
| RESEARCH ARTICLE

Energy Transition and Legal Challenges in Shifting from Fossil Fuels to Clean Energy: A United States Perspective

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| ABSTRACT

The United States is undergoing a transformational shift from fossil fuel-dependent energy systems to renewable energy sources, presenting unprecedented legal, regulatory, and institutional challenges. This article examines the complex legal framework governing America's energy transition, analyzing regulatory barriers, transmission infrastructure challenges, and the evolving federal and state policy landscape. With renewable energy accounting for over 21% of U.S. electricity generation in 2023, the legal system must adapt to accommodate this rapid transformation while ensuring grid reliability, economic efficiency, and environmental protection. Through comprehensive analysis of recent regulatory reforms, including FERC Orders 1920 and 2023, and examination of transmission planning challenges, this research identifies critical legal impediments and opportunities for facilitating a sustainable energy transition.

| KEYWORDS

Energy transition, renewable energy law, transmission planning, FERC regulation, grid interconnection, clean energy policy.

| ARTICLE INFORMATION

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1. Introduction

The United States energy sector stands at an inflection point as the nation grapples with the dual imperatives of addressing climate change and maintaining energy security. In 2023, about 4,178 billion kilowatthours (kWh) of electricity were generated at utility-scale electricity generation facilities in the United States, with about 21% from renewable energy sources. This significant shift from traditional fossil fuel-based generation represents not merely a technological transition but a fundamental transformation of the legal and regulatory frameworks that have governed the American energy system for over a century.

The legal challenges inherent in this energy transition are multifaceted and complex. They encompass federal and state regulatory coordination, transmission infrastructure development, grid interconnection procedures, environmental compliance, and the delicate balance between market forces and policy objectives. Several challenges persist that are slowing deployment, including lack of sufficient grid capacity and large interconnection queues, permitting and siting challenges, high interest rates, and lingering supply chain issues.

This transformation is occurring against the backdrop of unprecedented demand growth, driven by electrification trends, data center expansion, and manufacturing reshoring initiatives. The legal system must evolve rapidly to

support this transition while addressing concerns about grid reliability, cost allocation, and interstate commerce. Understanding these legal challenges is crucial for policymakers, energy developers, and legal practitioners navigating this complex landscape.

2. Legal Framework for Energy Transition in the United States

2.1 Federal Regulatory Structure

The federal regulatory framework for energy transition is anchored by several key statutes and regulatory bodies. The Federal Energy Regulatory Commission (FERC) serves as the primary federal regulator for interstate electricity transmission and wholesale markets under the Federal Power Act. The Department of Energy (DOE) provides policy leadership and research coordination, while the Environmental Protection Agency (EPA) oversees environmental compliance aspects of energy generation.

Recent federal legislation has significantly shaped the regulatory landscape. The Infrastructure Investment and Jobs Act of 2021 and the Inflation Reduction Act of 2022 have provided unprecedented federal investment in clean energy infrastructure and technology development. These laws have established new programs for transmission development, grid modernization, and renewable energy deployment while creating complex compliance requirements for developers and utilities.

2.2 State Regulatory Authority and Coordination

State governments retain significant authority over electricity generation, distribution, and retail sales within their borders. This dual federal-state jurisdiction creates a complex regulatory matrix that developers must navigate. State renewable portfolio standards (RPS), which now exist in 30 states plus the District of Columbia, mandate specific percentages of electricity generation from renewable sources, creating both market drivers and compliance obligations.

Table 1: Renewable Energy Legal Drivers by Jurisdiction Level

Jurisdiction Level	Key Legal Instruments	Primary Focus Areas	Implementation Challenges
Federal	Federal Power Act, IRA, IIJA	Interstate transmission, wholesale markets, investment incentives	FERC-state coordination, interstate planning
State	RPS laws, utility regulation, siting laws	Retail markets, generation standards, distribution	Interstate coordination, local opposition
Regional	RTO/ISO tariffs, regional compacts	Transmission planning, market operations	Cost allocation, resource adequacy
Local	Zoning ordinances, permitting	Project siting, land use	NIMBY opposition, varying standards

The legal challenge lies in coordinating these multiple layers of authority while ensuring consistent policy implementation. Interstate transmission projects, which are essential for renewable energy development, must satisfy both federal oversight and multiple state approval processes, creating potential veto points that can delay or prevent critical infrastructure development.

