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Legal Frameworks for Renewable Energy Integration: A Comparative Study of India, the EU, and the U.S.

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Legal Frameworks for Renewable Energy Integration: A Comparative Study of India, the EU, and the U.S.

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Abstract

The move towards renewable energy is central to addressing climate change and achieving sustainable growth. Legal frameworks are critical in this process, as they establish the rules, incentives, and obligations that determine how effectively renewable energy can be integrated into existing power systems. This paper undertakes a comparative examination of the regulatory approaches adopted in India, the European Union (EU), and the United States (U.S.), three regions that represent diverse governance models and energy priorities.

India's approach is anchored in statutory measures like the Electricity Act, 2003, and reinforced through Renewable Purchase Obligations (RPOs) and Renewable Energy Certificates (RECs), which create demand for clean energy. The EU, on the other hand, operates under a collective framework where instruments such as the Renewable Energy Directive (RED II) impose binding targets and encourage regional cooperation in grid management and energy trade. The U.S. follows a more fragmented model: federal tax incentives, including the Investment Tax Credit (ITC) and Production Tax Credit (PTC), coexist with state-level Renewable Portfolio Standards (RPS), leading to significant variations in renewable energy adoption across states.

The comparison reveals important similarities, such as the reliance on policy incentives and market mechanisms, while also pointing to key differences in centralization, enforceability, and regulatory consistency. The study concludes that blending mandatory obligations with flexible, incentive-based mechanisms may offer a pragmatic pathway to advancing renewable integration without compromising economic competitiveness or energy reliability.

Keywords: *Renewable Energy, Energy Transition, European Union, United States, Policy Integration*

INTRODUCTION

The global energy landscape is undergoing a rapid transformation, driven by the dual imperatives of mitigating climate change and ensuring energy security. At the heart of this transition lies the growing deployment of Renewable Energy (RE) energy derived from naturally replenishing sources such as solar, wind, hydro, biomass, and geothermal.¹ Renewable energy not only offers a clean alternative to fossil fuels but also holds the potential to democratize energy access, reduce import dependency, and enhance resilience to volatile

¹ Government of India, Ministry of New and Renewable Energy, "What is Renewable Energy?" Available at <https://mnre.gov.in> (last accessed on 25 July 2025).

fuel prices. Integration of RE into existing electricity grids, however, presents formidable legal, technical, and institutional challenges. Unlike conventional energy sources, many renewable sources are variable, decentralised, and location-dependent, necessitating a rethinking of grid architecture and regulatory governance.² RE integration, in legal terms, refers to the development and enforcement of regulatory and policy frameworks that enable renewable energy generators to connect to the grid, participate in electricity markets, receive fair compensation, and ensure grid stability and reliability.³

In this context, law plays a critical enabling role in facilitating the clean energy transition. A coherent legal framework governs everything from transmission access, tariff design, and scheduling to obligations of distribution licensees and rights of consumers. Without legal clarity and regulatory certainty, the renewable sector faces risks of curtailment, delayed payments, and underinvestment.⁴ As India aspires to achieve 500 GW of non-fossil capacity by 2030 and meet its net-zero target by 2070, the role of law in enabling seamless RE integration has become more urgent than ever.⁵

Globally, the European Union (EU) and the United States (U.S.) offer valuable models of RE integration through robust legal and institutional mechanisms. The EU's Renewable Energy Directives (RED I, II and now RED III), market unbundling reforms, and cross-border trading initiatives have placed it at the forefront of clean energy governance.⁶ The U.S., with its federal structure, presents a decentralized but dynamic legal framework where state-level Renewable Portfolio Standards (RPS), coupled with federal tax incentives, have driven significant growth in renewables.⁷ India, in contrast, follows a hybrid model where electricity is on the Concurrent List, creating a dual jurisdiction between the Centre and States, often leading to fragmented or delayed implementation.⁸

Against this backdrop, this research paper seeks to undertake a comparative legal analysis of the frameworks for renewable energy integration in India, the EU, and the U.S. The objective is not only to study the institutional and legislative structures in each jurisdiction but also to identify regulatory innovations, enforcement mechanisms, and policy tools that can offer lessons for India's energy transition.

² Amit Kapur, 'Renewable Energy and Grid Integration: Legal and Regulatory Challenges in India' (2022) 64(2) *Journal of the Indian Law Institute* 153.

³ Parag Diwan, *Electricity Laws in India* (6th edn, Universal Law Publishing 2021) 213.

⁴ Rahul Tongia and Rakesh Sarwal, 'Making Renewables Work for India's Power Sector' (NITI Aayog – Brookings India, 2020).

⁵ Press Information Bureau, 'India Commits to Achieving Net Zero by 2070: PM Modi at COP26' (1 November 2021).

⁶ European Commission, 'Clean Energy for All Europeans Package', Available at <https://energy.ec.europa> (last accessed on 20 July 2025).

⁷ Alexandra Klass, 'U.S. Energy Law and Policy' in Benjamin Sovacool (ed), *The Routledge Handbook of Energy Law* (Routledge 2022) 345.

⁸ V Umakanth, 'Electricity and Federalism in India: A Legal Critique' *Indian Journal of Public Administration* (2023) 59(4) 421.

RESEARCH QUESTIONS

This paper is structured around the following key questions:

1. How do India, the EU, and the U.S. legally regulate renewable energy integration into their electricity grids?
2. What are the similarities and divergences in legal design, institutional architecture, and policy implementation among the three jurisdictions?
3. What lessons can India draw from these comparative experiences to strengthen its own RE integration framework?

METHODOLOGY

The research adopts a comparative doctrinal methodology, with a focus on statutory instruments, regulations, judicial decisions, and policy documents. Key legal texts include India's Electricity Act, 2003, the EU's Clean Energy Package (including RED II & RED III), and the U.S. Federal Power Act, alongside relevant orders by regulatory bodies such as FERC (Federal Energy Regulatory Commission), CERC/SERCs (Central and State Electricity Regulatory Commissions), and the Agency for the Cooperation of Energy Regulators (ACER) in the EU.

The study will analyse key themes such as:

- Legal rights of RE generators for grid access;
- Priority dispatch and curtailment protocols;
- Open access and balancing charges;
- Renewable purchase obligations (RPOs) or Renewable Portfolio Standards (RPS);
- Regulatory treatment of distributed generation (especially rooftop solar);
- Interplay of central and sub-national legal regimes.

SCOPE AND LIMITATIONS

The paper focuses specifically on grid-connected renewable electricity (primarily solar and wind), excluding off-grid and biomass sectors for scope management. It does not delve into the technical specifications of grid design but focuses on the legal and regulatory mechanisms governing RE integration. While the analysis is legal in nature, references to policy effectiveness and market performance are drawn to contextualize legal impact.

