

TECHNOLOGICAL AND LEGAL INNOVATION IN
CHINA'S ELECTRIC POWER SYSTEM REFORM: A
REVIEW OF WANG MINGYUAN'S CHAPTER IN
INNOVATION IN ENERGY LAW AND TECHNOLOGY

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Abstract:

Wang Mingyuan's chapter in Innovation in Energy Law and Technology focuses on China's electricity sector reform and examines how technological progress has driven institutional change within the power system. Combining extensive empirical analysis with a coherent theoretical framework, the chapter conceptualizes technological and legal innovation as "two engines" propelling China's energy transition and offers concrete policy recommendations from a legal reform perspective. Building on Wang's analysis, this review summarizes the chapter's core insights and academic contributions, supplements them with major developments in China's electricity law and governance since 2018, and further develops its theoretical implications by bringing the concepts of creative destruction and energy justice into the discussion, aiming to promote continued legal innovation in China's energy governance.

Keywords: Key Words: Electricity Reform; Legal Innovation; Technological Innovation; Creative Destruction; Energy Justice; Energy Law

I. INTRODUCTION

The Paris Agreement ushered in a new era of global emissions reduction policies, directly accelerating the deployment of renewable energy and signaling a dual shift in energy systems towards low-carbonization and market-based mechanisms.¹ Set against the broader transformation of global energy systems, *Innovation in Energy Law and Technology: Dynamic Solutions for Energy Transitions* (Oxford University Press, 2018) explores the interplay between technological and legal innovation in shaping contemporary energy law. The volume represents a collective research outcome of the Academic Advisory Group (AAG) under the International Bar Association's Section on Energy, Environment, Natural Resources, and Infrastructure Law (IBA SEERIL). The AAG functions as SEERIL's academic arm, composed of leading scholars in energy and environmental law worldwide, tasked with

¹ See Olfa Berrich, Fereshteh Mafakheri & Halim Dabbou, *Renewable Energy Transition and the Paris Agreement: How Governance Quality Makes a Difference*, 17 ENERGIES 4238 (2024).

conducting research on key issues and advising SEERIL on legal developments in these areas. Edited by Donald Zillman, Martha Roggenkamp, LeRoy Paddock, and Lee Godden, the book embodies the latest phase of the AAG's long-standing inquiry into innovation and transformation in energy law. It serves both as a comparative assessment of existing regional legal systems and as an academic response to the future direction of global energy transitions.

The volume brings together contributions from scholars across twenty-one countries and is structured into four main parts. Part I outlines the conceptual and institutional context for legal innovation in the energy sector, addressing climate change legislation, low-carbon transition agendas, and the design of "smart" regulation. Part II examines the regulatory implications of leading-edge technologies, including nuclear, hydrogen, and electricity storage, showing how technological progress challenges existing legal frameworks. Part III turns to traditional energy industries—coal, oil, gas, and district heating—exploring how these sectors pursue efficiency and environmental innovation within established systems. Part IV focuses on energy transition through both technological and legal innovation, offering comparative studies from Alberta, the European Union, China, Brazil, and the Middle East. Together, these chapters present a comprehensive picture of how law and technology interact to shape the global transformation toward sustainable and secure energy systems.

This review focuses on Chapter 18, "Technological Innovation and the Reform of the Chinese Electric Power System," co-authored by Professor Mingyuan Wang of Tsinghua University and Lailong Gao, a legal counsel with the State Grid XinYuan Co., Ltd. As the only chapter devoted to China's energy law and governance, and the sole contribution by Chinese scholars, it occupies a distinctive and irreplaceable place within the volume. The chapter illustrates how, within China's dual framework of state leadership and market mechanisms, technological progress has acted as a major driving force for legal reform and institutional innovation. By tracing the evolution of China's electricity system and its regulatory modernization, Wang and Gao provide both a national case study of "legal energy innovation" and a valuable lens through which to understand non-Western pathways of energy governance.

II. MAIN CONTENT SUMMARY

The chapter "Technological Innovation and the Reform of the Chinese Electric Power System" provides a systematic analysis of the interaction between technological and legal innovations in China's electric power industry. It is organized into six sections: Introduction; Technological Innovation in the Chinese Electric Power Industry;

Construction of the Legal System for Electric Power in China; China's New Round of Electric Power System Reform; Main Issues, Countermeasures, Suggestions, and Prospects; and Conclusion.² The chapter is well structured and firmly grounded in the historical context of China's electric power system reform. Building upon a comprehensive review of existing technological innovations, it summarizes the development of China's legal system for electric power and the key reform measures introduced since 2015, before concluding with an overview of major challenges, countermeasures, and forward-looking recommendations.

