AL-HAYAT Research Journal

HJRS HEC Journal Recognition System Category Y

Volume 3 Issue 4 (July-Sep 2026)

ISSN (Online): 3006-4767
ISSN (Print):: 3006-4759

Legal and policy frameworks for renewable energy integration into national power grids: A comparative study of Pakistan and the European Union

Shaoor Ahmed

Telecommunication Engineer, Department of Engineering, Iqra University, Karachi, Sindh, Pakistan (shaoorahmed457gmail.com) (+923312818264)

Dr. Tansif Ur Rehman

Teaching Associate, Department of Sociology, University of Karachi, Pakistan; and Visiting Faculty, Department of Law, Dadabhoy Institute of Higher Education, Pakistan (tansif@live.com) (https://orcid.org/0000-0002-5454-2150)

Abstract

Shifting to renewable energy is one of the law and policy issues that need to be addressed to ensure energy security and sustainability. In the face of energy policies like ARE Policy 2019 and National Electricity Policy 2021, the energy sector in Pakistan is still facing energy shortages, dependence on imported fossil fuels, ballooning circular debt, and low penetration of renewable energy. The EU has a more unified and binding legal framework, to facilitate renewable integration. This study aims to highlight the gaps, regulatory differences, and policy lessons from both systems to facilitate the transition towards renewable energy in Pakistan.

Keywords: challenges, historical context, laws, opportunities, theoretical context.

Introduction

The transition towards renewable energy has become a central aspect of today's global climate, energy governance owing to the imperative of combating climate change, increasing energy security concerns and sustainable development. The national energy strategies feature (RES) like solar, wind, hydro, and biomass, which demand comprehensive regulatory frameworks to regulate decentralized generation, grid modernization, and investment flows. States are bound to implement low-carbon energy systems in the context of international commitments like the Paris Agreement and SDGs. However, the effectiveness of it relies on the institutional capacities, legal frameworks and market mechanisms that facilitate the implementation of the policy.

While Pakistan grapples with such issues as disunity in governance, poor infrastructure, and regulatory uncertainty, the EU has a more coherent legal approach with legally binding directives, regional cooperation, and sophisticated grid systems. Hence, this comparative study examines the legal and policy environment of renewable energy integration in Pakistan and the European Union, which indicates the presence of structural gaps and policy disparities that could be useful for achieving the integration of renewables in Pakistan more efficiently in the context of energy transition.

Research Justification

The need for this research is justified because of the impact of legal and policy frameworks on the integration of RE in the national grid that is necessary in uplifting economies like that of Pakistan. The infrastructure is not adequate and the regulatory weaknesses are also a hurdle for implementation of ARE Policy 2019 and NEP 2021 in Pakistan. The EU has, however, a more advanced and interconnected legal framework that enables effective integration of renewables. Comparative analysis is required to find the gap in the policy and lessons learn for transfer to achieve impact, and speed up energy transition leading to sustainability in Pakistan.

CC BY

Literature Review

The available literature confirms that renewable energy governance is now a key element of the global agenda on sustainability and climate change mitigation, not only in this particular case, but in all cases of integrating RE to the national electricity grid through legal and policy frameworks (Mujahid & Ahmed, 2019; Susan, 2025). Its applications are associated with themes of environmental governance, institutional-coordination and regulatory mechanisms that facilitate the security of investments, energy justice, and sustainable development (Olabi & Abdelkareem, 2022).

International cooperation has encouraged the implementation of cleaner energy systems, through the use of effective legal tools and policy implementation strategies (Andy, 2020). EU literature shows that the EU is setting the pace in the field of renewable energy governance (Wu et al., 2022). This is done by providing harmonized policies, energy cooperation, and legally binding renewable energy targets (Serim & Oran, 2017). There is a good balance between the positive effects of EU renewable energy policies on energy security and low carbon development (Haar, 2016).

Most of the literature available in Pakistan focuses on the potential of the country in the field of renewable energy resources such as solar, wind and bio resources and the challenges for policy implementation (Hulio et al., 2022). Furthermore, the government has been undertaking several initiatives like the policy regulatory framework of NEPRA, but a few issues remain in the integration of renewable energy (Leal-Arcas & Minas, 2016; Susan, 2025). The studies available typically focus on the economic and technical dimension and only limited work has been undertaken on the legal and comparative policy dimension of renewable energy governance between EU and Pakistan.

Historical Context

Initially, global energy law was mainly about resource extraction, energy trade and the protection of investment, and very little about environmental issues. Yet, as climate change and energy insecurity increased, international and regional organizations started to include renewable energy in their international governance agenda under sustainable development programmes. The EU became a major player for promotion of renewable energy by harmonizing its regulations, fostering incentives-based policies and low-carbon economic strategies.

Due to reliance on fossil fuels, the development of regulation for renewable energy in Pakistan was relatively slow. There have been a number of important renewable energy policies that brought renewable energy into the national grid. Thus, the policy to action spectrum of renewable energy governance in Pakistan reflects the ongoing challenge between policy making and its actual implementation.