3. Transmission Infrastructure: The Legal Bottleneck

3.1 Grid Interconnection Legal Framework

The legal framework governing grid interconnection has become the most significant barrier to renewable energy deployment. As of December 2022, more than 2,000 gigawatts of electricity generation and storage projects were waiting to connect with the electric grid, with 95% of projects left hanging being clean energy and battery storage projects. This massive backlog reflects fundamental flaws in the existing legal and procedural framework.

The interconnection process traditionally operated under a "first-come, first-served" serial study approach, which proved inadequate for the scale and diversity of renewable energy projects seeking grid access. Projects would enter lengthy study processes, often taking years to complete, with frequent delays and cost escalations. The legal framework provided insufficient mechanisms for managing speculative projects or ensuring timely completion of studies.

Figure 1: U.S. Renewable Energy Capacity Growth and Interconnection Queue Backlog (2018-2023)



3.2 FERC Order 2023: Interconnection Reform

In response to these systemic challenges, FERC issued Order No. 2023 in July 2023, representing the most significant reform of interconnection procedures in two decades. FERC adopted these reforms to reduce backlogs for projects seeking to connect to the transmission system, improve certainty in the interconnection processes managed by the dozens of transmission providers around the country, and ensure access to the transmission system for new technologies.

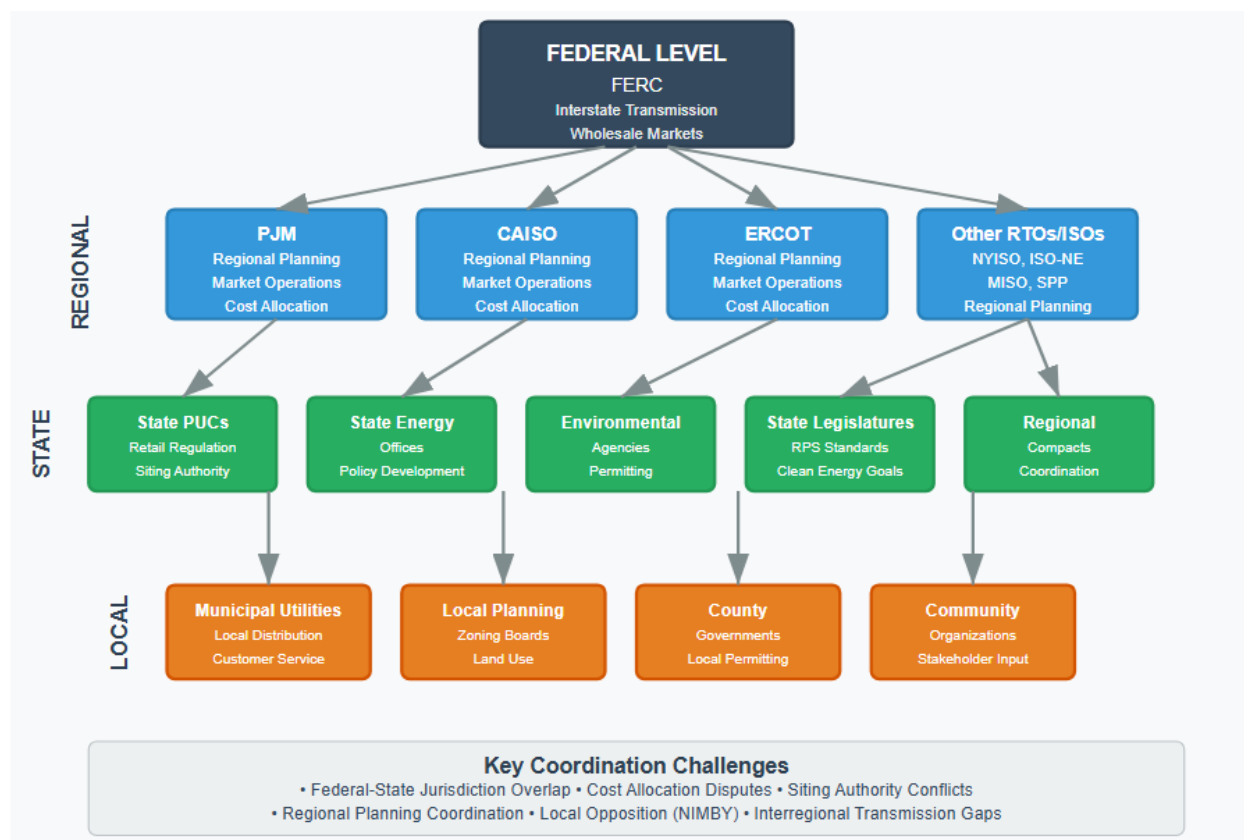
The order implements several key legal and procedural reforms:

