks and public resources to boost economic competitiveness and hasten the green transition.

[1] Rodrik, D. (N/D). Industrial Policy for the Twenty-First Century. *SSRN Electronic Journal*. doi:https://doi.org/10.2139/ssrn.617544.

[2] Kleimann, D., Poitiers, N., Sapir, A., Tagliapietra, S., Véron, N., Veugelers, R. and Zettelmeyer, J. (2023). *How Europe should answer the US Inflation Reduction Act*. [online] Available at: https://www.bruegel.org/system/files/2023-02/PB%2004%202023_0_1.pdf.

[3] OECD. (2025). *Better regulation for the green transition*. [online] Available at: https://www.oecd.org/en/publications/better-regulation-for- the-green-transition_c91a04bc-en.html.

2.2 The Two Approaches Compared: IRA (US) and Green Deal Industrial Plan (EU)

The two main approaches outlined in this thesis are the Clean Industrial Deal of the European Union and the Inflation Reduction Act (IRA) in the United States. The most consistent climate- related legislative agreement in US history is the IRA, which was signed in August 2022.[4] This is based in large part on its fiscal incentives, particularly tax credits, to encourage investments in renewable energy, electrical vehicles, and the development of clean technology, all of which are closely linked to the federal governance structure.

The Green Deal Industrial Plan (GDIP), introduced by the European Commission at the beginning of 2023, marked the beginning of a new a new European economic strategy based on guiding principles such as ecology, reindustrialization, competitiveness and strategic autonomy.[5] Rather than establishing entirely new legislative tools, the GDIP relies on a flexible adaptation of existing instruments – including Horizon Europe, the Innovation Fund, InvestEU and REPowerEU – together with the Temporary Crisis and Transition Framework (TCTF), which temporarily relaxes state aid rules to enable Member States to support strategic sectors such as renewable energy, energy storage and industrial decarbonization. The EU's approach is deliberately multi-level, a condition that exposes the Plan to challenges of coordination, fragmented transposition and uneven administrative capacity across Member States, all of which directly affect the EU's ability to match the pace of international competitors in the green transition.[6]

The institutional architecture, regulatory coordination and administrative execution modalities of the two approaches differ significantly, even though both pursue comparable environmental and economic outcomes. These differences provide a strong rational for comparison, especially when viewed from the perspectives of institutional capacity and regulatory governance. Although there is a wealth of research on regulatory governance, less focus has been placed on how various models of regulatory governance—such as centralised compared to decentralised—affect the flexibility of green industrial policy in adapting to quickly changing technological environments and climate demands. To preserve the validity of the comparison, this analysis will concentrate on the structural distinctions between the

[4] BUILDINGACLEANENERGYECONOMYGUIDEBOOK | JANUARY2023 | VERSION2 BUILDING A CLEAN ENERGY ECONOMY. (2023). Available at: https://bidenwhitehouse.archives.gov/wp-content/uploads/2022/12/Inflation- Reduction-Act-Guidebook.pdf.

[5] Masulli, M. and Zanoni, A. (2023). THE GREEN DEAL INDUSTRIAL PLAN: THE EUROPEAN COMPETITIVENESS STRATEGY FOR A NETZERO AGE. *ENERGY POLICY BRIEF*, [online] 2023(1). Available at: https://www.i-com.it/wp-content/uploads/2023/04/Policy-Brief-GDIP.pdf [Accessed Aug. 2025].

[6] European Commission (2023b). *The Green Deal Industrial Plan*. [online] commission.europa.eu. Available at: https://commission.europa.eu/strategyand-policy/priorities-2019-2024/european-green-deal/green-deal-industrial-plan_en.

European method, which is distinguished by a combination of current instruments and flexibility in state aid, and the US approach, which is mostly focused on centralised tax incentives.

2.3 Effectiveness and Efficiency of Implementation Mechanisms

Second, the analysis engages with the notions of effectiveness and efficiency of the implementation mechanisms, as both dimensions are crucial to the success and sustainability of any intervention [11] and are fundamental to the evaluation of such green industrial policies.

Effectiveness refers to the extent to which a policy achieves its stated objectives. In the context of green industrial policy, this means assessing, for example, the ability to mobilise a significant volume of private investment in clean technologies; the creation of green jobs. Effectiveness is crucial because, without it, well-intentioned policies would have no real impact on the ecological and industrial transition.

Efficiency, on the other hand, refers to the relationship between the results obtained and the resources used to achieve them. For green policies, efficiency implies: the public cost required to achieve a given emission reduction or to mobilise a given amount of private investment (cost- effectiveness); and the speed with which the benefits accrue relative to the initial investment. A policy can be effective in achieving its objectives, but be inefficient if it involves disproportionate costs, long lead times or suboptimal use of resources.

The two aspects will be considered in this thesis in a complementary manner: assessing only effectiveness or only efficiency would be insufficient and potentially misleading. A policy may be efficient but not ambitious or scalable enough to achieve urgent climate goals, or highly effective but unsustainable in terms of fiscal and social costs. To obtain a comprehensive and robust assessment of the performance of green industrial policies, it is therefore essential to analyse how the different institutional and administrative structures of the two policy frameworks (IRA and Clean Industrial Deal) influence the ability to simultaneously achieve both effectiveness and efficiency.

2.4 Measuring Transition: Key Indicators for Green Policies

To realise the concepts of effectiveness and efficiency and assess the success of green industrial policies, it is crucial to identify specific indicators that reflect the progress of the transition. This analysis will be based on the extraction and synthesis of data available from public sources, sectoral reports, international organisations and independent analyses. These indicators can be grouped into several categories.

2.4.1 Process and Administrative Indicators

The ease and timeliness of financing and approval procedures for both public and private investments in clean technologies are important administrative considerations. These metrics will make it possible to evaluate the effectiveness of the two policy strategies directly in terms of how well their regulatory and bureaucratic structures support the green transition. One example of how these administrative indicators are translated into concrete terms is the variation in time and complexity of the permits for energy infrastructure projects between the United States and the European Union. Due to more stringent procedures and a smaller percentage of local expertise, the time required to obtain the authorisation required to build innovative energy projects or key infrastructure may be significantly shorter in the United States.[7] This contrasts with Europe, where the complexity of multilevel governance, the hierarchy of national and local laws, and the mutual support of these entities can significantly hinder the process of granting permissions and delay the implementation of important projects for the green transition.[8] This discrepancy in administrative "velocity" is a direct measure of regulatory agility in terms of the effectiveness and efficiency of industrial policies in terms of the practical and timely realisation of investments.[9]

Additionally, academic literature highlights how transparent and concise administrative procedures can foster innovation and the spread of sustainable technologies, accelerating the energy transition.[10] Therefore, the difference between the United States and Europe in terms of authorisation time concerns not just bureaucratic aspects but also the ability to implement political policies in tangible and timely ways.

On the industrial capacity and innovation front, the focus will be on the growth of installed manufacturing capacity in key sectors such as batteries, photovoltaic modules.

Last but not least, environmental and climate indicators will provide a direct picture of outcomes with respect to decarbonisation targets: the reduction of greenhouse gas emissions[10] will be key parameters to assess the climate impact of policies.

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[7] International Energy Agency (IEA). (2021). Streamlining permitting for energy infrastructure. Retrieved from https://www.iea.org/reports/streamlining-permitting-for-energy-infrastructure

[8] European Commission. (2020). *Study on the barriers to renewable energy projects in the EU*. Retrieved from https://ec.europa.eu/energy/topics/markets-and-consumers/market-legislation/permitting_en

[9] OECD. (2019). *Regulatory policy outlook 2019*. OECD Publishing. https://doi.org/10.1787/9789264315410-en [10] Kivimaa, P., & Kern, F. (2016). Creative destruction or mere niche support? Innovation policy mixes for sustainability transitions. *Research Policy, 45*(1), 205-217. https://doi.org/10.1016/j.respol.2015.09.008

[10] United States Environmental Protection Agency (2025a). *Inventory of U.S. Greenhouse Gas Emissions and Sinks*. [online] US EPA.

The aim is to build a robust and reasoned comparative framework, allowing for a qualitative and, where data allow, quantitative assessment of the performance of the two policies.

2.5 Regulatory Governance and Administrative Capacity: The Causal Role of Agility

It is within this context of governance and administrative capacity that "regulatory agility" assumes a central and causal role, acting as a bridge to institutional design and policy outcomes. This thesis hypothesizes that greater regulatory agility can lead to enhanced effectiveness and efficiency, allowing objectives to be achieved through optimal use of resources, while low agility may hinder both.

2.5.1 The Importance of Regulatory Agility in the Energy Sector

Regulatory agility is defined as the inherent capacity of a regulatory and administrative system to adapt quickly and effectively to changing circumstances. This idea is inserted into the most extensive academic debate on responsive regulation and adaptive governance, demonstrating the need for regulatory frameworks that may change with the times. This capacity manifests itself through the flexibility of regulatory frameworks, the responsiveness of administrative procedures and the overall adaptability of institutions in implementing policies.[11] Regulatory capacity is one of the main tools that governments can use to enable and encourage progress towards environmental goals.[12] The importance of regulatory agility is particularly pronounced in the energy sector, an area characterised by rapid technological advances, high uncertainty and the need for immediate responses to global climate challenges. The transition to a low-carbon economy requires a dynamic and adaptable energy infrastructure. Agile regulatory systems can facilitate the adoption of new technologies, speed up authorisation processes for renewable energy projects and enable rapid responses to external shocks.

Without agility regulatory frameworks risk becoming obsolete, stifling innovation and slowing down the energy transition. The lens of regulatory agility will provide insight into how different governance structures influence responsiveness and adaptability. This is crucial for the thesis, as the analysis aims to determine whether structural differences between the two approaches, in terms of institutional

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Available at: https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks; European Environment Agency (2024). *Environmental statement 2023*. [online] Europa.eu. Available at: https://www.eea.europa.eu/en/analysis/publications/ environmental-statement-2023.

[11] OECD. (2025). *Better regulation for the green transition*. [online] Available at: https://www.oecd.org/en/publications/better-regulation- for-the-green-transition_c91a04bc-en.html.

[12] OECD. (2025). Better regulation for the green transition. [online] Available at: https://www.oecd.org/en/publications/better-regulation- for-the-green-transition_c91a04bc-en.html.

capacity and regulatory governance, translate into greater or lesser effectiveness and efficiency in achieving green industrial policy goals. In other words, regulatory agility will be the focus to assess which model is better equipped to navigate the complexity and dynamism of the energy sector for effective implementation and efficient use of resources.

It is precisely in this context that the EU needs to be faster in making decisions and implementing projects, the decision-making and funding processes need to be clear, predictable and open in order to avoid uncertainty for companies that want to invest (transparency), the process should involve a wide range of stakeholders in order to be more legitimate, and ideally, more effective (inclusiveness). These are the challenges that European multi-level governance must face in order to speed up the implementation of crucial projects. The cause-effect relationship between regulatory agility and policy outcomes (effectiveness and efficiency) will be analysed through several criteria that will serve as direct and measurable indicators of agility such as institutional coordination examining how effectively different institutions and levels of government work together in the implementation of green industrial policies, including potential conflicts or overlaps; procedural complexity including the clarity and stability of the regulatory framework; implementation timelines including the speed at which policies are translated into concrete actions and degree of discretion considering the level of flexibility granted to national or subnational authorities in implementing the policies.