The chapter first reviews the major technological innovations that have taken place in China's electric power industry since the beginning of the twenty-first century. Through independent technological innovation and equipment localization, China has continuously advanced its clean and low-carbon energy transition, achieving significant progress in key technologies and large-scale projects. In the generation sector, substantial progress has been made in large-capacity ultra-supercritical clean coal-fired power generation technology, third-generation nuclear power, independently developed hydropower technology, as well as wind and biomass power generation technologies. In the transmission sector, China's ultra-high-voltage (UHV) transmission and smart-grid technologies have reached a leading position globally, while energy storage and distributed energy systems have gradually expanded, thereby optimizing energy allocation on a larger scale.³ The authors then shift their focus to the legal system for electric power.

They note that China has established a legal system for electric power centered on the Electric Power Law, complemented by four key administrative regulations—namely, the Regulation on Electric Power Supply and Use, the Regulation on the Administration of Power Grid Scheduling, the Regulation on the Protection of Power Facilities, and the Regulation on Electric Power Supervision. Together with the Energy Conservation Law and the Renewable Energy Law, these instruments form a comprehensive framework covering power generation, transmission, distribution, and consumption. Building upon this foundation, the chapter also discusses several development policies of the renewable energy industry, including the following: a target-directed system; a monitoring and early-warning mechanism; a subsidy system for renewable energy tariffs; a guaranteed purchase system for electricity; and a supervision mechanism for the electric power market. It then provides a detailed analysis of China's New

² Wang Mingyuan & Gao Lailong, *Technological Innovation and the Reform of the Chinese Electric Power System*, in *INNOVATION IN ENERGY LAW AND TECHNOLOGY: DYNAMIC SOLUTIONS FOR ENERGY TRANSITIONS* 321 (Donald Zillman et al. eds., 2018).

³ *Id.* at 321–24.

Round of Electric Power System Reform, launched in 2015, and highlights its core principle of “holding the middle link and opening at both ends”—that is, regulating the transmission and distribution links while liberalizing the generation and retail markets.⁴

Although legal and institutional reforms have made certain progress, the authors observe that the pace of legal innovation has not kept pace with the remarkable achievements of China’s technological revolution in the power sector. The tension between the “acceleration” of technology and the “delay” of law represents a key analytical focus of this chapter. Several major problems are identified in China’s current legal regime: the inter-provincial mechanism for renewable-energy consumption remains underdeveloped; electricity pricing continues to rely primarily on government-determined tariffs rather than market mechanisms; the core statute, the Electric Power Law, has not undergone substantial revision for more than two decades, leaving gaps in renewable-energy integration and electricity-market transactions; coordination among related statutes, such as the Renewable Energy Law, remains weak; and the mandatory Renewable Portfolio Standard (RPS) has long failed to achieve effective implementation. Based on these analyses, the authors conclude that technological innovation and legal innovation serve as the “two engines” driving China’s energy transition. The coordinated advancement of technological progress and legal reform is essential to achieving the ultimate goal of building a “green, low-carbon, safe, reliable, and sustainable modern electric power system.”⁵

III. EVALUATION OF THEORETICAL AND PRACTICAL CONTRIBUTIONS

Professor Wang’s chapter stands out for its theoretical architecture and institutional insight. The chapter argues that technological innovation and legal innovation together constitute the dual driving forces of energy transition. This core idea is consistent with the overarching logic of the volume. By examining China’s power system as a focal case study, the authors further deepen and exemplify this key proposition. This theoretical framework expands the traditional perspective of energy law by moving beyond policy- or market-based analyses of China’s electricity reform, thereby demonstrating notable originality in theoretical innovation. At the same time, the chapter’s systematic account of China’s technological achievements in the power sector, rule-of-law construction, and institutional reform injects into the book a distinct perspective from a major developing country and energy consumer. It not only responds to the global trend of

⁴ *Id.* at 325–31.

⁵ *Id.* at 332–36.

energy transition and electricity market reform but also reflects the institutional characteristics of China's socialist market economy. As the editors note, legal innovation may either follow or lead technological innovation.⁶ In the Chinese power sector, however, this dynamic appears asymmetric; legal reform has thus far tended to follow rather than drive technological change. Based on this observation, the authors propose institutional reforms to “strengthen institutional construction” and to “further perfect the electric power legal system,”⁷ aiming to transform China toward a model in which rule-of-law construction leads technological innovation.

From a practical standpoint, the chapter maintains a close connection with the ongoing process of China's electricity reform, lending it significant real-world relevance. After reviewing the evolution of China's electricity legislation and reform measures, the authors address concrete challenges arising from technological development and propose corresponding policy and legal proposals. For instance, to tackle the difficulties of renewable energy integration and the persistent curtailment of wind and solar power, they advocate the removal of inter-provincial barriers and the creation of a unified national electricity market to optimize resource allocation. Likewise, in response to the widening subsidy gap and low efficiency of existing renewable energy incentives, they draw on international experience to recommend a market-based subsidy mechanism that combines mandatory Renewable Portfolio Standard (RPS) quotas with green certificate trading.⁸ These targeted measures provide valuable guidance for improving China's future power system.