- **Cluster Study Process:** Transition from serial, first-come-first-served studies to batch processing of interconnection requests, allowing more efficient evaluation of multiple projects simultaneously
- **Enhanced Financial Requirements:** Stricter site control and financial readiness requirements to discourage speculative projects and ensure serious development commitments
- **Technology-Neutral Procedures:** Updated procedures specifically designed to accommodate energy storage and other advanced technologies that operate differently from traditional generation
- **Performance Standards:** Introduction of penalties for transmission providers that fail to complete studies on schedule, creating legal accountability for timely processing

3.3 Transmission Planning and Cost Allocation Challenges

Long-distance transmission development faces particularly complex legal challenges related to planning authority, cost allocation, and siting approval. Studies estimate that transmission infrastructure will need to grow by as much as 57% by 2035 to meet increased electricity demand, yet the current legal framework struggles to facilitate such expansion.

Figure 2: Regional Transmission Planning Authority Structure



The fundamental legal challenge stems from the mismatch between the regional nature of modern electricity markets and the state-based approach to transmission siting and cost recovery. While FERC has jurisdiction over interstate transmission and wholesale markets, states retain authority over retail rates and much of the transmission siting process. This creates a complex web of legal requirements that must be satisfied for major transmission projects.

4. FERC Order 1920: Regional Transmission Planning Reform

4.1 Legal Framework for Long-Term Planning

FERC Order No. 1920, issued in May 2023, addresses many of the systemic legal challenges in transmission planning. FERC requires transmission providers to develop at least three long-term regional transmission scenarios of at least 20 years and to update those scenarios every five years. This represents a fundamental shift from the historically reactive, short-term approach to transmission planning.

The order establishes new legal requirements for transmission providers, including:

- **20-Year Planning Horizon:** Mandatory long-term planning scenarios that must consider changing resource mix, load growth, and policy requirements

- **Regional Coordination:** Enhanced requirements for coordination between transmission providers in planning and cost allocation decisions
- **Benefit-Cost Analysis:** Standardized methodologies for evaluating transmission investments based on reliability, economic, and public policy benefits
- **Stakeholder Participation:** Formal mechanisms for state and customer input in the planning process

4.2 Cost Allocation Legal Framework

One of the most contentious legal issues in transmission development is cost allocation. The traditional "beneficiary pays" principle becomes complex when transmission lines provide regional benefits, support public policy goals, or enhance system reliability. Order 1920 establishes new legal standards for allocating transmission costs based on the benefits provided to different customer classes and regions.

Table 2: Transmission Cost Allocation Methods Under Order 1920

Benefit Category	Allocation Method	Legal Standard	Implementation Challenge
Reliability	Load-ratio share	Must demonstrate need	Quantifying reliability benefits
Economic	Adjusted production cost	Market-based analysis	Measuring economic efficiency gains
Public Policy	State/regional policy goals	Policy-driven allocation	Defining policy nexus
Multiple Benefits	Hybrid approaches	Proportional allocation	Avoiding double-counting

The legal framework must balance several competing principles: ensuring that those who benefit from transmission infrastructure contribute to its costs, avoiding undue discrimination between customer classes, and providing sufficient cost recovery certainty to attract investment in transmission development.