3. Methodology

The purpose of this thesis is to compare the industrial policies of the United States and the European Union, with a particular emphasis on the Green Deal Industrial Plan and the Inflation Reduction Act (IRA). The main goal of this section is to outline the methodology used to assess the effectiveness and efficiency of the various implementation mechanisms, as well as to examine the role of administrative and regulatory indicators. The research will be based on a critical understanding of the relevant academic literature, official documents, reports from international organisations, and public data in order to produce a strong analytical framework.

3.1 Type of Study and Comparative Approach

The research uses a comparative study approach to analyse the industrial policies of two distinct geopolitical entities: the United States and the European Union. This approach has been chosen in order to enable a thorough identification of similarities and differences in their strategies, implementation methods, and relative performance. Through the comparison of the Green Deal Industrial Plan and the Inflation Reduction Act (IRA), it is intended to demonstrate how various legislative and administrative issues affect the ability to accelerate the energy transition. The study is primarily set up as a qualitative analysis based on document interpretation and information synthesis, with quantitative data being integrated where needed to support the valuations.

3.2 Data Sources and Information Gathering

The information required for analysis is derived from a variety of primary and secondary sources. The primary sources include legislative testimony and official communications pertaining to the Green Deal Industrial Plan and the Inflation Reduction Act (e.g., Congressional documents, European Commission proposals). The secondary sources include a wide range of academic publications (scientific articles, books), reports from international relief organisations (such as the International Energy Agency (IEA), the Organisation for Economic Cooperation and Development (OECD), the European Environment Agency (EEA), and the Environmental Protection Agency (EPA) of the United States), as well as analyses from think tanks and specialised research centres. The sources were chosen based on how directly they related to the areas of administrative effectiveness, regulatory agility, and green industrial policy.

3.3 Analytical Framework and Operationalisation of Key Concepts

The ideas of effectiveness, efficiency, administrative indicators, and regulatory agility have been operationalised in order to do the comparison analysis. Effectiveness will be evaluated in light of the accomplishment of declared policy goals, such as lowering greenhouse gas emissions and expanding the production capacity of clean technologies. Efficiency will be analysed in terms of the optimisation of resources (money and time) needed to accomplish the goals. Administrative metrics will concentrate on the predictability of regulations, the effectiveness of financial access mechanisms, and the speed and fluidity of bureaucratic procedures. As a concrete illustration of administrative performance, a comparison of the duration and complexity of permissibility for energy infrastructure projects will be a crucial component of this analysis. Agility in regulations will be evaluated based on factors like the ability to quickly implement and adjust to new market demands or technological advancements, the complexity of procedures, the predictability and transparency of rules, and the inter-institutional coordination between various governmental levels. These components will be essential to comprehending how responsive and efficient regulatory regimes are.

4. Agility in Granting Green Industrial Subsidies

The acceleration of the green transition and the drive for leadership in clean technology necessitate not only ambitious policy objectives but also extremely successful and efficient implementation strategies. The deliberate use of financial incentives, such as tax credits, grants, and subsidies, to encourage private investment and promote industrial growth is a crucial part of green industrial strategy. This chapter compares the ways in which the European Union, through the Green Deal Industrial Plan (GDIP), and the United States, through the Inflation Reduction Act (IRA), handle the approval and distribution of such financial assistance. The major objective is to assess each system's "regulatory agility" in this particular area, which is the ability of a regulatory and administrative system to swiftly and successfully adjust to changing conditions, as shown by flexibility, responsiveness, and adaptability. By facilitating faster access to funds, lowering administrative barriers for businesses, and speeding up the mobilisation of private capital, it is hypothesised that increased regulatory agility in subsidy granting can result in improved efficacy in accomplishing policy objectives and improved efficiency in resource utilisation. Key institutional and administrative factors that impact agility will be specifically examined in this comparative analysis. These factors include the governance structure (centralised vs. multi-level), the intricacy of the processes for obtaining and allocating funds, the timeliness and speed of implementation, and the extent of administrative discretion permitted in each system. By looking at these factors, the chapter hopes to provide a deeper understanding of how to implement policies effectively in the context of the global clean technology competition by empirically evaluating which framework shows superior agility in allocating financial support to green industries and why.

4.1 The Process of Authorizing Green Subsidies in the US (IRA)

Enacted in August 2022, the Inflation Reduction Act (IRA) is the largest clean energy initiative in U.S. history. It provides approximately $370 billion in grant and loan programs, together with more than 20 new or modified tax incentives, to accelerate the U.S. transition to a clean energy economy and spur investment in and deployment of new clean energy technologies.[13] These incentives, which

[13] BUILDING A CLEAN ENERGY ECONOMY GUIDEBOOK | JANUARY 2023 | VERSION 2 BUILDING A CLEAN ENERGY ECONOMY. (2023). Available at: https://bidenwhitehouse.archives.gov/wp-content/uploads/2022/12/InflationReduction-Act-Guidebook.pdf.

aim to quickly deploy capital and boost domestic output, are firmly ingrained in the current federal governance system and make use of organisations like the Department of Treasury, the Internal Revenue Service (IRS), and the Department of Energy (DOE).[14]

A wide range of financial products form the foundation of the IRA. Its extensive use of tax credits, in particular, makes them a pillar of its industrial policy.

Successfully navigating the federal funding made available by the Inflation Reduction Act will require an understanding of how federal programs are implemented and the various ways federal funds flow from federal agencies, whether through states and eventually to communities or directly to eligible entities (eligibility that will largely depend on what type of funding structure that program utilises).

4.1.1 Financial Architecture: Tax Credits as Core Instruments

The Inflation Reduction Act employs a number of tax credits to encourage the production and usage of clean energy. Tax credits come in two primary varieties: refundable and nonrefundable. A refundable tax credit can be used to receive a federal tax refund that exceeds the total amount of taxes paid during the year. A nonrefundable tax credit can only be used to offset taxes owed; it cannot be utilised to raise an applicant's federal refund. Therefore, a refundable tax credit can guarantee a benefit, whereas a nonrefundable credit cannot. The Investment Tax Credit (ITC), which encourages capital expenditures for renewable energy projects and the construction of manufacturing facilities to produce parts and materials for clean energy projects and clean vehicles, and the Production Tax Credit (PTC), which provides a refund based on the quantity of a relevant product produced by a company, such as a factory or utility, are examples of tax credits included in the IRA. One example is a concession for every kilowatt of power produced using renewable resources. These can also be applied to manufacturing since a production tax credit would pay a certain amount for each blade or solar panel component manufactured. By introducing "direct pay" and transferability possibilities, these incentives have become more accessible, removing long-standing obstacles related to tax responsibility. The first essentially converts a tax advantage into an upfront cash infusion by enabling non-taxable bodies, including state and local governments, tribal governments, and rural electric cooperatives, to receive a direct payment from the Treasury equivalent to the tax credit's value.

[14] US Department of Labor (n.d.). *Inflation Reduction Act Tax Credit*. [online] DOL. Available at: https://www.dol.gov/general/inflationreduction-act-tax-credit; US Department of Energy (2025). LPO Year in Review 2024. [online] Energy.gov. Available at: https://www.energy.gov/lpo/articles/lpo-year-review-2024 [Accessed 2025].

Instead, the second allows businesses to sell their earned tax credits to unaffiliated third parties for cash, giving them instant liquidity.[15]

4.1.2 Diversified Financial Mechanisms: Grants, Loans and Other Tools under the IRA

Loans and grants are also frequently utilised. A grant is a type of government money that has no repayment expectations. However, under this broad category, the Inflation Reduction Act distributes money through a number of subcategories of awards.[16] In fact, there are mandatory grants. These include formula grants like the High-Efficiency Electric Home Rebate and block grants like the Environmental and Climate Justice Block Grants included in the IRA. These grants are typically subsets of mandatory grants and are given out according to statutory criteria, frequently focussing on underprivileged communities[17]; competitive or discretionary grants, such as the $8.8 Home Energy Rebates, that are managed by organisations like the DOE and focus on strategic areas like clean hydrogen, critical minerals, and rural electrification[18] but they also include initiatives such as the $7 billion Solar for All program[19] administered by the Environmental Protection Agency (EPA); then categorical grants and projects grants.

Another mechanism utilized by the Inflation Reduction Act is the one of loans characterised as government financial pools that, in contrast to grants, are intended to be repaid. There are, also in this case, a number of loan programmes included in the Inflation Reduction Act, such as basic loans and loans guarantees notably through the LPO's Advanced Technology Vehicles Manufacturing (ATVM) program.

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[15] A User Guide to the Inflation Reduction Act A User Guide to the Inflation Reduction Act: How New Investments Will Deliver Good Jobs, Climate Action, and Health Benefits. (n.d.). Available at: https://www.bluegreenalliance.org/wp-content/uploads/2022/10/BGA-IRAUser-GuideFINAL-1.pdf; Irs.gov. (2023). Elective pay and transferability frequently asked questions: Elective pay | Internal Revenue Service. [online] Available at: https://www.irs.gov/credits-deductions/elective-pay-and-transferability-frequently-asked-questionselective-pay [Accessed 2025]; www.irs.gov. (n.d.). Elective Pay and Transferability Frequently Asked Questions: Transferability | Internal Revenue Service. [online] Available at: https://www.irs.gov/credits-deductions/elective-pay-and-transferability-frequently-askedquestions-transferability [Accessed 2025].

[16] A User Guide to the Inflation Reduction Act A User Guide to the Inflation Reduction Act: How New Investments Will Deliver Good Jobs, Climate Action, and Health Benefits. (n.d.). Available at: https://www.bluegreenalliance.org/wp-content/uploads/2022/10/BGA-IRAUser-GuideFINAL-1.pdf.

[17] The White House (2023). *Justice40 Initiative*. [online] The White House. Available at: https://bidenwhitehouse.archives.gov/environmentaljustice/justice40/.

[18] VERSION 2.1 (Version 2.1). (2023). Available at: https://www.energy.gov/sites/default/files/2024-12/program-requirements-andapplication-instructions_121624.pdf.pdf [Accessed 2025].

[19] United States Environmental Protection Agency (2023). *Solar for All*. [online] www.epa.gov. Available at: https://www.epa.gov/greenhouse-gas-reduction-fund/solar-all.

Thirdly, bonds, known as securities issued in exchange for a loan. An entity can raise money by issuing a bond and selling it for cash to an investor.

Cooperative agreements, which encourage the transfer of valuable assets for a public good or benefit from federal executive agencies to states, local governments, and private recipients, and technical assistance, which is the process of giving targeted support to an organisation with a development need or problem, are two more investment mechanisms included in the Inflation Reduction Act that do not fall under the previously mentioned categories.