Comparative jurisdictions the EU and the U.S. were selected for their leadership in renewable integration and the availability of mature legal frameworks. While differences in economic capacity and institutional design limit direct translatability to India, the comparative study aims to highlight adaptable legal mechanisms rather than prescriptive uniformity.

The findings aim to inform not only legal scholars but also policy-makers, regulators, and energy stakeholders engaged in shaping India's clean energy future.

EVOLUTION AND SCOPE OF ENERGY LAW

Historically, energy law evolved as a sub-branch of infrastructure and public utility regulation, largely dominated by fossil fuel interests and centralized electricity monopolies.⁹ In recent decades, however, the field has rapidly expanded to include *climate considerations, renewable resource governance, consumer rights, and sustainability frameworks*. Modern energy law now governs a wide array of issues including licensing, tariffs, access to grids, energy efficiency, and investment regimes for clean energy technologies.

The development of renewable energy law- a subset of energy law reflects this shift in focus. It encompasses statutory and regulatory mechanisms that *promote the generation, integration,*

⁹ Martha M Roggenkamp and others, *Energy Law in Europe* (3rd edn, Oxford University Press 2016) 19.

and consumption of renewable energy, alongside legal instruments that ensure grid stability, protect investor interests, and incentivize innovation. In India, renewable energy law intersects with environmental law, administrative law, and federal constitutional provisions, particularly since electricity is a Concurrent Subject under the Constitution.¹⁰ The same holds true in the United States, where federalism complicates uniform implementation, while the European Union has harmonised RE obligations through central regulations and directives.

INTERNATIONAL CLIMATE COMMITMENTS AND RENEWABLE ENERGY

The growth of renewable energy law is intrinsically linked to the global legal regime on climate change, particularly the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement. The Paris Agreement of 2015, while non-binding in its precise emission targets, creates a binding obligation on parties to formulate and implement Nationally Determined Contributions (NDCs).¹¹ Most countries, including India, the EU member states, and the U.S., have included renewable energy expansion as a core part of their NDCs.¹²

Article 4(2) of the Paris Agreement requires each Party to prepare, communicate, and maintain successive NDCs, with a view to achieving the objectives of the Agreement. Additionally, Article 2(1)(c) obligates nations to make financial flows consistent with pathways toward low greenhouse gas emissions and climate-resilient development. This creates a legal impetus for countries to develop robust regulatory ecosystems for renewable energy, particularly to enable grid integration of clean sources that reduce carbon intensity.

Although international environmental law does not impose direct obligations on countries regarding renewable energy integration, its soft law principles such as common but differentiated responsibilities (CBDR), precautionary principle, and inter-generational equity influence national regulatory designs.¹³ In the European Union, these principles are integrated within both climate and energy legal frameworks, while in India, they are judicially recognised through landmark cases such as *Vellore Citizens' Welfare Forum v. Union of India*.¹⁴

CORE LEGAL PRINCIPLES OF RE INTEGRATION

Several legal principles underpin national frameworks for RE integration across jurisdictions. These principles offer the theoretical bedrock for legislation and regulatory design.

I. Priority Grid Access and Dispatch

RE producers often rely on laws that guarantee non-discriminatory access to transmission and distribution infrastructure. In advanced jurisdictions, laws also ensure priority dispatch, whereby renewable electricity is given preferential treatment over conventional sources to ensure decarbonisation goals are met.¹⁵ The European Union mandates this through RED II and Electricity Regulation (EU) 2019/943, whereas in India, while the CERC and SERCs encourage such access, the lack of statutory mandate creates operational uncertainty.¹⁶

¹⁰ Constitution of India, Schedule VII, List III (Entry 38).

¹¹ Paris Agreement (2015), Art. 4(2), United Nations Treaty Series.

¹² UNFCCC, 'India's Updated Nationally Determined Contributions' (2022), Available at <https://unfccc.int> (last accessed on 21 July 2025).

¹³ Philippe Sands, *Principles of International Environmental Law* (3rd edn, Cambridge University Press 2012) 187.

¹⁴ *Vellore Citizens' Welfare Forum v. Union of India*, [1996] AIR 2715 SC.

¹⁵ European Parliament and Council, Directive (EU) 2018/2001, Art. 12.

¹⁶ CERC, 'Framework for Forecasting, Scheduling and Imbalance Handling of Renewable Energy', Suo Moto Order, 2015.

II. Open Access and Cross-Subsidy Charges

Open access refers to the right of electricity consumers and producers to access the grid irrespective of geographic location. It is a cornerstone for renewable generators to sell power directly to consumers or on power exchanges. However, in jurisdictions like India, excessive cross-subsidy surcharges and procedural hurdles dilute this right. In contrast, the EU and U.S. have more transparent mechanisms governed by independent system operators (ISOs) and transmission system operators (TSOs).¹⁷

III. Tariff Mechanisms and Market Incentives

Feed-in tariffs (FiTs), competitive auctions, and net metering laws are tools to incentivise RE integration. Each mechanism raises legal questions around contract enforceability, tariff determination authority, and consumer protection. While India initially relied on FiTs and has now shifted to competitive bidding under Section 63 of the Electricity Act, the EU uses Contracts for Difference (CfDs), and the U.S. uses tax credits and state-level RPS mandates.¹⁸

IV. Forecasting, Scheduling, and Balancing Duties

Grid operators must ensure real-time supply-demand equilibrium. Laws often impose forecasting and scheduling obligations on RE generators, especially wind and solar, to prevent grid imbalances. In India, the Deviation Settlement Mechanism (DSM) governs penalties for such deviations, while in the U.S., FERC's Order No. 764 addresses intra-hour scheduling for variable renewables.¹⁹ Legal clarity on such obligations is critical to grid reliability.

ROLE OF REGULATORY AUTHORITIES

Legal frameworks depend significantly on independent regulatory authorities to enforce grid codes, settle disputes, and issue binding orders. In India, this role is played by Central Electricity Regulatory Commission (CERC) and State Electricity Regulatory Commissions (SERCs). In the U.S., FERC holds federal authority, while state Public Utility Commissions (PUCs) regulate retail markets. In the EU, ACER coordinates cross-border regulatory efforts while national regulators implement directives domestically.

The degree of autonomy, technical expertise, and judicial oversight over these regulators determines the efficacy of RE integration laws. For instance, in India, the appellate process through APTEL (Appellate Tribunal for Electricity) allows checks on regulatory overreach but suffers from delays. In contrast, EU and U.S. regulators have clearer mandates and better staffing structures.