It is also noteworthy that the chapter supports its arguments with abundant empirical data and illustrative cases. For example, it cites statistics showing that by 2016 non-fossil energy installed capacity accounted for 36.7% of China's total power generation capacity, with wind and solar capacities ranking first in the world—demonstrating a tangible foundation for energy mix transformation.⁹ Through an analysis of the “Several Opinions on Further Deepening the Reform of the Power System” (Document No. 9, 2015) and the comprehensive power-sector reform pilot programs launched in twenty-one provinces (autonomous regions and municipalities), the authors reveal the phased progress and marketization outcomes of China's electricity reform.¹⁰

In sum, the chapter makes significant contributions on both theoretical and practical levels. It not only enriches the scholarship of

⁶ DONALD ZILLMAN ET AL., *INNOVATION IN ENERGY LAW AND TECHNOLOGY: DYNAMIC SOLUTIONS FOR ENERGY TRANSITIONS 2* (2018).

⁷ Wang & Gao, *supra* note 3, at 336.

⁸ *Id.* at 332–35.

⁹ *Id.* at 322.

¹⁰ *Id.* at 330–31.

energy law but also provides valuable insights for understanding and advancing the ongoing transformation of China's power sector.

IV. NEW DEVELOPMENTS IN CHINA'S ELECTRICITY LAW AND GOVERNANCE (2018–2025)

The book was published in 2018, and the chapter under review primarily analyzes the development of China's electricity technology and power-system reform within the context of the years around 2015. Several years have since passed, during which both the legal system for electric power in China and the electric power system reform have undergone significant evolution. Building upon the analytical foundation established in the book, this review examines the major legal developments in China's power sector from 2018 to 2025, with the aim of supplementing and updating Professor Wang's analysis in light of recent institutional progress.

A. INSTITUTIONAL INNOVATIONS UNDER THE ENERGY LAW

At a higher legislative level, China made a historic move in 2024 by promulgating its first Energy Law, filling the long-standing gap of a foundational statute in the energy sector. As a new overarching law, the Energy Law provides a coherent framework and strategic direction for the development of energy governance, thereby addressing the long-criticized fragmentation of China's previous energy legislation.

The legislative initiative for the Energy Law can be traced back as early as 1979. Since then, China's Energy Law has undergone three major draft iterations at different stages of the legislative process: an initial departmental draft completed around 2007, a revised draft submitted for State Council review in 2008, and a subsequent draft released for public consultation in 2020. However, the process experienced three interruptions due to deep divergences among stakeholders and shifting legislative priorities.¹¹ This prolonged legislative gridlock was finally overcome in 2024, removing one of the major institutional barriers to China's energy transition. The new law explicitly aligns itself with the national "dual-carbon" goals, aiming to serve the targets of peaking carbon emissions by 2030 and achieving carbon neutrality by 2060. At the same time, it places equal emphasis

¹¹ See Zhang Yuanyuan (张媛媛), *Jianduan Junheng Lilun Xia Zhongguo "Nengyuan Fa" De Lifa Jiangju Ji Poju* (间断均衡理论下中国《能源法》的立法僵局及破局) [*Legislative Deadlock and Breakthrough of China's Energy Law under the Theory of Punctuated Equilibrium*], 26 BEIJING LIGONG DAXUE XUEBAO (SHEHUI KEXUE BAN) (北京理工大学学报(社会科学版)) [JOURNAL OF BEIJING INSTITUTE OF TECHNOLOGY (SOCIAL SCIENCE EDITION)] 62, 62–66 (2024).

on energy security and stability of supply, reflecting a balanced approach between green transition and security assurance.¹²

The Energy Law also responds directly to the challenges of the electricity sector by establishing several key legal mechanisms. First, Article 23 creates a renewable-energy consumption mechanism that expands the responsible entities from grid companies to include power-supply enterprises, power retailers, and electricity users, while transforming the consumption principle from “full purchase of on-grid electricity” to “setting a minimum proportion of renewable energy in total energy consumption.”¹³ This partially alleviates the renewable curtailment and under-consumption problems identified in Professor Wang’s chapter. Second, Article 41 marks significant progress in the vertical separation between natural-monopoly and competitive segments, requiring the former to operate independently and the latter to undergo market-oriented reform, thereby providing a solid statutory basis for the next phase of electricity-market liberalization.¹⁴ Third, Article 34 establishes Green Electricity Certificate (GEC), replacing the previous subsidy-based model and promoting renewable-energy consumption through a market-based quota system. In doing so, the new law substantiates Professor Wang’s policy vision that renewable-energy integration should rely on market incentives rather than direct fiscal subsidies, thus rationally allocating the costs of clean energy among generators, retailers, and large consumers and striking a balance between market efficiency and price stability.¹⁵ Fourth, Articles 31 and 34 further optimize the systemization and networking of the energy sector, explicitly stipulating to “strengthen the coordinated development of power generation and power grids” and to “promote the intelligent upgrading of power grid infrastructure and the construction of smart microgrids” (Art. 31).¹⁶ They also “encourage the development of distributed energy and integrated energy services featuring multi-energy complementarity and joint supply” (Art. 34),¹⁷ thereby fostering the deep integration of renewable energy with the power system.