4.1.3 Institutional Architecture and Federal Implementation

The centralised nature of the federal government structure in the United States is reflected in the involvement of multiple important federal agencies in the implementation and supervision of IRA incentives. In this process, the Internal Revenue Service (IRS) and the Department of the Treasury play a crucial role. Their main responsibilities include processing claims, overseeing the direct pay and transferability processes, and providing complex advise on tax credit eligibility. Businesses and project developers' adoption and efficient use of the incentives are greatly impacted by the clarity, uniformity, and speed with which these regulations are finalised and disseminated. A key operational role is also played by the Department of Energy (DOE), which offers technical assistance, manages a number of competitive grant programs, including funding for critical materials processing or battery manufacturing under the Bipartisan Infrastructure Law, and creates pathways for the deployment of clean energy. It regularly works with industry to make eligibility clear and to make project creation and execution easier. However, organisations such as the Environmental Protection Agency (EPA) are in charge of some climate-related initiatives and offer advice on environmental regulations that are pertinent to clean technology ventures that the IRA funds. Additionally, a number of other departments, such as the Department of Agriculture and the Department of Transportation, administer particular programs or offer assistance pertinent to the IRA's overarching goals, supporting a multiagency yet federally coordinated implementation effort.[20]

[20] BUILDING A CLEAN ENERGY ECONOMY GUIDEBOOK | JANUARY 2023 | VERSION 2 BUILDING A CLEAN ENERGY ECONOMY. (2023). Available at: https://bidenwhitehouse.archives.gov/wp-content/uploads/2022/12/InflationReduction-Act-Guidebook.pdf.

4.2 The process for accessing IRA financial incentives

4.2.1 Accessing Tax Credits: A Self-Certification Approach

Given the major federal stakeholders listed above and their defined roles, the precise procedures an entity must follow in order to obtain IRA financial incentives primarily rely on the mechanism that is selected. The process for the majority of tax credits entails project developers or businesses carrying out qualified operations and confirming that they fulfil particular, frequently intricate legal requirements.[21] In order to maximise the value of the credits, these criteria may include strict requirements for domestic content sourcing and compliance with prevailing wage and apprenticeship norms. Businesses claim the credits on their federal tax returns after these tasks are finished and compliance is verified. Therefore, this "application" is more like a stringent self-certification procedure that may be reviewed by the IRS later on and possibly audited. In order to maintain appropriate accountability and stop fraud, organisations that choose direct pay or transferability must comply with strict reporting requirements and additional registration requirements with the IRS.

4.2.2 Competitive Grants: Structured Applications and Agency Review

In contrast, grant candidates use a more conventional, competitive application-based process. In most cases, this entails the relevant agency, like DOE, publishing a Notice of Funding Opportunity (NOFO) that carefully describes the program's goals, eligibility requirements, and extensive application requirements, as well as the transparent selection process. Then, interested parties prepare and submit detailed proposals, which are reviewed and selected by agency experts based on technical feasibility, merit, and alignment with program goals. Successful applicants are notified formally, and grant agreements are negotiated, often with complex terms and conditions. Funds are then disbursed based on predetermined project milestones and ongoing reporting requirements. Depending on the program's intrinsic complexity, the level of competition, and the volume of applications, the administrative load and grant-securing timelines can vary greatly. In contrast to the more predictable tax credit mechanism, the grant-securing process is frequently more drawn out and resourceintensive. Even while competitive awards are more focused, there may be longer administrative turnaround times. On the other hand, tax incentives provide comparatively quicker and more reliable routes to financial assistance, particularly those that are automatically claimed through filings. Implementation trackers like the Clean Investment Monitor indicate that tax-based incentives, which are quicker to

[21] www.irs.gov. (n.d.). Elective Pay and Transferability Frequently Asked Questions: Transferability | Internal Revenue Service. [online] Available at: https://www.irs.gov/credits-deductions/elective-pay-and-transferability-frequently-asked-questions-transferability [Accessed 2025].

implement and need less discretionary selection, have accounted for a significant portion of the IRA's early acceptance.[22]

All things considered, the IRA system maintains targeted support through more selective grant programs while combining speed and scale through the relative ease and automaticity of tax-based incentives. A comparatively flexible strategy for allocating industrial green subsidies can be attributed to the centralised governance, unambiguous legislative direction, and financial advances such as transferability.

4.3 The Process of Authorizing Green Aid in the EU (GDIP)

4.3.1 The Structure and Legal Basis of the GDIP

Early in 2023, the European Commission unveiled the Green Deal Industrial Plan (GDIP), its response to the global clean technology competition.[24] The GDIP expands upon a temporary easing of state aid regulations and a flexible reallocation of current EU instruments, in contrast to the U.S. Inflation Reduction Act (IRA), which established new legislative tools. Because Member States have differing administrative and financial capabilities as well as differing levels of political commitment to green industrial policy, the EU's approach is intentionally multi-level.

The four pillars of the GDIP are: (1) a streamlined and predictable regulatory framework; (2) quicker financial availability; (3) skill development; and (4) robust and open supplier chains. The Temporary Crisis and Transition Framework (TCTF)[23], which was established in March 2023 as an update to the previous crisis framework that was introduced in response to Russia's war in Ukraine, is its primary innovation in the financial pillar. This framework gives Member States more latitude in providing assistance to strategic green businesses that are essential to the green transition, such as energy storage, renewable energy, decarbonising industrial processes, and critical raw materials. The purpose of this legislation was to counteract distortions brought about by foreign subsidies and to enable a quicker and more flexible response to the energy crisis. Article 107 of the Treaty on the Functioning of the EU (TFEU), which ordinarily prohibits national subsidies that stifle competition, is loosened in order to achieve this. Despite the increased flexibility, the Commission's role is still crucial because

[22] www.cleaninvestmentmonitor.org. (n.d.). *The Clean Investment Monitor*. [online] Available at: https://www.cleaninvestmentmonitor.org.
[24] European Commission (2023). *The Green Deal Industrial Plan*. [online] commission.europa.eu. Available at: https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/green-deal-industrial-plan_en.
[23] European Commission (n.d.). *EUR-Lex - 52022XC0324(10) - EN - EUR-Lex*. [online] eur-lex.europa.eu. Available at: https://eurlex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.CI.2022.131.01.0001.01.ENG.

all state assistance measures under the TCTF must be reported to and approved by the Commission, which guarantees adherence to internal market regulations and avoids undue fragmentation.

4.3.2 EU Financial Instruments Supporting Green Industry

Concurrently, the GDIP makes use of a number of current EU-level funding tools, such as REPowerEU[24], a strategy to quickly lessen reliance on Russian fossil fuels, which allocates large sums of money to energy efficiency and renewable energy, including through national recovery and resilience plans. Support for emerging green industries is still provided by Horizon Europe, the EU's main funding initiative for research and innovation, including clean technologies. The EU Emissions Trading System (ETS) provides funding for the Innovation Fund, which promotes the deployment and demonstration of cutting-edge low-carbon technology. By offering financial partners EU budget guarantees, InvestEU encourages both public and private investment, particularly in green areas. Member states can also use other monies, such the Just Transition Fund and Cohesion Policy funding, to leverage green investments.

4.3.3 Multi-Level Governance and Administrative Roles

The European Commission and individual Member States both have important, frequently overlapping roles in the EU's multi-level governance structure. As the policy architect, the European Commission manages key EU funds like Horizon Europe and the Innovation Fund in addition to establishing and supervising broad frameworks like the GDIP and TCTF. In accordance with Article 107 TFEU, it also acts as the State Aid Approver. Although the TCTF permits rapid review, Member States are required to notify the Commission of their proposed state aid measures, which the Commission then evaluates for compliance with both the TCTF and EU regulations. Commission permission is still needed even though the rules have been softened. In addition, the Commission serves as a coordinator with the goal of coordinating national initiatives and guaranteeing fair competition within the single market. The Primary Implementers, however, are the Member States. They are mostly in charge of creating and carrying out national plans that make use of the TCTF's flexibility or EU funding as part of their national recovery plans. This entails defining precise

[24] European Commission (2022). *REPowerEU*. [online] European Commission. Available at: https://commission.europa.eu/topics/energy/repowereu_en.; Europa.eu. (2023). *EUR-Lex - 52023DC0062 - EN - EUR-Lex*. [online] Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52023DC0062.

qualifying requirements, putting in place administrative processes, and allocating funding on a regional or national scale. Under the guidelines established by the Commission, national governments ultimately decide whether particular projects or businesses receive funding.

4.3.4 Authorization Procedure and Systemic Limitations

The EU's multi-layered green aid authorisation and distribution process is a defining feature. The first step is EU Framework Development, in which the European Commission creates and approves broad frameworks that provide the general guidelines and requirements for aid, like the GDIP and the TCTF. National Scheme Design comes next, in which each Member State creates its own national assistance programs in accordance with national finances and priorities as well as EU frameworks. In order to obtain approval under state aid regulations, specifically the TCTF, Member States must first formally notify the European Commission of their planned national aid schemes or individual aid measures for very large projects.[25] Following that, the Commission carries out its Assessment, looking over the notified schemes to make sure they adhere to the TCTF and don't unnecessarily stifle competition in the single market. The goal of this phase's interaction between the Commission and the Member State is to expedite the adoption of TCTF-compliant measures. Lastly, Member States move forward with National Implementation of the aid programs after the Commission gives its approval. This entails creating national administrative organisations, putting in place business application procedures, reviewing applications, and finally allocating the aid. A crucial factor in evaluating agility is the degree of procedural complexity and the timeliness of disbursement, which can fluctuate greatly among Member States due to varying national administrative capacities and legal traditions. The unequal distribution of aid around the EU has drawn criticism, with fiscally stronger nations like France and Germany holding a disproportionate amount of the authorised assistance. This could make differences in the internal market's industrial competitiveness worse.[26]

The GDIP system mirrors the EU's broader regulatory culture, which places a higher priority on subsidiarity, procedural safeguards, and fair competition than the more centralised and rule-based model of the IRA. Although this guarantees flexibility and contextual adaptability, it frequently results

[25] Europa.eu. (2023). *EUR-Lex - 52023DC0062 - EN - EUR-Lex*. [online] Available at: https://eur-lex.europa.eu/legalcontent/EN/TXT/?uri=CELEX:52023DC0062.; Competition Policy. (2024). *Temporary Crisis and Transition Framework*. [online] Available at: https://competition-policy.ec.europa.eu/state-aid/legislation/temporary-crisis-and-transition-framework_en [Accessed 2025].

[26] Holmes, M. et. al(2024). *The expiry of the EU State Aid Temporary Crisis and Transition Framework*. [online] Trade Compliance Resource Hub. Available at: https://www.tradecomplianceresourcehub.com/2024/07/05/the-expiry-of-the-eu-state-aid-temporary-crisis-andtransition-framework-back-to-a-new-normal/ [Accessed 2025].

in administrative fragmentation and slower disbursement, particularly in cases when national and subnational institutions do not coordinate well.

All things considered, the EU's strategy for approving and implementing green aid provides a flexible, decentralised framework that permits focused assistance. Its efficacy, however, is largely dependent on the administrative capabilities of Member States and the Commission's competence to simplify oversight without compromising legal accountability. When compared to the U.S. system, this institutional structure presents serious obstacles to regulatory agility despite having a strong normative foundation.