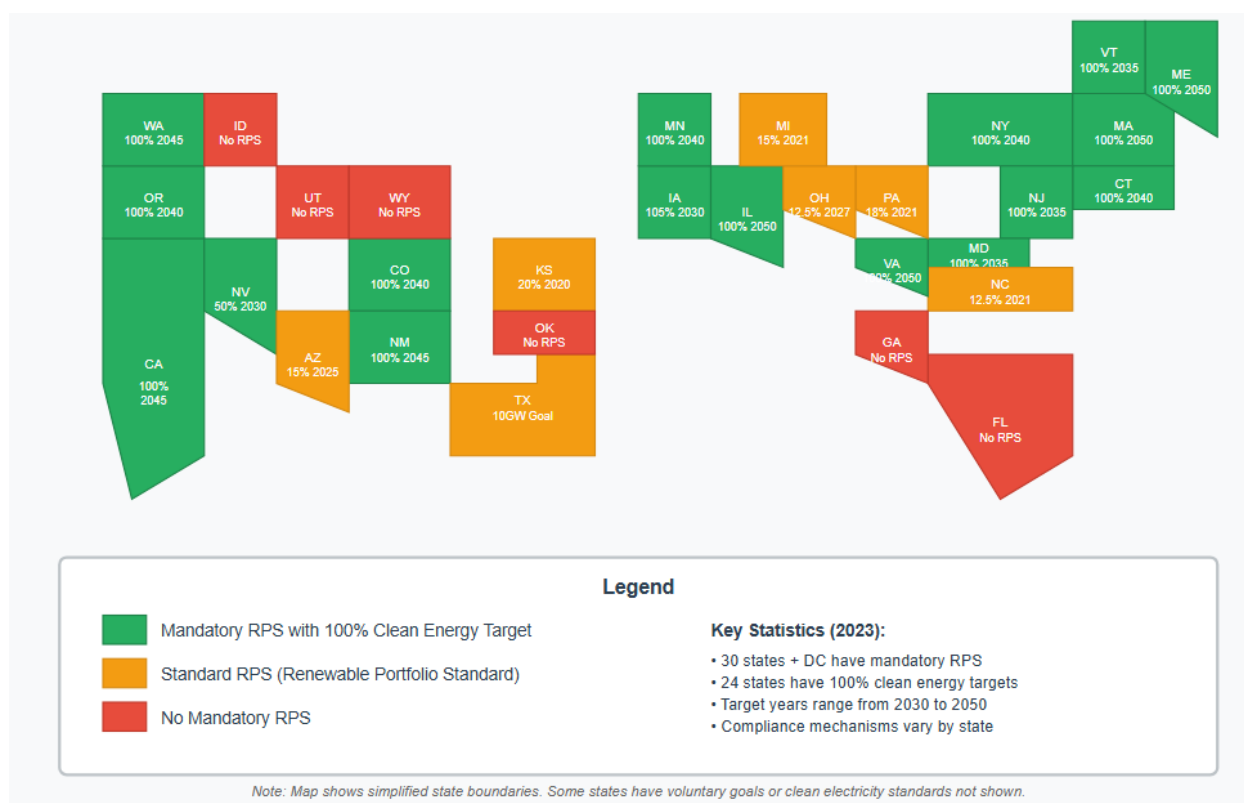
5. State-Level Legal Challenges and Opportunities

5.1 Renewable Portfolio Standards and Legal Compliance

State renewable portfolio standards create binding legal obligations for utilities while establishing market drivers for renewable energy development. However, the interaction between state RPS requirements and federal market regulations creates complex compliance challenges. Utilities must simultaneously satisfy state renewable energy requirements, federal market rules, and regional transmission planning obligations.

The legal framework for RPS compliance varies significantly across states, creating implementation challenges for multi-state utilities and developers. Some states allow out-of-state renewable energy to count toward RPS compliance, while others require in-state generation. These differences create legal barriers to efficient resource allocation and transmission planning.