¹² See *China Releases Its First Energy Law*, CLIMATE COOPERATION CHINA (Jan. 23, 2025), <https://climatecooperation.cn/climate/china-releases-its-first-energy-law/> (last visited Nov. 8, 2025).

¹³ See Yu Wenxuan (于文轩) & Qing Yue (卿悦), *Qihou Bianhua De Nengyuan Fazhi Yinying* (气候变化的能源法治因应) [*Legal Responses to Climate Change in China's Energy Law*], 4 XUEXI YU SHIJIAN (学习与实践) [STUDY AND PRACTICE] 100, 100–110 (2025).

¹⁴ See Xu Jun, Michael G. Pollitt, Xie Bai-Chen & Yang Chung-Han, *China's Energy Law Draft and the Reform of Its Electricity Supply Sector*, (Cambridge Working Papers in Economics, Faculty of Economics, University of Cambridge, 2020).

¹⁵ See Liu Lu & Chen Li, *China's 2024 Energy Law: An Integrated Approach to Energy Security*, 18 J. WORLD ENERGY L. & BUS. 1 (2025).

¹⁶ Nengyuan Fa (能源法) [Energy Law] (promulgated by the Standing Comm. Nat'l People's Cong., Nov. 8, 2024, effective Jan. 1, 2025), art. 31.

¹⁷ Nengyuan Fa (能源法) [Energy Law] (promulgated by the Standing Comm. Nat'l People's Cong., Nov. 8, 2024, effective Jan. 1, 2025), art. 34.

It is noteworthy that the new Energy Law introduces Chapter VI, “Energy Science and Technology Innovation,” as a dedicated section to promote technological innovation in the energy sector. This chapter highlights the pivotal role of smart grids, energy storage, and other emerging infrastructures in driving the energy transition and safeguarding energy security.¹⁸ This legislative emphasis resonates with Professor Wang’s conceptualization of technological and legal innovation as the dual driving forces of China’s energy revolution, confirming the close interdependence between legal reform and technological progress.

Overall, the enactment of the Energy Law marks a legislative-level response to the institutional transformation demanded by the growth of new energy sources. It compensates for the outdated provisions of the long-standing Electric Power Law, thereby providing a more comprehensive legal foundation for China’s ongoing electricity-sector reform.

B. PROGRESS IN AMENDING THE ELECTRIC POWER LAW

In recent years, the outdated nature of China’s Electric Power Law has become a topic of widespread concern. Originally enacted in 1995, the law has undergone only three minor amendments in 2009, 2015, and 2018, none of which involved substantive changes. These amendments were limited to modest adjustments in phrasing or procedural clarifications, leaving the core structure and essential content of the statute untouched. Some scholars have observed that the 1995 Electric Power Law was drafted in the context of a vertically integrated, administratively managed electricity sector, and have accordingly labeled it as an “administrative management law.”¹⁹ Such a legal framework runs counter to the global trend of electricity market liberalization. As a foundational statute in the energy sector, the Electric Power Law has clearly fallen behind the evolving needs of the times. This not only undermines the authority of the law itself but also impedes the advancement of reforms in both the power system and the broader energy sector.²⁰ Due to the technical complexity of the industry and the involvement of diverse stakeholders, laws and regulations in the electricity domain typically require long legislative

¹⁸ Tang Shuchen, *Revolutionizing China’s Energy Governance: An Analysis of the Energy Law 2024*, 17(2) TSINGHUA CHINA L. REV. 181, 182–99 (2025).

¹⁹ Yang Chuntao (杨春桃), *Ditan Shiyu Xia Woguo Dianli Falü Zhidu De Chonggou* (低碳视阈下我国电力法律制度的重构) [*Reconstruction of China’s Electric Power Legal System from a Low-Carbon Perspective*], 4 GANSU ZHENGFA DAXUE XUEBAO (甘肃政法大学学报) [JOURNAL OF GANSU UNIVERSITY OF POLITICAL SCIENCE AND LAW] 119 (2014).

²⁰ Li Yanfang (李艳芳) & Wu Qian (吴倩), *Lun Woguo <Dianli Fa> De Xiandai Hua Zhuanxing* (论我国《电力法》的现代化转型) [*On the Modernization Transformation of China’s Electric Power Law*], 7 ZHONGZHOU XUEKAN (中州学刊) [ACADEMIC JOURNAL OF ZHONGZHOU] 40 (2020).

cycles, and often display notable delays and fragmentation. The lack of coordination across various electricity-related laws and regulatory instruments has become a common problem.²¹ Against this backdrop, the obsolescence of the Electric Power Law, as the core statute of the sector, further exacerbates regulatory conflicts and weakens legal applicability, hindering both technological innovation and institutional reform.