4.4 Indicators and Assessment of Agility in Subsidy Granting

4.4.1 Analytical Framework and Institutional Coordination

In this analysis, the key indicators of regulatory agility defined in Chapter 2—namely, institutional coordination, procedural complexity, implementation timelines, and the degree of discretion—will be applied to compare the agility of the US and EU systems in providing green industrial subsidies. These factors show each system's ability to provide funding effectively, predictably, and quickly enough to meet climate demands.

One important factor that stands out is institutional cooperation. The Internal Revenue Service (IRS), the Department of Energy (DOE), and the Department of Treasury are the main actors in the centralised federal governance framework that underpins the U.S. model under the Inflation Reduction Act (IRA). With direct lines of power and fewer veto points in the federal decision-making process, this arrangement typically suggests a more efficient, top-down coordination approach. For example, within a year of the IRA's enactment, the Treasury Department and IRS released preliminary advice on transferability and direct pay, which made implementation easier starting in early 2023. [27] Overall, the consistency of federal tax legislation reduces the overall coordination load as compared to a multi-level system, even though coordination issues can still occur between various federal agencies or in guaranteeing consistent instructions across departments.

On the other hand, because of its multi-level governance structure, which includes the European Commission, several EU funds, and 27 different Member States, coordination within the EU's Green Deal Industrial Plan (GDIP) is intrinsically more complicated. This complexity is demonstrated by the necessity of demanding vertical alignment between the Commission and various national capitals,

[27] U.S. Department of the Treasury. (2024). *U.S. Department of the Treasury, IRS Release Additional Guidance to Boost American Clean Energy Manufacturing*. [online] Available at: https://home.treasury.gov/news/press-releases/jy2344.

which frequently results in "joint-decision traps," and effective horizontal alignment between various Commission departments, which frequently entails extensive inter-institutional working groups[28] and institutional fragmentation. These difficulties require constant compromise and adjustment at different levels of government. All state assistance actions are still subject to notification and Commission approval under the Temporary Crisis and Transition Framework (TCTF).[29] Although the Commission hastened decisions, frequently in a matter of weeks, institutional fragmentation and capacity limitations have caused national implementation to lag.

4.4.2 Procedural Complexity and Administrative Burdens

In terms of procedural complexity, the U.S. system offers two different routes. Rules-based, selfcertifying models are used by tax credits like the Production Tax Credit (PTC) and the Investment Tax Credit (ITC). After fulfilling objective requirements like the prevailing wage and domestic content criterion, eligible entities submit direct benefit claims through IRS filings[30]. For businesses, this frequently results in a heavy administrative load that necessitates specific legal, accounting, and supply chain knowledge to handle complex definitions, phased needs, and possible recapture laws. Although many tax credits use a self-certification mechanism, which in theory allows for quicker access to benefits, the complexity of the underlying regulations can still present a significant compliance barrier. It does, however, circumvent the drawn-out application procedures that are characteristic of grant-based structures.

There is more procedural complexity in the EU system. Even with short-term relaxations like the Temporary Crisis and Transition system (TCTF), traversing the overall EU state aid system and then adjusting to possibly 27 different national implementation schemes is the main source of the GDIP's complexity in the EU. This frequently implies that, depending on the particular Member State, businesses looking for assistance may encounter varied eligibility rules, national application portals, and administrative challenges. A Bruegel analysis indicates that one of the biggest obstacles to effective fund allocation is still the difficulty of appealing for assistance across 27 Member States.[31] The interplay between national co-finance arrangements and EU-level funds further complicates

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[28] Scharpf, F. (1999). *Governing in Europe: Effective and Democratic?* [online] *academic.oup.com*. Oxford University Press. Available at: https://academic.oup.com/book/11939.

[29] Competition Policy. (2024). *Temporary Crisis and Transition Framework*. [online] Available at: https://competitionpolicy.ec.europa.eu/state-aid/legislation/temporary-crisis-and-transition-framework_en [Accessed 2025].

[30] Irs.gov. (2024). *Clean Electricity Investment Credit | Internal Revenue Service*. [online] Available at: https://www.irs.gov/creditsdeductions/clean-electricity-investment-credit.

[31] Sgaravatti, G., Tagliapietra, S. and Trasi, C. (2024). *Re-energising Europe's global green reach*. [online] Bruegel | The Brussels-based economic think tank. Available at: https://www.bruegel.org/policy-brief/re-energising-europes-global-green-reach.; Kleimann, D. et al. (2023). *How Europe should answer the US Inflation Reduction Act*. [online] Available at: https://www.bruegel.org/sites/default/files/private/2023-02/PB%2004%202023.pdf [Accessed 2025].

matters for project developers working internationally, as they have to adhere to several sets of regulations and reporting requirements, including Recovery and Resilience Facility (RRF) allocations in conjunction with state aid.

4.4.3 Implementation Timelines and Disbursement Efficiency

When evaluating implementation timetables, businesses' benefit realisation for IRA tax credits in the US generally coincides with their tax filing schedules, which means that benefits may be realised quite quickly after qualifying. With the goal of delivering benefits to qualified activities in months rather than years, mechanisms such as transferability and direct pay are particularly created to speed up cash flow to beneficiaries. With more than $8.4 billion claimed for residential energy efficiency improvements alone, tax advantages under the IRA started to accrue in 2023.[32] Between August 2022 and December 2023, IRA incentives are expected to mobilise about $280 billion in private capital, according to the Clean Investment Monitor.[33] Relatively flexible disbursement was made possible by the combination of quick rulemaking and automated tax credit arrangements. Timelines for grant programs, however, are still based on agency-specific Notices of Funding Opportunity (NOFOs) and the review periods that follow. These can be lengthy, frequently lasting several months or longer for large-scale projects. However, there is a discrepancy in the EU between approved aid and actual disbursements. The European Commission must first approve national aid plans before each Member State may begin its own national implementation procedures. This is the schedule for green aid under the GDIP. Although the TCTF was specifically created to strive for quicker Commission approvals, which are frequently finished in a matter of weeks for compliance notifications, the ensuing national administrative processes can frequently cause considerable delays. The administrative capabilities of individual national agencies, the creation of national application windows, specific national legislative changes, or drawn-out public consultation procedures can all contribute to these delays, which result in varying rates of "translation into concrete actions" and notable differences in project start times amongst EU Member States. Only around 19% of the aid authorised under the Temporary Crisis and Transition Framework (TCTF) was actually disbursed by mid-2024, according to data from the European Commission, despite the fact that exact numbers for the March 2023–June 2024 period are not publicly available. This suggests a significant lag between approval and expenditure.[34] The

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[32] Iacurci, G. (2024). *Clean energy tax breaks more popular than expected, as U.S. households claimed $8.4 billion in Inflation Reduction Act credits for 2023, officials say*. [online] CNBC. Available at: https://www.cnbc.com/2024/08/07/american-households-claimed-billions-in-cleanenergy-credits-in-2023.html.

[33] www.cleaninvestmentmonitor.org. (n.d.). *The Clean Investment Monitor*. [online] Available at: https://www.cleaninvestmentmonitor.org.

[34] Ferraro, S., Cannas, G. & Van de Casteele, K. (2024) *The use of crisis State aid measures in response to the Russian invasion of Ukraine (until end-June 2023)*, *Competition State Aid Brief* No. 1/2024. European Commission, Directorate-General for Competition. Available at: https://competitionpolicy.ec.europa.eu/document/download/22938d94-beaa-44bf-97ca-8a1785ca1a1c_en (Accessed: August 2025)

European Court of Auditors has determined that fund absorption has been hampered by national-level impediments, such as delayed tenders, unclear legal status, and inadequate administrative capability.[35]

4.4.4 Degree of Discretion and Market Predictability

Finally, there are significant differences in the level of discretion. In the US, the IRA's tax advantages are mostly "rules-based" in nature. This gives investors a high level of predictability because a project is typically qualified for the credit provided it can be shown to meet the legislative requirements. This consistency makes financial planning easier, which is especially beneficial for large, standardised green projects. However, after the rule is passed, this inherent lack of administrative discretion may make it more difficult to accommodate extremely creative, specialised, or nontraditional initiatives that don't precisely meet the rigid requirements. By definition, grant programs include greater agency discretion in both funding distribution and beneficiary selection. On the other hand, the EU's GDIP gives Member States a great deal of "flexibility and discretion" in creating and focussing their national aid programs, especially because to the TCTF's loosened state aid regulations. Although this strategy makes it possible to critically tailor aid to particular national contexts, industrial needs, and regional priorities (e.g., focussing on sectors like hydrogen production or battery manufacturing), it may also result in market fragmentation and potential competitive distortions within the single market. This is due to the possibility that some Member States may provide more generous or unique aid packages than others, depending on their fiscal resources or political priorities. This could affect the overall coherence of the market and, depending on the national authority in charge of implementation, result in differing degrees of administrative burden and agility. Wealthier Member States like France and Germany, for instance, have been able to provide more substantial subsidies, which has sparked worries about internal market distortions.[36]

Because of its centralised structure, standardised procedures, and quick deployment mechanisms, the U.S. model exhibits higher regulatory agility in subsidy granting, while the EU's approach, while normatively sound and context-sensitive, is hampered by administrative diversity, fragmented implementation, and slower fund absorption. These structural differences reflect deeper trade-offs between agility, subsidiarity, and regulatory uniformity. Additionally, the reliance on political

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[35] European Court of Auditors. (2024). *Special report 14/2024: Green transition*. [online] Available at: https://www.eca.europa.eu/en/publications?ref=sr-2024-14 [Accessed 2025].

[36] Kustova, I., Rizos, V., Righetti, E., Elkerbout, M. and Egenhofer, C. (2024). *CEPS IN-DEPTH ANALYSIS How to deliver net zero and a more competitive EU*. [online] Available at: https://cdn.ceps.eu/wp-content/uploads/2024/06/InDepthAnalysis-2024-10_Green-and-enviable1.pdf [Accessed 2025].

discretion can make things less predictable for applicants, particularly in nations with limited transparency or political volatility.

4.5 Empirical Evidence and Comparative Agility

A detailed examination of how aid is converted into industrial output is necessary to evaluate the regulatory flexibility of the US and EU in providing green industrial subsidies. Both the EU Green Deal Industrial Plan (GDIP) and the U.S. Inflation Reduction Act (IRA) have their first full implementation windows in 2023 and 2024, which enables a preliminary empirical comparison in terms of the deployment of green industrial projects, the mobilisation of private investment, and the delivery of public funding. Using information from official government sources, institutional reports, and independent analysis, this section provides a comparative summary of the most pertinent facts on aid awarded. The emphasis is on the amount of money allotted, the kinds of incentives offered (such as tax credits, direct payments, and state aid approvals), and the quantity and kind of green industrial projects that each system supports. The EU approach depends on a combination of state aid authorisations and reallocation of existing funds under the Temporary Crisis and Transition Framework (TCTF), whereas the US model is mostly focused on extensive tax incentives enacted at the federal level. The quantitative basis for evaluating the two methods' strategic orientation and administrative capability is provided by this comparison.