Theoretical Context

This study's theoretical underpinning is drawn from the concepts of energy governance theory, policy implementation theory, and sustainable development frameworks. This will be explored through the lens of energy governance theory, which observes decision making in Pakistan and the EU. The inability to create and implement policies for renewable energy effectively and efficiently in Pakistan, is explained through the theory of policy implementation, especially the theory of top-down and bottom-up approaches.

The EU is showing coherent governance structures which improve policy enforcement and grid integration. In order to understand the relationship between the growth of the economy, the protection of the environment, and the ability of institutions to support the adoption of renewable energy; theories of sustainable development and energy transition are employed. Both of these allow for a comparison of legal and policy frameworks to assess their enabling or limiting effects in terms of renewable energy grid integration.

Relevant Laws

1. NEPRA Act 1997: Establishes National Electric Power Regulatory Authority as the central body to oversee electricity generation, transmission and distribution, and encourages the production of renewable energy sources by licensing and tariff regulation.

2. Electricity Act, 1910: Another key Act in this regard. It stipulates the use of licenses, the duties and rights of power companies.

3. Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997: This act created the National Electric Power Regulatory Authority (NEPRA) that is responsible for licensing, tariff fixation and regulation of performance.

4. National Energy Efficiency and Conservation Authority (NEECA) Act, 2016: It provides the regulatory framework for energy conservation and helps to increase efficiency of energy use along with generating renewable energy.

5. Alternative and Renewable Energy Policy 2019: Framework for expansion of renewable energy in the national systems. Its mission is to ensure sustainable and affordable electricity: Clean energy, solar, wind, biomass, etc.

6. National Electricity Plan 2023–2027: Offers a framework for electricity sector reform and renewable integration, and provides goals for integration of renewable energy.

7. NEPRA Renewable Energy Regulations: These regulations lay down technical and procedural guidelines for connecting RE projects with the national grid.

Challenges

There are significant legal, institutional, financial and regulatory barriers for integrating renewables into the national power grid, especially in Pakistan. This creates pressure on the structural dimension of development needs and climate commitments. The lack of institutional capacity and lack of coordination of governance is another setback; coupled with absence of technical expertise and regulation coordination. The implementation of policy is a challenge for renewables for several reasons. These are some of the reasons for slow running projects:

Issues facing renewable energy investments in developing markets include uncertainty of investors, capital limits and an upfront cost. Moreover, the absence of unstable policies is one of the factors that limit investments. Compliance continues to be a key agenda, especially since there are weak monitoring systems and corruption is high, hence transparency is low. Absence of legal frameworks within the energy and environmental sectors further contributes to the challenges.

Last but not least, the challenges in harmonization of the legal design are also emphasized, where energy expansion versus protecting the environment, and the rights of investors versus the autonomy of the State in regulating the investors clash with each other. A lack of strong institutions and governance is an issue for integration of renewables.

Opportunities

Transitioning to renewable energy is a promising opportunity for sustainable growth, economic diversification and energy security in Pakistan. One of the most significant opportunities is Green Economic Growth; investment in energy systems such as Solar, Wind, Biomass and Energy systems can promote jobs, industrial innovation and entrepreneurship in the local area, while reducing environmental damage. Renewable energy aids in achieving inclusive ways for development by making electricity accessible in the remote rural communities, through off-grid solutions.

Another critical moment for public involvement and social acceptance is the opportunity of stakeholder engagement and community-based renewable projects for transparency, legitimacy and sustainability in energy policies. There is ample experience of how strong policy measures and renewable energy targets can incentivize investments, create energy efficiency and promote low carbon economic growth, including in international experiences such as the EU.

Such opportunities are indicative of the fact that RE is not only a means of sustainability, but also a means of creating an economically resilient transformation in emerging markets. This also reduces the need for imported fossil fuels. The rest, of course, the flow of FDI into investments in renewable energy is also due to the more sustainable regulatory environment. These advancements are undeniable and can give Pakistan an opportunity to join the global climate commitments as well as provide economic resilience and environmental sustainability to the nation.

Discussion

The results show a huge variation in the implementation of robust policy narratives in the renewable energy sector in Pakistan. Renewable energy is well supported by the infrastructure, its incentives and financing schemes like NEPRA

and SBP schemes but there are issues in grid integration, institutional silos, and rural electrification. Benefits of access and environment need to be governed and coordinated in emerging markets. A lack of regulation, transmission capacity and geographical distance of projects from the village contribute to the uncertainty of achieving. Therefore, integrated planning, sound institutions and specific execution mechanisms are required.

Conclusion

The government of Pakistan has laid out fairly comprehensive legal and policy frameworks such as the NEPRA Act 1997 and the Alternative and Renewable Energy Policy 2019 to diversify energy mix and to achieve energy sustainability. Due to institutional fragmentation, lack of grid capabilities, financial constraint, and limited technical capability, there is a high level of policy intent. There is policy-practice mismatch which remains as a challenge to the mainstream RE deployment. A need to consolidate coordination between institutions, regulatory stability and new investment arrangements in order to reach energy transition goals. Pakistan can become energy secure, environmentally sustainable and economically resilient through effective energy reforms.