For these reasons, the revision of the Electric Power Law has become increasingly urgent. Calls for its overhaul have not only intensified in academic and policy circles but are now reflected in formal government initiatives. As early as 2015, “Several Opinions on Further Deepening the Reform of the Power System” (Document No. 9, 2015) already pointed out that the lag in electric power legislation had become a bottleneck for market-oriented reform and healthy sectoral development, and that legal amendments were needed to provide legitimacy for further reform measures.²² In response, the National Development and Reform Commission (NDRC) and the National Energy Administration (NEA) reportedly established a drafting committee in 2020 to begin work on revising the law, and included the amendment project in the State Council’s 2021 legislative plan. In its 2022 National Energy Work Conference, the NEA explicitly listed “improving the energy legal system and promoting the development of a competitive market system” as core objectives, with revision of the Electric Power Law formally placed on the agenda.²³ According to official information disclosed in 2022, the NDRC and NEA had already initiated the drafting and legislative review of the amendment bill.²⁴ Most recently, in its “2025 Annual Report on Building a Law-Based Government,” the NEA reaffirmed its commitment to accelerating the revision of the Electric Power Law, identifying it as a key task for China’s legal-institutional development in 2025.²⁵ These developments clearly show that the reform of the

²¹ Xiang Xuening (向雪宁) & Zhou Jiayan (周佳言), *Xinxing Dianli Xitong Jianshe Zhong De Falü Fengxian Guanli Lunxi* (新型电力系统建设中的法律风险管理论析) [*On Legal Risk Management in the Construction of New Power Systems*], 3 HUNAN JINGCHA XUEYUAN XUEBAO (湖南警察学院学报) [JOURNAL OF HUNAN POLICE ACADEMY] 87 (2025).

²² Zhao Ziyuan (赵紫原), *Dian Gai Ji Pan Dianli Fa Da Buding* (电改急盼电力法打补丁) [*Power Reform Urgently Awaits Amendments to the Electric Power Law*] ZHONGGUO NENGYUAN BAO (中国能源报) [CHINA ENERGY NEWS] (2022), available at https://paper.people.com.cn/zgnyb/html/2022-01/17/content_25899307.htm (last visited Nov. 8, 2025).

²³ *Id.*

²⁴ See *Dui Shisi Jie Quanguo Renda Yici Huiyi Di 5324 Hao Jianyi Dafu De Fuwen Zhiaiyao* (对十四届全国人大一次会议第5324号建议答复的复文摘要) [*Summary of the Reply to Proposal No. 5324 at the First Session of the 14th National People's Congress*], NATIONAL ENERGY ADMINISTRATION (Jul. 11, 2023), http://zfxgk.nea.gov.cn/2023-07/11/c_1310738666.htm (last visited Dec. 23, 2025).

²⁵ See *Guojia Nengyuanju: 2025 Nian Jiakuai <Dianli Fa> Xiuding Geng Hao Zhuli Xinxing Dianli Xitong Jianshe* (国家能源局: 2025年加快《电力法》修订 更好助力新型电力系统建设) [*National Energy Administration: Accelerating the Amendment of the Electric Power Law in*

Electric Power Law has evolved from scholarly discourse into a broad-based legislative consensus. The overdue modernization of this core electricity statute now appears both inevitable and imminent.

C. NEW ACHIEVEMENTS IN ELECTRICITY SYSTEM REFORM

Since 2018, China has made remarkable progress in advancing the market-oriented reform of its power sector. The concept of establishing a unified national electricity market, as discussed in Professor Wang's chapter, is now steadily becoming a reality. In 2020, China began to comprehensively promote the development of the medium- and long-term electricity trading market; in 2023, the regulatory framework for the electricity spot market was introduced. The "Notice on Accelerating Electricity Spot Market Development" (2025) requires that nationwide coverage of spot market operations be achieved by the end of 2025, alongside pilot programs for regional market integration.²⁶ Concrete data further illustrates the success of these reforms. By 2024, the number of market participants had reached 816,000, with a substantial increase in the participation of distributed energy resources, energy storage, and virtual power plants. By June 2025, this figure had grown to 973,000, representing a year-on-year increase of 23.8%. Taken together, these developments indicate that China has effectively completed the foundational phase of building a unified national electricity market by 2025, with full completion targeted for 2029.²⁷

To support this marketization process, a series of supporting regulations have been released or revised at an accelerated pace. In 2024, the National Development and Reform Commission (NDRC) and the National Energy Administration (NEA) revised the "Basic Rules for Power Market Operation," a document that had remained unchanged for 19 years. This revision established the "1" in the "1+N" foundational regulatory framework for a unified national power market. Subsequently, six additional regulations addressing core areas of market operation were issued, forming the complete "1+6" basic rules system.²⁸ These include the "Basic Rules for Medium- and

2025 to Better Support the Construction of a New Power System], NATIONAL ENERGY ADMINISTRATION (Mar. 31, 2025), <https://gdsh.org/article/24037.html> (last visited Dec. 23, 2025).