The legal foundations of renewable energy integration rest on a blend of international environmental commitments, domestic statutory law, regulatory practice, and market innovation. While the specific instruments and institutional designs vary across India, the EU, and the U.S., the underlying legal objectives facilitating clean energy transition, maintaining grid reliability, and ensuring fair access remain broadly consistent. As the next chapters explore the country-specific frameworks, this conceptual foundation enables a grounded analysis of similarities, divergences, and normative lessons.

¹⁷ Sushanta K Chatterjee, 'Open Access in India: Legal Challenges and Economic Potential', 2019, Journal of Energy Law and Policy.

¹⁸ Ministry of Power, Government of India, Tariff Policy, 2016.

¹⁹ FERC Order No. 764, Integration of Variable Energy Resources (2012).

INDIA'S LEGAL FRAMEWORK FOR RENEWABLE ENERGY INTEGRATION

India's renewable energy sector has witnessed exponential growth over the past two decades, propelled by policy ambition, international commitments, and the falling cost of clean technologies. As of June 2025, India has an installed renewable energy capacity exceeding 180 GW, making it one of the world's top five renewable energy producers.²⁰ However, despite this progress, the legal and regulatory framework for integrating renewable energy into the national grid remains fragmented, under-enforced, and inconsistently applied across states. This chapter analyses the core legislative, regulatory, and institutional structures governing RE integration in India, highlighting key gaps and operational challenges.

THE ELECTRICITY ACT, 2003: FOUNDATIONAL LEGISLATION

The Electricity Act, 2003 is the principal legislation governing generation, transmission, distribution, and trading of electricity in India.²¹ Though the Act does not use the term “renewable energy” explicitly, it provides the enabling framework under which Renewable Purchase Obligations (RPOs), open access, and tariff determination mechanisms are implemented.

Under Section 86(1)(e), State Electricity Regulatory Commissions (SERCs) are empowered to promote cogeneration and generation of electricity from renewable sources by specifying RPOs for distribution licensees. Further, Section 3 mandates the central government to prepare a National Electricity Policy and Tariff Policy in consultation with state governments and the Central Electricity Authority (CEA), both of which have evolved to incorporate renewable integration priorities.

While the Act permits non-discriminatory open access to the transmission and distribution system under Sections 9 and 42, in practice, procedural and financial disincentives particularly cross-subsidy surcharges, additional surcharges, and wheeling charges create barriers to market access for renewable generators.

Recent discussions on the Electricity (Amendment) Bill, 2022 aim to further liberalize open access, allow for multiple distribution licensees in the same area, and improve enforcement of RPOs.²² However, the bill has faced political resistance due to concerns of potential discom privatization and state control dilution.

ROLE OF REGULATORY BODIES AND INSTITUTIONS

The Indian electricity sector functions under a multi-tier regulatory framework:

- The Ministry of Power (MoP) and Ministry of New and Renewable Energy (MNRE) provide national policy direction.
- The Central Electricity Regulatory Commission (CERC) regulates interstate transmission, open access, and power markets.
- The State Electricity Regulatory Commissions (SERCs) determine RPO targets, tariffs, and intra-state open access conditions.
- The Central Electricity Authority (CEA) provides technical standards for connectivity, transmission planning, and forecasting regulations.

²⁰ MNRE, ‘Renewable Energy Installed Capacity as on June 30, 2025’, Available at <https://mnre.gov.in> (last accessed on 25 July 2025).

²¹ Electricity Act, 2003 (Act 36 of 2003).

²² Ministry of Power, ‘Electricity (Amendment) Bill, 2022’, Available at <https://powermin.gov.in> (last accessed on 22 July 2025).

Despite this structure, institutional fragmentation and regulatory inconsistency across states hamper effective RE integration. While some states (e.g., Gujarat, Karnataka, Tamil Nadu) have proactively supported renewables, others lag behind in RPO enforcement or delay signing Power Purchase Agreements (PPAs).

GREEN ENERGY OPEN ACCESS RULES, 2022

Recognising the bottlenecks in open access, the Green Energy Open Access Rules, 2022, issued by the Ministry of Power, mark a major legal intervention. The rules:

- Allow consumers with a minimum load of 100 kW to avail green open access (reduced from 1 MW).
- Provide for uniform short-term open access charges.
- Require discoms to facilitate energy banking and voluntary RPO compliance.
- Mandate processing of applications within 15 days.

These rules attempt to create a more investor-friendly and legally certain framework for RE transactions. However, lack of alignment with state regulations and resistance by discoms especially financially stressed ones pose serious implementation challenges.

DISTRIBUTED RENEWABLE ENERGY (DRE): ROOFTOP SOLAR AND LEGAL GAPS

The potential of rooftop solar remains largely untapped. The Rooftop Solar Programme Phase II aims to install 40 GW through household and commercial installations. Net metering regulations by SERCs provide the enabling legal framework.

However:

- Implementation varies significantly across states.
- Discoms resist due to revenue loss fears.
- Approval and installation timelines are non-transparent.

Despite the MNRE's efforts, there is no national legislation governing distributed RE, creating a fragmented legal space with little protection for prosumers (producer-consumers).

Despite significant progress, India's RE integration framework suffers from several systemic challenges:

- Weak RPO enforcement and regulatory inconsistency.
- Curtailment without compensation and scheduling burdens.
- State-centre friction in implementing national policies.
- Delays in open access and discom pushback.
- Lack of statutory protection for small-scale and distributed RE projects.

These issues indicate the need for a consolidated legal and institutional approach that strengthens compliance, harmonises state practices, and ensures accountability across the value chain.

THE EUROPEAN UNION'S LEGAL FRAMEWORK FOR RENEWABLE ENERGY INTEGRATION

The European Union (EU) stands at the forefront of global climate leadership and energy transition. Through its binding climate targets and supranational regulatory approach, the EU has established one of the most comprehensive legal frameworks for renewable energy (RE) integration. Unlike India and the U.S., the EU's structure is uniquely shaped by its multi-level governance, where Member States retain sovereignty over their energy mix, but EU institutions mandate collective targets, facilitate market harmonisation, and monitor compliance. This

chapter explores the legal architecture enabling RE integration in the EU, focusing on directives, regulations, market design, and institutional mechanisms.