4.5.1 United States – Inflation Reduction Act (IRA)

After being put into law in August 2022, the Inflation Reduction Act (IRA) went into full effect in 2023 and 2024. The IRA, the biggest piece of climate-related legislation in U.S. history, aims to lower emissions, boost local manufacturing, and speed up the clean energy transition by combining targeted federal investment with extensive tax incentives. The Internal Revenue Service (IRS) oversees the production and investment tax credits, and government organisations like the Department of Energy (DOE) coordinate the grant and loan programs that provide aid. Since the law's passage in August 2022, IRA provisions have sparked nearly $280 billion in private clean energy investments, according to the Clean Investment Monitor (CIM) as of December 2023. An estimated 400,000 employment were created by the more than 700 clean energy projects that were started or expanded. These projects covered industries like solar and wind energy, battery manufacturing, electric vehicle manufacturing,

and green hydrogen.[37] Large-scale facilities from First Solar, Hyundai, and Plug Power were among the main beneficiaries.

This impetus is supported by fiscal statistics, which shows that in 2023 alone, over 3.4 million families received tax credits for domestic energy improvements, totalling $8.2 billion, of which $6 billion was allocated for home energy retrofits, according to the U.S. Treasury Department.[38] A significant loan to Plug Power for the development of six green hydrogen production plants around the United States is part of the more than $1.66 billion in funding that has been made available under the Title 17 Clean Energy Financing Program by early 2024, according to DOE. Additionally, in July 2024, DOE announced $371 million for grid modernisation projects in 16 states, with an emphasis on infrastructure enhancements and accelerated permitting.[39] According to the Congressional Budget Office (CBO), the IRA's energy-related tax provisions will cost $270 billion between 2023 and 2031.[40]

This quick financial outlay demonstrates the federal model's administrative effectiveness and predictability in addition to the magnitude of the U.S. investment. Faster adoption and lower financing hurdles have been made possible by the use of tax credits with "direct pay" and "transferability" methods, especially for smaller businesses and non-taxable companies.[43] Because of the IRS and DOE's centralised roles, distribution processes were streamlined and state-by-state timescales were comparatively consistent.

4.5.2 European Union – Green Deal Industrial Plan (GDIP)

The EU's coordinated response to the global clean tech race, especially in response to the IRA, is embodied in the Green Deal Industrial Plan (GDIP), which was introduced in February 2023. Through four pillars—a streamlined regulatory framework, financial accessibility, skill development, and open trade resilience—the GDIP encourages net-zero industry investments. The Temporary Crisis and

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[37] Hudson, G.P. (2023). *More than 400,000 clean energy jobs created since 2022, politics could halt growth*. [online] WAER. Available at: https://www.waer.org/news/2025-04-19/greenjobs [Accessed 2025].

[38] Department of the Treasury (2023). *2023 FINANCIAL REPORT OF THE U.S. GOVERNMENT*. [online] fiscal.treasury.gov. Available at: https://fiscal.treasury.gov/files/reports-statements/financial-report/2023/02-15-2024-FR-(Final).pdf.

[39] Energy.gov. (2024). *Biden-Harris Administration Invests $371 Million in 20 Projects to Accelerate Transmission Permitting Across America*. [online] Available at: https://www.energy.gov/articles/biden-harris-administration-invests-371-million-20-projects-acceleratetransmission.

[40] Congressional Budget Office Cost Estimate. (n.d.). Available at: https://www.cbo.gov/system/files/2022-09/PL117-169_9-7-22.pdf. [43] Dressler, L. and Warwick, R. (2025). Corporate income tax, investment, and the Net-Zero Transition. *OECD taxation working papers*. doi:https://doi.org/10.1787/08e15e33-en.; Energy Central. (2024). *Insight into Direct Pay for Clean Energy Tax Credits*. [online] Available at: https://www.energycentral.com/energy-biz/post/insight-direct-pay-clean-energy-tax-credits-VkZmjG04c7womGa [Accessed 2025].

Transition Framework (TCTF), which permits accelerated state aid approvals for green projects under Article 107 TFEU, is one of its primary tools.

A wide range of geographic and technological areas are represented in the major national programs authorized under the Temporary Crisis and Transition Framework (TCTF). In France the European Commission approved €10.82 billion for two offshore wind parks in Normandy and the Atlantic, with up to 10 TWh/year output. In Belgium a €682 million support scheme was allocated for the development of the 700 MW *Princess Elisabeth Zone*, expected to generate 2.6 TWh/year**.** Meanwhile Portugal received approval for a €1 billion aimed at co-financing clean tech production, including solar panels, batteries, and heat pumps. In Poland a €1.2 billion initiative was authorized to support industrial decarbonization and the domestic production of clean energy components.[41]

Simultaneously, the Recovery and Resilience Facility (RRF) and other current instruments are reallocated to strengthen the GDIP. However, actual disbursement lags significantly, even though at least 37% of national Recovery and Resilience Plans (NRPs) under the Recovery and Resilience Facility (RRF) are designated for climate-related measures. By the end of 2023, only about 40% of the grant funds that were allocated had been paid out, which is less than 30% of the total RRF funds. This signifies significant challenges in absorption capacity and procedural complexities.[42]

Thus, the EU's approach differs from the US model. Although the total amount of aid approved is substantial, the multi-level governance structure, diverse national capacities, and complex financial routes have caused disbursement to be slowed down.

Furthermore, the competitive character of state assistance approvals has sparked worries about internal market fragmentation and possible competition distortion. According to Bruegel analysts,

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[41] European Commission (2024) Commission approves €10.82 billion French state aid scheme for offshore wind, Enerdata, 4 July. Available at: https://www.enerdata.net/publications/daily-energy-news/eu-commission-approves-eu11bn-french-aid-scheme-offshore-wind.html (Accessed: August 2025); European Commission (2024) Commission approves €682 million Belgian state aid scheme to support renewable offshore wind energy, Eureporter, 18 September. Available at: https://www.eureporter.co/politics/europeancommission/2024/09/18/commission-approves-e682-million-belgian-state-aid-scheme-to-support-renewable-offshore-wind-energy-tofoster-the-transition-to-a-net-zero-economy/ (Accessed: August 2025).; European Commission (2024) Commission approves €1 billion Portuguese state aid scheme, Portugal Global, September. Available at: https://www.portugalglobal.pt/en/news/2024/september/commission-approves-1-billion-portuguese-state-aid-scheme/ (Accessed: August 2025).; European Commission (2024) Commission approves €1.2 billion Polish state aid scheme to support investments in strategic sectors, Eureporter, 23 September. Available at: https://www.eureporter.co/environment/2024/09/23/commission-approves-e1-2-billionpolish-state-aid-scheme-to-support-investments-in-strategic-sectors-to-foster-the-transition-to-a-net-zero-economy/ (Accessed: August 2025).

[42] Strupczewski, J. (2024). EU recovery fund disbursement slow at mid-point of scheme, auditors warn. *Reuters*. [online] 2 Sep. Available at: https://www.reuters.com/world/europe/eu-recovery-fund-disbursement-slow-mid-point-scheme-auditors-warn-2024-09-02/.; Europa.eu. (2023a). 2023 EU audit in brief. [online] Available at: https://op.europa.eu/webpub/eca/audit-in-brief-2023/en/ [Accessed 2025].

these delays are made worse by differences in national implementation capabilities, as wealthier nations are able to allocate funds more effectively.[43] Additionally, there is more discretion and

fluctuation in the deployment rate due to the EU's reliance on project-specific state aid approvals. The Renewable Energy Directive's (RED III) "go-to areas" and other fast-track requirements are frequently applied inconsistently and with procedural friction due to overlapping competencies among ministries, regions, and agencies.

4.5.3 Comparative Interpretation and Preliminary Reflections

Two distinctly different kinds of public support for the green industrial transition are revealed by comparing aid awarded under the IRA and the GDIP throughout the 2023–2024 period. Large-scale fiscal incentives provided through a centralised federal framework are the cornerstone of the US method, which has shown high administrative velocity and little procedural friction in putting policy into practice. Rapid investment scaling and robust private sector participation have been made possible by the automaticity of tax credit claims in conjunction with targeted grants and loans overseen by the DOE and Treasury.

The European Union approach, on the other hand, is distinguished by a decentralised and selective framework, despite having comparable total permitted quantities. Agility has been impacted by longer deployment timetables and inconsistent development across Member States as a result of the TCTF's reliance on national implementation and the multi-layered design of EU financial instruments like the RRF and Innovation Fund. A level of procedural stacking not present in the U.S. case is introduced by the Commission's twin position as gatekeeper and regulator. The slower rate of disbursement indicates fundamental limitations in administrative coordination and delivery capabilities, even if the GDIP has been successful in mobilising critical investments in important areas, including offshore wind, battery production, and clean tech manufacturing.

From the standpoint of policy design, the EU places more emphasis on targeted support, regulatory consistency, and market fairness than the U.S. model, which stresses scale, speed, and simplicity. In the upcoming chapters, these distinctions will be examined in more detail, especially in relation to the administrative capability, regulatory flexibility, and institutional efficacy of green industrial policies in adapting to rapidly changing geopolitical and technological forces. But it's crucial to

[43] Aghion, P. (n.d.). *SPARKING EUROPE'S NEW INDUSTRIAL REVOLUTION A policy for net zero, growth and resilience Edited by Simone Tagliapietra and Reinhilde Veugelers BLUEPRINT SERIES 33*. [online] Available at: https://www.bruegel.org/system/files/202308/Bruegel%20Blueprint%2033%20080823%20web.pdf [Accessed 2025].

remember that regulatory agility is more than just a numerical idea. The EU method focuses more on legal scrutiny, environmental protections, and competitive neutrality than the U.S. model, which seems to be more quick and expansive. These elements support a more thoughtful—though maybe less flexible—policy implementation approach.

Overall, the 2023–2024 empirical data indicates that the U.S. system, operating under the IRA, is currently more flexible in allocating green industrial subsidies and converting them into project activity. Although the EU has established a flexible policy framework and made significant pledges, its efficacy is still being slowed by structural issues with administrative execution. Reforms in national coordination capabilities and EU administration in the upcoming years will determine whether this gap closes over time.

5. Agility in Granting Permits for the Green Production

Through the permission processes for renewable electricity generation in the US and the EU, this chapter examines the idea of regulatory adaptability. A key administrative link between the creation of policies and their practical implementation is permitting; any delays, complications, or ambiguity at this point might seriously impair the green transition's efficacy and speed.

The chapter is divided into four parts. A thorough review of the permitting procedures in the US and the EU is given in Sections 5.1 and 5.2, which also list the main regulatory players, procedural specifications, and typical bottlenecks. In Section 5.3, the relative agility of each system is evaluated and compared using a set of predetermined indicators, such as average permitting times and procedural complexity. Lastly, section 5.4 examines whether variations in administrative performance correspond to varying degrees of energy transition advancement by presenting empirical data on the actual deployment of renewable electricity capacity throughout the 2023–2024 timeframe.

By means of this approach, the chapter seeks to demonstrate the degree to which institutional design and administrative capacity impact the rate of green industrial implementation.

5.1 The Process of Granting Permits in the United States

Federal, state, and local authorities are all involved in the intricate, multi-jurisdictional regulatory structure that oversees the permission process for green electricity production in the United States. The U.S. federal system, where the balance between land-use rights, energy development, and environmental protection is negotiated across several administrative levels, is reflected in the regulatory authority's fragmented structure. Despite being thorough, this tiered structure frequently causes procedural lags and ambiguity, which are important factors affecting regulatory agility.