²⁶ See *China Advances Power Market Reform to Support Renewable Integration and System Flexibility*, CLIMATE COOPERATION CHINA (July 9, 2025), <https://climatecooperation.cn/climate/china-advances-power-market-reform-to-support-renewable-integration-and-system-flexibility/> (last visited Dec. 23, 2025).

²⁷ See "1+6" Jichu Guize Tixi Chubu Goujian Quanguo Dianli Shichang Tongyi "Duliang heng" Gaige Hongli Jiasu Shifang ("1+6"基础规则体系初步构建 全国电力市场统一"度量衡"改革红利加速释放) [The "1+6" Basic Rule System Has Been Initially Established: Reform Dividends Accelerate as the Unified Electricity Market Benchmark Takes Shape], XINHU A NET (Aug. 7, 2025), <http://www.xinhuanet.com/20250807/5182bde13b254ba1bc4804e7252414db/c.html> (last visited Dec. 23, 2025).

²⁸ *Id.*

Long-term Power Trade,” the “Basic Rules for Electricity Spot Markets,” the “Basic Rules for Electricity Ancillary Services Market,” the “Basic Rules for Information Disclosure in the Electricity Market,” the “Basic Rules for Electricity Market Registration,” and the “Basic Rules for Electricity Market Metering and Settlement.”²⁹ Together, these rules span various market types and operational stages, forming a coherent and interlocking regulatory system that provides institutional support for the stable operation of the electricity market. The construction of unified national electricity trading standards has also reduced the risks associated with inter-provincial transactions. To a significant extent, it has fulfilled the vision articulated in Professor Wang’s chapter regarding the establishment of “inter-provincial and cross-regional electricity transactions.”³⁰

Overall, the marketization of China’s power sector has achieved unprecedented progress since 2018. The sharp expansion of trading volumes, the increasing flexibility of price mechanisms, the development of distinct market platforms, and the establishment of a coherent regulatory architecture all signify a systemic shift from a planned to a market-based model.³¹ By 2025, the fundamental “four beams and eight pillars” (si liang ba zhu) structure³² of the national unified electricity market has been largely completed, with a diversified and competitive landscape of market participants beginning to take shape. As legal and regulatory frameworks continue to improve and the national unified market deepens, China’s power sector reform is poised to enter a more mature and stable phase.

V. THEORETICAL EXTENSIONS ARISING FROM THE CHAPTER

Professor Wang Mingyuan’s chapter offers several insightful theoretical propositions that merit further reflection. It conceptualizes technological innovation and legal innovation as the “two engines” propelling China’s energy transition, and advocates the coordinated construction of legal institutionalization and market-based mechanisms to ensure fair competition and the public interest. Yet, owing to limitations of length and the overall orientation of the volume, these theoretical dimensions are only briefly sketched.

²⁹ See *Quanguo Dianli Shichang “Yi Pan Qi” Kao Sha Datong?* (全国电力市场“一盘棋”靠啥打通?) [How Can the “Unified Chessboard” of the National Electricity Market Be Achieved?], NATIONAL ENERGY ADMINISTRATION (Aug. 8, 2025), <https://www.ncexc.cn/mobile/c/2025-08-08/501105.shtml> (last visited Dec. 23, 2025).

³⁰ Wang & Gao, *supra* note 3, at 333–34.

³¹ *Quanguo Tongyi Dianli Shichang Jiakuai Goujian* (全国统一电力市场加快构建) [The construction of a unified national electricity market has been accelerated] ZHONGGUO NENG YUAN BAO (中国能源报) [CHINA ENERGY NEWS] (2025), available at https://paper.people.com.cn/zgnyb/pc/content/202509/01/content_30102030.html (last visited Nov. 8, 2025).

³² This term, commonly used in Chinese policy discourse, refers to a stable institutional framework supported by multiple pillars of rules, mechanisms, and organizations.

Building upon Wang's analysis, this review seeks to further develop and extend the theoretical questions arising from his chapter, with the aim of deepening scholarly understanding of China's energy transition and its institutional evolution.

A. THE THEORY OF CREATIVE DESTRUCTION

Professor Wang's chapter emphasizes the pivotal role of technological innovation in the ongoing wave of energy transition, reflecting the book's broader concern with how innovation reshapes the legal and institutional foundations of the energy sector. It argues that this transition is not merely a process of technological substitution, but one that entails a deep restructuring of institutional and governance systems. This perspective resonates strongly with Joseph A. Schumpeter's theory of "creative destruction."