RENEWABLE ENERGY DIRECTIVE (EU) 2018/2001 (RED II)

The current framework is governed by RED II, adopted as part of the Clean Energy for All Europeans Package, which came into force on 1 July 2021. It sets an EU-wide binding target of at least 32% renewable energy in gross final energy consumption by 2030.²³

RED II is structured around several core principles:

I. Market Integration

Member States must ensure RE producers are integrated into electricity markets on equal footing with conventional generators. This includes:

- Priority access and dispatch, where applicable;
- Full market participation rights (e.g., in balancing and capacity mechanisms).

II. Support Schemes

While Member States retain discretion to design support mechanisms (e.g., Feed-in-Premiums, Contracts for Difference), RED II encourages technology neutrality and competitive allocation.

III. Streamlined Permitting

RED II mandates Member States to create one-stop shops for project permitting and fix maximum timelines (2 years for large projects).²⁴ This is critical to accelerate deployment.

IV. Energy Communities and Prosumers

RED II recognises citizens' energy communities and individual prosumers, granting them legal rights to generate, consume, store, and sell RE without facing disproportionate burdens.

THE EUROPEAN GREEN DEAL AND RED III (2023 REVISION)

With the adoption of the European Green Deal in 2019 and the legally binding European Climate Law (Regulation (EU) 2021/1119), the EU committed to reducing net GHG emissions by at least 55% by 2030 and achieving climate neutrality by 2050.

This led to RED III, the 2023 amendment of RED II, which:

- Raises the EU-level renewable target to 42.5% by 2030, with an aspiration to reach 45%.²⁵
- Sets sector-specific sub-targets (e.g., 49% RE in buildings, 29% in industry).
- Introduces mandatory cross-border cooperation, particularly for offshore wind.

The RED III is binding on Member States and will be implemented through national energy and climate plans (NECPs), subject to Commission review.

LEGAL FRAMEWORK FOR GRID ACCESS AND DISPATCH

Grid integration is governed by:

- Directive (EU) 2019/944 on the internal electricity market,
- Regulation (EU) 2019/943 on the electricity market structure.

These instruments mandate:

- Non-discriminatory and cost-reflective access to the grid for RE generators,
- Removal of priority dispatch for new RE installations post-2021 (except for small-scale installations),

²³ Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the Promotion of the Use of Energy from Renewable Sources [2018] OJ L 328.

²⁴ Ibid art.16.

²⁵ Directive (EU) 2023/2413 amending Directive 2018/2001 on the Promotion of Renewable Energy [2023] OJ L 293.

- Full participation of RE in ancillary services markets.

Transmission System Operators (TSOs) and Distribution System Operators (DSOs) are legally bound to plan infrastructure investments, based on Ten-Year Network Development Plans (TYNDPs) prepared by ENTSO-E.

However, challenges persist:

- Grid congestion in high-RE penetration regions (e.g., Germany's north-south transmission bottleneck),
- Curtailment without adequate compensation in some Member States,
- Varying national implementation of EU obligations.

INTERNAL ENERGY MARKET AND CROSS-BORDER TRADE

The EU's legal framework encourages integration of national electricity markets through:

- Market coupling mechanisms,
- Cross-border balancing markets,
- Interconnection targets (15% of installed capacity by 2030).

RE integration benefits from this unified market as surplus generation in one Member State can be absorbed by another. The Regulation on Risk-Preparedness (EU) 2019/941 and the Electricity Regulation (EU) 2019/943 require coordinated RE integration planning at regional and pan-European levels.

Yet, implementation remains uneven, and political disagreements (e.g., France–Germany differences on nuclear classification) sometimes hinder cooperation.

THE ROLE OF THE EUROPEAN COMMISSION AND ACER

The European Commission plays a central role in:

- Drafting binding and non-binding legal instruments,
- Monitoring Member State compliance,
- Initiating infringement proceedings for failure to implement EU law.

The Agency for the Cooperation of Energy Regulators (ACER) coordinates national regulatory authorities (NRAs) and ensures harmonised implementation. ACER also assists in cross-border grid code development and resolving regulatory disputes.

Such supranational enforcement mechanisms give EU law more teeth compared to India or the U.S., where federal mandates are often weaker or politically diluted.

JUST TRANSITION AND SOCIAL SAFEGUARDS

The Just Transition Mechanism (JTM) and Social Climate Fund are part of the legal-financial architecture supporting RE integration. Legal provisions within EU regulations ensure:

- Financial support to fossil-dependent regions,
- Worker retraining and social security,
- Equitable cost distribution of the energy transition.

Legal obligations under the EU Taxonomy Regulation also direct sustainable finance flows toward RE infrastructure, aligning financial law with energy goals.²⁶

²⁶ Regulation (EU) 2020/852 on the establishment of a framework to facilitate sustainable investment [2020] OJ L 198.

LEGAL BARRIERS AND EMERGING ISSUES

Despite a robust legal framework, several barriers persist:

- Permit delays and administrative complexity in some Member States;
- Legal disputes over land use, especially in Natura 2000 protected areas;
- National opposition to EU directives in politically volatile Member States (e.g., Hungary, Poland);
- Grid connection costs and cost allocation conflicts between TSOs and developers.

Moreover, the EU's carbon border adjustment mechanism (CBAM) and classification of nuclear and gas as “transitional activities” under the taxonomy have led to legal ambiguity in investment decisions.

THE UNITED STATES' LEGAL FRAMEWORK FOR RENEWABLE ENERGY INTEGRATION

The United States (U.S.) presents a markedly decentralized approach to renewable energy (RE) integration, reflecting its federal constitutional structure and political polarization on climate issues. Unlike the European Union (EU), where supranational institutions mandate collective goals, or India, where the Centre leads national energy policy, the U.S. features a patchwork of federal, state, and market-driven legal mechanisms. This results in both remarkable innovation and fragmentation. This chapter explores the key legislative instruments, regulatory bodies, grid governance frameworks, and policy mechanisms influencing RE integration in the U.S.

CONSTITUTIONAL STRUCTURE AND REGULATORY FRAGMENTATION

The U.S. Constitution does not mention "energy", resulting in divided authority:

- Federal government: Regulates interstate commerce and energy markets.
- States: Control intrastate utility regulation, land use, and building codes.

Thus, energy law is shaped by federal statutes, state-level mandates, and regional grid operators, without a single unified RE policy or national target.

The absence of binding federal RE obligations means much depends on state-level renewable portfolio standards (RPSs), tax credits, and market dynamics.

FEDERAL STATUTES AND EXECUTIVE POLICIES

I. Public Utility Regulatory Policies Act (PURPA) 1978

PURPA was a watershed moment, requiring utilities to purchase power from qualifying RE facilities at **avoided cost rates**. It opened the grid to **independent power producers (IPPs)** and decentralized generation.²⁷

PURPA's influence has diminished, but some states continue to rely on it for small-scale RE procurement, especially in the Southeast.