Figure 3: State RPS Legal Requirements and Clean Energy Targets (2023)



5.2 Siting and Permitting Legal Challenges

Transmission line siting presents some of the most complex legal challenges in energy infrastructure development. Projects must navigate multiple layers of approval, including state public utility commission review, environmental permits, local zoning approvals, and federal agency consultations. DOE is issuing a final rule to establish the Coordinated Interagency Transmission Authorizations and Permits (CITAP) Program, which aims to significantly improve Federal environmental reviews and permitting processes for qualifying transmission projects.

The legal challenges in siting include:

- **Jurisdictional Complexity:** Multiple agencies with overlapping authority and different legal standards
- **Environmental Review:** NEPA compliance, endangered species consultations, and cultural resource protection
- **Property Rights:** Eminent domain procedures, compensation standards, and landowner consent requirements
- **Local Opposition:** NIMBY concerns, aesthetic impacts, and property value effects

5.3 Legal Mechanisms for Overcoming Siting Challenges

Recent federal legislation has attempted to address some siting challenges by restoring federal backstop authority. The recently enacted Infrastructure Investment and Jobs Act attempts to restore backstop siting authority for FERC by allowing it to overrule state or local opposition. However, this authority remains limited and the legal framework continues to provide multiple veto points for transmission development.

6. Market Design and Legal Framework Evolution

6.1 Capacity Markets and Resource Adequacy

The legal framework for capacity markets must evolve to accommodate the changing resource mix and ensure system reliability. Traditional capacity market designs were based on dispatchable thermal generation that could provide firm capacity commitments. The integration of variable renewable resources challenges these legal and market structures.

Table 3: Legal Framework Challenges in Capacity Market Design

Challenge Area	Traditional Framework	Legal	Renewable Issues	Integration	Proposed Solutions
Resource Adequacy	Firm capacity requirements		Variable output profiles		Probabilistic standards
Performance Standards	Simple availability metrics		Weather-dependent resources		Technology-specific metrics
Market Participation	Uniform offer rules		Storage dual participation		Flexible participation rules
Planning Reserves	Fixed reserve margins		Correlated output	renewable	Dynamic reserve requirements

6.2 Energy Storage Legal Framework

Energy storage presents unique legal challenges because these resources can function as both generation and load, depending on their operational mode. Traditional regulatory classifications struggle to accommodate this dual nature, creating legal uncertainty for storage developers and operators.

FERC has issued several orders addressing energy storage participation in wholesale markets, including Order 841, which requires market operators to accommodate storage resources. However, state-level regulation of storage remains inconsistent, with some states classifying storage as generation while others treat it as transmission or a customer service.