The concept first appeared in Schumpeter's early work *The Theory of Economic Development* (1911), but it was given its most celebrated formulation in *Capitalism, Socialism and Democracy* (1942). In Chapter 7 of the latter, "The Process of Creative Destruction," Schumpeter famously described capitalism as a process of industrial mutation that "incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one."³³ This dynamic of creative destruction implies that the emergence of new technologies and products inevitably dismantles established industrial structures while simultaneously generating new industries and economic configurations. As Thomas K. McCraw illustrates in *Prophet of Innovation: Joseph Schumpeter and Creative Destruction*, Schumpeter viewed creative destruction as the fundamental driving force of economic renewal: entrepreneurs continuously revolutionize the economic structure from within, creating new combinations while rendering the old order obsolete.³⁴ This dual process of destruction and creation aptly captures the disruptive and reconstructive impacts of technological innovation on the traditional electricity system and the broader architecture of energy governance.

From the perspective of the chapter under review, the rapid advancement of new energy technologies and smart grids has profoundly challenged the vertically integrated structure of the conventional power industry. Technological transformation has, in turn, compelled institutional reform, exemplifying a Schumpeterian logic of institutional evolution. In the context of China's power sector reform, this form of creative destruction manifests in the way technological innovation propels institutional renewal: breakthroughs

³³ JOSEPH A. SCHUMPETER, *CAPITALISM, SOCIALISM AND DEMOCRACY* 81–86 (3d ed. 1962).

³⁴ MCCRAW, THOMAS K., *PROPHET OF INNOVATION: JOSEPH SCHUMPETER AND CREATIVE DESTRUCTION* 83–84 (Belknap Press of Harvard University Press 2007).

such as ultra-high-voltage (UHV) transmission, large-scale renewable integration, and virtual power plants necessitate the dismantling of planned grid dispatch and monopoly operation models, prompting the government to innovate in legislation and policy in order to accommodate the new production relations introduced by emerging technologies.

Schumpeter's theory of creative destruction has continued to evolve and has been applied to analyses of energy transitions, offering valuable theoretical perspectives. Dunford and Han argue that creative destruction in the energy domain must be inclusive—that is, alternative systems should be constructed before dismantling the old ones to prevent energy insecurity and social disorder, thereby ensuring an orderly and stable transition.³⁵ Within the Schumpeterian framework, Kivimaa and Kern take the argument further, suggesting that effective policy design should not only include instruments supporting emerging technologies but also “policy instruments aimed at destabilising existing regimes,” such as removing subsidies for obsolete industries, strengthening environmental regulation, and withdrawing institutional legitimacy. In the energy sector, this means proactively phasing out high-carbon systems so as to promote the coevolution of institutional restructuring and the development of emerging green technologies.³⁶ These perspectives impose higher demands on the rule of law in the energy field. As technological progress accelerates, institutional frameworks must anticipate and address new challenges in a timely and effective manner—ideally, even preceding technological change itself. The legal system should facilitate the diffusion of new technologies while eliminating outdated capacities, thereby driving the energy revolution and power-sector reform through legal innovation. In contrast, the lag of legal development behind technological advancement remains particularly pronounced in China's electricity sector. Greater emphasis should therefore be placed on legal innovation—to align with the logic of creative destruction and embrace technological transformation. This is essential for turning technological disruption into net social and economic welfare gains.

B. THE THEORY OF ENERGY JUSTICE

Professor Wang's chapter reveals the inherent tension between energy security and environmental protection, emphasizing that reform of the electricity sector must balance energy development with

³⁵ Dunford Michael & Han Mengyao, *Energy Dilemmas: Climate Change, Creative Destruction and Inclusive Carbon-Neutral Modernization Path Transitions*, 15 INTERNATIONAL CRITICAL THOUGHT 76 (2025).

³⁶ See Paula Kivimaa & Florian Kern, *Creative Destruction or Mere Niche Support? Innovation Policy Mixes for Sustainability Transitions*, 45 RESEARCH POLICY 205 (2016).

environmental protection to achieve a public-interest-oriented green transition. Yet, as a foundational principle of energy law, the notion of the public interest invites further conceptual elaboration. From a jurisprudential perspective, the public interest should not only encompass the sustainable supply and national security dimensions of energy, but also extend to issues of equitable access, participatory procedures, and fair risk-sharing among individuals and communities. In other words, to further interrogate the notion of “publicness” is to engage in a deeper inquiry into energy justice.

Energy justice has recently emerged as a theoretical framework for assessing the fairness and legitimacy of energy decision-making, advocating for the equitable distribution of benefits and burdens both among individuals and across generations during energy transitions. In *Global Energy Justice*, Sovacool and Dworkin articulated eight normative principles: “availability,” “affordability,” “due process,” “transparency and accountability,” “sustainability,” “intragenerational equity,” “intergenerational equity,” and “responsibility,” thereby establishing a comprehensive ethical framework for evaluating justice in global energy systems.³⁷ As Jenkins and her co-authors have argued, energy justice comprises three interrelated dimensions—distributional, procedural, and recognition justice. They further contend that energy policy should safeguard the rights to information and participation of vulnerable groups throughout the transition process.³⁸ Building on these foundations, Heffron and McCauley expanded the prevailing tripartite framework to include restorative justice and a perspective of acknowledging past harm, emphasizing the need to address historical and institutional injustices within processes of change.³⁹ Together, these theories reveal that energy transition is not merely a matter of efficiency, but also one of equity and participation. Energy justice reorients the discussion from macro-level systems to micro-level experiences of fairness at the individual level, highlighting the voices and vulnerabilities of marginalized communities throughout the transition process.