II. Energy Policy Act (EPAct) 2005

The EPAct expanded federal powers to:

- Certify interstate transmission projects (backstop authority),
- Promote smart grids and renewable integration,
- Provide loan guarantees for clean energy infrastructure.²⁸

It also enhanced the role of the Federal Energy Regulatory Commission (FERC) in ensuring open access to the transmission grid.

²⁷ Public Utility Regulatory Policies Act 1978, 16 U.S.C. § 2601 et seq.

²⁸ Energy Policy Act, 2005, 42 U.S.C. § 15801 et seq.

III. Inflation Reduction Act (IRA) 2022

The IRA is the most ambitious climate law in U.S. history, offering over \$370 billion in tax incentives for RE, grid infrastructure, and storage.²⁹

Key provisions:

- Production and Investment Tax Credits (PTC/ITC) for solar, wind, and other RE sources until 2032;
- Energy Community Bonus Credits for projects in fossil fuel-dependent areas;
- Support for green hydrogen, carbon capture, and domestic manufacturing.

While not a legal mandate to integrate RE into the grid, the IRA's financial incentives are expected to reshape power sector economics significantly.

FEDERAL ENERGY REGULATORY COMMISSION (FERC) AND GRID ACCESS

FERC, an independent agency under the Department of Energy, regulates:

- Interstate transmission,
- Wholesale electricity markets,
- Open access to transmission networks under the Federal Power Act (FPA).³⁰

Through Order No. 888 (1996) and Order No. 1000 (2011), FERC required:

- Unbundling of transmission from generation,
- Open access tariffs,
- Regional planning and cost allocation for transmission projects, including RE lines.³¹

In 2023, FERC Order No. 2023 was issued to modernize interconnection procedures, expediting connection of RE and storage projects.³²

Despite these reforms, interconnection delays and cost allocation disputes remain major legal and technical barriers, particularly for offshore wind and large solar farms.

ROLE OF REGIONAL TRANSMISSION ORGANIZATIONS (RTOS) AND INDEPENDENT SYSTEM OPERATORS (ISOS)

The U.S. grid is divided into seven RTO/ISOs, which manage regional electricity markets and ensure grid reliability. Key RTOs include:

- PJM Interconnection (Mid-Atlantic),
- California ISO (CAISO),
- Midcontinent ISO (MISO),
- New York ISO (NYISO).

Legal powers of RTOs stem from FERC, but membership is voluntary, and states outside RTOs (like most of the Southeast) follow traditional utility regulation models.

RTOs play a central role in RE integration through:

- Market rules for RE bidding and dispatch,
- Congestion management and transmission planning,
- Balancing services and ancillary market access.

²⁹ The White House, 'Inflation Reduction Act Guidebook' (2022), Available at <https://www.whitehouse.gov> (last accessed on 27 July 2025).

³⁰ Federal Power Act, 16 U.S.C. §§ 791a–828c.

³¹ FERC Order No. 1000, Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities, 136 FERC ¶ 61,051 (2011).

³² FERC Order No. 2023, Improvements to Generator Interconnection Procedures and Agreements, 184 FERC ¶ 61,054 (2023).

Challenges include:

- Lack of capacity markets in CAISO, leading to reliability concerns;
- Inconsistent treatment of storage and hybrid RE projects across RTOs;
- State–federal tensions, especially where clean energy goals clash with wholesale market rules (e.g., FERC–New York conflict over zero emissions credits).

STATE-LEVEL RENEWABLE MANDATES AND GRID INTEGRATION

Over 30 U.S. states have Renewable Portfolio Standards (RPS), legally requiring utilities to procure a certain percentage of RE. Notable examples:

- **California:** 100% zero-carbon electricity by 2045 under SB 100.³³
- **New York:** 70% RE by 2030 under the Climate Leadership and Community Protection Act (CLCPA).
- **Texas:** Though lacking a current RPS, it leads the nation in wind energy due to market-friendly policies and vast open land.

These laws are enforceable by state utility commissions and often include:

- Tradable renewable energy credits (RECs),
- Feed-in tariffs and net metering,
- Grid upgrade mandates for RE absorption.

However, transmission development remains a bottleneck, especially in high-generation states like Iowa and Texas. Legal fights over eminent domain, environmental permitting, and NIMBYism (Not In My Backyard) slow progress.

INTERCONNECTION AND GRID CODE REFORMS

Unlike the EU or India, the U.S. lacks a uniform national grid code. Each RTO/ISO or vertically integrated utility has its own interconnection standards, governed by FERC regulations or state laws.

Major legal gaps include:

- No mandatory timelines for interconnection at federal level (though FERC is addressing this),
- Curtailment without compensation, especially in areas like CAISO,
- Weak forecasting and grid flexibility mandates.

LITIGATION AND CONSTITUTIONAL CHALLENGES

Unlike the EU, U.S. RE law faces constant judicial scrutiny. Recent examples include:

- *West Virginia v. EPA (2022)*: Supreme Court limited EPA’s power to set system-wide carbon standards, weakening federal leverage over power plant emissions.³⁴
- Lawsuits over pipeline siting and NEPA (National Environmental Policy Act) delays,
- State preemption disputes, e.g., whether FERC rules override state climate policies.

Such litigation creates regulatory uncertainty and delays investment in long-term RE projects.

COMPARATIVE LEGAL ANALYSIS OF INDIA, THE EU, AND THE U.S.

A comparative analysis of India, the European Union (EU), and the United States (U.S.) reveals three fundamentally distinct approaches to renewable energy (RE) integration, each shaped by constitutional structure, institutional maturity, market dynamics, and climate ambitions. This chapter provides a cross-jurisdictional comparison on key legal dimensions: binding mandates, grid governance, market structure, regulatory capacity, and justice frameworks.

³³ California Senate Bill 100 (2018) codified in Cal. Pub. Util. Code §§ 399.11 et seq.

³⁴ *West Virginia v. Environmental Protection Agency*, [2022] 597 U.S.

LEGAL MANDATES AND TARGETS: AMBITION VS ENFORCEABILITY

Jurisdiction	Binding RE Targets	Enforceability
EU	Yes (e.g., 42.5% RE share by 2030 under RED III)	High – enforced via EU Directives and ECJ ³⁵
India	Ambitious policy targets (e.g., 500 GW non-fossil capacity by 2030)	Weak – not backed by statute or judicial remedies ³⁶
U.S.	No federal mandate; state-level RPS laws	Medium – enforced by state utility commissions ³⁷

EU's supranational model ensures legal enforceability of RE goals through Directives (e.g., RED II/III), while India's targets are largely aspirational, driven by executive policy (e.g., National Electricity Plan). The U.S. hybrid model, with state-level legal obligations and federal incentives, creates a legally diverse and often inconsistent framework.