Major permitting duties are divided among several federal agencies, including the Environmental Protection Agency (EPA), which also regulates emissions and ensures environmental compliance, especially with regard to air and water quality standards; the Bureau of Land Management (BLM), which manages rights-of-way for renewable energy developments on public lands; the U.S. Army Corps of Engineers, which manages Section 404 permits under the Clean Water Act for projects affecting wetlands and navig Additionally, the National Environmental Policy Act (NEPA) often

requires environmental evaluations, particularly for large-scale projects requiring federal financing or land.[44]

Each state upholds its own environmental and energy-related policies at the state level. The California Energy Commission (CEC), for example, centralises permitting for wind and solar thermal projects larger than 50 MW and, more broadly, for projects exceeding certain capacity criteria[45], however, Texas does not use a centralised permitting model for renewable energy; rather, local zoning and land use procedures are usually used to manage approvals. The state has very few siting regulations.

In community consultations, building permits, and land use approvals, local governments are essential. Particularly in suburban and rural areas, zoning regulations, noise restrictions, visual impact assessments, and local opposition—often referred to as "Not In My Backyard" (NIMBY)—can all seriously impede or delay project construction.

Large-scale solar and wind project permits in the United States usually take two to five years, with the NEPA review process alone frequently taking one to two years. "Long and uncertain permitting processes remain one of the primary bottlenecks for renewable energy deployment in the United States," according to a 2023 research published by the International Energy Agency (IEA).[46]

The Vineyard Wind offshore wind project in Massachusetts is a well-known example of significant delays, requiring over five years of federal environmental evaluations prior to construction starting. The project's lengthy permitting process, numerous agency meetings, and legal issues pertaining to the protection of marine animals caused delays despite its strategic significance.[47]

As of late 2023, more than 2,000 projects were waiting to connect to major regional transmission operators like PJM, CAISO, and MISO, making the interconnection process another significant bottleneck. To address these delays, the Department of Energy's Interconnection Innovation e-Xchange (i2X) initiative aims to improve data transparency, planning coordination, and stakeholder engagement.[48]

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[44] CEQ (2022). *Federal Register :: Request Access*. [online] unblock.federalregister.gov. Available at: https://www.federalregister.gov/documents/2022/04/20/2022-08288/national-environmental-policy-act-implementing-regulationsrevisions.

[45] California Energy Commission (2024). *Energy Facility Licensing*. Available at: https://www.energy.ca.gov/rules-and-regulations/energyfacility-licensing [Accessed 2025].

[46] International Energy Agency (2024). *Renewables 2023 – Analysis*. [online] IEA. Available at: https://www.iea.org/reports/renewables2023.

[47] BOEM (2021). *Vineyard Wind 1 Offshore Wind Energy Project Record of Decision*. U.S. Department of the Interior, Bureau of Ocean Energy Management. Available at: https://www.boem.gov/sites/default/files/documents/renewable-energy/state-activities/Vineyard-WindRecord-of-Decision.pdf [Accessed 2025].

[48] US Department of Energy (2023). *Transmission Interconnection Roadmap Transforming Bulk Transmission Interconnection by 2035*

Inconsistent timescales across jurisdictions, changing regulatory requirements, and a lack of interagency collaboration all contribute to the complexity of the permitting landscape. The Biden administration started the Permitting Action Plan in 2022 to expedite federal environmental evaluations and enhance agency coordination in response to these systemic issues. Additionally, the plan aims to use best practices like designated permission liaisons, standardised environmental evaluations, and early stakeholder participation. The results of these changes' implementation, however, have been inconsistent, with numerous marquee projects continuing to be delayed as a result of litigation, stakeholder disagreements, or ambiguous procedural requirements.[49]

Overall, the regulatory agility of the U.S. permitting system is moderate; state-level flexibility and federal standardisation enable dynamic responses, but overall efficiency is frequently constrained by structural fragmentation and local discretion. The U.S. permitting discussion is still centred on the conflict between environmental rigour and the pace of renewable energy deployment, especially as climate targets become more pressing.

5.2 The Process of Granting Permits in the European Union

A complex, multi-level governance structure that distributes regulatory authority among EU institutions, national governments, and regional/local bodies defines the European Union's permitting environment for green electricity production. Although the EU's fundamental subsidiarity principle is reflected in this decentralised structure, it also brings about substantial administrative fragmentation, procedural delays, and legal uncertainty—problems that still impede the prompt deployment of renewable energy infrastructure throughout Member States.

The primary legal documents that control permitting at the EU level are contained in a number of important directives. The Renewable Energy Directive (RED II and its updated version, RED III), which was enacted in 2018, and its 2023 modification (RED III as part of the Fit for 55 package), which encourages Member States to expedite permission for renewable energy projects, are the most pertinent. RED III specifically presents the idea of "go-to areas"—pre-designated regions where permitting must adhere to streamlined, expedited processes with less requirements for environmental

Interconnection Innovation e-Xchange (i2X). [online] Available at: https://www.energy.gov/sites/default/files/202404/i2X%20Transmission%20Interconnection%20Roadmap.pdf.; US Department of Energy (2023a). *Tackling High Costs and Long Delays for Clean Energy Interconnection*. [online] Energy.gov. Available at: https://www.energy.gov/eere/i2x/articles/tackling-high-costs-and-longdelays-clean-energy-interconnection.

[49] House, T.W. (2022). *FACT SHEET: Biden-Harris Administration Releases Permitting Action Plan to Accelerate and Deliver Infrastructure Projects On Time, On Task, and On Budget | The White House*. [online] The White House. Available at: https://bidenwhitehouse.archives.gov/briefing-room/statements-releases/2022/05/11/fact-sheet-biden-harris-administration-releasespermitting-action-plan-to-accelerate-and-deliver-infrastructure-projects-on-time-on-task-and-on-budget/ [Accessed 2025].

assessments and legal deadlines.[50] Permitting decisions must be made within 12 months in go-to zones and 24 months elsewhere, under RED III. The application of these regulations is still uneven and narrowly focused, nevertheless. Then, by requiring statutory maximum timetables and single points of contact for cross-border projects, the TEN-E Regulation (EU/2022/869) expedites processes for Projects of Common Interest (PCIs) and Projects of Mutual Interest (PMIs) in energy infrastructure. It calls for a maximum 3.5-year statutory permit process (two years before to application plus 18 months of statutory, extendable nine months).[51]

Transposing these guidelines into domestic law is the responsibility of national governments, which results in notable differences in institutional coordination, administrative capability, and permitting processes. Every Member State appoints a National Competent Authority (NCA) to oversee its own permitting programs. Schemes can be coordinated or collaborative (several authorities issue binding judgements, coordinated by the NCA with enforceable timeframes) or integrated (NCA issues complete decisions directly). By 2025, NCAs will meet every three months to talk about best practices and national permitting frameworks, such as procedural scheduling and public involvement requirements.[52]

5.2.1 Case Studies and Bottlenecks

Administrative configurations and implementation schedules vary greatly at the national and regional levels. Although the directive stipulates timelines, national capacity and transposition determine enforcement. As mentioned previously, EU law establishes clear deadlines for PCI/PMI initiatives. Many Member States have yet to completely implement RED III regulations for non-PCI renewable energy projects, particularly with regard to timelines and go-to area procedures. Not all states make their precise implementation statistics publicly available.

In national practice, overlapping responsibilities (cultural heritage agencies, environmental organisations), requirements for consultation, and uneven court thresholds can cause delays in projects.

Since 2022, efforts to increase permitting agility have accelerated. Permit acceleration is listed as a strategic priority in the REPowerEU Plan, which was adopted in response to the energy crisis brought

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[50] European Commission (2023a). *Renewable energy directive*. [online] energy.ec.europa.eu. Available at: https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-directive_en.

[51] European Commission (2023a). *Permitting schemes and process*. [online] Energy. Available at: https://energy.ec.europa.eu/topics/infrastructure/projects-common-interest-and-projects-mutual-interest/permitting-schemes-andprocess_en.

[52] European Commission (2023a). *Permitting schemes and process*. [online] Energy. Available at: https://energy.ec.europa.eu/topics/infrastructure/projects-common-interest-and-projects-mutual-interest/permitting-schemes-andprocess_en.

on by Russia's invasion of Ukraine. It encourages Member States to pre-zone regions for renewable energy, digitise processes, and create one-stop shops. More recently, the proposed Net-Zero Industry Act (NZIA) advocates for standardising administrative processes throughout the EU and further streamlining the permitting process for important net-zero technologies. However, there are still a lot of disparities between Member States. Germany and Italy, for example, accounted for a significant portion of TCTF approvals through 2023, according to the State Aid Scoreboard, while Eastern and Southern states trailed behind in terms of distribution pace.[53]

Despite these challenges, a few encouraging instances show how prioritising administrative reforms might lead to increased adaptability. Lead times for offshore wind have been reduced to less than two years by Denmark and the Netherlands' effective implementation of one-stop shops and simplified permitting. Lithuania offers a notable example of procedural acceleration through regulatory innovation. The adoption of the "breakthrough package" eliminated key permitting bottlenecks—such as land-use conversion and overlapping environmental requirements—allowing utility-scale solar projects to be authorised and operational within 12 months. Onshore wind projects also experienced time savings of at least six months, illustrating how legal streamlining and digital tools can yield measurable efficiency gains [54]

In conclusion, even while the EU legislative framework offers a more solid foundation for expedited permitting, its actual application is still uneven. Project deployment is delayed and predictability is compromised by the patchwork of administrative realities created by the reliance on national and subnational agencies. In contrast to the U.S. model, which primarily internalises permitting complexity through federal or state channels, the EU's multi-level system still has challenges with efficient institutional functioning, legal clarity, and effective coordination. These difficulties have a direct effect on the EU permitting regime's regulatory flexibility and bring up significant issues regarding how well the Union's administrative delivery capabilities and its climate ambitions fit.

5.3 Indicators and Assessment of Agility in Permit Granting

5.3.1 Analytical Framework and Average Permitting Timelines

This section uses key indicators outlined in Chapter 2 to evaluate the relative agility of the US and the EU in approving renewable electricity projects. These indicators include average permitting times,

[53] Europa.eu. (2024). *IMMC.COM%282024%29115%20final.ENG.xhtml.1_EN_ACT_part1_v4.docx*. [online] Available at: https://eurlex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX%3A52024DC0115&utm [Accessed 2025].;

[54] CEE Legal Matters (2024) *Lithuania: A Breakthrough Period in Renewable Energy*. Available at: https://ceelegalmatters.com/briefings/22990lithuania-a-breakthrough-period-in-renewable-energy (Accessed: August 2025).

the number of permits issued each year, the level of procedural complexity, and the predictability of the permitting outcomes.