The articulation of this theory allows us to re-examine electricity sector reform through a normative lens: attention should be directed not only to the efficiency of institutional design and the feasibility of technological innovation, but also to the fair distribution of rights and responsibilities throughout the reform process. Without such an energy justice perspective, reforms driven primarily by efficiency and technological imperatives may inadvertently reproduce new forms of

³⁷ See BENJAMIN K. SOVACOO & MICHAEL H. DWORKIN, *GLOBAL ENERGY JUSTICE: PROBLEMS, PRINCIPLES, AND PRACTICES* 14–27 (2014).

³⁸ See Kirsten Jenkins, Darren McCauley, Raphael Heffron, Hannes Stephan & Robert Rehner, *Energy Justice: A Conceptual Review*, 11 ENERGY RSCH. & SOC. SCI. 174 (2016).

³⁹ See Raphael J. Heffron & Darren McCauley, *The Concept of Energy Justice Across the Disciplines*, 105 ENERGY POL’Y 658 (2017).

inequality. In the context of China's Confucian conception of justice, which traditionally prioritizes collective welfare over individual rights, energy transition policies tend to enhance efficiency but often at the expense of equitable protection of personal interests. Across the entire life cycle of China's energy system, there persists a victim structure in which a minority sacrifices happiness for the majority.⁴⁰ In another co-authored work, Professor Wang, in another article co-authored with Sun Xueyan, takes China's electric power legal system as the object of analysis and conducts an in-depth study on the theme of energy justice and its sinicization. They argue that, unlike in Western countries, where overreliance on market mechanisms has led to market failures, the primary source of injustice in China's power sector stems from excessive governmental intervention. Hence, energy justice in China carries a dual significance: it must both prevent new inequities that may arise during market-oriented reform and redress the legacy of past injustices inherited from the planned economy.⁴¹ In essence, it calls for a careful balance between revitalizing market dynamism and safeguarding against extreme inequality. Integrating the theory of energy justice into the Chinese context offers a useful extension to the chapter under review, enhancing its discussion of electricity reform from a normative perspective. Beyond the greening of technology and the improvement of efficiency, greater attention should be devoted to the fairness and inclusiveness of the transition process itself. Future revisions of the Electric Power Law and related energy legislation could usefully incorporate provisions on electricity affordability for vulnerable groups, regional equity compensation mechanisms, and public participation in decision-making, thereby ensuring that China's energy transition is governed by the rule of law that is both efficient and just.

VI. CONCLUSION

Wang Mingyuan and Gao Lailong's chapter, *Technological Innovation and the Reform of the Chinese Electric Power System*, stands as the only contribution in *Innovation in Energy Law and Technology* devoted to China's energy legal system. The chapter not only provides a systematic account of technological advancement, the legal system for electric power, and the latest round of power system reform, but also offers a penetrating analysis of the interactive

⁴⁰ See Cheng Yu & Yang Weiming, *A Reflective Analysis of China's Energy Policy from the Perspective of Systemic Energy Justice Principles*, 42 J. ENERGY & NAT. RESOURCES L. 403, 413 (2024).

⁴¹ See Wang Mingyuan (王明远) & Sun Xueyan (孙雪妍), "Nengyuan Zhengyi" Jiqi ZhongguoHua—Jiyu Dianli Fazhi De Fenxi ("能源正义"及其中国化——基于电力法制的分析) [A Conceptual Review of "Energy Justice" and Its Application: An Analysis Based on Chinese Electricity Law and Policy], 1 ZHONGZHOU XUEKAN (中州学刊) [ACADEMIC JOURNAL OF ZHONGZHOU] 60, 60–69 (2020).

relationship between technological progress and legal transformation. The core concept is that technological and legal innovation function as the “two engines” driving China’s energy transition. Yet, as the chapter observes, legal reform in China’s electricity sector has lagged behind rapid technological change. Since the book’s publication, notable legal developments have occurred: the Energy Law has been promulgated as a fundamental statute, the revision of the Electric Power Law is underway, and market-based reform of the power system has yielded substantial results. Building on Wang’s insights, this review extends the discussion through the lenses of creative destruction and energy justice, situating them within the context of energy transition and power sector reform. Taken together, these perspectives suggest that China should embrace the logic of creative destruction, fostering institutional innovation to lead its energy revolution; while ensuring, in the evolution of electricity law, that energy justice bridges efficiency with equity.