7. Environmental Law Integration and Clean Energy Transition

7.1 Environmental Review Requirements

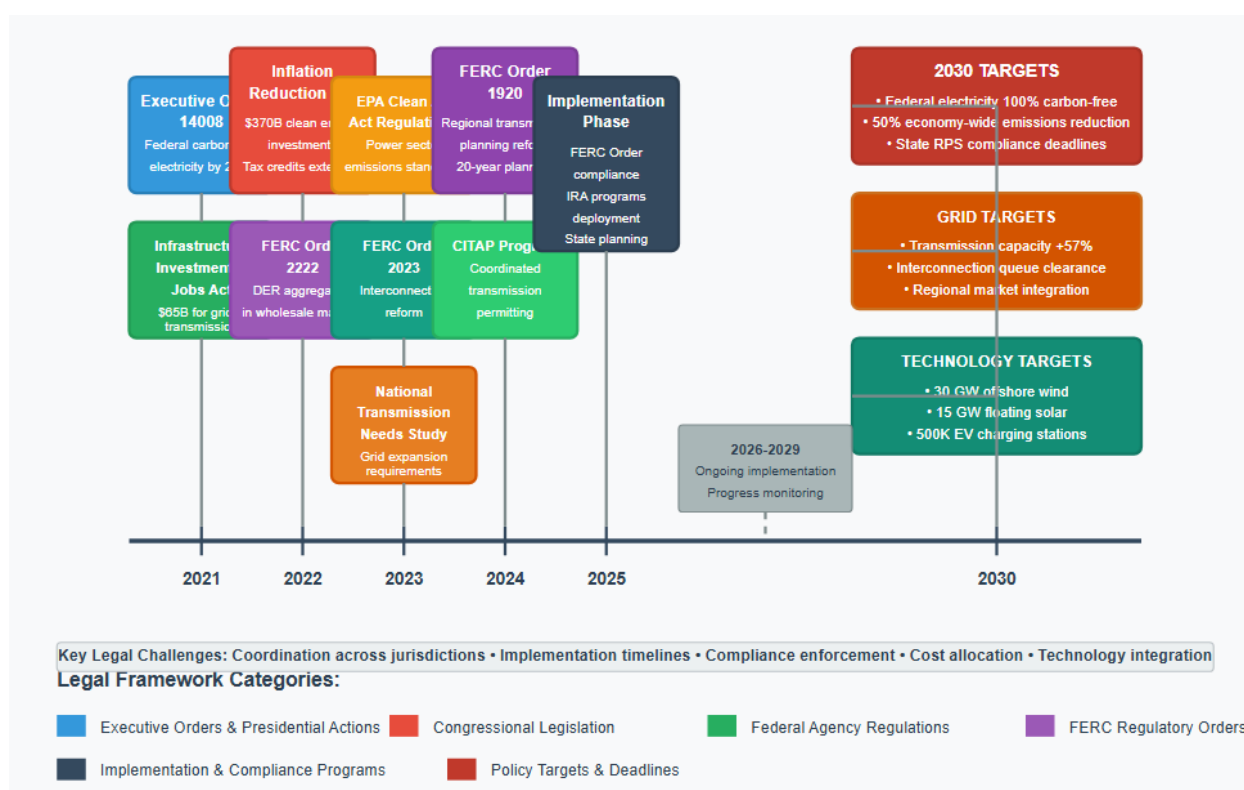
Environmental law presents both opportunities and challenges for clean energy development. While renewable energy projects generally produce fewer environmental impacts than fossil fuel facilities, they still must comply with comprehensive environmental review requirements under NEPA, the Endangered Species Act, and other federal environmental statutes.

The legal challenge lies in balancing thorough environmental review with the urgency of climate action. Under the CITAP Program, DOE will coordinate a Federal integrated interagency process to consolidate Federal environmental reviews and authorizations within a standard two-year schedule while ensuring meaningful engagement with Tribes, local communities, and other stakeholders.

7.2 Climate Change and Legal Mandates

Climate change legislation and executive orders create legal mandates that drive renewable energy development while establishing compliance obligations for federal agencies and regulated entities. The legal framework must balance these climate objectives with other statutory requirements, including economic efficiency, system reliability, and environmental protection.

Figure 4: Federal Climate Policy Legal Mandates Timeline (2021-2030)



8. Investment and Financial Legal Framework

8.1 Tax Policy and Renewable Energy Development

Federal tax policy serves as a primary driver of renewable energy investment through production tax credits (PTC), investment tax credits (ITC), and accelerated depreciation. The Inflation Reduction Act significantly expanded and extended these incentives while creating new mechanisms such as direct pay options for tax-exempt entities.

The legal framework for these incentives involves complex qualification requirements, compliance obligations, and transfer mechanisms. Developers must navigate intricate tax law provisions while ensuring compliance with securities law, project finance requirements, and utility regulatory frameworks.

8.2 Securities Law and Clean Energy Finance

Clean energy projects require substantial capital investment, often involving complex financial structures that implicate federal securities law. The legal framework must accommodate innovative financing mechanisms such as green bonds, yieldcos, and tax equity partnerships while ensuring investor protection and market transparency.

Recent developments in sustainable finance have created new legal frameworks for climate risk disclosure, ESG investing, and green finance standards. These evolving requirements present both opportunities and compliance challenges for clean energy developers and investors.

9. Emerging Legal Challenges and Future Considerations

9.1 Distributed Energy Resources and Grid Edge Regulation

The proliferation of distributed energy resources (DER) presents new legal challenges related to utility business models, rate design, and grid operations. Residential solar attachment rates expected to rise from 14% in 2023 to a record 25% in 2023, creating significant regulatory pressures on traditional utility frameworks.