Large-scale renewable project permits in the US usually take two to five years, depending on the project's location, size, and the participation of federal agencies. Delays caused by permits continue to be a significant obstacle to the growth of sustainable energy in the United States.[55] Environmental Impact Statements (EIS) and other environmental evaluations required by the National Environmental Policy Act (NEPA) may take one or two years to complete.[56] The U.S. system benefits from more predictable processes notwithstanding interagency fragmentation. Despite their length, federal deadlines are comparatively uniform, and the Biden Administration's 2022 Permitting Action Plan includes improvements aimed at enhancing speed and collaboration. Developers now have more assurance because to mechanisms like the Federal Permitting Improvement Steering Council (FPISC), which has established goal schedules and tracking systems for important infrastructure projects. Meanwhile, simplified municipal approvals and a "connect & manage" approach for grid access have allowed projects to move forward in as little as 12 to 18 months in the top-performing states, including as Texas and Arizona.[57]

5.3.2 Multi-Level Governance and Delays in the EU

In contrast, because of the multi-level governance framework in the European Union, permitting agility varies significantly among Member States, making permitting operations there frequently slower and more fragmented. Maximum durations for renewable energy projects are established at 12 months in "go-to areas" and 24 months elsewhere by the Renewable Energy Directive III (RED III), which was adopted in 2023.[58] The flexible timetable rules had not yet been fully implemented by the majority of Member States as of mid-2024, which raised concerns of delays longer than three years in France, Italy, and Germany.[59]

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[55] Hu, A. (2023). *Red tape is slowing the shift to renewables, but Biden's permitting reform likely won't help*. [online] Grist. Available at: https://grist.org/energy/red-tape-is-slowing-the-shift-to-renewables-but-bidens-permitting-reform-likely-wont-help/.

[56] House, T.W. (2024a). *FACT SHEET: Biden-Harris Administration Takes Action to Deliver More Projects More Quickly, Accelerates Federal Permitting | The White House*. [online] The White House. Available at: https://bidenwhitehouse.archives.gov/briefing-room/statementsreleases/2024/08/29/fact-sheet-biden-harris-administration-takes-action-to-deliver-more-projects-more-quickly-accelerates-federalpermitting/.

[57] Burn-Murdoch, J. (n.d.). *How red Texas became a model for green energy*. [online] www.ft.com. Available at: https://www.ft.com/content/ef2f6f8e-60df-4ccd-8c4f-ef5cd0eb3176.

[58] eur-lex.europa.eu. (n.d.). *Directive - EU - 2023/2413 - EN - EUR-Lex*. [online] Available at: https://eurlex.europa.eu/eli/dir/2023/2413/oj/eng.

[59] Solarpowereurope.org. (2024). *New Report: Average EU Member State transposition of permitting rules for renewables falls short at just under 50% - SolarPower Europe*. [online] Available at: https://www.solarpowereurope.org/press-releases/new-report-average-eu-member-statetransposition-of-permitting-rules-for-renewables-falls-short-at-just-under-50 [Accessed 2025].; EASE (2024). *Renewable Energy Directive Revision Briefing*. [online] Available at: https://ease-storage.eu/wp-content/uploads/2024/10/2024_EASE_RED_LINKS.pdf.

The disparity in agility between the two systems is also seen in the number of licenses granted each year. Utility-scale solar installations in the US reached a record of 32.4 GW in 2023, while wind added about 6.4 GW of new capacity, totalling about 32 GW. This indicates efficient deployment, especially in areas where permitting was simplified. In the same year, the European Union added roughly 16.2 GW of wind and 55.9 GW of solar capacity. However, rooftop installations, which usually avoid utility-scale permitting processes, accounted for a large portion of the solar expansion.[60]

5.3.3 Procedural Complexity and Administrative Fragmentation

The United States benefits from a more distinct separation of permitting obligations in terms of procedural complexity. Different regulatory functions are supervised by federal agencies like the EPA, FERC, and the Bureau of Land Management (BLM): Through regulated rights-of-way under the FLPMA, the BLM oversees renewable energy projects on federal lands and provides organised pre-application and coordination procedures[61]; The EPA upholds environmental regulations, while FERC oversees interstate transmission and hydropower licensing, providing developers with a stable foundation.[62]

The U.S. process is more navigable since it is prescriptive and linear, even though overlapping reviews are still possible. Project developers may anticipate procedures including land identification, pre-application coordination, NEPA documents, and leasing agreements.[63]

Complexity in the EU arises from the need to adhere to national laws, regional or local planning requirements, and EU-level directives. For example, solar installations in Italy may need several approvals from local governments, environmental organisations, and cultural heritage organisations. Procedures are intended to be streamlined by changes made under the Decreto Semplificazioni bis (2021), such as replacement powers and tacit consent processes. Nonetheless, there is still inconsistency in enforcement and overlap amongst authorities.[64] The European Commission

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[60] O'Sullivan, R. (2024). *The EU built a record 17 GW of new wind energy in 2023 - wind now 19% of electricity production*. [online] WindEurope. Available at: https://windeurope.org/newsroom/press-releases/the-eu-built-a-record-17-gw-of-new-wind-energy-in-2023-wind-now-19percent-of-electricity-production/.; www.solarpowereurope.org. (2023). *New report: EU solar reaches record heights of 56 GW in 2023 but warns of clouds on the horizon - SolarPower Europe*. [online] Available at: https://www.solarpowereurope.org/press-releases/new-report-eusolar-reaches-record-heights-of-56-gw-in-2023-but-warns-of-clouds-on-the-horizon.

[61] BLM (n.d.). *Solar and Wind Energy Applications- Pre-Application and Screening | Bureau of Land Management*. [online] Bureau of Land Management. Available at: https://www.blm.gov/policy/im-2011-061 [Accessed 2025].; SEIA. (2024). *Utility-Scale Solar Power on Federal Lands Permitting Process – SEIA*. [online] Available at: https://seia.org/research-resources/utility-scale-solar-power-federal-landspermitting-process/.

[62] Sud, R. and Patnaik, S. (2022). *How does permitting for clean energy infrastructure work?* [online] Brookings. Available at: https://www.brookings.edu/articles/how-does-permitting-for-clean-energy-infrastructure-work/.

[63] Lundin, A. (2024). *The Next Phase of Energy Development on Federal Lands*. [online] Kimley-Horn. Available at: https://www.kimleyhorn.com/news-insights/perspectives/energy-development-federal-lands/.

[64] Allena, F.G., Miriam (2021). *Italy: 'Decreto Semplificazioni bis' converted into law - the main changes to administrative and environmental law*. [online] Global Compliance News. Available at: https://www.globalcompliancenews.com/2021/09/17/semplificazioni-decree-bis-lawdecree-no-77-of-31-may-2021-was-converted-into-law-no-108-of-29-july-2021-upon-conversion-into-law-the-text-of-the-decree-wassubject-to-further-amendments-and-ad/.;

established a Technical Support Instrument in 2024 to help Italy with allowing framework consolidation, digitisation, and the creation of uniform legislative texts across regions in order to address coordination concerns.[65]

5.3.4 Legal Predictability and Implementation Tools

In general, the United States provides a more solid framework in terms of legal and procedural predictability. Even though they can be drawn out, NEPA evaluations and project schedules are based on well-established public guidelines, specified consultation periods, and unambiguous legal appeal alternatives. In an effort to cut down on delays, the White House recently proposed revisions in April 2024 that broadened category exclusions, imposed page limitations, and set one- and two-year timelines for federal agencies to complete NEPA environmental evaluations.[66] More predictable approval results are supported by these process enhancements.

In contrast, the European Union continues to face legal ambiguity as a result of inconsistent permitting deadline execution, administrative disarray, and frequent court challenges. According to a World Economic Forum analysis from September 2024, WindEnergy permits in Europe are frequently delayed by seven to nine years, which results in major investment bottlenecks (approximately 81% of Europe's wind capacity is still in the permitting stages) and highlights a lack of coordination and digitalisation among Member States.[67]

In summary, the US exhibits a somewhat greater level of regulatory flexibility, particularly in areas with specialised permission offices and fewer levels of government. Despite its legislative advancements, the EU still faces challenges in coordinating permits among its member states in practice. The comparison indicators indicate that U.S. permission procedures are more effective at facilitating the timely realisation of renewable energy projects, even if both models reflect trade-offs between deployment speed and environmental vigilance.

5.4 Empirical Evidence and Comparative Agility

The annual growth in installed renewable electricity capacity and deployment effectiveness in 2023–2024 can be used to evaluate the practical implications of legislative agility in the US and the EU.

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[65] Reform Support. (2024). *Faster Permitting for Renewable Energy Projects in Italy*. [online] Available at: https://reformsupport.ec.europa.eu/what-we-do/green-transition/faster-permitting-renewable-energy-projects-italy_en [Accessed 2025].
[66] Gardner, T. (2024). US reforms green law to speed clean energy, infrastructure permits. *Reuters*. [online] 30 Apr. Available at: https://www.reuters.com/world/us/us-reforms-environmental-law-speed-up-clean-energy-infrastructure-approval-2024-04-30/.
[67] Piotrowski, M., Marushia Gislén and World Economic Forum (2024). *How permitting processes hamper Europe's energy transition*. [online] World Economic Forum. Available at: https://www.weforum.org/stories/2024/09/wind-energy-permitting-processes-europe/.

With the addition of 33.8 GW of new utility-scale clean energy capacity in 2023—roughly 19.6 GW of utility-scale solar and 7.9 GW of battery storage—clean energy deployment in the US hit all-time highs.[68] Nearly 49.3% of all new capacity increases in 2023 came from solar alone. Further acceleration is indicated by preliminary statistics for 2024, which shows that WRI reports additions of 39.4 GW of solar and 28.8 GW of storage, with solar and batteries accounting for more than 80% of new capacity additions.[69] These outcomes demonstrate the efficacy of the Inflation Reduction Act's incentive framework, which has sparked the rapid development and deployment of renewable energy and battery technologies while mobilising over 270 billion USD in clean energy investments.[70] In addition, project delivery capabilities have been greatly improved in leading states like Texas and Arizona due to permitting changes and state-level regulatory flexibility.[71]

In the 2023–2024 timeframe, institutional responsiveness has significantly increased thanks to the simplified tax credit system, more predictable permitting processes in states like Texas and Arizona, and centralised administrative monitoring. But there are still issues in some areas. Permitting delays remain a challenge for federal land-based projects and offshore wind. Before starting offshore construction in 2023, Vineyard Wind, the first sizable offshore wind farm in the United States, had to wait years for regulatory approval, including a supplemental Environmental Impact Statement under NEPA.[72]

Although legacy licensing systems for federal lands and offshore ventures continue to provide substantial procedural challenges, these experiences demonstrate how regulatory reforms have accelerated the deployment of many projects.

In contrast, despite strong legislative commitments, the European Union's deployment of renewable energy grew more slowly in 2023–2024. About 56 GW of solar and 16–17 GW of wind capacity were

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[68] Staff, S.B. (2024). *U.S. clean energy installations set a new record in 2023*. [online] Solar Builder Magazine. Available at: https://solarbuildermag.com/projects/u-s-clean-energy-installations-set-a-new-record-in-2023/.; ACP (2023). *NEW REPORT: Record Year for U.S. Clean Power Installations in 2023*. [online] ACP. Available at: https://cleanpower.org/news/market-report-2023/.