GRID GOVERNANCE AND INTERCONNECTION LAWS

Aspect	EU	India	U.S.
Grid Code	Uniform via ENTSO-E and NC RfG	Unified but inconsistently enforced	Fragmented – FERC Orders + RTO/ISO rules
Grid Operator	TSOs under EU law, ENTSO-E coordination	CTU, STUs under CEA & state laws	RTOs/ISOs + vertically integrated utilities
Legal Clarity	High	Moderate	Low to moderate

The **EU's legal harmonisation** through the Third Energy Package and ENTSO-E enables coordinated grid planning, especially for cross-border integration.³⁸ **India's grid code**, though centralized under the Central Electricity Authority (CEA), suffers from delays and inadequate

³⁵ Directive (EU) 2023/2413 of the European Parliament and of the Council of 18 October 2023 on the promotion of the use of energy from renewable sources.

³⁶ Government of India, 'National Electricity Plan 2023', Available at <https://cea.nic.in> (last accessed on 25 July 2025).

³⁷ Clean Energy States Alliance, 'RPS Map' (2024), Available at <https://www.cesa.org> (last accessed on 25 July 2025).

³⁸ ACER-CEER, 'Annual Report on the Results of Monitoring the Internal Electricity Market' (2023).

enforcement at the state level.³⁹ In contrast, the **U.S. has no national grid code**, leading to regulatory fragmentation, with each ISO/RTO or state defining its own standards.⁴⁰

MARKET DESIGN AND FINANCIAL INSTRUMENTS

Feature	EU	India	U.S.
Wholesale Power Markets	Mature day-ahead/intraday markets	Developing; DAM via IEX, PXIL	Advanced in RTOs; weak in non-RTO states
Support Mechanisms	Feed-in tariffs (past), CfDs, capacity markets	Competitive bidding, viability gap funding	Tax credits (PTC/ITC), direct subsidies under IRA
Carbon Pricing	EU ETS legally enforced	EU ETS legally enforced	Voluntary markets; state-led pricing (e.g., California cap-and-trade)

EU's use of Contracts for Difference (CfDs) and carbon pricing through the EU Emissions Trading System (ETS) embeds legal certainty in long-term investment decisions.⁴¹ India, while moving towards competitive bidding, lacks carbon pricing or a legal emissions cap.⁴² The U.S. market design is dual-track: federal tax incentives under the Inflation Reduction Act (IRA) and varying state schemes.⁴³

INSTITUTIONAL AND REGULATORY CAPACITY

Factor	EU	India	U.S.
Central Regulator	ACER + national regulators	CERC + SERCs	FERC + state commissions
Legal Power	Strong under EU Treaty	Moderate; subject to political overrides	Limited to interstate issues; state preemption is strong

³⁹ CEA, 'National Electricity Plan' (2023); Central Electricity Authority (Grid Standards) Regulations 2010.

⁴⁰ FERC Order No. 1000 (2011); FERC Order No. 2023 (2023).

⁴¹ European Commission, 'EU Emissions Trading System (EU ETS)' (2024) <https://climate.ec.europa.eu> (last accessed on 26 July 2025).

⁴² S Chawla, 'Carbon Pricing in India: A Missed Opportunity?' (2023) 58 EPW 42.

⁴³ The White House, 'Inflation Reduction Act Guidebook' (2022), Available at <https://www.whitehouse.gov> (last accessed on 25 July, 2025)

Judicial Oversight	ECJ ensures compliance	Courts rarely intervene in RE regulation	Courts highly active, e.g., <i>West Virginia v. EPA</i>
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EU institutions benefit from binding regulatory coordination via ACER and supranational adjudication via the ECJ. **India's regulators** face institutional limitations, frequent central/state overlap, and under-enforcement.⁴⁴ In the **U.S.**, judicial review significantly influences RE policy, often limiting federal ambition due to constitutional challenges.⁴⁵

TRANSMISSION INFRASTRUCTURE AND CURTAILMENT LAW

Area	EU	India	U.S.
Transmission Access	Priority for RE under law	Priority on paper; often not enforced	Open access via FERC, but delays and congestion persist
Curtailment Regulation	Transparent and compensated	Frequent, non-transparent	Common in CAISO; mostly uncompensated
Legal Remedies	Available	Weak to absent	Varies by region and regulator

EU law requires priority dispatch and financial compensation for curtailment.⁴⁶ In India, RE generators often face arbitrary curtailment with no statutory recourse.⁴⁷ The U.S. grid, especially in California, sees curtailment due to overgeneration or lack of storage, with legal compensation frameworks still evolving.⁴⁸

COMMUNITY ENERGY AND ENERGY JUSTICE

Theme	EU	India	US
Prosumers in Law	Legally protected under RED II	Net metering policies; fragmented across states	Net metering, community solar – varies by state

⁴⁴ R Thakur and A Goel, 'Challenges before Indian Electricity Regulators' (2021) 14 NUJS L Rev 89.

⁴⁵ *West Virginia v. Environmental Protection Agency*, [2022]597 U.S.

⁴⁶ RED II (2018), Art 12.

⁴⁷ Niti Aayog, 'Curtailment of Renewable Energy: Causes and Remedies' (2022).

⁴⁸ California ISO, 'Renewables Curtailment Report' (2023).

Energy Access as Right	Embedded in EU Charter	Not a constitutional right; addressed via schemes	Not a right; addressed via subsidies
Justice-Oriented Policies	Just Transition Fund (JTF), REPowerEU	PM-KUSUM, Saubhagya, but implementation weak	Justice40, WAP – strong on paper, discretionary in effect

EU leads with a legally enshrined just transition framework under its climate law. India's social schemes, while ambitious, lack enforceable rights or oversight.⁴⁹ The U.S. Justice40 initiative mandates equity in federal funding, yet legal enforceability remains weak.

SUMMARY OF COMPARATIVE FINDINGS

Criteria	EU	India	US
Legal Certainty	High – treaty-based law	Moderate policy-dependent	Fragmented federal/state tension
Grid and Market Design	Harmonized, mature	Centralized, uneven	Advanced in parts, inconsistent
Enforceability	Strong via EU law & ECJ	Weak due to lack of statutory mandates	Court-driven, often unpredictable
Justice and Access	Codified	Scheme-based	Policy-based
Adaptability	High – legal flexibility within EU mandates	Medium – state coordination required	High in some states, low in others

KEY LESSONS FOR INDIA

1. From the EU:

- Introduce **legally binding RE targets** through statutory amendments to the Electricity Act, 2003.
- Establish **independent regulatory oversight** for transmission planning and curtailment practices.
- Integrate **community energy rights** and legal status for prosumers.