Recommendations

A wide range of recommendations can be offered to bridge the policy formulation to implementation gap. Energy, environmental, investment and trade laws need to be prepared in a single harmonized instrument under clear institutional mandates for policy makers. Uncertainty needs to be reduced to prompt investment in the project, through regulatory stability, targets to be met over specific periods with enforcement, and shorter and clearer approval procedures. Capacity building also plays a significant role, such as HR development in renewable technologies, which has to be available to satisfy the required skills.

Data and evidence must be transparent in order to support planning by institutions, and this requires institutions to provide reliable assessments of the available renewable resources. Moreover, market-based instruments, such as RPS and competitive bidding, can promote efficiency and private sector investment.

Project development should be technology-led, be connected with national sustainability goals, and participatory, involving civil society in monitoring; accountability for socially just and environmentally responsible development of renewable energy should be established.

Research Limitations

The study is surrounded with methodology which is based on literature review; that limits the empirical validation of the outcome of the renewable energy sector in Pakistan. It is a reality that there is a lack of primary data such as stakeholder interviews and project-based performance analysis. Additionally, the analysis is comprehensive, but because of the lack of data or the way data is sometimes reported in official statistics and secondary sources, this comprehensiveness may be reflected in the analysis. Changes in renewable energy policies may not be fully captured due to the dynamic nature of the developments. The study is, however, a structured legal and policy evaluative study with some limitations.

Research Implications

The results obtained from this research are important for further research on renewable energy governance and legalization in Pakistan at academic and policy levels, respectively. In doing so, the study illuminates the need for interdisciplinary studies, combining the disciplines of environmental law, energy policy, economics, governance, and sustainable development. Furthermore, the research identifies existing policy implementation literature gaps, particularly on the aspects of institutional coordination, regulatory enforcement, and participation of stakeholders. The implications are that comparative, doctrinal and mixed methodology approaches have to be adopted to comprehensively analyze future renewable energy governance challenges and reforms.

Future Research Directions

Further studies on empirical assessment of renewable energy projects in Pakistan to evaluate the effectiveness of the current legal and policy environment in an operational context are required. More study is also required of institutional design models to improve the coordination of regulators, diminish fragmentation and increase the capacity for

enforcement. Research should be carried out on investor behavior in terms of investment barriers. Last but not least, it is critically important to have a framework that is more adaptive towards sustainable energy transitions in Pakistan integrated with a mix of disciplines including law, policy, economics and environmental science.

References

Andy, I. (2020). Legal frameworks governing renewable energy integration, environmental compliance, and sustainable economic growth in emerging global markets. *World Journal of Advanced Research and Reviews, 8*(3), 531-549 https://doi.org/10.30574/wjarr.2020.8.3.0500

Haar, L. (2016). *Renewable energy: Lessons from the EU experience.* Discussion Papers No. ks-1636-dp030a. King Abdullah Petroleum Studies and Research Center. https://ideas.repec.org/p/prc/dpaper/ks-1636-dp030a.html [1]

Hulio, Z. H., Jiang, W., & Chandio, G. S. (2022). Power policies, challenges, and recommendations of renewable resource assessment in Pakistan. *Sage Journals,* 40(3),9 47-976. https://doi.org/10.1177/01445987211064678

Leal-Arcas, R., & Minas, S. (2016). Mapping the international and European governance of renewable energy. *Oxford Yearbook of European Law, 2016 special issue Beyond Pluralism? Co-Implication, Embeddedness and Interdependency between Public International Law and EU Law,* pp. 1-46. https://doi.org/10.1093/yel/yew022

Mujahid, M., & Ahmed, T. (2019). A framework for sustainable energy policies: A case of Pakistan. *International Journal of Engineering Works, 6*(12), 431-438. https://doi.org/10.34259/ijew.19.612431438

Olabi, A.G. & Abdelkareem, M. A. (2022). Renewable energy and climate change. *ScienceDirect,* 158, 112111. https://doi.org/10.1016/j.rser.2022.112111

Serim, N., & Oran, F. C. (2017). The renewable energy policy convergence in the European Union: A comparison on Germany and Turkey's incentives for the wind and solar energy resource. *International Journal of Energy Economics and Policy, 7*(3), 308-320. https://izlik.org/JA33CW63ZZ

Wu, D., Yang, Y., Shi, Y., Xu, M., & Zou, W. (2022). Renewable energy resources, natural resources volatility and economic performance: Evidence from BRICS. *ScienceDirect,* 76, 102621. https://doi.org/10.1016/j.resourpol.2022.102621.

Susan, S. K. (2025). Renewable energy laws in Pakistan: Bridging the gap between policy and implementation. *Sarhad Institute of Legal Studies,* 1(2), 35–44. https://journal.suit.edu.pk/index.php/sjls/article/view/1152