[69] Lu, M. (2025). *Charted: Renewable Energy Capacity in the U.S. (2014-2024)*. [online] Visual Capitalist. Available at: https://www.visualcapitalist.com/charted-renewable-energy-capacity-in-the-u-s-2014-2024/ [Accessed 2025].; Ajot.com. (2023). *Wind, solar, and batteries increasingly account for more new U.S. power capacity additions*. [online] Available at: https://www.ajot.com/news/windsolar-and-batteries-increasingly-account-for-more-new-u.s-power-capacity-additions.

[70] Worland, J. (2023). *How the Inflation Reduction Act Has Reshaped the U.S.—And The World*. [online] Time. Available at: https://time.com/6304143/inflation-reduction-act-us-global-impact/.

[71] Staff, S.B. (2024). *U.S. clean energy installations set a new record in 2023*. [online] Solar Builder Magazine. Available at: https://solarbuildermag.com/projects/u-s-clean-energy-installations-set-a-new-record-in-2023/.

[72] www.boem.gov. (n.d.). *Vineyard Wind 1 | Bureau of Ocean Energy Management*. [online] Available at: https://www.boem.gov/renewableenergy/state-activities/vineyard-wind-1.

installed throughout the EU in 2023; however, utility-scale PV installations were still only about 19 GW, and the majority of solar additions (~37 GW) were modest rooftop systems.[73]

Large-scale projects continue to face major structural obstacles, especially because of decentralised authorisation processes, grid congestion, and licensing delays.[74] One example is the NeuConnect interconnector, a €2.8 billion UK-German link that was initially scheduled to open in 2023 but has been continually postponed until 2028 because of intricate multijurisdictional permission and regulatory processes.

Over 100 GW of solar and wind power were still pending clearance in Italy by the middle of 2024, hampered by disjointed permitting and contradictory rulings from environmental and cultural heritage authorities.[75] These limitations demonstrate how administrative delay and regulatory heterogeneity can severely impede utility-scale implementation in the EU.

T1. Comparison table: EU vs US (2023–2024)

Dimension	**United States**	**European Union**
Installed solar capacity 2023	≈ 21–22 GW (dominant utility scale)	≈ 56 GW (of which ~37 GW rooftop; ~19 GW utility)
Wind capacity 2023	≈ 6 GW	16–17 GW
Market dominance	Predominantly utility-scale	Prevalence of small-scale plants and local projects
Permitting	Centralised and with reforms in some states	Decentralised, multi-regulatory
Notable examples of delay	Vineyard Wind awaiting authorisation in 2023	NeuConnect, Italian pipeline > 100 GW

[73] Abnett, K. (2024). EU's power mix in 2024 the greenest yet, industry data show. *Reuters*. [online] 1 Jul. Available at: https://www.reuters.com/sustainability/climate-energy/eus-power-mix-2024-greenest-yet-industry-data-show-2024-06-30/.

[74] Jacobo, J.T. (2024). *Solar and wind accounted for 27% of EU electricity in 2023*. [online] PV Tech. Available at: https://www.pv-tech.org/solarand-wind-accounted-for-27-of-eu-electricity-in-2023/ [Accessed 2025].; www.solarpowereurope.org. (2023a). *New report: EU solar reaches record heights of 56 GW in 2023 but warns of clouds on the horizon - SolarPower Europe*. [online] Available at: https://www.solarpowereurope.org/press-releases/new-report-eu-solar-reaches-record-heights-of-56-gw-in-2023-but-warns-of-cloudson-the-horizon.

[75] Reddit.com. (2024). *Reddit - The heart of the internet*. [online] Available at: https://www.reddit.com/r/energy/comments/1i3ecnt/italy_total_solar_pv_generation_increased_20_in/ [Accessed 2025].

At first glance, the data in the table suggests a paradox: while the United States demonstrates higher regulatory agility in terms of procedural execution, the European Union recorded a larger volume of installed renewable capacity in 2023. This outcome can be explained by structural factors rather than administrative efficiency. First, the EU represents a larger and more diversified internal market, although practical implementation among EU Member States remains highly uneven, despite the expedited authorization procedures introduced by RED III and the ambitious targets set under REPowerEU. Second, the Union has benefitted from long-standing policy instruments – such as feed in tariffs and binding renewable targets under the 2009 and 2018 Renewable Energy Directives – that created a path dependency in favour of sustained deployment. Finally, cumulative investment trajectories and higher baseline penetration of renewables in several Member States contribute to greater aggregate output. Therefore, the EU's larger installed capacity does not contradict its lower administrative agility, but reflects the interplay of market size, historical support schemes and policy continuity. Nevertheless, permitting delays remain the greatest enduring obstacle to achieving the EU's renewable ambitions. According to a 2024 IEA backed study, coordination problems in environmental, grid-connection and land-use frameworks continue to slow implementation.[76] Less than 50% of the major RED III permitting reforms had been incorporated into national law as of mid-2025, according to SolarPower Europe, and in a several Member States, project clearance times typically exceed four years, well beyond the legally mandated two-year limit set forth in the directive.[77] The problem is further highlighted by project backlogs: industry data indicates that more than 500 GW of wind projects are stuck in grid connection lines, with individual licensing delays in certain jurisdictions surpassing nine years. In Italy and the United Kingdom alone, there are more than 100 GW of outstanding capacity.[81] These delays highlight the ways in which administrative fragmentation, insufficient digitalisation, inconsistent enforcement, and imperfect transposition still obstruct the achievement of REPowerEU's declared goals.

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[76] International Energy Agency (2022). *Is the European Union on track to meet its REPowerEU goals? – Analysis*. [online] IEA. Available at: https://www.iea.org/reports/is-the-european-union-on-track-to-meet-its-repowereu-goals.; IEA (2025). *IEA Support to Accelerating Renewable Energy Permitting (ARPE) – Analysis - IEA*. [online] IEA. Available at: https://www.iea.org/reports/iea-support-to-acceleratingrenewable-energy-permitting-arpe.; European Commission (2024). *Faster Permitting for Renewable Energy Projects in Italy*. [online] Reform Support. Available at: https://reform-support.ec.europa.eu/what-we-do/green-transition/faster-permitting-renewable-energy-projectsitaly_en.

[77] Solarpowereurope.org. (2024a). *EU Renewable Energy Permitting: State of Play - SolarPower Europe*. [online] Available at: https://www.solarpowereurope.org/insights/thematic-reports/eu-renewable-energy-permitting-state-of-play [Accessed 2025].; Bhambhani, A. (2025). *EU Member States Lag On RE Permitting Reforms*. [online] TaiyangNews - All About Solar Power. Available at: https://taiyangnews.info/markets/eu-member-states-lag-on-renewable-energy-permitting-reforms-solarpower-europe [Accessed 2025]. [81] Abnett, K. (2024b). Years-long wait for permits blocking European wind farms, industry says. *Reuters*. [online] 5 Jul. Available at: https://www.reuters.com/sustainability/years-long-wait-permits-blocking-european-wind-farms-industry-says-2024-07-04/.

T2. Summary table – REPowerEU status and permits in the EU

Aspect	Current situation
RED III transposition	< 50 % of the measures into law
Typical permit issuance times	2–4 years, up to 9 in some countries
Projects awaiting connection (EU)	Over 500 GW
Countries with significant accumulations	Italy, UK: > 100 GW
Main causes	Lack of harmonisation, digitisation, administrative resources

5.5 Comparative Reflections on Regulatory Agility

According to the analysis of deployment patterns, the US currently has a higher level of administrative efficacy in converting policy promises into installed capacity. Accelerated project execution has been made possible by regulatory agility, which is fuelled by financial incentives and simplified permitting.

On the other hand, because of its multi-level governance structure and procedural complexity, the European Union exhibits a slower rate of implementation despite having high political ambition and extensive legal reform.

Regulatory agility, however, is more than just procedural quickness. The EU's more methodical approach reflects normative values including inclusive decision-making, legal coherence, and environmental protection. These elements support institutional credibility and social acceptance even though they might lengthen approval procedures.
On the other hand, the U.S. model prioritises efficiency and procedural simplicity, but it may overlook regional issues and long-term environmental protections.

In the end, the comparison evidence reveals two different regulatory agility models: balanced governance and swift execution. The US model demonstrates greater agility through its streamlined permitting processes and centralized fiscal incentives, enabling rapid deployment in renewable energy and related technologies. In contrast, the EU model is slower, owing to the complexity of its multi-level governance structure and national implementation capacities. However, the EU’s larger installed

capacity is a result of its long-standing policy instruments and the accumulated investments in renewable energy, which have provided a solid foundation for continued expansion.

Although the US model is more efficient in terms of procedural execution, the EU's approach emphasizes a broader range of policy objectives, balancing the need for industrial growth with environmental safeguards and social equity. Regulatory agility should, therefore, not be measured solely by deployment speed, but also by the broader capacity of institutions to adapt to complex societal and ecological challenges.

6. Conclusions

This thesis set out to examine the regulatory agility of two major industrial policy frameworks: the U.S. *Inflation Reduction Act* (IRA) and the EU's *Green Deal Industrial Plan* (GDIP).

The findings reveal two distinct models of regulatory agility. The United States exemplifies a model of "swift execution". By centralizing authority in federal agencies and relying on rules-based tax credits, the IRA has enabled rapid and large-scale mobilization of private capital. Within a year of enactment, over 32 GW of new renewable capacity were deployed, supported by tax credits that provide investors with predictable benefits. The introduction of transferability and direct pay has further enhanced liquidity and accessibility, lowering traditional barriers associated with tax equity markets. This demonstrates the strength of centralized fiscal incentives in accelerating deployment. However, the U.S. model also carries risks: permitting bottlenecks for offshore winds and federal land projects persist and the emphasis on speed may reduce opportunities for local participation or environmental scrutiny.

The European Union illustrates a model of "balanced governance". Through the GDIP and its reliance on TCTF and existing EU instruments, Member States have been granted more flexibility to support strategic green sectors. This has enabled large-scale state-aid schemes, particularly in wealthier Member States such as France and Germany and contributed to record levels of solar capacity deployment in 2023. Yet the EU's multi-level governance structure has also resulted in fragmented implementation. Permitting delays remain widespread, with average clearance times often exceeding legal deadlines and more than 500 GW of renewable projects still stuck in approval pipelines. The EU's slower pace reflects both its administrative heterogeneity and its normative commitments to subsidiarity, environmental safeguards and democratic processes.

A key finding of the comparison is that grater regulatory agility does not automatically translate into higher installed capacity. Despite slower processes, the EU recorded larger renewable capacity additions than the U.S. in 2023. This apparent paradox can be explained by structural factors: the EU's larger internal market, cumulative investment trajectories in several Member States. These elements have created a strong deployment baseline that compensates for lower administrative agility.

Overall, the evidence shows that the United States currently demonstrates greater regulatory agility in the implementation of green industrial policies. By contrast, the European Union, despite ambitious reforms and higher cumulative installed capacity, remains constrained by governance complexity, fragmented procedures and slower disbursements rates.

In conclusion, the United States demonstrates how centralized fiscal incentives can deliver rapid execution, while the European Union shows how cumulative policy continuity and structural scale can drive large deployment volumes despite slower administration processes. Together, the comparison highlights the trade-offs between speed, complexity and stability that will continue to shape the governance of the clean energy transition.

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