2. From the U.S.:

- Create **financial certainty** through production-based incentives or performance-linked subsidies.
- Develop regional transmission frameworks similar to RTOs.

⁴⁹ Ministry of Power, 'Saubhagya Dashboard' (2023); 'PM-KUSUM Scheme Guidelines' (2023).

- Strengthen legal remedies for grid access, delays, and transparency.
3. **Common Takeaway:**
India must move from policy-led to law-anchored renewable energy governance to ensure sustainable, equitable, and accountable transition.

CHALLENGES AND EMERGING TRENDS

The process of integrating renewable energy (RE) into existing energy systems is fraught with complex technical, legal, and socio-political challenges. While legal frameworks in India, the EU, and the U.S. have evolved significantly, emerging trends and persistent problems continue to test their resilience. This chapter explores six major areas:

- curtailment and forecasting,
- grid congestion and storage issues,
- decentralised integration,
- emerging technologies and regulatory gaps,
- legal responses to climate events, and
- justice-centred critiques.

DECENTRALISED RE SYSTEMS AND LEGAL INTEGRATION

With rooftop solar, off-grid mini-grids, and community solar projects growing, the legal frameworks must evolve to ensure integration, protection, and fairness. India has struggled to incentivise distributed energy resources (DERs) effectively due to fragmented state regulations, lack of enforceable net-metering policies, and DISCOM resistance.⁵⁰

In the EU, the Clean Energy for All Europeans Package legally mandates member states to enable self-consumption, net metering, and community energy schemes.⁵¹ The U.S., through state-level initiatives in New York, California, and Hawaii, has enacted enforceable net metering laws and offered legal clarity to “prosumers.”

India lacks a national legal framework recognising the rights of individual or collective energy producers. Without clear grid codes, data-sharing obligations, and pricing standards, decentralised systems remain legally precarious.

PEER-TO-PEER TRADING, GREEN CERTIFICATES, AND EMERGING REGULATORY GAPS

The emergence of peer-to-peer (P2P) trading platforms and blockchain-based energy exchanges marks a shift towards decentralised, consumer-driven markets. While pilot projects exist in Uttar Pradesh and Delhi,⁵² there is no dedicated law in India governing P2P electricity transactions or consumer data privacy in energy trade.

By contrast, the EU recognises citizen energy communities and mandates their inclusion in national energy plans, enabling them to sell electricity directly within legally defined networks.⁵³ U.S. states like Vermont and New York are exploring regulatory sandboxes for similar innovation.

In addition, India's Renewable Energy Certificates (RECs) remain underutilised and under-regulated, suffering from price volatility and weak enforceability.⁵⁴ The EU uses Guarantees of Origin (GOs) under RED II with legal recognition across member states, and the U.S. employs Renewable Energy Credits with strong compliance mechanisms.

⁵⁰ Prayas Energy Group, ‘Rooftop Solar: Status and Challenges’ (2022).

⁵¹ European Commission, ‘Clean Energy for All Europeans’ Package Overview (2019).

⁵² Energy Blockchain Consortium India, ‘P2P Pilot in Uttar Pradesh’ (2023).

⁵³ Directive (EU) 2019/944 on common rules for the internal market for electricity, Art 16-18.

⁵⁴ CERC, ‘REC Market Analysis’ (2022).

ENERGY JUSTICE AND ENVIRONMENTAL JUSTICE CRITIQUES

Legal integration of RE must also address distributional equity. In India, large-scale solar parks have triggered land alienation, displacement, and environmental degradation—often in tribal or ecologically sensitive zones.⁵⁵ The lack of Environmental Impact Assessments (EIAs) for solar projects under current laws leaves affected communities without legal remedy.

In contrast, the EU and several U.S. states embed energy justice into law. The Justice40 initiative in the U.S. mandates 40% of benefits from clean energy investments to flow to disadvantaged communities.⁵⁶ The EU Just Transition Mechanism offers legal guarantees for workers and regions facing structural changes.

India lacks a dedicated legal framework for energy justice, and judicial recognition remains inconsistent. Constitutional principles under Article 21⁵⁷ and 48A⁵⁸ offer only limited recourse unless transformed into specific statutes.

Renewable energy law is no longer limited to tariff-setting and grid access; it must now grapple with climate resilience, decentralisation, emerging markets, and socio-legal equity. As India marches toward a green energy future, its legal frameworks must be future-proofed to accommodate evolving technological, environmental, and ethical realities. Comparative models from the EU and the U.S. show that proactive legislation, rather than reactive policy-making, is the only sustainable path forward.

RECOMMENDATIONS FOR INDIA

India's transition to a renewable-dominated energy system requires a robust, future-ready legal framework. Despite ambitious targets, structural and regulatory gaps continue to hamper integration, predictability, and fairness in renewable energy (RE) deployment. Drawing from comparative insights of the EU and the U.S., this chapter provides concrete legal and institutional recommendations to address India's current deficiencies and future needs.

AMENDMENTS TO THE ELECTRICITY ACT, 2003

The Electricity Act, 2003 has served as the backbone of India's power sector reforms but remains outdated in key areas concerning RE integration. A new amendment should:

- Define energy storage systems (ESS) as a distinct asset class and prescribe regulatory obligations for their deployment and grid interconnection.
- Mandate national-level standards for forecasting, balancing, and curtailment compensation to address grid reliability and RE uncertainty.
- Codify "must-run" status for renewables with legal remedies against unlawful curtailment.
- Create a dedicated chapter on decentralised and prosumer energy systems with clear rights, duties, and connectivity provisions.

Such amendments would bring Indian law closer to the EU's Clean Energy Package and U.S. FERC Orders 841 and 2222, which explicitly recognise emerging RE technologies and market models.⁵⁹

⁵⁵ Centre for Policy Research, 'Solar Parks and Land Rights' (2021).

⁵⁶ U.S. White House, 'Justice40 Initiative Factsheet' (2022).

⁵⁷ Article 21, Constitution of India, 1950.

⁵⁸ Article 48A, Constitution of India, 1950.

⁵⁹ Central Electricity Authority, 'Electricity Act Amendment Proposals' (2023); FERC Order No. 841, 162 FERC ¶ 61,127 (2018); FERC Order No. 2222, 172 FERC ¶ 61,247 (2020).