The legal challenges include:

- **Net Metering Policies:** Compensation mechanisms for customer-owned generation and their impact on utility cost recovery
- **Grid Modernization:** Legal frameworks for smart grid investment and cost recovery
- **Virtual Power Plants:** Regulatory treatment of aggregated DER and their participation in wholesale markets
- **Cybersecurity:** Legal requirements for grid security and data protection in an increasingly connected system

9.2 Technology Innovation and Legal Adaptation

Emerging technologies such as enhanced geothermal systems, offshore wind, and advanced nuclear present new legal challenges requiring regulatory adaptation. Enhanced geothermal systems (EGS) that can provide 24/7 baseload electricity by accessing deep heat reservoirs is benefiting from federal funding and cross-sector investment in technological advances.

The legal framework must evolve to accommodate these technologies while ensuring safety, environmental protection, and market efficiency. This requires careful consideration of existing regulatory structures and their applicability to new technologies.

10. Recommendations for Legal Framework Enhancement

10.1 Institutional Reforms

Based on the analysis of current legal challenges, several institutional reforms could enhance the effectiveness of the energy transition legal framework:

- **Enhanced Federal-State Coordination:** Establishment of formal mechanisms for coordinating federal and state energy policies, including joint planning processes and shared performance metrics
- **Streamlined Environmental Review:** Implementation of programmatic environmental review processes for standardized renewable energy projects, reducing duplicative reviews while maintaining environmental protection
- **Integrated Planning Authority:** Creation of regional planning entities with authority to coordinate transmission, generation, and demand-side resource planning across state boundaries

10.2 Procedural Improvements

Several procedural reforms could improve the efficiency and effectiveness of the legal framework:

- **Standardized Interconnection Procedures:** Development of uniform interconnection standards across regions to reduce regulatory complexity and transaction costs
- **Expedited Siting Processes:** Implementation of fast-track approval procedures for transmission projects that meet pre-defined criteria for public benefit and environmental compatibility
- **Performance-Based Regulation:** Adoption of outcome-based regulatory standards that focus on performance metrics rather than prescriptive compliance requirements

10.3 Market Structure Reforms

The legal framework should be enhanced to better accommodate clean energy resources in competitive markets:

- **Technology-Neutral Market Rules:** Development of market participation rules that do not discriminate against particular technologies while ensuring system reliability

- **Flexible Resource Adequacy Standards:** Implementation of probabilistic resource adequacy standards that properly value the contribution of variable and limited-duration resources
- **Regional Market Integration:** Legal mechanisms to facilitate greater coordination between regional markets and reduce barriers to interregional trade

11. Conclusion

The legal challenges associated with America's energy transition are complex and multifaceted, requiring coordinated action across multiple levels of government and regulatory bodies. While significant progress has been made through recent regulatory reforms such as FERC Orders 1920 and 2023, substantial challenges remain in areas including transmission planning, environmental review, cost allocation, and market design.

Clean energy jobs represented more than half of energy jobs added in 2023, with hiring for renewable energy particularly solar at twice the levels of the fossil fuel industry. This economic transformation underscores the importance of developing legal frameworks that can support continued growth while ensuring system reliability and cost-effectiveness.

The path forward requires a balanced approach that acknowledges the legitimate concerns of all stakeholders while maintaining focus on the overarching goal of transitioning to a clean, reliable, and affordable energy system. Success will depend on the legal system's ability to adapt to changing technological and market conditions while maintaining the fundamental principles of due process, environmental protection, and economic efficiency.

The energy transition represents not just a technological and economic transformation but a fundamental evolution of the legal and regulatory systems that govern American energy infrastructure. Meeting this challenge will require sustained commitment from policymakers, regulators, industry participants, and legal practitioners working together to create a framework that can support America's clean energy future.

The legal challenges identified in this analysis are not insurmountable, but they require proactive attention and coordinated action. As the pace of energy transition accelerates, the legal framework must evolve to keep pace with technological innovation, market transformation, and climate imperatives. The decisions made in the coming years regarding these legal frameworks will determine not only the success of America's energy transition but also the nation's ability to maintain energy security, economic competitiveness, and environmental stewardship in the 21st century.

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