PROPOSAL FOR A NATIONAL RENEWABLE ENERGY REGULATOR (NRER)

India currently lacks a single regulatory body solely focused on RE integration. A proposed National Renewable Energy Regulator (NRER) should:

- Monitor compliance with RE targets, RPOs, and REIS.
- Harmonise state-level policies on net metering, storage incentives, and P2P trading.
- Recommend minimum standards for interconnection, pricing, and RE data sharing.

REGIONAL COORDINATION LESSONS FROM EU AND U.S.

India's inter-state RE management can benefit from regional coordination models in the EU and U.S.:

- Establish Regional Renewable Energy Zones (RREZs), legally mandated under a central act, with shared transmission planning and cost allocation across participating states.
- Empower regional load dispatch centres (RLDCs) to enforce common grid codes and storage rules.
- Introduce a harmonised regional market platform for RE bidding, balancing, and ancillary services.

INTEGRATING JUST TRANSITION AND CONSUMER RIGHTS

Energy law must also be equity-sensitive. To ensure a just transition, legal reforms should:

- Mandate Environmental and Social Impact Assessments (ESIAs) for all utility-scale RE projects, including solar parks.
- Provide legal rights for affected communities, including landowners and indigenous populations, through compensation and participation guarantees.
- Introduce a Clean Energy Consumer Charter, legally recognising prosumers, net-metered users, and community energy members.

India can emulate the U.S. Justice40 initiative and the EU Just Transition Mechanism, both of which link RE funding and licensing to inclusion, social protection, and environmental standards.

India's RE law must transition from fragmented policy instruments to a coherent, legally enforceable framework. By aligning the Electricity Act with global best practices, empowering national regulators, and safeguarding equity, India can not only achieve its climate targets but also build a legally resilient and socially just energy system.

CONCLUSION

The decarbonisation of energy systems is no longer a policy aspiration but an existential imperative. As climate change accelerates, legal frameworks governing renewable energy (RE) integration must evolve rapidly, decisively, and inclusively. This paper undertook a comparative legal analysis of RE integration mechanisms across three key jurisdictions India, the European Union (EU), and the United States (U.S.) with the objective of identifying structural strengths, regulatory innovations, and critical gaps in India's existing approach.

COMPARATIVE TAKEAWAYS

A cross-jurisdictional analysis reveals that legislative precision, institutional clarity, and regulatory enforceability are key variables that distinguish successful RE integration.

- The EU offers a binding, multi-level governance model under the Renewable Energy Directive (RED II), supplemented by harmonised network codes, regional cooperation, and ACER's supranational oversight. Its Clean Energy Package ensures legal certainty for investors and uniform grid access for RE generators.

- The U.S. illustrates the power of federal rulemaking and sub-national flexibility, where FERC Orders 841 and 2222 enable storage and distributed energy resource (DER) integration while state-level Renewable Portfolio Standards (RPS) drive innovation.⁶⁰
- India, in contrast, operates within a fragmented and uneven legal structure, where ambitious policies exist, but enabling statutes, enforceable standards, and unified institutional mechanisms remain weak or absent.
- Despite India's constitutional emphasis on sustainable development under Article 48A and judicial recognition of environmental rights under Article 21,⁶¹ the RE legal framework remains predominantly executive-driven, with insufficient legislative depth.

STRUCTURAL ISSUES IN INDIA'S RE LEGAL FRAMEWORK

The analysis revealed several limitations in India's current setup:

- Absence of a dedicated RE chapter or statute, unlike the EU's consolidated legislative package or the U.S.'s Energy Policy Acts.
- Inconsistent implementation of Renewable Purchase Obligations (RPOs), with little punitive deterrence or monitoring.
- Lack of legally enforceable standards on forecasting, grid balancing, or curtailment compensation.
- No centralised regulatory agency to ensure uniformity and resolve inter-state conflicts.

TOWARDS A COHERENT LEGAL ECOSYSTEM

India needs a shift from policy-driven administration to a rights-based, legally enforceable energy transition. The research identifies six major pillars for reform:

1. Statutory Amendments: Update the Electricity Act, 2003 to define RE integration standards, energy storage, and decentralized generation.
2. National Regulator: Establish a National Renewable Energy Regulator (NRRER) for consistent implementation of RE norms and inter-state harmonisation.
3. RPO Enforcement: Create a legal mechanism for CERC to monitor and penalise non-compliance uniformly across states.
4. Regional Planning: Legally mandate Renewable Energy Zones (REZs) and regional transmission coordination.
5. Just Transition Laws: Include environmental safeguards, compensation rights, and social inclusion for affected communities.
6. Consumer-Centric Laws: Legally define the rights of prosumers, including dispute resolution and service guarantees.
7. These changes align with both global best practices and India's own developmental and climate commitments under the Paris Agreement.⁶²

CONTRIBUTION AND SCOPE FOR FURTHER RESEARCH

This paper contributes to the field by highlighting the comparative legal architecture of RE integration, a subject underexplored in Indian legal academia. By combining statutory analysis, regulatory evaluation, and institutional comparison, it provides a blueprint for legal reform that is both aspirational and implementable.

However, certain limitations remain:

⁶⁰ Federal Energy Regulatory Commission (FERC), 'Order No. 841' (2018); 'Order No. 2222' (2020); U.S. Department of Energy, 'State Renewable Portfolio Standards and Goals' (2022).

⁶¹ M.C. Mehta v. Union of India, AIR 1987 SC 965; Constitution of India, Article 21 and 48A.

⁶² United Nations Framework Convention on Climate Change (UNFCCC), 'India's Nationally Determined Contributions (Updated), 2022'; Ministry of Power, 'Draft National Electricity Plan' (2023).

- The analysis focuses primarily on electricity sector integration and does not include legal frameworks for renewable fuels or heating.
- The U.S. model is highly state-dependent, and generalisations are drawn only from representative states and federal rules.
- Technological forecasting and financial instruments (e.g., green bonds) are not addressed in detail but merit future inquiry.

FINAL REFLECTION

India stands at a legal crossroads. While its RE ambitions are bold, they require legal architecture that is modern, enforceable, and just. Neither markets nor executive policy alone can drive this transformation law must become the engine of transition.

By drawing lessons from the EU's regional coordination and the U.S.'s federal-state synergy, India has an opportunity to craft a hybrid model one that balances centralised oversight with decentralised innovation, legal uniformity with federal autonomy, and technological modernity with social inclusion.

The success of the energy transition will ultimately depend not just on how much renewable energy is generated but on how legally equipped the system is to absorb it.

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